
State of Food Security and Nutrition in Bangladesh 2014





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Foreword





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Ministry of Planning, Government of the People's Republic of Bangladesh

The Food Security and Nutritional Surveillance Project (FSNSP) by its activity has become a vital source of information in the area of food and nutrition. This joint venture of James P Grant School of Public Health, BRAC University, Helen Keller International and Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning and European Union has helped to chart the country's health and nutrition situation, and has yielded important findings on the causes of malnutrition. This information has been disseminated through annual reports since 2010. This is the fifth and last annual report "State of Food Security and Nutrition in Bangladesh 2014" published by this project. The report has highlighted the latest status of food security; water, sanitation and hygiene; nutrition in women and adolescent girls; maternal care and nutrition; child care and feeding; nutritional status of children of Bangladesh. The Government of the People's Republic of Bangladesh including different ministries e.g. Ministry of Planning, Ministry of Health and Family Welfare (MoHFW), Ministry of Food and European Union-Bangladesh are allied with different concern of FSNSP surveillance system and are immensely delighted to be a part of this survey. The information achieved through this surveillance will enable the creation of more effective policies and programmes through partnership between local and international institutions and the government. We also hope that, through utilization of new technology the nutrition surveillance will be institutionalized in BBS to generate more focused data that will help the government to undertake appropriate policy interventions on food security and nutrition. We welcome the release of the fifth annual report of the surveillance findings, and we look forward to this new knowledge being used both by government and civil society for their specific purposes.



Syed Monjurul Islam, Secretary
Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh

The Food Security and Nutritional Surveillance Project (FSNSP) by its activity has become a vital source of information in the area of food and nutrition. This joint venture of James P Grant School of Public Health, BRAC University, Helen Keller International and Bangladesh Bureau of Statistics, Ministry of Planning and funded by European Union has helped to chart the country's health and nutrition situation, and has yielded important findings on the causes of malnutrition. This information has been disseminated through annual reports since 2010. This is the fifth and last annual report "State of Food Security and Nutrition in Bangladesh 2014" published from this project. The Government of the People's Republic of Bangladesh including different ministries e.g. Ministry of Planning, Ministry of Health and Family Welfare (MoHFW), Ministry of Food and European Union-Bangladesh are allied with different concern of FSNSP surveillance system and have been immensely delighted to be a part of this national nutrition surveillance system and from this year through HPNSDP we have started funding FSNSP. I expect, the information achieved through this surveillance will enable the creation of more effective policies and programmes through partnership between local and international institutions and the government. MOHFW is also working on institutionalization of nutrition surveillance, along with BBS to generate more focused data that will help the government to undertake appropriate policy interventions on food security and nutrition. We welcome the release of the fifth annual report of the surveillance findings, and we look forward to this new knowledge being used both by government and civil society for nation's progress towards the targets around food security and nutrition.



Pierre Mayaudon
Ambassador of the European Union to Bangladesh

I am glad to launch the release of this fifth annual report on "State of Food Security and Nutrition in Bangladesh 2014". The Food Security and Nutritional Surveillance Project (FSNSP) is a joint initiative between BRAC University and Helen Keller International coordinated with the Bangladesh Bureau of Statistics (BBS), Ministry of Planning. Over the last years, this annual report became a reliable source of nutrition-related information supporting policy development and implementation, providing evidence for analysis, planning and financing. With a stronger understanding of the major drivers of malnutrition, I strongly believe Bangladesh will be better prepared to translate poverty reduction and food availability into faster improvement on nutritional outcomes. The EU looks forward to the nutrition surveillance mechanisms being fully institutionalised. I trust the Government will be in a position to continue generating relevant quality information and analysis, and to develop the appropriate partnerships and policy interventions to consolidate and sustain food and nutrition security achievements for the betterment of the people of Bangladesh.



Executive Summary



In 2014, Bangladesh sustained an upward trajectory in advancing food security and nutrition alongside other areas of economic and social development. Overall, food security status improved from 2013, while child nutrition indicators remained unchanged. Maintaining this trend will require redoubled efforts and targeted approaches to reach nutritionally vulnerable populations across the country.

Using state-of-the-art methods and indicators, the Food Security Nutritional Surveillance Project (FSNSP) has been providing seasonal, nationally representative estimates of the food security and nutrition situation of Bangladesh since 2010. In 2014, FSNSP surveyed 27,072 households in 969 villages and 159 mohallas. In randomly selected households, a total of 22,713 women aged 19 to 49 years, 4,763 adolescent girls aged 10 to 18, and 1,603 pregnant women were interviewed. Additionally, 13,918 children were measured and 11,680 caregivers were interviewed about care and feeding practices for the youngest child in the household.

Food security

FSNSP provides information on food availability, accessibility and utilization in households of Bangladesh. The average cost of the food basket in Bangladesh declined slightly in 2014, and food security improved. The number of households that reported worrying about food decreased from 2011 to 2014, with the largest reduction in households experiencing frequent episodes of worry. As was the case in prior years of surveillance, among household members, adult women are most likely to sacrifice intake in times of shortage, followed by men. Adolescent girls and even those aged 5-9 years tend to sacrifice intake before male children of similar ages. Support from social safety nets such as cash for education, old age allowance, freedom fighter allowance have reached to one third of households in 2014.

Water, sanitation and hygiene

Bangladesh has made tremendous improvements in providing improved drinking water and toilet facilities throughout the country. However, much work is needed to foster proper sanitation and hygiene practices. Residence in rural areas, low economical status, low maternal education, food insecurity, and inadequate facilities are some of the factors associated with improper hand washing practices. Around one quarter of mother/caregivers of under five children in Bangladesh practice appropriate hand washing behaviours with much lower adherence during crucial moments such as before feeding children (2%) and before and during meal preparation (4%). Even among wealthier households, only 35% of the caregivers of under five children practice appropriate hand washing behavior although the availability of soap is very high (97%). It is concerning that only 40% of the households of Bangladesh have improved toilet facility and 26% of the households of Bangladesh have shared toilet facility. On a positive note, accessibility to improved sources of drinking water was almost universal.

Nutrition in women and adolescent girls

In 2014, more than half of the Bangladeshi women age 19 to 49 years consumed diets of inadequate diversity, with those living in rural areas and from Barisal, Rajshahi and Rangpur divisions representing the worst off. The effect of early marriage, poverty and early pregnancy on

the linear growth have apparent in rates of short stature that are higher among adolescent mothers aged 10-18 years with children (44%) compared to those without children (24%). The nutritional status of adult women is significantly associated with wealth and food security status. A distinct and growing trend of double burden of undernutrition continues to be apparent, with a higher proportion of women from the lower wealth quintiles being underweight (poorest, 29% and wealthiest, 8%), while the proportion of overweight & obesity greater among those residing in higher quintile households (poorest, 22% and wealthiest, 62%).

Maternal care and nutrition

Adolescent girls of Bangladesh continue to experience unacceptable levels of early marriage and early pregnancy. In 2014, a slight rise in the proportion of women reporting adequate ANC visits and ANC in the early stage of pregnancy have apparent, with an increase of 10% in the proportion of women visiting a trained health care provider for ANC. IFA consumption during pregnancy also improved in 2014 compared to the previous four years of surveillance. Adequate dietary diversity during pregnancy improve slightly during first and second trimesters, and the proportion of women "at risk" in terms of their nutritional status, decline from 21% in 2013 to 16% in 2014, although the proportion of women who are severely undernourished (2%) remain constant. Alarming, the proportion of women receiving post partum VAC within six weeks of delivery decreased in the last three years since 2011. In contrast, the percentage of women receiving PNC within 42 days of delivery increase slightly in 2014 (from 42% in 2013 to 44% in 2014), continuing a rising trend since 2010. Low birth weight, which provides a proxy indicator for assessing maternal undernutrition, while found in two-fifths of children weighed at birth.

Child care and feeding

Over the last few decades there have been significant improvements in child nutrition and health care in Bangladesh. However, child nutritional care related to appropriate infant and young child feeding (IYCF) practices remains unsatisfactory. The prevalence of children who are exclusively breastfed declined from 2013. This is particularly apparent in the first month of life when rates of exclusive breastfeeding decreased from 74% in 2013 to 67% in 2014 due to an increased rate of other milk feeding. Interestingly, in 2014, working mothers tended to practice early initiation of breast feeding and to avoid prelacteal feeding in a greater proportion than non-working mothers. Majority (88%) of children 6-8 months of age are fed complementary foods during 2014, but only 19% of them are fed diets diverse enough to provide adequate micronutrients. Regarding complementary feeding during first two years of life, only two-fifths of children under two years are taking minimally adequate diets in 2014. Although this is a notable improvement in the proportion of children having minimally adequate diets since 2011, the current level is still much lower than the target of 52% set in the HPNSDP. Regarding preventative health care, VAC coverage for children under 5 years has fallen from 90% in 2010 to 62% in 2014 due to drops in programme coverage. The proportion of children who received anti-helminthic tablets also dropped from two-thirds in 2013 to nearly three-fifths in 2014 although rates remain higher among those from food-secure households and children who have better educated caregivers.

Nutritional status of children

Child feeding, care and protection are the integral parts of FSNP which have unambiguous effects on the constant high rates of child under nutrition among Bangladeshi under five children. Since 2010, sizable declines in rates of childhood stunting have occurred. Falling from 45% in 2010 to 35% in 2014, the level of stunting in Bangladesh is now below the WHO cut-off for very high prevalence. However, the prevalence of wasting has not been change substantially during this period. The highest proportion of stunted (46%) and underweight (38%) children under 5 years of age were found in the Haor zone; while the highest rate of wasting (12%) was in the coastal belt. Acute undernutrition peaked during the monsoon season. Children of illiterate mothers, and those living in poor and food-insecure households, remain more likely to become undernourished.

Introduction





Food Security and Nutrition Surveillance

In support of this effort by the GoB, the Food Security and Nutrition Surveillance Programme (FSNSP) provides timely and accurate monitoring of the nutrition situation in Bangladesh. FSNSP builds on the 17 years of the Nutrition Surveillance Programme, managed by HKI and IPHN. FSNSP provides data and information about the level and distribution of food insecurity and malnutrition in Bangladesh to policy-makers, development partners and implementing agencies. FSNSP covers an extensive sample and implements rigorous quality control systems to ensure data precision and validity. It is the only source of seasonal, nationally representative data on food security and nutrition in Bangladesh.

As depicted in the FSNSP conceptual framework (Figure 1.1), the surveillance system's central objective is to detect changes in household vulnerability to nutrition and food insecurity by directly monitoring indicators of food insecurity and malnutrition, examining related variations in household-level factors and establishing links with data sources that measure change in the external factors listed outside the circles in the framework.¹

Figure 1.1: Conceptual framework



Additionally, while keeping methodologies sufficiently stable to enable comparison of data across time, FSNSP continues to evolve with changing national priorities and a deepening understanding of the factors which impact nutrition, such as those highlighted in the Lancet nutrition series. For

¹ External data sources identified include economic data from macroeconomic reports, BBS's Household Income and Expenditure survey, rain and weather data from meteorological services, and production data from agricultural reports, as well news media and regular health surveys like BDHS that capture cultural and policy changes, and associated health effects.

example, recognising the importance of nutrition-sensitive practices such as water and sanitation, in 2013 FSNSP started incorporating data collection around hand washing points in the home and observational methodologies to assess hand washing practices.

Structure of This Report

This report on the ***State of Nutrition and Food Security in Bangladesh: 2014*** presents selected annual and seasonal findings from three rounds of surveillance conducted during the fifth year of FSNSP surveillance. Its structure is similar to past reports enabling comparisons. Sections of this report, particularly in the description of the indicators used, are taken directly from the 2011, 2012 and 2013 reports.

The report reviews FSNSP's data collection methods, followed by surveillance results organised around six thematic headings: 1) Household characteristics, 2) Food security, 3) Water, sanitation and hygiene, 4) Nutrition of women and adolescent girls, 5) Maternal care and nutrition, 6) Child care and feeding, and 7) Nutritional status of children. The report presents national, divisional, and urban/rural estimates under each theme based on data collected in 2014. Seasonality is captured by comparing estimates from three rounds of data collection in surveillance zones and the nation as a whole.

Aggregates from more recent surveillance rounds can be found at the recently updated FSNSP website: fsnsp.bracu.ac.bd.



Methodology

FSNSP has continued its commitment to identifying households at greatest risk of food and nutrition insecurity.

FSNSP collects data representative of Bangladesh as a whole, of each division, and of agro-ecological zones at greater risk of food and nutrition insecurity.

FSNSP's methodology has not changed since 2012.

The system provides representative information about pregnant women, non-pregnant women, adolescent girls and households with and without children.

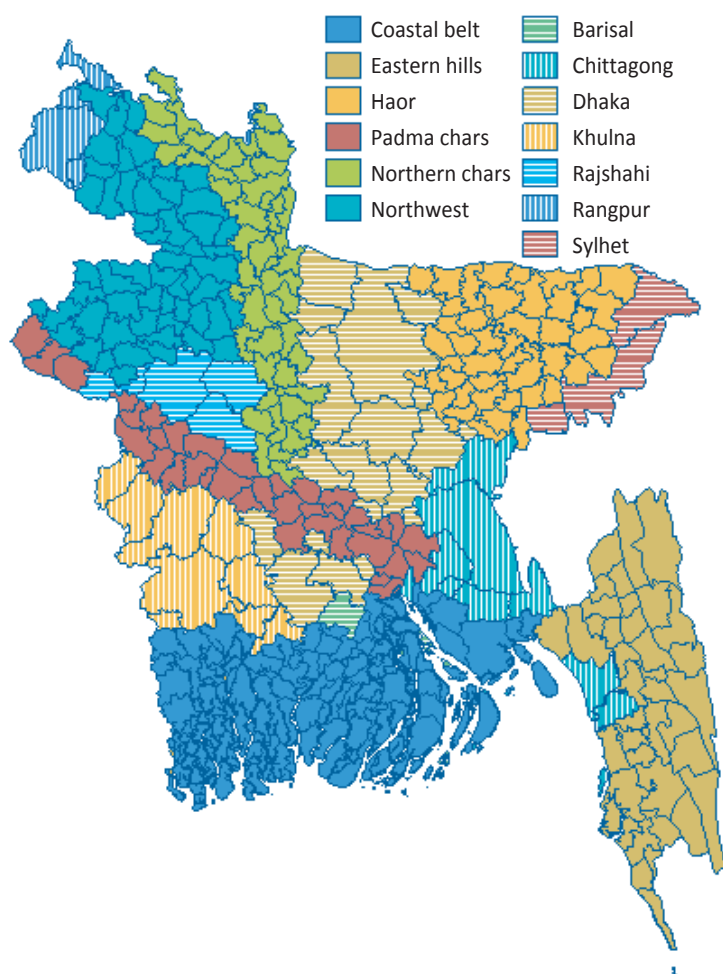
FSNSP collects multiple measures of nutritional status for women and children, including dietary diversity, height, weight and MUAC.

In 2014, FSNSP interviewed individuals from 27,072 households in 1,128 communities (villages/mohalla).



Since its inception, the Food Security and Nutrition Surveillance Project (FSNSP) has implemented a nationally representative surveillance system that tracks variation in indicators of food security and nutrition over three seasons in Bangladesh: the post-*aman* harvest period (January-April); the height of the monsoon (May-August); and the post-*aus* harvest season (September-December) (1). While FSNSP has consistently provided nationally representative data, sampling methods have been refined over time, most notably between the first and second rounds of data collection in 2010, and between Round 3, which ended in December 2010, and Round 4, which began in February 2011(2). Details on the first year of implementation and initial sampling methods can be found in *State of Food Security and Nutrition in Bangladesh: 2010* while additional details on the revised sampling methods can be found in the subsequent annual reports (2,3,4). In the fifth year of implementation, 2014, there were no changes in sampling procedures.

Figure 2.1: FSNSP surveillance zones (2014)



Sample selection

By identifying vulnerable zones for targeted surveillance, FSNSP maintains its commitment to identifying households at greater risk of food and nutrition insecurity, the large majority of which are clustered in specific geographic areas. The rationale behind and process of defining the surveillance zones was provided in the 2011 report (2).

Since 2011, FSNSP has used a three-stage sampling design to reduce travel time and provide a representative sample per zone. For the first stage of sampling, the country was divided into 13 strata as depicted in Figure 2.1. Six strata correspond to the six surveillance zones, while the remaining seven strata, which contain all the *upazila* not included in a surveillance zone, correspond to the seven divisions of Bangladesh. From each stratum, a set number of *upazila* were selected with replacement. For each of the six surveillance zones, twelve *upazila* were selected in

each round, while 22 *upazila* were selected from the other areas of the country. The number of *upazila* from non-surveillance zone strata varied depending on the number of *upazila* in the zone,

ranging from one to eight.¹ From each of the surveillance zones, *upazila* were selected by rotation into the sampling frame in order to reduce random variation in estimates between rounds, as has been recommended for surveillance systems by the UN (United Nations), and is commonly done in labour participation surveillance (5,6,7,8,9). This process is detailed in the 2011 report (1).

As was done since 2012, in 2014 the list of villages/*mohalla* in each *upazila* were broken into units of equal size before communities from this list were selected.² There was no stratification of rural and urban areas during the second stage of selection; four communities were chosen at random and without replacement from all the communities in each selected *upazila*. The third stage of sample selection was done in the field and has not changed since 2011. The team approached the assigned community starting from the first eligible house from a randomly assigned approach road (North, South, East, or West) as determined by a random number generator until 24 households were selected systematically and interviewed. The next and subsequent households for interview were chosen systematically by skipping four households from the previously interviewed household and, in a "zigzag" fashion, selecting households from both sides of the road. In situations where the identified household was not eligible for inclusion or refused participation, the next household that met the inclusion criteria was selected. Households were considered eligible for surveillance if there was at least one woman in the household aged 10 to 49 years.

The system of selecting caregivers, women, and children in each household for questionnaire administration and anthropometric measurements has not changed since 2011. In every household sampled, one non-pregnant woman or adolescent girl (10 to 49 years of age) was randomly selected for height/weight/mid-upper-arm-circumference (MUAC) measurement and asked a series of questions about dietary consumption. In addition, all currently pregnant women had their MUAC measured and were asked about their dietary patterns and care they received during pregnancy. All children less than five years of age in the household were weighed and measured, but only the caretaker of the youngest child in each household answered questions about child feeding and morbidity relevant to that child. See the 2011, 2012 and 2013 reports for further details on the implementation of the sampling system (2,3,4).

Sample size

The sample size of the system is verified before data collection each year. The system is designed to obtain representative prevalence estimates for indicators of food insecurity and child and women's undernutrition by surveillance zone. Sample size calculations were based on the estimated prevalence of eight key indicators:

1. Round-wise estimation of acute childhood undernutrition based on weight-for-length/height from the 2006 WHO Growth Reference (10,11,12)
2. Round wise estimation of child underweight based on weight-for-age from the 2006 WHO Growth Reference (10,12)
3. Annual estimation of child underweight based on weight-for-age from the 2006 WHO Growth Reference (10,12)
4. Annual estimation of chronic childhood undernutrition based on length/height-for-age from the 2006 WHO Growth Reference (10,12)

¹ The 22 *upazila* were stratified as follows: 8 *upazila* from Dhaka; 4 from Chittagong; 3 from Khulna; 2 each from Sylhet, Rangpur, and Rajshahi; and 1 from Barisal

² For further details see the 2012 report State of Food Security and Nutrition in Bangladesh: 2012 (3).

5. Round-wise estimation of the proportion of women with chronic energy deficiency (CED), which is defined as a body mass index (BMI) of less than 18.5 kg/m² among women 19-49 years of age (13,14)
6. Annual estimation of the proportion of women with CED, which is defined as a BMI of less than 18.5 kg/m² among women 19-49 years of age (13,14)
7. Round-wise estimation of the proportion of women who are overweight or obese based on the WHO-endorsed Asian cut-off, which is defined as a BMI of greater than 23.0 kg/m² among women 19-49 years of age (14)
8. Annual estimation of the proportion of women with overweight, which is defined as a BMI of greater than 23.0 kg/m² among women 19-49 years of age (14)
9. Round-wise estimation of the proportion of households with food insecurity as defined using the Household Food Insecurity Access Scale (HFIAS) (15)
10. Annual estimation of the proportion of households with food insecurity as defined using the HFIAS (15)
11. Round-wise estimation of the proportion of households with "food deficits" as defined using the Food Deficit Scale (FDS) (16)
12. Annual estimation of the proportion of households with "food deficits" as defined using the FDS (16)
13. Round-wise estimation of the proportion of households with poor or borderline food consumption patterns as defined using the Food Consumption Score (FCS) methodology and cut-offs designed for Bangladesh from the Household Food Security and Nutrition Assessment (HFSNA) (17)
14. Annual estimation of the proportion of households with poor or borderline food consumption patterns as defined using the FCS methodology and cut-offs designed for Bangladesh from the HFSNA (17)

Sample sizes for each round were calculated using the formula for calculating a 95% confidence interval for a single population proportion (given below). The formula used to calculate sample size is as follows (18):

$$n = [1 + \delta(c - 1)] \times \left[\frac{Z_{\alpha/2}^2 \times P \times (1 - P)}{E^2} \right]$$

where

- n = required minimum sample size
- δ = the inter cluster correlation
- c = the number of households sampled in each village (24 in this survey)
- P = the estimated prevalence of an indicator, and
- $Z_{\alpha/2}$ = the z-score corresponding to the degree of confidence with which it is desired to be able to conclude that an observed change of size $(P_2 - P_1)$ would not have occurred by chance ($Z_{\alpha/2}$ the level of statistical significance)
- E = $P_2 - P_1$

Estimates of the prevalence and inter-cluster correlation (ICC) used in calculating the sample size were drawn from the 2013 FSNP dataset.³ Based on this data, it was assumed that children aged

³ For these measures, estimated prevalence estimates were obtained by looking at all the food insecure zone wise estimates from all three rounds of data collection and using the estimate closest to 50% for each indicator. The ICC estimates were obtained by regressing the indicator of interest from the annual dataset over the village identifiers (using the xtlogit command in Stata) (20).

zero to five years would be in 49% of the households sampled, and women aged 19 to 49 years would be in 77% of the households sampled (based on 2013 results). These proportions were used to convert the sample size requirements for individuals (7th column in Table 2.1) into estimates of the number of households that would have to be visited to reach that many individuals (8th column in Table 2.1).

Table 2.1: Estimated sample size

<i>Indicators</i>	<i>Estimated Prevalence</i>	<i>Desired Precision</i>	<i>Desired sample</i>	<i>ICC</i>	<i>Design effect</i>	<i>Required sample</i>	<i>Required households (each round)</i>
Child Indicators							
Acute (wasting, seasonal)	17%	5.0%	214	0.08	1.889	404	826
Underweight (seasonal)	42%	7.5%	166	0.06	1.681	279	570
Underweight (annual)	35%	5.0%	351	0.06	1.647	578	394
Chronic (annual)	45%	5.0%	380	0.08	1.889	718	489
Women's Indicators (19-49 years of age)							
Women's CED (seasonal)	30%	7.5%	145	0.11	2.875	417	540
Women's CED (annual)	28%	5.0%	309	0.10	2.765	854	369
Women's overweight (seasonal)	47%	7.5%	170	0.13	3.227	549	710
Women's overweight (annual)	44%	5.0%	378	0.11	2.277	1239	535
Household Indicators							
Food insecurity (HFIAS, seasonal)	50%	7.5%	171	0.22	6.052	1035	1035
Food insecurity (HFIAS, annual)	49%	5.0%	384	0.20	5.628	2161	720
Food deficit (FDS, seasonal)	31%	7.5%	147	0.30	7.841	1153	1152
Food deficit (FDS, annual)	18%	5.0%	225	0.24	6.494	1461	487
Food consumption (FCS, seasonal)	32%	7.5%	148	0.26	6.900	1021	1021
Food consumption (FCS, annual)	26%	5.0%	294	0.26	6.907	2031	677

The largest sample size required by these indicators was the number of households needed to estimate food deficit seasonally, which was calculated to be 1,152 households per zone per round. This requirement was met by including 12 *upazila* in each zone and interviewing 96 households per *upazila* (24 households in each of four communities). In keeping with these minimum requirements, the final sample size was 1,152 households per surveillance zone per round. The total target sample size per round was 9,024 households.

Measurement

Surveillance data were collected through structured interviews by means of paper questionnaires and proprietary survey software (Survey master v1 & v2, HKI) administered using commercially available personal digital assistants (PDAs) (Hewlett Packard, HP iPAQ 112, USA). The questions were the same on the paper questionnaire and the PDA. More than one third of the data were collected using PDAs. Data collected on PDAs were imported using the Survey master software, while data collected using paper questionnaires were entered into a custom-made data entry screen. To the extent possible, surveillance questionnaires and protocols employed by FSNP are based on existing global standards and guidelines. Surveillance instruments are available on the

FSNSP website (www.fsnsnp.net), and key indicators are described in the relevant sections of this report. The questionnaire used in the third year of FSNSP closely matches the format and structure of the questionnaire used in the first year and second year, details of which can be found in past reports (1,2). There were no changes in the questionnaire between the first two rounds (Round 13 and Round 14) of 2014, while a minor change in the questions related to food consumption pattern of women has been made in Round 15.

Enumeration team training

Data collection officers received two weeks of initial training on how to interview, use PDAs for questionnaire administration, conduct anthropometric measurements, and maintain anthropometric instruments. Before each surveillance round, a one-week refresher training was conducted to share lessons learned from the field and discuss any changes in the questionnaire. Mid-way through each round of data collection, a one or two-day refresher training was organised to reinforce skills and knowledge.

Anthropometric measurement

In each selected household, the weight of children, women, and adolescent girls was measured to the nearest 0.1 kg using a portable electronic weighing scale (TANITA Corporation Japan, model HD-305). The height of women, adolescent girls, children older than two years of age, and the recumbent length of children younger than two years of age were measured to the nearest 0.1 cm using a locally made height and length board. The MUAC of children, women (both pregnant and non-pregnant), and adolescent girls was measured to the nearest 0.2 mm using a numerical insertion tape produced by Teaching Aids at Low Cost (TALC). All anthropometric measurements were performed according to WHO guidelines as specified in the FANTA anthropometry manual (19).

Consent and ethical clearance

To obtain informed consent, FSNSP field coordinators explain the objectives and procedures of the surveillance system to the leaders of the selected districts, upazila, and communities. At the beginning of each interview, the data collection officers give details about the purpose of surveillance and read a statement which informs them that participation is completely voluntary and that respondents who grant consent have the right to refuse to answer any questions and to discontinue the interview at any time. Consent for measuring children less than five years of age is obtained from their caretaker.

Field work

In 2014, data were collected by 36 two-member teams which consisted of one female and one male data collector who shared responsibility for interviewing and anthropometric measurements. This is the same management structure as was used in the last two surveillance rounds of 2013.

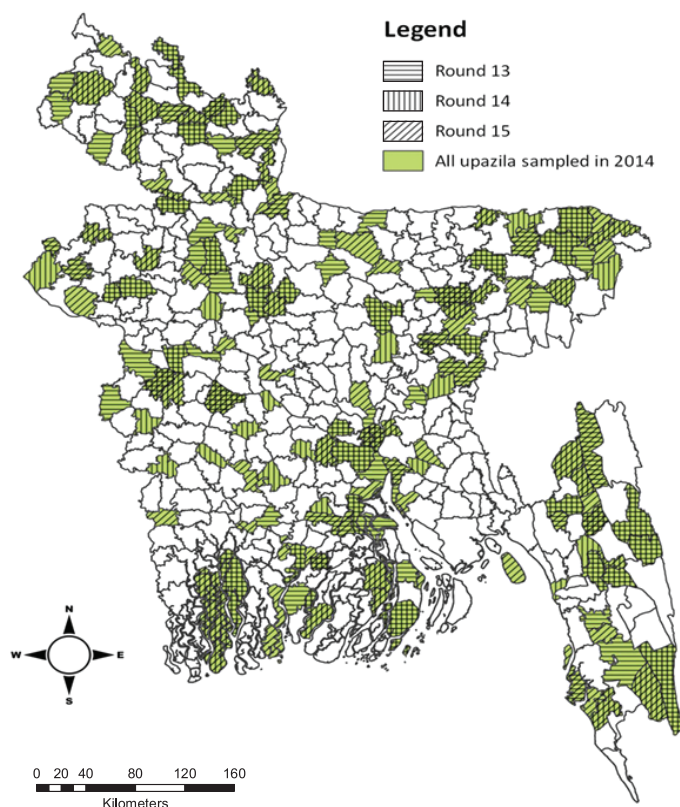
Monitoring officers supervised the activities of every team, and two field managers provided oversight of the data collection process.

Table 2.2: Dates of data collection

Round	Dates
13	February 06 - April 29
14	June 07 - September 15
15	October 18 - December 28

The three rounds of data collection (Table 2.2) were divided into two phases. The data collection teams spent four to six weeks at a time in the field. The monitoring officers visited each data collection team at random at least once a week to check questionnaires and ensure adherence to the questionnaire protocol in the field.

Figure 2.2: Sampled upazila by round



During 2014, 27,072 households were interviewed in 969 rural communities and villages and 159 urban communities (1128 communities in total) of 170 upazila. Overall, refusal rates remained low, with only 661 households declining to participate in the survey (2.4%). As expected, refusal rates in urban areas were much greater than in rural areas (rural: 1.5% and urban: 8.4%). As this is a doubling of refusal rates from the last year, this indicators will be watched closely during the final round of the project and considered seriously during plans to continue this project. In selected households, a total of 22,713 women aged 19 to 49 years of age and 4,763 adolescent girls aged 10 to 18 years of age were interviewed. Of these 27,476 women and girls, 1,603 were pregnant (5.8%). Additionally, 13,918 children were measured and 11,680 caregivers were interviewed about the care and feeding practices of the youngest child in the household. Table 2.3 breaks these aggregate figures up by surveillance round.

Table 2.3: Number of communities, households, and individuals sampled

	Round 13	Round 14	Round 15
Communities	376	376	376
Households	9,024	9,024	9,024
Women and girls	9,160	9,167	9,149
Young children	4,730	4,534	4,654

Quality control

Data quality was ensured through multiple procedures of review and cross-checking. Monitoring officers reviewed all questionnaires on the day

of completion by the data collectors so that any errors or inconsistencies identified could be corrected in the field. Quality control officers revisited a randomly selected sub-sample (around 10%) of interviewed households within 48 hours of the initial visit by the data collection team to verify the quality of data collected. For all three rounds conducted in the second field year of FSNP, internal FSNP quality control operations were supplemented by Bangladesh Bureau of Statistics (BBS) staff performing a 10% post-enumeration check using a shortened questionnaire.

Quality control data were compared to the surveillance data collected by data collectors. Inconsistencies were reviewed by the project manager, project coordinator, training officer, and field managers to identify possible reasons for the discrepancy and to implement appropriate solutions, such as a review session on selected indicators during the refresher training or a revision of the questionnaire.

Data management

Data entry or importation was done concurrently with data collection. Data obtained using paper questionnaires were entered on two computers using a data entry programme developed in FoxPro software (v2.6) while PDA data were imported using Surveymaster (HKI, v2). One senior data management officer supervised data entry and cleaning, including the transfer of data from PDAs to computer and merging the data from paper questionnaires and PDAs using SPSS Statistics (IBM, v19).

Data management officers reviewed, edited, and cleaned the data by performing a series of logic, frequency and data range checks.⁴ Any inconsistencies identified were checked visually by comparing the electronic entry to the entry on the original questionnaire or to the data collectors' notebooks. If required after this further examination, the senior data management officer made necessary corrections. The data management officers consulted with field managers and monitoring officers to understand any discrepancies during the data cleaning process.

Statistical analysis

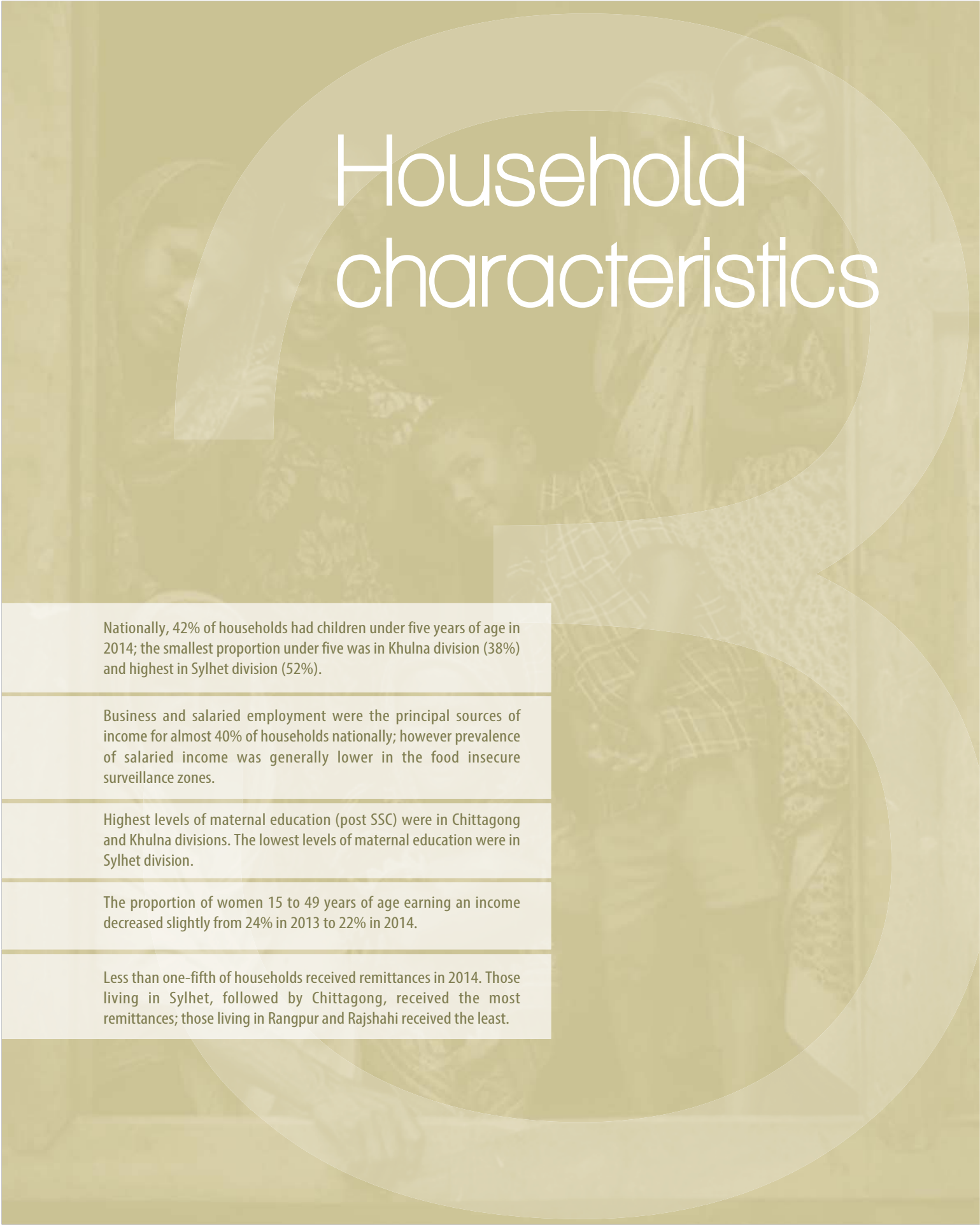
Data analysis was done using Stata (StataCorp, v13.0). In this report, the data are described using proportions and means. Whenever statistical significance is referred to in the text, the tests employed were an Adjusted Wald (for proportions) or a t-test (for means) with a 95% confidence level. Estimates were weighted using sampling weights that were constructed based on each household's probability of selection. These weights were constructed using the same sampling frame used for sample selection which is housed at BBS (2011 census, 2nd field sampling frame). All analyses and estimations were performed utilising the svy commands in Stata, to take into account the complex sampling design.

Strengths and limitations

Revisions to the design and sampling strategy of FSNSP in its second and third years of implementation have added to its strength and credibility as a nationally and sub-nationally representative surveillance system. Moving forward, FSNSP will continue to learn, adapt and adopt the latest surveillance strategies and technologies. The major challenge confronting the system is to maintain comparability to previous years of data even when system improvements are taking place. In this report, systematic efforts are made to overcome this challenge by linking and/or reanalysing past and present datasets using common indicators, and displaying national and regional estimates. The limitations of the system in 2014, as was the case in 2013, are mainly with regards to the way

⁴ The manual which guides these routine operations is available upon request.

the sampling system is collected at the field level. Though the on-the-spot, field sampling method has resulted in a low level of absent households, to date, this may change in the future. Moreover, though every effort was made to visit the randomly selected sample of communities, it was not always possible for the surveillance team to visit the most remote locations. This was particularly true in the Chittagong Hill Tracts, due to government regulations and security concerns.



Household characteristics

Nationally, 42% of households had children under five years of age in 2014; the smallest proportion under five was in Khulna division (38%) and highest in Sylhet division (52%).

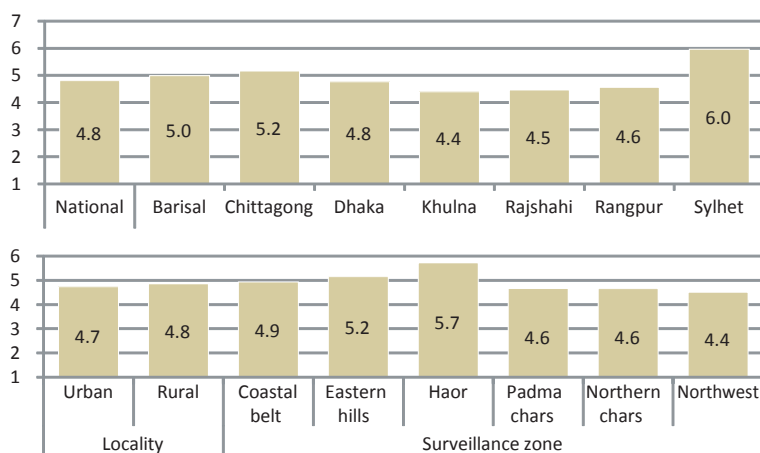
Business and salaried employment were the principal sources of income for almost 40% of households nationally; however prevalence of salaried income was generally lower in the food insecure surveillance zones.

Highest levels of maternal education (post SSC) were in Chittagong and Khulna divisions. The lowest levels of maternal education were in Sylhet division.

The proportion of women 15 to 49 years of age earning an income decreased slightly from 24% in 2013 to 22% in 2014.

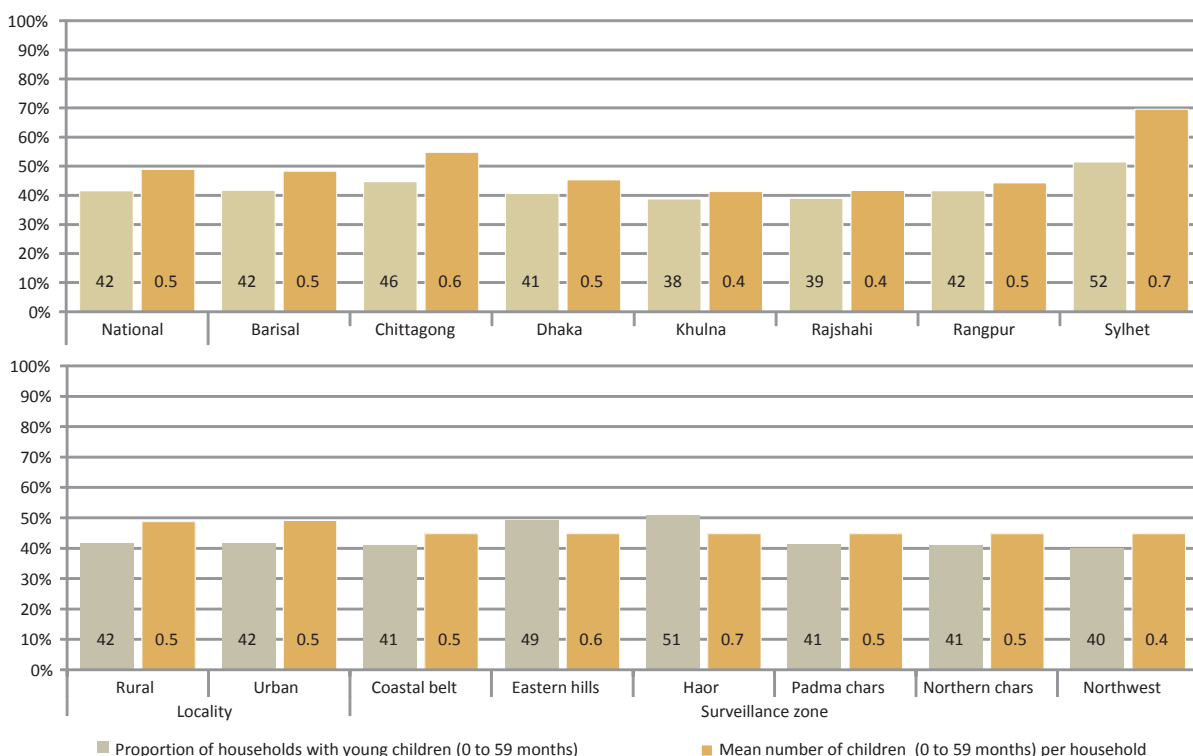
Less than one-fifth of households received remittances in 2014. Those living in Sylhet, followed by Chittagong, received the most remittances; those living in Rangpur and Rajshahi received the least.



Figure 3.1: Average household size by area of residence

Similar to the previous years, the mean household size estimated through the FSNP system was 4.8 members- slightly larger than the 2011 Census (4.4) and the 2011 BDHS (4.6) (1,2,3,4,5,6). The difference between these results and FSNP is likely due to the exclusion of households without a woman 10-49 years of age in the FSNP system (and thereby the *de facto* exclusion of single member households) and/or the *de jure* definition of households employed by FSNP.

Estimates of household size have been consistent since FSNP began (3,4,5,6). Additionally, the ranking of divisions by household size is similar between FSNP estimates and the 2011 census (1), with the largest average household size found in the eastern divisions of Sylhet and Chittagong, and the smallest in the western divisions of Khulna, Rajshahi and Rangpur. In line with the previous findings, average household size was higher in rural areas compared to urban areas but the largest household size was found in the Eastern hills and Haor (Figure 3.1). As expected, no differences in household size were observed across seasons (graph not shown).

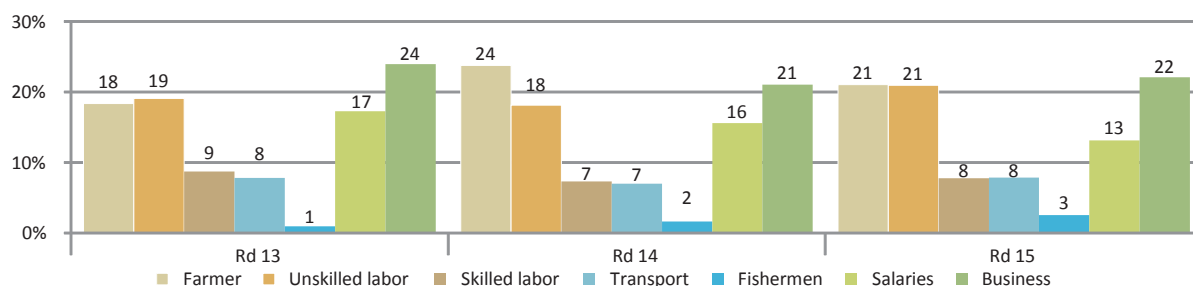
Figure 3.2: Proportion of households with children (0-59 months) and the mean number of children per household

Consistent with past results, fewer than half of households included a child younger than five years of age (Figure 3.2). Around 16% of households with children under five had more than one child in this age range, leading to an overall average of 0.5 children less than five years of age per household, roughly the same since 2011. In 2014, the number of children under five and the proportion of households with under five children varied greatly across different regions of Bangladesh. Divisionally, the smallest proportion of children under the age of five was found in Khulna (38%), with an average number of 0.4 under five children per household. In contrast, Sylhet had the highest proportion of households with under five children (52%), followed by Chittagong (46%) where a steady decline in the average number of children per households has been seen since 2012.

Household occupation

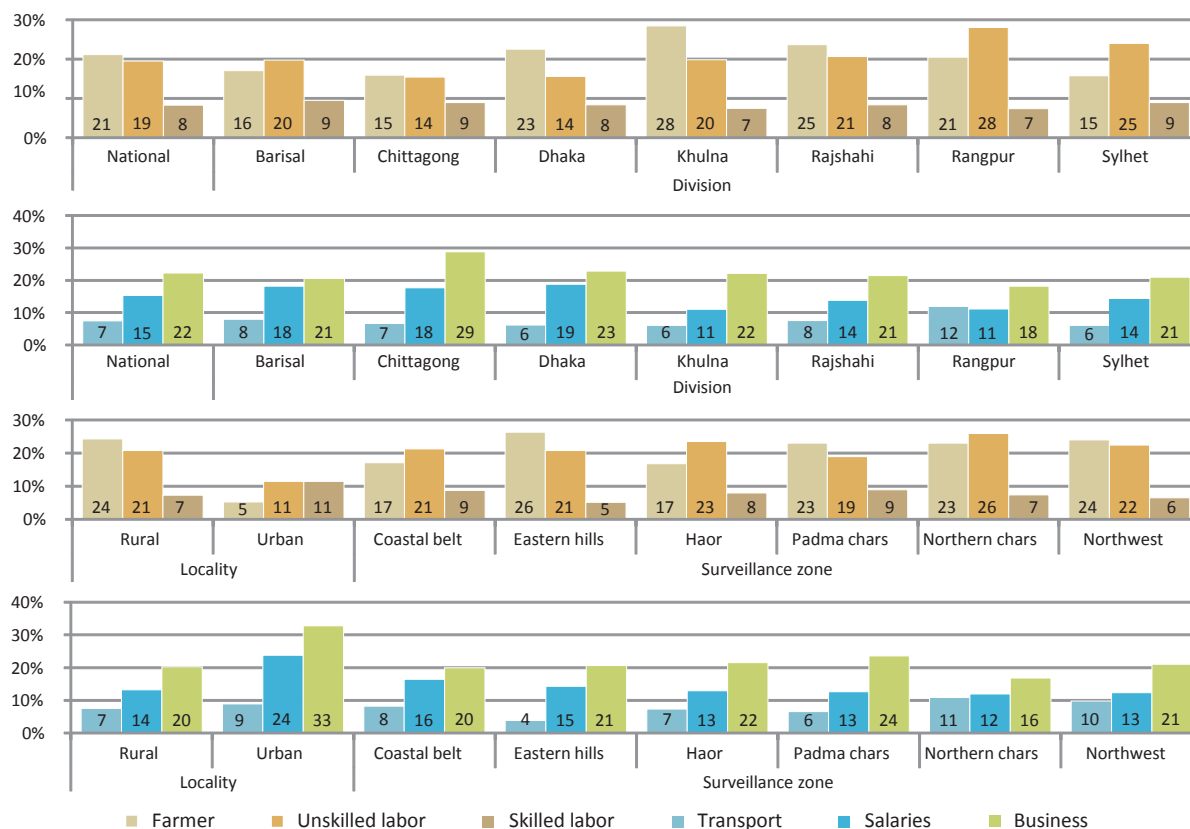
FSNSP classifies the occupation from which every member of the household earned income in the two months prior to the interview into 20 categories. Additionally, FSNSP records which member of the household is the principal income earner.¹ Using these two pieces of information, FSNSP categorises households by the main occupation of the principal income earner. For reporting purposes, occupational data were further grouped into seven occupation types: 1) farmer - farming their own leased, owned, controlled, or sharecropped land; 2) unskilled day labourer - daily or contract wage labour that does not require training; 3) skilled day labour - labour that requires formal or informal training; 4) transport sector - transporting goods or people; 5) fisherman - catching fish on open or owned waters; 6) salaried worker - employed and drawing a regular wage; 7) business - trade in any good, including petty trading.

Figure 3.3: Occupation of principal income earner by season

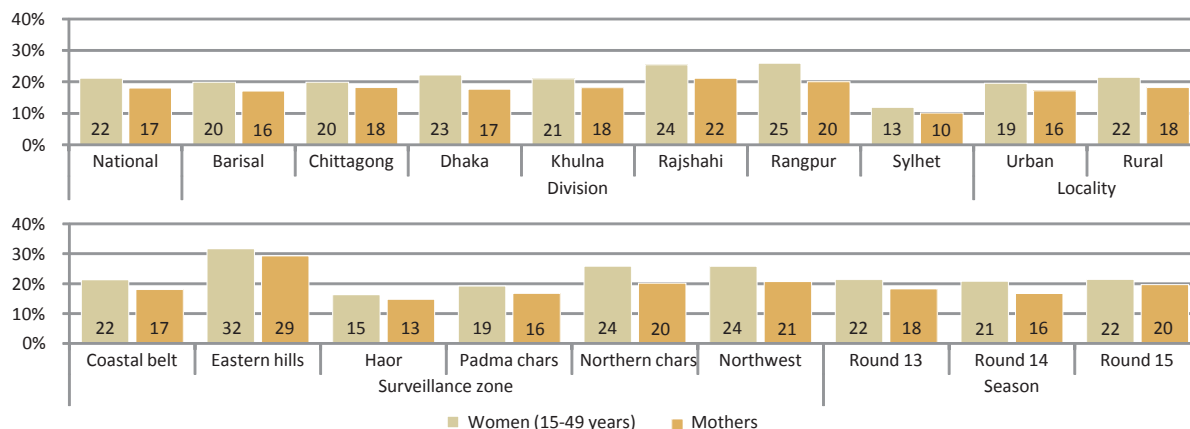


Only the proportion of households with main income earners primarily earning income from farming increased substantially across seasons (Figure 3.3). In addition, distinct occupational patterns were apparent for some occupations across the regions of Bangladesh (Figure 3.4). Reliance on skilled labour was similar across areas but rates of unskilled labour varied from around 25% in the three western divisions of the country (Khulna, Rajshahi, and Rangpur), to only around 14% in Dhaka and Chittagong. No specific trend in occupational pattern was seen between 2011 and 2014 in any region. Nationally, business and salaried employment (combined) constituted the principal source of income for around 40% of households, reaching almost 60% in urban areas. As expected, the proportion of households earning income from farming and unskilled labour was much greater in rural compared to urban areas, though the proportion earning income from skilled labour was close. Farming, unskilled day labour and business seems to be the dominant source of income in all the agro ecological zones since 2011.

¹ Even if the principal income earner for the households did not reside in the household, the income category for this member was obtained and categorised.

Figure 3.4: Occupation of principal income earner by area of residence

As shown in Figure 3.5 FSNP also captures women's contributions to household income even if these women primarily identify as housewives. Nationally, 22% of women 15 to 49 years of age earned income while only 17% of mothers with a child younger than five years of age did so. Both of these estimates are slightly higher than those were in 2013. Notably, the proportion for both of these indicators was higher in rural areas compared to urban areas. The highest proportion of women as well as mother earned income in the Eastern Hills, while Haor had least proportion of women as well as mothers doing so. Overall, there was a steady and significant increase in the proportion of women earning in all three seasons of 2014.

Figure 3.5: Proportion of women and mothers earning income by area of residence and season

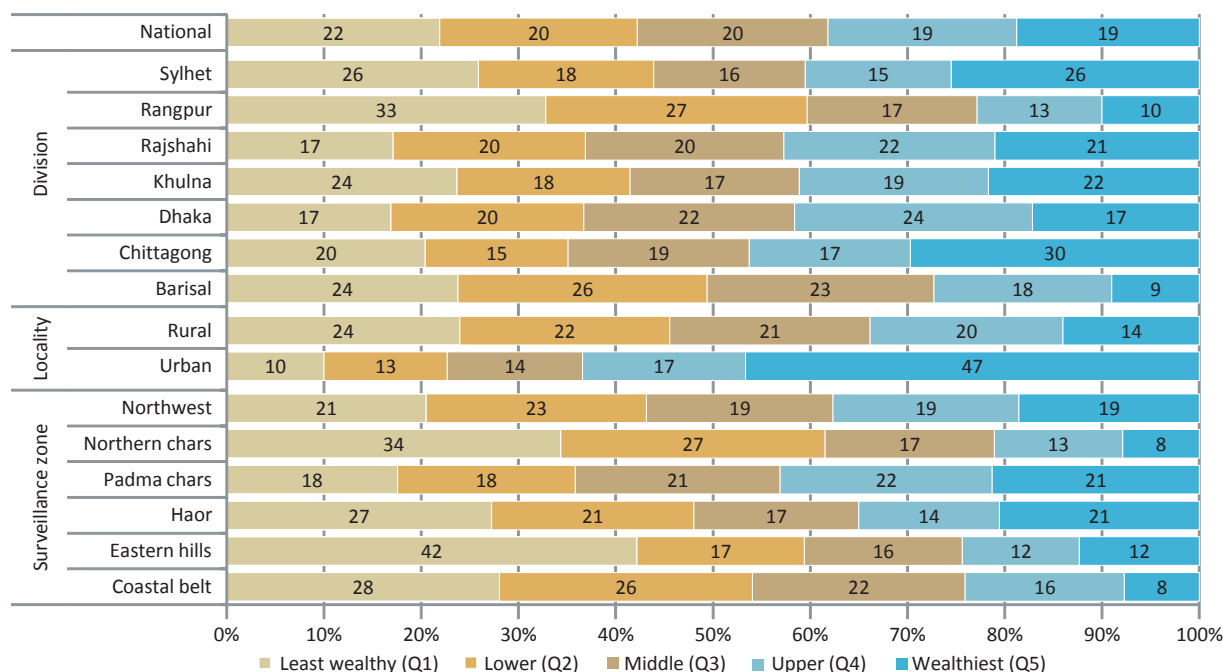
Household relative wealth

The surveillance system collects information on the quality of household structures, cooking, water and sanitation systems, and asset ownership. These household characteristics are typically associated with overall health and nutritional outcomes and the ability to weather periods of crisis. Additionally, using standard methodology, these assets can be used to determine the relative wealth status of households (7,8,9). There has been a steady increase in the number of households with access to electricity, with 58% of households with access in 2011, 62% in 2012, 68% in 2013 and 72% in 2014 (figure not shown). By contrast, there has been little change in the floor and roofing materials used to construct dwellings. Only 21% of households live in a dwelling where the floors, walls, and roofs are made of finished materials, declining slightly from the previous year.

Wealth index

Based on these characteristics and the assets that households owned, a composite wealth index was derived using the DHS method which consists of area specific indexes that are combined into a national model (9).² The wealth index was then divided into five quintiles, each containing an equal population of household members. Figure 3.6 displays wealth quintiles by division, rural or urban locality and surveillance Zone. Overall, richer families had slightly larger households, resulting in slightly lower proportions of households in the upper wealth quintiles. Dhaka and Rajshahi division had the lowest proportion of households in the poorest wealth quintile and Chittagong had the greatest proportion in the wealthiest quintile. In line with previous year, Rangpur had the highest proportion of households in the least wealthy quintile, one-third of households, and the fewest numbers of households in the wealthiest quintile (one-tenth). Rural areas were much poorer on average than urban areas, in line with the findings from 2012 and 2013 which also used the new wealth index creation method. All surveillance zones except the Padma chars and Haor were less wealthy on average than the nation as a whole.

Figure 3.6: Proportion of households in each wealth quintile by area of residence



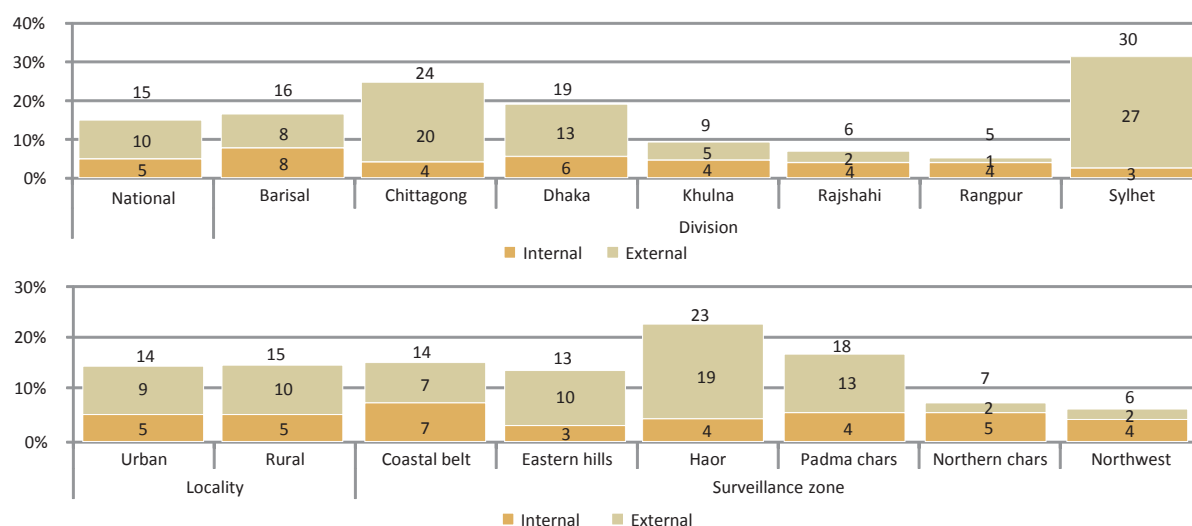
² This wealth index was constructed using the same methodology that the DHS system has used from 2010 (9,2) and used in FSNSP starting with the 2012 report (5). The 2010 and 2011 reports used the previous wealth index methodology initially outlined in Filmer and Pritchett, article and subsequently adopted by the DHS system (8,7). This index was derived separately for rural areas, municipalities, and city corporations, before being combined with nationally relevant indicators. A complete list of the variables used in this index is given in Appendix B on page 156.

Remittance

Workers' international remittances-transfers from national and international migrants to family members in their country of origin-represent one of the largest sources of financial flows to developing countries. Because remittances are generally spent on consumption necessities food, clothing, medicine, and shelter-they help lift huge numbers of people out of poverty by supporting a higher level of consumption than would otherwise be possible (10).

In 2014, FSNSP estimated the relative flow of remittance and also the source of remittance nationwide. Figure 3.7 indicates that less than one-fifth households received remittance in 2014 declining slightly from the previous year with changes in foreign remittances accounting for most of the variation. Sylhet was the highest remittance receiver followed by Chittagong where a sharp decline has occurred since 2013. Rajshahi and Rangpur ranked lowest in terms of remittances. Among the surveillance zones, reported remittances were lowest in Northern chars and Northwest, and highest in the Haor. Seasonally, a greater share of remittances was received in Round 14 compared to Round 13 and 15.

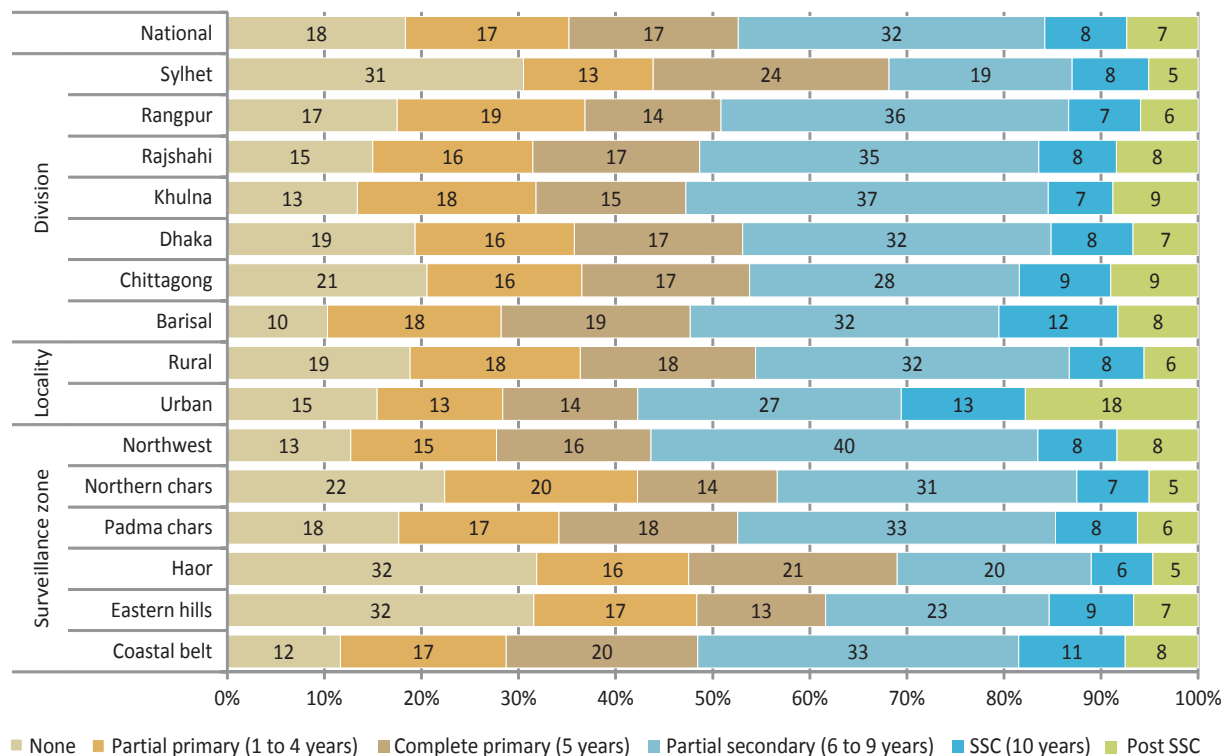
Figure 3.7: Source of remittance by type and area of residence ³



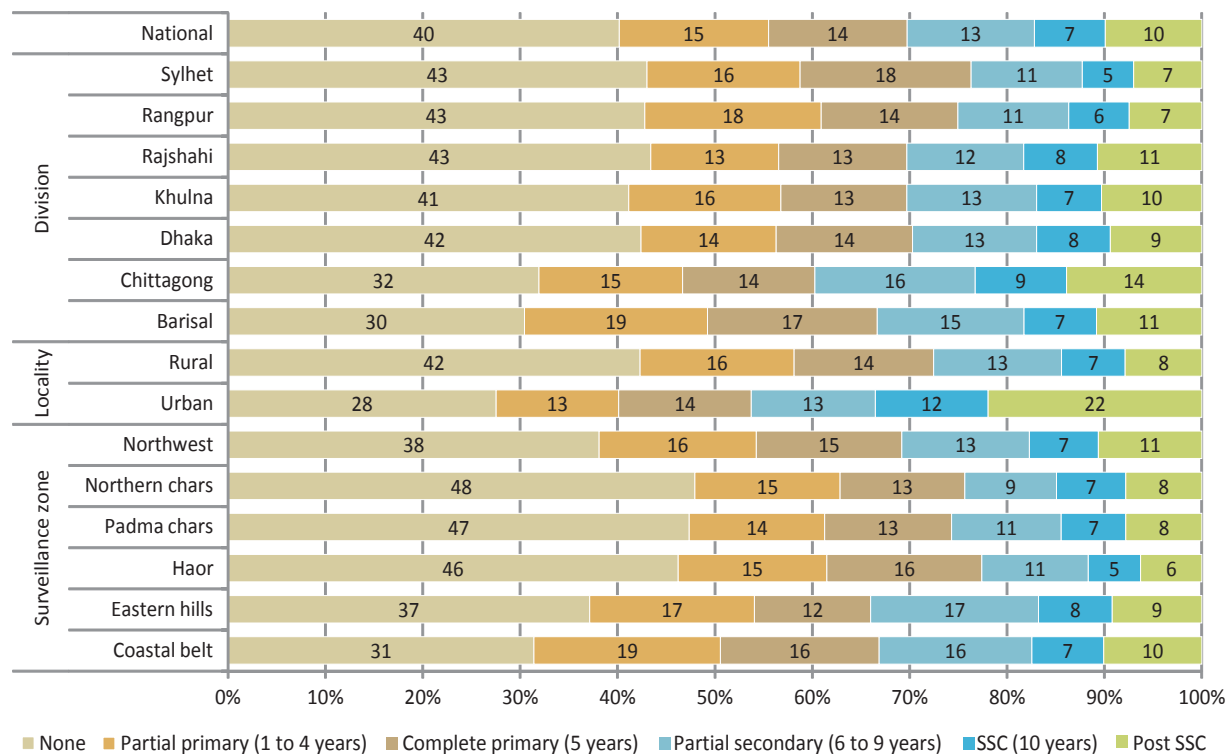
Education levels

The educational attainment of all household members is recorded in years of education passed and later categorised into six groups as follows: 1) none - 0 years; 2) partial primary - 1 to 4 years; 3) primary completion - 5 years; 4) partial secondary - 6 to 9 years; 5) SSC certificate - 10 years; and 6.) Post SSC - 11 or more years. This report uses two household indicators to summarise education levels in different areas of the country and for households with different structures and sizes. Educational attainment level of the mother is used to examine childcare and feeding practices, given the known importance of maternal education as a protective factor against childhood malnutrition and illness; the educational attainment of the household's principal income earner is used for most other analyses. Additionally, indicators reflective of the situation of adult women are presented against the woman's own educational attainment.

³ The proportion of both internal and external source of remittance is not shown as estimate is less than 1% for all categories (Figure 3.7).

Figure 3.8: Educational attainment of mothers by area of residence

Maternal education and the education of the household's principal income earner were strongly correlated across regions but only weakly within households (Figure 3.8 and 3.9). Interestingly, a greater proportion of principal income earners, compared to mothers, were more educated (more than ten years) and completely uneducated (zero years). Nationally, around 18% of mothers had never gone to school compared to over 40% of principal income earners. Across divisions, the highest level of maternal education (post SSC) was found in Chittagong and Khulna. For principal income earners, highest level of education was found in Chittagong followed by Barisal and Rajshahi. A greater proportion of people with the lowest level of educational attainment was found in Sylhet, Rajshahi and Rangpur for principal income earners and in Sylhet for mothers. As expected, people in urban areas were much more educated than those in rural areas. On average, educational attainment in the surveillance zones was around the national average.

Figure 3.9: Educational attainment of principal income earners by area of residence



Food security

The cost of the average food basket in Bangladesh has fallen in 2014, and food security has generally improved across a range of indicators.

The number of households who reported worrying about food fell dramatically from 2011 to 2014, with the largest reduction among those who reported frequent episodes of worry.

Sacrifices in consumption of food, particularly in times of scarcity is highly gendered. Where only one person in a household must make a sacrifice in their diet it is almost always an adult woman. Adults, including men, tend to make consumption sacrifices in favour of children, but girls sacrifice food more often and sooner than boys.

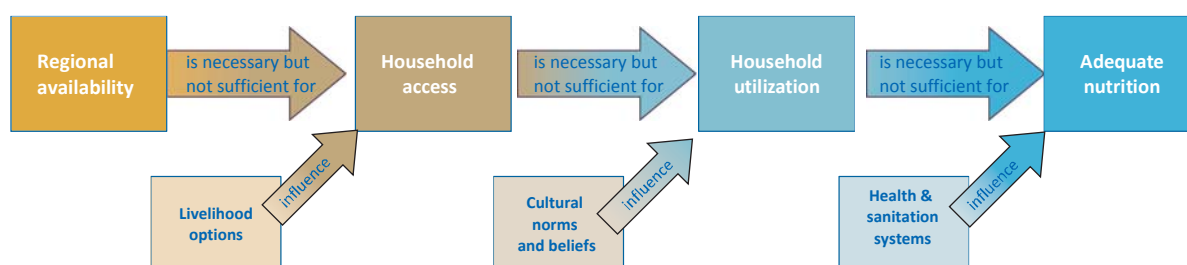
One-third of households in Bangladesh reported receiving support from a social safety net programme, the majority from the education programme.



FSNSP links food and nutrition security through the conceptual framework depicted in Figure 4.1. Under this definition, food and nutrition security exists when: 1) food is present nationally, regionally, and locally (availability); 2) food can be purchased or produced by households (access); 3) diverse and nutritious foods are consumed equitably within the household as per nutritional needs (intra-household utilisation); 4) the health of the environment and individual allows for adequate absorption of nutrients (nutrient uptake); and 5) safeguards are in place to ensure that this situation will not deteriorate in the near future (vulnerability) (1). The unit of reference for these components of food security becomes smaller over these conditions - moving from national to regional to household to individual - and each of these components is a necessary, though not sufficient, condition to achieve the subsequent aspect of food security.

Non-food conditions also play a major role (bottom row of Figure 4.1). Livelihood options provide households with income from which food can be purchased and/or skills to produce food directly. The cultural norms and beliefs of an area impact both what foods are demanded by households and who eats what from the household's food basket. Finally, adequate absorption of nutrients is dependent upon the health and immune system of each individual. Without adequate sanitation and healthcare, frequent infections will rob individuals of adequate nutrition no matter how sufficient their diet (2).

Figure 4.1: Relationship between components of food and nutrition security



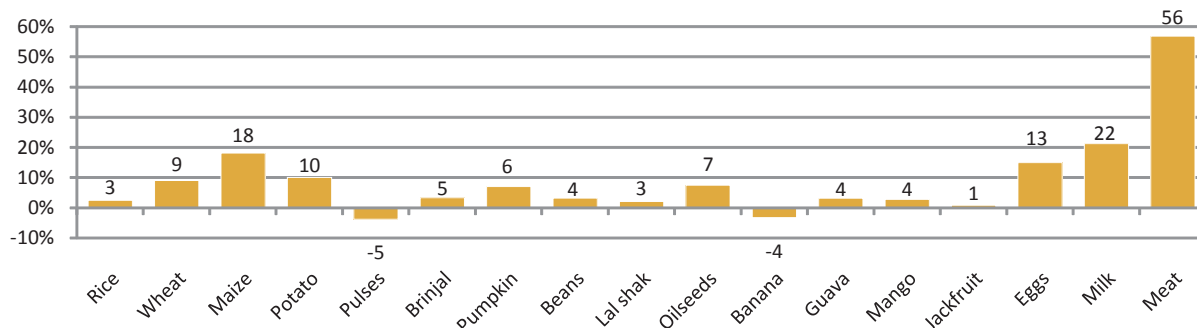
FSNSP continues to be the only source of seasonal information on the food security status of the country at the household level. FSNSP estimates the prevalence of food insecurity in Bangladesh using internationally standardised questions that assess respondents' perceptions of household access to food. Following the diagram above, this section will focus on indicators that quantify gaps in food availability, access, and equitable utilisation of food in Bangladesh, while analysis of nutrition security and its determinants will be taken up in subsequent chapters. In addition to the examination of seasonal variation, trends over time will be assessed using surveillance data from 2010.

Availability

In line with the goals laid out in the *National Food Policy: Plan of Action and the Country Investment Plan*, the Government of Bangladesh is committed to increasing and diversifying the foods available through improved agricultural production and maintenance of trade relations (3,4). As shown in Figure 4.2, the crops which have not increased in production over the six years between 2007 and 2014 are pulses, banana, and jackfruit (5). For animal source food, the growth has been even larger: the average annual production increase from 2007/2008 levels has been 13% for eggs, 22% for

milk, and 56% for meat (5). In spite of these gains, domestic production is increasingly unable to meet the consumer demand for a more diversified diet, leading to a surge in imports since 2006 (6,7). "Overall, production of fruits and vegetables in Bangladesh need to be increased as well as processing, preservative and storage facilities of fruits and vegetables need to be strengthened to promote optimum health and nutrition" (8,9).

Figure 4.2: Annual growth rates for selected crops (2007 to 2014) and animal source foods (2008 to 2014)¹



Because food availability through markets, barter-systems, and/or subsistence agriculture is adequate to meet current levels of demand in most areas of Bangladesh (10,11), FSNP focuses mainly on household level rather than market indicators. Instead, the surveillance system monitors differences in food prices across regions of the country and over time, recording the price at which common food items are available in every community visited.² The vast majority of these items were found to be ready for purchase in over 97% of markets. Notably the proportion of markets in which fresh milk is available has increased from 87% in 2011, to 88% in 2012, to 99% in 2013.

Economic access

As noted at the outset of this chapter, availability of foodstuffs in markets does not ensure household access; cost of food items and purchasing capacity of households must be considered. Since 2007, global food prices have become increasingly volatile. In early/mid 2010 the price of many food commodities increased worldwide and remained high until mid 2011, which elevated levels of food insecurity in 2011. Sharp increases in the cost of food disproportionately affect household food security in South Asia, where food spending typically comprises 50% of household income (12). Fortunately, the price of rice and other commodities declined at the end of 2011, resulting in an improvement in food security in 2012 which has been sustained to the present. Bangladesh has seen real wage growth in the past five years- between 2005 and 2010 the proportion of Bangladeshi household in poverty fell from 40% to 31.5% (13,14) and the recent estimate from General Economic Division (GED) shows that the poverty rate is 26.2% (15).

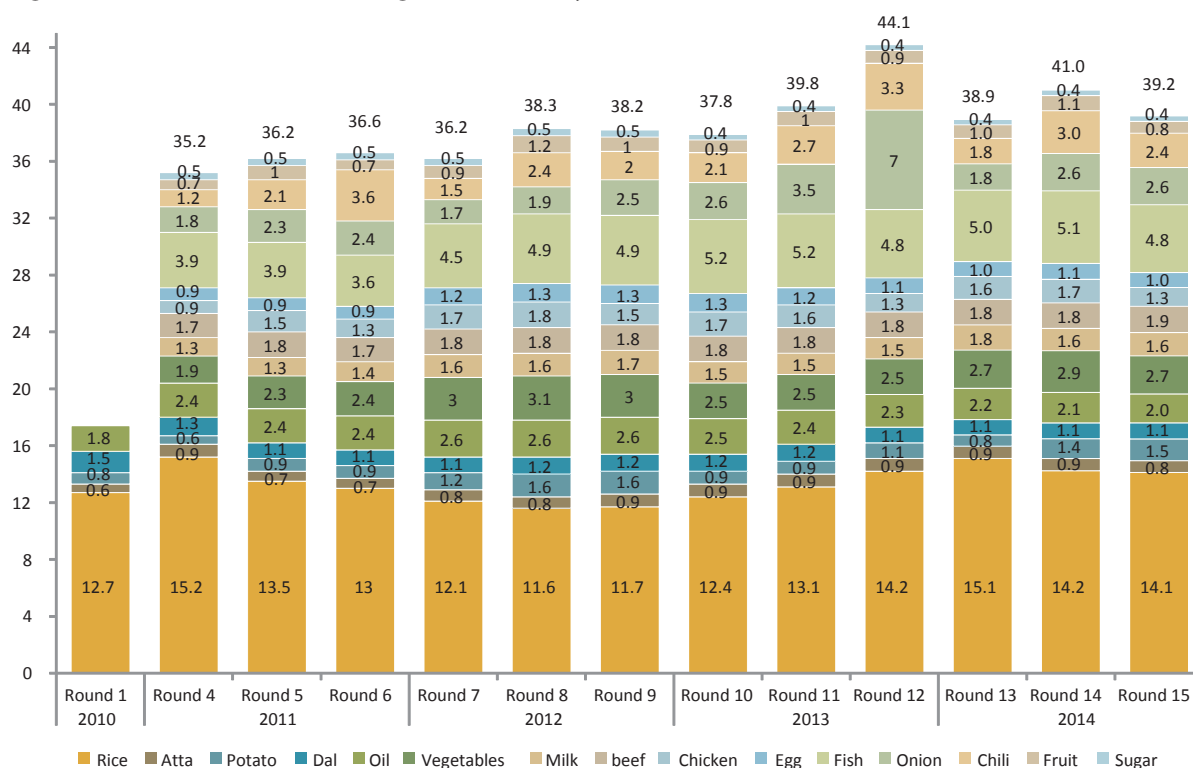
Since its inception, FSNP has tracked the average market price of several food commodities in local markets nationwide. Following global food price volatility in 2010, the price of rice has risen progressively since a low point in mid 2012 of 11.6 BDT. In January-April 2014, rice prices rose to 33

¹ This graph was constructed from Table 7 and Table 16 of the *National Food Policy Plan of Action and Country Investment Plan: Monitoring Report 2015* (29) and the same tables from the previous reports of 2012, 2013, 2014 and 2015 (5,6,7).

² Items included in this assessment are rice, wheat flour, potatoes, eggs, onion, two varieties of lentils, two varieties of cooking oil, fresh milk, beef, fish, chicken, green chili, leafy vegetables, other vegetables, banana, and sugar.

BDT, their highest point in recent years, before stabilizing the increase rate at around 14.2 BDT in subsequent rounds.

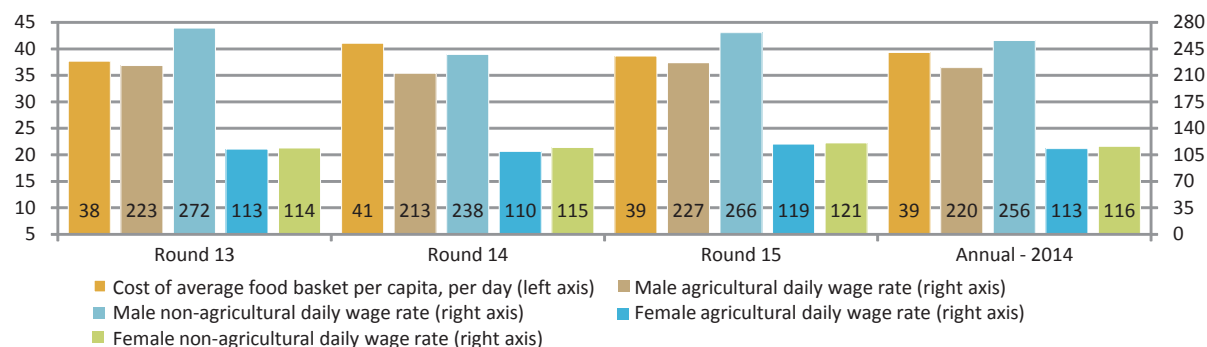
Figure 4.3: Cost of items in the average food basket by season³



The cost of the average, per-capita, daily amount of each food commodity, as reported in the Report of the Household Income and Expenditure Survey (HIES): 2010 (13), is added together to create the price of the average daily, per capita Bangladeshi food basket.⁴ The costs of components of the food basket are detailed in Figure 4.3. Clearly, diets in Bangladesh are greatly dependent on commodities (rice, wheat, lentils, and oil), which is the only portion of the food basket which was measured in 2010 (Round 1). The commodity portion of the food basket contained around half of the total cost of food, though this proportion shrank over 2011 and early 2012 as the price of rice fell, but has increased since that time. In 2014, relative to previous years, the cost of onions and green chillies has slightly fallen, while the price of fish has slightly increased. The overwhelmingly most costly item in the average food basket was rice, which reflects the large quantities of this staple that is consumed on a daily basis. Comparing the costs of this basket to the one used in the 2010 report, which was based on the 2005 HIES, it appears that households in Bangladesh are increasingly demanding more expensive food baskets. The mean cost of the average 2005 HIES food basket was 34.2 BDT in comparison to a mean of 39.3 BDT for the average 2010 HIES basket.

³ This graph excludes the cost of miscellaneous items, and therefore the overall cost is lower than that given in Figure 4.4.

⁴ See page 48 of HIES report: 2010; methods used in the construction this indicator are the same as was used in 2012 (28).

Figure 4.4: Seasonal variation in mean food price and daily labour wages in BDT by gender and category of work

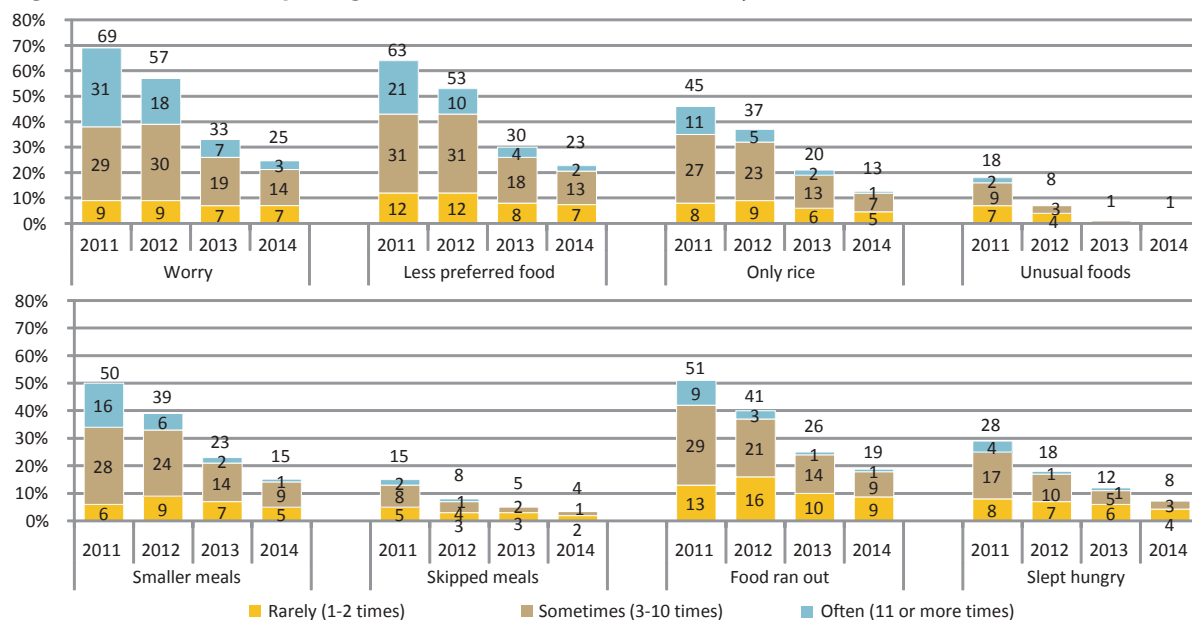
FSNSP also tracks the average wage rates earned by one of the most vulnerable populations in the country - day labourers. Labour wage rates were calculated by asking all households that reported that one or more member was working for a daily wage in the month prior to the interview to disclose what cash wage male and female household members received on the last day worked for both agriculture and non-agricultural occupations. Figure 4.4 displays seasonal variations in the average cost of the food basket and the wage rates for men and women, by category of labour. In line with past results, women's daily wage rates are around half that of men's,⁵ and there is less difference in the daily wage rates paid to women comparing agricultural and non-agricultural occupations.

Perceptions of household access

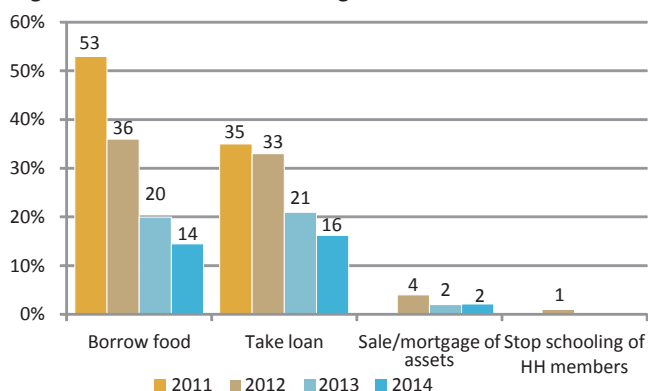
FSNSP also asks households about their food security situation and, in particular, their ability to access sufficient food to meet the perceived needs of household members in the month prior to the interview. Food insecurity results in a typical range of responses independent of whether the episode of food insecurity is chronic or acute, or its cause. When individuals face constraints, or predict that they will face constraints in their ability to procure sufficient food for their households, they may experience uncertainty or worry. As the gap widens between a household's food needs and its ability to procure sufficient food, various strategies are employed such as purchasing foods of lower quality, consuming smaller amounts of preferred items, or resorting to socially unacceptable or unsustainable behaviours such as begging and borrowing (16). An acute episode of food insecurity may result in households reducing their food intake. The consequences of food shortages are observable and range from feeling hunger to short-term weight loss to retarded growth attainment among children. In FSNSP, these indicators are elicited by asking the household food manager about whether specific behaviours occurred during the month prior to interview.

Figure 4.5 displays the national prevalence of selected behaviours in the month prior to interview averaged over all surveillance rounds from 2011 to 2014. Remarkably, the prevalence of all indicators fell between these years. The overall height of the bars indicates the proportion of households in which any member practiced the selected behaviour one or more times during the month long recall period. The different coloured segments inside the bars estimate the proportion of households who practiced the behaviour with the given frequency.

⁵ For information on why this difference is slightly greater than has been reported elsewhere (5,26,7), please see the 2012 report (28).

Figure 4.5: Households reporting behaviours linked to food insecurity (2011-2014)

Levels of worry fell dramatically from 2011 to 2014, with the largest reduction among those who reported frequent episodes of worry. Similarly, the proportion of households who reported running completely out of food stocks and being unable to purchase more that day at least once in the month prior to the interview declined from over half of households in 2011 to less than one fifth of households in 2014. In 2014, nearly a quarter of households reported eating less preferred foods, a decline by nearly 75% since 2011. The proportion of households that contained a member or several members who were reduced to eating a meal of only rice, also declined from nearly half in 2011 to only around one tenth in 2014. The consumption of unusual foods was quite rare in all years, but the overall prevalence fell from nearly one-fifth in 2011 to only 1% in 2014. Similarly, in 2014, less than one-fifth of households had members who had eaten insufficient meals in the month prior to interview, in contrast to half of households in 2011. Moreover, the proportion of households with members who had skipped meals declined from 15% in 2011 to 4% in 2014. In 2014, a little less one-tenth of households reported that one or more members had slept hungry in the month prior to interview, a decline from over one-fourth in 2011. Less than 1% of households in all three years contained members who had ever had to go the entire day and night without eating, so that question is not included in the graph above.

Figure 4.6: Households resorting to unsustainable means to obtain food

Household reliance on socially unacceptable or unsustainable means to obtain food has declined dramatically since 2011 (Figure 4.6). While more than half of households reported borrowing food or rice in the month prior to interview in 2011, the proportion of households resorting to these unsustainable practises fell to a little more than one-tenth in 2014.

Similarly, the proportion of households relying on loans to purchase food reduced from around one-third in 2011 and 2012 to less than one-fifth in 2014. Indicators for selling or mortgaging assets in order to purchase food and stopping the schooling of household members were not recorded in 2011. Only a few households reported these behaviours in the period 2012 to 2014, with a slight decline apparent in the latter two years.

Composite indexes

The indicators of food insecurity presented in the previous section are combined to create two internationally standardised indexes, both developed by the Food and Nutrition Technical Assistance project (FANTA). The first index, the Household Food Insecurity Access Scale (HFIAS), measures food insecurity, while the second index, the Food Deficit Scale (FDS), measures serious shortcomings in households' ability to maintain adequate levels of food.⁶ HFIAS includes all eight indicators in Figure 4.5 in addition to the frequency of going day and night without eating. The results of this scale are not comparable across cultures but can measure changes in the level of food insecurity within a culture over time (17,18). In contrast, the second index, FDS, is created from the most severe subset of questions in HFIAS (food running out, sleeping hungry, and day and night without food). FDS has been validated for comparing food access across cultures (17).

Figure 4.7: Seasonal variation in food insecurity and food deficits

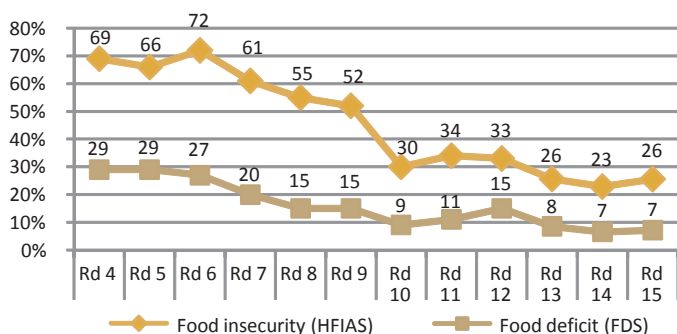


Figure 4.7 displays the seasonal prevalence of food insecurity and gaps in food provisioning among households, from the fourth to the fifteenth round of FSNP. The proportion of households who were food insecure or had a deficit in food provisioning was greatest during 2011, before trending downward through 2012 and into early 2013. A slight rise in levels of food insecurity occurred during 2013, but

decreased in the early 2014 to a low point mid-year (23%), then rise again at year end. The proportion of household's experiencing food deficit followed the same trend, stabilizing at 7-8% through 2014.

There were substantial regional variations in levels of food insecurity and food deficits (Figure 4.8). Food insecurity was lowest in the divisions of Rajshahi and Dhaka and highest in Rangpur and Barisal. Among surveillance zones, rates of food insecurity and the proportion of households reporting food insecurity and food deficits was substantially higher in rural areas compared to urban areas. Among surveillance zones, rates of food insecurity and the proportion of households with food deficits were greatest in the Northern chars (Figure 4.8). The remainder of this section will focus on the prevalence rates for food insecurity (HFIAS) across household characteristics, as the patterns observed for food deficit are very similar.

⁶ This measure is identical to the Household Hunger Score. For more information on these indicators, please refer to past reports (27,28).

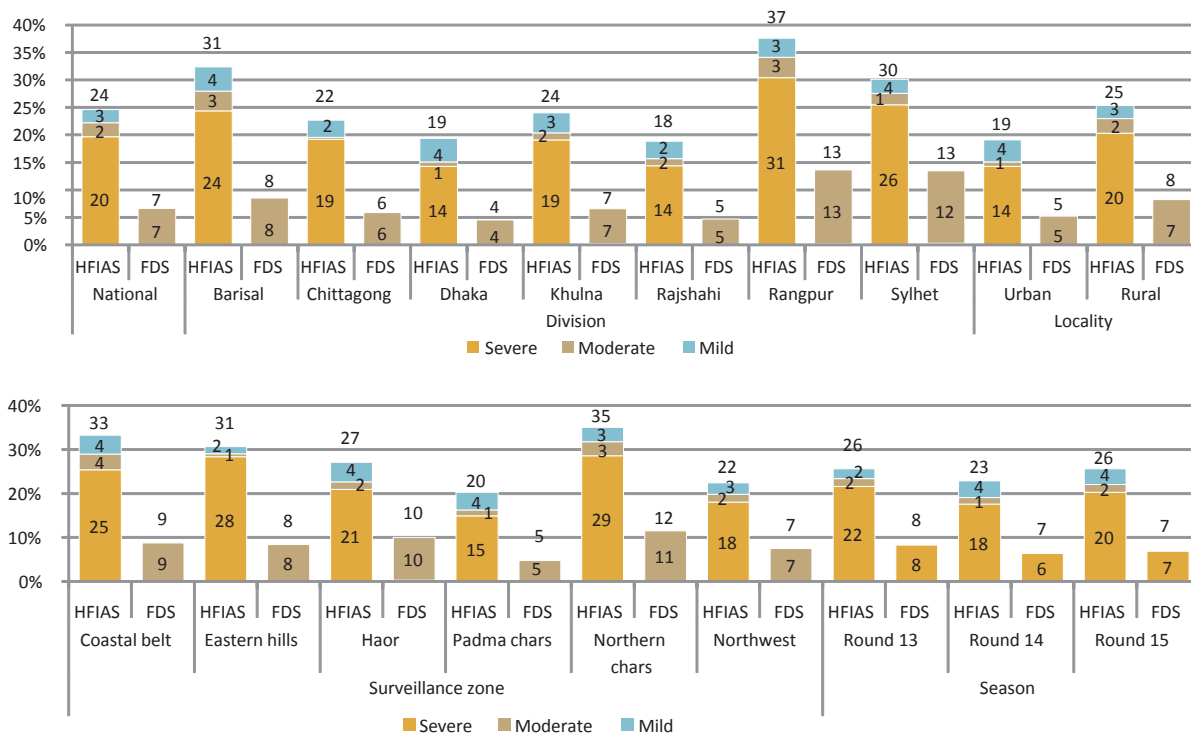
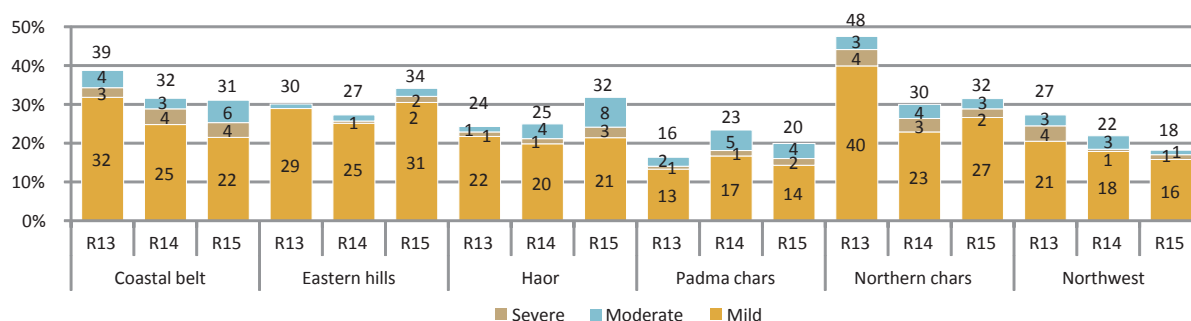
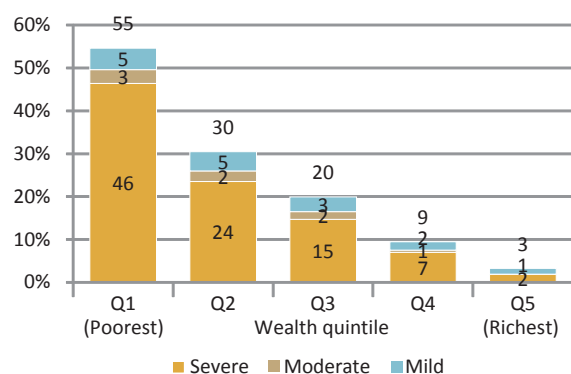
Figure 4.8: Proportion of households food insecure or with deficits by area of residence and season**Figure 4.9: Regional variation in household food insecurity by season (HFIAS)**

Figure 4.9 displays seasonal variation in food insecurity by surveillance zone. In the Coastal belt, and Northern chars, households were found more food insecure in monsoon season, while the households in the Northwest were less food insecure in this season. These differences underline the diverse seasonal and harvest patterns across the country, which are important in predicting when lean periods are experienced.

Figure 4.10: Household food insecurity by household wealth

Similar to past results, the proportion of food insecure households was much lower in wealthier quintiles in 2014; with an almost linear stepwise decline in evidence (Figure 4.10). Between 2011 and 2014, declines in the proportion of households that were food insecure were apparent in all quintiles; however, the decline was much larger among the wealthiest quintiles. In 2014, 55% of the poorest quintile was food insecure, which constitutes a substantial decline from 2013.

Household utilisation

A household's food utilisation is a function of the qualities and quantities of food a household is able to, and chooses, to access. Since 2011, FSNSP has included the food consumption score (FCS), an indicator developed by the World Food Programme (WFP) to capture the diversity of food available in the household, thereby measuring household's access to, and demand for, diverse foods. For this indicator, respondents were asked how many days in the past week any food item from eight food groups had been prepared and consumed in the household (staples, pulses, vegetables, fruits, meat/fish/eggs, dairy, oil, and sugar). This indicator includes both food groups that have nutritive value, such as vegetables or meat, as well as those which have little nutritive value, such as sugar and condiments (19). To create the FCS, responses are weighted by a rough approximation of their nutritional content - standardised across countries by WFP - then summed (20,21). The resulting index is a continuous score ranging from 0 to 112. Standardised cut-offs are then applied to categorise households into groups according to their ability to adequately access food.⁷

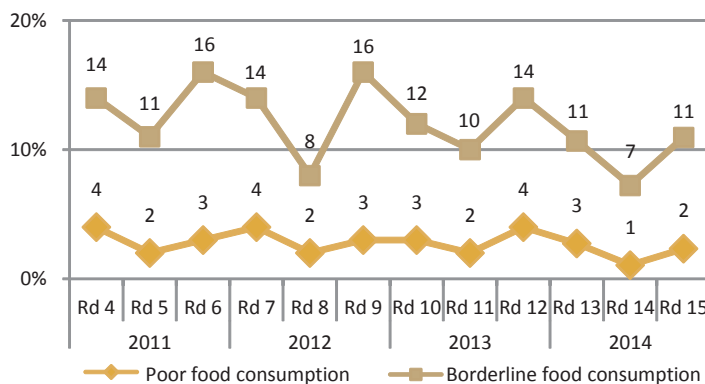
Figure 4.11: Households with poor or borderline food consumption (2011-2014)

Figure 4.11 compares year-wise estimates of the proportion of households consuming poor and borderline diets to the results of the *Household Food Security and Nutrition Assessment* (HFSNA) from 2009 (20). Between 2011 and 2014, despite substantial reductions in the prevalence of food insecurity, there has been little reduction in the proportion of households consuming poor or borderline diets. The proportion of households with borderline diets was slightly lower in the monsoon season compared to the other two seasons of 2014.

⁷ For FSNSP, cut-offs are drawn from the HFSNA survey (20).

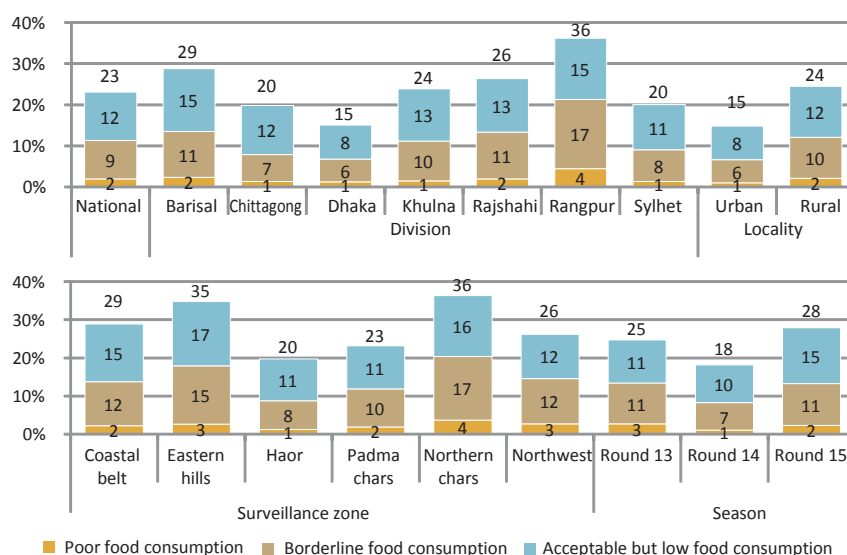
Figure 4.12: Regional variation in proportion of households with sub-optimal food consumption

Figure 4.12 depicts regional variation in the proportion of households with sub-optimal diets - defined here as a diet categorised as poor, borderline, and acceptable low. Nationally, than one-quarter of households consumed sub-optimal diets in 2014, slightly lower than the proportion in 2013. The highest proportion of households with sub-optimal food consumption was found in Rangpur, Barisal and

Rajshahi Divisions. Compared to 2013, some improvement is apparent, particularly in Khulna where rates of sub-optimal diet declined by 10%. Across the surveillance zones, the Padma chars and Northwest areas experienced reduction in the proportion of the households with poor or borderline diets, while the level in Eastern hills increased around 5% in 2014 than in 2013.

Interestingly, the proportion of households with inadequate diets varies more over the year than food insecurity or household hunger (Figure 4.13). Additionally, the pattern of change seems to be countercyclical to the general perceptions of the cycle of food insecurity in Bangladesh. While it is more common for households to be food insecure between rice harvests during the monsoon months, a lower proportion of households recorded eating a sub-optimal diet during this season nationally. This pattern held in all zones except for the Padma chars and Eastern hills. This difference may have been a consequence of households having to diversify diets into other food groups because rice was less available between the *boro* and *aus* harvests. This pattern also indicates a limitation of this indicator, as food habits may vary over seasons, but for reasons that are not related to food insecurity. For example, households which are low on staple foods are likely to eat more varied diets during a time of constrained food access (22,23).

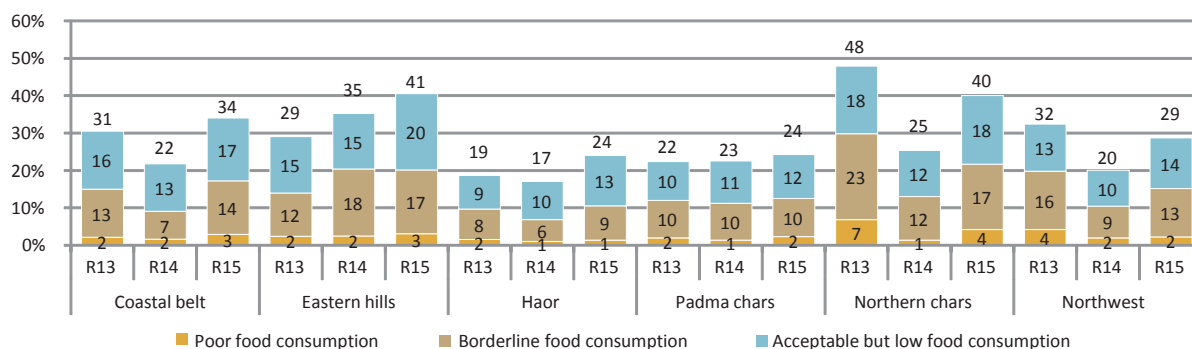
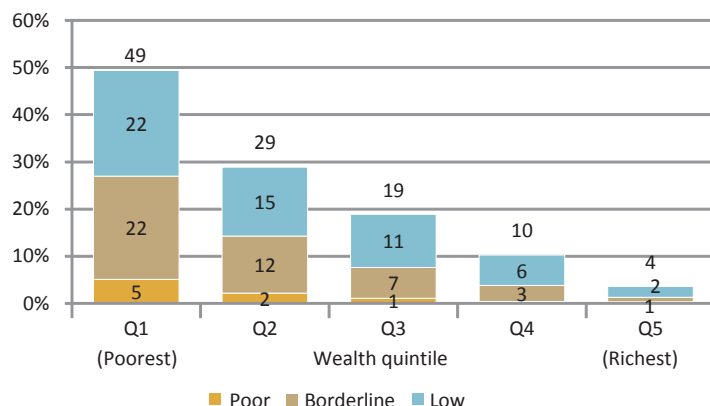
Figure 4.13: Seasonal and regional variation in proportion of households with sub-optimal food consumption

Figure 4.14: Suboptimal food consumption by household wealth

As shown in Figure 4.14, there was a stepwise decrease in levels of sub-optimal food consumption with increasing household wealth. Compared to 2013 to 2014, the proportion of households eating sub-optimal diets declined slightly among all quintiles except the most wealthy. In line with the previous year's results, households without children under the age of five consumed sub-optimal diets in a lower proportion than households with young children (76% compared to 79%).

Intra-household utilisation of food

Even if meals prepared and/or consumed in a household constitute an adequate diet, it does not necessarily follow that all members of that household are uniformly food and nutrition secure as diets and dietary needs will vary among household members. The impacts of food insecurity within a household are often not experienced equally by all members. Among households resorting to the use of coping behaviours that do not affect the whole household, such as skipping meals or reducing portion size, FSNRP requests respondents to identify up to five people in the household who practiced that behaviour the last time it was required. This enables the FSNRP system to identify who was disproportionately affected by household food constraints.

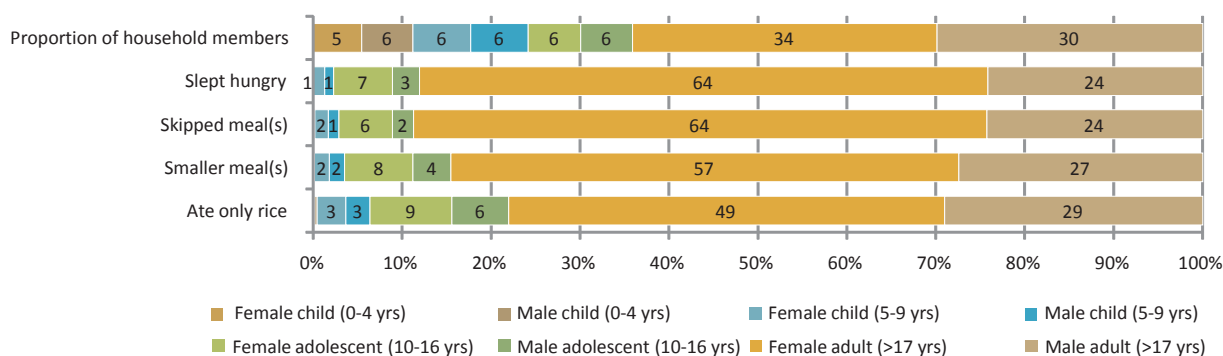
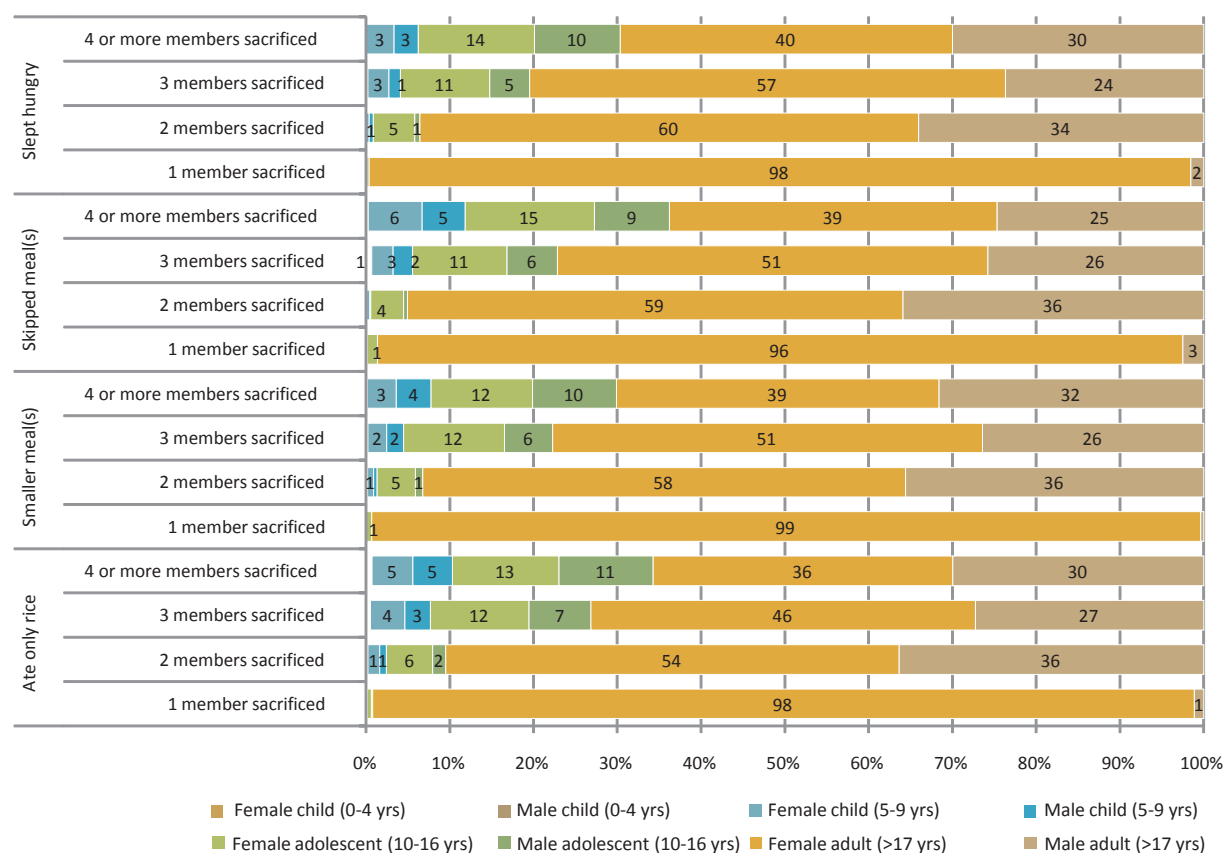
Figure 4.15: Households members by age and sex who practice coping strategies in food insecure households

Figure 4.15 displays the proportion of household members by age and sex categories who undertook coping behaviours when the whole household did not reduce consumption. Notably, adults sacrificed their consumption in a much higher proportion than their underlying population proportion, implying that they protected younger individuals in the household. Worryingly, across all age groups except the youngest, a greater proportion of female adolescents sacrificed consumption compared to males.

Figure 4.16: Households members by age and sex who practice coping strategies by number who sacrificed

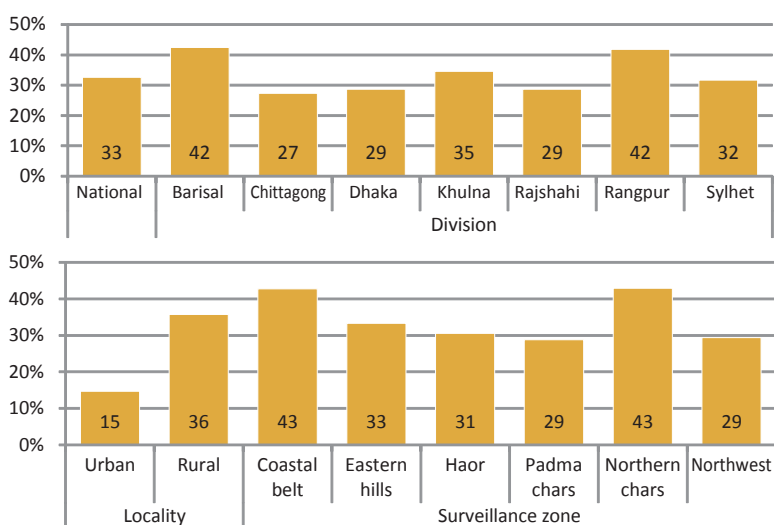
This pattern is even more apparent in households where only a few members had to reduce or change their consumption practices. If only one member of a household reduced consumption, it was almost always an adult woman. When two members sacrificed, adults of both sexes were involved along with some adolescent girls. Children younger than ten years of age only reduced or changed consumption when three or more members were affected. Even among children younger than 10 years of age, a greater proportion of girls than boys changed their eating habits due to food insecurity. Notably, however, nearly no households reported cutting consumption for children less than five years of age.

Vulnerability

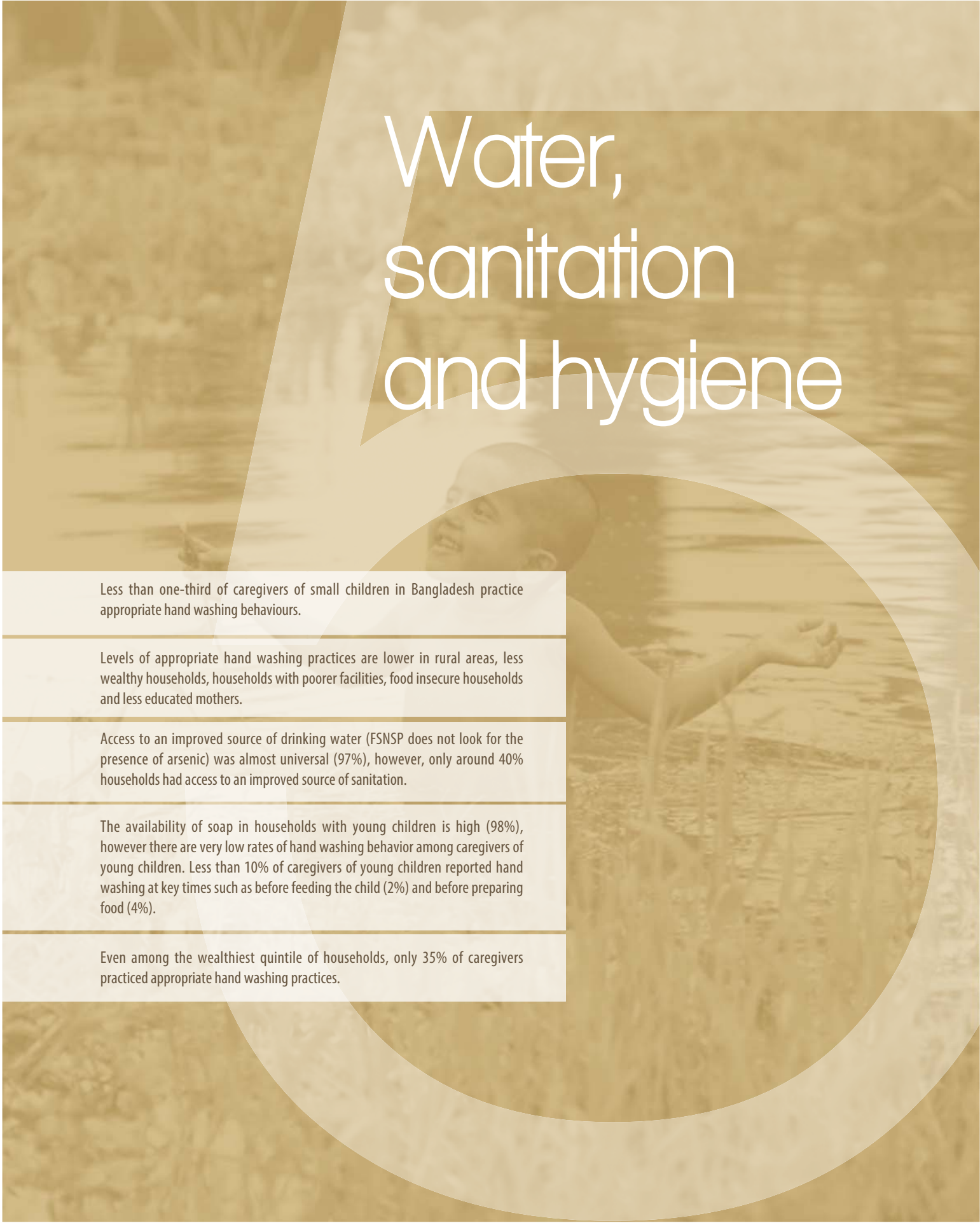
As noted in the introduction to this section, the final element of food and nutrition security is safeguards to ensure that a currently food secure household will continue to be food secure even in the face of shocks or disasters, be these predictable seasonal shocks, or unexpected events. The methods used for estimating food insecurity in FSNP have a short recall period in order to minimise recall bias, however, this short period enables the system to classify households based on their situation at the time of the interview and not their "regular" food security situation. As such, FSNP cannot separate the population of the country into those who are food secure at the time of interview but are food insecure seasonally or vulnerable to food insecurity when shocks occur.

However, FSNP is able to separate out groups that are more vulnerable to food insecurity based on occupational, educational, and wealth characteristics. In addition, starting in Round 5, FSNP recorded if households had received a cash benefit from any governmental social safety net programme in the past six months. Safety nets include income transfers for those chronically unable to work-because of age or handicaps-and for those temporarily affected by natural disasters or economic recession. These transfers can be without conditions, such as the Freedom Fighters allowance, or conditional, such as cash for work or cash for education programmes. Social protection and social safety net programmes are an important component of Bangladesh's antipoverty strategy (24,25).

Figure 4.17: Households who received cash from a social safety net programme by area of residence



Encouragingly, one third of households in Bangladesh reported receiving a cash benefit from a social safety net programme; the vast majority from the cash for education programme (26%) followed by the old age allowance programme (4%) (Appendix C, Table no 1). Overall, a greater proportion of households in rural areas (36%) reported receiving benefits than in urban areas (15%). This is expected, as the Cash for Education programme targets poor, rural households in less wealthy areas of the country (Figure 4.17).



Water, sanitation and hygiene

Less than one-third of caregivers of small children in Bangladesh practice appropriate hand washing behaviours.

Levels of appropriate hand washing practices are lower in rural areas, less wealthy households, households with poorer facilities, food insecure households and less educated mothers.

Access to an improved source of drinking water (FSNSP does not look for the presence of arsenic) was almost universal (97%), however, only around 40% households had access to an improved source of sanitation.

The availability of soap in households with young children is high (98%), however there are very low rates of hand washing behavior among caregivers of young children. Less than 10% of caregivers of young children reported hand washing at key times such as before feeding the child (2%) and before preparing food (4%).

Even among the wealthiest quintile of households, only 35% of caregivers practiced appropriate hand washing practices.

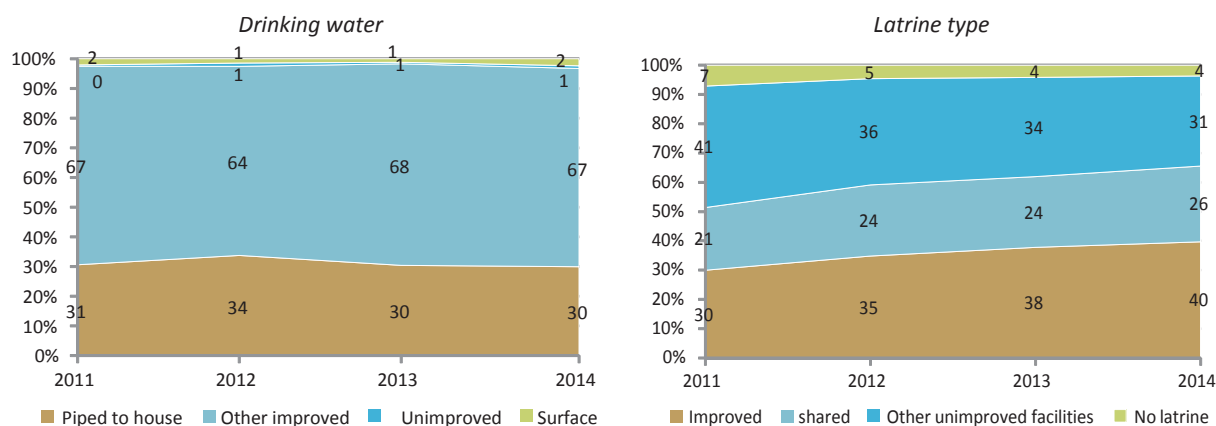


Diseases resulting from inadequate water facilities, sanitation, and hygiene account for 4% of all deaths and approximately 6% of the total disease burden worldwide (1). The majority of these cases are in developing countries where an estimated 2 million child deaths from diarrhoea occur annually. According to WHO and UNICEF, nearly three quarter of under five children in Bangladesh die due to diarrhoea in every year (2). In addition to the acute effects of these illnesses, frequent bouts of intestinal diseases and helminthes (worm) infections lead to medium term nutrient loss and long term damage to the digestive organs, impeding the absorption of nutrients from food and resulting in malnutrition. In Bangladesh, children as young as three months of age have been shown to have faltering growth related to chronic and acute infection (3). Furthermore, acute illnesses due to these infections result in significant costs to the health care system that could be easily prevented. This section will examine the water and sanitation facilities used by households in Bangladesh and review indicators of hygiene.

Drinking water and sanitation facilities

Bangladesh has made remarkable progress in providing safer drinking water and improved toilet facilities to its citizens. Access to safe drinking water and sanitation is one of the basic determinants of good health. Unsafe water and inadequate sanitation are linked to diarrhoeal diseases, acute respiratory infections (ARIs), and skin diseases (2). FSNSP uses the two indicators to assess basic water and sanitation which are included in MDG Target 7c: "Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation" (4). For both measures, two broad indicators of improved and unimproved facilities have been further categorized in four sub-groups, following the WHO/UNICEF Joint Monitoring Programme for water supply and sanitation (JMP) guidelines (5). For drinking water the categories are: piped water to dwelling (as improved source), other improved sources (protected dug well, tube well etc.), unimproved sources (unprotected dug well, cart with small tank etc.), and surface water. In recent years there has been little change in the proportion of households relying on unimproved sources of drinking water, with less than 2% of households using an unimproved source (Figure 5.1).

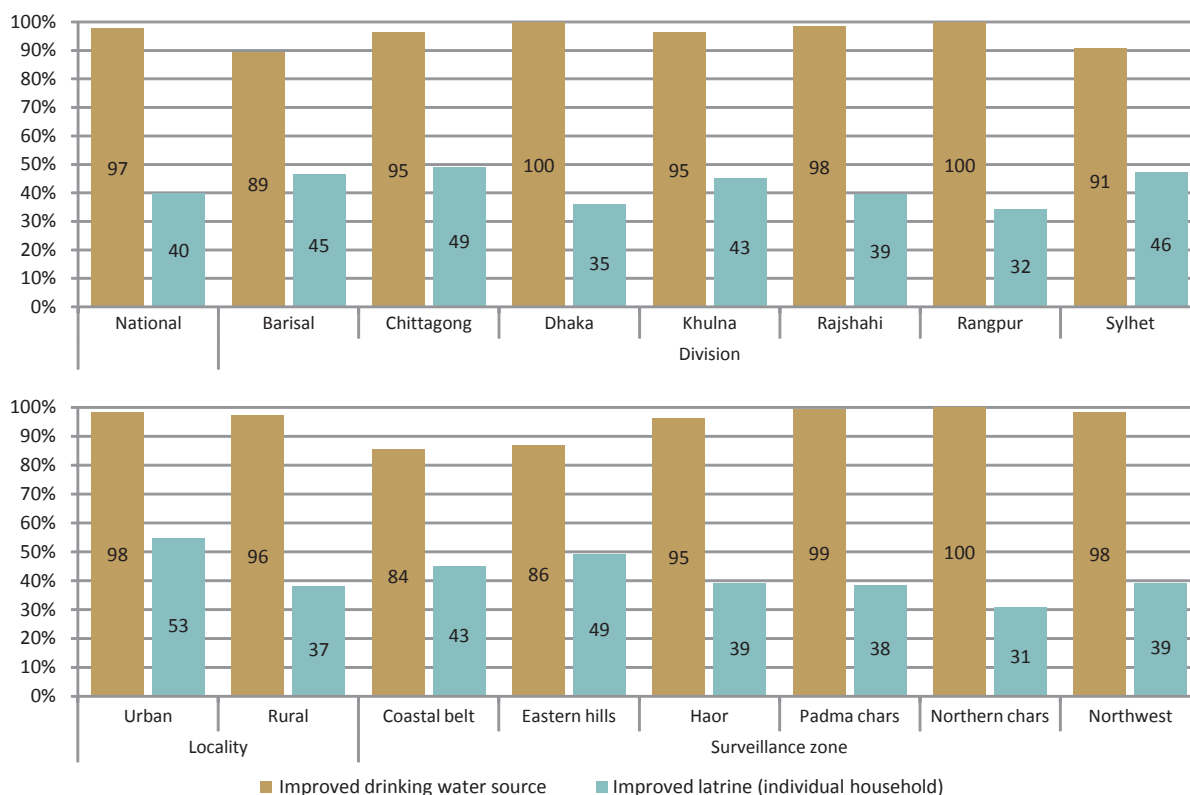
Figure 5.1: Source of drinking water and type of latrine, 2011-2014



For sanitation facilities, four categories are also used: proportion of people with no toilet facility at all (open defecation), unimproved facilities which do not ensure hygiene, otherwise improved facilities which are shared by two or more households and thereby not sanitary, and lastly improved household facilities which include flush toilets, water sealed toilets, and closed pit toilets.

The percentage of households without access to any toilet facilities has declined from 7% in 2011 to 4% in 2014 (Figure 5.1). This has been largely due to reductions in open defecation in rural areas. Additionally, the proportion of households with an improved single family toilet facility has increased from 30% in 2011 to 40% in 2014. Households with children less than five years of age had sanitary latrines in a greater proportion than households without children (figure not shown).

Figure 5.2: Source of drinking water and type of latrine by area of residence



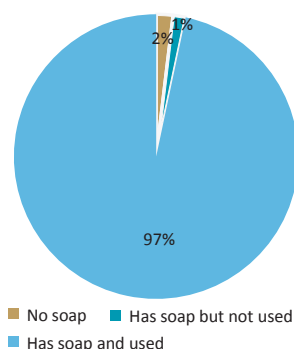
Over 90% of households in all divisions except Barisal had access to an improved water source (Figure 5.2). Barisal and Sylhet division, and the Coastal belt, and the Eastern hill areas have a lower proportion of households with access to an improved drinking water source compared to the national level. The proportion of households with improved drinking water sources is similar comparing urban and rural areas. While almost all divisions have shown an increase in the proportion of households with sanitary latrines, Chittagong's increase has been the largest by far: from one-third to nearly one-half. Rangpur and Dhaka have the lowest proportion of households with improved facilities. Sanitary latrines are more common in urban than rural areas, and least common in the Northern chars.

Hygiene and hand washing

Hygiene refers to conditions and a specific set of practices associated with the preservation of health, for example, safe waste disposal, hand hygiene, and water and sanitation facilities (6). Though Bangladesh has made progress in providing safer drinking water and improved toilet facilities to citizens, other components of a healthy environment are still lagging behind. FSNP has

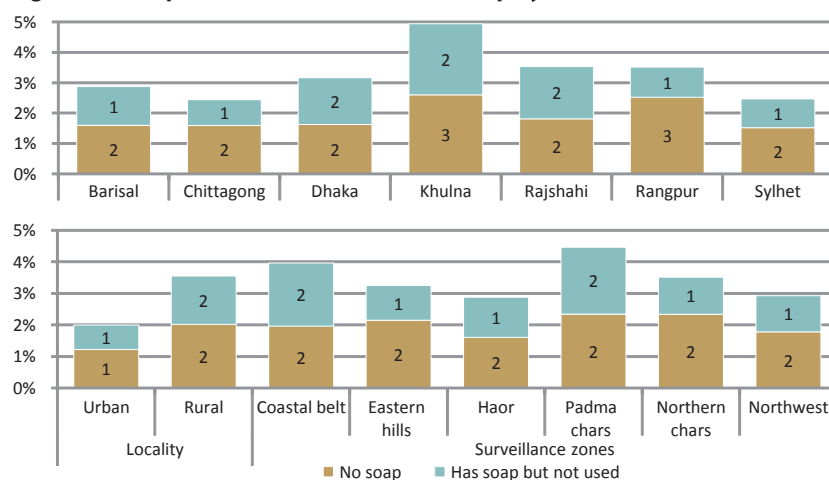
measured a few key indicators of hand washing, but these have not been widely reported on due to the lack of comparative data.

Figure 5.3: Soap use among households



Beginning in 2012 and continuing in 2014, FSNSP has expanded these indicators using sections from the modules contained in the Maternal Child Health Integrated Programme/project (MCHIP) - formerly the child survival technical support project (CSTS), knowledge practices and coverage (KPC), and survey tools (7), supplemented by indicators shown to be effective at predicting diarrhoea episodes in Bangladesh (8). In addition to this, starting from 2013 FSNSP is able to provide a comprehensive look at households hand washing behavior as this set information was collected for all households unlike previous years when it was collected only for children under five.

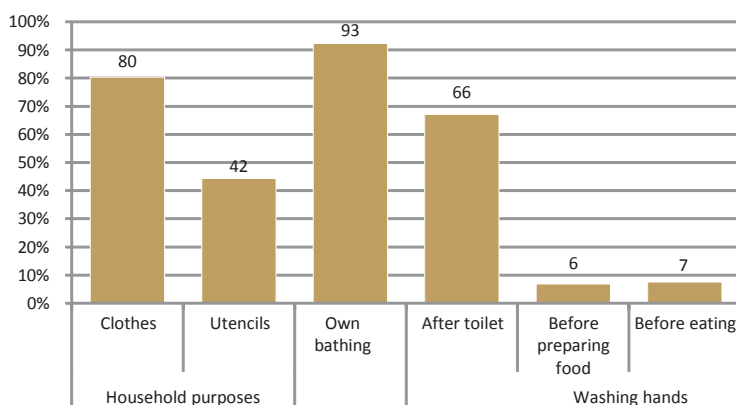
Figure 5.4: Proportion of households with soap by area of residence



Basic ability to wash hands was assessed by asking households about the presence or absence of soap in the household. As seen in Figure 5.3, soap was present in around 98% of households and it was used the day before the interview in almost all of these households (97%). This pattern was the same in households regardless of the presence

or absence of children less than five years of age. By division, soap use was less prevalent in Khulna, and Rangpur than other areas (Figure 5.4). Rural households used soap in a lower proportion than urban households. Soap use was similar across surveillance zones.

Figure 5.5: Times when soap was used



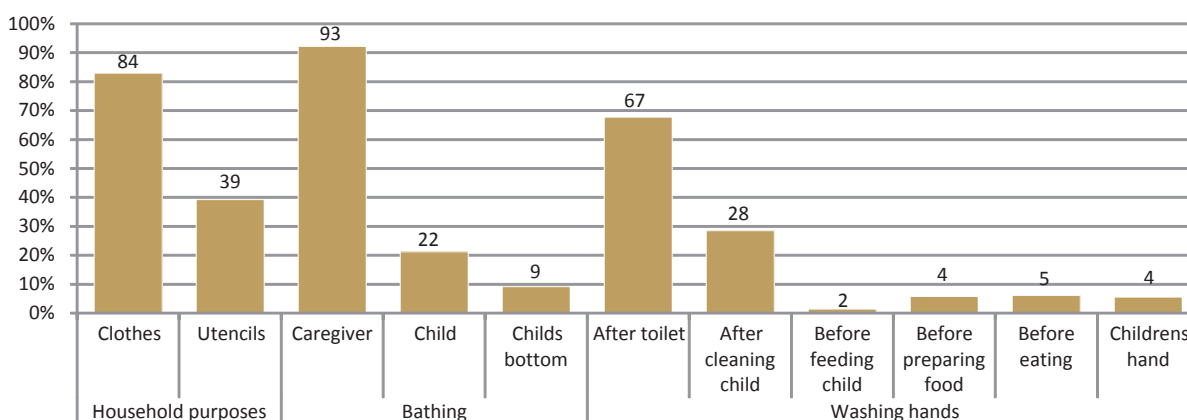
FSNSP also asked the manager of the kitchen in each household about when he or she used soap the day before the interview. Although soap use has increased during critical times since previous year, troublingly, only 6% of these individuals reported washing hands before preparing food and only 7% before eating. Soap was most often used for washing

clothes, bathing and after using the toilet. Clearly, a lack of soap is not the cause of inadequate hand washing.

Sanitation and hygiene in households with children

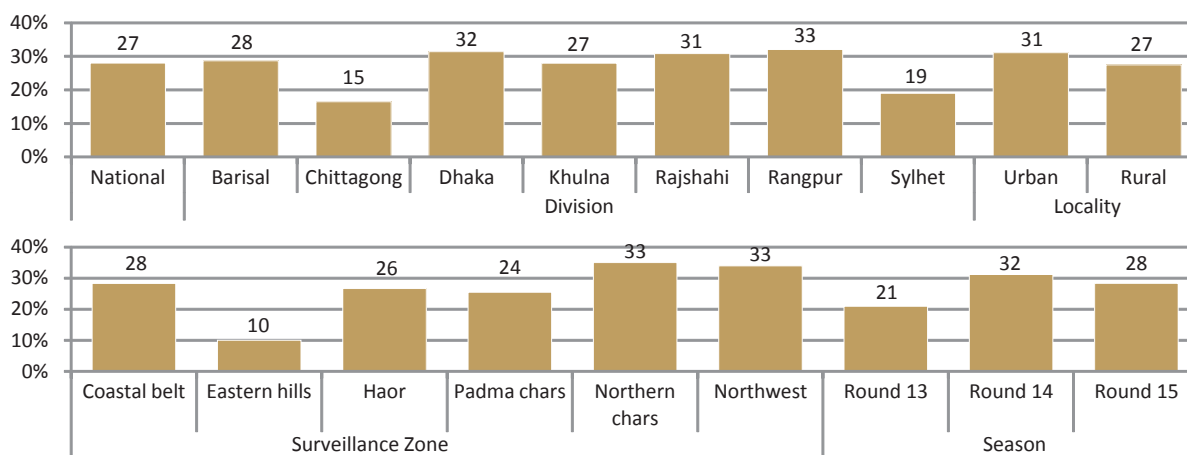
Proper hand washing before child feeding is a life-saving and cost-effective intervention for families in Bangladesh, as absence of this practice may lead to infections and poor appetite; and eventually malnutrition and death (9). Interventions that promote hand washing through education and/or through provision of hand washing supplies, such as soap, have been shown to be effective in reducing episodes of diarrhoeal disease by one-third. However, the amount of behavior change communication required to motivate individuals to wash their hands at key moments should not be underestimated (10). Hand washing is a vital intervention for children under five who are both more likely to put their fingers in their mouth and become seriously ill or die from diarrhoeal dehydration (11).

Figure 5.6: Times when soap was used by caregivers



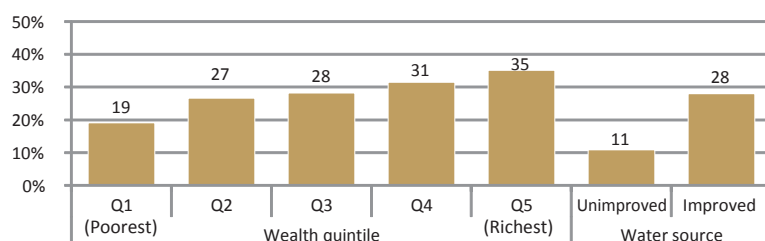
However, the key times in which soap was used is limited (Figure 5.6). While most caregivers reported using soap to wash clothes and for bath, the proportion of caregivers who reported using soap at key hand washing moments was extremely low. In line with the previous findings, while two-thirds of caregivers reported washing their hands with soap after using the toilet, less than one tenth of caregivers reported washing their hands before preparing food and feeding their child.

Figure 5.7: Proportion of caregivers with appropriate hand washing behavior by area of residence



FSNSP further classifies hand washing practice through the use of a KPC indicator that measures the proportion of caregivers in households which used soap for hand washing at least two critical times in the past 24 hours (7). These two times include after own defecation and at least one for the following: after cleaning a young child, before preparing food, before eating, and/or before feeding a child. Based on this measure, a little more than one-fourth of households with infants and young children were practicing appropriate hand washing behaviors. These practices vary somewhat over the country, with lower levels of hand washing apparent in Chittagong and Sylhet (Figure 5.7). A slightly greater proportion of households in urban areas washed hands at key moments than households in rural areas. Across surveillance zones, households washed hands much less frequently in the Eastern hills and more frequently in Northern Chars and Northwest.

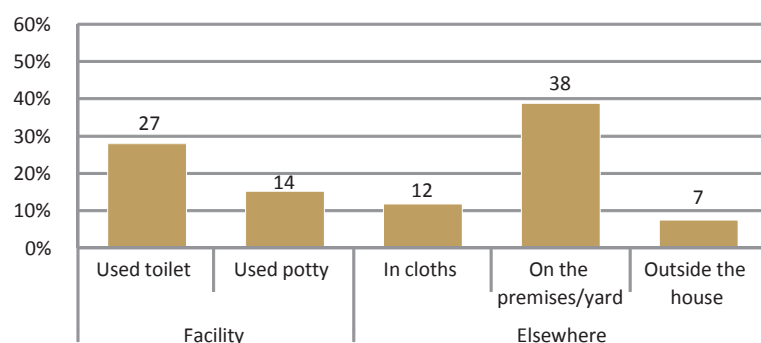
Figure 5.8: Caregivers with appropriate hand washing by household characteristics



Appropriate hand washing requires timely access to water; as such, the provision of convenient water source is a necessary precondition to this behavioral practice. Not surprisingly, caregivers from less wealthy households or households with poorer

facilities, practice appropriate hand washing much less frequently than households with better facilities (Figure 5.8). Furthermore, caregivers who use unimproved water sources practice appropriate hand washing only half as often as caregivers with improved water sources. Caregivers from food insecure household also practice appropriate hand washing less often (figure not shown). Similarly, less educated mothers report appropriate hand washing behavior much less frequently than mothers with greater educational attainment (figure not shown).

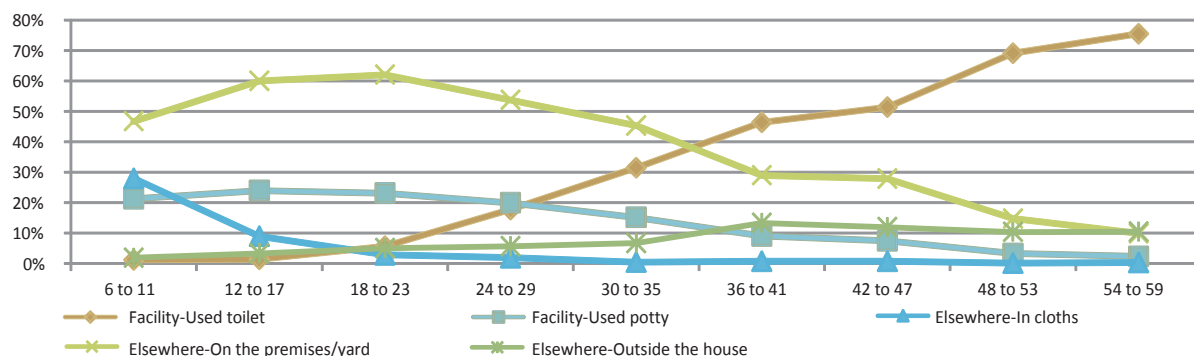
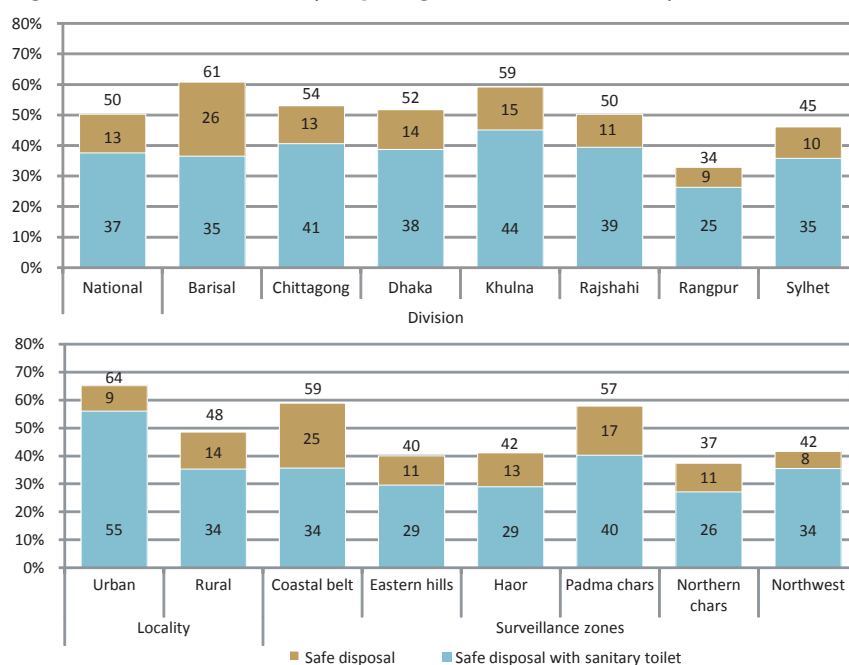
Figure 5.9: Location of child defecation¹



Very young children tend not to use sanitation facilities on their own, but are equally or more likely to be disease vectors than adults. In 2014, the plurality of children defecated outside the home while around a quarter of children use the household toilet facility (Figure 5.9). Location of defecation is mainly a function of age (Figure 5.10). While infants and young children

most commonly use their clothes and outside locations, after around two years of age, children begin to use a toilet facility. At five years of age, around 75% of children are using a toilet facility.

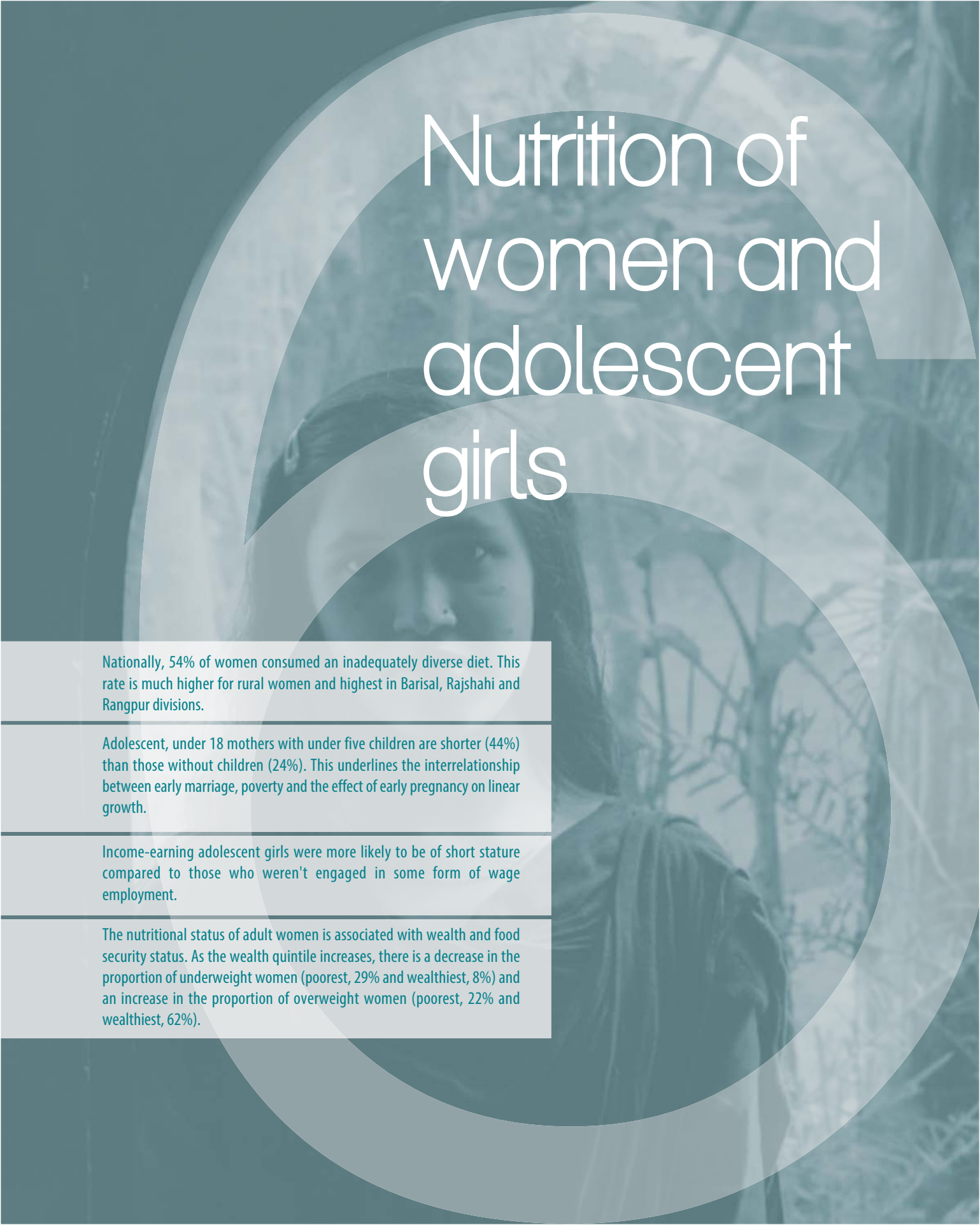
¹ Not included in this graph are diapers, other areas, and don't know, as very few caregivers reported that their child used these locations for defecation.

Figure 5.10: Location of child defecation other than a toilet facility by child age (in months) group**Figure 5.11: Households safely disposing of child's solid waste by area of residence**

Complementary to having a sanitary toilet facility is proper disposal of children's solid waste. FSNP defines safe disposal of a child's feces using the KPC/DHS criteria in which the only safe option is disposal into a toilet facility (7,12). Additionally, FSNP examines the proportion of households who also have access to an improved toilet facility, whether shared or individual, as only through a combination of these indicators can contamination be controlled. Nationally, only half of households disposed of children's solid

waste in the appropriate manner, but only a little over one third of households disposed of children's solid waste in a toilet facility that will adequately contain waste and prevent contamination (Figure 5.11). The proportion of households safely disposing of waste was greatest in Barisal (61%) and lowest in Rangpur (34%), where around one-third of households disposed of waste in this manner. A higher proportion of households in urban areas disposed of child waste safely compared to rural areas, and once sanitary toilet facilities were taken into account, this difference increased. In line with previous findings, across surveillance zones, the Coastal belt and the Padma chars had a much greater proportion of households that disposed of child solid waste safely than in the other zones.

Similar to the patterns seen between appropriate hand washing and background characteristics, wealthier and more food secure households appropriately dispose of child waste in greater proportions (figures not shown). Children in food insecure households, and with less educated mothers are also at greater risk of infection due to inappropriate disposal of children's solid waste, with no advantage apparent if the mother is involved in income earning.

The background of the entire page is a photograph of a woman, likely a mother, looking towards the camera. She is wearing a light-colored, possibly white, garment. The image is overlaid with several large, semi-transparent circles in shades of blue and teal, creating a layered effect. The title text is positioned in the upper right quadrant, overlaid on these circles.

Nutrition of women and adolescent girls

Nationally, 54% of women consumed an inadequately diverse diet. This rate is much higher for rural women and highest in Barisal, Rajshahi and Rangpur divisions.

Adolescent, under 18 mothers with under five children are shorter (44%) than those without children (24%). This underlines the interrelationship between early marriage, poverty and the effect of early pregnancy on linear growth.

Income-earning adolescent girls were more likely to be of short stature compared to those who weren't engaged in some form of wage employment.

The nutritional status of adult women is associated with wealth and food security status. As the wealth quintile increases, there is a decrease in the proportion of underweight women (poorest, 29% and wealthiest, 8%) and an increase in the proportion of overweight women (poorest, 22% and wealthiest, 62%).



As mentioned in the previous chapter, a household is defined as food insecure when one or more members face limited or uncertain access to food. In contrast, nutritional security can only be measured on an individual basis - taking into account an individual's nutrient intake, stores, and requirements. FSNP quantifies the nutrition security of adults through the inclusion of one woman from each selected household. Women's nutritional status offers a window into the larger household, as they are often the first to feel the effects of food shortage and generally receive lower levels of care and resources compared to male household members (1). Moreover, adolescents and women of reproductive age are a well-studied population, for whom many standardised indicators have been developed, allowing cross-country comparisons. Women's nutrition is also important because it is closely linked to child nutrition and health.

A woman's nutritional status is a complex function of her current food consumption habits and level of health, the care and diet she has had since childhood, as well as previous illness and past demands on her body, such as pregnancies. To capture some of this complexity, FSNP collects data on women's dietary habits and measures their height, weight, and MUAC. In 2014, FSNP interviewed and measured over 25,800 women and girls aged 10 to 49 years throughout Bangladesh.

Table 6.1: Women interviewed and measured by age

Age group in years	Interviewed		Measured (BMI)	
	Number	Weighted proportion	Number	Weighted proportion
10 to 14	1843	10%	1819	7%
15 to 20	3888	17%	3426	13%
21 to 25	5241	16%	4565	18%
26 to 30	5511	16%	4994	20%
31 to 35	4274	15%	4023	16%
36 to 40	3253	12%	3164	12%
41 to 45	2202	9%	2185	9%
46 to 49	1264	5%	1246	5%
Total	27476	100%	25422	100%

This report provides nationwide estimates of the nutritional status and dietary patterns for two categories of women: adolescent girls, aged 10 to 18 years, and adult women, aged 19 to 49 years. This information supplements the maternal indicators covered in Chapter 7 of this report. As shown in Table 6.1, the sample distribution is uneven across age groups, with fewer women identified at both the upper and lower end of the age range. To enable comparisons between FSNP and past survey results on slightly different populations of women, results for corresponding sub-groups of women are presented.

Dietary assessment

In each household, one woman between the ages of 10 and 49 years and all pregnant women were asked to recall what they had eaten during the day before the interview. Data collectors categorised their item-by-item responses into 18 pre-coded food groups (2,3). These 18 food groups include those with high micronutrient content, such as dark green leafy vegetables, and those that are nutrient poor but representative of increased household purchasing power, such as soft drinks (4). This enables FSNP to observe dietary patterns and estimate the quality and adequacy of women's diets in Bangladesh.

Dietary patterns and diversity

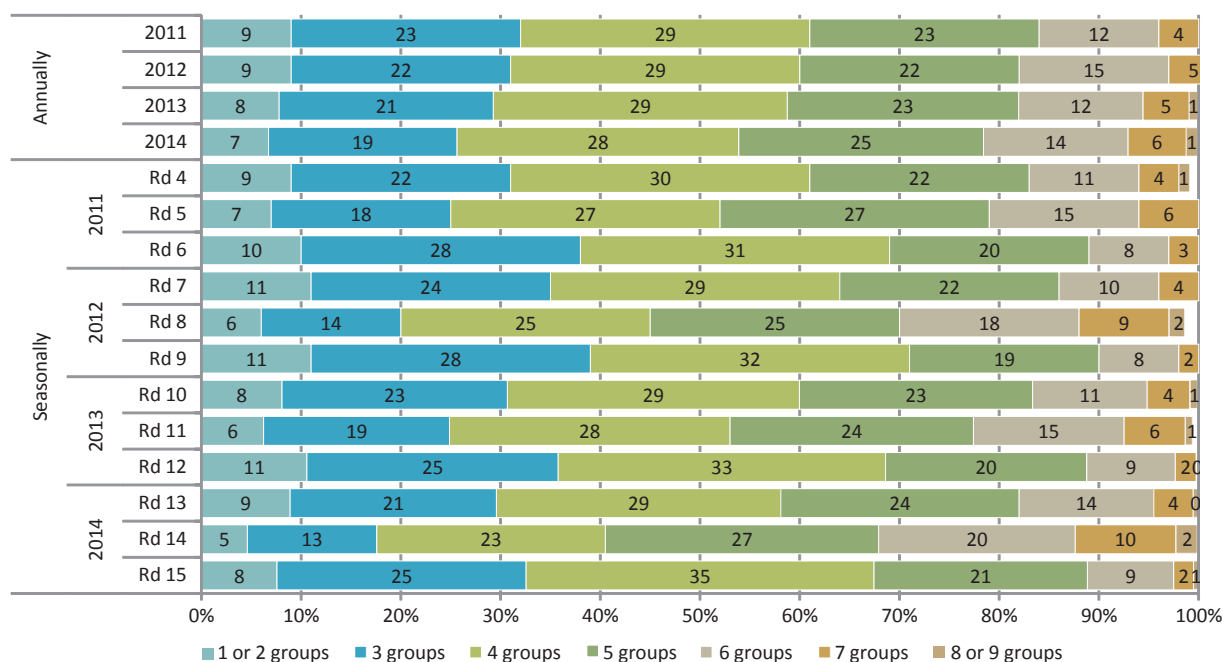
The proportion of all women 10 to 49 years of age who ate any items from the 18 food types by division. Nationally, there were no major changes in dietary pattern between 2013 and 2014, except for sizable increases in the proportions of women eating eggs and red/orange/yellow fruits (by 4 and 6 percentage points, respectively). In line with past results, notable differences in

consumption patterns were seen across divisions. Chittagong and Sylhet had the highest levels of beverage consumption and items from the dairy and sugar food groups, similar to 2012 and 2013. Small fish consumption was highest in Sylhet, while consumption of large fish was comparatively higher in Dhaka, Chittagong, and Khulna. Notably, the proportion of women consuming fish was greater than the proportion consuming other flesh foods (see appendix C, Figure 1). In line with 2012 and 2013 results, diets were most monotonous in Rangpur.

Individual dietary diversity, or the number of food groups eaten by a person in a set period of time, is a proxy measure for both quantity and quality of food consumed, thereby providing an indication of the overall nutrient adequacy of routine dietary intake on a population level (2,3,5,4). The measure of dietary diversity is derived by clustering the 18 food types listed in the questionnaire into a nine-item scale that was developed to ascertain the quality of a woman's diet in light of her nutritional needs and validated for women in Bangladesh (2). The nine items are: starches, dairy products, legumes, dark green leafy vegetables, vitamin A rich fruits and vegetables, other fruits and vegetables, flesh foods (fish, chicken, beef, etc.), eggs, and organ meats.¹

Trends in the dietary diversity score for women between 2011 and 2014 are provided in Figure 6.1. In all years, the greatest number of respondents (28-29%) report having consumed four food groups in the previous 24 hours, with a larger proportion of women consuming more than four food groups than less than four food groups. Between these three years there has been an incremental trend towards greater dietary diversity. Seasonal variation was very similar in all years and in line with the household food consumption score; more diverse diets were consumed during the monsoon period. Overall, seasonal patterns appeared most pronounced in 2014.

Figure 6.1: Trends in dietary diversity score seasonally and annually (2011 to 2014)



¹ In mid 2014 it was recommended that programs switch to a 10 item scale in the near future. Once guidance for data collection has been developed, FSNP will transition to using this scale (16).

Figure 6.2 displays the distribution of dietary diversity scores among all women and adolescent girls regionally. Divisionally, women in the divisions of Barisal, Rajshahi, and Rangpur stand out for having less diverse diets. Consistent with 2011 and 2014, urban women's diets were much more diverse than rural women's. Among the surveillance zones, women consumed less diverse diets in the Northern chars and Northwest, followed by the Coastal belt, Haor, and Padma char zones. Women in the Eastern hills consumed more diverse diets.

Figure 6.2: Regional variation in dietary diversity scores

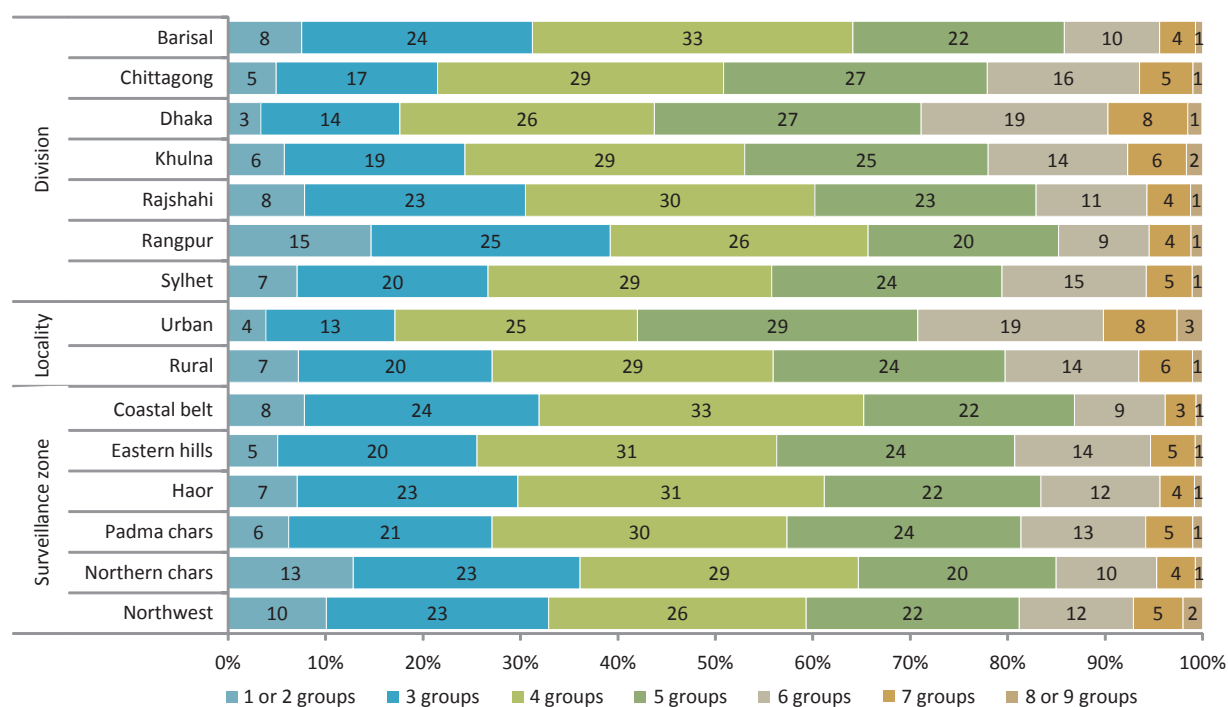
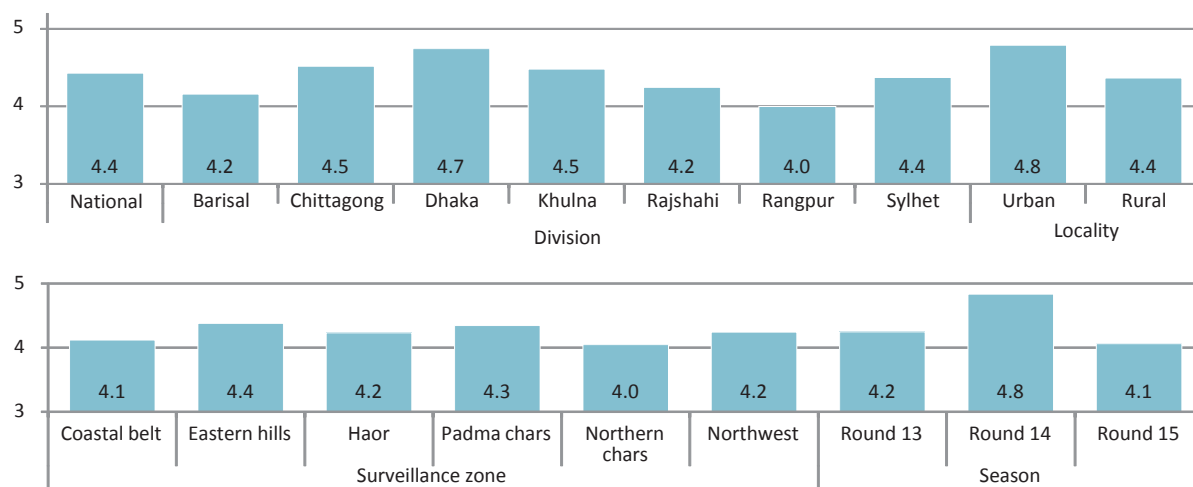


Figure 6.3: Regional variation in mean dietary diversity scores

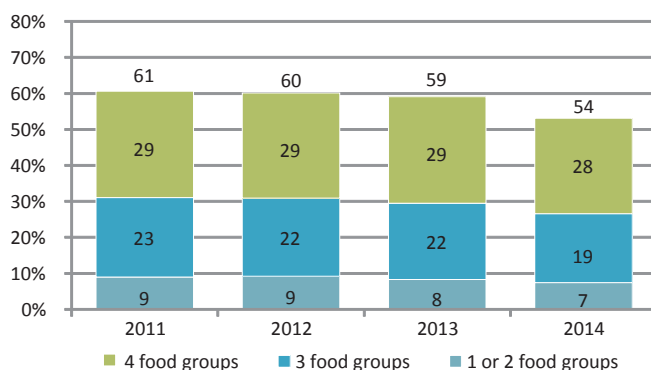


As expected, regional differences in eating patterns persist when dietary diversity is expressed as an average score (Figure 6.3). There has been no remarkable change between 2011 and 2014. The mean dietary diversity score nationally increased by only 0.1 points annually, which is far from statistically appears to be part of an incremental trend. Between 2013 and 2014, except Barisal and Sylhet, all other divisions showed improvement, albeit marginal in nature in most cases, in terms of mean dietary diversity score. The mean dietary diversity score of urban areas is significantly higher than that of rural areas. In line with 2013, the mean dietary score for the monsoon season (Round 14) is still higher than other seasons.

Dietary inadequacy

In order to judge if women's diets are adequate in Bangladesh, confining assessment to the comparison of dietary distributions or average dietary diversity score is insufficient. Rather, scores need to be examined in light of their relationship to dietary adequacy, or the likelihood that a diet with a given score has met all or most of the macro- and micronutrient requirements for an average woman. Given the extent of micronutrient inadequacy in women's diets in Bangladesh, the Food and Nutrition Technical Assistance 2 (FANTA-2) Programme has adopted a minimum cut-off approach, below which non-pregnant and non-lactating women were unlikely to have received a diet adequate in micro- and macronutrients, identifying dietary insufficiency instead of dietary sufficiency (2). FSNSP employs the FANTA-2 cut-off of fewer than five food groups as indicating a diet inadequate in micro- and/or macronutrients.² Though these cut-offs have only been evaluated among non-pregnant and non-lactating married women over 15 years of age, FSNSP also applies this methodology to unmarried women, to lactating women, and girls younger than 15 years of age.

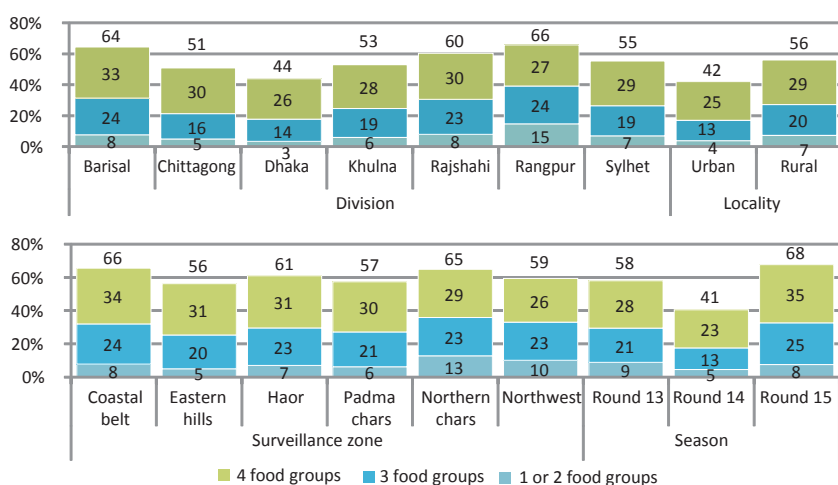
Figure 6.4: Women consuming inadequately diverse diets



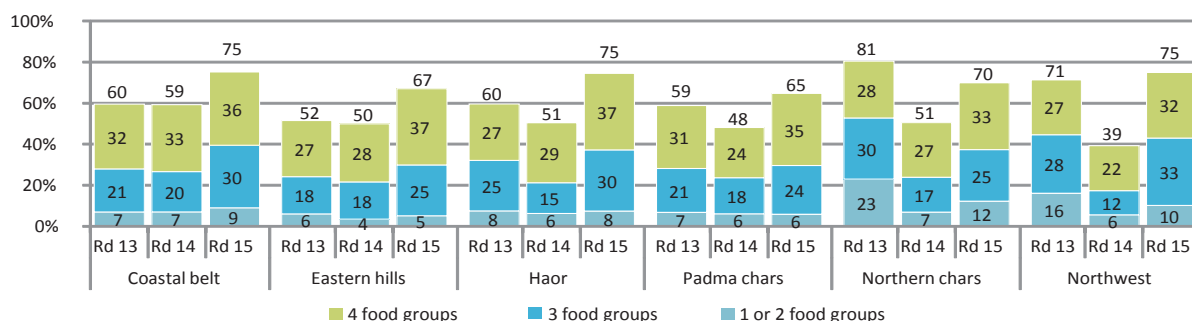
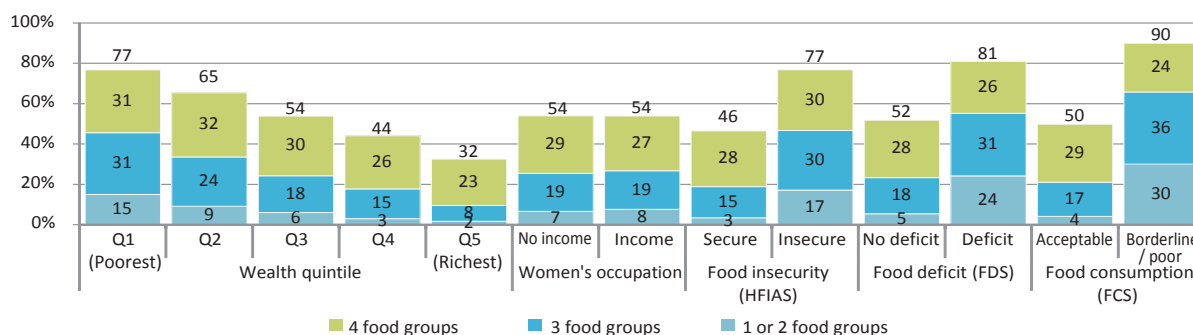
As was the case since 2011, the cut-off value is greater than the average number of food groups women consumed, leading to the majority of women in Bangladesh eating inadequate diets. The proportion of women eating inadequate diets has fallen from 59% to 54% between the last two years. Though the decline is not statistically significant, the annual trend since 2011 attests to a secular downward movement in this indicator.

Women's dietary diversity in the divisions of Barisal, Rajshahi, and Rangpur was worse compared to the other divisions. Dhaka was the only division where less than 50% of women consumed inadequate diets. The same holds for the urban stratum. Across surveillance zones, there were more varied diets in the Eastern hills compared to other areas. In the Padma and Northern chars, and in the Northwest, there was a decline in the proportion of women eating inadequate diets between 2013 and 2014. There was much more variation in the proportion of women eating inadequate diets across

² This cut-off will be revised when the ten group scale (MDD-W) is adopted by FSNSP.

Figure 6.5: Women consuming inadequately diverse diets by area of residence

seasons in 2014 compared to 2013. All the surveillance zones more or less conformed to the expected pattern of seasonal variation. Compared to 2013, however, seasonal fluctuations were much more pronounced in 2014 for the Northwest and for the Northern and Padma chars. The opposite was true for the Coastal belt and Eastern hills.

Figure 6.6: Variation in the proportion of women consuming inadequate diets by season and zone**Figure 6.7: Proportion of women consuming inadequate diets by household wealth and food security status**

As shown in Figure 6.7, consumption of inadequate diets was less common among women from wealthier and food-secured households. However, even among the wealthiest households, almost one-third of women consumed inadequate diets, underlining the need for intensified nutrition education activities nationwide. Nearly one-third of women in households with poor and borderline food consumption habits consumed only one or two food groups the day before the interview. In contrast to past results, there is no difference in the likelihood of consuming a less diverse diet comparing women earning income and those who are not.

Nutritional status

While the nutritional status of women and girls is assessed using the same two measurements of height and body mass index (BMI), the way these measurements are used to define malnutrition differ in rationale and methodology for the two populations. In adolescence, girls are still growing, and therefore their nutritional status must be examined in light of the normal growth pattern for their age in a well-nourished population. By contrast, women 19 years of age or older have completed their growth, and thus cut-offs are applied which are associated with different degrees of risk to health and wellbeing. Because of this, comparisons between these two populations cannot be made. Additional details of these differences are described in the following sub-headings.

Height of women and girls

Nutritional status indicators based on height are useful in capturing periods of malnutrition suffered during childhood or adolescence. For younger adolescent girls, this measure may provide information about current or recent experiences of chronic malnutrition. For adult women, height also predicts the risk of complications during delivery, because pelvic size is related to height (6). In addition, since small stature can result from inadequate nutrition during childhood, women of short stature also have higher odds of delivering low-birth weight babies due to the intergenerational cycle of malnutrition (6,7).

For girls, assessment of height is based on growth curves from the World Health Organization's (WHO) 2007 growth standards for school aged children (8,9). These standards are used to compare the growth of adolescent girls in Bangladesh to what is expected in an average, well-nourished population through the use of z-scores. In contrast, for adult women, height is typically evaluated against a cut-off between 140 and 150 cm that indicates increased risk of requiring a caesarean section during delivery and of giving birth to low birth weight babies due to intra-uterine growth restriction. FSNP uses a cut-off of 145 cm since that is the benchmark used by the DHS system (10),³ resulting in the measure for adult women's malnutrition only having one category, while the adolescent measure has two. The cut-offs used throughout this section are detailed in Table 6.2.

Table 6.2: Rationale and definitions for the categories of malnutrition based on height

Population	Rationale	Category	Definition
Adolescent girls (10 to 18 years of age)	Comparing the growth of the Bangladeshi population to an international standard	Severely undernourished	Height-for-age z-score less than -3 SD
		Moderately undernourished	Height-for-age z-score less than -2 SD but greater than or equal to -3 SD
		Globally undernourished	Height-for-age z-score less than -2 SD
Adult women (19 to 49 years of age)	Identifying the proportion of reproductive age women at increased risk during a normal delivery	Moderate risk	Height less than 145 cm

Due to this difference in the rationale behind these measures, rates of malnutrition based on height are much greater in adolescent girls than in adult women. Nationally, one-fourth of adolescent girls

³ Due to the use of these two internationally standardised methodologies, a disjunction occurs between women aged 18 and women aged 19. Whereas a woman measuring 146 cm in height would be considered short for her age when she is 18 (z-score < -2SD from the mean), among 19 year olds, her height would fall into the normal range (see Figure 6.11).

are short for their age while only a little over one-seventh of adult women are at risk of difficulties during delivery or having low birth weight babies due to small stature. Figure 6.8 compares adolescent height attainment in Bangladesh with that expected in a well-nourished population, indicating that height attainments for adolescent girls were much lower than would be expected in a well-nourished population. For example, 4% of adolescent girls were severely short, while 0% would be expected in a well-nourished population. In addition, 22% of adolescent girls were moderately short, while only 2% would be expected in a well-nourished population. In contrast, almost no girls were found to be mildly, moderately, or severely tall for their age, even though this figure should be 16% according to the reference population. Between 2012 and 2014, there appears to be a steady decline in the proportion of adolescent girls moderately and severely short for their ages. For adult women, there is no "ideal" height structure; but the proportion of women under 150 cm should approach 0%. For adult women in Bangladesh, 2% of the population was shorter than 140 cm and one-tenth of adult women were shorter than 145 cm (Figure 6.9). This indicates that over two in five women in the country are short enough to experience an increased risk at delivery.

Figure 6.8: Nutritional status of adolescent girls by height for age measures (2011-2014, 10 to 18 years of age)

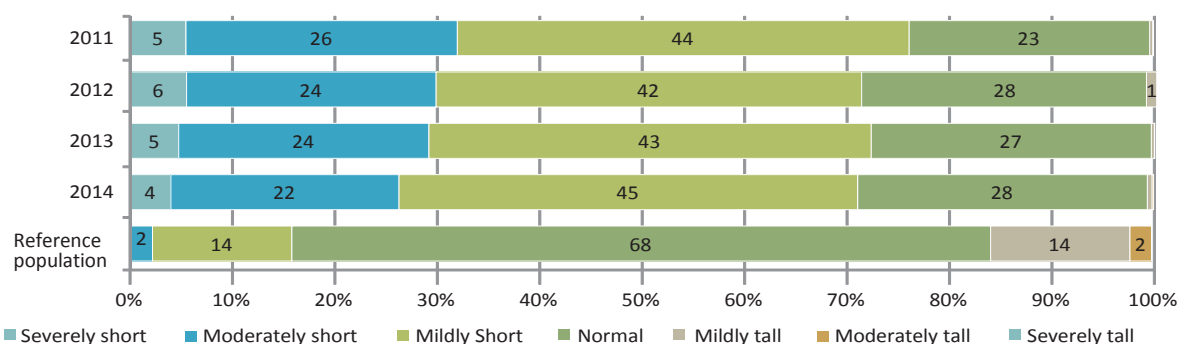
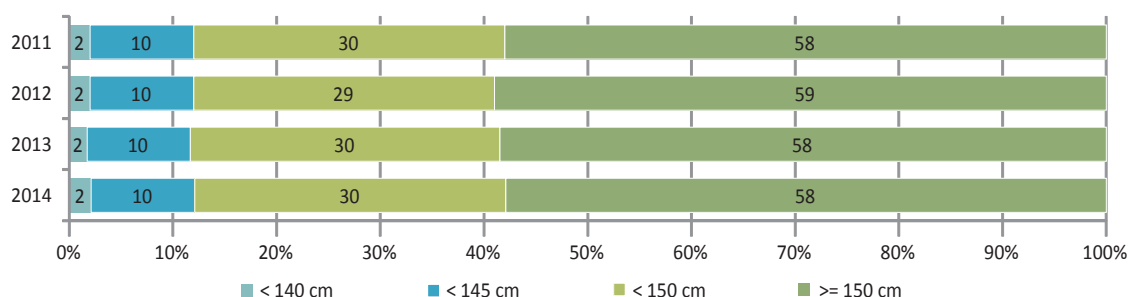
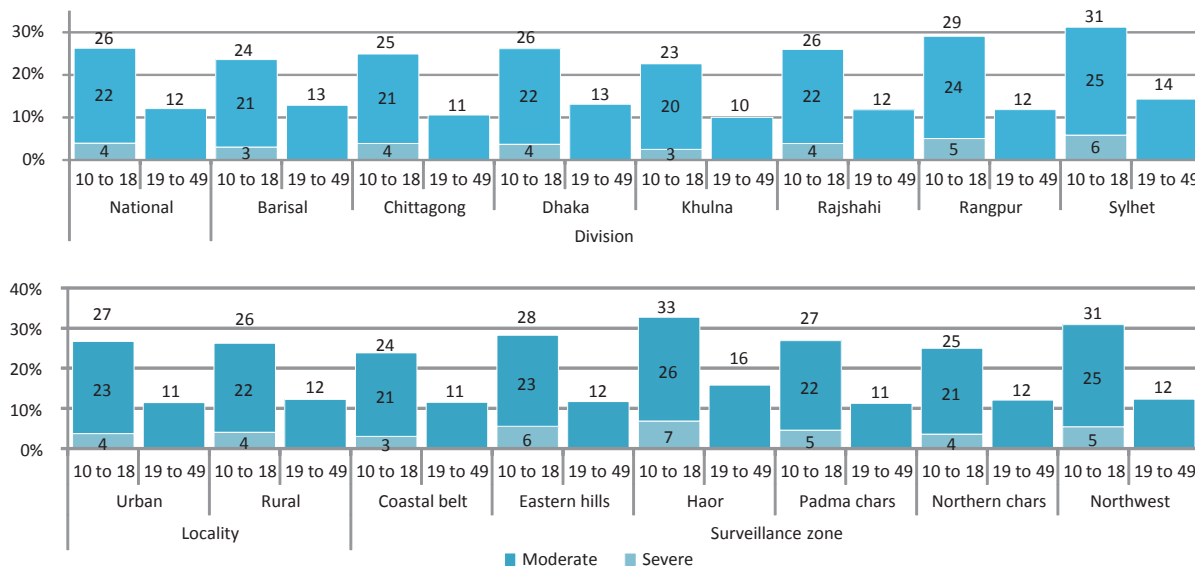


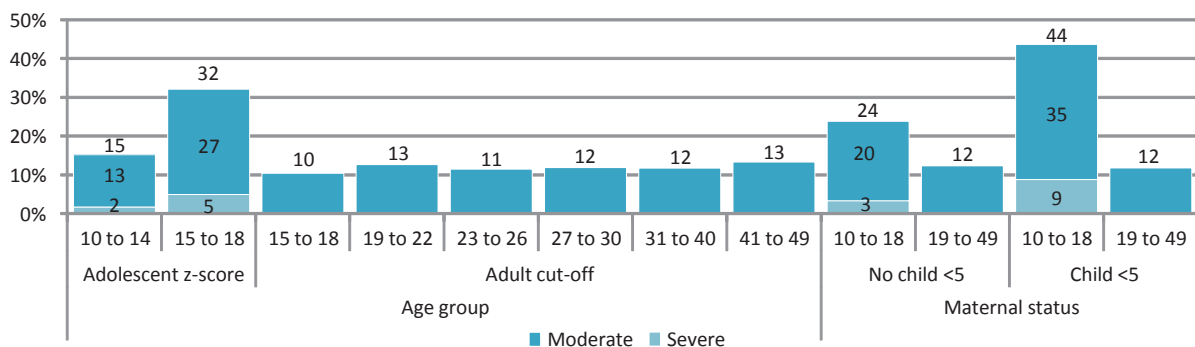
Figure 6.9: Nutritional status of women by height measures (2011-2014, 19 to 49 years of age)



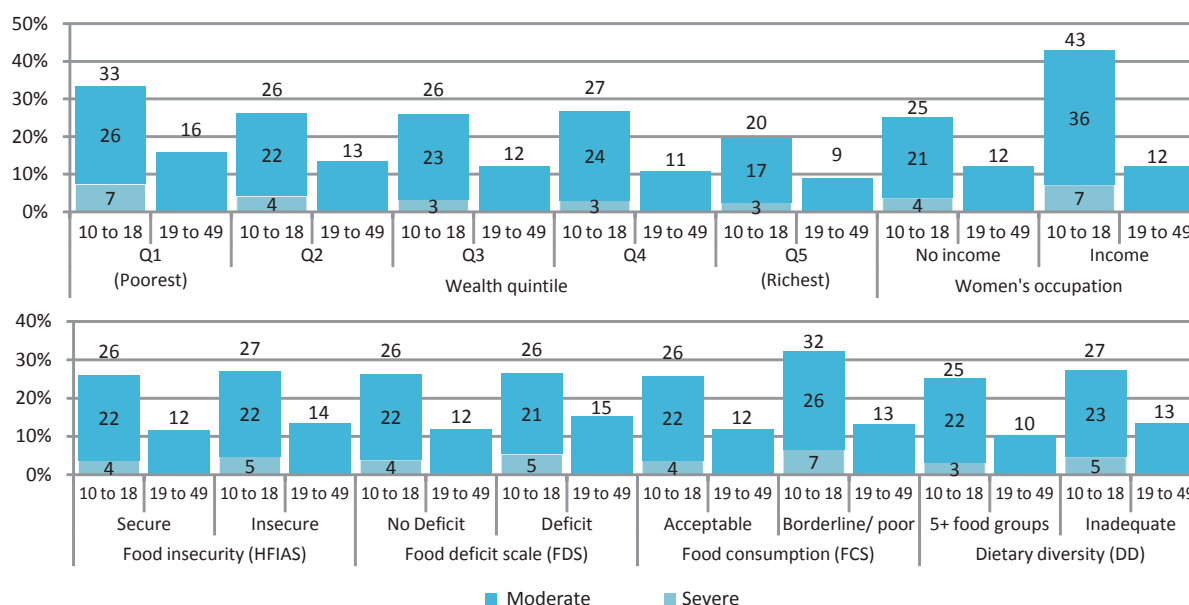
In 2014, across divisions and zones there is little variation in both the proportion of women at risk during delivery due to small stature and in the proportion of adolescents who are too short for their ages. As was the case in 2013, Sylhet stands out with higher rates of adolescent stunting, though this proportion has fallen notably in the past year (from 34% to 31%). Surprisingly, however, the prevalence of adolescent girl stunting was the same across urban and rural areas.

Figure 6.10: Indicators of inadequate height by area of residence

The proportion of women with short stature remained stable over the age range from 15 to 49 years, while adolescent girls over 15 are short for their age in much greater proportion (more than double) than girls aged 10 to 14 (Figure 6.11). This could be due to an early cessation of growth, or because of poor nutrition and early childbearing (11). Adolescent mothers with children under five years of age are shorter (44%) than those without children (24%), presumably owing to the interrelationship between early marriage, poverty and the effect of early pregnancy on linear growth. Figure 6.11 illustrates the divergence between the different adolescent and adult measures. Little less than three times more 15 to 18 year olds are short for their age based on the WHO growth standards are at risk during delivery due to small stature.

Figure 6.11: Inadequate height by age and maternal status

There was notable variation in the proportion of adolescents and adults with low height attainments across wealth quintiles. In 2014, a greater proportion of adolescents and adults belonging to the poorest quintile of the population were short compared to adolescents and adults in wealthier quintiles. This difference was high for adolescent girls, probably due to underlying

Figure 6.12: Indicators of inadequate height by household wealth, women's occupation, and food insecurity

poverty and its relationship with child labour and height. Women who earned income were shorter than women who did not. The association between short-term food security measures and height, a long-term measure of malnutrition, was rather weak for both adult women and adolescent girls. In contrast, dietary diversity was related to the height of both adolescent girls and adult women (Figure 6.12).

Body mass of non-pregnant women and girls

The nutritional status of non-pregnant women and adolescent girls is calculated using body mass index ($BMI = \text{Weight (kilograms)} / \text{Height}^2 \text{ (metres}^2\text{)}$) (10). By normalising the weights of individuals over their heights, BMI gives an indication of the thinness or obesity of an individual, and thereby information about the energy and nutrient composition of the diet consumed in relation to the requirements of the individual. Nutritional status indicators based on BMI are useful in determining if the individual is suffering from acute malnutrition, but cannot be applied to pregnant women or those who have recently given birth (10)⁴.

In FSNP, two distinct approaches are used to classify the nutritional status of women and girls using BMI, as was done with height indicators (see Table 6.3). For adult women, 19 to 49 years of age, nutritional status is calculated through the use of BMI cut-offs, while for adolescents and young women, 10 to 18 years of age, BMI-for-age z-scores are employed (9,10,12). As with height classification, adolescents are categorised based on what would be normal in a well-nourished population, while adults are categorised based on the observed relationship between illness, activity levels, and BMI scores (13).

For girls, growth curves provided by the World Health Organization for school-aged children are employed as a reference population (9,8). This reference categorises the BMI of the adolescents

⁴ All women who reported that they were pregnant and whose youngest measured child was less than two months of age are excluded from all estimates in this section in line with DHS recommendations (3). FSNP uses the presence of no child less than two months of age for a woman as a proxy for no delivery in the last two months.

according to what is expected in a well-nourished population through the use of z-scores. In contrast, for adult women, a cut-off approach is employed based on the point at which women have a greater propensity for illness and reduced work capacity (13). As was the case with height measures, these two systems are not compatible or directly comparable, though there is a closer alignment between the BMI classification systems for malnutrition, and in both systems varying grades of severity are provided.⁵ Because the adult measure includes mildly malnourished individuals while the adolescent measure does not, the adult measure of under nutrition is expected to contain a greater share of the population.

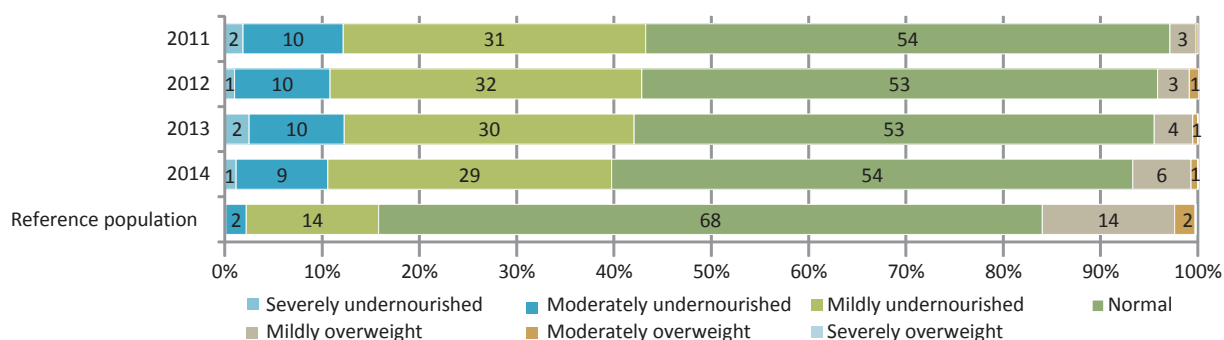
Table 6.3: Rationale and definitions for the categories of malnutrition based on BMI

<i>Population</i>	<i>Rationale</i>	<i>Category</i>	<i>Definition</i>
Adolescent girls (10 to 18 years of age)	Comparing the growth of the Bangladeshi population to an international standard	Severely undernourished	BMI-for-age z-score less than -3 SD
		Moderately undernourished	BMI-for-age z-score less than -2 SD but greater than or equal to -3 SD
		Globally undernourished	BMI-for-age z-score less than -2 SD
		Severely overweight	BMI-for-age z-score greater than +3 SD
		Moderately overweight	BMI-for-age z-score greater than +2 SD but less than or equal to +3 SD
		Globally overweight	BMI-for-age z-score greater than +2 SD
Adult women (19 to 49 years of age)	Identifying the proportion of the reproductive age population with increased risk of communicable illness and decreased energy levels	Severely thin	BMI less than 16
		Moderately thin	BMI less than 17 but greater than or equal to 16
		Mildly thin	BMI less than 18.5 but greater than or equal to 17
		Chronically energy deficient (CED)	BMI less than 18.5
	Identifying the proportion of the reproductive age population with increased risk of non-communicable disease	Overweight for Asian populations	BMI greater than 23 but less than or equal to 25
		Overweight (International cut-off)	BMI greater than 25 but less than or equal to 28
		Obese for Asian populations	BMI greater than 28 but less than or equal to 30
		Obese (International cut-off)	BMI greater than 30
		Overweight	BMI greater than 23

⁵ For example, a girl with a BMI of 18.4 at 18.9 years of age would be considered mildly malnourished (z-score < -1 SD but > -2SD), but this level of malnutrition is of less concern and generally not reported when z-scores are used, as approximately 14% of the population are expected to fall into this category in a well-nourished population. However, when this girl turns 19, she will be included in the estimate for CED.

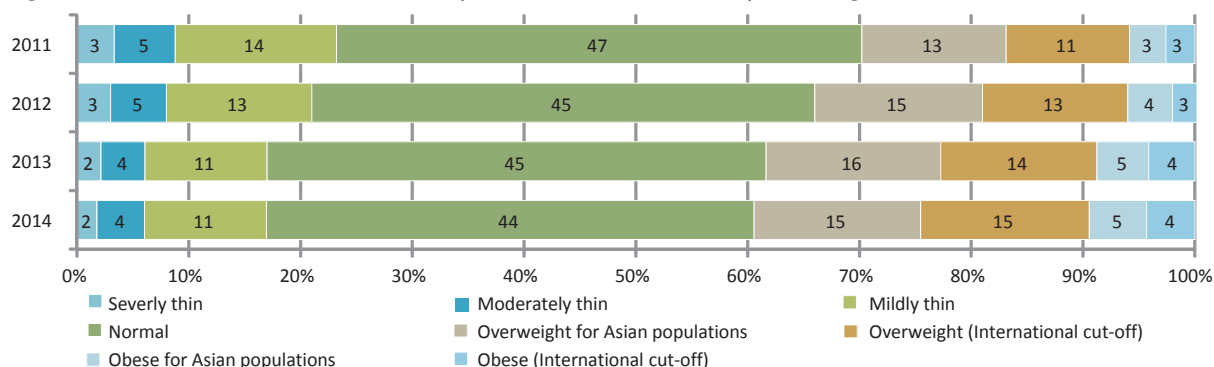
BMI measures are also used to estimate the proportion of the population who are overweight or obese, and thereby at greater risk for non-communicable disease (12,13). Similar to the system used for malnutrition, to estimate the level of overweight and obesity in a population, different cut-offs are employed for adolescent girls and adult women. Girls are classified relative to what is expected in a well-nourished population, while women are classified based on the BMI score at which an increased risk of non-communicable diseases has been observed (12). As was the case with the BMI malnutrition measures, these two approaches to BMI measurement are aligned but not entirely comparable. As an international system of classification, the adolescent measure more closely aligns with the international cut-offs for obesity in the highest age groups instead of the Asian or at risk values.⁶ Because of these differences, and similar to the estimates of under nutrition, the adult measure of overweight and obesity contains a greater share of the population (see Figure 6.18).

Figure 6.13: Nutritional status of adolescent girls by BMI (2011-2014, 10 to 18 years of age)



Illustrating these two systems of classification, Figure 6.13 presents national level data for adolescent girls' nutritional status. Using z-scores, figures for Bangladeshi girls aged 10 to 18 years of age (upper bars) are juxtaposed against the WHO reference group (lowest bar). This reference indicates that 68% of the population should fall in the normal range, with 16% in underweight and overweight groups on either end. In contrast to this ideal, in 2014, only 54% of girls in Bangladesh fall in the normal range and 39% of girls are undernourished below -1SD from the mean, with only a small percentage overweight (mild - 6%, moderate - 1%, severe - <0.1%). This distribution has been more or less static since 2012, notwithstanding marginal improvements in the lower tail.

Figure 6.14: Nutritional status of women by BMI (2011-2014, 19 to 49 years of age)



⁶ For example, +1SD at 18.9 years of age is approximately equal to a BMI score of 25, while +2SD at 18.9 years of age is approximately equal to a BMI score of 30. As a practical example, a girl with a BMI of 23 at 18.9 years of age would not be overweight (z-score<+1 SD), but she would be when she became 19 as a member of an Asian population.

For adult women, aged 19-49 years, international standards provide eight categories of nutritional status but no guidance on what an "ideal" distribution should be (12,13). While 17% of the population are undernourished, an even larger proportion are overweight based on Asian cut-offs (39%). The proportion of women overweight increased by around two percentage points each year between 2012 and 2014 (Figure 6.14). The level of under nutrition among adult women identifies Bangladesh as having a medium severity public health problem, but no international classification system exists to assess the public health risk for the increasing level of overweight (14). As rates of child under nutrition have remained high, this worrisome trend towards a double burden of malnutrition requires urgent attention (15,16).

Figure 6.15: Nutritional status of women and girls by locality⁷

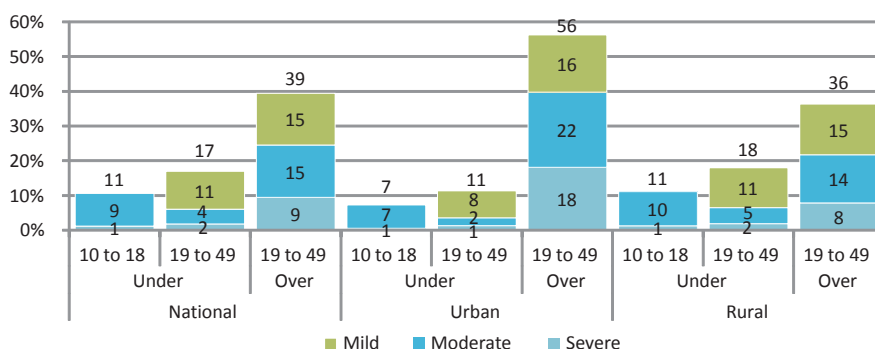


Figure 6.15 presents national, urban and rural rates of underweight for women and adolescent girls, coupled with the rates of overweight among adult women.⁸ As might be expected, overweight among adult women is much

more prevalent in urban areas than rural areas. Over half of adult women in urban areas were classified as being overweight, the same proportion as was identified in 2013. The proportion of the population in the most severe category, 'women obese' using the Asian cut-off, however, has not changed from 2013. In rural areas, the prevalence of overweight was twice that of underweight. Rates of underweight among girls were somewhat higher in rural areas compared to urban areas, but have fallen in both since 2013. In contrast, a decline in the rate of under nutrition among adult women was only apparent in urban areas.

As shown in Figure 6.16, there is substantial variation in rates of women's underweight and overweight by division of residence and surveillance zone. While an almost equal proportion of underweight and overweight women was found in Sylhet, in all other areas of the country - apart from the Northern chars and Haor - there was a greater proportion of women overweight compared to underweight. The proportion of adolescent underweight was highest in Sylhet and Khulna. Between 2013 and 2014, rates of adolescent underweight have increased in Rajshahi and Khulna while the proportion of women underweight increased in Dhaka, Khulna and Barisal (albeit both changes lack statistical significance). The proportion of overweight adult women has increased most in Chittagong.

Among the surveillance zones and nationally, there is some evidence, although very weak, of seasonal variation in levels of under nutrition among adolescent girls and adult women (Figures 6.16 and 6.17). With the exception of Northwest and Padma chars surveillance zones, the rate of

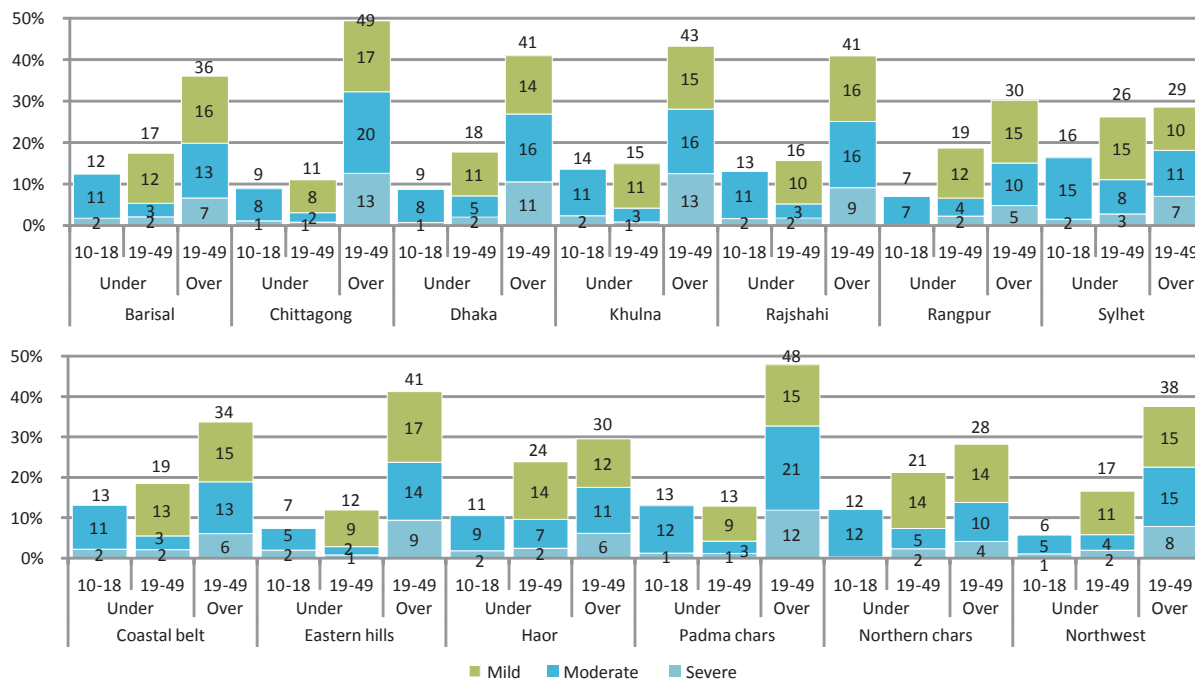
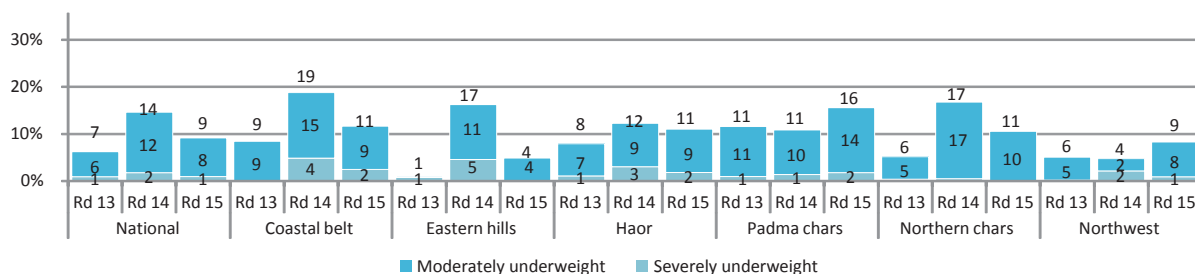
⁷ For the remainder of the graphs in this chapter the following cut-offs will be used:

10 to 18 years underweight: *Severe* - BMI z-score less than -3 SD; *Moderate* - BMI z-score greater than or equal to -3 SD but less than -2 SD

19 to 49 years underweight: *Severe* - BMI less than 16; *Moderate* - BMI greater than or equal to 16 but less than 17; *Mild* - BMI greater than or equal to 17 but less than 18.5

19 to 49 years overweight: *Mild* - BMI greater than 23 but less than or equal to 25; *Moderate* - BMI greater than 25 but less than or equal to 28; *Severe* - BMI greater than 28

⁸ The proportion of 10 to 18 year old girls who are overweight is not shown because prevalence is less than 1% for all categories (Figure 6.13).

Figure 6.16: Nutritional status of adolescent girls and women by division and surveillance zone⁷**Figure 6.17: Seasonal variation in malnutrition among adolescent girls by surveillance zone⁷**

malnutrition peaked in the monsoon months. This was also true for the country as a whole. Under nutrition among adult women, on the other hand, peaked in the monsoon months nationally and in the Coastal belt, Eastern hills, and Northwest. These trends were mirrored in the proportion of women overweight.⁹

Figure 6.19 clearly illustrates the discontinuity between z-score and cut-off methodologies using the 15-18 year old age group. A much greater proportion of young women are classified as both underweight and overweight using the cut-off methodology compared to the z-score approach, with an almost stepwise increase in the proportion of women overweight until age 27-30. After age 30, rates of underweight and overweight appear to stabilize.

⁹ Adolescent overweight and obesity is not shown because levels were too low to disaggregate by season.

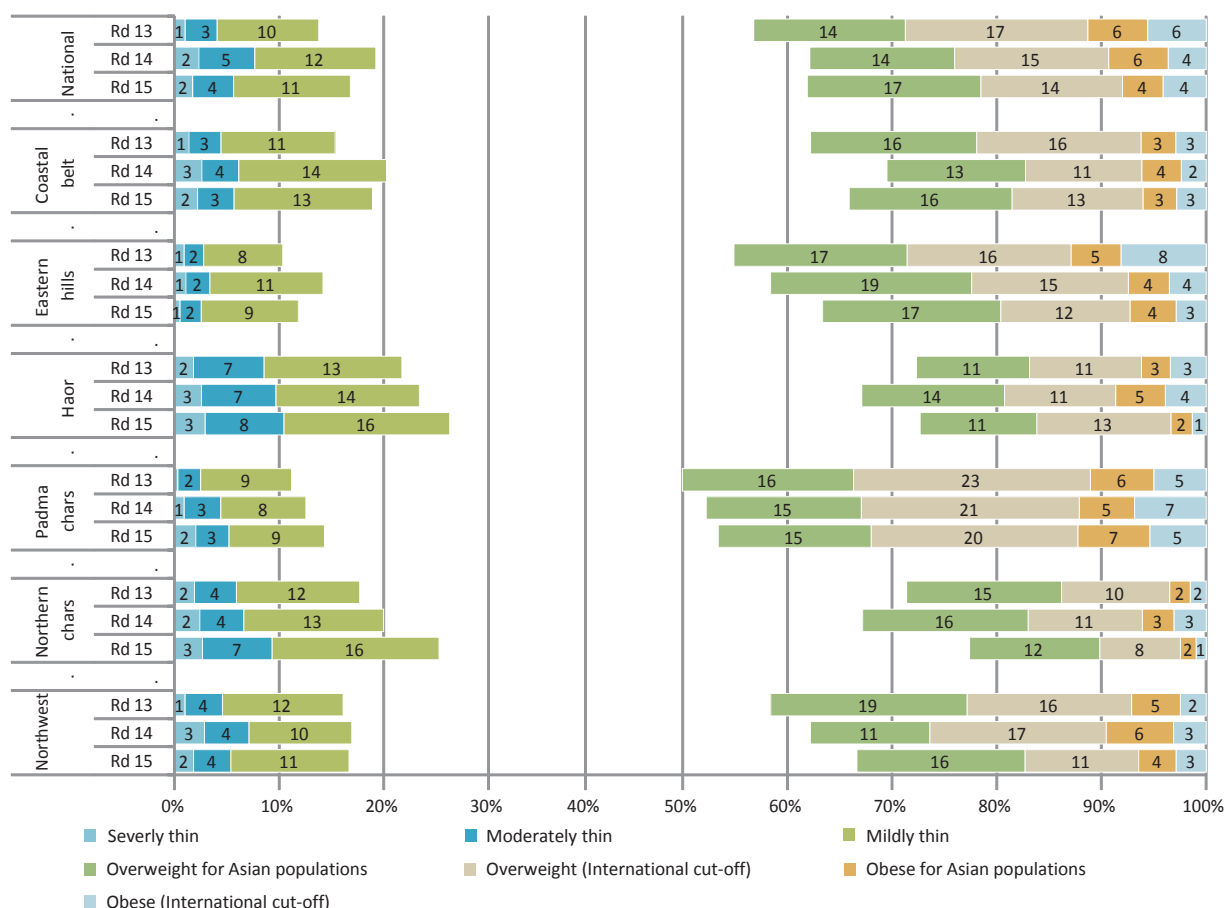
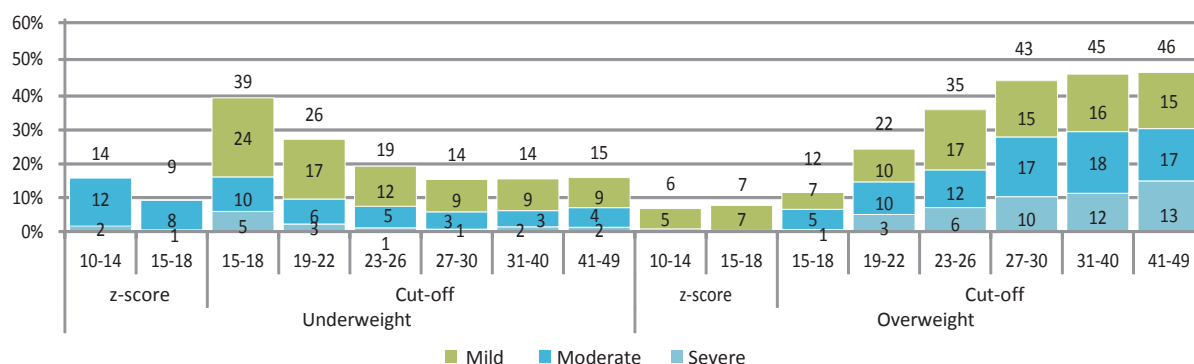
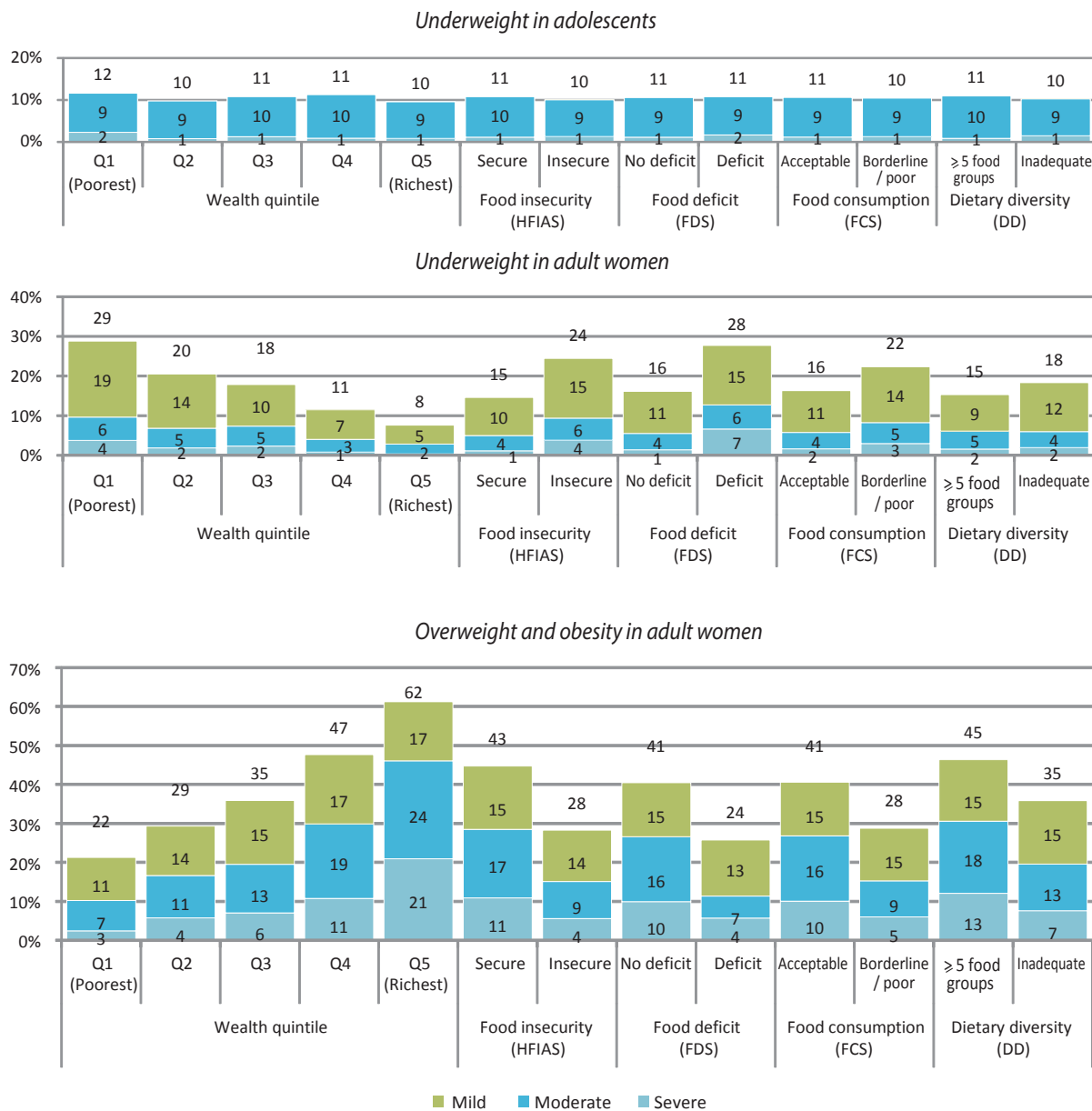
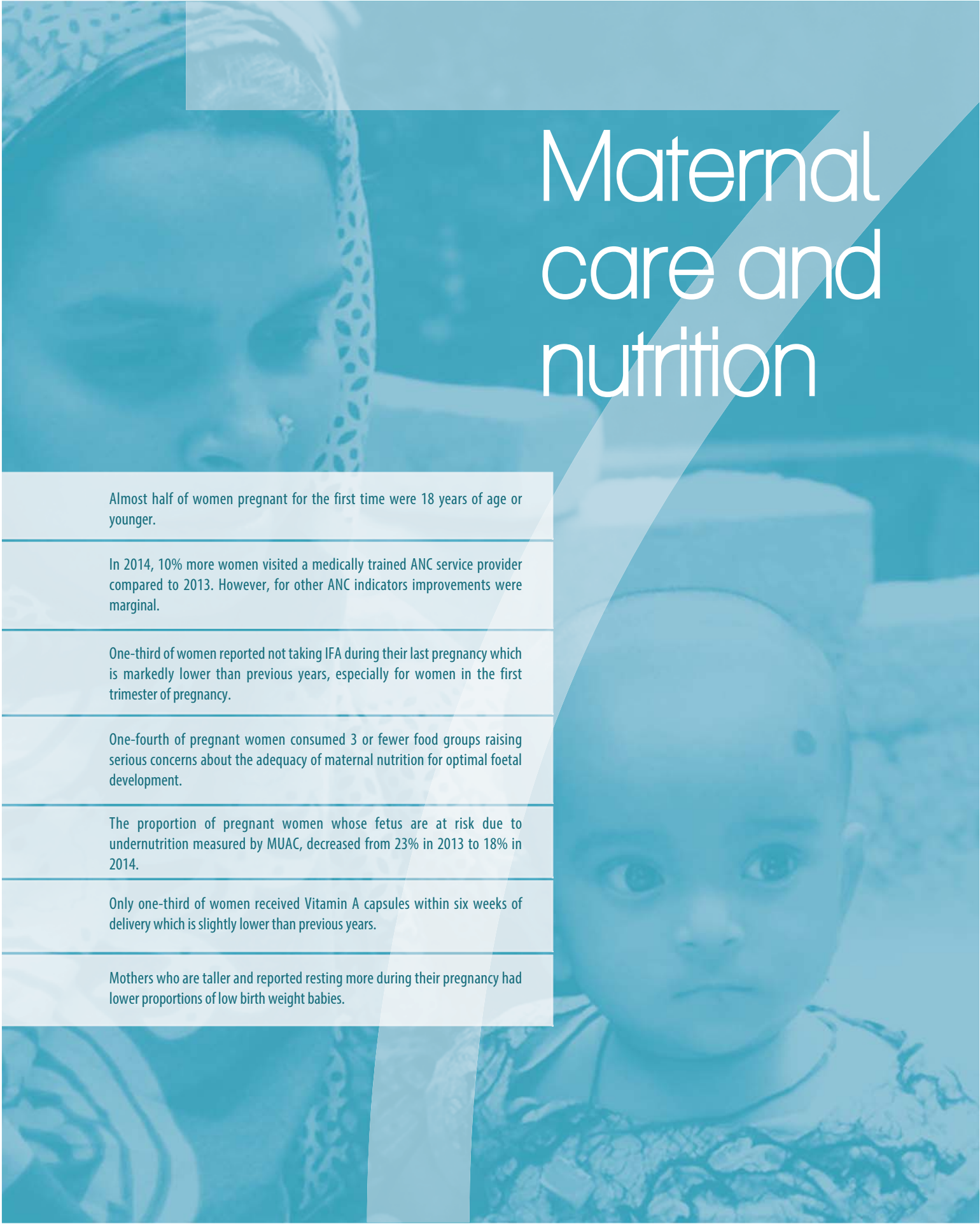
Figure 6.18: Seasonal variation in nutritional status among women by surveillance zone⁷**Figure 6.19: Nutritional status of women and adolescent girls by age⁷**

Figure 6.20 shows a strong association between malnutrition among adult women and household wealth and food security status. As wealth increases, there is a decrease in the proportion of underweight women and an increase in the proportion of overweight women. In 2014, like previous years of surveillance, underweight is strongly associated with food insecurity, hunger, poor food access and lack of dietary diversity. By contrast, rates of malnutrition among adolescent girls vary little by wealth quintile, food security, and dietary adequacy.

Figure 6.20: Nutritional status of women and adolescent girls by wealth, food security, and dietary diversity⁷



Maternal care and nutrition

Almost half of women pregnant for the first time were 18 years of age or younger.

In 2014, 10% more women visited a medically trained ANC service provider compared to 2013. However, for other ANC indicators improvements were marginal.

One-third of women reported not taking IFA during their last pregnancy which is markedly lower than previous years, especially for women in the first trimester of pregnancy.

One-fourth of pregnant women consumed 3 or fewer food groups raising serious concerns about the adequacy of maternal nutrition for optimal foetal development.

The proportion of pregnant women whose fetus are at risk due to undernutrition measured by MUAC, decreased from 23% in 2013 to 18% in 2014.

Only one-third of women received Vitamin A capsules within six weeks of delivery which is slightly lower than previous years.

Mothers who are taller and reported resting more during their pregnancy had lower proportions of low birth weight babies.



Optimal pregnancy outcomes occur when women are well-nourished and healthy throughout their life cycle and receive special care in preparation for, during, and after pregnancy. In Bangladesh, multiple constraints, such as poverty, inadequate health services, and culturally-based taboos on care seeking, lead to a lack of adequate protection for pregnant women, compromising the health and wellbeing of both mothers and infants (1,2,3). Care in early pregnancy confers a beneficial effect on pregnancy outcomes; women who do not receive clinical antenatal care (ANC) have a significantly greater odds of miscarriage compared to those who attended a clinic for a check-up during their first trimester (4). In addition, low nutritional status of women results in low birth weight (LBW) babies. According to Multiple Indicator Cluster Survey 2012-2013, low birth weight (<2,500 g) affected 26% of infants in Bangladesh, almost twice the 15% threshold that indicates a public health problem (5). A recent study in 2013 recorded even higher rates, with nearly one-quarter of children born preterm, over one-half born at a low birth weight, and over one-third of children stunted from birth (6).

Care during pregnancy has multiple components, some requiring health professionals and some dependent on family. FSNSP measures aspects of both. In 2014, FSNSP interviewed and measured 1,603 pregnant women and interviewed 1,029 women with a child less than six months of age about the care they received during and immediately after their pregnancy (Table 7.1).

Table 7.1: Number of mothers interviewed

Age group in years	Pregnant at interview		With a child less than six months old	
	Number	Weighted proportion	Number	Weighted proportion
10 to 14	11	1%	0	0%
15 to 19	404	23%	200	21%
20 to 24	532	35%	365	33%
25 to 29	422	27%	280	27%
30 to 34	178	11%	128	14%
35 to 39	50	4%	44	4%
40 to 44	5	0%	10	1%
45 to 49	1	0%	2	0%
Total	1603		1,029	

Fertility patterns

Ideally, pregnancy-related care should start before conception, ensuring women are healthy enough to conceive and carry a child to full term (7,8). Pregnancy should be delayed until a woman's body has matured and pregnancies should not be timed too close together (9,10,8). Since independence, Bangladesh has made great strides in reducing the frequency of birth and increasing birth spacing. Bangladesh has been much less successful in raising the age of first pregnancy, though there has been improvement in reducing the number of births among the very young (those less than 15 years old). The median age of first birth of women 20-24 years of age increased by only one year, from 18 years in 1992/1993 to 19 years in 2011 (11,12,13). As the first birth typically takes place one or two years after marriage, this implies that most marriages still occur before Bangladesh's legal age of marriage (18 years for women).

For all pregnant women interviewed, FSNSP recorded the number of previous pregnancies that each woman had, regardless of whether that pregnancy resulted in a live birth or not. As would be expected in a country where the average fertility rate is 2.3 (12), the plurality of pregnant women—about 35%—were in their first pregnancy and a little less than one-third were in their second pregnancy. Similar to past results, in 2014, about 21% of women were in their third pregnancy; only 16% of women were in their fourth and higher pregnancy (Figure 7.1). Due to the early age of marriage, almost half of women pregnant for the first time were 18 years of age or younger. Even more alarming, a little below one-tenth of women in their second pregnancy were 18 years or younger. While it is likely that the girls, 15 to 18 years of age, who reported being on their third or

fourth pregnancy did not complete all previous pregnancies, frequent pregnancies and/or complications can compromise the nutritional status and health of the mother and infant (9).

Figure 7.1: Age group of pregnant women by number of previous pregnancies

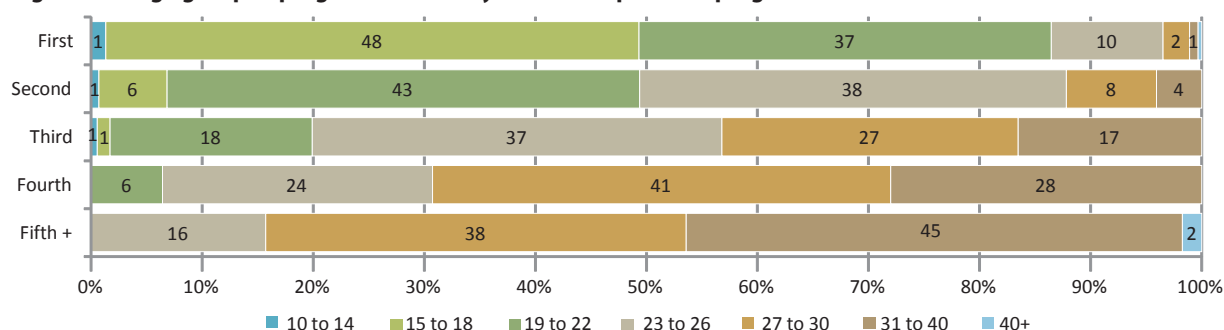


Figure 7.2: Distribution of number of previous pregnancies by age¹

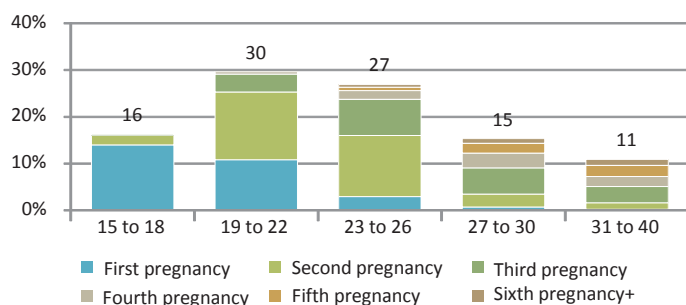


Figure 7.2 displays the age distribution of pregnant women. Almost half of pregnant women were 22 years of age or younger and the largest proportion of pregnant women were 19 to 22 years of age. Still 16% of pregnant women were 18 years or younger while only one-tenth of pregnancies occurred among women over the age of thirty.

Clinical antenatal care

Clinical antenatal care encompasses many different components, which together help ensure the health and safety of mother and baby during pregnancy and delivery. FSNSP collects information on the coverage of care received by women during pregnancy. The focus of FSNSP's indicators is to estimate the proportion of women who are meeting demand-level recommendations of the World Health Organization's (WHO) Technical Working Group on Antenatal Care (14). These recommendations state that proper care for mother and child requires that pregnant women have a minimum of four visits with skilled health personnel which are to be completed at specific times during the pregnancy (14). The FSNSP system ascertains this information by interviewing mothers of children less than six months of age about care they received during their pregnancy.

Figure 7.3 tracks changes in ANC coverage over time. The proportion of women receiving no ANC has decreased from 20% in 2013 to 15% in 2014. Moreover, the proportion of women visiting a medically trained ANC service provider has increased by 10% between 2013 and 2014. The proportion of women completing four or more ANC visits, and the proportion of women who had an ANC check-up in their first trimester have also increased during this year compared to 2013. Ultimately, only one-fifth of pregnant women had adequate ANC coverage, indicating that they had received at least four ANC visits, at least one of which was during the first trimester and from a medically trained provider, as per guidelines set out by the Technical Working Group (14).

¹ This graph excludes eleven fourteen-year-old pregnant girls due to the small number of pregnancies at these ages.

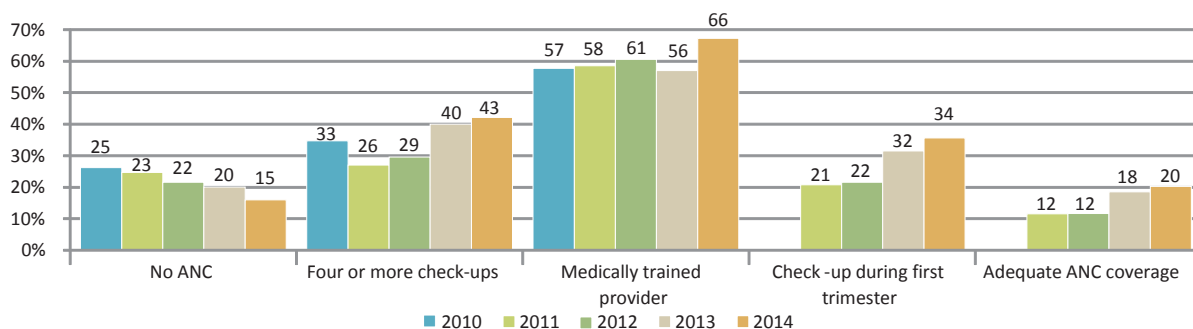
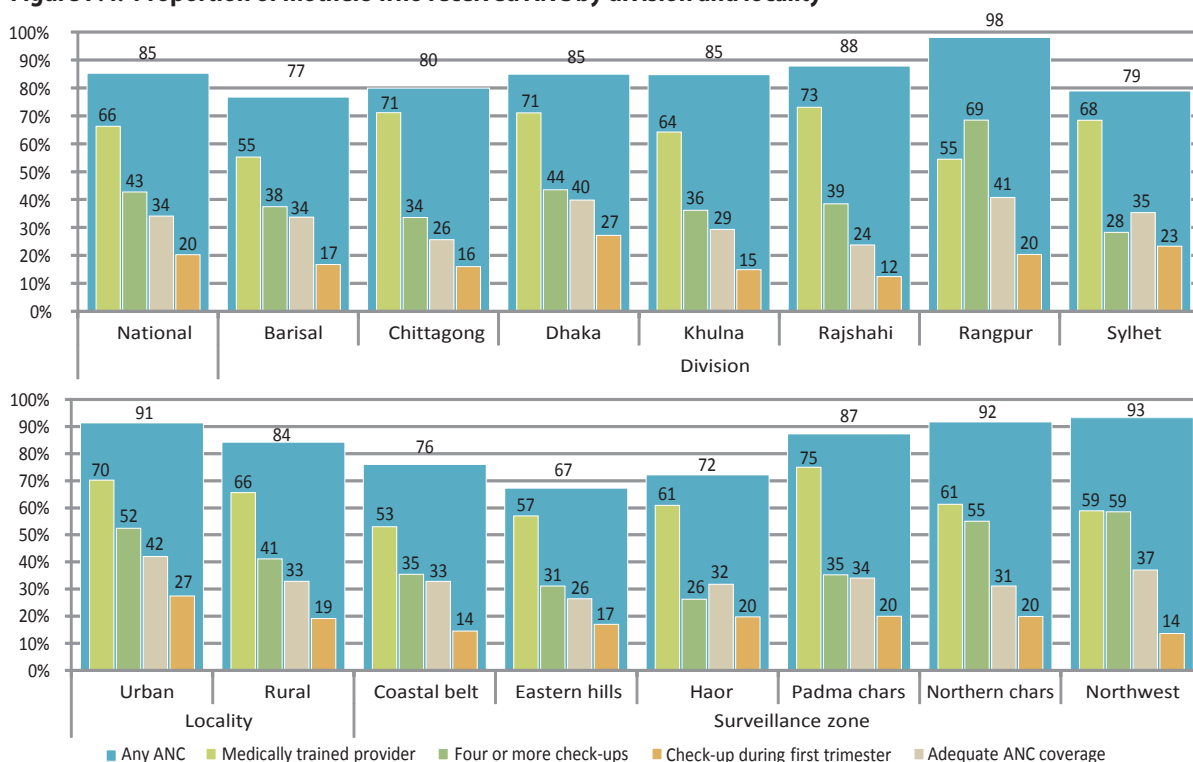
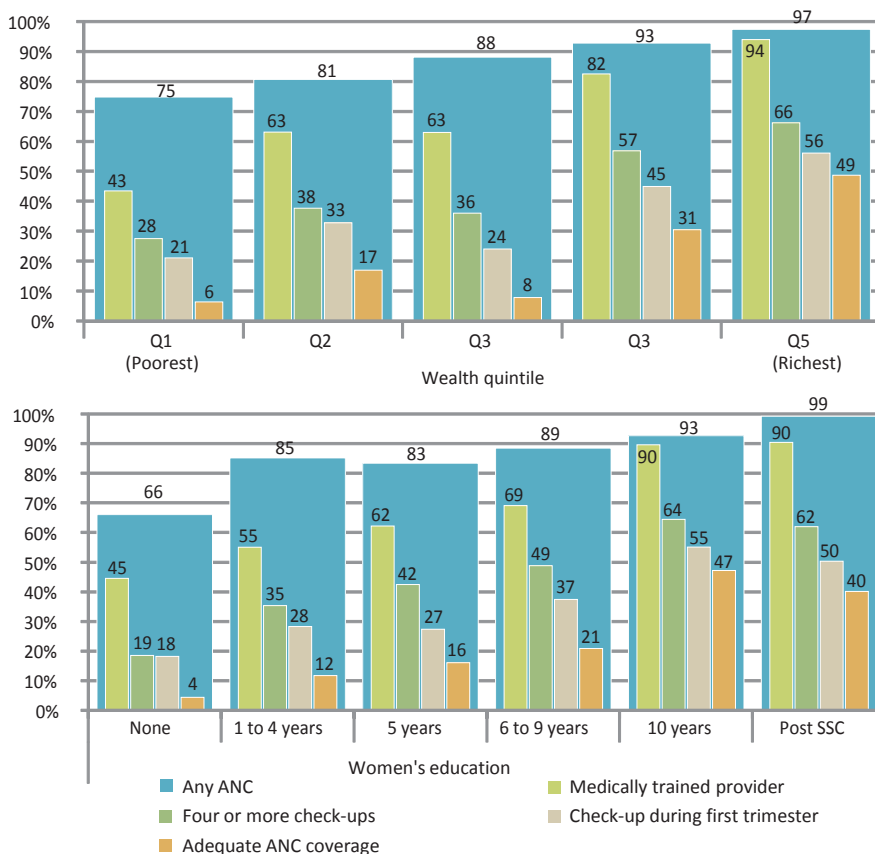
Figure 7.3: Trends in ANC for women who delivered in the six months before the interview (2010-2014)**Figure 7.4: Proportion of mothers who received ANC by division and locality**

Figure 7.4 shows the proportion of mothers receiving ANC by division and rural or urban residence. The thick bar indicates the proportion of mothers who received any ANC, while the four thinner bars show the proportion of mothers who received each component of care. At the national level, about 85% of women completed at least one ANC check-up during their pregnancy and well over half of these women received care from a medically trained provider. However, only one-third of pregnant women had their first ANC visit in the first trimester, and around two-fifths received at least four check-ups. Furthermore, only one-fifth of women who had gone for any ANC, received minimum adequate care. This pattern varies dramatically by division, locality, and surveillance zone. Differences in the indicators of ANC may indicate substantial variation in the knowledge level of mothers and their ability to access care. In Barisal and Sylhet, pregnant women received ANC care in a much lower proportion than those in other divisions. However, in Sylhet and Chittagong division, the majority of women who received ANC did so from a medically trained provider,

possibly indicating a greater use of the formal health system. In Rangpur division, only one half of women received ANC from a medically trained provider, suggesting substantial barriers to formal health services although the proportion of women seeking any ANC check-up was much higher than the national level. Dhaka had the highest proportion (27%) of women who obtained adequate ANC care.

Figure 7.5: ANC indicators by household wealth and women's education



Elements of ANC increased in an almost step-wise fashion by mother's education level and wealth quintile (Figure 7.5). Overall, ANC coverage was the highest among the most educated women and those in the wealthiest quintile. However, overall rates of adequate ANC coverage (three conditions fulfilled) are alarmingly low regardless of wealth. In the poorest quintile, only 6% of pregnant women received adequate ANC, while even in the richest wealth quintile, less than one-half received adequate ANC.

Iron and folic acid (IFA) supplementation

Iron and folic acid tablets are an essential component of adequate ANC. Iron assists in the prevention of anaemia and associated complications during pregnancy and delivery - such as pre-term and low birth weight births as well as increased risk of haemorrhage during delivery - and folic acid reduces the risk of neural tube defects in the infant while helping the body fight anaemia (15). In Bangladesh, this supplement is provided to pregnant women by the Directorate General of Family Planning as part of regular ANC services; however, coverage of and compliance with the IFA supplementation intervention is low due to lack of awareness and inadequate delivery mechanisms (16). Compliance with an IFA regimen requires two elements: timely receipt of or access to IFA tablets and regular consumption of the tablets provided. FSNP does not regularly record if and when IFA tablets are received by pregnant women, but it records two measures of women's consumption of IFA tablets: the reported frequency of consumption during past pregnancy for women with a child less than six months of age, and the number of tablets taken in the last week for currently pregnant women.

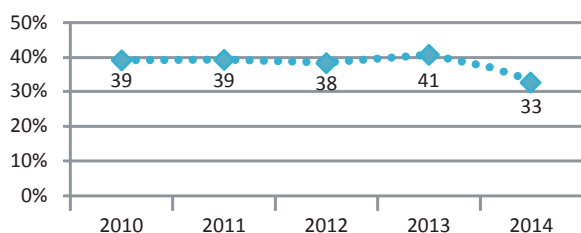
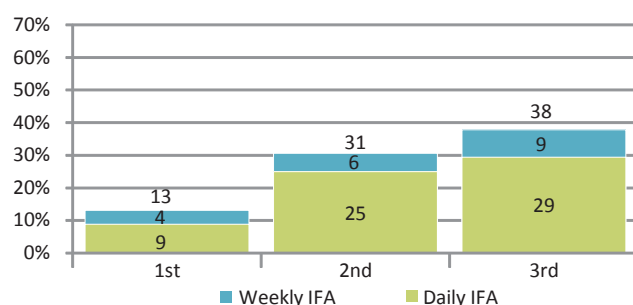
Figure 7.6: Proportion of pregnant women with no IFA intake during last pregnancy (2010-2014)

Figure 7.6 displays the proportion of women who have given birth to a child in the six months before they were interviewed who did not take IFA tablets during their last pregnancy. In 2014, one third of the women reported not taking IFA during their last pregnancy, which is lower than the previous four years of data collection. In all years, still a

high proportion of mothers did not take IFA rationalize the fact that nearly half of pregnant women of Bangladesh are anaemic (17).

Figure 7.7: Proportion of pregnant women taking IFA during pregnancy by trimester

However, these figures understate the level of IFA consumption, as women with completed pregnancies tend to report their practices during the last trimester, but few women took IFA consistently throughout pregnancy. When currently pregnant women reported on their consumption of IFA tablets in the past week, the proportion of women taking IFA varied greatly between trimesters of

pregnancy. In 2014, less than one-fifth of women reported they had taken IFA tablets weekly in the first trimester, this rose to nearly two-fifths of women in their final trimester (Figure 7.7).

Figure 7.8: Proportion of pregnant women who took IFA during pregnancy by area of residence

When examining these figures, it is important to keep in mind the specific nutrient needs associated with different stages of pregnancy. Although anaemia is a concern throughout pregnancy and especially at the time of delivery, folic acid is essential during the first trimester when the developing foetus is at risk of developing neural tube defects (18,19,8). The proportion of women taking IFA during their first trimester

is very low, putting unborn children at risk of birth defects. The increased use of IFA throughout the pregnancy is positive in terms of preventing anaemia, especially around the time of birth, however more needs to be done to encourage women to take folic acid earlier in their pregnancy.

As shown in Figure 7.8, across the divisions, Sylhet had the lowest and Rangpur had the highest proportion of women taking IFA during pregnancy. Iron supplementation is higher among women from urban areas compared to those from rural areas, a difference that has remained consistent since 2010. Among the different zones, the Padma chars had the lowest proportion of women taking IFA while the Northwest had the highest.

Figure 7.9: Proportion of pregnant women who took IFA by household wealth and own education

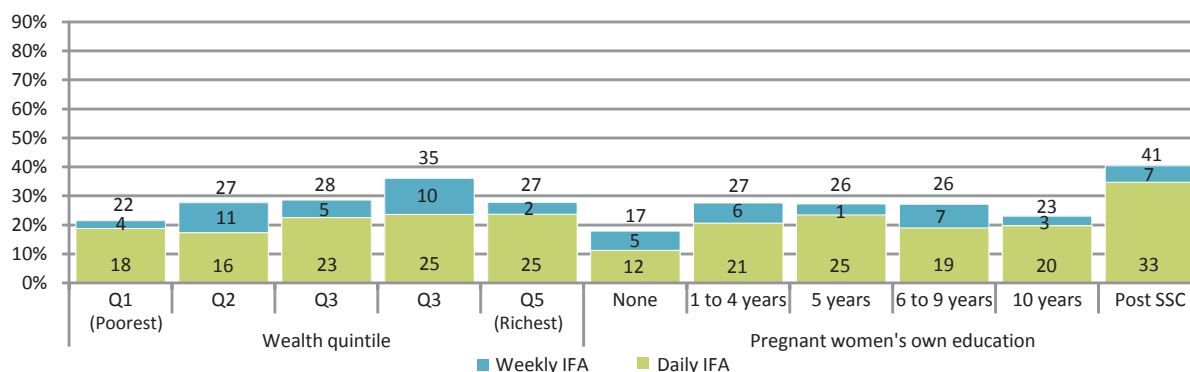
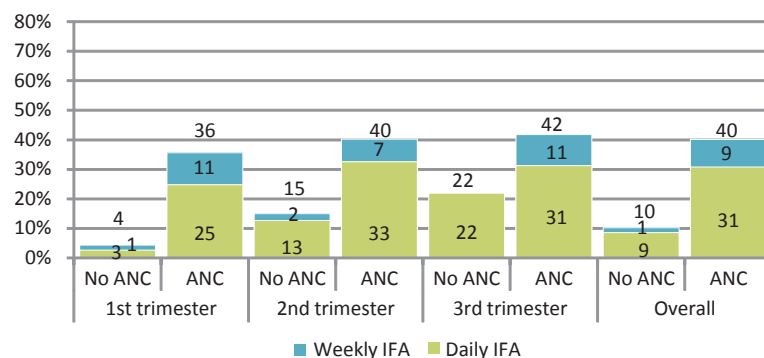


Figure 7.10: Proportion of pregnant women who took IFA during pregnancy by ANC care and trimester



While there was limited association between women's age and adherence to an IFA regimen (not shown), expected patterns related to wealth were observed. As education increased, so did the proportion of women who reported taking IFA regularly. A greater proportion of educated women also maintained a

weekly IFA regime during pregnancy than less educated women. Overall, four times more women who had completed at least one ANC visit took IFA weekly compared to those who had no ANC visits (Figure 7.10).

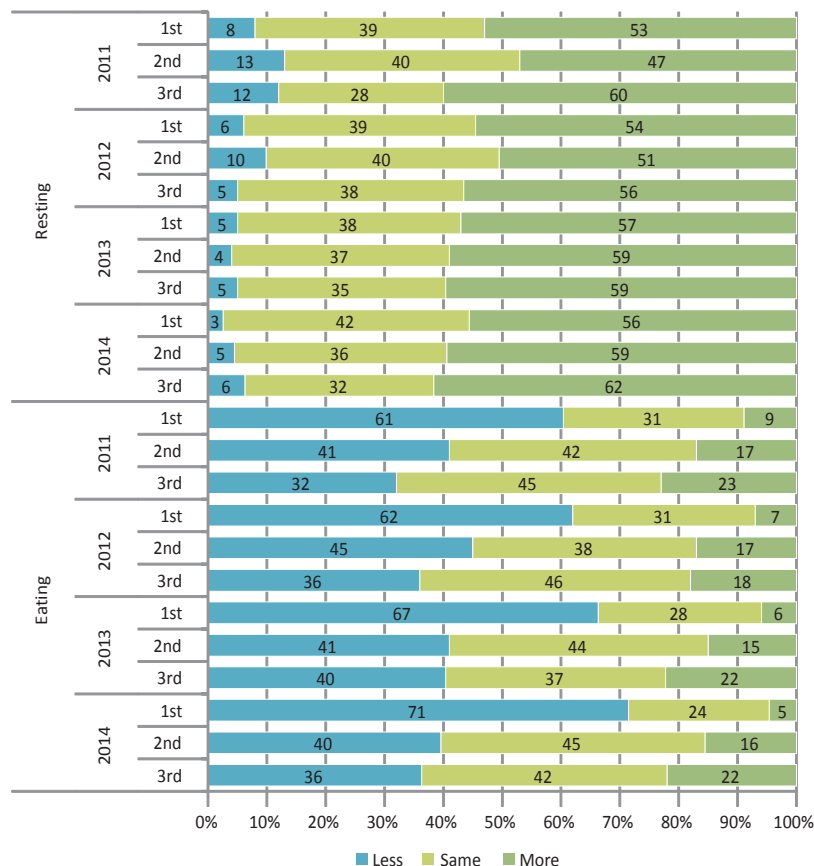
Family and self-care

Along with clinical ANC, women must receive special consideration in the home during pregnancy to ensure optimum health of mother and child. A pregnant woman's household should support her to reduce heavy work and increase the quantity and quality of her diet. Household and self-care for pregnant women are captured by a number of FSNP measurements including diet composition, amount of rest taken, and amount of food consumed.

As shown in Figure 7.11, most women report being able to rest more during pregnancy, but only a minority report consuming greater amount of food. Strikingly, the majority of women actually report eating less during the first trimester of their pregnancy in comparison to before, perhaps due to morning sickness. As the pregnancy proceeds, a higher proportion of individuals report eating more;

however, there is still an alarmingly high number of individuals who claim to be eating less than pre-pregnancy levels. Though the proportion of women who rested less than usual remain steady between 2013 and 2014, the proportion that ate less food than usual increased by 4 percentage points during the first trimester. However, in the final trimester, the number of women claiming to consume less food than usual declined 4 percentage points from the previous year.

Figure 7.11: Rest and food consumption during pregnancy compared to before by trimester and year



Patterns of food consumption are not entirely consistent with information obtained on women's dietary diversity as depicted in Figure 7.12. In 2014, for example, the diets of pregnant women were slightly more diverse during their first trimester compared to other trimesters despite the fact that they reported eating less than later trimesters. Overall, dietary diversity during pregnancy improved slightly during the second two trimesters comparing 2013 and 2014. In light of the increased nutritional needs of pregnant women, however, the fact that about one fourth of pregnant women consume 3 or fewer food groups raises serious concerns regarding the proper nutrition of women and unborn children.

Figure 7.12: Dietary diversity scores by trimester and year

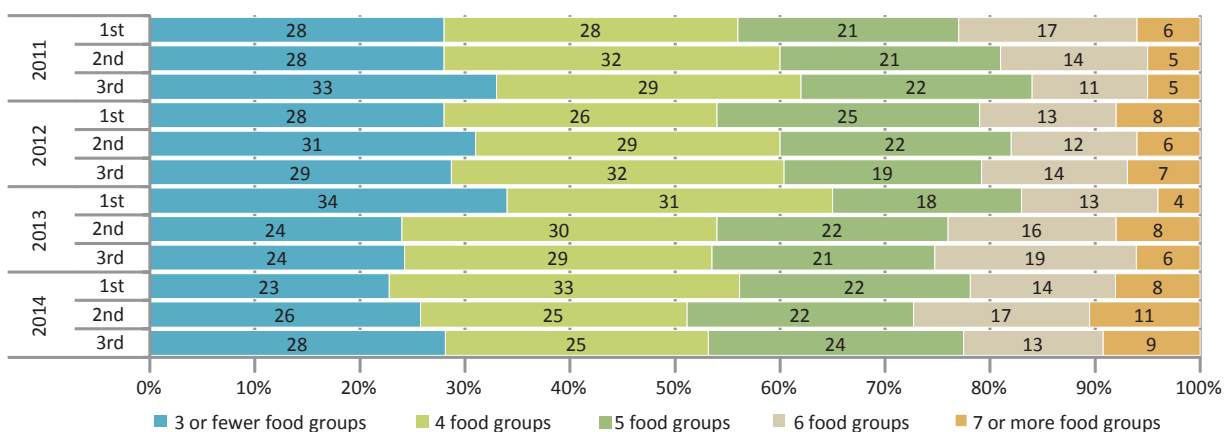
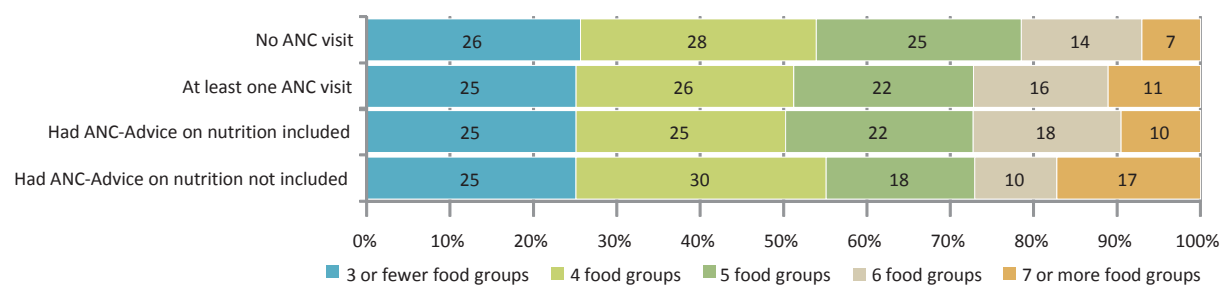


Figure 7.13: Dietary diversity scores by ANC visit

Around 56% of the pregnant women interviewed had received at least one ANC visit before the interview, and these women reported eating more diverse diets than women who had not yet attended an ANC visit (Figure 7.13). Moreover, around 80% of women who had an ANC visit reported that some advice on diet was included in the visit. Among women who had an ANC visit, those who also received advice on their diet at the time of the ANC visit had more diverse diets than those who had not received such advice. If women had not received advice on ANC during their ANC check-up, these women's dietary diversity was similar to those who had not yet received any ANC care at all. This relationship highlights the importance of including nutrition messages at key contact points throughout the life cycle.

Nutritional status

Because women should gain around twelve kilograms during pregnancy, BMI is not a useful indicator to assess the nutritional status of pregnant women unless data are available on the pre-pregnancy weight of the mother or the pattern of weight gain since pregnancy. Given that FSNP is a cross sectional surveillance system, FSNP does not have access to these pre-pregnancy weights. Instead, current nutritional status is assessed among pregnant women using MUAC while delivery risk among pregnant women is assessed using height. For pregnant mothers, Sphere standards recommend that women whose MUAC measurements fall under 230 mm be included in emergency feeding programmes, as the foetus is at an increased risk of intrauterine growth restriction at this point (20,21). In addition, FSNP Sphere classifies pregnant women with a MUAC less than 207 mm as severely undernourished (21). Although obesity is also associated with negative pregnancy outcomes (22,23), there is no standard to classify women's overweight or obesity based on MUAC.

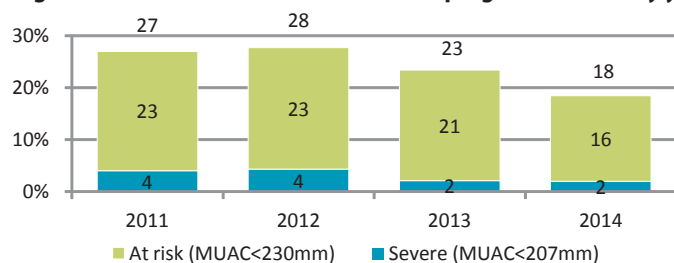
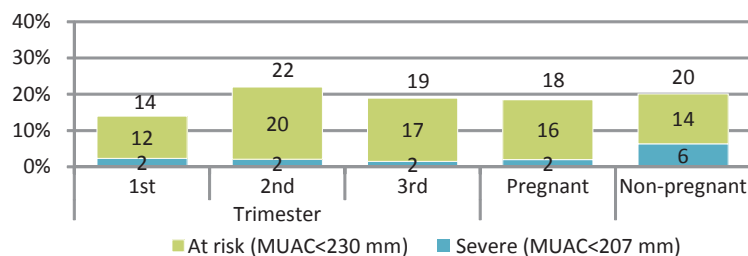
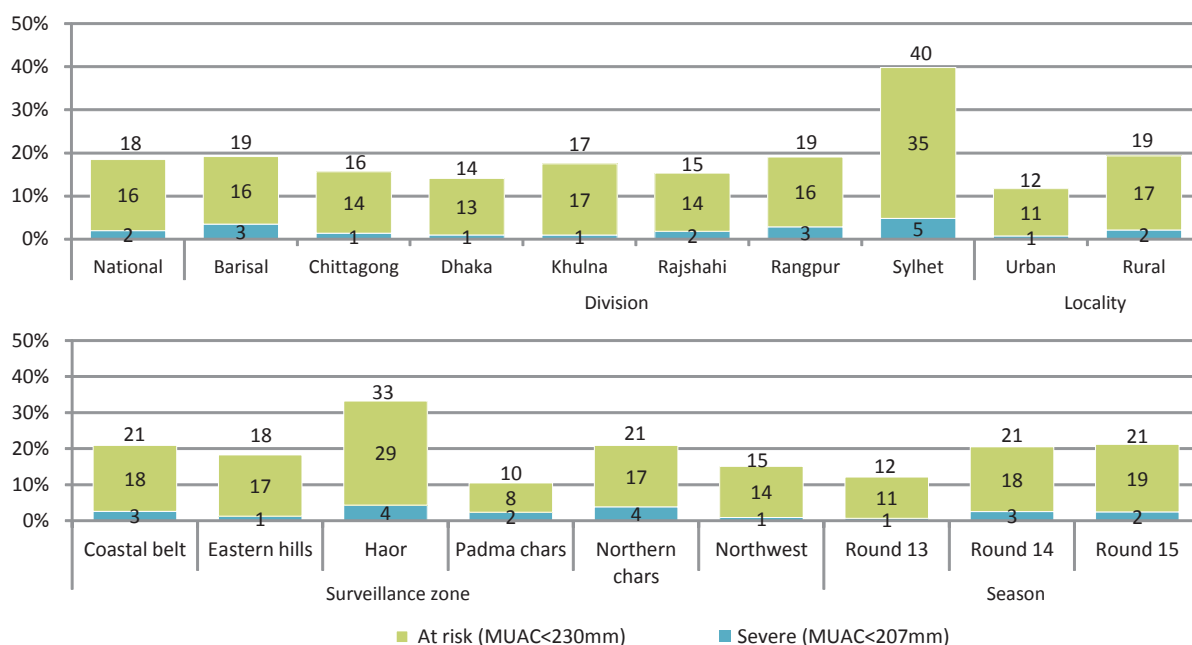
Figure 7.14: Trends in undernutrition in pregnant women by year

Figure 7.14 reveals that the proportion of pregnant women who are severely malnourished did not change between 2013 and 2014, but numbers at risk decreased from 21% to 16%. Similar to findings for non-pregnant women, an estimated 60% of pregnant women were over 150 cm tall; only 13% were of short stature (height less than 145 cm) and 2% were shorter than 140 cm.

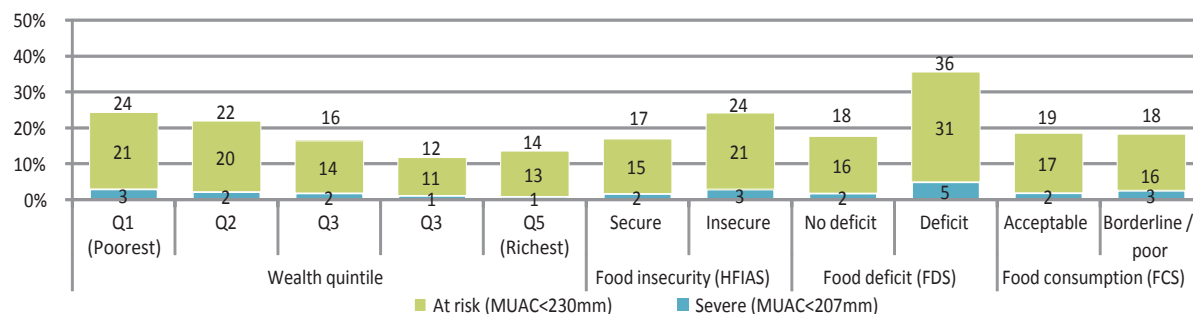
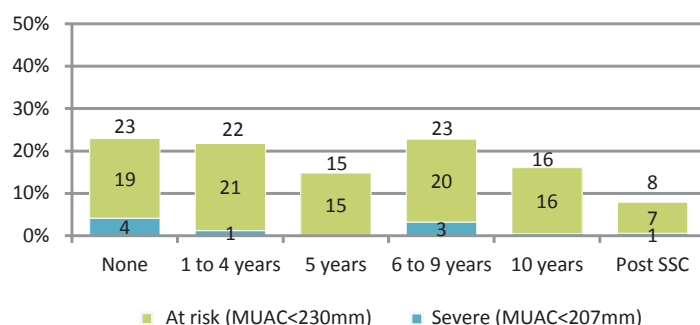
Figure 7.15: Undernutrition in women by trimester and pregnancy status

According to MUAC measurements, pregnant women were undernourished to the greatest extent in their second trimester, a situation that is sustained in until the end of their gestational period. (Figure 7.15). For comparison purposes, non-pregnant women

have been included on this graph though the at-risk cut-off of 23.0 cm does not apply to this group. Contrary to what might be expected, there is little difference in the proportion of women with MUAC measurements of less than 23.0 cm comparing pregnant and non-pregnant populations despite the weight gain that should accompany pregnancy. This difference is not simply due to the age difference between pregnant women and non-pregnant women; across all ages, the proportion of undernourished pregnant women equals or exceeds that of the non-pregnant women (see Figure 7.19)

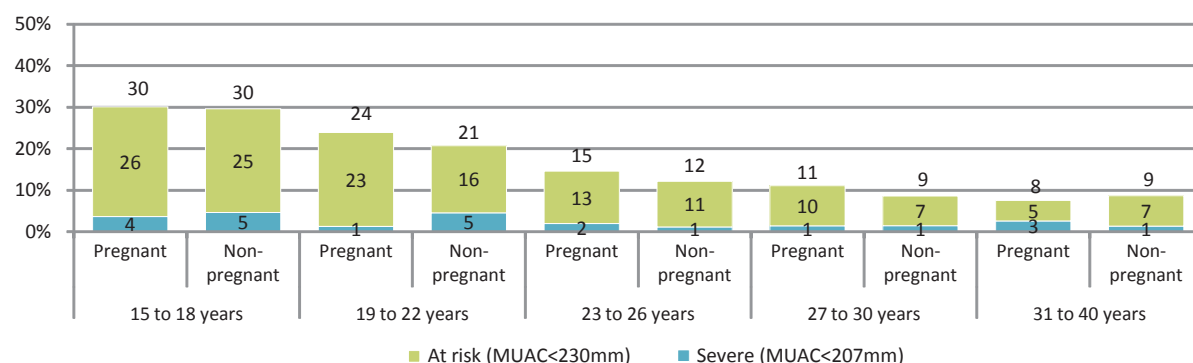
Figure 7.16: Nutritional status of pregnant women by area of residence and season

Similar to patterns of under nutrition among non-pregnant women, there were variations in the nutritional status of pregnant women across areas (Figure 7.16). Dhaka District stood out for having the lowest rates of malnutrition. As expected, pregnant women in rural areas were at greater nutritional risk than those in urban areas. The Haor had the highest rates of under nutrition during pregnancy whereas pregnant women in the Padma chars were undernourished at a lower rate than pregnant women in the other surveillance zones. The proportion of pregnant women undernourished varied across seasons, with a smaller proportion of pregnant women at risk due to thinness during Round 13 compared to Rounds 14 and 15.

Figure 7.17: Nutritional status of pregnant women by household wealth and food security status**Figure 7.18: Nutritional status of pregnant women by women's own education**

As expected, more educated pregnant women and those from wealthier and more food secure households were malnourished in a lower proportion than those less educated or from poorer and more food insecure households (Figure 7.18). In the wealthiest quintile, a little over one-tenth of pregnant women were at risk, whereas in the poorest quintile, the rate was nearly one-quarter.

Across women's education levels, nearly one-tenth of pregnant women with post SSC education were at risk compared to nearly one-fourth of pregnant women with no education at all. Indicators of care, such as dietary diversity and amount of rest taken, had little association with nutritional status (results not shown).

Figure 7.19: Undernutrition in pregnant women by age group and pregnancy status

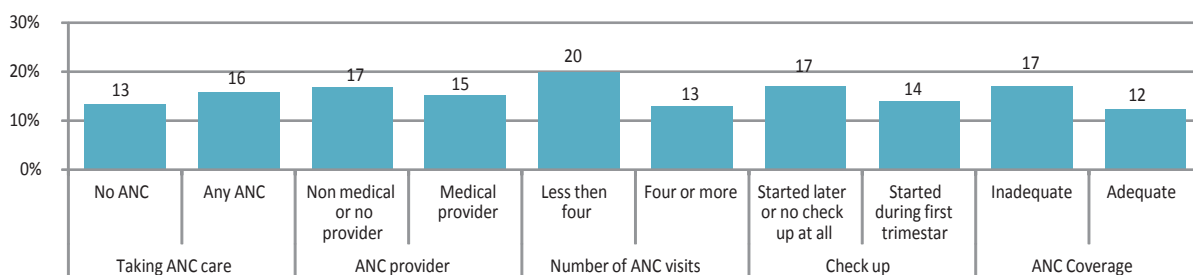
As mentioned at the outset, across all ages, the proportion of undernourished pregnant women mostly exceeds that of the non-pregnant women. Not surprisingly, the youngest cohort of women was undernourished in the greatest proportion with nearly one-third of pregnant women at risk (Figure 7.19). Pregnant girls and women were also much thinner than their non-pregnant counterparts with the exception of those over 30 years of age. Clearly more focus is needed on women's nutritional status, but especially during the adolescent and pregnancy periods to ensure that their bodies are prepared to support the needs of the developing foetus.

Low birth weight

As discussed earlier in the chapter, better maternal nutrition is an important means to reduce low birth weight and its consequences. Though FSNP cannot directly estimate the prevalence of low birth weight, as children's weight at birth does not measure a random subset of all children in the country, and the precision with which these children were weighed is unknown (27). Of the children weighed at birth in the two years before the interview whose weight could be recalled, 15% were found to be low birth weight infants, or children with a weight at birth of less than 2.5 kg. Through these records, FSNP can outline some possible risk factors and examine the impact of these factors on the birth weight of children for whom we have information.

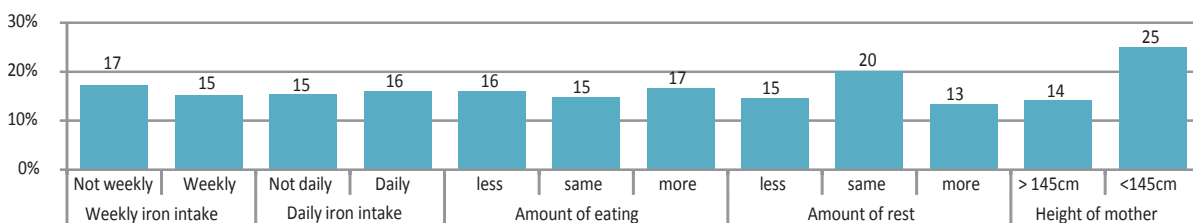
Figure 7.20 shows the prevalence rate of children born with low birth weight by the indicators included in this and the previous chapter. Studies have shown that the birth weight of babies increased with improved clinical ANC visits of mothers (28), and FSNP data are in line with this. In 2014, of the children whose mothers reported not receiving any ANC, 13% were reported to have been born at low birth weight compared to 16% among mothers who had taken at least one ANC visit. A stronger association with reduced low birth weight prevalence was apparent for measures of timely ANC, four or more ANC visits, and the composite measure of ANC care (Figure 7.20).

Figure 7.20: Relationship between ANC and low birth weight (<2.5 kg) in children



In 2014, results indicated no association between IFA consumption of mothers and low birth weight of babies (Figure 7.21). Mothers who reported resting more during their pregnancy, and taller mothers also had lower proportions of low birth weight babies than mothers who rested the same during their pregnancy than before and shorter mothers. However, no association was apparent between low birth weight and mother's reported food intake during pregnancy.

Figure 7.21: Relationship between maternal care and low birth weight (<2.5 kg) in children

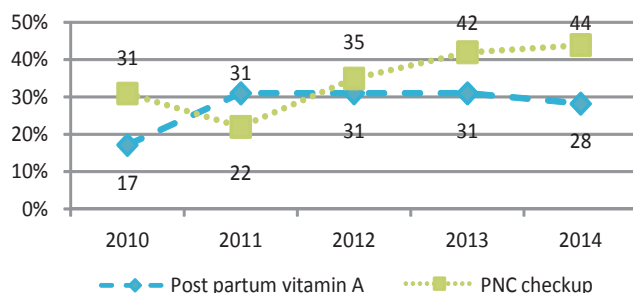


Care after delivery

In addition to ANC, it is essential that both mothers and babies receive care soon after birth. This facet of care is especially vital in Bangladesh where few deliveries occur within a hospital or with a medically trained provider. Post-natal care (PNC) visits provide an opportunity to screen for and treat complications experienced during and after delivery. These visits also allow health workers to guide new mothers in proper care of infants and to provide support on vital aspects of nutrition, including breastfeeding and nutritional supplementation for mothers.

In spite of the importance of this care, there is a lack of evidence on the optimal timing of PNC, and therefore limited indicators for assessing adequate coverage of care (29,30). As such, FSNP uses only three indicators to evaluate care after delivery: receipt of a vitamin A capsule (VAC) post-delivery, PNC check-up within 42 days of delivery by a medically trained provider, and whether or not the child was weighed within three days of birth. The Government of Bangladesh currently implements a large scale vitamin A supplementation programme (31), which provides women who have recently given birth with high potency vitamin A capsules within six weeks of delivery.² Vitamin A given to the mother is passed to the child through breast milk and helps the child's immune system to develop (32).

Figure 7.22: Post-natal care over time (2010 to 2014)

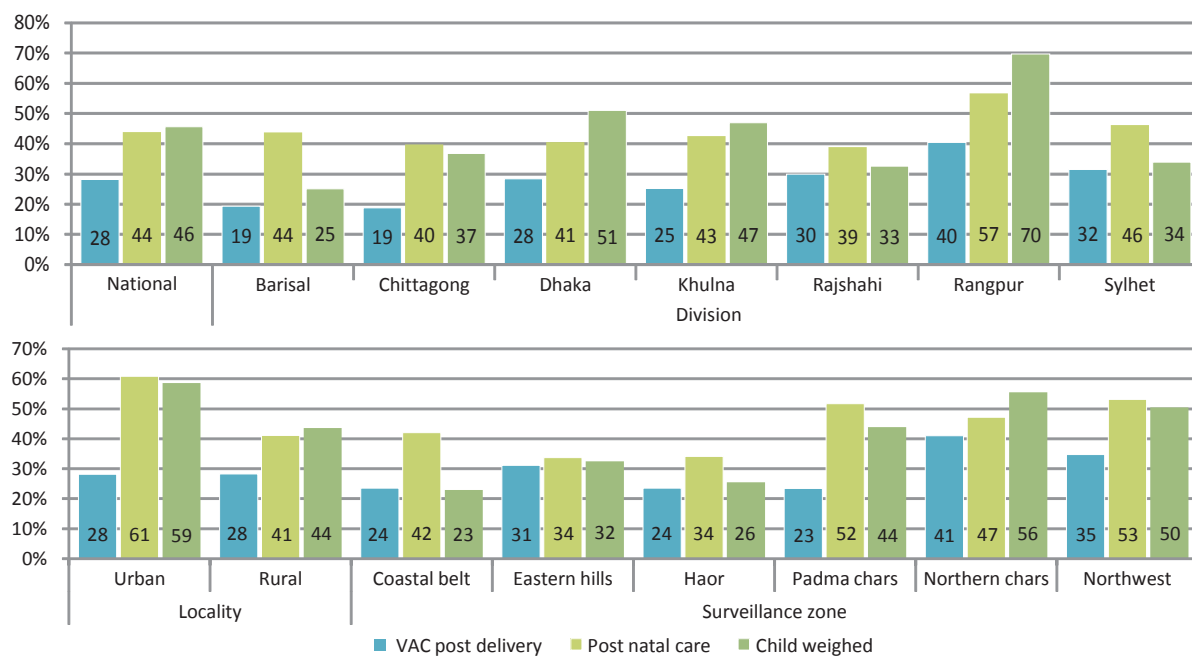


In 2014, a little less than one-third of women nationally reported receiving a VAC within six weeks of delivery which is slightly lower than previous years (Figure 7.22). Only two-fifths of women received a post-natal check-up within 30 days after birth, and only two-fifths of children were weighed at birth. As shown in Figure 7.23, across divisions, Rangpur performed best

across all PNC-related indicators. The lowest rates of post-delivery VAC and the lowest proportion of children weighed at birth was found in Barisal, while Rajshahi performed least well in terms of PNC check-up. There is no difference between urban and rural areas for VAC post-delivery, however a greater proportion of urban mothers (more than half) receive post-natal care and had children weighed at birth.

In general, rates of PNC are extremely low, and even when PNC was received, opportunities for relaying nutrition messages and supplementation did not always occur. For example, among women who received PNC check-ups, only two fifths reported receiving VAC, four-fifths received nutrition messages and two thirds received support for breastfeeding. It is unclear if these gaps were due to supply gaps with VAC, a lack of provider time, or a lack of provider training.

² Recently the World Health Organization has provided detailed recommendations for vitamin A supplementation programme, which do not recommend supplementing women postpartum (32). The Government of Bangladesh has decided to keep this programme component but to shorten the period of postpartum supplementation to two weeks, which was the initial guideline set in 2003 (31).

Figure 7.23: Post-natal care by area of residence



Child care and feeding

The prevalence of exclusive breastfeeding in the first month of life decreased from four-fifths in 2012 to three-quarters in 2013 to about two-thirds in 2014. Though fresh milk is now more available in local markets, the proportion of children begin bottle fed and fed with breast milk substitutes has not changed since 2010.

In 2014, a little over two-fifths of children were fed minimally adequate diets. This represents a substantial improvement since 2011, yet falls short of the 52% target set in the Health, Population, and Nutrition Sector Development Plan (HPNSDP).

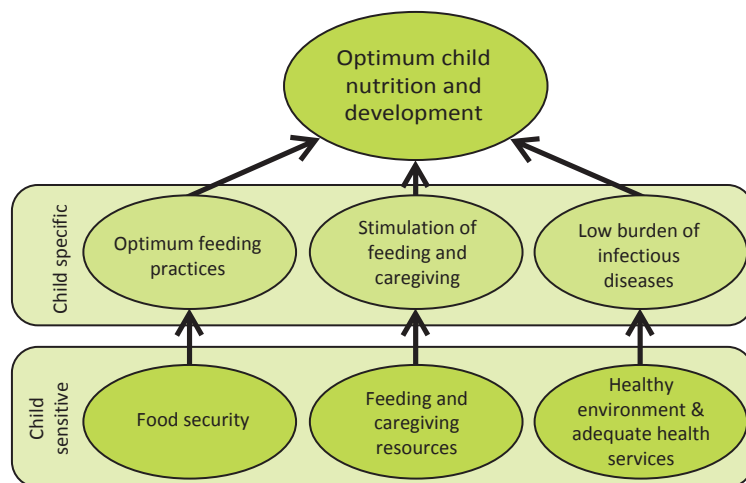
Vitamin A coverage for children under five has decreased alarmingly from 90% in 2010 to 62% in 2014 due to drops in programme coverage since 2010 and the absence of a National Immunization Day (NID) in 2014.

The proportion of children who received anti-helminths tablet dropped from two-thirds in 2013 to nearly three-fifths in 2014. Coverage was higher among those from food secure households and among the children whose caregivers had better education.



Adequate infant and young child feeding (IYCF) is necessary for the survival, growth, and development of children through to adolescence and adulthood. The *Lancet* series in 2013 estimated that 12% of all deaths of children under the age of five could be prevented through universal coverage of appropriate breastfeeding (1); a further 6% of deaths could be reduced with appropriate complementary feeding practices (2).

Figure 8.1: Lancet 2013 framework of child development



Appropriate IYCF practices have long-term cognitive and health benefits, all of which reduce the economic burden of disease and malnutrition (3,1). Optimal child development results from environments where children and their mothers are fed diverse and nutritious diets, where children receive appropriate stimulation and care from the earliest ages, and where children have a low burden of infectious diseases (Figure 8.1). Children can only receive this care and attention in situations where households are food secure, caregivers have

adequate support and education, home environments are adequate, and health services are available and accessible.

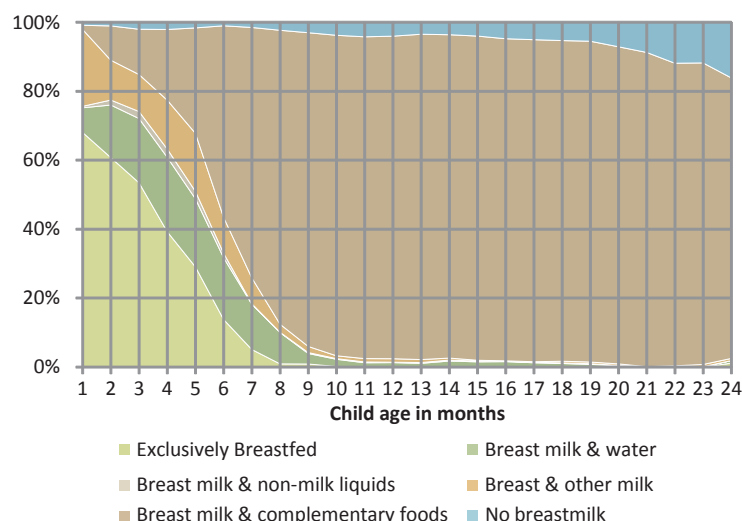
This chapter explores the child specific causes of child malnutrition. To obtain estimates of care and feeding practices for infants and young children, FSNP interviews the caregiver of the youngest child in each selected household. As such, all estimates in this section should be interpreted as prevalence of the indicators for the youngest born child in the household. This approach to data reduces the number of older children included in the surveillance system (Table 8.1). Table 8.1 indicates the number of children surveyed in each age group.

Table 8.1: Children surveyed by age

Age group in months	Number surveyed	Weighted proportion
0 to 5	1173	9%
6 to 11	1347	11%
12 to 17	1297	11%
18 to 23	1293	11%
24 to 35	2504	22%
36 to 47	2254	20%
48 to 59	1812	16%
Total	11680	100%

Child feeding

Using the WHO suite of child feeding indicators, this section will focus on the package of World Health Organization (WHO) recommended and Government of Bangladesh endorsed IYCF practices, which includes: early initiation of breastfeeding; exclusive breastfeeding from birth through six months of age; appropriate introduction of varied and nutritious complementary foods in sufficient amounts from the age of six months; and continued breastfeeding for two years (3,4). In addition to ongoing large-scale activities by civil society in support of improved IYCF practices, nutrition

Figure 8.2: IYCF practices by child age in month ¹

were breastfed throughout their first two years of life. In the coming sections, these feeding patterns are further explored using the standardised set of indicators recommended by the WHO as a basis for assessing IYCF practices (5,6)

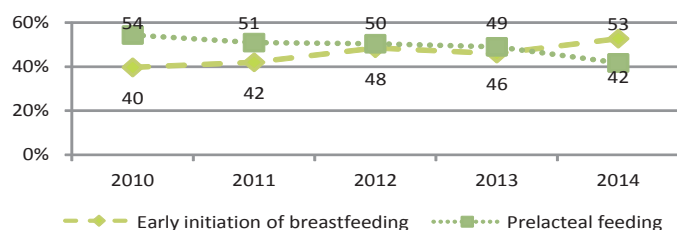
Breastfeeding

Breast milk is the ideal food for infants and an important part of the diet of young children. Interventions to protect and promote breastfeeding can greatly improve child survival, averting over one-tenth of deaths among children younger than five years of age (7). Additionally, during illness, a child's appetite for foods is often diminished but their demand for breast milk remains unchanged (8,9), thus breastfeeding helps to prevent dehydration and provides vitamins, minerals, and energy to aid recovery (10). Optimum breastfeeding practices also improve cognitive, motor, and socio-emotional development as well as learning capacity (11,12,1).

Breastfeeding during the first days of life

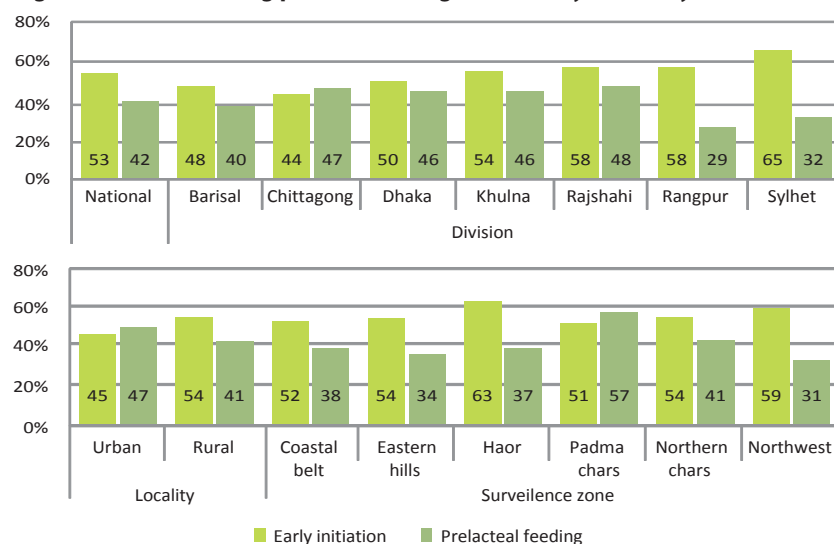
The Government of Bangladesh, in line with WHO recommendations, promotes the "early initiation of breastfeeding," which is defined as providing breast milk to the infant within one hour of birth. Early initiation helps ensure that infants consume the first milk, colostrum, which is rich in antibodies and contains a larger percentage of protein, minerals and fat soluble vitamins than mature milk. However, traditional beliefs delay breastfeeding. In line with this, FSNP records the proportion of living infants who are fed prelacteal foods in the first three days of life (13). Prelacteal feeding refers to the practice of feeding an infant anything other than breast milk during the first three days after birth. Prelacteal feeding is discouraged by UNICEF and WHO because it can adversely affect breastfeeding and introduce pathogens into a child's digestive system.

¹ This figure is constructed using a three month moving average and will differ from point estimates given elsewhere in this report.

Figure 8.3: Child feeding during the first days of life (2010-2014)²

Since 2010, there has been a small increase in the percentage of children breastfed in the first hour of life and a similar decrease in the proportion of children fed prelacteally (Figure 8.3). The most notable change, however, occurred between 2013 and 2014.

During this period, the rate of early initiation of breastfeeding increased from 46% to 53%, while the rates of prelacteal feeding declined from 49% to 42%. In 2014, Chittagong division had the lowest rates of early initiation while Rajshahi had the highest rates of prelacteal feeding- followed by Chittagong (Figure 8.4). In line with past results, rates of early initiation were similar between

Figure 8.4: Child feeding practices during the first days of life by area of residence

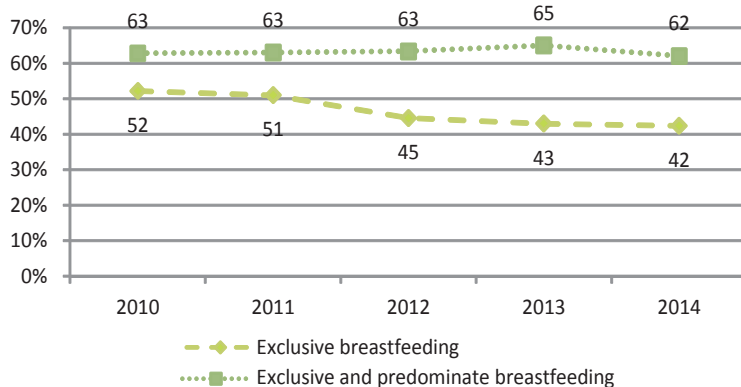
rural and urban areas though slightly more urban households engaged in prelacteal feeding. Looking across surveillance zones, there were very high rates of prelacteal feeding in Padma char compared to very low rates in the Northwest. There was little variation in rates of early initiation of breastfeeding or prelacteal feeding across wealth quintiles or categories of food security, although rates

of early initiation were significantly higher in the poor households (figure not shown). Child gender also had no significant effect on rates of early initiation and prelacteal feeding (figure not shown). More educated mothers provided prelacteal feeds to their children in lower proportion than less educated mothers, yet, at the same time, initiated breastfeeding later than the less educated group (figure not shown). Earning mothers initiated breastfeeding earlier compared to mothers without income, and provided prelacteal feeds to their children in lower proportion than the mothers without income.

Exclusive breastfeeding

Exclusive breastfeeding for the first six months provides all the nutrients required for an infant's healthy growth and protects them from consumption of food contaminants before their immune system has matured. Because of this, exclusive breastfeeding, feeding nothing but breast milk and required medicines, is the only recommended feeding practice for infants under six months of age. According to the scientific literature, during the first six months of life, exclusively breastfed infants have one-third lower odds of death than infants who are fed breast milk and non-milk liquids (predominantly breastfed) and two-thirds lower odds than children who are breastfed and receive

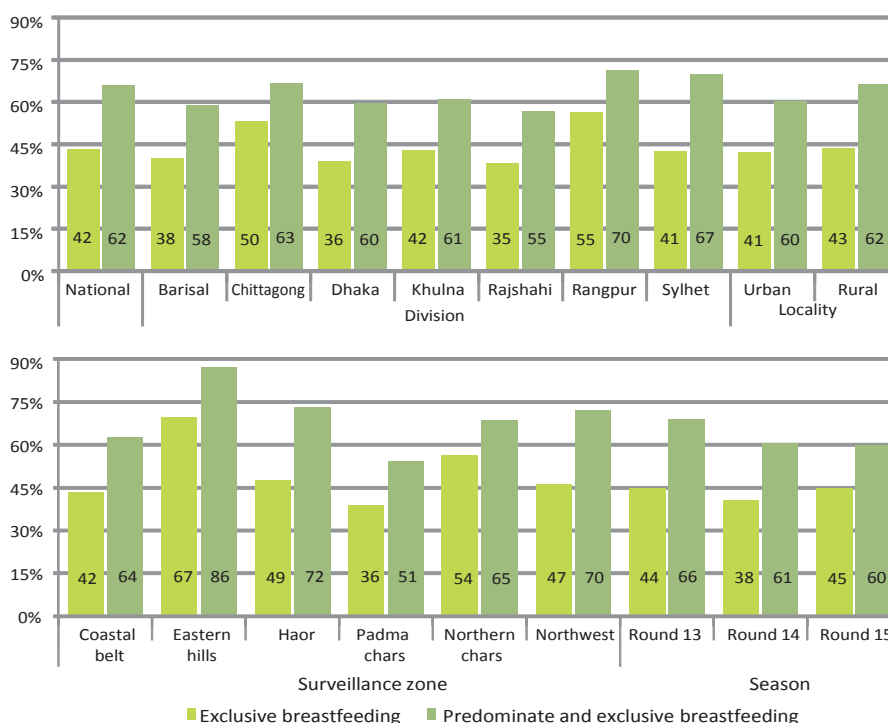
² FSNSP asks these questions only to mothers about their youngest living children who is less than two years of age (43).

Figure 8.5: Exclusive and predominant breastfeeding rates (2010-2014)

complementary foods or breast milk substitutes (7). FSNSP records the proportion of children who were exclusively and predominantly breastfed, as these combinations indicate that the principal source of nutrients in the child's diet come from breast milk.

As shown in Figure 8.5, between 2010 and 2014, rates of exclusive breastfeeding fell from 52% to 42%. Predominate breastfeeding

also decreased from 63% in 2010 to 62% in 2014. This declining performance suggests that Bangladesh remains well below the global goal set by the 65th World Health Assembly of at least 50% of infants being exclusively breastfed by 2025 (14).

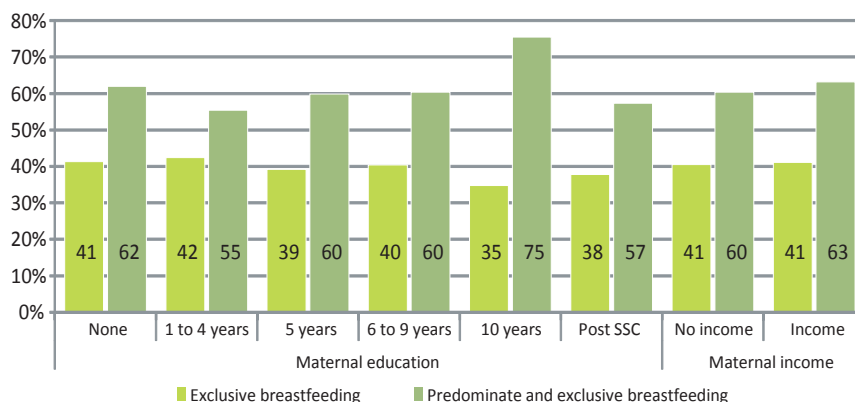
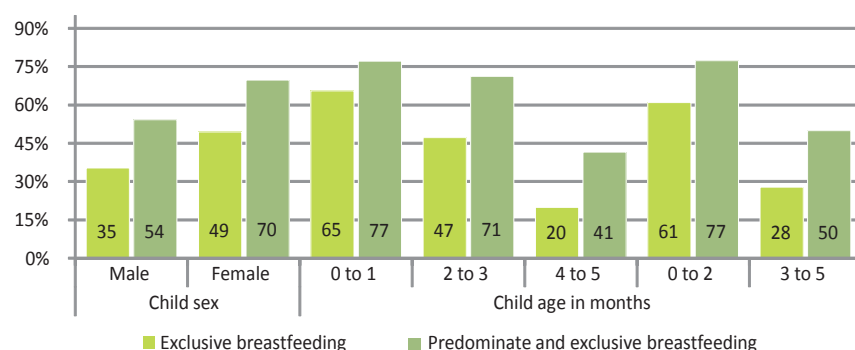
Figure 8.6: Exclusive and predominant breastfeeding rates by area of residence

Rangpur had the highest rates of exclusive breastfeeding, while Rajshahi had the lowest - followed by Dhaka and Barisal (Figure 8.6).

Compared to urban children, slightly more rural children were exclusively breastfed in 2014. Rates of exclusive breastfeeding were more consistent across the surveillance zones. Largely due to differences in the age of the children

included in the rounds of surveillance, there was a lower proportion of children exclusively breastfed during the monsoon season.

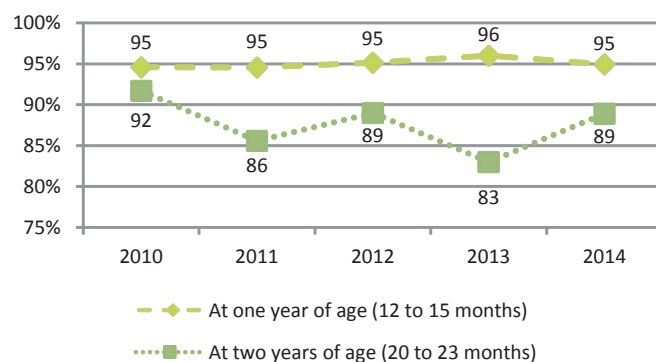
The proportion of exclusive breastfeeding was higher for the mother who had either no or less than primary education (Figure 8.7). Mothers earning doesn't play any significant role on exclusive breastfeeding of the children. Unlike the past findings, a significantly higher proportion of poor or food insecure households practiced exclusive breast feeding in 2014 (figure not shown).

Figure 8.7: Exclusive and predominant breastfeeding rates by maternal characteristics**Figure 8.8: Exclusive and predominant breastfeeding rates by child characteristics**

The association between child's sex and rates of exclusive breastfeeding was found statistically significant in 2014, with a higher proportion of female infants exclusively breastfed compared to male infants (Figure 8.8). As might be expected, rates of exclusive breastfeeding decline steadily with the age of a child. While more than three-fifths of children were exclusively breastfed in the first two months of life, the rate decreased to one-fifth of children in the fourth and fifth months of life.

Continued breastfeeding

At six months of age, an infant's diet should transition from exclusive breastfeeding to breast milk accompanied by semi-solid and solid foods. During this transition and up to two years of age, breast milk continues to provide an essential nutritional contribution to the child's diet, supplying 35% - 40%

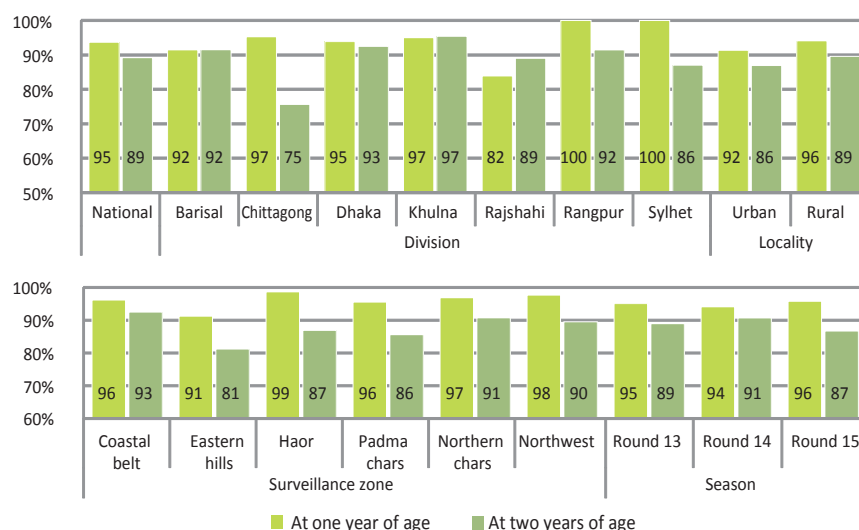
Figure 8.9: Breastfeeding continuation rates (2010-2014)

of calories, 70% of vitamin A, 40% of calcium, and 37% of riboflavin required by the child during the second year of life (15,16). Bangladesh has consistently had very high rates of continued breastfeeding; the median age of breastfeeding discontinuation (i.e. the point at which 50% of children are no longer breastfed) is 35 months and just over 10% of children in Bangladesh continue to be breastfed until the start of the fifth year of life. FSNSP measures these behaviours using two WHO-recommended indicators. The first is

continuation of breastfeeding at one year of age, which is defined as the proportion of children 12 to 15 months of age who were breastfed the day before the interview. The second is continuation of breastfeeding at two years of age, which is defined as the proportion of children 20 to 23 months of age who were breastfed the day before the interview.

Figure 8.9 depicts trends in continued breastfeeding from 2010 to 2014. Since 2010, rates of continued breastfeeding for children at one year of age have been consistent at 95%, while rates of

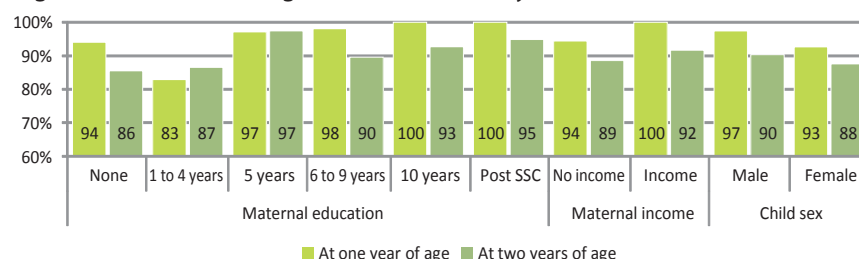
Figure 8.10: Breastfeeding continuation rates by area of residence



continued breastfeeding at two years of age have been greater than 80%. However, the proportion of children breastfed at two years of age has declined since 2010. Across the nation, there was limited geographical and seasonal variation in these indicators (Figure 8.10). The proportion of children who continued to receive breast milk at two years of age was comparatively lower in Chittagong than the other divisions.

Little variation in rates of discontinuation was apparent comparing mothers with different levels of education (Figure 8.11). Among mother earning income, a slightly higher proportion of children continued to be breastfed at one and two years of age than the children whose mothers had no income. There were no significant effects of child sex on the proportion of children who continued

Figure 8.11: Breastfeeding continuation rates by maternal and child characteristics



breastfeeding at one and two years of age. Continuation rates of breastfeeding were higher in the poorest wealth quintile compared to the richest quintile and also in households with borderline food

consumption compared to the households having acceptable food consumption, a finding consistent with the literature and known to confound studies that associate continued breast feeding with nutritional outcomes (17,18,19).

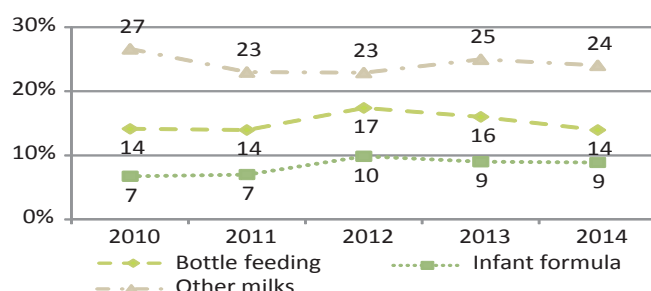
Figure 8.12: Breastfeeding continuation rates by households' wealth and food security



Threats to breastfeeding

In Bangladesh, despite high rates of breastfeeding, there is poor knowledge of the benefits and recommended duration of breastfeeding and widespread misconceptions about mothers being unable to produce milk sufficient to meet their baby's needs (3,13). There is also limited understanding of the risks of bottle feeding and breast milk substitutes. Bottles are a frequent source of bacterial or viral contamination and the substitutes themselves do not provide increased immunity for the child (8,5,20). While the Government of Bangladesh supports the protection of breastfeeding through various legislation and policy initiatives - such as the International Code for the Marketing of Breast Milk Substitutes, six months maternity leave, health system support, and community support (3,21) - the marketing of breast milk substitutes remains widespread.

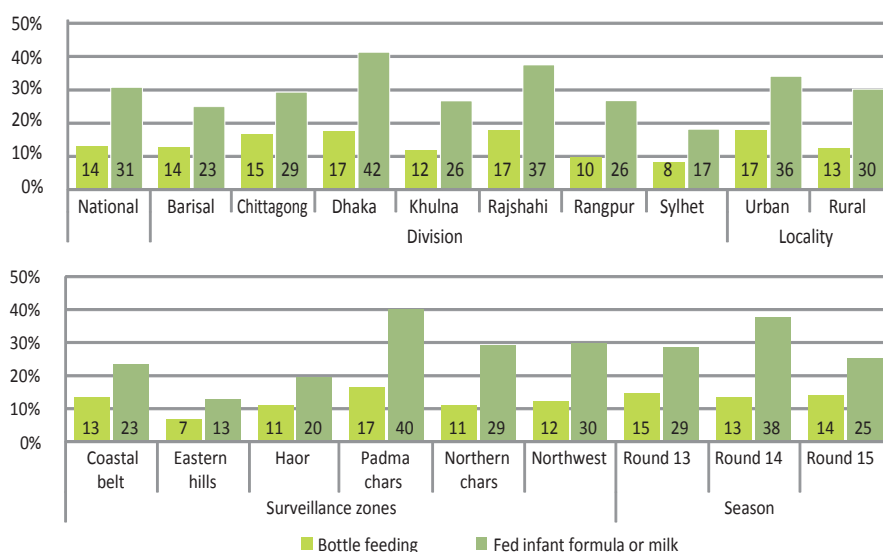
Figure 8.13: Threats to breastfeeding(2010-2014)



To monitor the use of breast milk substitutes, FSNP tracks the proportion of infants and young children zero to twenty-three months of age who were fed animal milk or milk substitutes, such as infant formula, the day before the interview, and/or those who were fed anything from an artificial nipple, such as a bottle. As noted in Figure 8.13, the proportion of children who were fed with

any of the three practices has not changed appreciably over the past five years. Around one in ten children less than two years of age were fed with a bottle.

Figure 8.14: Indicators of threats to breastfeeding by area of residence and season



The proportion of infants and young children fed breast milk substitutes or with bottles varies greatly across the regions (Figure 8.14). Dhaka stands out for having the highest rates of both bottle usage and formula /milk feeding-followed by Rajshahi. Bottle and milk-supplement feeding are much more frequent in urban areas compared to rural areas and have

decreased somewhat between 2013 and 2014. The proportion of children fed with a bottle did not vary greatly over seasons, but feeding breast milk substitutes was lowest during Round 15. Most of the seasonal variation was caused by a change in the proportion of children fed animal milk.

More educated mothers fed their children breast milk substitutes in a much greater proportion than less educated mothers (Figure 8.15). A mother's income earning status had no association with these practices. As expected, less wealthy and food insecure households fed their children through these means less frequently (figure not shown). No significant difference was found

Figure 8.15: Indicators of threats to breastfeeding by maternal characteristics

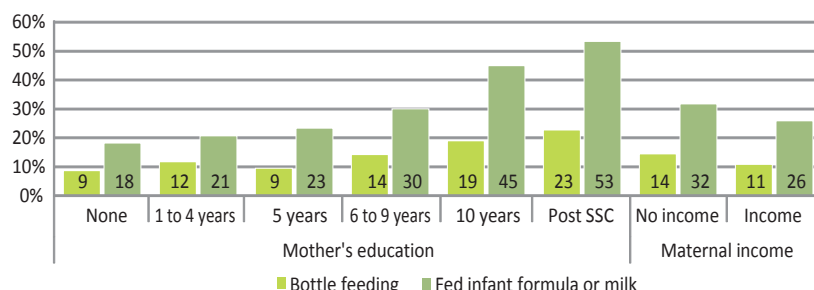
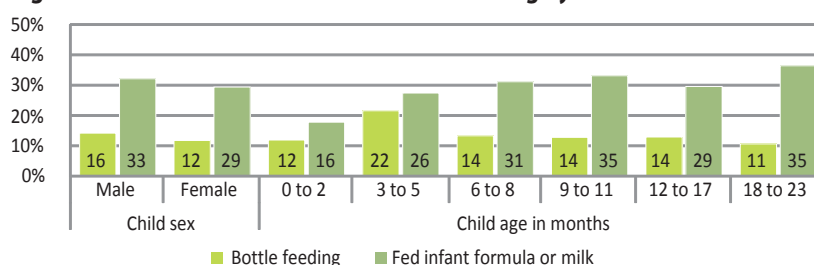


Figure 8.16: Indicators of threats to breastfeeding by child characteristics



between the proportions of male and female infants and young children who were bottlefed, or received infant formula or milk. The majority of bottle feeding takes place during the first year of life; approximately one-fifth of children three to five months of age were fed with a bottle and one-quarter were given breast milk substitutes instead of being exclusively breastfed. Between 6 to 23 months of age the proportion of children receiving supplementary feedings increases to almost one-third.

Complementary feeding

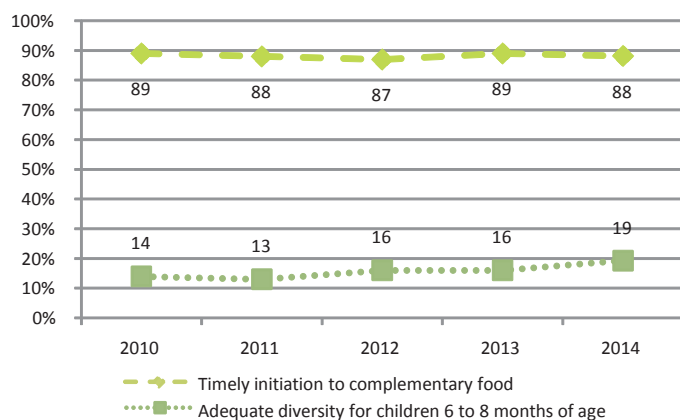
Complementary feeding refers to the transition from exclusive breastfeeding to breast milk accompanied with semi-solid and solid foods in the young child's diet. This transition should begin at six months of age after the period of exclusive breastfeeding has ended. The Bangladesh National IYCF Strategy (following WHO guidelines) stipulates that adequate complementary feeding be timely (meaning introduced immediately after the child has reached six months of age); adequate to meet the energy, protein, and micronutrient needs of the child; safe and hygienically prepared; responsively fed, meaning that the foods are provided in response to the child's cues and that the child is actively encouraged to self-feed, and includes proper recuperative care when children fall ill (3,4). This section will use five standardised indicators to examine complementary feeding practices in-depth and over targeted age ranges. The indicators in this section will focus on children 6 to 23 months of age, a critical period when inappropriate diets and nutritional deficiencies can retard growth and development for the remainder of the child's life (22).

Timely introduction to complementary feeding

As mentioned above, children should begin receiving complementary foods as soon as they reach six months of age. This transition is required because the concentration of some nutrients, such as zinc and to a lesser extent iron, are relatively low in human breast milk and after six months of age it is difficult for infants to meet their nutrient needs from human breast milk alone (23,8,24). To estimate the proportion of infants who begin eating complementary foods at this ideal time, WHO recommends

measuring the proportion of infants six to eight months old who ate any solid or semi solid food the day before the interview. As noted in Figure 8.17, the proportion of children who are fed complementary foods as per ideal practices has not changed from 2010 to 2014 with the level remaining a little below 90% across the period.

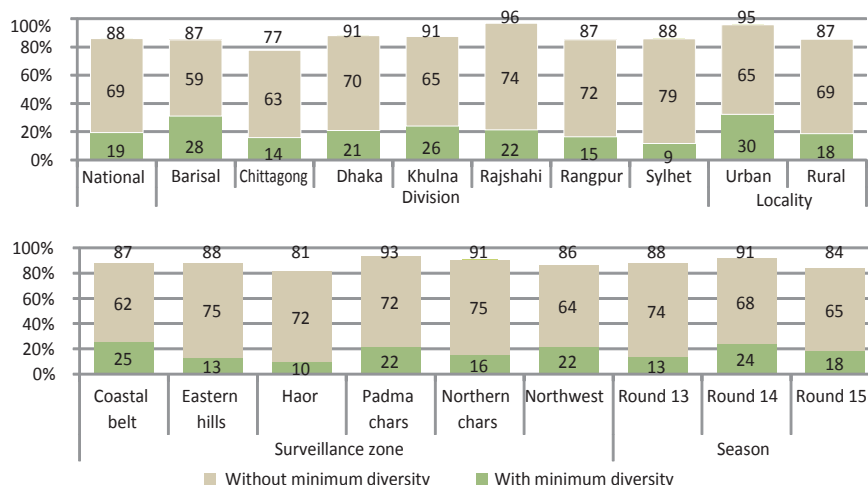
Figure 8.17: Introduction to complementary foods (2010-2014)



While this high rate of child feeding at six to eight months of age is heartening, the majority of children's diets are not diverse enough to provide adequate micronutrients. The Government of Bangladesh recommends that children six to twenty-three months of age eat a diverse diet, while WHO has indicated that a diverse diet should consist of at least four out of seven food groups every day. In 2014, only around one-fifth of infants six to eight months of age were eating in line with this standard (Figure 8.17).

Minimum dietary diversity for children aged six to eight months of age ranged from 9% in Sylhet to 28% in Barisal, while introduction to any complementary foods ranged from 77% in Chittagong to 96% in Rajshahi (Figure 8.18). A greater proportion of infants in urban areas were fed with

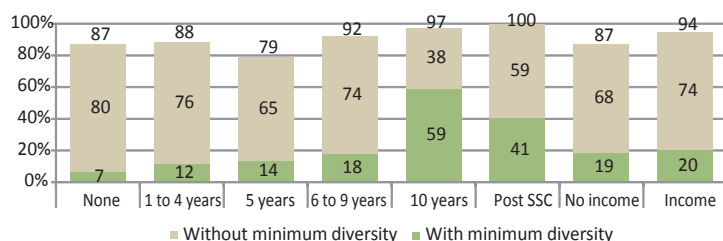
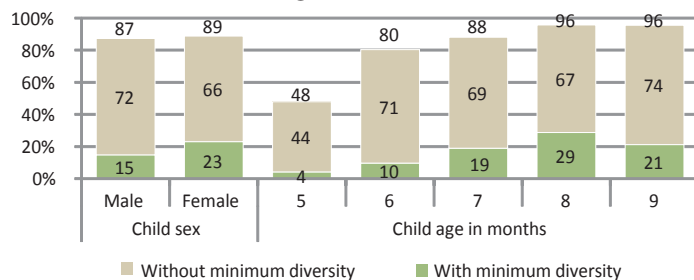
Figure 8.18: Timely introduction to complementary foods by residence and season



minimum diversity than the rural areas. Overall, rates of timely introduction to complementary foods did not vary significantly over the year, but rates of adequate diversity was comparatively higher in the monsoon season (Round 14).

The wealth and food security status of the household had only a limited association with the proportion of children who were

introduced to complementary foods at six to eight months of age, but a stronger association with the proportion of children receiving an adequately diverse diet (Figure 8.19). While only 10% of infants six to eight months old in the lowest wealth quintile had an adequately diverse diet, nearly half of those in the wealthiest quintile did. Similar patterns were apparent for household food security; children from food secure households or from households with no food deficit had adequate diverse diet in a greater proportion than those from food insecure households or from

Figure 8.19: Timely introduction to complementary foods by household wealth and food security status**Figure 8.20: Timely introduction to complementary foods by maternal characteristics****Figure 8.21: Timely introduction to complementary foods by child sex and age in months**

households living in hunger. There was no significant relationship between maternal income and indicators of introduction to complementary foods (Figure 8.20). Although a very limited association was found between level of mother's education and timely introduction of complementary foods to the child, mothers with higher education provided a diverse diet to their child in a greater proportion compared to less educated mothers (Figure 8.20).

The proportion of male infants introduced to complementary foods on time was not significantly different from the proportion of female infants (Figure 8.21). Likewise, there was no significant

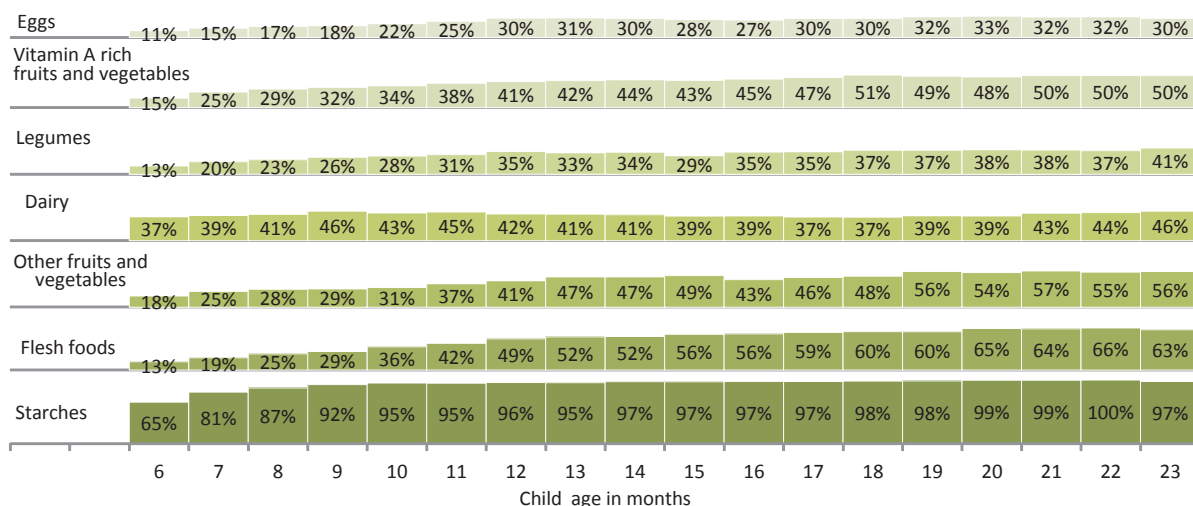
difference in the proportion of male versus female children fed foods with adequate diversity. As child age increased, the proportion of children fed complementary foods and the diversity of their diets increases. Results by age in months indicate one shortfall of the measure: it fails to account for the considerable number of children who are fed before six months of age. In Bangladesh, nearly half of children aged five months were fed complementary foods.

Dietary quality

As indicated above, children need to eat a variety of foods every day to meet their nutritional needs (3,8,25). Because of children's rapid growth and development, during the first two years of life, nutrient needs are very high in comparison to a child's overall size and the amount of food that they are able to eat in one sitting. Caregivers should ensure that meals contain sufficient fats and are nutrient and energy dense (8,25). In addition, children should consume animal source foods and vitamin rich vegetables and fruits every day (26,8,25).

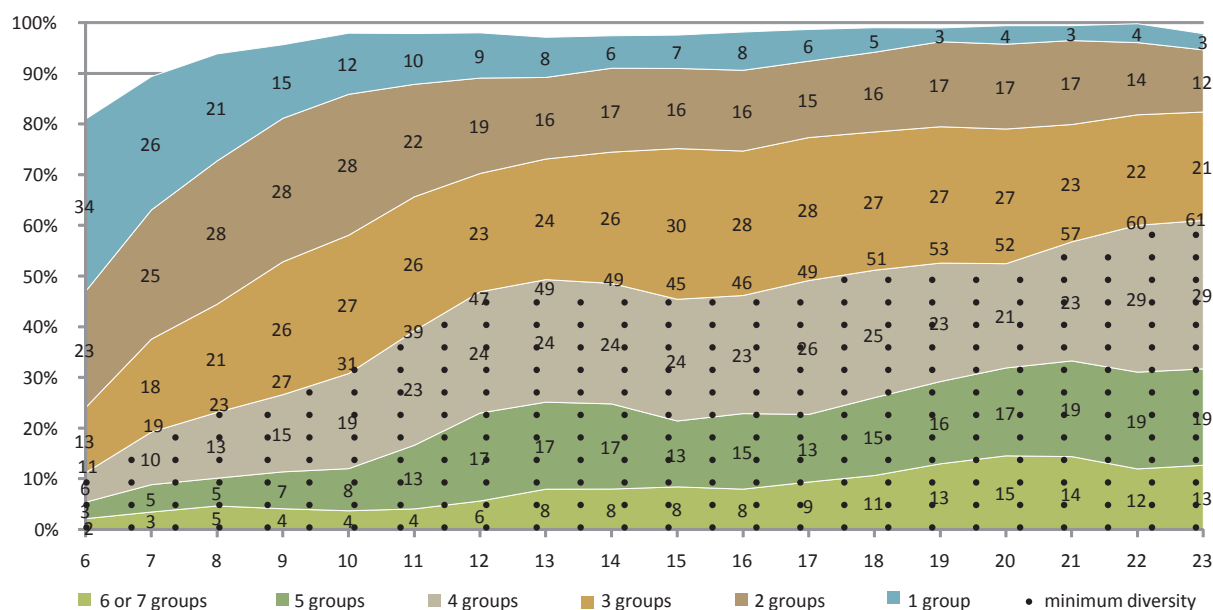
Using the WHO methodology, dietary quality is measured through the use of a seven-item scale - containing starches, legumes and nuts, dairy products, flesh foods, eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables -constructed from the 16 food type categories included in WHO's standardised IYCF questionnaire (5,6). Figure 8.22 displays the proportion of children who

Figure 8.22: Composition of childhood diets by WHO food group across age in months



were consuming foods from these groups by child age in months. As was seen in 2012 and 2013, until ten months of age, the only food groups eaten by more than a third of children were micronutrient poor starches and dairy products that often replace breast milk. Until fifteen months of age, a little over half of the children were consuming micronutrient-rich flesh foods. Overall, diets are lacking in diversity.

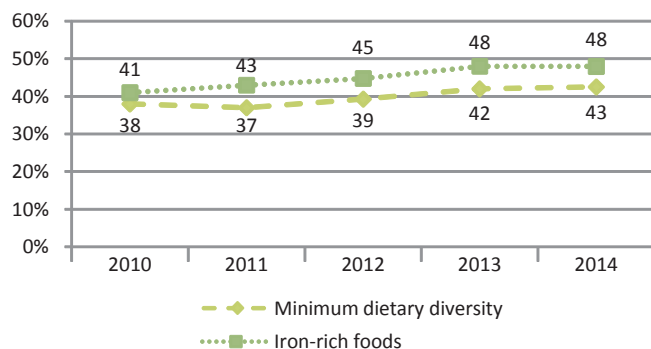
Figure 8.23: Number of food groups consumed by age in months³



³ This graph is constructed using a three month moving average thus it will differ from point estimates elsewhere in this report.

Similar to the logic that informed the women's dietary diversity measures, a summary of food groups eaten is not enough to quantify the proportion of children eating a diet with adequate diversity. Instead, a cut-off for the minimum number of food groups required for an adequate diet has been constructed for children six months to two years of age: four out of seven food groups are required each day. Unlike the adult indicator, the minimum dietary diversity measure for children identifies probable dietary sufficiency. Figure 8.23 suggests that, too few children are meeting this requirement in Bangladesh. Though virtually all children are being fed complementary foods by 10 months of age, 12% of these children are only consuming foods from one food group, usually micronutrient poor starches. By two years, around three-fifths of children were eating a diet that is minimally diverse.

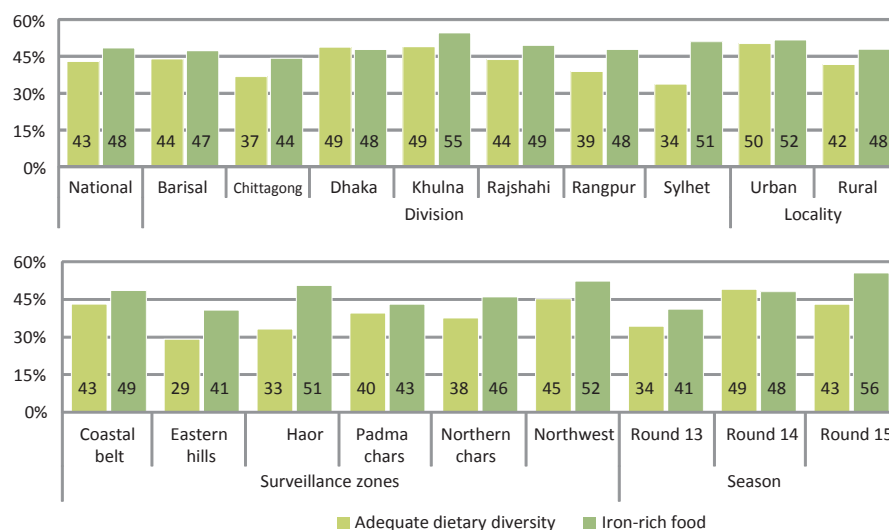
Figure 8.24: Trends in child dietary quality indicators



As shown in Figure 8.24, the proportion of children fed a minimally diverse diet has increased incrementally since 2010, with only a little over two-fifths of children eating a minimally diverse diet in 2014 (27,28). In addition to general dietary diversity, WHO recommends measuring the proportion of children six months to two years of age who ate an iron-rich food (any item in the flesh food category) or any iron supplement or iron fortified food (including home fortified foods) the

previous day. This indicator has also increased slightly over a five year period. The vast majority of these children met this requirement through the consumption of flesh foods, particularly fish, and only around 2% of children had consumed an iron supplement or micro-nutrient powder packet the day before the interview.

Figure 8.25: Minimum dietary diversity and iron consumption by area of residence and season



In 2014, Sylhet stood out as the division with the lowest proportion of children, only around one-third, meeting the minimum diversity standard, followed by Rangpur and Chittagong (see appendix C, Figure 2). In contrast, in Khulna and Sylhet slightly over half of the children in these areas ate an iron-rich

food the previous day. A greater proportion of children in urban areas meet the minimum dietary diversity standards than children in rural areas, but there is a little difference in the proportion of children eating an iron-rich food.

Across surveillance zones, the Northwest stands out as the zone with highest percentage of children eating a minimally diverse diet as well as iron-rich foods. The proportion of children eating a minimally diverse diet is higher in the monsoon (Round 14) compared to Rounds 13 and 15, which is in line with the pattern observed in women's diets and households level food consumption. As was the case with these other indicators, this pattern of seasonal variation was not found in all surveillance zones (figure not shown).

Figure 8.26: Indicators of dietary quality by household wealth and food security status

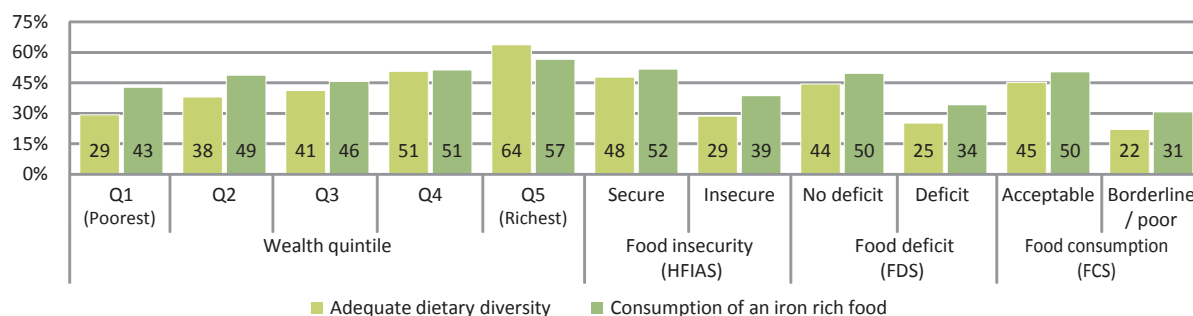
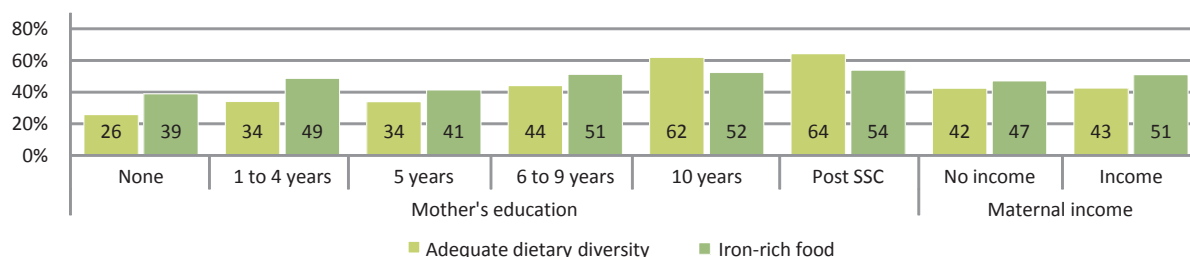
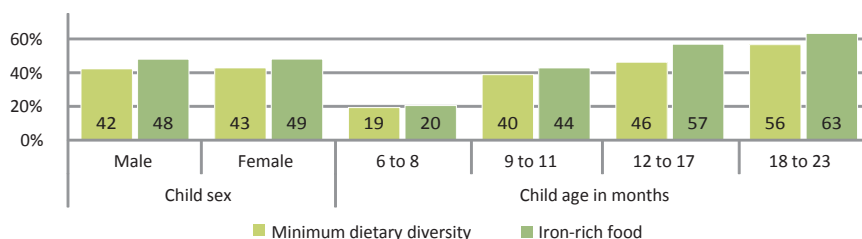


Figure 8.27: Indicators of dietary quality by maternal characteristics



There was a step-wise increase in the proportion of children consuming diverse diets with increasing wealth quintile. As shown in Figure 8.26, children from households in the wealthiest quintile ate significantly more diverse diets than children from households in the lowest quintiles. A similar pattern was evident comparing acceptable and borderline household food consumption categories. For iron-rich foods, greater variation was apparent across the food security categories than wealth quintiles. Maternal education was more strongly associated with children's dietary quality than wealth category, while maternal income was insignificant for both indicators (Figure 8.27).

Figure 8.28: Indicators of dietary quality by child age and sex



There were small and statistically insignificant differences in the proportions of male versus female children who ate minimally diverse diets and who ate an iron-rich food.

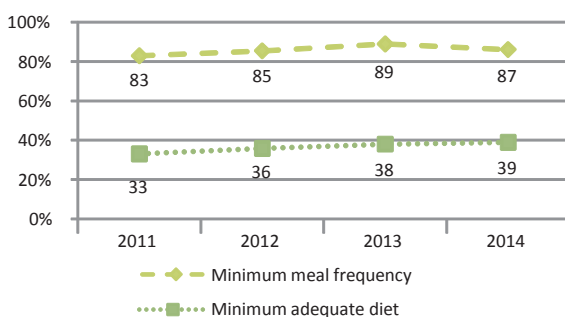
However, age was significantly associated with both of these indicators; as age increased, so did the proportion of children that ate in line with these practices. However, even among children 18 to 23 months of age, only a little over half ate minimally diverse diets and a little over three-fifths consumed an iron-rich food the day before the interview.

Minimum acceptable diets

In addition to adequate dietary diversity, infants and young children need to be fed a sufficient quantity of complementary foods for their diets to be adequate. The amount of complementary food in children's diets should increase gradually over the period from six months to two years of life and care must be taken so that complementary feeding does not replace breast milk (8). Bangladesh's IYCF guidelines, in line with the WHO complementary feeding guidelines, recommend using frequency of feeding as a proxy for amount of food fed. Guidelines state that children six to eight months of age should be fed two to three meals of soft foods a day in addition to snacks, and children nine months to two years of age should be fed three to four meals a day in addition to snacks (3,8). To measure the proportion of children consuming a minimum acceptable diet, FSNP uses two indicators recommended by WHO: minimum meal frequency and minimum acceptable diet. Both of these measures require separate tabulation for breastfed and non-breastfed children, the results of which are combined into one indicator. Because 94% of children six months to two years of age are breastfed, the overall estimates of these indicators closely track those for breastfed children (see Figure 8.30). Because the definitions of these indicators differ by breastfeeding status, it is important not to directly compare these indicators between breastfed and non-breastfed children (5,6).

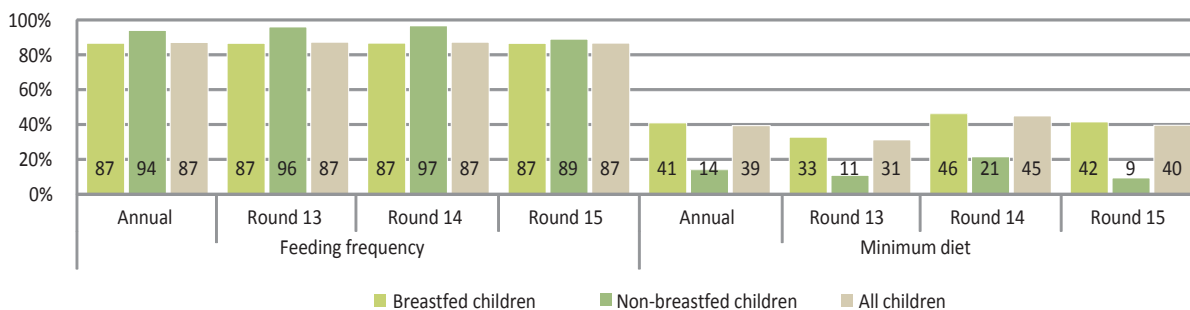
FSNP directly asks caregivers the number of times they fed their child a meal or snack during the day before the interview. For breastfed children, the indicator for minimum meal frequency is met when a breastfed child is fed in line with the recommendations given above. For non-breastfed children, the frequency with which children were given milk feeds is also considered, and the indicator for minimum feeding frequency is met when a child six months to two years of age ate meals, snacks, and had milk-feeds a total of at least four times. In 2014, 86% of all children were fed with minimum frequency, indicating a slight fall in this level compared to 2013.

Figure 8.29: Adequate diets (2011-2014)



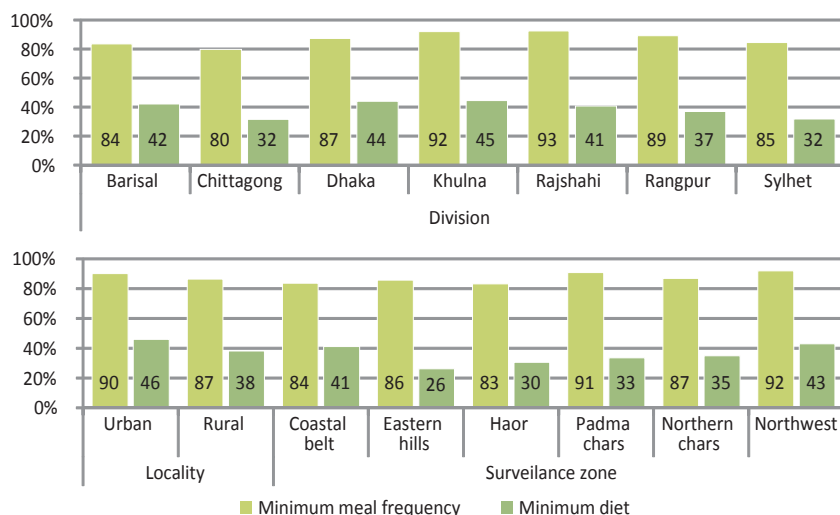
The second indicator, minimum acceptable diets, combines the dietary diversity measure given in the previous section with the feeding frequency indicator just reviewed. Breastfed children aged six months to two years are classified as having had a minimum acceptable diet if they met the criteria for both of these indicators. For non-breastfed children, the tabulation is more difficult. Non-breastfed children aged six months to two years old are classified as having had a minimum acceptable

Figure 8.30: Minimum meal frequency and adequate diet nationally by breastfeeding status and season



diet if they had been fed milk at least twice, had been fed milk or solid/semi-solid foods at least four times, and if they had eaten at least four food groups excluding dairy products. In 2014, around two-fifths of children were fed minimally adequate diets (Figure 8.29). This represents a considerable increase in children eating minimally acceptable diets since 2011, although the current level is still falls short of the target of 52% set in the HPNSDP.

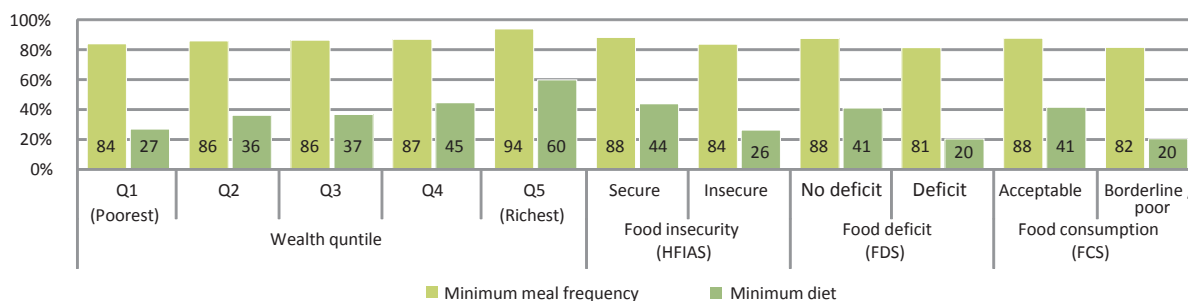
Figure 8.31: Minimum meal frequency by area of residence



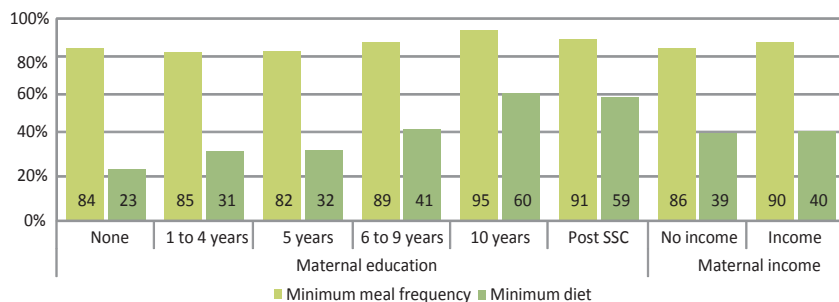
Similar to 2013, the vast majority of children received meals with minimum meal frequency, and the proportion was largely the same across areas of Bangladesh and across seasons in 2014 (Figure 8.31). A slightly greater proportion of non-breastfed children compared to breastfed children were fed with adequate frequency in all seasons, but this group attained a minimal diet less frequently than the

breastfed group across all seasons (Figure 8.30). Children in urban areas ate an adequate diet more frequently than children in rural areas. There was much greater variation in the proportion of children fed minimally adequate diets than those fed with minimum frequency. Across the seasons of 2014, there were slightly greater proportions of children eating minimum adequate diets in the monsoon months than at other times of the year. This difference was largely due to changes in the diversity of children's diets during the year.

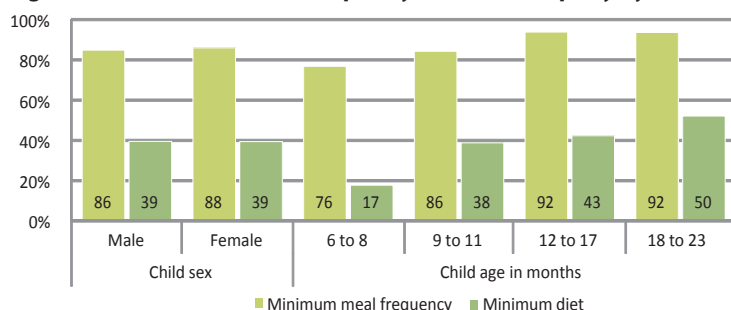
Figure 8.32: Minimum meal frequency and diet adequacy by wealth and food security



The proportion of children fed with the minimum frequency was slightly lower in the lowest quintile compared with that in the highest wealth quintile (Figure 8.32). In contrast, there was a step-wise increase in the proportion of children fed with minimally adequate diets as wealth quintile increased. However, even in the wealthiest quintile only around three-fifths of children received the minimum diet. There was little or no difference in the proportion of children fed with minimum frequency in food secure compared to food insecure households, but there were sizable

Figure 8.33: Minimum meal frequency and diet adequacy by maternal characteristics

differences in the proportion of children being fed minimum adequate diets. The proportion of children fed with minimum acceptable diets was associated positively with the level of maternal education (Figure 8.33).

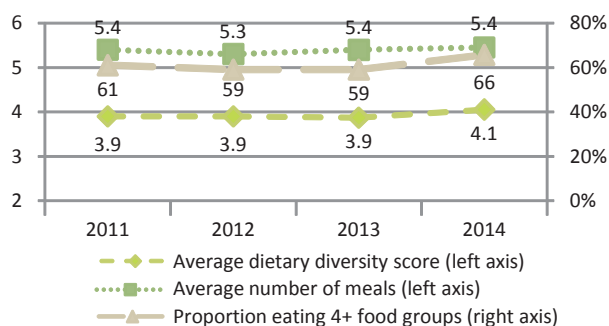
Figure 8.34: Minimum meal frequency and diet adequacy by child sex and age

In 2014, there was virtually no difference in the proportions of male and female children who were fed minimally acceptable diets the day before the interview. As with many of the complementary feeding variables, the proportion of children fed in line with these guidelines

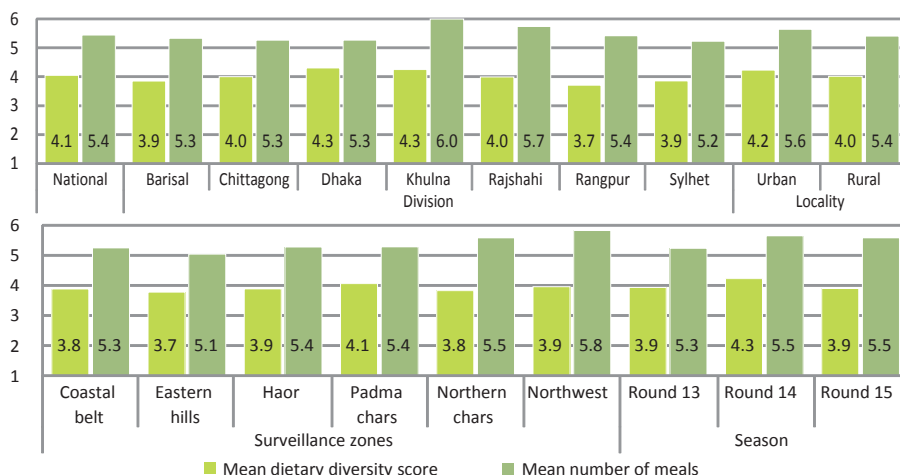
increased with age. While less than one fifth of children six to eight months of age were fed in line with minimum standards, this increased to 50% of children in the oldest age group.

Dietary patterns among older children

FSNSP includes pre-school children older than two years of age in dietary assessment, even though standardised IYCF indicators currently do not include this group (5,6). The information on older children allows FSNSP to track changes in the dietary diversity and eating habits of this population (5,6,29). Foods types eaten by mothers and children are largely the same but there are some notable differences. Nationally, the only items consumed by a significantly greater number of children than mothers were sweets, followed by beverages, dairy and eggs. A lower proportion of children eat spices, fish, dark green leafy vegetables, and other fruits and vegetables than their mothers (Appendix C, Figure 2).

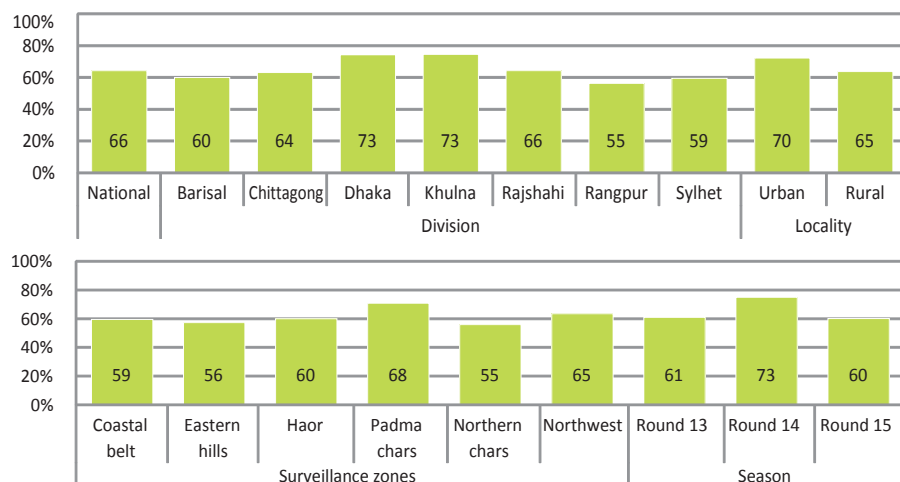
Figure 8.35: Diets fed to children 24 to 59 months of age

The mean dietary diversity score and meal frequency for older pre-school children has changed little since 2011 (Figure 8.35). Regionally, children ate less diverse diets in Sylhet and Rangpur, in line with the pattern seen for younger children (compare Figure 8.25 and Figure 8.36). Children ate more diverse diets and more frequently in urban areas compared to rural areas. The diversity of child diets and frequency of feeding increased slightly during the monsoon (Round 14).

Figure 8.36: Mean dietary diversity scores and meals by residence (24 to 59 months of age)

shown), and many are eating much more frequently than this. Nationally, on average, children are fed standard meals plus two to three snacks a day.

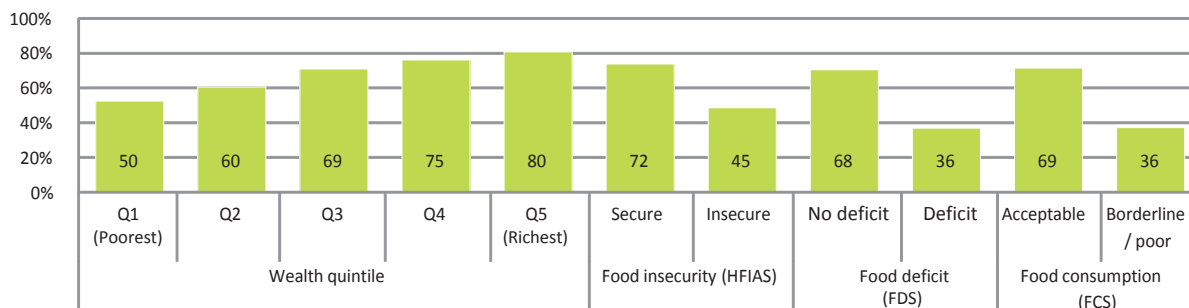
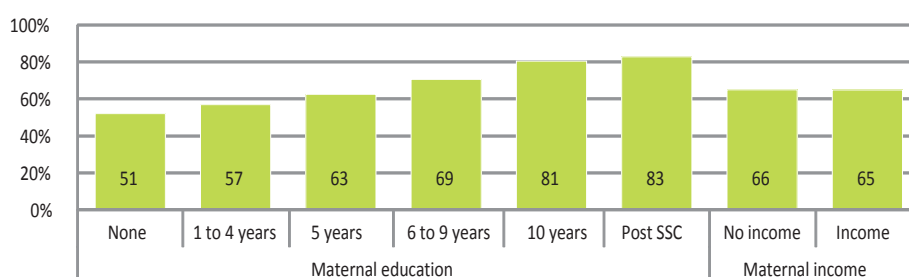
In contrast, many children still did not meet the requirement of eating four out of seven food groups the previous day (Figure 8.37). Only a slightly over half of children in Rangpur ate diets which were minimally diverse. A higher proportion of urban children 24 to 59 months of age ate minimally diverse diets than rural children. Significantly, more children ate a diverse diet during the monsoon months (Round 14), which is consistent with the observed dietary diversity patterns of women and households.

Figure 8.37: Children 24 to 59 months of age eating four or more food groups by residence

households were able to manage more diverse diets for older children, but failed to do so for younger children. However, a little over half of the food insecure households were unable to meet the diversity requirements for children of this age. This level is higher in households with poor or borderline food consumption as well as in the households living in hunger.

By applying the IYCF criteria to older children, excluding the breast milk requirements, FSNP estimates the proportion of older children who are eating an adequate diverse diet. Nearly all children over two years of age are eating at least three meals or snacks a day (98%, figure not

Interestingly, in all the wealth quintiles, the proportion of children 24 to 59 months of age fed four or more food groups is much higher than the proportion of children six months to two years of age eating diverse diets (compare Figure 8.26 with Figure 8.38). This indicates that even less wealthy

Figure 8.38: Children 24 to 59 months of age eating four or more food groups by wealth and food security**Figure 8.39: Children 24 to 59 months of age eating four or more food groups by maternal characteristics**

Maternal education but not maternal income earning status was associated with an increase in the proportion of children fed adverse diet (Figure 8.39). There was no

difference in the proportion of male and female children who ate a minimally diverse diet (graph not shown). There was also no age group difference in the proportion of children eating a diverse diet (graph not shown).

Preventative health care

Appropriate feeding practices are very important for preventing illness in infant and young children. Moreover, nutritional supplements and routine medicines play an important role in building the immune systems of children so that they can fight infections. Children who do not receive adequate micronutrients while young are at a higher risk of suffering from developmental delays and chronic health problems later in life (30). This section will focus on two Government of Bangladesh-led preventative health care campaigns: the national vitamin A supplementation programme and the national deworming programme.

National vitamin A campaigns

Required by all body tissues for normal growth and repair, vitamin A is vital for proper immune system functioning, visual perception, and cellular reproduction (31). Vitamin A deficiency, even when mild, has been linked to increased morbidity and mortality and delayed development of infants and young children. Clinical vitamin A deficiency is identified by the decreased vision, particularly at night. Though vitamin A deficiency is still the leading cause of preventable blindness in children, the number of children affected has fallen dramatically since the early 1990s. This is no doubt due to large scale interventions that seek to improve breastfeeding and complementary feeding practices and provide vitamin A supplementation to children (32). Vitamin A and nutrient components that can be made into vitamin A in the human body (vitamin A precursors) are naturally occurring in many foods.

The Government of Bangladesh currently implements a large scale vitamin A supplementation programme coordinated out of the Ministry of Health, Directorate of Health Services (32). This programme provides low potency vitamin A supplementation (100,000 i.u.) to children six to 11 months of age and high potency vitamin A capsules (200,000 i.u.) to children from one to five years of age twice a year on national immunisation day (NID) and national vitamin A campaign (NVAC) days. Recent WHO recommendations support this programme (33). In addition, the national vitamin A policy and WHO encourage all to eat more diverse diets, especially those for whom vitamin A supplementation is not recommended (32,34,33).

Figure 8.40: VAC coverage for children 12 to 59 months of age (2010 to 2014)

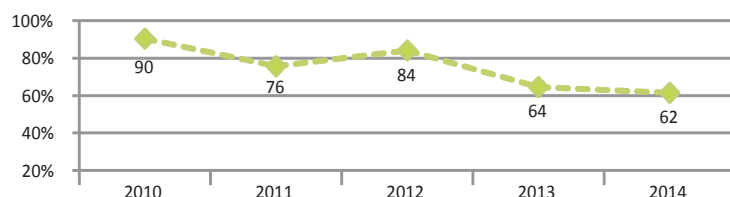
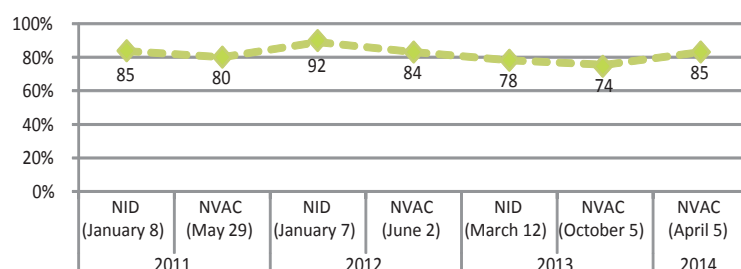


Figure 8.41: Coverage of recent VAC campaigns (6 to 59 months)



2011 and 2012, and was notably higher than the NVAC event held in 2013. However, the overall coverage remain slower than the HPNSDP target of 90% for 2016 (Figure 8.44).

Figure 8.42: Coverage of the NVAC campaigns by area of residence (6 to 59 months)

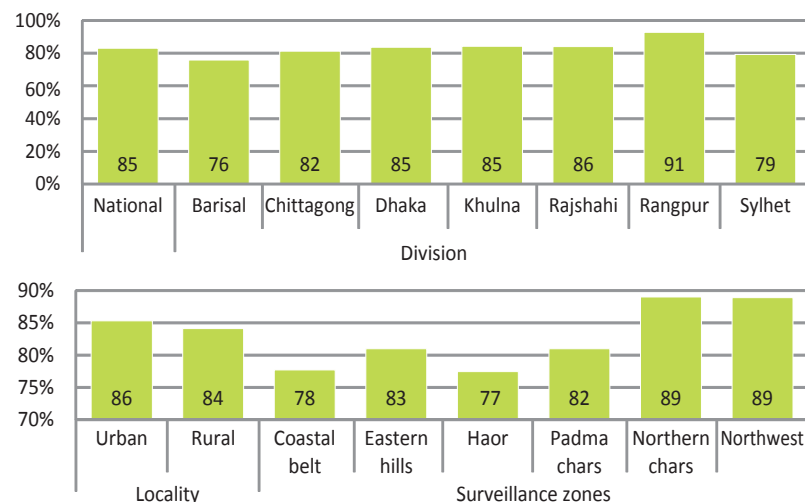
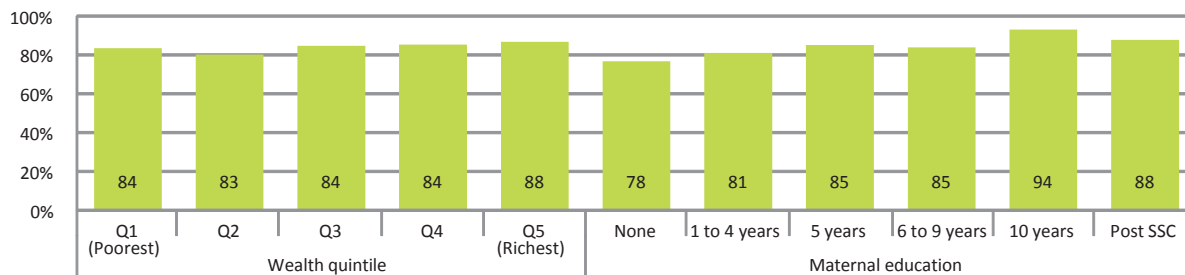
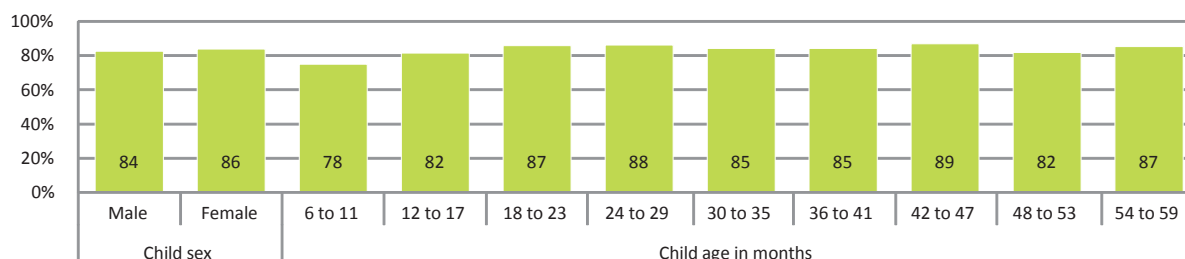


Figure 8.42 shows coverage of NVAC events among children 6 to 59 months of age at the time of the event by division and surveillance zone. In 2014, Rangpur division had the greatest coverage while Barisal division had the lowest. Across the surveillance zones, Northern chars and Northwest had the highest coverage rates while Haor had the lowest. There was not much variation in coverage between urban and rural areas in 2014 as was the case in 2013.

⁴ The younger age cohort of six to eleven months is not shown in this graph because recommendations for this age group changed in 2011.

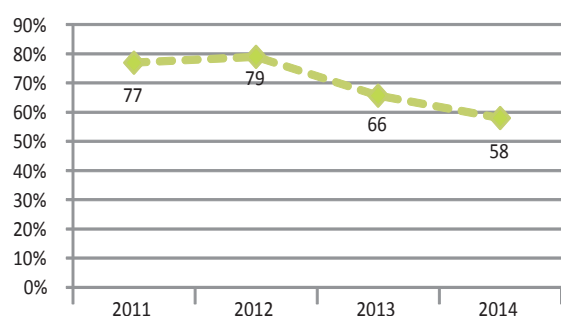
Figure 8.43: Coverage of the NVAC campaigns by household wealth quintile and mother's education (6 to 59 months)**Figure 8.44: Coverage the NVAC campaigns by child sex and age**

As shown in Figure 8.43, there were small differentials in coverage between children from different wealth and food security categories. Additionally, children whose mothers had greater educational attainment received VAC in a higher proportion. This is problematic because children from less wealthy and more food insecure households ate less diverse diets in greater proportion (See Figure 8.26) and thereby had less opportunity to obtain adequate vitamin A from their diet. Figure 8.44 shows little variation in proportion of children who received VAC by age, and no significant difference in coverage between male and female children.

Deworming

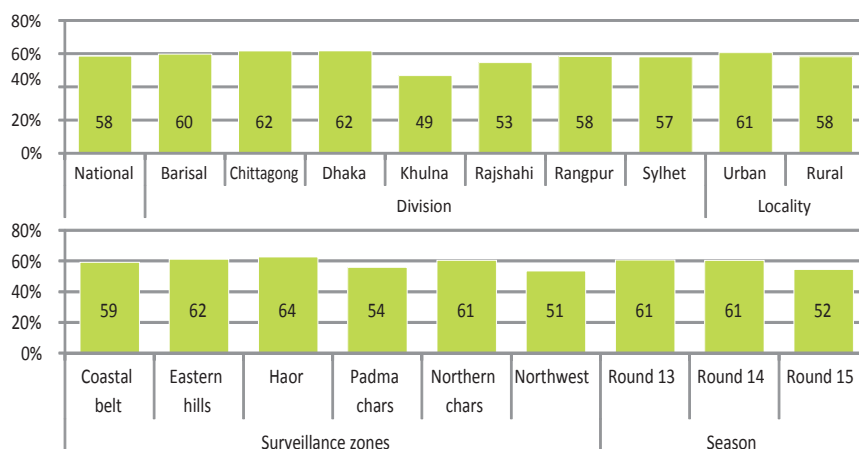
Mass provision of allopathic deworming to children is another preventive health care programme linked to NVAC campaigns. By directly absorbing nutrients from the body, helminths (worm) infections have a highly detrimental impact on the nutritional status of an individual. In infants and young children, such an impact often results in growth faltering, increased illness, and lower immunity. The burden of these infections falls disproportionately on the poor living in areas with inadequate sanitation. Though the estimated prevalence of helminths infections for Bangladesh is not available, all estimates available from Bangladesh point to a combined prevalence above the 20% cut-off for intervention (35).

Treating helminths infections is inexpensive; multiple effective drugs exist in the market and are provided via the government health services. The Government of Bangladesh recommends regular receipt of allopathic anti-helminthic tablets by all children 24 of 59 months of age as part of the country's anaemia control programme (3), but does not extend the provision of these tablets to children aged 12 to 23 months as stated in WHO recommendations (36). These tablets are often distributed at the same time as, or shortly after, the NID or NVAC days. Troublingly, between 2012 and 2014, the proportion of children who received both VAC and allopathic anti-helminths tablets decreased 7 percentage points to 55% while the proportion receiving neither decreased from 12% in 2013 to 7% in 2014.

Figure 8.45: Allopathic deworming (24 to 59 months)

Coverage of this programme was measured by the proportion of children 24 to 59 months of age who had received an allopathic anti-helminthic tablet in the six months prior to interview. According to this measure, the proportion of children who received anti-helminths tablets dropped from two-thirds in 2013 to nearly three-fifths in 2014 (Figure 8.45). Coverage rates were above 50% in all parts of the country except in Khulna, but round-wise estimates show a drop in coverage rates during Round 15.

Similar to the NVAC campaign, the deworming campaign shows a stepwise increase in coverage among the children as we move from less wealthy quintile to wealthier quintiles, and coverage is higher among food secure households (figure not shown). Coverage rates were also higher among

Figure 8.46: Coverage of allopathic deworming by area of residence

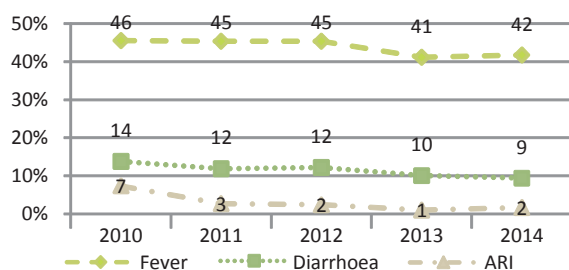
children whose caregivers had better educational attainment (figure not shown). In line with government guidelines, two times the proportion of children two to four years of age were given allopathic anti-helminths tablets than children one year of age (30%, figure not shown). Coverage did not vary by child sex (figure not shown)

Illness and recuperative health care

One barrier to child growth and development is inappropriate feeding during illness, particularly during diarrhoea. Government of Bangladesh endorsed infant and young child feeding practices (IYCF) include proper recuperative care when children fall ill (37,38). During and after illness, children have greater fluid and nutrient requirements to overcome the nutrient loss and mal-absorption that occurred during illness (39,40). WHO and UNICEF recommend that caregivers continue feeding (or breastfeeding) the child throughout the illness and increase feeding immediately after the illness (39,40). Counselling for appropriate sick child feeding should be provided to caregivers through integrated management of childhood illness (IMCI) programmes and at every visit of the sick child to a treatment facility.

Childhood illness

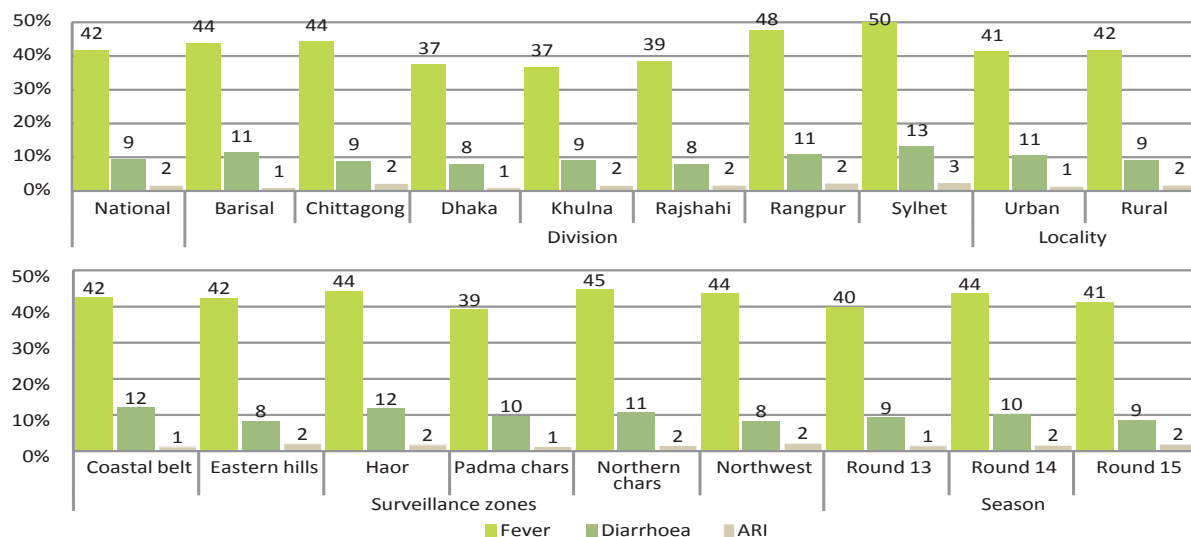
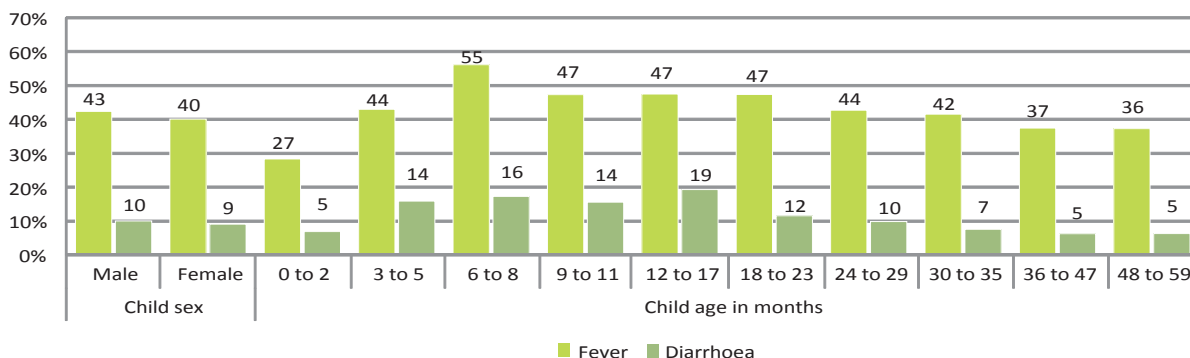
FSNSP includes estimates of the period prevalence rate of three common childhood illness conditions - fever, diarrhoea, and acute respiratory infections (ARI) - for the two weeks prior to

Figure 8.47: Proportion of children ill (2010-2014)

interview. FSNP defines fever based on a caregiver report of elevated temperature, diarrhoea as three or more loose motions in a twenty-four hour period, and ARI as a cough coupled with difficulty breathing. In 2014, the proportion of children suffering from fever was similar as in 2013 (Figure 8.47).

Fever period prevalence was lowest in Dhaka and Khulna and highest in Sylhet (Figure 8.48). The

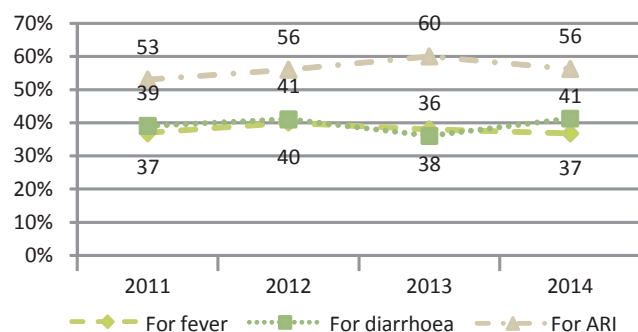
proportion of children suffering from fever was similar in urban and rural areas. The period prevalence of fever was lowest during the post-aman harvest season (Round 13), while the period prevalence of diarrhoea did not vary greatly over the year. In line with past results, wealthier households and those with more educated mothers had slightly but significantly lower period prevalence rates for fever (figure not shown). No difference in the period prevalence of fever and diarrhoea was apparent comparing girls and boys, but the age of the child was associated with prevalence of recent illness (Figure 8.49). Fever period prevalence peaked at six to eight months of age, while diarrhoea period prevalence peaked at 12 to 17 months of age.

Figure 8.48: Proportion of children ill by area of residence**Figure 8.49: Proportion of children ill with fever and diarrhoea by child sex and age**

Clinical care for illness

Recuperative care for child illness consists of both seeking guidance from a health care professional, and proper care of the child at home. In line with DHS methodology, FSNP records the proportion of children who were taken to a formal health facility or provider, excluding pharmacies, shops, or traditional practitioners (29). As expected, the proportion of children who are taken to a medical provider when sick varies greatly by the symptoms experienced and the ability of the household to access care.

Figure 8.50: Ill children who were taken to a medical provider



For ARI and fever, the proportion of children taken to a medical provider has somewhat decreased, while the proportion of children ill with diarrhoea has increased between 2013 and 2014. In line with past results, parents take children sick with ARI to a medical provider more frequently than children sick with diarrhoea or fever. There was little congruence between care seeking by illness type across divisions; areas with relatively high rates of care seeking for one illness did not have elevated rates of care seeking for other illnesses. The proportion

of children taken to a medical provider when ill with fever were slightly higher in urban areas compared to the rural areas, but there was no difference for diarrhoea and ARI. No significant variation was found over the seasons during 2014 (see Figure 8.51)

Figure 8.51: Proportion of children ill who were taken to a medical provider by area of residence

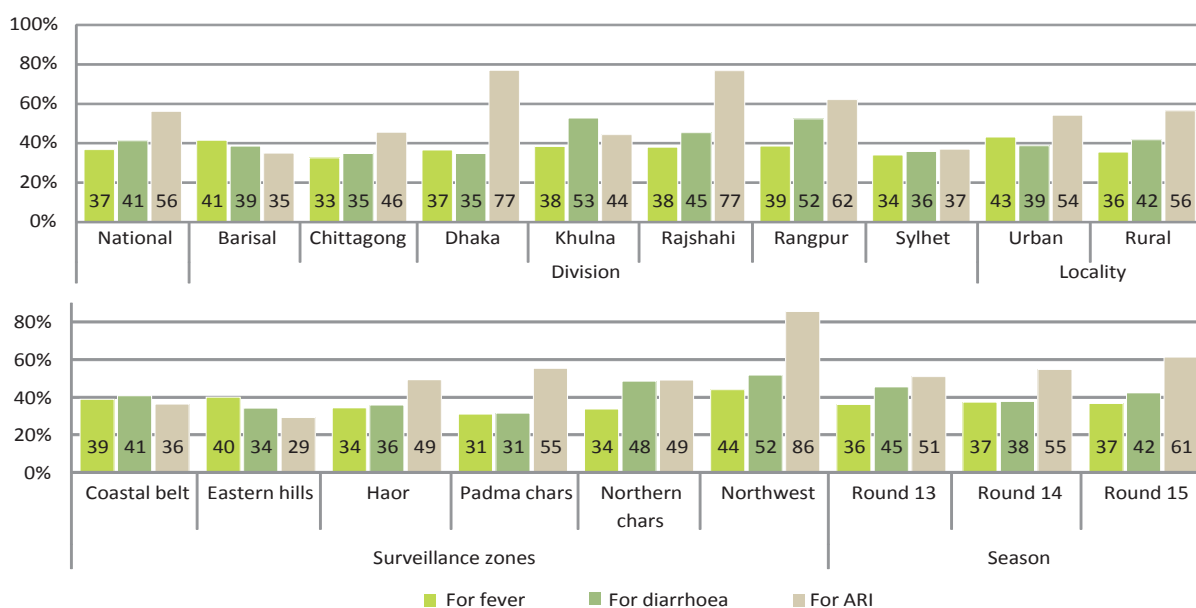
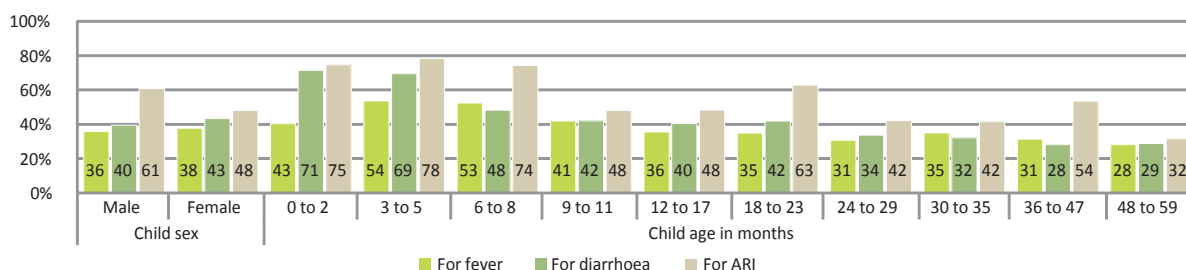
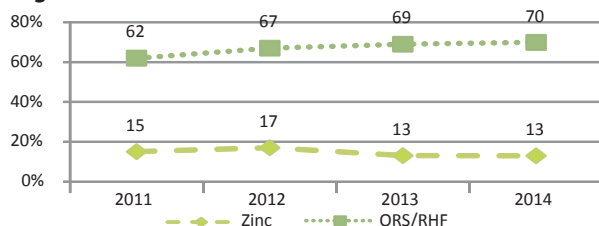


Figure 8.52: Proportion of sick children taken to a medical provider by child age and sex

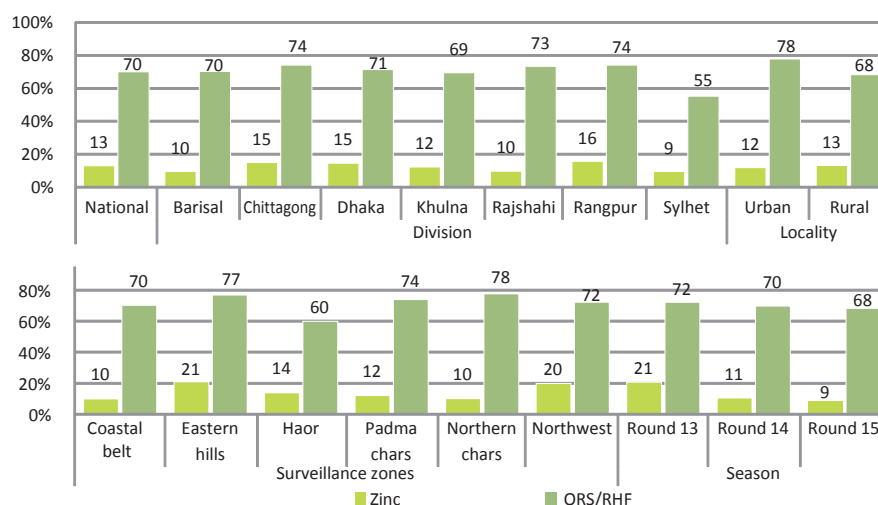
No significant differences were found in the proportions of children taken to a medical provider when sick by household wealth quintile and category of food security (figure not shown). However, the rates of care seeking were higher for the mothers with better educational attainment than their less educated peers (figure not shown) in case of diarrhoea and fever, while for ARI no such kind of variation was found. Professional medical care was sought more frequently for children in their first year of life (Figure 8.52). There was no systematic difference in the proportion of male compared to female children who received care for illness.

Home care for diarrhoea

In addition to medical and facility based care, care at home can greatly improve recovery time for children, particularly those suffering with diarrhoeal illness. Effective treatment of children during diarrhoea can prevent over 90% of deaths related to diarrhoea.

Figure 8.53: Zinc and ORT for diarrhoea

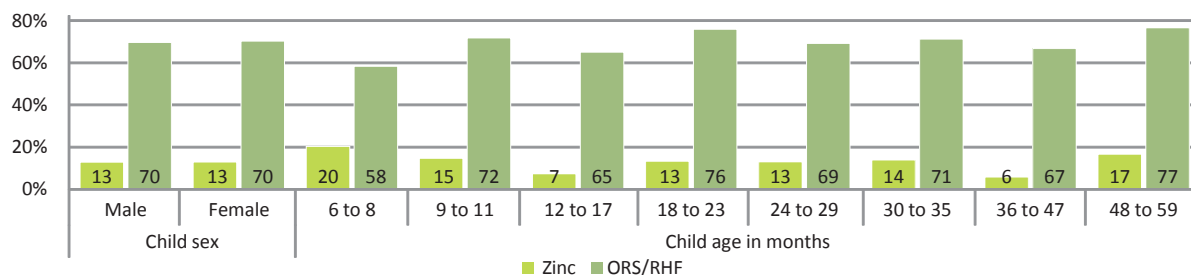
While ORS is effective at saving lives due to dehydration, zinc has been shown to reduce the time that children over six months of age suffer diarrhoea (41). Zinc is currently available free of cost from governmental health care providers and at a fixed cost through the Social Marketing Company's distribution channels (42). Focusing on

Figure 8.54: Zinc and ORT for diarrhoea by area of residence

home care for diarrhoea, FSNP records the proportion of the youngest children aged six to fifty-nine months among those ill with diarrhoea in the two weeks prior to the interview who were treated with zinc or oral rehydration therapy. Oral rehydration therapy includes both liquids prepared from

commercial oral rehydration salts (ORS packets) and rehydration liquids prepared with homemade ingredients such as salt, sugar, and rice starch. Nationally, a little over one tenth of children who had diarrhoea diagnosed by their caregiver were given zinc supplementation - a level constant

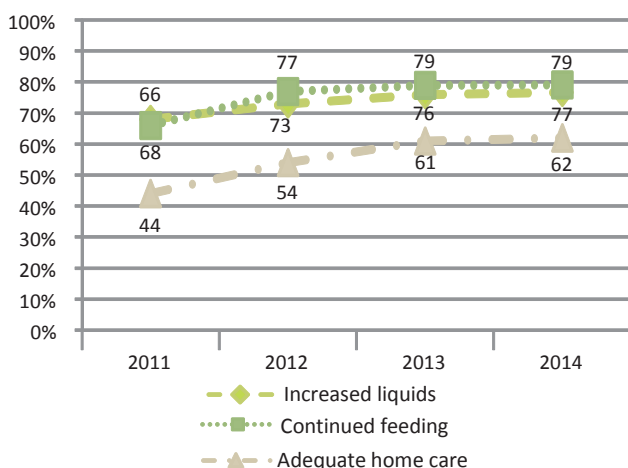
Figure 8.55: Proportion of children with diarrhoea given zinc or ORT therapy by child age and sex



between 2013 and 2014 - while over two thirds of children were provided oral rehydration therapy - a slight increase from past years. Chittagong and Rangpur had the highest proportion of children treated in line with these recommendations. More children received zinc and ORT in the first season of 2014 compared to later periods. As shown in Figure 8.55, infants younger than nine months received ORT in a lower proportion than older children. A greater proportion of sick children aged six to eight months were fed zinc than other age groups. There was no difference in the proportion of male and female children treated with zinc or ORT who were recently ill with diarrhoea.

FSNSP also includes more general indicators of child feeding during illness. The caregivers of children six to fifty-nine months of age who were sick with diarrhoea are asked to provide a comparative assessment of the amount of food and liquids that had been given to the child during

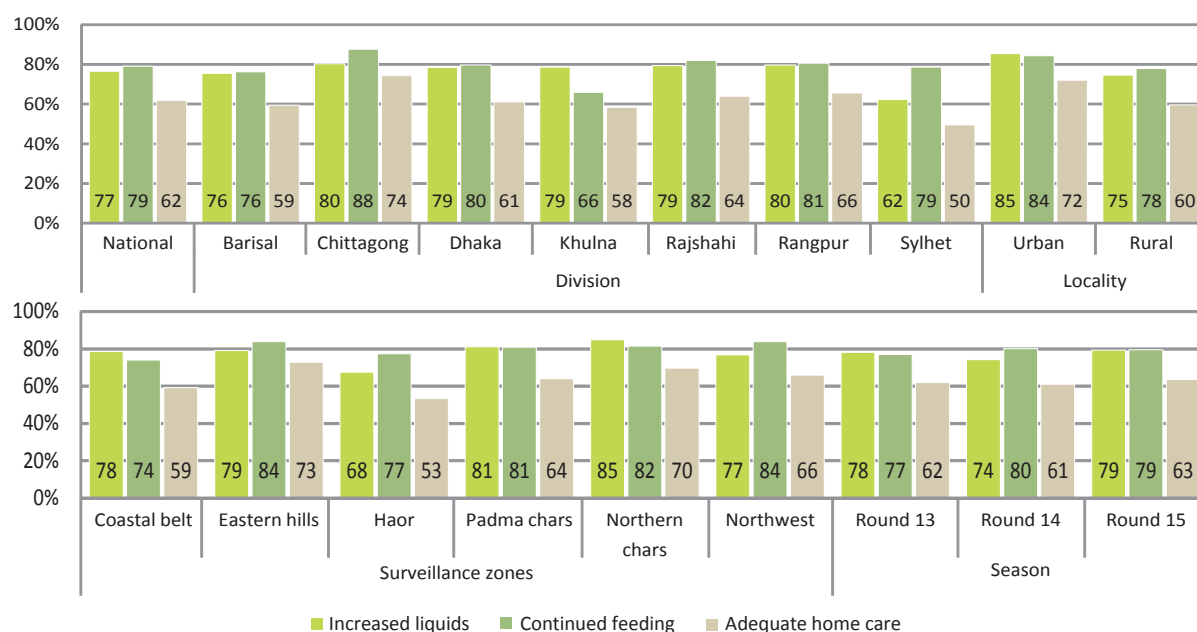
Figure 8.56: Adequate home care for diarrhoea



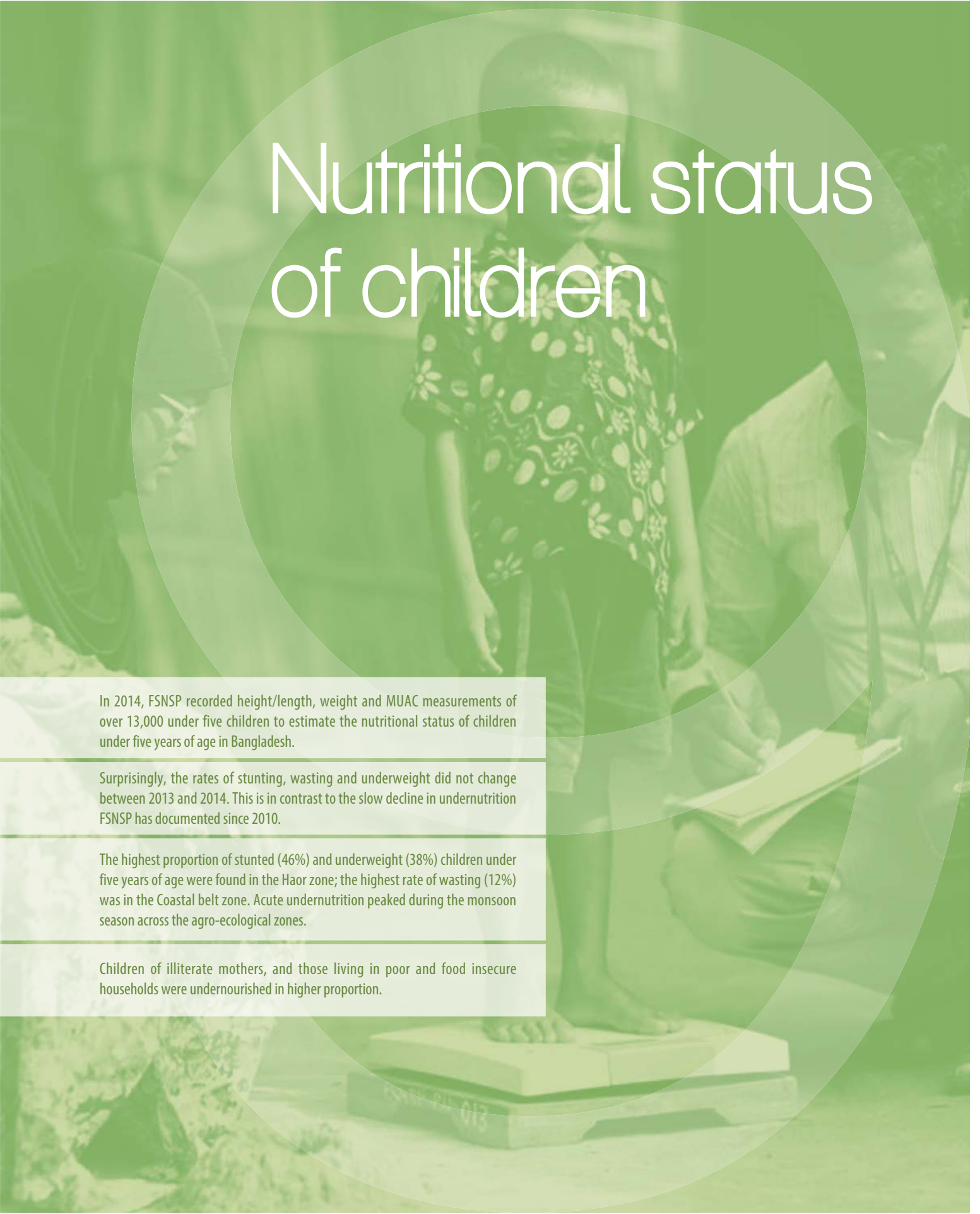
the recent illness compared to usual practice. Children recently sick with diarrhoea are classified as having received increased liquids if their caregiver reported giving them increased liquids or ORT during their illness. On the other hand, children recently sick with diarrhoea are classified as having received continued feeding if their caregiver reported giving them the same or more food during their illness compared to normal practice. Finally, children recently sick with diarrhoea are classified as having received adequate home care if they received both increased liquids and continued feeding. All three indicators have improved since

2011 (Figure 8.56), but while over three quarters of children recently ill with diarrhoea were given increased liquids and continued feeding during their most recent illness, only a little under two-thirds of recently ill children received both of these care practices.

Across divisions the proportion of ill children receiving all three forms of home cares during the course of illness were highest in Chittagong (Figure 8.57). Overall, Sylhet division had the lowest proportion of sick children receiving increased liquids and adequate home care, while the

Figure 8.57: Proportion of children with diarrhoea given increased fluids and continued feeding by residence

proportion receiving continuous feeding was lowest in Khulna. The children in urban areas had any of the forms of home cares for diarrhoea in a greater proportion than those in rural areas, although the differences were not statistically significant. There was little seasonal variation in the proportion of sick children receiving different types of home care during diarrhoea. Except for a lower rate of adherence to these recommended practices for the youngest age group (6 to 8 months of age), these practices did not vary by age or sex (figure not shown).

A young child in a patterned shirt stands on a platform, being measured by a health worker. The background shows other people and a green circular overlay.

Nutritional status of children

In 2014, FSNSP recorded height/length, weight and MUAC measurements of over 13,000 under five children to estimate the nutritional status of children under five years of age in Bangladesh.

Surprisingly, the rates of stunting, wasting and underweight did not change between 2013 and 2014. This is in contrast to the slow decline in undernutrition FSNSP has documented since 2010.

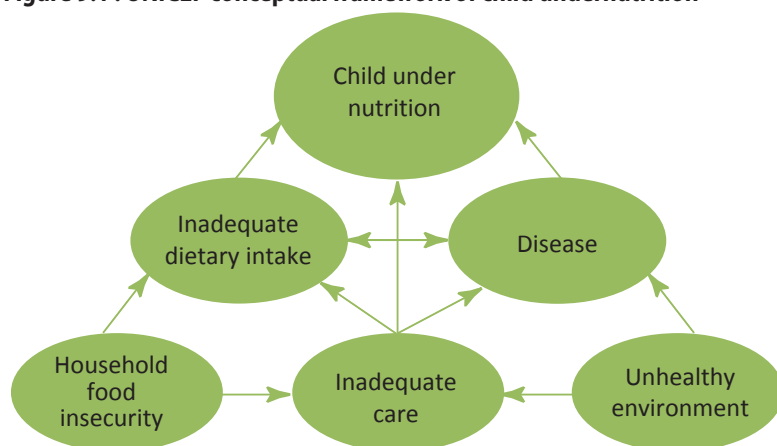
The highest proportion of stunted (46%) and underweight (38%) children under five years of age were found in the Haor zone; the highest rate of wasting (12%) was in the Coastal belt zone. Acute undernutrition peaked during the monsoon season across the agro-ecological zones.

Children of illiterate mothers, and those living in poor and food insecure households were undernourished in higher proportion.



As stated in previous chapters, numerous shortcomings in child care, protection, and feeding have contributed to the high rates of child under nutrition seen in Bangladesh (Figure 9.1). Under nutrition has a staggering cost. The Lancet Maternal and Child Nutrition Series estimated that on an aggregate level, under nutrition is the cause of 3.1 million child deaths annually or 45% of all child deaths in 2011 (1). In addition, about 11% of days lost to illness and disability and around 35% of the global disease burden in children is due to under nutrition (2). Changes in levels of child under nutrition in developing countries tend to be closely related to mortality trends (3), making health interventions less effective unless nutrition is addressed concurrently (4,5).

Figure 9.1 : UNICEF conceptual framework of child undernutrition



In addition, under nutrition during critical periods of child development can result in lower worker productivity in adulthood (6). On a national scale, the aggregate impact of high rates of under nutrition may impede prospective economic growth as the health and nutritional status of the children in a country today represents the productive potential of a nation tomorrow. In particular, the first thousand

days of life - beginning with conception up until the age of two - is the most critical period in a child's development. Even if a child's health and diet improve later in life, damage done during this period is largely irreversible (7). In addition to understanding the major causes of malnutrition and the range of options to combat it, efforts must be focused on increasing the quality and effective coverage of nutrition specific interventions to ensure optimal child development (8).

This report has discussed some of the underlying and immediate determinants of child under nutrition including unhealthy home environments, household food insecurity, and inadequate care practices for pregnant mothers, women, and young children. This chapter details the level of child malnutrition in Bangladesh in 2014. In order to estimate the nutritional status of children, FSNSP records the height, weight, and MUAC measurements of all able-bodied children in interviewed households. In 2014, FSNSP measured over 13,000 children across the country (detailed in Table 9.1). Child nutritional status is calculated by comparing multiple measures from Bangladeshi children to those of a multi-ethnic population of children who grew up under recommended feeding and care conditions in both developing and developed countries (9).

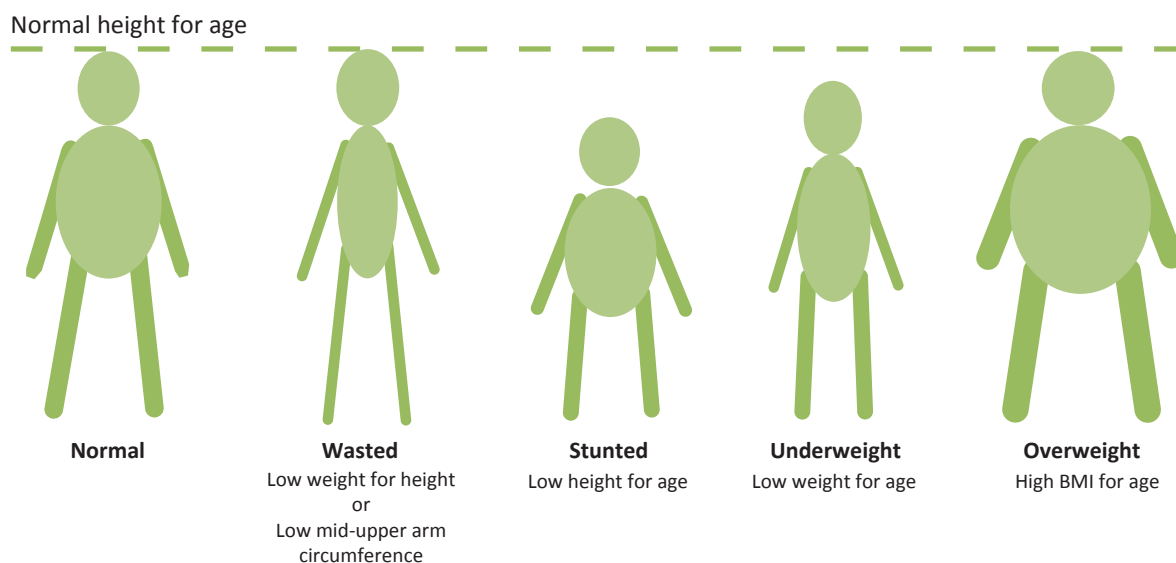
Table 9.1: Children measured by age

Age group in months	Number Surveyed	Weighted proportion
0 to 5	1,257	9%
6 to 11	1,426	10%
12 to 17	1,402	10%
18 to 23	1,408	10%
24 to 29	1,496	11%
30 to 35	1,423	11%
36 to 41	1,455	10%
42 to 47	1,447	10%
48 to 53	1,389	10%
54 to 59	1,215	8%
Total	13,918	100%

FSNSP examines multiple measures of childhood malnutrition using this reference population. To estimate the level of chronic undernutrition, comparisons are made between height/length by age as this measures the cumulative effects of growth retardation. This measure is called "stunting" or low height/length-for-age. Another comparison is between the child's weight and height/length, irrespective of the child's age. This measure of thinness estimates the levels of acute undernutrition in the population and is referred to as "wasting" or low weight-for-height/length. Other measures of acute undernutrition use the circumference of a child's upper arm, comparing this measurement to that of a reference population by age or against a static international standard. The final measure of undernutrition, child underweight, compares the weight of children by their age. Child underweight, or low weight-for-age, is a composite measure of undernutrition and does not distinguish between children who are stunted or wasted, but may include children who are only mildly undernourished based on both of these indicators. For all measures, children who fall between negative two standard deviations (-2 SD) and negative three standard deviations (-3 SD) from the mean of the reference population are classified as moderately undernourished. Children who are below negative three standard deviations (-3 SD) are classified as severely undernourished. Taken together, all children who fall below negative two standard deviations (-2 SD) are classified as globally undernourished (10).

In contrast to measures of child undernutrition, levels of early childhood obesity in a population is calculated by comparing BMI scores by age to the WHO reference population in order to determine the percentage of children with a very high ratio between their weight and their length.¹ For this measure, children are considered moderately overweight if their measurements indicate that they are between positive two standard deviations (+2 SD) and positive three standard deviations (+3 SD) from the mean of the reference population. Children who are above positive three standard deviations (+3 SD) are classified as severely overweight (10). A depiction of these indicators is given in Figure 9.2.

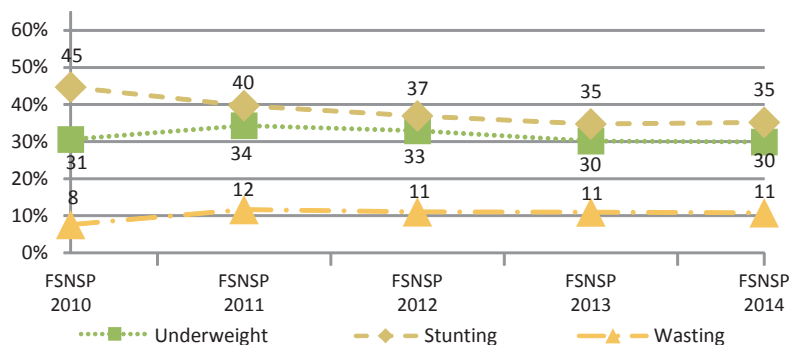
Figure 9.2 : Indicators of childhood malnutrition



¹ BMI for age is the recommended indicator for determining childhood overweight and obesity according to the WHO (37,43).

Children grow with slightly different trajectories, and lulls and spurts in growth occur even among well-fed children (11,12). As such, nutritional status measures are expressed in population terms and only have a limited value in assessing malnutrition in an individual child. Even in a healthy, well-nourished population, approximately 2% of children would naturally be short enough to be classified as stunted, light enough to be considered underweight, or thin enough to be classed as wasted.

Figure 9.3: Trends in the prevalence of child undernutrition (0 to 59 months)

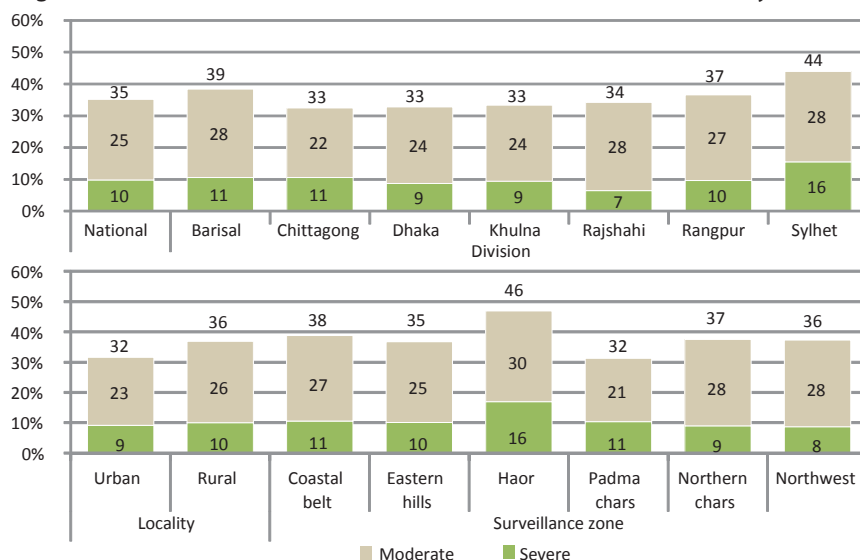


Since independence, Bangladesh has greatly reduced levels of child undernutrition. Since 2010 there has been an incremental reduction in child wasting and more sizable declines in child stunting. Notably the prevalence of stunting fell from 45% in 2010 to 35% in 2014. The level of stunting in Bangladesh is now below the WHO cut-off for very high prevalence (13).

Chronic child undernutrition

Chronic child undernutrition is the result of multiple factors, including poor maternal nutrition before birth, infection leading to mal-absorption of nutrients, and/or caloric or micronutrient inadequacy due to a poor diet. Stunting or linear growth retardation increases the child's likelihood of death, due in part to a reduced ability to fight infection, and has been linked to a greater risk of chronic diseases later in life, such as heart disease, diabetes, and kidney damage (14,15,16). In line with a decrease of childhood stunting from 40% to 27% globally and from 49% to 28% in Asia between 1990 and 2010 (17), rates of stunting have reduced greatly in Bangladesh. However, Bangladesh is still classified as having a high prevalence of chronic undernutrition and over five and a half million children in Bangladesh are stunted (13).

Figure 9.4: Prevalence of chronic child undernutrition (0-59 months) by area of residence



Because stunting prevalence does not change rapidly and only adjusts slowly after changes in dietary intake, this section will only present annual estimates of chronic undernutrition. As shown in Figure 9.4, levels of chronic child undernutrition varied greatly by area of residence. Similar to past

results, Sylhet had the highest rates of childhood stunting, but Chittagong and Sylhet were also the areas which had the largest reduction in stunting rates between 2013 and 2014. On average, urban areas had much lower rates of stunting than rural areas. Among the surveillance zones, rates of stunting were lowest in the Padma chars zone, and highest in the Haor zone.

Consistent with previous FSNP results, a lower proportion of children from wealthier households and with more educated mothers were chronically undernourished compared to children from poorer households and those with less educated mothers (Figures 9.5 and 9.6). No matter the metric of food security, children living in food insecure households were chronically undernourished in higher proportion than children from food secure households. However, a sizable proportion of children were chronically undernourished even in the wealthiest and food secure households.

Figure 9.5: Prevalence of chronic child undernutrition (0-59 months) by household wealth and food security

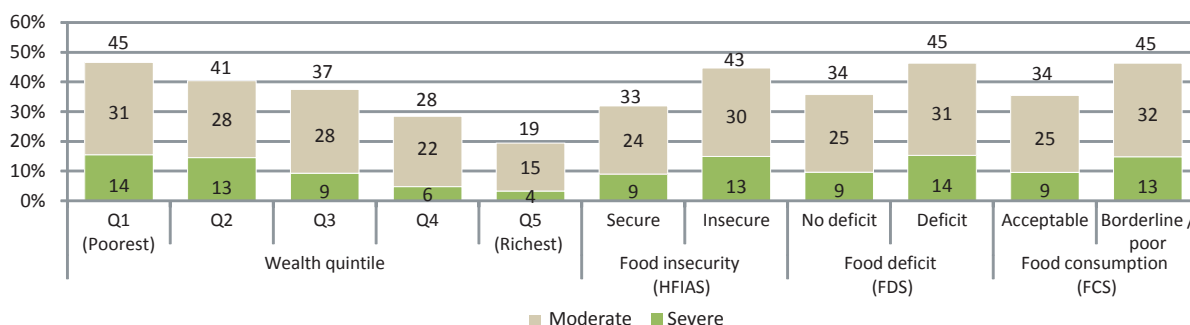
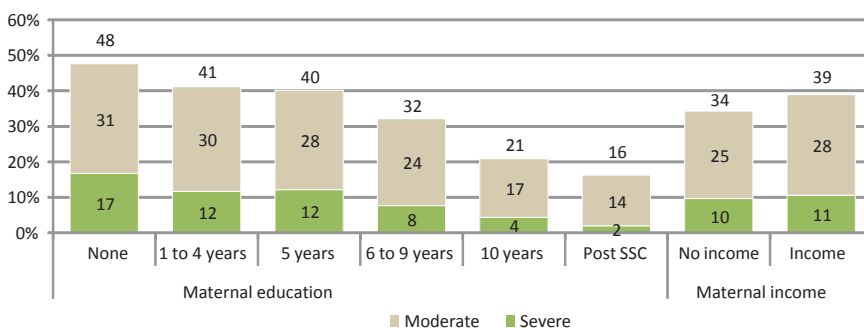


Figure 9.6: Prevalence of chronic child undernutrition (0-59 months) by maternal characteristics



There were no differences in rates of undernutrition between male and female children, but some age-related patterns are apparent (Figure 9.7). Chronic undernutrition starts before birth with intrauterine growth

retardation, and more than one-fourth of children zero to two months of age in Bangladesh were stunted. Rates of chronic undernutrition increase sharply after the first year of life, after which the proportion of children with chronic undernutrition vary between 38% and 40% through the rest of the under five period.

Figure 9.7: Prevalence of chronic child undernutrition (0-59 months) by child's characteristics

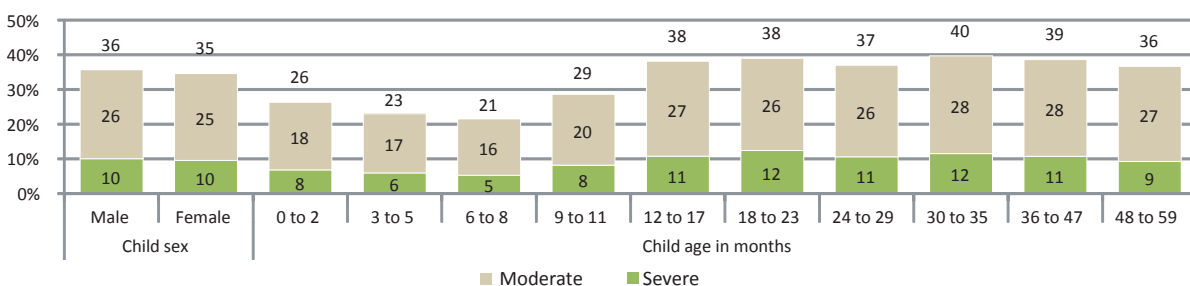
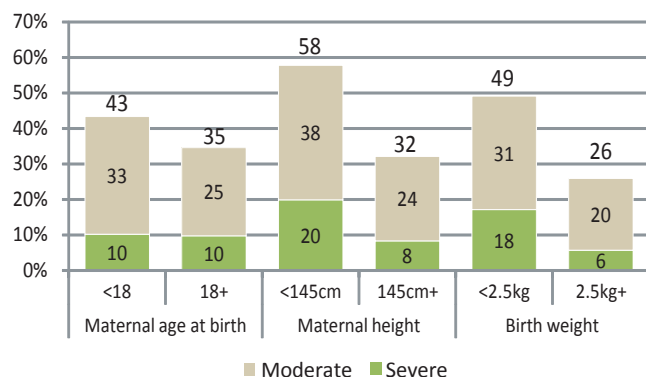
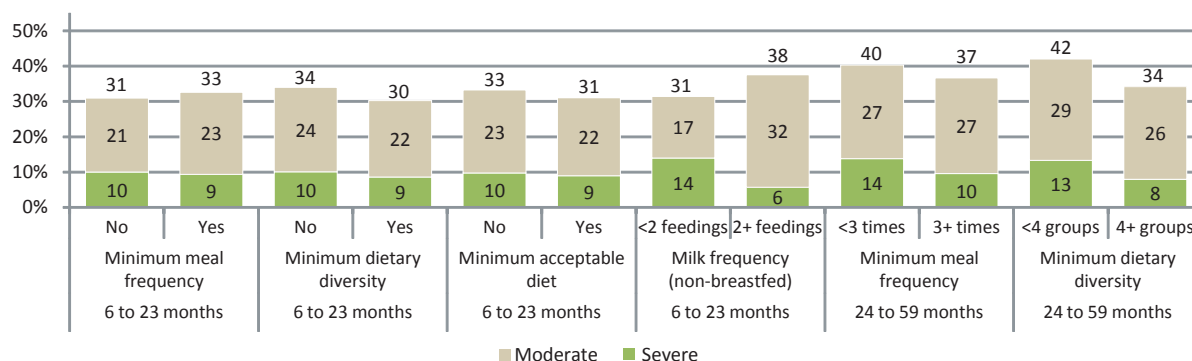


Figure 9.8: Prevalence of chronic child undernutrition (0-59 months) by maternal characteristics

No sizable and significant differences in the rates of stunting among children less than six months of age were found for early initiation of feeding, prelacteal feeding, exclusive breastfeeding, predominant breastfeeding, and bottle feeding (results not shown). However, in line with past results, early maternal age at birth, short maternal height, and a low birth weight were significantly associated with greater levels of childhood stunting (Figure 9.8). Among children for whom

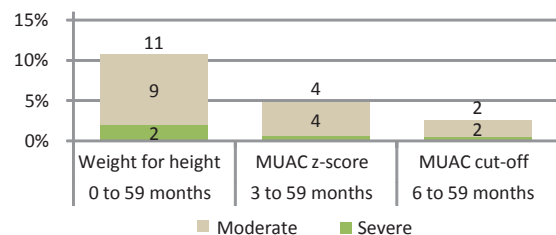
birth weight was recorded, children whose birth weight was below 2.5 kg (low birth weight) were stunted at almost double the rate of children who were 2.5kg or over at birth (26%).

Figure 9.9: Prevalence of chronic child undernutrition (0-59 months) by complementary feeding practices

There were no measureable differences in rates of undernutrition between children who had experienced illness in the previous two weeks and those who had not been ill (graph not shown). Stunting was not associated with minimum dietary diversity, minimum acceptable diet, milk feeding frequency of non-breastfed infants and minimum meal frequency of children 6 to 23 months of age (Figure 9.9). Among children 24 to 59 months of age, however, there was a strong association between minimum dietary diversity and prevalence of stunting.

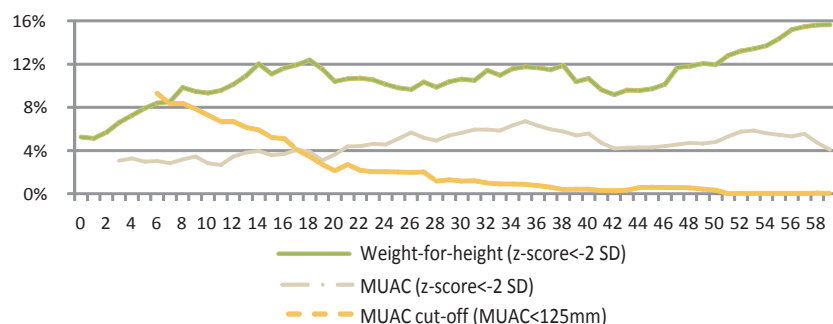
Acute child undernutrition

Acute undernutrition, caused by a sharp reduction in the absorption of sufficient nutrients required for health, can be prevented through adequate feeding practices and improved hygiene, assuming that households are food secure and able to access health care. A child who suffers from severe acute undernutrition has a risk of death up to 20 times greater than that of a healthy child. Once acute undernutrition develops, it is treated in line with WHO protocols which have been regulated by the Government of Bangladesh.

Figure 9.10 : Comparison of measures of acute child undernutrition (0-59 months)

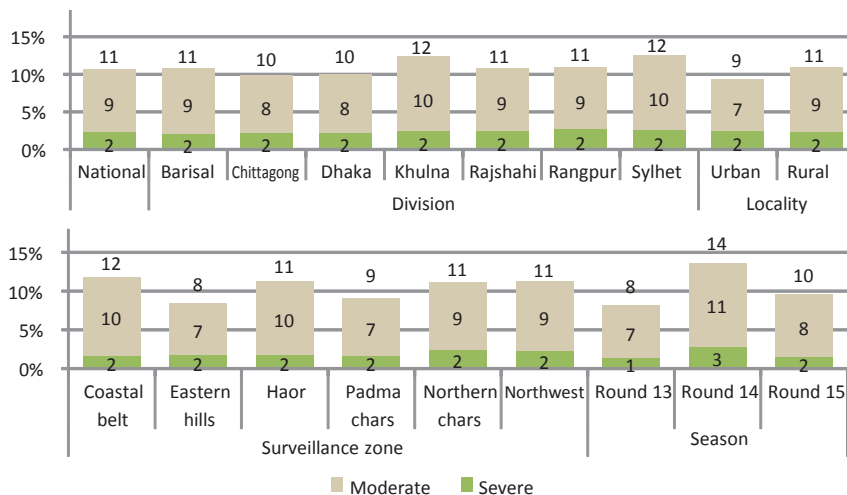
As mentioned at the outset of this chapter, acute undernutrition can be measured in a population through three means: 1) weight and height converted to weight-for-height z-scores; 2) MUAC measurements converted to MUAC-for-age z-scores; and 3) MUAC measurements expressed in terms of standard cut-offs, with moderate acute

undernutrition defined as a MUAC <125 mm and severe acute undernutrition defined as a MUAC <115mm (18). While weight-for-age z-scores can be calculated for even the youngest children, MUAC z-scores are only available for children over three months of age and MUAC cut-offs should only be used for children over six months of age (18,10).

Figure 9.11 : Comparison of measures that estimate the prevalence of Global Acute Malnutrition (GAM) by age in months

Rates of acute undernutrition in Bangladesh vary considerably depending on what classification system is used (Figure 9.10). These differences were also apparent when prevalence was examined over age in months (Figure 9.11). While

the MUAC cut-off and weight for height prevalence rates are similar from six to ten months of age, beyond 28 months of age very few children are found to be acutely undernourished using the MUAC cut-off criteria. In contrast, the proportion of children identified as acutely undernourished by MUAC for age z-scores was roughly constant across all ages. These patterns are consistent with past findings in Bangladesh but are not universally true (19,20). For the rest of this section, weight-for-height z-score criteria will be used to determine acute undernutrition.

Figure 9.12: Prevalence of acute child undernutrition (0-59 months) by area of residence and season

Though harder to discern in Figure 9.3, it is likely that Bangladesh has experienced reductions in the proportion of children acutely undernourished once seasonality is taken into consideration. In 2014, Bangladesh had a serious public health problem with respect to acute child undernutrition, according to the WHO classification system (13).

Moreover, in the monsoon months, rates of acute undernutrition increased to the level of a critical public health problem in regions of Bangladesh (13). Due to the transient nature of wasting, where children move into and out of this status over the year, it is estimated that over 4.3 million children suffered from wasting at some point during 2014 (21).

As shown in Figure 9.12, rates of wasting across administrative divisions were in line with the national estimates (11%). Wasting rates in urban areas were insignificantly lower than rural areas of the country and there was more variation in wasting rates across surveillance zones than across the divisions of Bangladesh. However, seasonal variations within zones were more remarkable. In line with historical variation, rates of wasting spiked during the monsoon months (Figure 9.13). In 2014, this pattern was prevalent in all the zones.

Figure 9.13 : Seasonal variation in the prevalence of acute child undernutrition (0-59 months) by surveillance zone

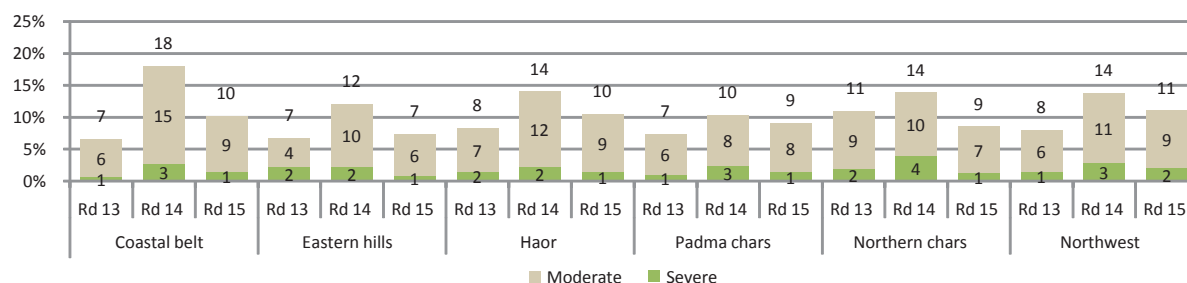


Figure 9.14: Prevalence of acute child undernutrition (0-59 months) annually and seasonally by household wealth

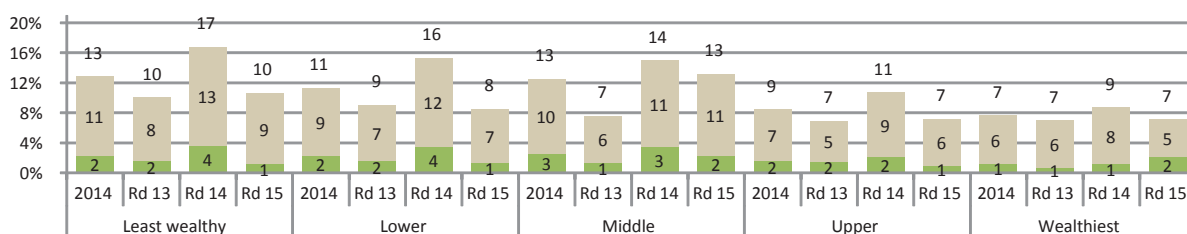
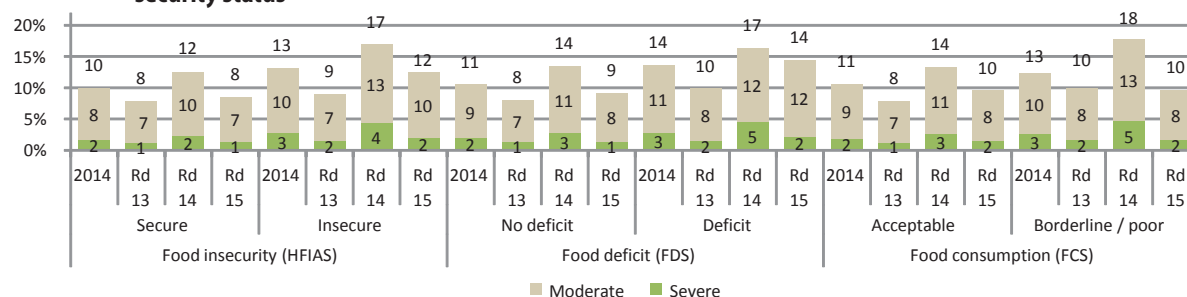


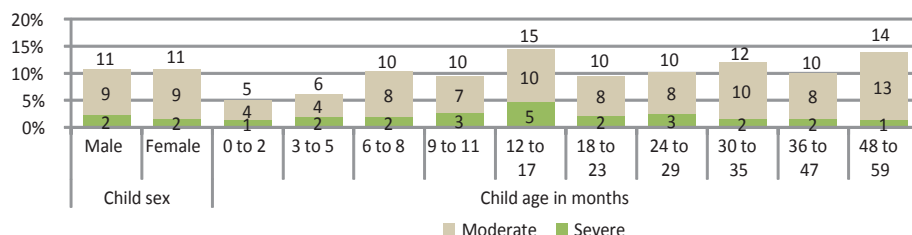
Figure 9.15: Prevalence of acute child undernutrition (0-59 months) annually and seasonally by household food security status



Patterns of acute undernutrition by household and maternal characteristics were similar to those for chronic undernutrition; a smaller proportion of children from wealthier households were wasted compared to children from poorer households (Figure 9.14). Seasonally, children from households in the lower wealth quintiles showed a sharp peak in wasting rates in the monsoon months, reaching critical levels. Children from food insecure households had higher rates of wasting annually than food secure households by every measure (Figure 9.15); these disparities

became even more apparent during the monsoon season. However, the differences in acute undernutrition rates between a food secure and a food insecure household were much less than that for chronic undernutrition and, in case of food consumption, not statistically significant. In line with the past results, children with more educated mothers were wasted in a lower proportion than those with less educated mothers. For the year as a whole, maternal income earning status had no association with child wasting rates (graph not shown).

Figure 9.16: Prevalence of acute child undernutrition (WHZ<-2) annually by child sex and age



While there were no differences in the proportion of male and female children wasted annually (Figure 9.16) or seasonally (Figure

9.17), there were differences by child age. Rates of wasting appear greater after one year of age and marked seasonal variation is apparent; wasting peaked during the monsoon season, for every age group except the second year of life.

Figure 9.17: Prevalence of acute child undernutrition (WHZ<-2) seasonally by child sex and age

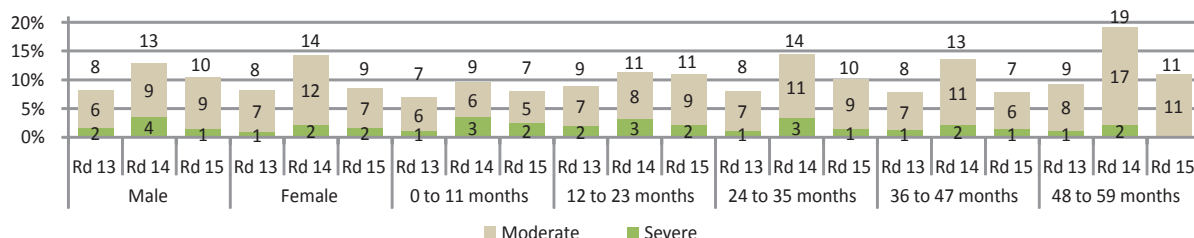


Figure 9.18: Acute child undernutrition (WHZ<-2) by complementary feeding

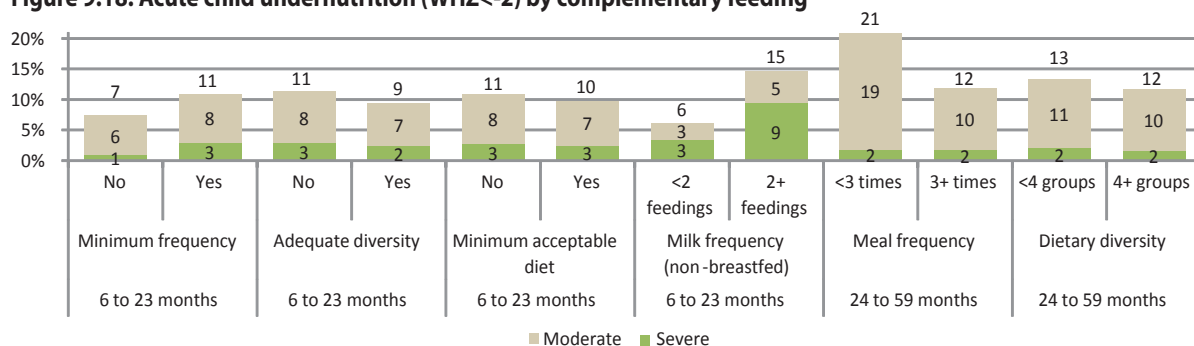
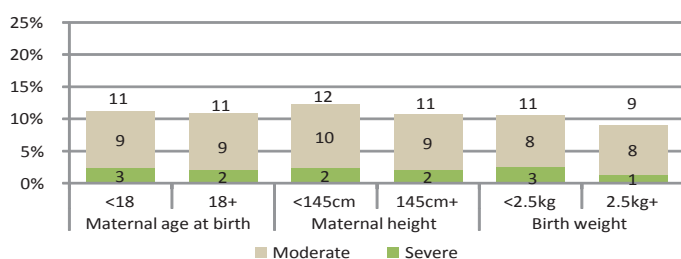
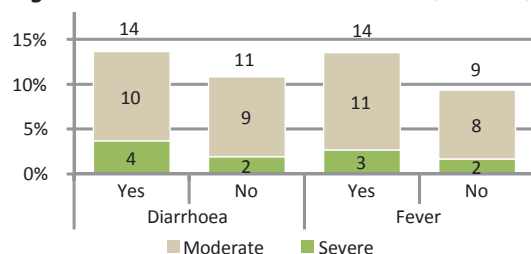


Figure 9.19: Acute child undernutrition (WHZ<-2) by maternal characteristics



Few indicators of child care were significantly associated with acute undernutrition. Early breastfeeding behaviours such as early initiation, no pre-lacteal feeding, exclusive breastfeeding, predominant breastfeeding and bottle feeding were

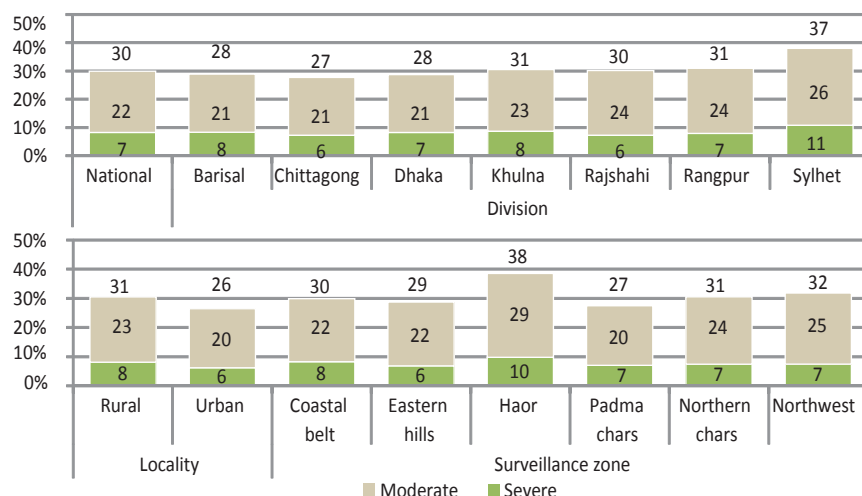
Figure 9.20: Acute child undernutrition (WHZ<-2) by recent illness

not linked to reduced rates of wasting in the children zero to six months of age (not shown). No statistically significant differences in rates of wasting across complementary feeding indicators were apparent, except minimum frequency and meal frequency of children 6-23 and 24-59 months respectively (Figure 9.18).

No variation was found in the level of wasting based on maternal age and maternal height (Figure 9.19). Low birth weight babies were wasted at a slightly but insignificantly greater rate. However, both diarrhoea and fever were significantly associated with higher rate of wasting (Figure 9.20).

Child underweight, overweight, and obesity

Child underweight is a measure of child undernutrition that encompasses all children who have a low weight for their age. This could be due to stunting or wasting or a combination of the two. Nationally, the rate of child underweight was 30%. Based on the WHO cut-off values for public

Figure 9.21: Prevalence of child underweight (WAZ<-2) by area of residence

health significance, this very high prevalence rate indicates a critical situation (13). Sylhet had the highest proportion of children underweight in 2014 as was the case in all years since 2011. More than one quarter of children in urban areas was underweight, compared to one third of children in rural areas. In contrast to age patterns in stunting and wasting, rates of child underweight rapidly

increased at age one, and stabilised above 30% after two years of age (Figure 9.22). Variations by household characteristics were very similar to those observed for wasting and stunting and are therefore not presented.

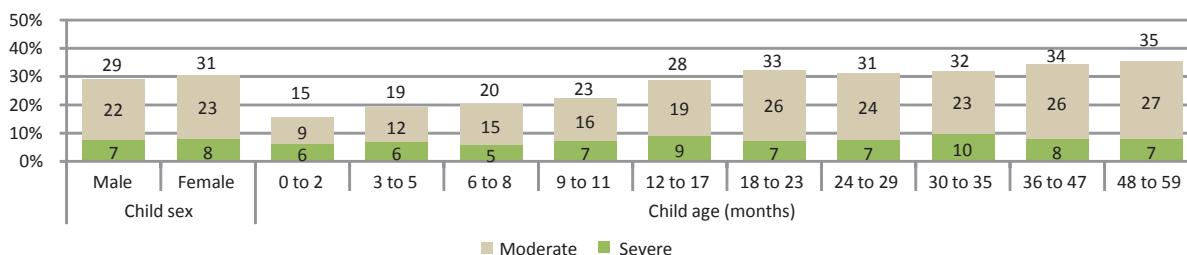
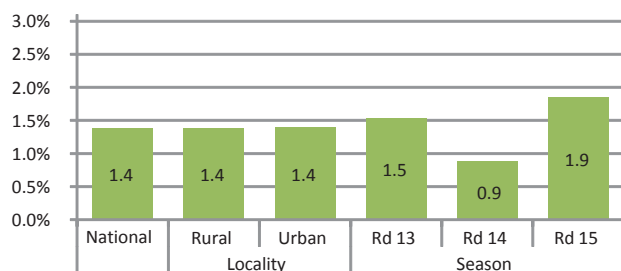
Figure 9.22: Prevalence of child underweight (WAZ<-2) by child age and sex

Figure 9.23: Early childhood overweight (WHZ >+2) among 0-59 months by area of residence and survey round

In contrast to child underweight, overweight and obesity among young children is not yet a large concern in Bangladesh, as has been indicated in FSNP. In 2014, 1.4% of young children were moderately overweight and almost no young children were severely overweight, a small increase over 2013 (Figure 9.23). However, the proportion of young children in urban areas who are

overweight was 1.4%; in line with what is expected in a well-nourished population.

Tracking global development targets

The practice of setting global development targets has a long history dating back to before the Second World War. The systematic tracking of targets with quantifiable indicators has a much shorter history, and was most notably employed in the process leading up to the articulation of the Millennium Development Goals (MDGs) (22,23). As the 2015 target date for the MDG's approaches, new goal setting processes are being discussed that differ from those used at the turn of the 21st century. Future targets will be further imbedded within country contexts and increasingly led by southern partners. This section will review progress towards MDG 1 - Child hunger and the World Health Assembly targets for 2025.

MDG 1 - Child hunger

Given that the MDG goal to reduce child underweight was set in 2000 with the base year of 1990, long before the 2006 WHO child growth standard reference population was established, the older NCHS/CDC/WHO reference population was used. As a result, the prevalence estimates presented in Figure 9.24 based on the NCHS/CDC reference population, do not correspond with earlier estimates based on the WHO reference population that have been used elsewhere in this chapter. These differences are demonstrated in Figure 9.25, which shows global levels of child undernutrition as determined by the two reference groups for children aged 6-59 months of age - the age group used in the MDG 1 child hunger goal in Bangladesh. Notably, use of the NCHS reference group results in higher levels of underweight and lower levels of child stunting than use of the WHO reference group (24).

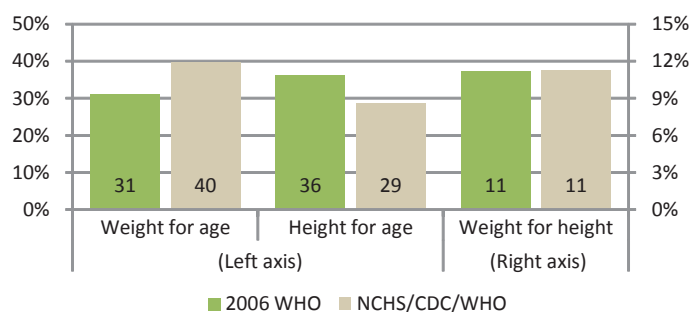
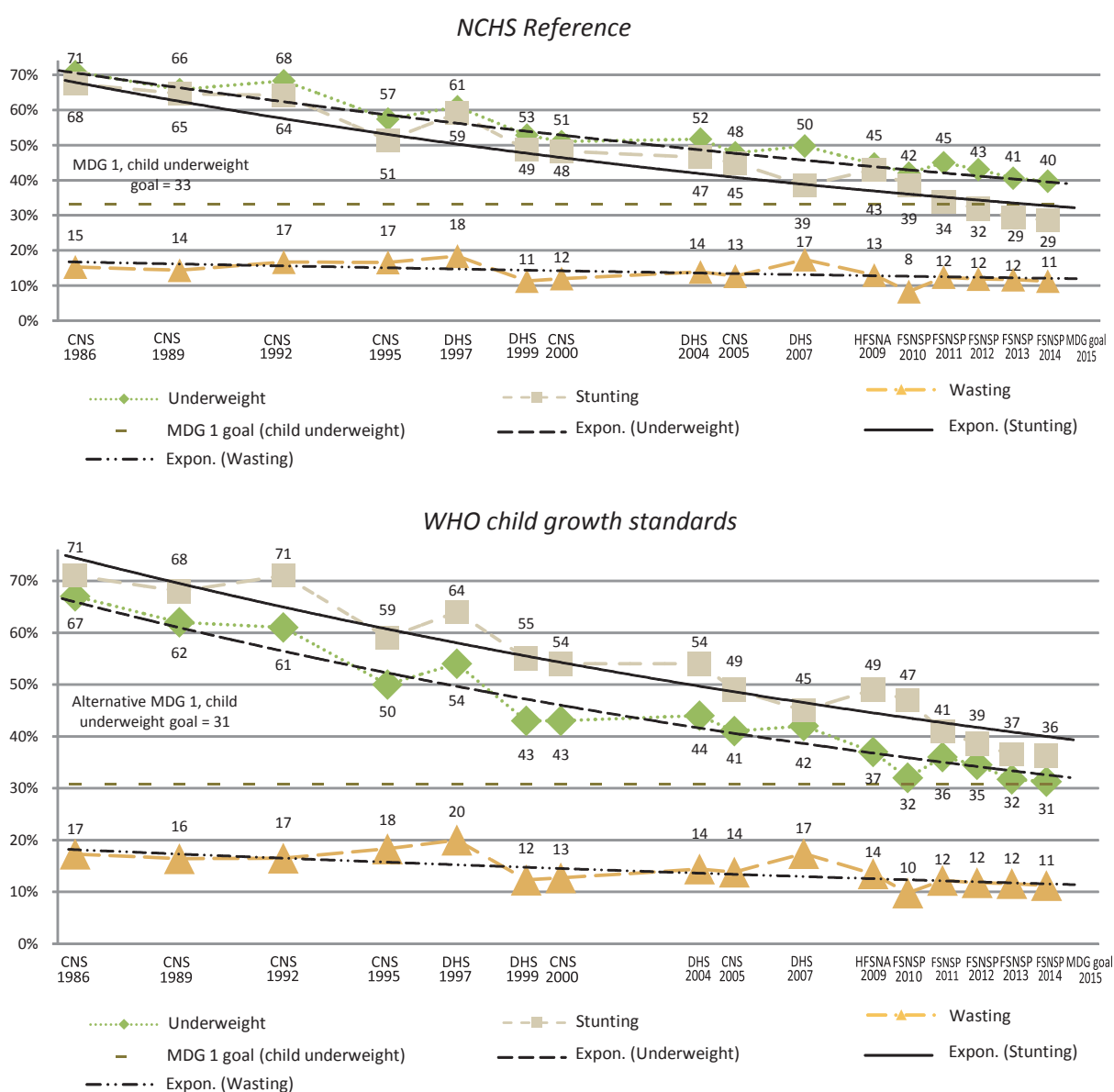
Figure 9.24: Rates of global child undernutrition (6 to 59 months)

Figure 9.25 graphs FSNP alongside past survey results in order to track Bangladesh's progress toward the MDG 1 child underweight goal - to halve rates of child underweight from 66% in 1990 to 33% by 2015 (25,26,27,28,29,30,31,32,33,34,35,36). Because of the seasonality of these estimates, care in interpretation is required. Results indicate a reduction of more than one and half percentage points per year from 2011 to 2014. In

order to reach the MDG goal, the rate of reduction would be around 7% from 2014 to 2015. Therefore, it is unlikely that Bangladesh will reach the MDG1 goal if the NCHS reference group is used. However, using WHO standards, Bangladesh met this goal a year prior to the 2015 target. This is due to the fact that the children in the NCHS reference group were overly heavy for their ages compared to the WHO reference (37).

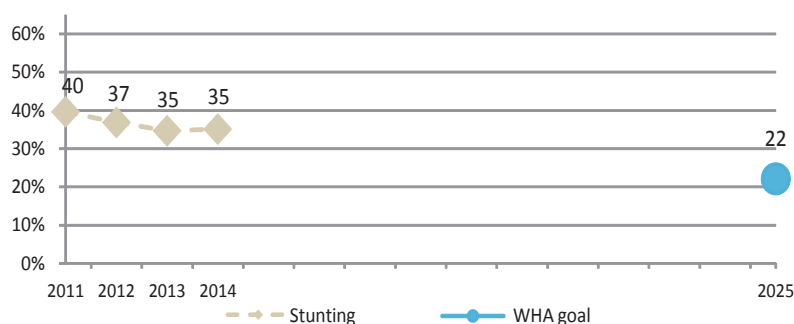
Figure 9.25: Trends in child undernutrition (6-59 months) in Bangladesh using NCHS reference and WHO child growth standards



World Health Assembly global targets

In May 2012, the Sixty-Fifth World Health Assembly endorsed the Comprehensive Implementation Plan (2012-2025) on Maternal, Infant and Young Child Nutrition, which included global targets on six nutrition indicators: stunting, anaemia, low birth weight, overweight, breastfeeding, and wasting (38). These six targets aimed at improving the nutritional status of mothers, infants and young children. More specifically, the targets are, by 2025, to reduce by 40% the number of under five children who are stunted, to achieve a 50% reduction in anaemia in women of reproductive age, to achieve a 30% reduction of the number of infants born with low birth weight, to ensure that there is no increase in the number of children who are overweight, to increase to at least 50% the rate of exclusive breastfeeding in the first six months and to reduce, and maintain childhood wasting to less than 5% (38).

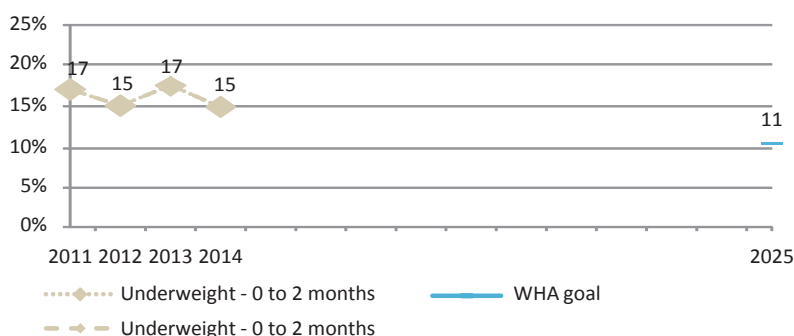
Figure 9.26 : Trends of stunting (HAZ<-2) for under five children in Bangladesh



Stunting in children was included as the first World Health Assembly global nutrition target. Stunting is also one of the key indicators recommended by both the *Countdown to 2015 for Maternal, Newborn and Child Survival* (39) and the *Commission on Information*

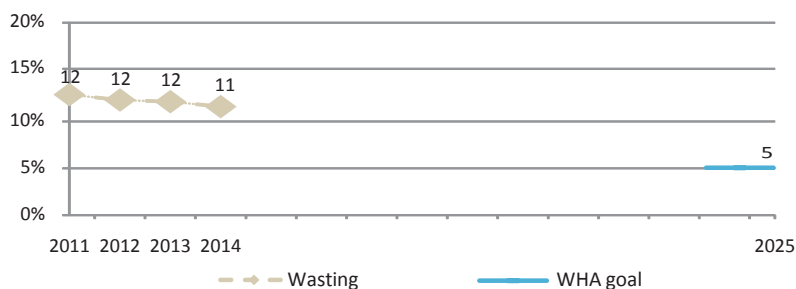
and Accountability for Women's and Children's Health (40). The specific goal is to reduce the prevalence of stunting by 40% of its 2011 level by 2025. If past years' trends continue, this goal will be met (Figure 9.26).

Figure 9.27: Trends of underweight for infants zero to 2 months of age in Bangladesh



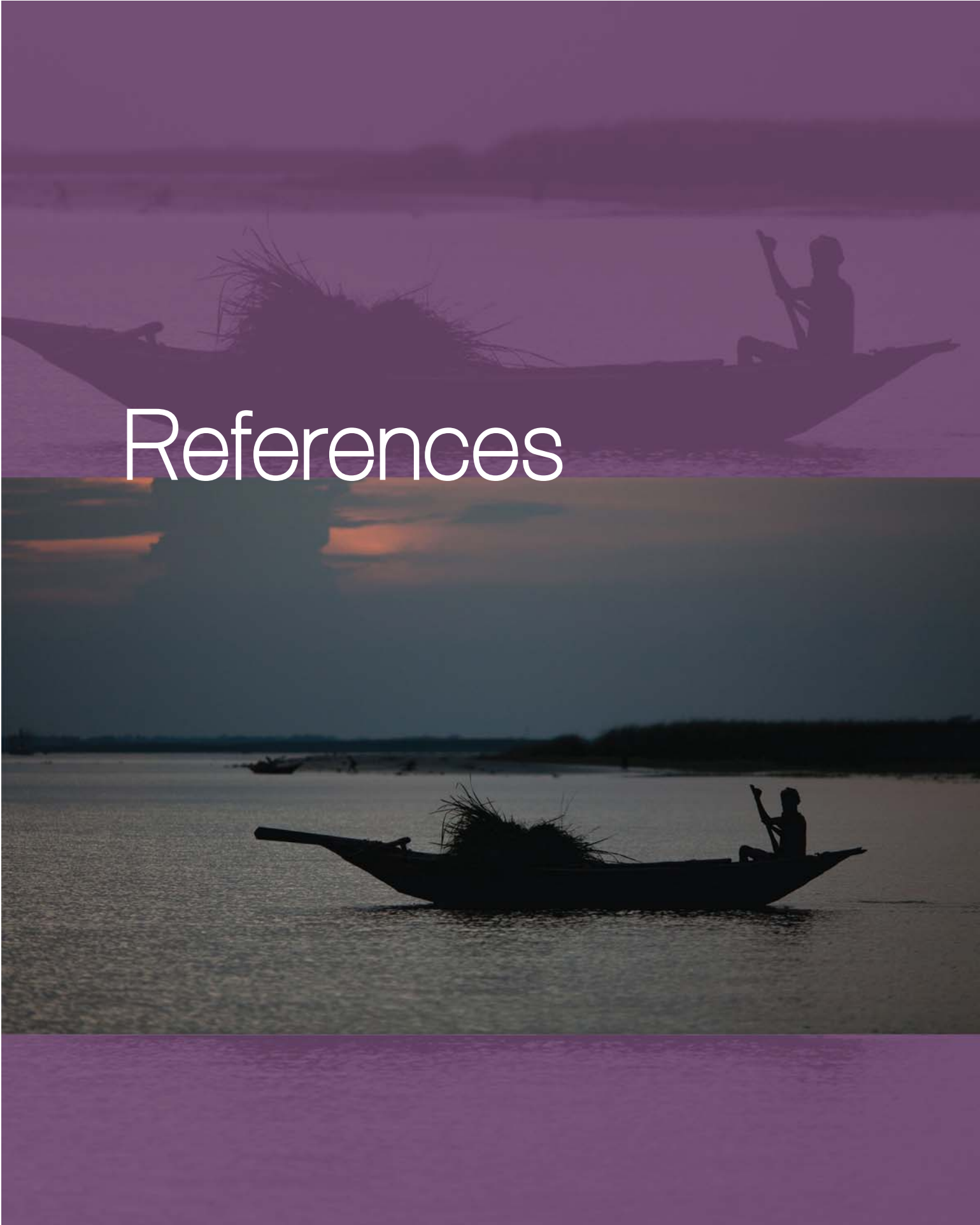
The second goal is to reduce low birth weight by 30% between 2010 and 2025. Globally, more than 20 million infants, an estimated 15 %, were born with low birth weight in 2011 (41). Though FSNP cannot track the incidence of low-birth weight directly because too few babies in Bangladesh are weighed at

birth, it can examine changes in the proportion of young infants underweight for their age. This indicator has been used as a proxy for low birth weight, but unfortunately no trend is seen (Figure 9.27).

Figure 9.28: Trends of wasting for under five children in Bangladesh

children are high in urban areas (42). If this continues, Bangladesh will reach this goal. The final nutritional status-related World Health Assembly target is to reduce and maintain childhood wasting to less than 5% by 2025. Currently, Bangladesh is very far from this goal and has had only a very small decline in wasting rates in recent years.

The fourth target is to ensure that there is no increase in the number of children who are overweight between 2010 and 2025. In recent years there has been no measureable increase in child overweight among children under five years of age in the nation as a whole (see Figure 9.23), though rates of overweight among older

The background image shows a person in a small boat on a body of water during sunset. The person is silhouetted against the bright orange and yellow sky. The boat is filled with a large pile of reeds or grass. The water is calm, and the overall scene is peaceful. The word "References" is overlaid in white text on the left side of the image.

References

References

Chapter 2: Methodology

1. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2010. Dhaka, BD;; 2011.
2. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2011. Dhaka, BD;; 2013.
3. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2012. Dhaka, BD;; 2014.
4. Helen Keller International (HKI) and James P. Grant School of Public Health (JPGSPH). State of food security and nutrition in Bangladesh: 2013. Dhaka, BD;; 2014.
5. McLaren CH, Steel DG. In search of a good rotation pattern. *Advances in Statistics, Combinatorics, and Related Areas*. 2002;; p. 309-319.
6. McLaren CH, Steel DG. Rotation patterns and trend estimation for repeated surveys using rotation group estimates. *Statistica Neerlandica*. 2001; 55(2): p. 221-238.
7. McLaren CH, Steel DG. The effect of different rotation patterns on the revisions of trend estimates. *The Journal of Official Statistics*. 2000; 16(1): p. 61-76.
8. McLaren CH, Steel DG. The impact of different rotation patterns on the sampling variance of seasonally adjusted trend estimates. *Survey Methodology*. 2000; 26(2): p. 163-172.
9. Statistics Division, Department of Economic and Social Affairs, United Nations Secretariat. *Designing household survey samples: Practical guidelines* New York, US: The United Nations; 2005.
10. Bhan MK, Norum KR. The WHO Multicentre Growth Reference Study (MGRS): Rationale, planning, and implementation. *Food and Nutrition Bulletin*. 2004; 25(Supplement 1): p. S3-S84.
11. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). *WHO child growth standards the the identification of severe acute malnutrition in infants and children*. Geneva, Switzerland;; 2009.
12. WHO Multicentre Growth Reference Study Group. *WHO Child Growth Standards based on length/height, weight and age*. Acta paediatrica (Oslo, Norway: 1992). Supplement. 2006; 450: p. 76.
13. Rutstein SO, Rojas G. *Guide to DHS statistics*. Calverton, Maryland;; 2006.
14. World Health Organization (WHO) expert consultation. *Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies*. 2004; 363.
15. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3)*. Washington, D.C.; 2007.
16. Deitchler M, Ballard T, Swindale A, Coates J. *Validation of a Measure of Household Hunger for Cross-Cultural Use*. Washington, D.C., US;; 2010.
17. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP), Institute for Public Health and Nutrition (IPHN), & United Nations' Children's Fund (UNICEF). *Bangladesh Household Food Security and Nutrition Assessment Report 2009 (HFSNA)*. New York, New York, USA & Rome, Italy;; 2009.

18. Bartlett III JE, Kotrlik JW, Higgins CC. Organizational research: Determining appropriate sample size in survey research. 2001; 19(1).
19. Cogill B. Anthropometric Indicators Measurement Guide. Washington, D.C.; 2003.
20. The Johns Hopkins University and Ahmed, S. JHSPHOPEN courseware. [Online].; 2009 [cited 2011 January 10. Available from:
<http://ocw.jhsph.edu/courses/statmethodsfor samplesurveys/PDFs/Lecture5.pdf>.

Chapter 3: Household characteristics

1. Bangladesh Bureau of Statistics (BBS). Report of the population and household census: 2011. Dhaka, BD;; 2012.
2. National Institute of Population Research and Training (NIPORT), Mitra and associates, and Macro International. Bangladesh demographic and health survey 2011. Dhaka, Bangladesh and Claverton, Maryland, USA;; 2013.
3. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2010. Dhaka, BD;; 2011.
4. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2011. Dhaka, BD;; 2013.
5. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2012. Dhaka, BD;; 2014.
6. Helen Keller International (HKI) and James P. Grant School of Public Health (JPGSPH). State of food security and nutrition in Bangladesh: 2013. Dhaka, BD;; 2014.
7. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data or tears: An application to educational enrollments in states of India. Demography. 2001; 38(1).
8. Rutstein SO, Johnson K. DHS comparative reports no. 6: The DHS wealth index. Calverton, US;; 2004.
9. Rutstein SO. The DHS Wealth Index: Approaches for Rural and Urban Areas. Calverton, US;; 2008. Report No.: 60.
10. Barajas A, Chami R, Fullenkamp C, Gapen M, Montiel P. Do Workers' Remittances Promote Economic Growth? ; July 2009..

Chapter 4: Food security

1. Food and Agriculture Organization of the United Nations (FAO). Policy brief: Food security; 2006.
2. Scrimshaw NS, SanGiovanni JP. Synergism of nutrition, infection, and immunity: An overview. The American Journal of Clinical Nutrition. 1997; 66: p. 464S-477S.
3. Government of the People's Republic of Bangladesh. Bangladesh country investment plan: A road map towards investment in agriculture, food security and nutrition. Dhaka, Bangladesh; 2011.
4. Food Planning and Monitoring Unit. National Food Policy: Plan of Action (2008-2015). Monitoring Report 2009. Dhaka; 14 December 2009.
5. Food Planning and Monitoring Unit (FPMU). National food policy plan of action and Country investment plan: Monitoring report 2012. Monitoring Report 2009. Dhaka, BD; July 2012.

6. Food Planning and Monitoring Unit (FPMU). National food policy plan of action and Country investment plan: Monitoring report 2013. Monitoring Report 2009. Dhaka, BD; June 2013.
7. Food Planning and Monitoring Unit (FPMU). National food policy plan of action and Country investment plan: Monitoring report 2014. Monitoring Report 2009. Dhaka, BD; June 2014.
8. Food Planning and Monitoring Unit (FPMU). National Food Policy Plan of Action and Country Investment Plan: Monitoring Report 2015. Dhaka, BD; June 2015.
9. Hasan MK, Chowdhury B, Akhter N. Postharvest Loss Assessment: A Study to Formulate Policy for Loss Reduction of Fruits and Vegetables and Socio-Economic Uplift of the Stakeholders, GoB-USAID-EU-FAO-NFPCSP; 2010.
10. Lock K, Pomerleau J, Causer L, MdKee M. Low fruit and vegetable consumption. In Ezzati M, Lopez AD, Rodgers AR, Murray CJL, editors. Comparative quantification of health risks: Global and regional burden of disease attributable to selected major risk factors. Geneva, CH: World Health Organization; 2004.
11. International Food Policy Research Institute (IFPRI). Out of the shadow of famine: Evolving food markets and food policy in Bangladesh Ahmed R, Haggblade S, Chowdhury Tee, editors. Baltimore, US: The Johns Hopkins University Press; 2000.
12. Hossain M, Naher F, Shahabuddin Q. Food security and nutrition in Bangladesh: Progress and determinants. e-Journal of Agricultural and Development Economics. 2005; 2(2): p. 103-132.
13. Economist Intelligence Unit. The Global Food Security Index 2012: An assessment of food affordability, availability and quality London, UK: The Economist Intelligence Unit Ltd.; 2012.
14. Bangladesh Bureau of Statistics (BBS). Report of the Household Income and Expenditure Survey: 2010. Dhaka, BD: Government of the People's Republic of Bangladesh, Planning Division, Ministry of Planning; 2012.
15. Bangladesh Bureau of Statistics (BBS). Report of the Household Income and Expenditure Survey: 2005. Dhaka, BD: Government of the People's Republic of Bangladesh, Planning Division, Ministry of Planning; 2007.
16. Government of the People's Republic of Bangladesh. Millennium Development Goal, Bangladesh Progress Report., Bangladesh Planning Commission, General Economics Division (GED); 2013.
17. Maxwell D, Caldwell R. The Coping Strategies Index (Second Edition). Washington, D.C.; 2008.
18. Deitchler M, Ballard T, Swindale A, Coates J. Validation of a Measure of Household Hunger for Cross-Cultural Use. Washington, D.C., US; 2010.
19. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.; 2007.
20. International Food Policy Research Institute (IFPRI). Validation of food frequency and dietary diversity as proxy indicators of household food security. Rome, Italy; 2008.
21. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP), Institute for Public Health and Nutrition (IPHN), & United Nations' Children's Fund (UNICEF). Bangladesh Household Food Security and Nutrition Assessment Report 2009 (HFSNA). New York, New York, USA & Rome, Italy; 2009.

22. World Food Programme (WFP). Technical guidance sheet: Food consumption analysis. Rome, IT; 2008.
23. Compton J,WS,&KS. Impact of the global food crisis on the poor: What is the evidence? London, UK; 2010.
24. Savy M,MPY,TP,EDS,&DF. Dietary diversity scores and nutritional status of women change during the seasonal food shortage in rural Burkina Faso. The Journal of Nutrition. 2006 October; 136(10).
25. The World Bank. Social safety nets in Bangladesh: An assessment. Bangladesh Development Series. Dhaka, BD; 2006.
26. Zohir S, Mallik BA, Zabeen S, Ahsan G. Strengthening social safety nets for mitigating adverse impacts of food crisis in Bangladesh. Dhaka, BD; 2010.
27. World Food Programme (WFP), Bangladesh. Bangladesh Food Security Monitoring Bulletin. 2011 Jan-March..
28. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2011. Dhaka, BD; 2013.
29. Helen Keller International and the James P. Grant School of Public Health. State of Food Security and Nutrition in Bangladesh: 2012. Dhaka, BD; 2014.

Chapter 5: Water, sanitation and hygiene

1. Pruss A, Kay D, Fewtrell L, Bartram J. Estimating the burden of disease from water, sanitation, and hygiene at a global level. Environmental Health Perspectives. 2002 May; 110(5): p. 537-542.
2. World Health Organization (WHO) and United Nations Children's Fund. Diarrhea: Why children are still dying and what can be done; 2009.
3. Goto R, Mascie-Taylor CGN, Lunn PG. Impact of intestinal permeability, inflammation status and parasitic infections on infant growth faltering in rural Bangladesh. British Journal of Nutrition. 2008.
4. General Economics Division, Bangladesh Planning Commission, Government of the Peoples Republic of Bangladesh. The Millenium Development Goals: Bangladesh Progress Report 2011. Dhaka, Bangladesh; 2012.
5. UNICEF/WHO. Joint Monitoring Programme (JMP) for Water Supply and Sanitation. [Online]. Available from: <http://www.wssinfo.org/definitions-methods/watsan-ladder/>.
6. World Health Organization (WHO). Health topics: Hygiene; 2014.
7. Maternal and Child Helath Integrated Program. [Online].; 2009 [cited 2010 June 18. Available from: http://www.mchipngo.net/controllers/link.cfc? method=tools_modules_kpc2009.
8. Luby SP, Halder AK, Huda TM. Using child health outcomes to identify effective measures of handwashing. 2011; 85(5).
9. Institute of Public Health Nutrition. Why Hand Washing Is Critical to Child Health and Nutrition in Bangladesh- How to Make it a Reality. Dhaka.
10. Ejemot-Nwadiaro RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing diarrhoea. Cochrane Database of Systematic Reviews. 2008;(1).
11. REACH. Acting at scale: Intervention summaries; 2008.

12. Rutstein SO, Rojas G. Guide to DHS statistics. Calverton, Maryland; 2006.
13. The United Nations Children's Fund (UNICEF)/World Health Organization (WHO). Diarrhoea :Why children are still dying and what can be done. Geneva, Switzerland: UNICEF & WHO; 2009.

Chapter 6: Nutrition in women and adolescent girls

1. Arimond M, Torheim LE, Weismann D, Joseph M, Carriquiry A. Dietary diversity as a measure of the micronutrient adequacy of women's diets: Results from Rural Bangladesh Site. Washington, D.C.; 2009.
2. Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide, Version 2. Washington, D.C.; 2006.
3. Rutstein SO, Rojas G. Guide to DHS statistics. Calverton, Maryland; 2006.
4. Shafique S, Akhter N, Stallkamp G, de Pee S, Panagides D, Bloem MW. Trends of under- and overweight among rural and urban poor women indicate the double burden of malnutrition in Bangladesh. *International Journal of Epidemiology*. 2007; 36(2).
5. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: Global and regional exposures and health consequences. 2008; 371(9608).
6. World Health Organization (WHO). Nutritional Landscape Information System (NLIS): Country profile indicators - Interpretation guide. Geneva, Switzerland; 2010.
7. Kennedy G, Ballard T, Dop M. Guidelines for measuring household and individual dietary diversity. Rome, IT:; Nutrition and Consumer Protection Division; 2011.
8. Razzaque MA, Khondker BH, Raihan S, editors. Poverty, intra-household distribution and gender relations in Bangladesh: Evidence and policy implications Dhaka, BD: The University Press Limited; 2011.
9. Conley D, Bennett NG. Is biology destiny? Birth weight and life chances. *American Sociological Review*. 2000 June; 65: p. 458-467.
10. de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization*. 2007; 85(9): p. 660-667.
11. Rah JH, Christian P, Shamim AA, Arju UT, Labrique AB, Rashid M. Pregnancy and lactation hinder growth and nutritional status of adolescent girls in rural Bangladesh. *The Journal of Nutrition* CITATION NOT FINISHED! 2008.
12. World Health Organization (WHO). World Health Organization (WHO). [Online].; 2011 [cited 2011 July 21. Available from: <http://www.who.int/growthref/tools/en/>.
13. World Health Organization (WHO) expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. 2004; 363.
14. World Health Organization (WHO). WHO expert committee on physical status: The use and interpretation of anthropometry. In; 1995; Geneva, Switzerland: World Health Organization (WHO).
15. Ruel MT, Deitchler M, Arimond M. Developing Simple Measures of Women's Diet Quality in Developing Countries: Overview. *The Journal of Nutrition*. ; 140(11).
16. FANTA III. Introducing the Minimum Dietary Diversity - Women (MDD-W): Global Dietary Diversity Indicator for Women. Washington, DC;; July 15-16, 2014.

Chapter 7: Maternal care and nutrition

1. World Health Organization (WHO), United Nations Children's Fund (UNICEF). Antenatal care in developing countries: promises, achievements and missed opportunities: an analysis of trends, levels and differentials, 1990-2001. Geneva, CH; 2003.
2. Hossain AHMK. Utilization of antenatal care services in Bangladesh: An analysis of levels, patterns, and trends from 1993 to 2007. *Asia-Pacific Journal of Public Health*. 2010 22: 395-406.
3. Rahman SA, Parkhurst JO, Normand C. Maternal Health Review: Bangladesh. London, UK; 2003. Report No.: HSD/WP/02/03.
4. Clifford K, Rai R, Regan L. Future pregnancy outcome in unexplained recurrent first trimester miscarriage. *Human Reproduction*. 1997; 12(2): p. 387-389.
5. Bangladesh Bureau of Statistics (BBS), UNICEF. National Low Birth Weight Survey of Bangladesh 2003-2004. Dhaka; 2005.
6. Klemm RD, Merrill RD, Wu L, Shamim AA, Ali H, Labrique A, et al. Low-birthweight rates higher among Bangladeshi neonates measured during active birth surveillance compared to national survey data. *Maternal and Child Nutrition*. 2015 October ; 11(4).
7. March of Dimes, PMNCH, Save the Children, WHO. Born Too Soon: The Global Action Report on Preterm Birth Howson CP, Kinney MV, Lawn JE, editors. Geneva, CH: World Health Organization; 2012.
8. United Nations Children's Fund (UNICEF), World Health Organization (WHO), The United Nations Educational, Scientific and Cultural Organization (UNESCO) et al. Facts for Life, Fourth Edition. New York, US; 2010.
9. Marston C. Report of a WHO Technical Consultation on Birth Spacing: Geneva, Switzerland, 13-15 June 2005. Geneva, CH; 2007.
10. World Health Organization (WHO). Standards for maternal and neonatal care: Provision of effective antenatal care. Geneva, Switzerland; 2006.
11. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 1993-1994. Dhaka, Bangladesh and Calverton, Maryland, USA; 1994.
12. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 2011. Dhaka, Bangladesh and Calverton, Maryland, USA; 2012.
13. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 2007. Dhaka, Bangladesh and Calverton, Maryland, USA; 2009.
14. World Health Organization (WHO). Antenatal care: Report of a Technical Working Group, Geneva, 31 October - 4 November 1994. [Online]. Geneva, CH: World Health Organization; 1999 [cited 2012 October 19. Available from: <https://apps.who.int/rht/documents/MSM96-8/msm968.htm>.
15. Bangladesh Bureau of Statistics (BBS) and United Nations Children's Fund (UNICEF). Child and mother nutrition survey of Bangladesh. Dhaka, Bangladesh: Government of the People's Republic of Bangladesh, Statistics Division, Ministry of Planning ; 2007.
16. Institute of Public Health Nutrition (IPHN). National Strategy for Anaemia Prevention and Control in Bangladesh. Dhaka, BD; 2007.

17. Helen Keller International. The burden of anemia in rural Bangladesh: The need for urgent action. 2006; Nutritional Surveillance Project Bulletin(16).
18. Kaufer-Horwitz M, Gómez FE. Effects and safety of preventive oral iron or iron+folic acid supplementation for women during pregnancy: RHL commentary. The WHO Reproductive Health Library. 2010 December 1.
19. Bhutta ZA, Hasan B. Periconceptional supplementation with folate and/or multivitamins for preventing neural tube defects: RHL Commentary. The WHO Reproductive Health Library. 2002.
20. United Nations High Commission for Refugees (UNHCR) & World Food Programme (WFP). Guidelines for selective feeding: The management of malnutrition in emergencies. ; 2009.
21. The Sphere Project. Sphere handbook: Humanitarian charter and minimum standards in humanitarian response Bangalore, IN: The Sphere Project; 2011.
22. PMNCH. Knowledge Summary 15: Noncommunicable Diseases. Geneva: Partnership for Maternal, Newborn, and Child Health, 2011. PMNCH. Knowledge Summary 15: Noncommunicable Diseases. Geneva, CH;; 2011.
23. Eklund M, Shaat N, Almgren P, Groop L, Berntorp K. Prediction of postpartum diabetes in women with gestational diabetes mellitus. *Diabetologia*. 2010; 53(3): p. 452-457.
24. Mullany LC, Darmstadt GL, Katz J, Khatry SK, Tielsch JM. Effect of instrument precision on estimation of low birth weight prevalence. *Journal of Perinatology*. 2005;(25): p. 11-13.
25. Gomes NC,HMA&MNT. Relationship between Antenatal-care Visit of Mothers and Birth-weight of Baby in a Rural NGO Hospital. 2003.
26. Rutstein SO, Rojas G. Guide to DHS statistics. Calverton, Maryland;; 2006.
27. World Health Organization (WHO). WHO Technical consultation on postpartum and postnatal care Matthews M, von Severin X, Jelka Z, editors. Geneva, CH; 2010.
28. Institute of Public Health Nutrition (IPHN). Micronutrient Initiative. [Online].; 2008 [cited 2011 November 17. Available from:
<http://www.micronutrient.org/CMFiles/MI%20Around%20the%20World/Asia/FINAL%20VERSION%20National%20Guidelines-VAS3.pdf>.
29. World Health Organization (WHO). Guideline: Vitamin A supplementation in postpartum women. Geneva, CH; 2011. Report No.: ISBN 978 92 4 150177 4.

Chapter 8: Childcare and feeding

1. Black RE, Victora CG, Walker SP, et a. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*. 2013 August ; 382(9890).
2. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How Many Child Deaths can we prevent this year? *The Lancet*. 2003 July; 2003(362).
3. Institute of Public Health Nutrition (IPHN). National strategy for infant and young child feeding in Bangladesh. Dhaka, BD;; 2007.
4. e-Library of Evidence for Nutrition Actions (eLENA). [Online]. [cited 2011 December 22. Available from:
http://www.who.int/elena/titles/exclusive_breastfeeding/en/index.html.
5. World Health Organization (WHO). Indicators for assessing infant and young child feeding practices. Part 1: Definitions. Geneva; 2008.

6. World Health Organization (WHO). Indicators for assessing infant and young child feeding practices. Part 2: Measurement. Geneva, Switzerland; 2010.
7. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: Global and regional exposures and health consequences. 2008; 371(9608).
8. Dewey K, Lutter C, Martines J, Daelmans B, Feeding WGCoC. Guiding principles for the complementary feeding of the breastfed child. Washington, D.C.; 2003.
9. Brown KH, Stallings RY, de Kanashiro HC, Lopez de Romaña G, Black RE. Effects of common illnesses on infants' energy intakes from breast milk and other foods during longitudinal community-based studies in Huascar (Lima), Peru. *The American Journal of Clinical Nutrition*. 1990; 52(6).
10. World Health Organization (WHO). Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva; 2009.
11. Horta BL, Bahl R, Martines JC, Victora CG. Evidence on the long-term effects of breastfeeding: Systematic reviews and meta-analyses. Geneva, CH; 2007.
12. Hanson M A GPDRCMPRG. Early life opportunities for prevention of diabetes in low and middle income countries. 2012; 12(1025).
13. Haider R, Rasheed S, Sanghvi TG, Hassan N, Pachon H, Islam S, et al. Breastfeeding in Infancy: Identifying the Program-Relevant Issues in Bangladesh. *International Breastfeeding Journal*. 2010; 5(21).
14. Chestnov O BF. worldbreastfeedingweek.org. [Online]; 2013 [cited 2013 11 7. Available from: <http://worldbreastfeedingweek.org/pdf/wbw2013-who-statement.pdf>.
15. Dewey KG, Brown K. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food and Nutrition Bulletin*. 2003; 24(2).
16. Prentice AM, Paul AA. Fat and energy needs of children in developing countries. *American Journal of Clinical Nutrition*. 2000; 72((5 Supplement)).
17. Caulfield LE, Bentley ME, Ahmed S. Is prolonged breastfeeding associated with malnutrition? Evidence from nineteen Demographic and Health Surveys. *International Journal of Epidemiology*. 1996; 25(4).
18. Habicht JP. The association between prolonged breastfeeding and poor growth- what are the implications? *Advances in Experimental Medicine and Biology*. 2002; 478: p. 195-200.
19. Marquis GS, Habicht JP, Lanata CF, Black RE, Rasmussen KM. Association of breastfeeding and stunting in Peruvian toddlers: An example of reverse causality. *International Journal of Epidemiology*. 1997; 26(2).
20. Ziegler EE, Fomon SJ, Nelson SE, Rebouche CJ, Edwards BB, Rogers RR, et al. Cow milk feeding in infancy: Further observations on blood loss from the gastrointestinal tract. *The Journal of Pediatrics*. 1990; 116(1): p. 11-18.
21. Arzu A. <http://archive.thedailystar.net/>. [Online].; 2011 [cited 2013 November 17. Available from: <http://archive.thedailystar.net/newDesign/news-details.php?nid=169720>.
22. Barker DJP. Introduction: The Window of Opportunity. *The Journal of Nutrition*. 2007; 137: p. 1058-1059.
23. World Health Organization (WHO) and United Nation's Children's Fund (UNICEF). Complementary feeding of young children in developing countries: A review of current scientific knowledge. Geneva, CH;; 1998.

24. Krebs NF. Dietary zinc and iron sources, physical growth, and cognitive development of breastfed infants. *The Journal of Nutrition*. 2000; 130(2): p. 358S-360S.
25. Dewey K, Cohen RM, Motilal L, et al. Guiding principles for feeding non-breastfed children 6-24 months of age. Washington, D.C.; 2005.
26. Allen LH, Gillespie SR. What works? A review of the efficacy and effectiveness of nutrition interventions. *The Asian Development Bank Nutrition and Development Series*. Geneva, CH and Manila, PH; 2001.
27. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP), Institute for Public Health and Nutrition (IPHN), & United Nations' Children's Fund (UNICEF). *Bangladesh Household Food Security and Nutrition Assessment Report 2009 (HFSNA)*. New York, New York, USA & Rome, Italy; 2009.
28. Helen Keller International (HKI) and the James P. Grant School of Public Health (JGSPH). *State of Food Security and Nutrition in Bangladesh: 2010*. Dhaka, BD; 2011.
29. Rutstein SO, Rojas G. *Guide to DHS statistics*. Calverton, Maryland; 2006.
30. Dalmiya N, Schultink W. Combating hidden hunger: The role of international agencies. *Food and Nutrition Bulletin*. 2003.
31. Solomons NW. Vitamin A and Carotenoids. In Bowman BA, Russell RM. *Present knowledge in nutrition*. 8th ed. Washington, US: International Life Sciences Institute; 2001.
32. Institute of Public Health Nutrition (IPHN). Micronutrient Initiative. [Online].; 2008 [cited 2011 November 17. Available from:
<http://www.micronutrient.org/CMFiles/MI%20Around%20the%20World/Asia/FINAL%20VERSION%20National%20Guidelines-VAS3.pdf>.
33. World Health Organization (WHO). *Guideline: Vitamin A supplementation in infants and children 6-59 months of age*. Geneva, CH; 2011.
34. World Health Organization (WHO). *Guideline: Vitamin A supplementation in postpartum women*. Geneva, CH; 2011.
35. London School of Hygiene and Tropical Medicine and the Partnership for Child Development at Imperial College, London. *Global Atlas of Helminth Infections (GAHI)*. [Online].; 2011 [cited 2011 November 18. Available from:
<http://www.thiswormyworld.org/Maps/bangladesh>.
36. World Health Organization (WHO) and United Nations Children's Fund (UNICEF). *How to add deworming to vitamin A distribution*. Geneva, CH; 2004.
37. e-Library of Evidence for Nutrition Actions (eLENA). [Online].; 2012 [cited 2012 December 25. Available from: http://www.who.int/elena/titles/zinc_diarrhoea/en/index.html.
38. Institute of Public Health Nutrition (IPHN). *National strategy for anemia prevention and control in Bangladesh*. Dhaka, BD; 2007.
39. Dewey K, & Motilal L. Guideline principles for feeding non-breastfed children 6-24 months of age. Washington, D.C.; 2005.
40. Dewey K, LC, MJ, DB, & FWG. *Guideline principles for the complementary feeding of the breastfed child*. Washington, D.C.; 2003.
41. Lazzerini M, & RL. Oral zinc for treating diarrhea in children. *The Cochran Collaboration*. 2008.
42. Larson CP, Saha UR, Nazrul H. Impact monitoring of the national scale-up of zinc treatment for childhood diarrhea in Bangladesh: Report of a survey. *PLoS Medicine*. 2009 November; 6.

43. Cooperative for Assistance and Relief Everywhere, Inc. (CARE). Infant and young child feeding practices - Collecting and using data: A step-by-step guide. Atlanta, US; 2010.

Chapter 9: Nutritional status of children

1. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*. 2013 August; 382(9890).
2. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet*. 2008; 371(9608).
3. Pelletier DL, Frongillo EA. Changes in child survival are strongly associated with changes in malnutrition in developing countries; 133(1).
4. Pelletier DL, Frongillo Jr. EA, Schroeder DG, Habicht JP. The effects of malnutrition on child mortality in developing countries. *Bulletin of the World Health Organisation*. 1995; 73(4): p. 443-448.
5. Rice AL, Sacco L, Hyder A, Black RE. Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries. *Bulletin of the World Health Organization*. 2000; 78: p. 1207-1221.
6. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B, et al. Child development in developing countries 1: Developmental potential in the first 5 years for children in developing countries. *The Lancet*. 2007; 369.
7. Barker DJP. Introduction: The Window of Opportunity. *The Journal of Nutrition*. 2007; 137: p. 1058-1059.
8. Gillespie S, Haddad L, Mannar V, Menon P, Nisbett N. The politics of reducing malnutrition: building commitment and accelerating progress. *The Lancet*. 2013 August ; 382(9890).
9. The WHO Multicentre Growth Reference Study (MGRS): Rationale, planning, and implementation. *Food and Nutrition Bulletin*. 2004; 25(Supplement 1): p. S3-S84.
10. World Health Organization. WHO Anthro for Personal Computers Manual. Geneva, Switzerland; 2011.
11. Lampl M, Thompson AL. Growth chart curves do not describe individual growth biology. *American Journal of Human Biology*. 2007; 19: p. 643-653.
12. Cameron N, Preece MA, Cole TJ. Catch-up Growth or Regression to the Mean? Recovery from Stunting Revisited. *American Journal of Human Biology*. 2005; 17: p. 412-417.
13. World Health Organization (WHO). Nutritional Landscape Information System (NLIS): Country profile indicators - Interpretation guide. Geneva, Switzerland; 2010.
14. Barker DJP. Fetal origins of coronary heart disease. *British Medical Journal*. 1995 July 15; 311.
15. Barker DJP. The fetal and infant origins of disease. *European Journal of Clinical Investigation*. 1995 July; 25(7): p. 457-463.
16. Barker DJP, Eriksson JG, Forsen T, Osmond C. Fetal origins of adult disease: strength of effects and biological basis. *International Journal of Epidemiology*. 2002.
17. de Onis M, Blössner M, Borghi E. Prevalence and trends of stunting among pre-school children, 1990-2020. *Public Health Nutrition*. 2011.

18. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). WHO child growth standards the the identification of severe acute malnutrition in infants and children. Geneva, Switzerland; 2009.
19. Helen Keller International. Nutritional Surveillance Project [Dataset]. Dhaka, Bangladesh; 1998-2006.
20. Helen Keller International (HKI) and the James P. Grant School of Public Health (JPGSPH). State of Food Security and Nutrition in Bangladesh: 2010. Dhaka, BD; 2011.
21. Briend A. Prevention and treatment of moderate acute malnutrition forum. [Online].; 2009 [cited 2012 April 19. Available from: <http://www.en-net.org.uk/question/157.aspx>.
22. Hulme D. The Millennium Development Goals (MDGs): A short history of the world's biggest promise. Manchester, UK;; 2009. Report No.: ISBN : 978-1-906518-58-5.
23. Development Assistance Committee (DAC). Shaping the 21st century: The contribution of development co-operation. Paris; 1996.
24. de Onis M, Onyango AW, Borghi E, Garza C, Hong Y, Group WMGRS. Comparison of the World Health Organization (WHO) Child Growth Standards and the National Center for Health Statistics/WHO international growth reference: Implications for child health programmes. Public Health Nutrition. 2006; 7(9): p. 942-947.
25. Bangladesh Bureau of Statistics (BBS). Child Nutrition Survey: 1985-1986. Dhaka, BD; 1987.
26. Bangladesh Bureau of Statistics (BBS). Child Nutrition Survey: 1989-1990. Dhaka, BD; 1990.
27. Bangladesh Bureau of Statistics (BBS). Child Nutrition Survey: 1992. Dhaka, BD; 1993.
28. Bangladesh Bureau of Statistics (BBS). Child Nutrition Survey: 1995-1996. Dhaka, BD; 1997.
29. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 1996-1997. Dhaka, Bangladesh and Calverton, Maryland; 1997.
30. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 1999-2000. Dhaka, Bangladesh and Calverton, Maryland, USA; 2001.
31. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 2004. Dhaka, Bangladesh and Calverton, Maryland, USA;; 2005.
32. Bangladesh Bureau of Statistics (BBS) & United Nation's Children's Fund (UNICEF). Child and Mother Nutrition Survey of Bangladesh. Dhaka, Bangladesh: Governemtn of the People's Republic of Bangladesh, Statistics Division, Ministry of Planning; 2007b.
33. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. Bangladesh Demographic and Health Survey 2007. Dhaka, Bangladesh and Calverton, Maryland, USA; 2009.
34. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP), Institute for Public Health and Nutiriton (IPHN), & United Nations' Children's Fund (UNICEF). Bangladesh Household Food Security and Nutrition Assessment Report 2009 (HFSNA). New York, New York, USA & Rome, Italy; 2009.
35. Bangladesh Bureau of Statistics (BBS). Child and Mother Nutrition Survey: 2000. Dhaka, BD; 2001.

36. Yang H, de Onis M. Algorithms for converting estimates of child malnutrition based on the NCHS reference into estimates based on the WHO Child Growth Standards. *BCM Pediatrics*. 2008; 8(19).
37. WHO Multicentre Growth Reference Study Group (MGRS). Rationale, planning, and implementation. *Food and Nutrition Bulletin*. 2004; 25 (Supplement 1)(S3-S84).
38. World Health Organization (WHO). *Maternal, infant and young child nutrition*. Geneva, Switzerland; 2012.
39. World Health Organization (WHO). *Countdown to 2015 Decade Report (2000-2010): Taking Stock of Maternal, Newborn and Child Survival*. Geneva, Switzerland; 2010.
40. World Health Organization (WHO). *Keeping Promises, Measuring Results: Commission on Information and Accountability for Women's and Children's Health*. Geneva, Switzerland; 2011.
41. United Nations Children's Fund (UNICEF). *Improving Child Nutrition: The achievable imperative for global progress*; April, 2013.
42. ICDDR,B. Press Release: New icddr,b study reveals that 14 out of every 100 children living in an urban area in Bangladesh are overweight. Dhaka, Bangladesh; 2013.
43. de Onis M, Lobstein T. Defining obesity risk status in the general childhood population: Which cut-offs should we use? *International Journal of Pediatric Obesity*. 2010; 5: p. 458-460.

Appendix A: Composition of surveillance zones

Table A.1 : Upazila in agro-ecological zones

Zone	Upazila (organised by district)
Coastal belt	Bagerhat (Bagerhat Sadar, Kachua, Mongla, Morrelganj, Rampal, Sarankhola); Barguna (All 5 upazilas); Barisal (Babuganj, Bakerganj, Banaripara, Barisal Sadar, Hizla, Mehendiganj, Muladi); Bhola (All 7 upazilas); Chandpur (Haimchar); Chittagong (Sandwip); Feni (Sonagazi); Jhalakhati (All 4 upazilas); Khulna (Batiaghata, Dacope, Dumuria, Koyra, Paikgachha); Lakshmipur (Kamalnagar, Lakshmipur Sadar, Ramgati, Roypur); Noakhali (Companiganj, Hatiya, Kabirhat, Noakhali Sadar, Subarnachar); Patuakhali (All 8 upazilas); Pirojpur (All 7 upazilas); Satkhira (Assasuni, Debhata, Kaliganj, Satkhira Sadar, Shyamnagar, Tala)
Eastern hills	Bandarban (All 7 upazilas); Chittagong (Banshkali, Chandanaish, Fatikchhari, Lohagara, Mirsharai, Rangunia, Satkania); Cox's Bazar (Chakaria, Cox's Bazar Sadar, Maheshkhali, Pekua, Ramu, Teknaf, Ukhia); Khagrachhari (All 8 upazilas); Rangamati (All 10 upazila)
Haor	Brahmanbaria (Bijoynagar, Nasirnagar, Sarail); Habiganj (Ajmiriganj, Bahubal, Baniachong, Habiganj Sadar, Lakhai, Madhabpur, Nabiganj); Kishoreganj (Austagram, Bajitpur, Hossainpur, Itna, Karimganj, Katiadi, Kishoreganj Sadar, Kuliar Char, Mithamain, Nikli, Tarail); Maulvibazar (Maulvibazar Sadar, Rajnagar); Netrokona (Atpara, Barhatta, Durgapur, Kalmakanda, Kendua, Khaliajuri, Madan, Mohanganj); Sunamganj (All 11 upazilas); Sylhet (Balaganj, Bishwanath, Companiganj, Gowainghat, Sylhet Sadar)
Padma chars	Chandpur (Chandpur Sadar, Matlab Dakshin); Chapai Nawabgonj (Chapai Nawabganj Sadar, Shibganj); Dhaka (Dohar, Nawabganj); Faridpur (Char Bhadrasan, Faridpur Sadar, Nagarkanda, Sadarpur); Kushtia (All 6 upazilas); Madaripur (Shib Char); Manikgonj (Harirampur, Shibhalaya); Munshigonj (Lohajang, Munshiganj Sadar, Sreenagar, Tongibari); Natore (Lalpur); Pabna (Ishwardi, Pabna Sadar, Sujanagar); Rajbari (All 4 upazilas); Rajshahi (Bagha, Charchat, Godagari); Shariatpur (Bhedarganj, Damudya, Gosairhat, Naria, Zanjira)
Northern chars	Bogra (Dhurat, Sariakandi, Sonatola); Gaibandha (Fulchari, Gaibandha Sadar, Saghatta, Sundarganj); Jamalpur (Bakshiganj, Dewanganj, Islampur, Madarganj, Melandaha, Sarishabari); Kurigram (All 9 upazilas); Lalmonirhat (All 5 upazilas); Manikgonj (Daulatpur); Nilphamari (Dimla, Jaldhaka, Kishoreganj); Pabna (Bera); Rangpur (Gangachara, Kaunia, Pirgachha); Sirajganj (Belkuchi, Chauhali, Kazipur, Shahjadpur, Sirajganj Sadar); Tangail (Bhuapur, Delduar, Gopalpur, Kalihati, Nagarpur, Tangail Sadar)
Northwest	Bogra (Adamdighi, Bogra Sadar, Dhupchanchia, Gabtali, Kahaloo, Nandigram, Shajahanpur, Sherpur, Shibganj); Chapai Nawabgonj (Bholahat, Gomastapur, Nachole); Dinajpur (Biral, Birampur, Birganj, Chirirbandar, Dinajpur Sadar, Fulbari, Ghoraghat, Hakimpur, Kaharole, Khansama, Nowabganj, Parbatipur); Gaibandha (Gobindaganj, Palashbari, Sadullapur); Joypurhat (All 5 upazilas); Naogaon (All 11 upazilas); Nilphamari (Domar, Nilphamari Sadar, Saidpur); Panchagarh (Boda, Debiganj); Rajshahi (Baghmara, Durgapur, Mohanpur, Tanore); Rangpur (Badarganj, Mitha Pukur, Pirganj, Rangpur Sadar, Taraganj)

Appendix B: Wealth Index construction

In 2012, FSNSP began using the updated methodology the DHS System has used since 2010 to construct the wealth index (1).¹ The DHS System method requires dividing households' assets and facilities into urban and rural areas before constructing separate wealth indexes for each area and then combining these location specific indexes with and index based on nationally relevant indicators. The overarching methodology for wealth index construction is available in the 2008 report, *The DHS Wealth Index: Approaches for Rural and Urban Areas*, but this document lacks specific guidelines on how to assign assets to urban or rural areas (1). Analysts at FSNSP used the guidance given in this report to construct the specific guidelines described below.

FSNSP determined to which setting assets and facilities were applicable by examining the distribution of assets across localities. As Bangladesh has two categories of urban areas, municipalities and city corporations, and these two are quite different from one another in the types of assets owned, FSNSP assigned assets and facilities to four categories: national, rural, municipality, and City Corporation. Assets which were available in all areas were assigned to the national category, while assets which were only available in one or more of the rural or urban localities were assigned to that area. Table B. 1 provides a listing of index assets and household facilities, and assigns those as appropriate to these four categories. From these groups of assets, separate indexes were created for urban, rural and municipalities; a national model was then composited from all the three indexes.

Table B.1: Assets and household facilities used in the construction of the wealth index

Item		National	Rural	Municipality	City Corporation
Floor material	Earth/sand				
	Ceramic tiles/Mosaic				
	Cement/Bricks/Stone (omitted)				
	Wood planks/Palm/Bamboo				
Wall material	Cement/Bricks/Stone with lime/cement				
	Cane/palm/trunks				
	Bamboo with mud				
	Wood planks/shingles				
	Tin (omitted)				
	Dirt				
Roof material	Cement/bricks/stone with lime/cement				
	Tin (omitted)				
	Thatch/palm				
House characteristics	Electricity				
	Only one room in the house				
	House constructed of permanent materials				
	Number of rooms per household member				

¹ In 2010 and 2011, FSNSP used same methodology as the DHS system had from 1998 to 2009(2).

Latrine type	Household piped sewer system				
	Shared piped sewer system				
	Shared ring with water seal				
	Shared ring without water seal				
	Household ring with water seal				
	Household ring without water seal				
	Household pit latrine with slab				
	Household pit latrine without slab				
	Shared pit latrine with slab				
	Shared pit latrine without slab				
	Hanging				
	No facility				
	Septic toilet- share				
	Septic toilet- own (omitted)				
Water source	Piped to dwelling				
	Piped to yard/plot				
	Public tap				
	Household tube well				
	Shared tube well (omitted)				
	Dug well (protected/unprotected)				
	Surface water				
Fuel source	Liquefied petroleum gas tank (LPG)				
	Piped natural gas				
	Wood/Straw/grass/dung (omitted)				
Assets	Plough				
	Solar panel				
	Country boat				
	Power tiller				
	Shallow machine				
	Fishing net				
	Car/truck				
	UPS/Generator				
	Radio/TV				
	Telephone/mobile Phone				
	Fan				
	Bed				
	Cabinet				
	Refrigerator				
	Table/chair				
	Watch/clock				
	Bicycle				
	Motorcycle/scooter/tempo				
	Rickshaw/van				
Land ownership	Homestead land				
	Agricultural land				
	Total decimals of land owned				
Livestock	Any livestock owned				
	Large ruminants (cow/buffalo)				
	Small ruminants (sheep/goat/pig)				
	Poultry (chicken/duck/geese)				
	Small game (rabbits/pigeons)				

Appendix C: Additional figures and tables

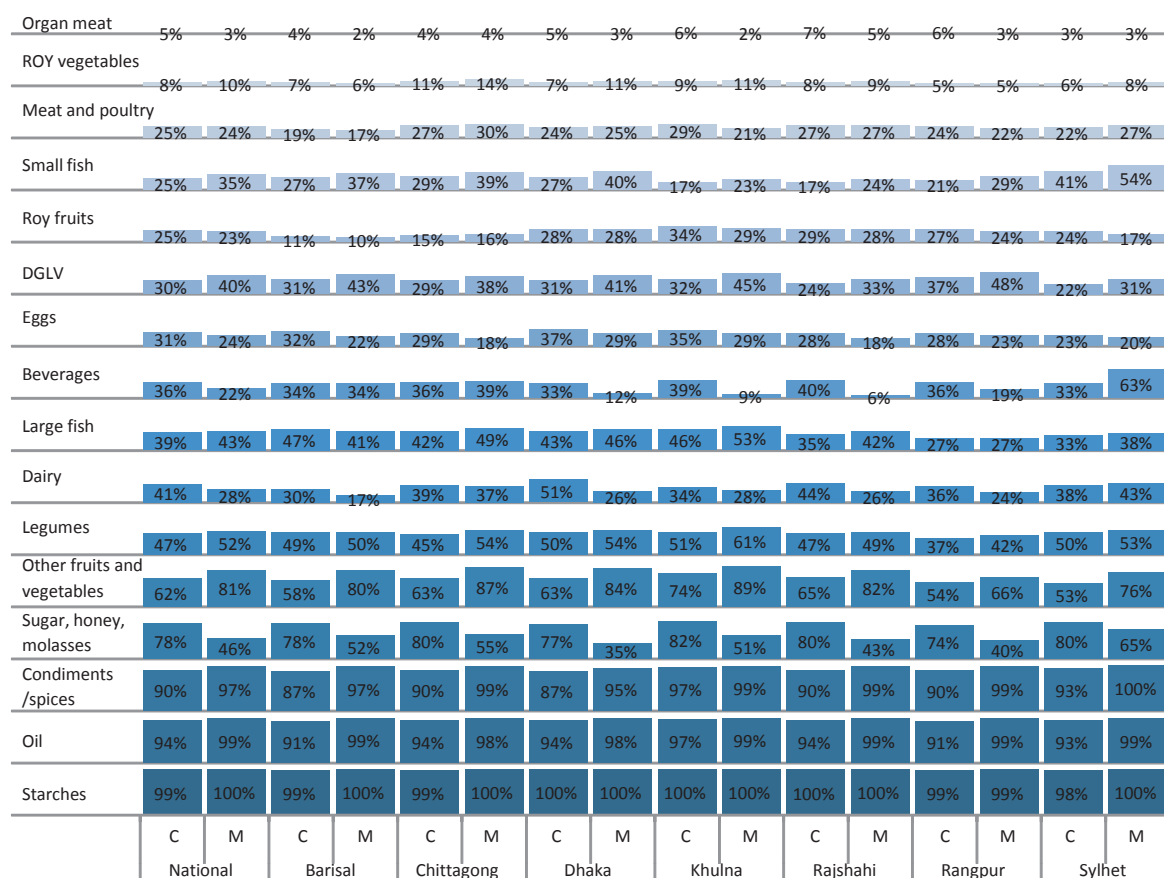
Table 1: Households received cash from any social safety net programme

Types of social safety net programme	Proportion
Cash for education	26%
Old age allowances	4%
Vulnerable group development	2%
Widow allowances	2%
Vulnerable group feeding	1%
None	65%

Figure 1: Divisional variation in dietary patterns among women aged 10 to 49 years



Figure 2: Proportion of mothers and children (24 to 59 months of age) consuming food types by division



C=Child M=Mother

Implemented by:



James P. Grant School of Public Health (JPGSPH): The James P. Grant School of Public Health is an international educational and research institution established within BRAC University in 2004. The School focuses on education, health promotion, and research. Aside from its flagship educational programme, the Master of Public Health, JPGSPH also provides public health courses and specialised trainings through Continuing Education. The School has an extensive research portfolio and provides health promotion services through advocacy workshops and seminars.



Helen Keller International (HKI): Helen Keller International is a technical assistance agency that emphasizes building the technical and operational capacities of local government and non-governmental partners. In the past two decades, HKI has successfully designed, implemented, monitored, and evaluated more than 40 community-based, health and nutrition projects in 22 countries. During its 30 years of working in Bangladesh, HKI has provided technical leadership in nutritional surveillance, homestead food production, vitamin-A supplementation, and nutrition behaviour change education.



Bangladesh Bureau of Statistics (BBS): The Bangladesh Bureau of Statistics is the national statistical organization of Bangladesh. BBS collects, compiles, analyzes and publishes official statistics on all sectors of the economy to meet the needs of development planning, research, and policy. BBS flagship publications include the Population, Agriculture, and Economic Censuses. Additionally, BBS's portfolio includes the Household Income & Expenditure Survey, Sample Vital Registration System, Multiple Indicator Cluster Survey, Labour Force Survey, and the Child and Mother Nutrition Survey.

