State of Food Security & Nutrition in Bangladesh 2011

fsnSp
FOOD SECURITY NUTRITIONAL SURVEILLANCE PROJECT

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FOOD SECURITY NUTRITIONAL SURVEILLANCE PROJECT

FOOD SECURITY NUTRITIONAL SURVEILLANCE PROJECT (FSNSP)

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Foreword

Md. Humayun Kabir, Senior Secretary, Ministry of Health & Family Welfare, Government of the People's Republic of Bangladesh

The Ministry of Health & Family Welfare seeks to create conditions whereby the people of Bangladesh have the opportunity to reach and maintain the highest attainable level of health. Accomplishing this goal requires timely and reliable information of the health and nutrition status of the population. FSNSP, paired with other data sources supported by the Government of Bangladesh fills this need. The results of this surveillance system will aid the Ministry to improve the health of the whole nation. As part of the approved Health Population and Nutrition Sector Development Program (HPNSDP), the Ministry of Health and Family Welfare looks forward to taking an active role in the future surveillance in this country through the National Nutrition Service.

Mushfeka Ikfat, Secretary in Charge, Ministry of Food, Government of the People's Republic of Bangladesh

The Ministry of Food recognises the value of reliable and timely food security and nutrition data in order to implement policy and programmes that ensure an adequate diet for all. The Food Security Nutrition Surveillance Project (FSNSP) has been and will be a vital source of information on these topics. Since implementation, the data collected by FSNSP has been utilised in the FPMU Food Situation Reports and to assist in monitoring our nation's progress towards the goals laid out in the Country Investment Plan. In the coming years, I hope that FSNSP data will be made more available to policy makers and food security analysts through common electronic networks and targeted policy briefs.

William Hanna, Ambassador, Head of Delegation of the European Union to Bangladesh

The European Union, a development partner of Bangladesh since 1973 with a delegation to the country since 1982, is currently Bangladesh's largest export market and one of the largest and most reliable donors of aid. The relationship between the European Union and Bangladesh has grown from one primarily concerned with emergency humanitarian assistance to a focus on long term national goals and sustainable development. FSNSP typifies this transition as it fosters local knowledge. The information gained through this system will enable the creation of more effective policies and programmes through partnership between local and international institutions and the government. We welcome the release of the second year of surveillance findings, and we look forward to this new knowledge being incorporated into government and civil society planning.

Executive Summary

The Food Security and Nutrition Surveillance Project (FSNSP) is the only source of seasonal, nationally representative estimates of food security and nutrition in Bangladesh. Using state-of-the-art methods and indicators, the FSNSP system provides up-to-date information on the food security and nutrition of women and children to support the design, implementation, and evaluation of national strategies and assess progress towards development targets. In 2011, FSNSP surveyed over 26,000 households and 15,000 children.

The methods used in FSNSP's surveillance system improved between 2010 and 2011. In 2011, FSNSP provided seasonal estimates for the country as a whole and from six surveillance zones which were delineated jointly by staff from multiple organisations. The sampling system and indicator list has been expanded and now provides representative information about pregnant women, non-pregnant women, adolescent girls, and households with and without children. During 2011, rates of food insecurity and malnutrition were higher in the surveillance zones than in the rest of the country, indicating that FSNSP has correctly selected more vulnerable areas for seasonal surveillance while maintaining a nationally representative system.

Food security

In 2011, FSNSP's food security indicators include measures of availability, access, intra-household utilisation, and vulnerability. After a sharp rise in the price of rice in 2010, rice prices stabilised in early 2011 and slowly declined over the year. Though the cost of rice declined, the cost of an average Bangladeshi diet increased slightly but significantly over the year as the result of small price increases for other staple foods. Additionally, the daily wage rate for both male and female labourers increased slightly but significantly. This resulted in a constant wage to food costs ratio over the year for daily wage labourers. However, as expected due to the food price shock in 2010, and the fact that perceptions and behaviours related to food tend to be based on recent events (rather than future projections), households reported resorting to behaviours linked to food insecurity in a much greater proportion in 2011 than they did in 2010. Notably, nearly half of households with children reported that one or more members had to eat a smaller meal than they desired due to a lack of food and that food in the household ran out at least once in the month before the interview. However, the proportion of households which reported resorting to severe behaviours such as going day and night without eating or even skipping meal, did not increase between the two years. Moreover, the proportion of households practicing these coping behaviours has fallen dramatically in early 2012.

A review of composite indexes of food insecurity (HFIAS) and household food deficits (FDS) showed that the increase in food insecurity observed between January to April 2010 and February to March 2011 likely occurred between the January to April 2010 and June to August 2010 periods with little change in these indicators during 2011. However, preliminary results show a decrease in these indicators in 2012. Rates of food insecurity and food deficit showed much less seasonality in 2011 than in 2010, but were much greater in rural areas than in urban areas. In contrast to these increased perceptions of food insecurity, longer term trends in household food consumption patterns showed an increasing diversity of diet. The proportion of households with poor or borderline food consumption patterns, based on the food consumption score (FCS) methodology, decreased from one-quarter in 2009 to less than one-fifth in 2011. However, this reduction was inconsistent across areas of the country, with little or no change in Barisal, Rajshahi, and Rangpur.

Within households, in times of food scarcity, women and girls were found to reduce consumption at a much higher rate than men and boys. When only one person was required to reduce consumption in the household, this individual was almost always an adult woman. When two people reduced consumption, male adults and female adolescents also sacrificed. Notably, when three or more members had to sacrifice, female children less than ten years of age also sacrificed in a much greater proportion than their male counterparts.

Nutrition of women and adolescent girls

In 2011, FSNSP interviewed and measured 27,073 women and girls aged 10 to 49 years throughout Bangladesh, supplying the first ever nationally representative estimates of these populations. Women provide a window into the nutritional status of the larger household, as women and girls are usually the first to feel the effects of food shortages. Dietary patterns did not differ much between women/adolescent girls and mothers of children under five years of age. In 2011, dietary diversity increased during the monsoon months, similar to the pattern observed in 2010. Strikingly, the consumption of flesh foods and sugar appears to have increased between 2010 and 2011, and the consumption of vitamin-rich vegetables has fallen. In line with 2010 findings, around 60% of women consumed diets inadequate in micro- and macronutrients. This varied greatly over household wealth quintiles and food security indicators. Of women in the wealthiest quintile, 36% consumed inadequate diets compared to over two-thirds of women in the poorest three quintiles. In households with poor or borderline food consumption practices, 90% of women consumed an inadequate diet the day before the interview.

There were also considerable levels of chronic and acute under nutrition in Bangladesh. Nationally, 32% of adolescent girls were short for their ages and there was little difference between urban and rural areas. Additionally, over 10% of adult women were at increased risk during delivery due to short stature. Similarly, 12% of adolescent girls had a moderately or severely low BMI for their age, and nearly one quarter of women were chronically energy deficient (CED), indicating a medium severity public health problem. There was little variation in the proportion of women and girls who are short across regions of the country or household characteristics but much more variation when body mass based indicators were used. Over one-third of the women in Sylhet were CED and 18% of the girls in Khulna were underweight. Only 8% of women from the wealthiest households were CED, in comparison to 32% of women from households in the least wealthy quintile. The proportion of thin women was highest among those aged 19 to 22 years, stabilising to around 20% after 23 years of age. Women from households facing food insecurity and women with limited dietary diversity were CED in higher proportion than women from food secure households and those eating more diverse diets. These relationships did not hold for adolescents.

Women's overweight is a growing problem; nationally in 2011, more adult women were overweight than CED. Nearly half of urban adult women were overweight and the proportion of women overweight increases as wealth increases. Among adult women, overweight slowly increased with age, peaking between 30 and 40 years. This trend towards overweight is not yet seen in the adolescent population but this is partially due to the way the adolescent measure is designed (see page 84).

Maternal care and nutrition

Women's health and nutrition is also important due to its impact on child health outcomes. Indicators of maternal care and nutrition show progress and highlight remaining gaps. In 2011, too many girls had children too early. Due to the early age of marriage, over half of first pregnancies occurred among adolescent girls (18 years of age and younger), despite Bangladesh's low fertility rate. While there was a dramatic increase in antenatal care (ANC) coverage from 1993-2011, only a quarter of pregnant women obtained at least four ANC visits in 2011. Moreover, only 12% received ANC in line with the guidelines provided by the World Health Organization's Technical Working Group on Antenatal Care (at least four ANC check-ups from a medically trained provider with at least one visit in the first trimester). Well over a third of women reported never taking iron folic acid (IFA) during their pregnancy, and only one in three pregnant women reported taking IFA daily in the week before the interview. Additionally, IFA supplementation was extremely low during the first trimester (12% daily and 16% in the last week), although this is the period during which folic acid helps to prevent neural tube defects.

Additionally, diets remained extremely poor even during pregnancy. Dietary diversity was similarly low among pregnant and non-pregnant women, and three out of four women reported that food consumption during the third trimester was the same as or less than before the pregnancy. As a result, one in four pregnant women was so thin that their foetuses faced a moderate risk of growth retardation. Shockingly, pregnant women were thinner on average than non-pregnant women when mid-upper arm circumference (MUAC) was used as the measure.

Child feeding and care

Child feeding and care are important proximate determinants of child nutritional status. The overall pattern of child feeding practices was similar between 2010 and 2011. There were no significant changes in early breastfeeding behaviours; a slight majority of newborn children continued to be fed prelacteal foods (51%) and only a minority were breastfed within the first hour of life (42%). The overall rate of exclusive breastfeeding did not increase and currently stands at 51%, which ranged from 79% among zero to one month old infants to 33% for infants of four or five months of age. The rate of continued breastfeeding at one year of age remained constant at 95% but the rate of breastfeeding continuation at two years of age fell sharply from 92% in 2010 to 86% in 2011 (at 20 to 23 months). Because this reduction is unprecedented, it is unclear if this change is reflective of changed breastfeeding habits or just random variation between years. There was no change in the overall proportion of children being fed with bottles (16%) or fed breast milk substitutes (28%).

Complementary feeding indicators also changed little between 2010 and 2011. While 88% of children six to eight months of age were fed complementary foods, only a small minority of them (13%) were fed diets diverse enough to provide adequate micronutrients. Moreover, just under half of children were fed too early, with 45% eating solid foods during the fifth month of life. Poor diets were not limited to the youngest cohort of complementary fed infants. Overall, among children six to twenty-three months of age, only 37% met minimum dietary diversity targets and this proportion has changed little since 2008. In contrast, the proportion of children eating iron rich foods has increased since 2008 but remained at the same level as was observed in 2010 (41%). The proportion of children eating with minimum meal frequency has improved dramatically since 2008, from 52%

to 83%. However, improvements in minimum adequate diet have been much smaller, from one-fifth to one-third. The eating patterns for older children also reflect slightly less diverse diets for children than for mothers.

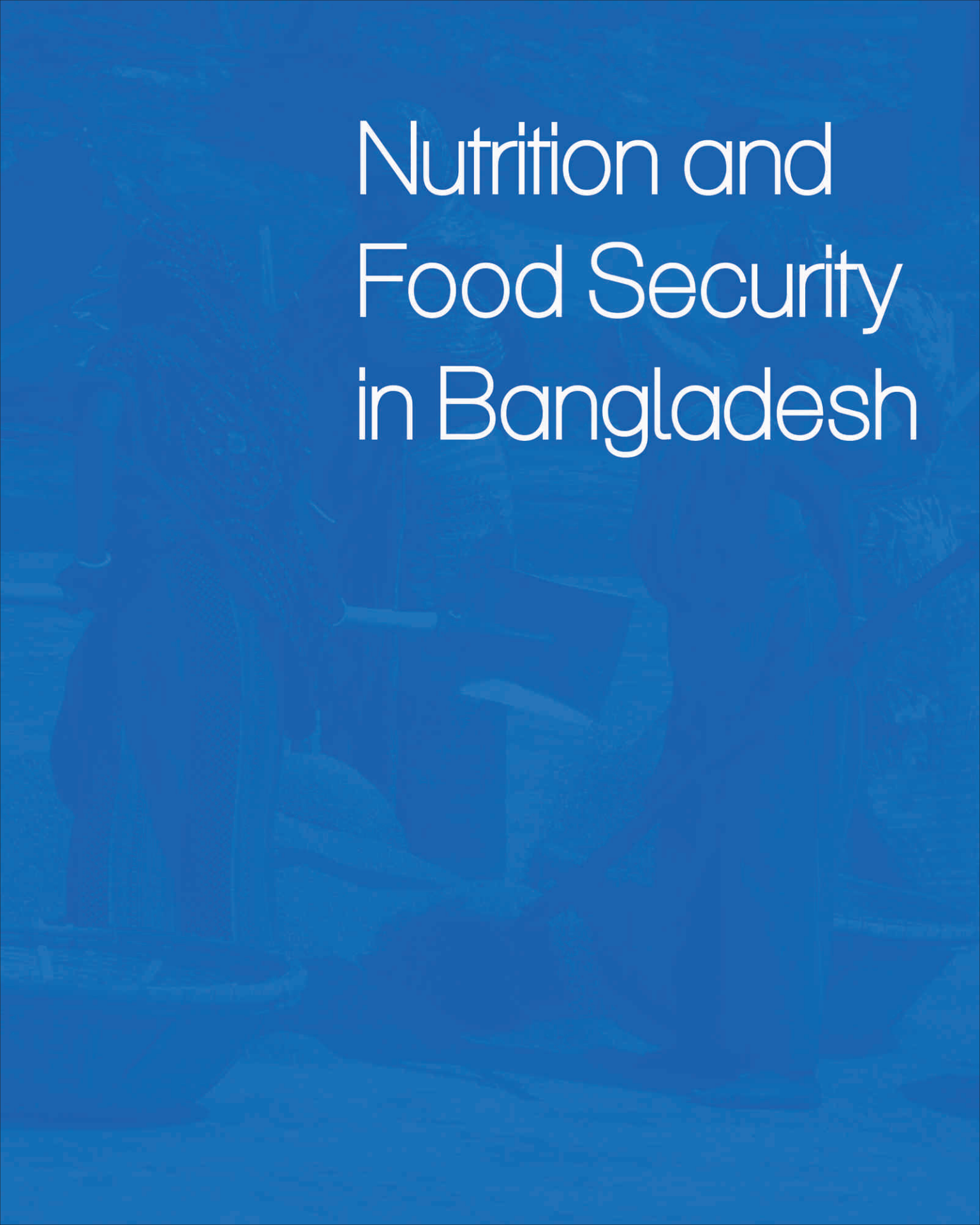
FSNSP also tracks indicators of child illness and preventative and recuperative care. The coverage of the Government of Bangladesh's vitamin A capsule (VAC) programme appeared to reduce in 2011 due to both a long gap between the National Vitamin A Campaign (NVAC) event of 2011 and the National Immunisation Day (NID) of 2012 and a lower coverage rate of the two events in 2011. During the year as a whole, 76% of children one to five years of age had received VAC in the six months prior to the interview, while the coverage rates of VAC among children six to fifty-nine months of age on the day of distribution was 85% on NID and 80% on NVAC day. These rates are lower than the HPNSDP target of 90% by 2016 and the coverage rates of over 90%, which were recorded from 2005 to 2010. The coverage of anti-helminthes was similar, with 77% of children 24 to 59 months of age receiving a de-worming tablet in the six months before the interview. The proportion of children ill with diarrhoea and fever was largely the same between 2010 and 2011, however, the proportion of children sick with acute respiratory infection (ARI) reduced sharply from 7% in 2010 to 3% in 2011.

Nutritional status of children

In 2011, FSNSP measured over 15,000 children aged zero to fifty-nine months throughout Bangladesh. In line with other recent estimates, the prevalence of stunting (chronic child malnutrition) was 40%, impacting over 6 million children under the age of five. While stunting has been declining twice as fast in Bangladesh as in the rest of the world, the rate remains near the cut-off for “very high prevalence.” Additionally, in Rangpur, Barisal and particularly Sylhet, stunting levels were even higher. Annually, 12% of children were wasted which suggests that approximately 4.8 million children suffered from acute malnutrition at some point during 2011.

Bangladesh remains off target for the MGD 1 goal of reducing children underweight; the historical rate of reduction of one percentage point a year will have to double to slightly over two percentage points a year between 2011 and 2015 in order to reach this goal. Increased action is urgently required, and FSNSP findings serve to justify focused investments in interventions that will impact areas of care and regions of the country that are lagging behind. For example, more attention needs to be given to supporting mothers during pregnancy and their child's infancy. Regionally, increased focus must be given to Sylhet, which is lagging behind in most indicators of child, maternal, and women's well-being. In addition, special efforts are needed to address the large seasonal spikes in wasting, which occur in the Northwest every year.

Nutrition and Food Security in Bangladesh



In Bangladesh, national government, civil society and development partners have increasingly recognised nutrition and food security as key components of national progress. As a result, the country has seen new and scaled-up investments in stand-alone nutrition programmes as well as integration of food utilisation and food production/access components in other development projects and programmes. Strategies to improve nutrition and food security encompass national efforts as well as international initiatives, which call on the leadership of national government and civil society to plan, implement, and evaluate.

These investments and commitments require strong monitoring and evaluation to ensure available resources yield optimal returns in terms of impact on human development. Food security and nutrition surveillance assists in targeting resources to the areas and interventions where they will have the greatest impact. It also enables planners and policy makers to track outcomes and progress resulting from these investments, mobilise additional resources, and assess the country's overall progress towards MDG 1 – the eradication of extreme poverty and hunger. Ongoing surveillance is a critical complement to larger, less frequent surveys (such as the Bangladesh Demographic and Health Survey, Household Income and Expenditure Survey, Mother and Child Nutrition Survey, and Multi-Indicator Cluster Survey), providing frequent, up-to-date data and information about the food security and nutrition status at the national level and in the most vulnerable areas of the country.

In the last three years, the Government of Bangladesh has prioritised the mainstreaming of nutrition in all government systems. Nutrition's formal inclusion in the health system is reflected in the Health, Population and Nutrition Sector Development Programme (HPNSDP) plan, finalised in 2011 and operationalised through the establishment of the National Nutrition Services (NNS). NNS is now gearing up to deliver nutrition interventions through community clinics countrywide, while playing an important coordination and advocacy role across other key sectors. Promisingly, NNS has committed to investing in Nutrition Information Systems (NIS) to help focus interventions and assess progress towards 2016 targets, including: underweight reduced from 41% to 33%, stunting reduced from 43% to 38% and appropriate complementary feeding practices increased to 65%.

Nutrition goals have also been included in government plans outside the health sector. The Bangladesh Country Investment Plan (CIP) is a five year comprehensive plan which aims to catalyse US$ 7.8 billion to ensure sustained food security (1). This plan incorporates the “Rome Principles” governing food security interventions (first articulated at the 2009 World Summit on Food Security) which include:

Country-led plans

Comprehensiveness (including food availability, food access and food utilisation)

Coordination among ministries and their departments, civil society and NGOs

Increased and secured financing

The result of a multi-year consultation process, the Bangladesh CIP builds upon the Government's 2006 National Food Policy and 2008 Plan of Action (2.3), and provides strategic guidance on how to address challenges across the dimensions of food security, including physical and social barriers to access and

utilise food. True to the Rome Principles, CIP programmes cut across sectors and will have synergistic impacts from local to national levels, thus requiring representative monitoring systems to assess progress. Key programme components include research and extension to sustain and diversify agriculture; improved water resource management; development of livestock (including poultry), fisheries, and aquaculture; improved access to markets and off-farm incomes; and community-based nutrition services implemented through NNS.

A number of additional plans and programmes guide the Government of Bangladesh's investments in food security and nutrition. Each plan and programme addresses specific nutritional issues and/or the vulnerabilities of particular groups, such as:

- Micronutrient supplementation for anaemia prevention and control (4)
- Vitamin A and de-worming capsule distribution (5)
- Ministry of Women and Children Affairs cash transfers
- The National Plan of Action for Children, prioritising food availability, fortification and supplementation
- Ministry of Agriculture initiatives for sustainable growth, diversification of agricultural products (promotion of fruits, vegetables and animal-sourced foods), and resilient crops

Bi-lateral donors have increasingly prioritised nutrition, with a number of single- and multi-donor commitments to increase food production and reduce losses, diversify agriculture, improve nutrition practices, improve food safety, and address underlying causes of food insecurity and poor nutrition from poverty and inequitable gender norms to poor health, water and sanitation. Key investments include:

- The European Union's Food Facilities supporting poverty reduction, school feeding nutritional surveillance, along with the Maternal and Young Child Nutrition Fund supporting programmes to improve child survival, growth and development through nutrition security throughout Asia
- USAID's Feed the Future programmes improving food security through increased on-farm productivity and investments in market systems and value chains, alongside programmes to directly address nutrition and build policy and planning capacity
- DFID's Challenge Funds addressing extreme poverty and the World Bank-managed South Asia Food and Nutrition Security Initiatives fostering cross-cutting interventions that will lead to measureable improvements in food and nutrition security
- The Government of Spain's Millennium Development Goal Fund to reduce the underweight prevalence and proportion of the population which is food insecure
- CIDA's Muskoka Initiative on maternal, newborn, and child health targeting 26 countries including Bangladesh

Bangladesh is also engaged in several initiatives involving multiple international organisations, UN agencies and development partners. Notably, under the leadership of civil society (including both national and international NGOs), Scaling Up Nutrition (SUN) launched in 2009 to catalyse and complement governments' focus on nutrition, specifically during the critical “thousand days” from

conception to age two (6). The global *Road Map for SUN*, published in late 2010, details the need for advocacy, nutrition-focused development, and implementation of nutrition-specific interventions. SUN participants, including Bangladesh as one of the SUN "early riser" countries, have pledged their commitment to nutrition-focused governance, financing and political action (7). Bangladesh's SUN movement involves both high-level government leadership and a growing network of civil society organisations committed to nutrition. All partners have recognised the importance of ambitious targets and rigorous monitoring, which requires regular data and information about nutrition.

Launched in Bangladesh in 2011, the UN Renewed Efforts against Hunger and Under nutrition (REACH) initiative aims to assist countries with high burdens of child and maternal under-nutrition to implement and to mobilise resources for food and nutrition security programmes. REACH is generating new evidence about the impact of an integrated package of interventions in Satkhira district in south-western Bangladesh. Additionally, REACH will build government institutional capacity for policy planning, prioritisation of scarce resources, and mobilisation of new resources – all areas where robust data and information about nutrition and food security are key.

In Bangladesh, national NGOs continue to play a critical role in implementing large scale programmes to protect and promote food security and nutrition. In particular, BRAC, the largest NGO in Bangladesh, works alongside government and other partners throughout the country to address nutrition and food security. BRAC's programme to improve infant and young child feeding (IYCF) practices trains community health workers in the most impoverished areas of Bangladesh to provide counselling, coaching, and demonstration in IYCF for individual households and local communities. BRAC's *Pushtikona* (sprinkles) programme has provided 11.2 million sachets containing micronutrients that prevent iron deficiency and anaemia to children under five in 61 of Bangladesh's 64 districts. In addition, BRAC has developed hybrid maize and rice crops that can sustain increases in water levels and temperature and has introduced alternative cropping patterns to help families feed themselves in seasons when traditionally, crops were not grown.

Food Security and Nutrition Surveillance

Launched in 2009 with the support of the European Union (EU), the Food Security and Nutritional Surveillance Project (FSNSP) builds on more than 17 years of nutrition surveillance programming in Bangladesh – making it one of the longest running nutrition and food security surveillance systems in a low-income country. Like the Nutrition Surveillance Program (NSP), managed by HKI and Institute of Public Health Nutrition (IPHN), which preceded it, 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 (more than 26,000 households and 15,000 children in 2011) 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. The data collection, management, analysis and reporting systems are designed to provide critical information on:

What household characteristics are indicative of, or correlated to, food and nutrition insecurity

Where in Bangladesh the most food and nutrition insecure households are located

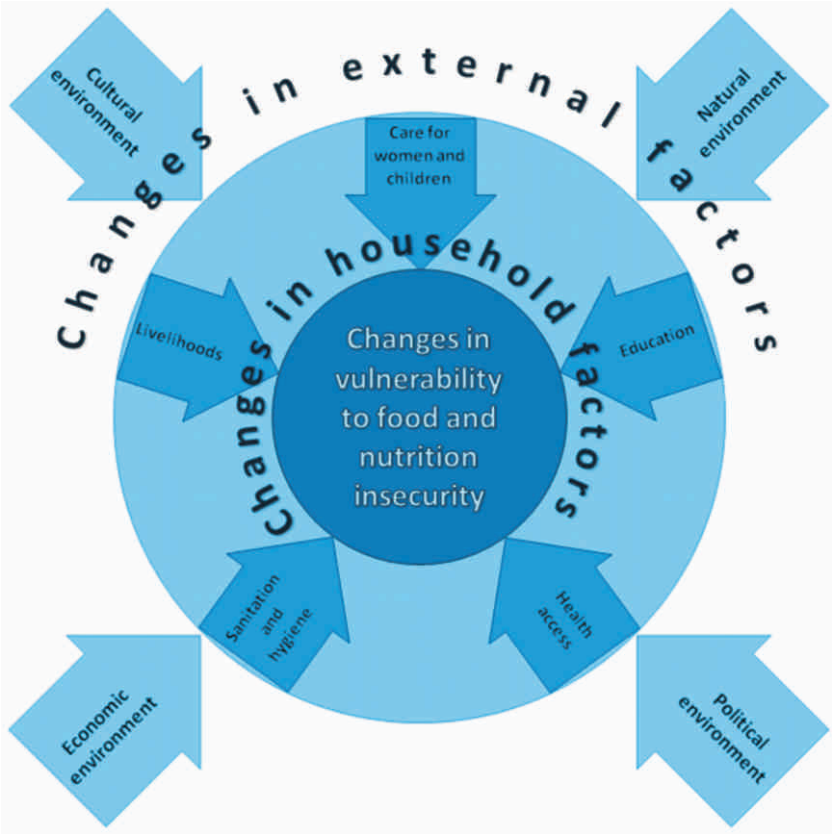
The number of families and individuals facing food and nutrition insecurity, both seasonally and throughout the year

The severity of food and nutrition insecurity in the country overall and in specific geographic zones

Which households, by demographic characteristics or geographic location, are vulnerable to increased risk of food and nutrition insecurity in the near future

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**



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 as news media and regular health surveys like BDHS that capture cultural and policy changes, and associated health effects.

Structure of this report

This report on the ***State of Food Security & Nutrition in Bangladesh: 2011*** presents selected annual and seasonal findings from three rounds of surveillance conducted during the second year of FSNSP. Its structure is similar to ***State of Food Security & Nutrition in Bangladesh: 2010 (8)***, enabling comparison between the two 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.) nutritional status of women and girls, 4.) maternal care and nutrition, 5.) child feeding and care, and 6.) nutritional status of children. The report presents national, divisional, and urban/rural estimates under each theme based on data collected in 2011. Seasonality is captured by comparing estimates from three rounds of data collection in surveillance zones and the nation as a whole.

While this report presents findings based on a selected subset of key indicators available in the surveillance system, the companion book, ***State of Food Security & Nutrition in Bangladesh: Summary Statistics 2011,*** provides a more complete compendium of tables representing the full range of indicators collected by the system. Aggregates from more recent surveillance rounds can be found at the FSNSP website: www.fsnsp.net

Methodology

FSNSP's methodology was revised in early 2011 to provide nationally representative data every four months.

Based on recommendations from stakeholders, FSNSP targets six surveillance zones drawn from the agro-ecological make-up of Bangladesh for seasonal estimates. In addition, the system randomly samples from the rest of the country each round.

In each surveillance zone, *upazilas* are selected by rotation in order to reduce random variation in estimates between rounds.

FSNSP's system includes 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 height, weight, and MUAC.

In 2011, FSNSP interviewed individuals from 26,447 households in 828 communities.

Since its inception in 2010, 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 major 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). While FSNSP has been consistent in providing 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. These changes reduced costs and increased the representativeness of information drawn from FSNSP. This section will focus on modifications to the sampling strategy which took place between 2010 and 2011. Details on the first year of implementation can be found in the *State of Food Security and Nutrition in Bangladesh: 2010* (8).

Revising the sampling system

In 2010, FSNSP based its sampling system on obtaining district-level estimates from households with children under 5 years of age, which required very large sample sizes nationally. Additionally, the district estimates obtained were less precise than desired due to higher than expected design effects for many key variables, thereby reducing the usefulness of these estimates. Additionally, FSNSP was only representative of households with children under 5 years of age, impairing the system's capacity to assess the food security situation in roughly half of the households of Bangladesh – those without children. Accordingly, between Round 3 and Round 4, the sampling frame was revised based on the recommendations of the Technical Consultative Group (TCG) during three meetings held in late 2010.

During TCG meetings, numerous sampling system modifications were considered, including maintaining the current system (9). In the end, the TCG recommended removing district estimates, instead targeting surveillance to food insecure areas, and ensuring a nationally representative sample each round (10). The ultimate sampling unit was expanded to all households with an adolescent girl/woman from 10 to 49 years of age or a child less than five years or age. After the new sampling plan was drafted through the TCG, feedback was solicited from the World Food Programme (WFP) and the Food Planning and Monitoring Unit (FPMU); both organisations approved the new system. Following these meetings, the Bangladesh Bureau of Statistics (BBS) approved the structure of the new sampling process and inclusion criteria, but the structure of the new zones was not accepted due to the lack of consistent and clear criteria used to delineate the food insecure zones in the 2004 *Food Security Atlas (11)*

In order to come to a consensus on the structure of the revised surveillance zones, the former Director General of BBS, Md. Shahjahan Ali Mollah, called a high level meeting and formed a working group that included staff from BBS, FSNSP, FPMU, the World Food Programme (WFP), and the United Nations' Children's Fund (UNICEF). This working group agreed that the revised surveillance zones should be derived from unchanging or very slowly changing structures of the country and not findings from any survey or assessment, in order to ensure that the sampling system would remain consistent over time.

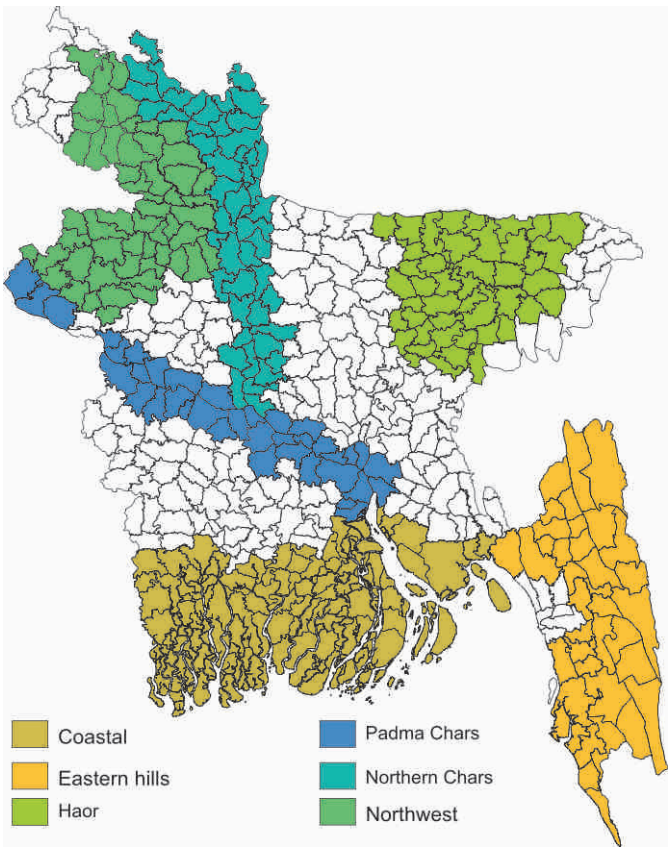
Furthermore, consensus was that the surveillance system should continue to focus on rural and disaster prone zones of the country. Based on these criteria, the physical and meteorological structures of Bangladesh were used as the basis of the surveillance areas and the agro-ecological zones map, developed by the Bangladesh Agricultural Research Council (BARC), was selected as the primary reference for the demarcation of surveillance zones (12).

Further meetings focused on deriving surveillance areas from combinations of the thirty agro-ecological zones, in order to streamline sampling and focus on the most vulnerable areas. Consensus was that the system should focus on the *chars* – unstable and often temporary, riverine islands that are destroyed and re-formed during and after the monsoons each year – and the coastal belt, as well as the areas of the country with poor road communication, such as the Chittagong Hill Tracts and the *haor* basin – a collection of saucer-shaped, shallow depressions or back swamps in Bangladesh's northeast. In addition to these four areas, it was decided to include the agro-ecological zones in the northwest of the country due to the lower levels of rainfall in this area. These recommendations were applied with some additional information from the 2004 *Food Security Atlas* and six surveillance zones were defined (11) .

Description of the surveillance zones

By defining vulnerable zones for targeted surveillance, FSNSP maintained its commitment to identifying households vulnerable to food and nutrition insecurity, which tend to be clustered in certain geographic areas of Bangladesh. The *upazilas* included in each surveillance zone are mapped Figure 2.1 in and listed in appendix A (page 169). Brief descriptions of the six surveillance zones are given below:

Figure 2.1: **FSNSP surveillance zones (2011)**



Coastal belt: This zone is characterised by a constantly changing geographic and geomorphologic situation with high risks for natural and manmade disasters, such as cyclones and tidal surges. The coastal belt consists of the 62 *upazilas* in which at least 33% of the land area is in the *Ganges Tidal Floodplain* or *Young Meghna Estuarine Floodplain* agro-ecological zones – excluding the Khulna statistical metropolitan area (SMA). The zone contains three distinct geographies: the southwest region above the Sundarban mangrove forest; the active delta area of the central south region; and the southeast estuary (13). The region includes both small and large islands as well as *chars* (11).

Eastern hills: This area differs substantially from the flatlands of Bangladesh. The Eastern hills zone consists of the 38 *upazilas* in Chittagong division in which at least 33% of the land area is in the *Northern and Eastern Hills* agro-ecological zone – excluding Chittagong SMA. The sections of this zone nearer the coast and plains of Bangladesh are home to a primarily Bengali population, while the hillier areas inland are predominantly inhabited by ethnic minorities. The large amount of government managed "forest land" in this area leads to many inhabitants not having legal access to cultivable land. This area is highly vulnerable to flash flooding and intermittent rodent infestations. Moreover, this area has been subject to multiple episodes of civil unrest in recent years (14) .

Haor: The Haor zone consists of all *upazilas* in which any land area is in the *Sylhet Basin* agro-ecological zone as well as 14 additional *upazilas* that are immediately adjacent and were listed as food insecure in the WFP/BBS Food Security Atlas (11). The 35 *upazilas* have dramatic seasonal changes in standing water levels, resulting in scattered settlements clustered on small patches of raised land. Roads are few and many are submerged during the rainy season leading to villages only accessible by boat and thereby limiting residents' access to schools, health facilities and markets. Many households depend on sharecropping and day labour, and many men migrate for labour opportunities during the rainy season. Flash floods at the end of the dry season can damage the rice crop and severe storms can affect crop production and destroy marginal housing.

Padma chars: This zone consists of all *upazilas* in which any land area is in the *Active Ganges Floodplain* agro-ecological zone – excluding Rajshahi SMA. These 38 *upazilas* bordering the slower moving Padma and lower Brahmaputra Rivers contain active floodplains including *char* areas that are highly erosion prone and offer only seasonal livelihoods. Since the Farakkha barrage (dam) was constructed in India in 1975, this area has suffered from the impact of changes in the dry season discharge of the Padma, resulting in greater fluctuation of water levels, accelerated sedimentation and increased salinity (15). This is the only area of the country that did not form part of the "food insecure" zones in the 2010 system.

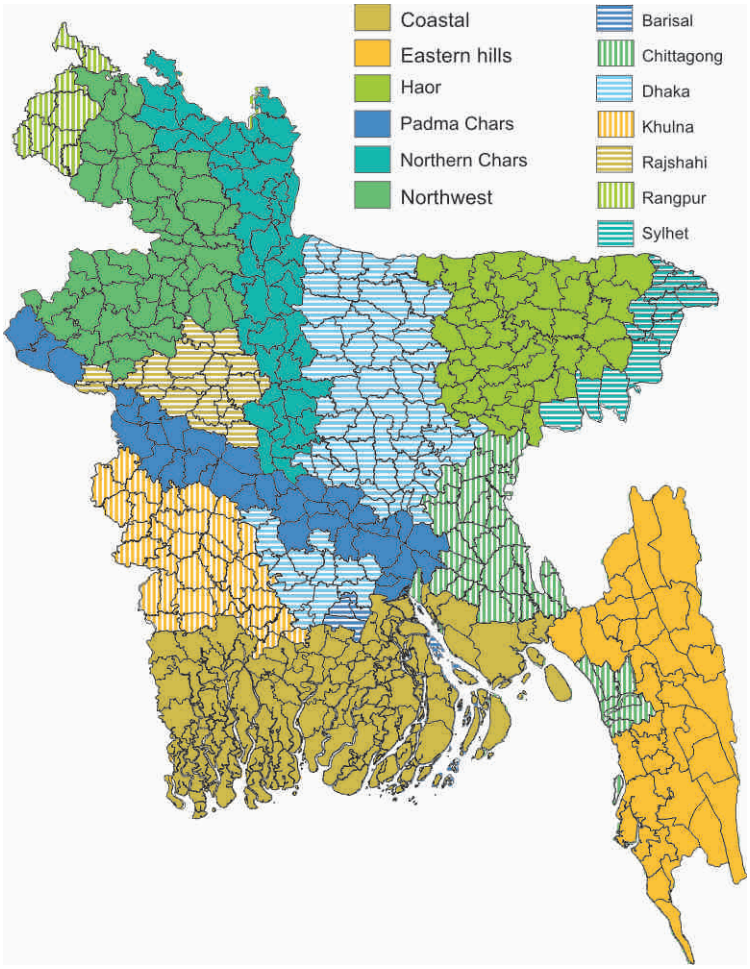
Northern chars: The Northern chars are unstable lands concentrated around the fast-moving Tista and upper Brahmaputra rivers that are characterised by high levels of flooding, erosion and instability. Inhabitants are particularly vulnerable as land erosion leads to frequent migration. There is limited access to infrastructure and services; communication and transportation systems are poor. As there are few roads through this area, river transport is primarily used, particularly during the rainy season (11). The soil is extremely sandy and generally poor for cultivation. This zone consists of the 47 *upazilas* in which any land is in the *Active Tista Floodplain* or *Active Brahamanputra-Jamuna Floodplain* agro-ecological zones, the two northernmost major rivers of Bangladesh.

Northwest: This zone includes 54 *upazilas*: those in which any percentage of the land area is in the *Tista Meander Floodplain* agro-ecological zone along with 13 additional *upazilas* that are immediately adjacent and were listed as food insecure in the WFP/BBS Food Security Atlas (11) . This area of the country differs from the rest of Bangladesh by greater inequality in land ownership, higher soil fertility levels, and lower amounts of rainfall. The Northwest is a food surplus production area, and agriculture is the principal source of employment. However, natural disasters such as seasonal floods, cold and droughts frequently destroy crops, livelihoods and homes (11). Most of the agricultural land is used to grow rice, mainly *aman*, harvested from early November to mid-December, and secondarily *boro*, harvested from mid-April to the end of May (16).

Sample selection

A three-stage sampling design was used 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 2.2. Six strata correspond to the six surveillance zones, as indicated above, while the remaining seven strata, which contain all the *upazilas* not included in a surveillance zone, correspond to the seven divisions of Bangladesh. From each strata, a set number of *upazilas* were selected with replacement for further sampling based on the number of *upazilas* in the strata. These were capped at 11 in the first round of 2011 (Round 4) and 12 during the remaining rounds of FSNSP (Round 5 and Round 6).

Figure 2.2: **Strata used in sample selection**



From each of the surveillance zones, *upazilas* 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 and is commonly done in labour participation surveillance (17;18;19;20;21). FSNSP's rotational pattern ensures that 50% of all *upazilas* in zones are identical between the same season in subsequent years and between two consecutive rounds. In each round, three new *upazilas* were selected for sampling and the remaining nine *upazilas* are drawn from past rounds in each surveillance zone. Each selected upazila remains in the system for four rounds of data collection. The rotational pattern is illustrated in Figure 2.3, where each letter represents a selection of three *upazilas* from each zone.

Figure 2.3: **Rotation pattern for selecting *upazilas***

Year 2	Round 4	A	B		D	E			
Year 2	Round 5		B	C		E	F		
Year 2	Round 6			C	D		F	G	
Year 3	Round 7				D	E		G	H

In the second stage of sample selection, three rural villages or urban *mohalla* were chosen at random and without replacement from all the villages/*mohalla* in each selected *upazila*. There was no stratification of rural and urban areas during the second stage of selection. In the FSNSP system, these villages/*mohalla* are referred to as communities; this is how they will be referred to in the remainder of this report.

The third stage of sample selection was done in the field. In each community, 32 households were selected systematically and interviewed. The starting point for interviews in each village was the first eligible house from a randomly assigned approach road (north, south, east, or west) determined by a random number generator. The next and subsequent households for interview were chosen systematically by counting five or ten households from the previously interviewed household (depending on the size of the village) 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.

Table 2.1**: Process for sample selection**

Selection unit	*Process*
Strata	**All rounds:** The country was divided into 13 areas: Six agro-ecologically based surveillance zones and the rest of the nation by the seven administrative divisions (Figure 2.2)
Upazila (PSU)	**Round 4:** From each agro-ecological zone, 11 *upazilas* were selected with replacement, while, from the rest of the country, 22 *upazilas* were selected with replacement (stratified by division)[1] **Round 5 & 6:** From each agro-ecological zone, 12 *upazilas* were selected with replacement by rotation, while, from the rest of the country, 22 *upazilas* were selected with replacement but without rotation (stratified by division)[1]
Community (SSU)	**All rounds:** Random draw of three communities from each selected *upazila*; if an *upazila* was selected multiple times, three additional communities were pulled for each time the *upazila* was selected
Household	**All rounds:** Every 5th or 10th house was selected depending on the size of the community, starting with the 1st house in the north, south, east, or west side of the community and moving in a counter clockwise direction
Women	**All rounds:** All pregnant women in the household plus the random selection of one non-pregnant woman or adolescent girl 10-49 years of age who was home and available at the time of interview
Children	**All rounds:** All children in the household were selected for measurement, but only the care giver of the youngest child was selected to complete the child morbidity and feeding module

A household was defined as a group of related or unrelated individuals that live together and share the same eating and cooking arrangements.[2] Households were considered eligible for surveillance if there was at least one woman in the household aged 10 to 49 years or a child less than 5 years of age. As implied above, non-response households were substituted with other households in the same village. A record of each household identified in the community was recorded on a specially designed sheet

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. In FSNSP, any family member would be considered a member of the household if they lived in the same dwelling, ate from the communal arrangements if he/she were in the house, and spent at least seven contiguous nights in the house at a non-festival period in the past four months. Due to this definition and employment patterns in Bangladesh, it is possible that some individuals could be a *de jure* household member of multiple households.

which indicated the survey status of the households (either skipped, absent, interviewed, refused, or not eligible). This record enabled monitoring and quality control officers to easily find sampled households when revisiting communities and to verify that data collectors were maintaining the prescribed skip pattern. In addition, these numbers were used to verify the sampling frame and construct weights.

The system of selecting caregivers, women, and children in each household for questionnaire administration and anthropometric measurements did not change between rounds. In all rounds, one non-pregnant woman or adolescent girl (aged 10 to 49 years of age) was randomly selected from each household for height/weight/mid-upper-arm-circumference (MUAC) measurement and asked to complete a section on dietary consumption. In addition, all currently pregnant women were asked to complete a module that measures dietary patterns and care received during pregnancy, including MUAC measurement. 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 was chosen to complete the child feeding and morbidity sections of the questionnaire about their youngest child.

Sample size

Sample size was calculated to obtain representative prevalence estimates for indicators of food insecurity and children's and women's malnutrition by surveillance zone. Sample size calculations were based on the estimated prevalence of seven key indicators:

1. Round-wise estimation of acute childhood malnutrition (based on weight for length/height)
2. Round wise estimation of child underweight (based on weight for age)
3. Annual estimation of chronic childhood malnutrition (based on length/height for age)
4. 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 among women 19-49 years of age (31)
5. Round-wise estimation of the proportion of households with food insecurity as defined using the Household Food Insecurity Access Scale (HFIAS) (22)
6. Round-wise estimation of the proportion of households with “household food deficit” as defined using the Food Deficit Scale (FDS) which is identical to the FANTA 2 Household Hunger Scale (23)
7. 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) (24)

Sample sizes for each round were calculated using the formula for calculating a 95% confidence interval for a single population proportion (given below). A 5% precision was used in the calculation for childhood acute malnutrition, women's CED, and annual childhood chronic malnutrition. A less precise estimate of 7.5% was deemed sufficient for child underweight and 10% for the three indicators of household food insecurity. The formula used is as follows (25) :

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

Where:

n = required minimum sample size

δ = the inter cluster correlation

c = the number of households sampled in each village (32 in FSNSP)

P = the estimated level of an indicator, and

Z_α = the value for the selected alpha level (the level of risk the researcher is willing to take that the true margin of error may exceed the acceptable margin of error)

E = acceptable margin of error for proportion being estimated (error researcher is willing to except)

Estimates of the prevalence and inter cluster correlation (ICC) used in calculating the sample size were drawn from the 2010 FSNSP dataset, whenever the indicators of interest were available (i.e., measures of child nutritional status and HFIAS and FDS indicators).[3] It was assumed that children would be present in 50% of households and women over the age of 18 years would be selected in 76% of households. These proportions were used to convert the sample size requirements for individuals (7th column in Table 2.2) into estimates of the number of households that would have to be visited to reach that many individuals (8th column in Table 2.2)

Table 2.2**: Estimated sample size**

Indicators	*Estimated prevalence*	*Desired precision*	*Desired sample*	*ICC*	*Design effect*	*Required sample*	*Required households*
Children's nutrition							
Acute	23%	5%	275	0.058	1.87	515	1029
Underweight	44%	7.5%	169	0.055	1.82	308	616
Chronic (annual)	50%	5.0%	384	0.071	2.06	264	529
Women's nutrition							
Women's CED	18%	5%	227	DHS	1.57	356	462
Household food security							
Food insecurity (HFIAS)	50%	10%	96	0.267	9.29	892	892
Food deficit (FDS)	40%	10%	92	0.265	9.23	849	849
Food consumption (FCS)	25%	10%	72	Est.	9.50	684	684

Because the first year of FSNSP only included mothers of children 0 to 59 months of age and not all women of reproductive age, FSNSP data was not used to estimate the required sample for this indicator. Instead, the sample size calculation was done using the design effect and prevalence estimates found in the 2007 Bangladesh Demographic and Health Survey (BDHS)(26). The proportion of households with poor or borderline food consumption was pulled from the HFSNA as it is the only

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. This was done in order to maximise sample size as estimates were expected to vary both between rounds and between seasons, and to facilitate data collection activities by making the sample size target uniform across zones and rounds of data collection. 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) (174).

recent and nationally representative source of this information in Bangladesh (24). As information on the observed ICC or design effect was not available in this publication, we used the estimate of 9.5 which is in line with the other indicators of food insecurity measured in FSNSP.

The largest sample size required by these indicators was the number of children necessary in order to estimate the prevalence of wasting, which required 515 children per zone per round out of an estimated 1,029 households. This requirement was met by including 11 *upazilas* in each zone and interviewing 96 households per *upazila* (32 households in each of three communities). After Round 4 (the first round of 2011), it was found that some zones had lower populations of children than estimated, thus requiring a greater number of households per zone to provide an adequate sample. Thereby the number of *upazilas* selected from each zone was increased to 12 per round for Rounds 5 and 6.[4] In keeping with these minimum requirements, the final sample size was 1,056 per surveillance zone in Round 4 and 1,152 per surveillance zone in Rounds 5 and 6. Total target sample size per round was 8,448 households in Round 4 and 9,024 households in Rounds 5 and 6.

Measurement

Surveillance data were collected through structured interviews by means of paper questionnaires and proprietary survey software (Surveymaster 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. Approximately two-thirds of the data were collected using PDAs. Data collected on PDAs were imported using the Surveymaster 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 FSNSP are based on existing global standards and guidelines. Surveillance instruments are available on the FSNSP website (www.fsnsp.net), and key indicators are described in the relevant sections of this report and in the glossary provided in the companion book: *State of Food Security and Nutrition in Bangladesh: 2011 summary statistics*. The questionnaire used in year two of FSNSP closely matches the format and structure of the questionnaire used in the first year, details of which can be found in the *State of Food Security and Nutrition in Bangladesh: 2010* (8).

The questionnaire did not change significantly between the three rounds of surveillance in 2011, but some questions were modified based on field observation, skip patterns were altered slightly, and a few questions were added based on perceived information needs and stakeholder requests (See Table 2.3). Before each round of data collection, field testing and back translation were undertaken for any altered sections of the questionnaire. After each field test, monitoring officers and other supervisors refined the questionnaire and protocol in collaboration with enumerators.

Enumeration team training

An experienced staff of data collection officers received two weeks of initial training on how to interview, how to use PDAs for questionnaire administration, how to 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

4. This change also facilitated the creation of the rotational pattern.

in the questionnaire. Mid-way though each round of data collection, a one-day refresher training was organised to reinforce skills and knowledge.

Table 2.3: Sections of the FSNSP questionnaire

Sections	*Components*
Identification	**All rounds:** Administrative area and the religious and ethnic identity of the household
Household demography	**All rounds:** Age group, sex, marital status, education level, and occupation of each household member as well as the identification of the main earner and if the household is currently receiving remittances
Child feeding	**All rounds:** Pre-lacteal feeding practices. **Round 4:** 12 out of 15 infant and young child feeding (IYCF) indicators from the 2008 WHO IYCF guidelines for all children; 14 out of 15 IYCF indicators for breastfed children. (27; 28)[5] **Round 5 & 6:** All fifteen IYCF indicators in the 2008 WHO IYCF guidelines (27; 28)
Child morbidity	**All rounds:** Recent illness of the youngest child, sick child care practices, use of health facilities, child night blindness, and receipt of public health services
Food security	**All rounds:** Frequency of behaviours related to food insecurity and simplified household food frequency; Identification of the household member(s) who undertook coping behaviour
Dietary diversity	**All rounds:** Dietary diversity pattern of one non-pregnant woman or adolescent girl in the household (24-hour recall based on the day before the interview)
Reproductive health	**All Rounds:** Antenatal care (ANC) and post-natal care (PNC) for mothers of children less than 6 months of age; care practices and dietary diversity for currently pregnant women
Socio-economic status	**All rounds:** Asset index, land ownership, source of drinking water, gardening practices, composition of the main dwelling structure, cooking fuel, latrine type, and daily wage rates
Anthropometry	**All rounds:** Height, weight, and MUAC of a non-pregnant woman or adolescent girl and all children under five years of age; MUAC and height measurement of all pregnant women; birth weight of the youngest child in the households if recorded or recalled by the caregiver.
Community	**All rounds:** The local cost of food commodities (perishable and non-perishable)

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

5. The indicators excluded were *minimum feeding frequency*, *minimum acceptable diet*, and *milk feeding frequency for non-breastfed children* because the frequency of milk feedings for non-breastfed children was not recorded in Round 4.

Teaching Aides at Low Cost (TALC). All anthropometric measurements were performed according to WHO guidelines as specified in the FANTA anthropometry manual (29).

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, *upazilas*, and communities. At the beginning of each interview, the data collection officers give details about the purpose of surveillance and read a consent statement to all respondents, informing 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.

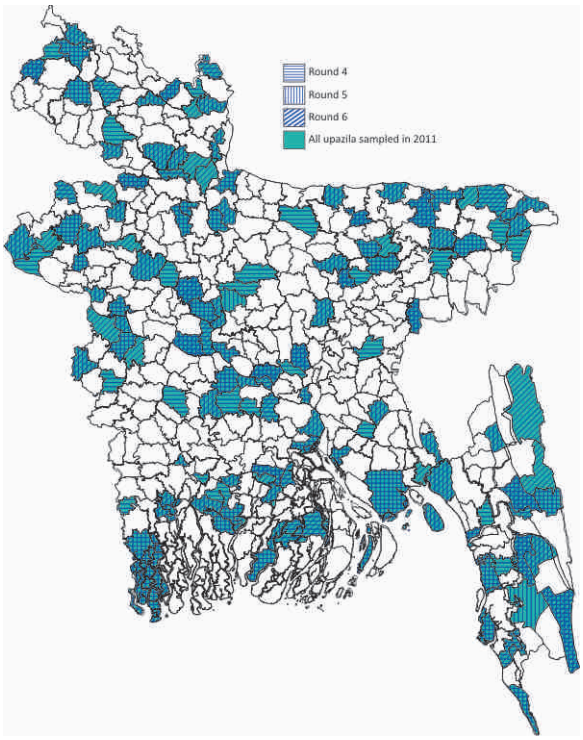
Field work

The composition of field teams changed during 2011. In Rounds 4 and 5, data were collected by 24 and 22 teams, respectively, and each three member team consisted of one male and two female data collectors. In Round 6, data were collected by 34 two-member teams which consisted of one female and one male data collector who were equally responsible for interviewing and anthropometric measurements. This change was made to reduce the number of staff required in the field and address the high turnover rates of female data collectors. Monitoring officers supervised the activities of every team, and two field managers provided oversight of the data collection process.

Table 2.4: Dates of data collection

Round	*Dates*
4	February 21 – May 08
5	June 5 – August 25
6	October 2 – December 19

Figure 2.4**: Sampled upazilas by round**



All rounds of data collection were divided into two phases with a break between data collection periods. 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.

During 2011, 26,447 households were interviewed in 759 villages and 69 *mohalla* (828 communities in total) of 147 *upazilas* (Figure 2.4). Overall, refusal rates remained very low, with only 742 households declining to participate in the survey (3%). As expected, refusal rates in urban areas were greater than in rural areas (rural: 2% and urban: 3%). In selected households, a total of 21,639 women aged 19 to 49 years of age and 5,434 adolescent girls aged 10 to 18 years of age were interviewed. Of these 27,074 women and girls, 2,071 were pregnant (8%).

Table 2.5: Number of communities, households, and individuals sampled

	Round 4	Round 5	Round 6
Communities	264	282	282
Households	8,431	9,000	9,016
Women and girls	8,622	9,227	9,225
Young children	5,016	5,247	4,973

Additionally, 15,236 children were measured and 13,342 caregivers were interviewed about the care and feeding practices of the youngest child in the household. Table 2.5 breaks these aggregate figures up by surveillance round.[6]

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 FSNSP, internal FSNSP quality control operations were supplemented by BBS staff performing a ten percent 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 from PDA to computers and merging of the data from paper questionnaires and PDAs using SPSS (IBM, v16.1).

Data management officers reviewed, edited, and cleaned the data by performing a series of logic, frequency and data range checks.[7] 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 would make 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, v11.0). In this report, the data are described using proportions with confidence intervals and means with standard deviations. Whenever statistical significance is referred to in the text, the tests employed were an Adjusted Wald (for proportions) or a t-

6. Further information about sample size attainment for various indicators can be found in the companion report, *State of Nutrition and Food Security in Bangladesh: Summary Statistics 2011.*

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

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 analysis 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 year of implementation have added to its strength and credibility as a nationally and sub-nationally representative surveillance system. The new approach enables the inclusion of most households in Bangladesh, thus increasing FSNSP's comparability with other data sources, while preserving the systems' focus on the most food insecure areas of the country. Improvements have been made in the method of interview as indicators have been polished. Additionally, the variation of data weights has been reduced by changing the way secondary sampling units were chosen.

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 2011 are mainly with regards to the way the sampling system is collected at the field level. While, to date, the on-the-spot field sampling method has resulted in a low level of absent households, 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. In the coming years, the FSNSP system will carefully monitor these risks to ensure that they do not compromise data quality.

Household Characteristics

Only 46% of households contained a child less than five years of age, however, the proportion varied greatly across divisions with far more young children per household in Sylhet and fewer in Khulna.

Nearly 30% of households relied on day labour as their principal source of income, while 20% depended on salaried occupations.

Only one-quarter of women reported earning income in the two months prior to interview; there was little difference between the proportion of women earning income in rural compared to urban.

Mothers of young children under the age of five years earned income less frequently than women without young children.

On average, there were fewer uneducated mothers than uneducated principle income earners, and only a quarter of mothers have had no education.

In 2011, the mean household size estimated through the FSNSP system was 4.9 members – slightly larger than the 2011 Census (4.4) and the 2007 BDHS (4.7) (30; 26).[1] The difference between these results and FSNSP is likely due to the exclusion of households without a woman 10-49 years of age in the FSNSP system (and thereby the *de facto* exclusion of single member households) and/or the *de jure* definition of households employed by FSNSP (see page 31). However, for households with children, 2011's FSNSP's estimate closely aligns with the results from 2010 (5.4 and 5.3 members respectively). Additionally, the ranking of divisions by household size was similar between FSNSP estimates and the 2011 census (30), with the largest average household size found in Sylhet, and the smallest in Rajshahi and Rangpur. As expected no differences in household size were observed across seasons.

Figure 3.1: **Average household size by area of residence**

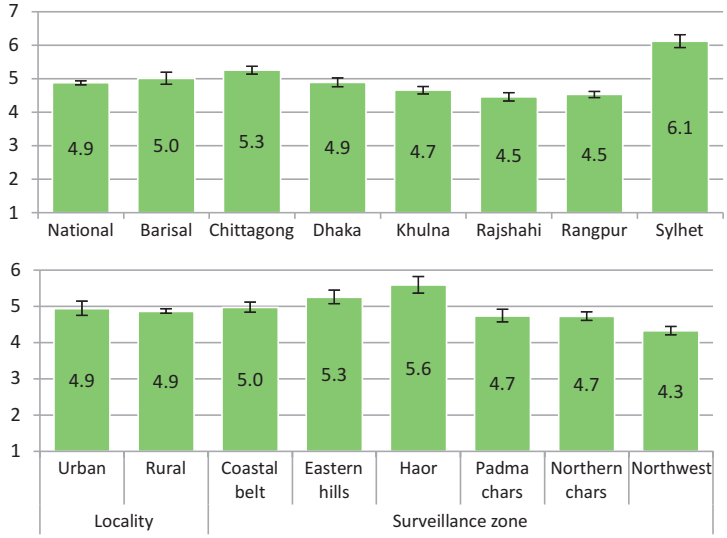
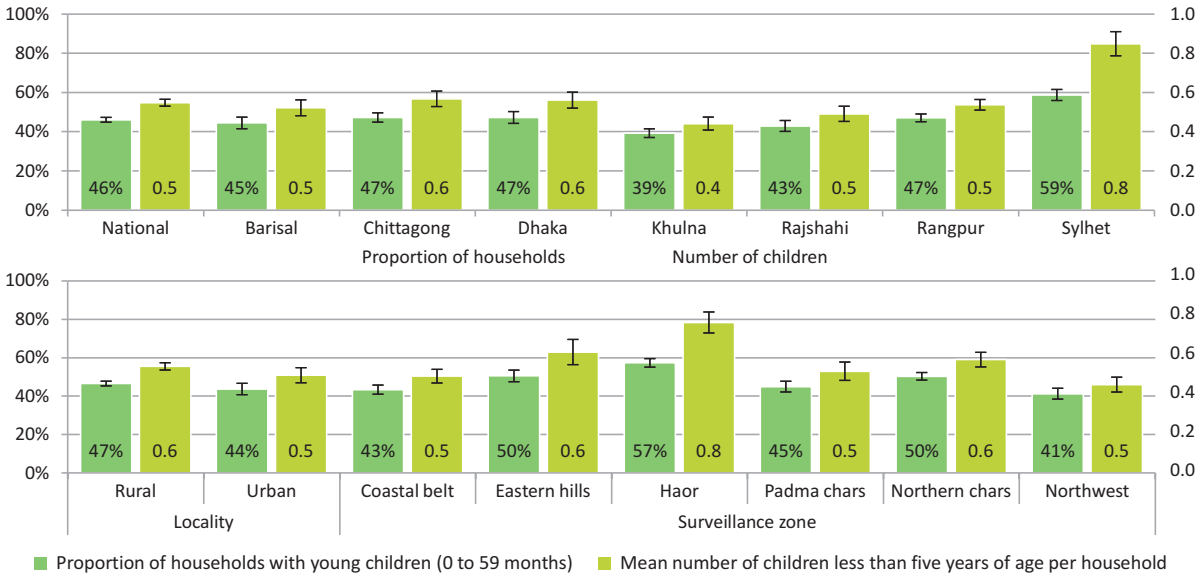


Figure 3.2 : **Proportion of households with children and the mean number of children per household**



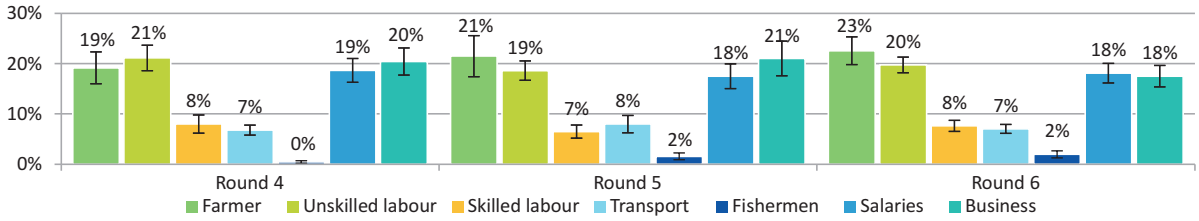
1. The 2011 BDHS full report was not yet released at the time of this publication.

Overall, fewer than half of households included a child less than five years of age (46%). However, around 20% 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. The number of children under five and the proportion of households with young children varied greatly across different regions of Bangladesh. Divisionally, the fewest children under the age of five were found in Khulna, where only 39% of households had young children and the average number of children under five per household was 0.4. In contrast, Sylhet had both the highest proportion of households with young children, 59%, and the greatest number of children under the age of five per household, 0.8 – double that found in Khulna. There was little difference in the proportion of households with young children in rural compared to urban areas.[2]

Household income, assets, and wealth

FSNSP classifies the occupation from which all members of every 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.[3] Using these two pieces of information, FSNSP can categorise households by the main occupation of the principal income earner. For reporting purposes, occupational data was 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**

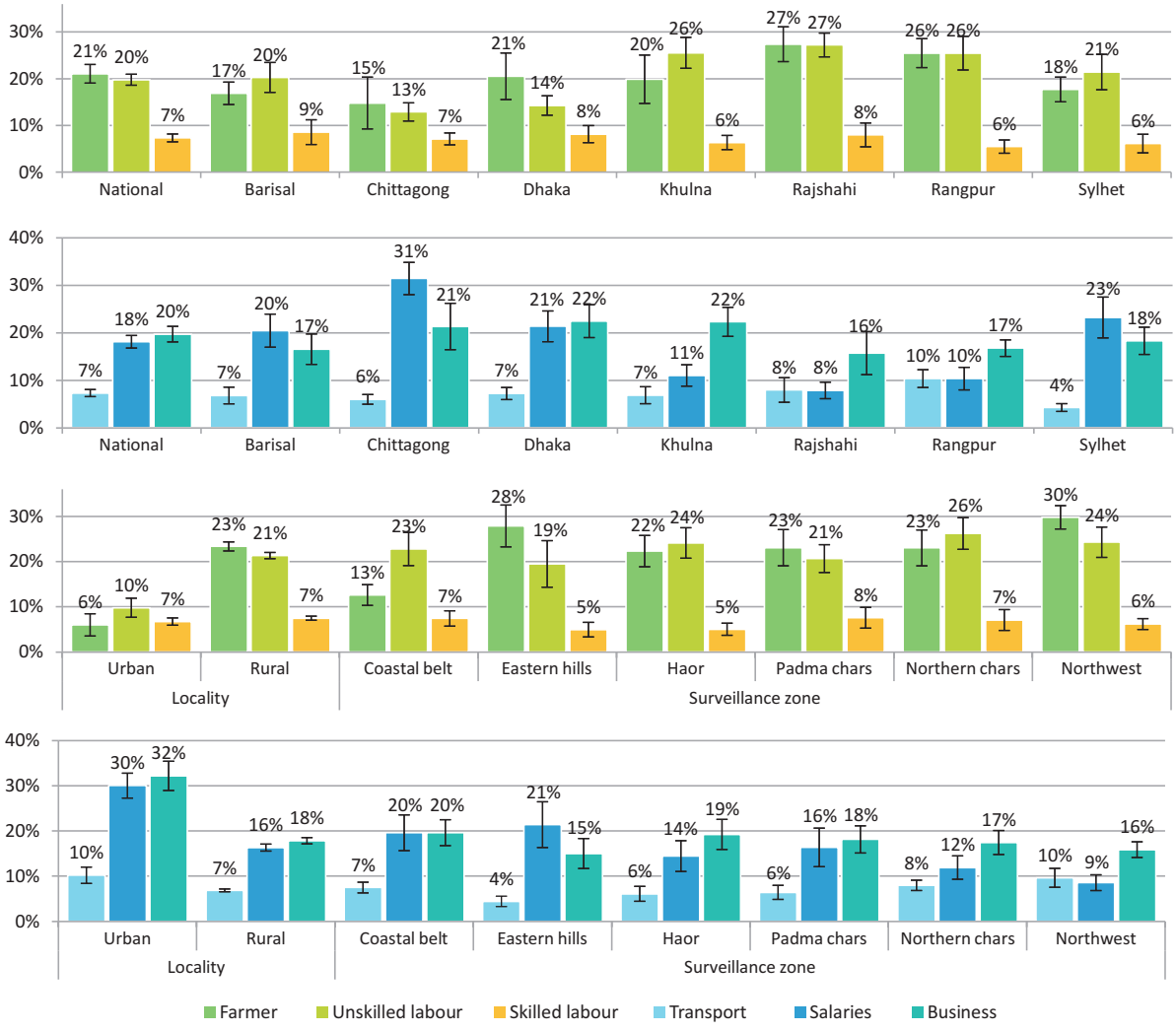


Distinct occupational patterns were apparent for some occupations across the regions of Bangladesh. For example, reliance on skilled labour was similar across areas but rates of unskilled labour varied from over 25% in the three western divisions of the country (Khulna, Rajshahi, and Rangpur), to only around 10% in Chittagong and Dhaka divisions and in urban areas nationally. The northwestern divisions of Rajshahi and Rangpur also had the greatest proportion of households involved in farming, while Barisal, Sylhet, and Chittagong had fewer farming households than the national average. With the exception of the Coastal belt, all surveillance zones had greater proportions of households reliant on farming as a main source of income than the national average. Nationally, there were no clear seasonal trends.

2. As mentioned previously, the very low numbers of children found in the Northwest and the Char zones drove the decision to increase the number of *upazilas* selected per zone between Rounds 4 and 5 as mentioned in the methods section (34).
3. 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.

The only areas with a sizable proportion of households primarily reliant on fishing were Barisal and Sylhet (4% in both areas, not shown). However, this income source was seasonal, with most households reliant on this livelihood during and after the monsoon. Together, business and salaried employment constituted the principal source of income for almost 40% of households nationally; however, in urban areas almost three-quarters of households were dependent on these sources of income. Salaried income was more prevalent in Chittagong and least common in the three western divisions. On average, the proportion of households earning income from business and salaried occupations was much lower in the surveillance zones than in the rest of the country.

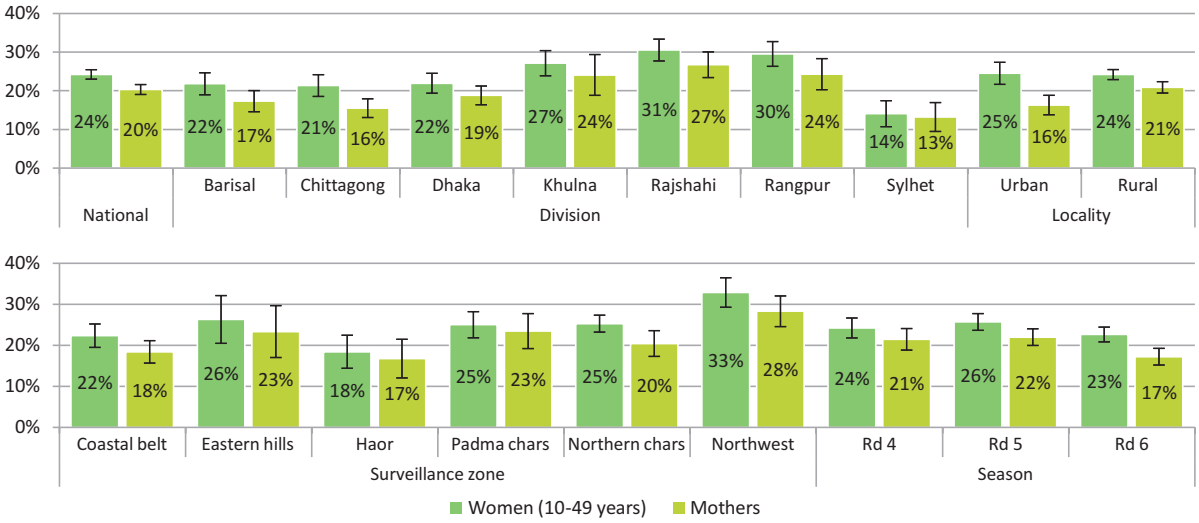
Figure 3.4 : **Occupation of principal income earner by area of residence**



FSNSP also captures women's contributions to household income even if these women primarily identify as housewives. Nationally, 24% of women 15 to 49 years of age earned income while only 20% of mothers with a child less than 5 years of age did so. These proportions varied greatly, with more women engaged in income-earning activities in three western divisions of Rangpur, Rajshahi, and Khulna, and very few women earning income in Sylhet. For women, there was little difference in

income earning status between rural and urban areas, but mothers in urban areas earned less frequently than did their rural counterparts. Notably, the proportion of women and mothers earning income was higher in all surveillance zones except for the Coastal belt and the Haor.

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



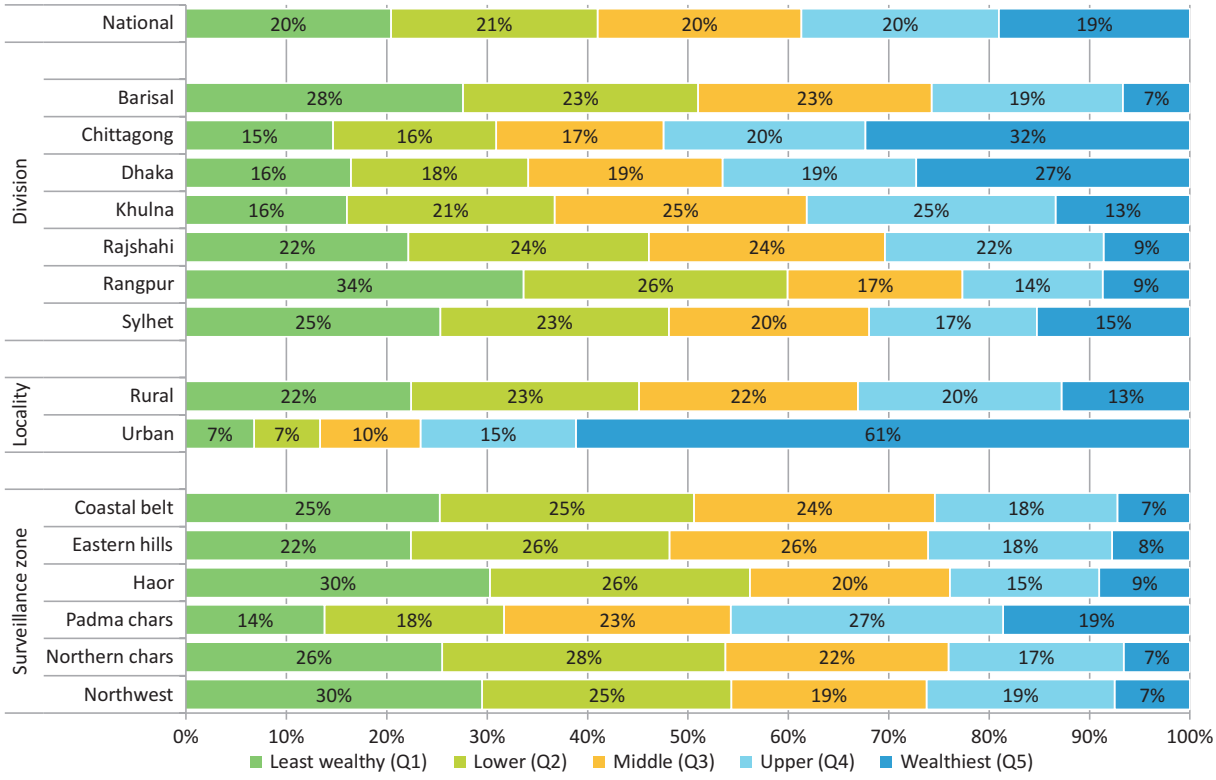
The surveillance system collects information on the quality of household structures, cooking, water and sanitation systems, and asset ownership. These household characteristics are typically associated with overall health and nutritional outcomes and the ability to weather periods of crises. Additionally, using standard methodology, these assets can be used to determine the relative wealth status of households (31;32). There has been a small but significant increase in electricity provision (connection or solar generator) from early 2010 to 2011 (55% to 58%). Similar to 2010 findings, houses were largely constructed of unfinished materials; for example, 74% of houses had mud floors and only 25% of households had floors, walls, and roofs all made of finished materials such as cement, wood, tiles, or tin. A sizable proportion of houses were single room dwellings (24%), and the average number of occupants per room was 1.7. A few households (2%) continued to use unsafe surface water for drinking, and many still possessed rudimentary sanitation facilities; 6% of households used a hanging toilet or no facility, and 8% of households used an open pit toilet.

From these indicators, a composite wealth index was derived using standard DHS techniques (31).[4] The wealth index was then divided into five quintiles, each containing an equal population of household

4. The construction of this wealth index was done using the same methodology as the DHS system used from 1998 to 2009 (31) . Variables included in the wealth index are: drinking water source (communal tube well/piped water, individual tube well/piped water, dug well, or surface water), latrine type (individual sanitary latrine, shared sanitary latrine, individual ring latrine, shared ring latrine, individual pit latrine, shared pit latrine, hanging latrine, or no latrine), house composition (single room dwelling, contains three furnishings, unfinished floor, finished floor, unfinished walls, finished walls, unfinished roof, finished roof, or finished house), cooking material (wood/straw/animal dung, kerosene/coal, or LPG/biogas/electricity/piped CNG), access to electricity, and ownership of any of the following assets – homestead land, agricultural land, cow, sheep/goat, chicken/duck, rabbit/small game, any livestock, solar panel, radio/TV, telephone/mobile phone, electric fan, cot, cabinet, refrigerator, table/chair, watch/clock, power tiller, irrigation pump, UPS/electric generator, fishing net, un-motorised transportation, and motorised transportation. The continuous variables are: amount of land owned and number of rooms per household member.

members. Similar to 2010, Chittagong division had both the lowest proportion of households in the poorest wealth quintile and the greatest proportion in the wealthiest quintile. By contrast, around 30% of the households in Barisal and Rangpur fell into the poorest wealth quintile while only around 5% were in the wealthiest. Rural areas were much poorer than urban areas where over 50% of the households were in the upper-most wealth category. All surveillance zones were less wealthy than the national average and rural areas, except the Padma chars.

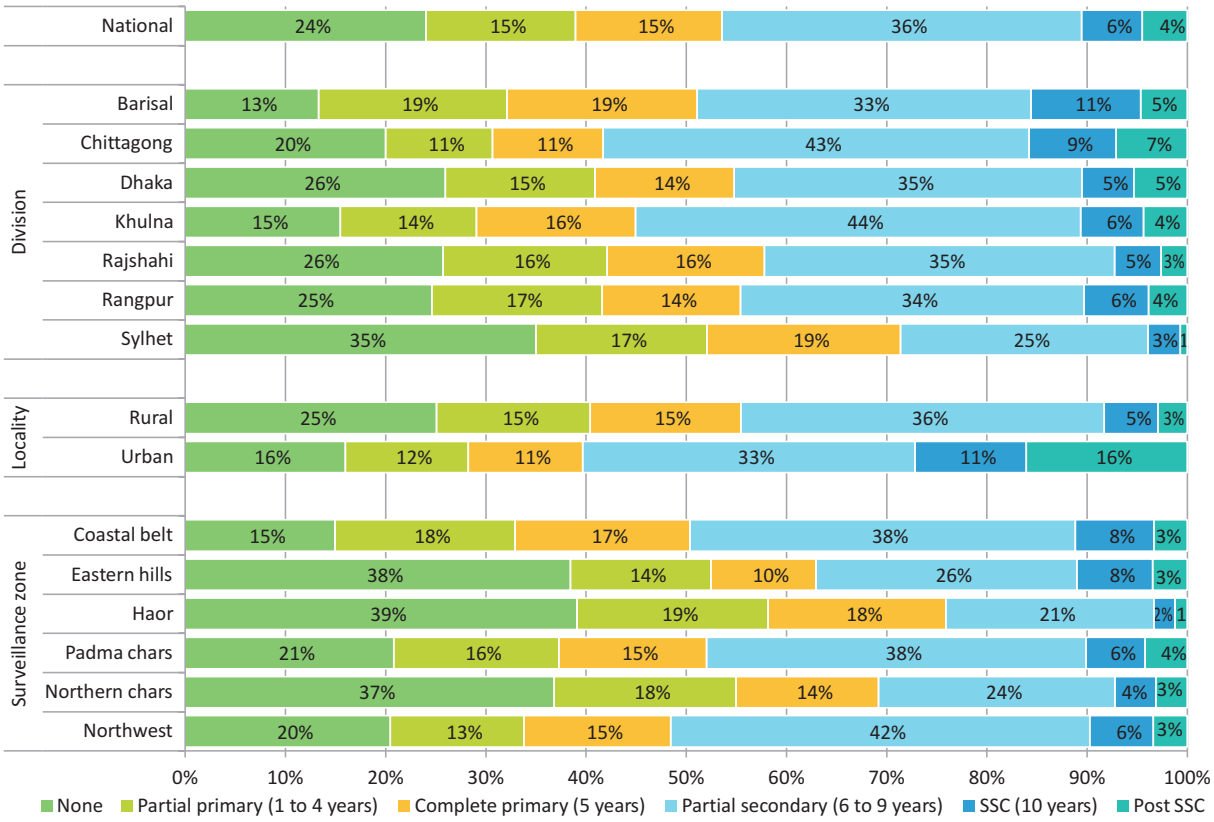
Figure 3.6 : **Proportion of households in each wealth quintile by area of residence**



Education levels

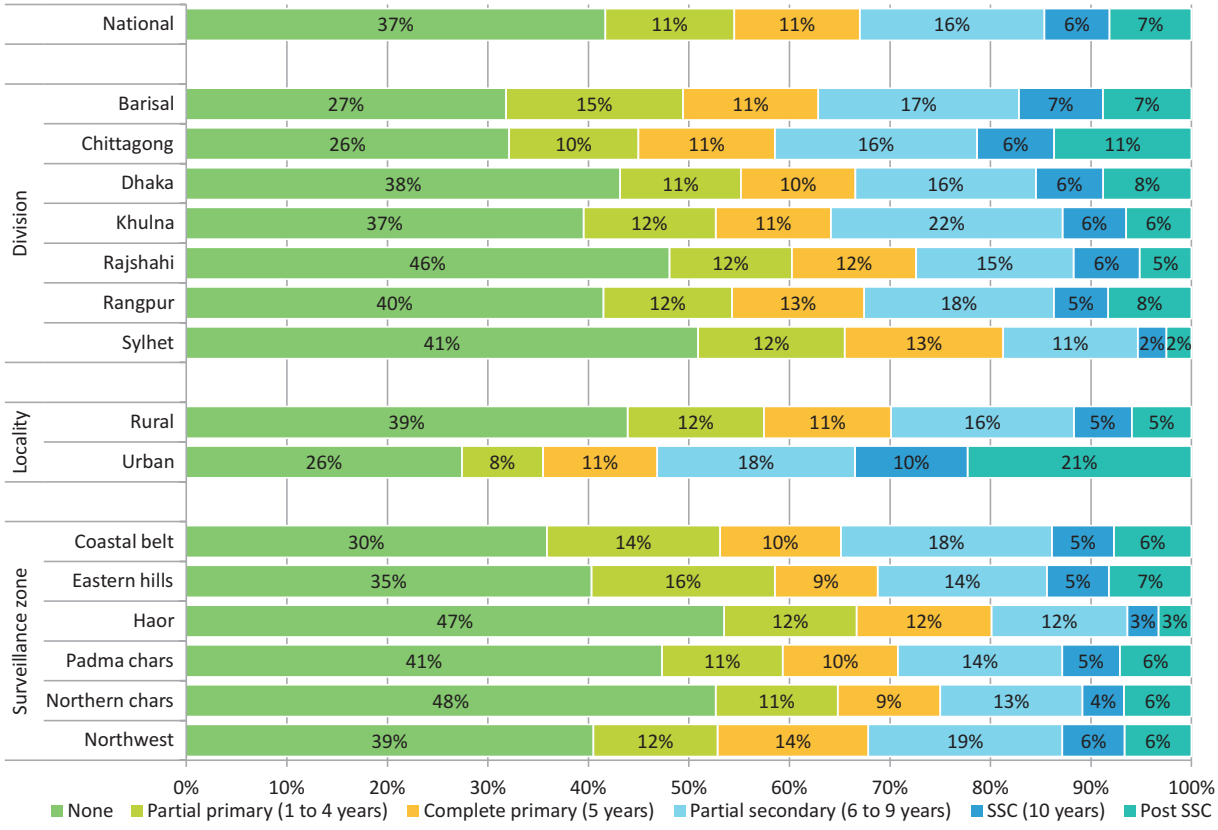
The educational attainment of all household members is recorded in years of education passed and later categorised into six groups as follows: 1.) none – 0 years; 2.) partial primary – 1 to 4 years; 3.) primary completion – 5 years; 4.) partial secondary – 6 to 9 years; 5.) SSC certificate – 10 years;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

Figure 3.7 : **Educational attainment of mothers by area of residence**



Maternal education and the education of the principal income earner of the household were strongly correlated across regions but only moderately within households (r=0.58). Interestingly, a greater proportion of principal income earners, compared to mothers, were highly educated (more than ten years) and completely uneducated (zero years). Nationally, slightly less than a quarter of mothers had never gone to school compared to over two thirds of principal income earners. Across divisions, the highest levels of education were found in Chittagong for both groups, followed by Khulna for mothers and by Barisal for principal income earners. The lowest level of educational attainment was found in Sylhet for both mothers and principal income earners. As expected, people in urban areas were much more educated than those in rural areas. On average, educational attainment in the surveillance zones was lower than the national average; however this was not the case for the Coastal belt.

Figure 3.8 : **Educational attainment of principal income earners by area of residence**



Food Security

Due to the continued effect of rapid increase in rice prices that began in late 2009, 2011 was an atypical year for Bangladesh's food security situation.

During 2011, the price of rice began to fall to earlier levels, due in part to government efforts. The effects of this reduction were not seen until 2012.

While a greater proportion of households reported experiencing milder food insecurity conditions, such as food running out and eating smaller meals, there was no change in the proportion of households experiencing severe food insecurity conditions, such as skipping meals and going day and night without food.

Seasonal variation in food insecurity was much lower in 2011 than 2010.

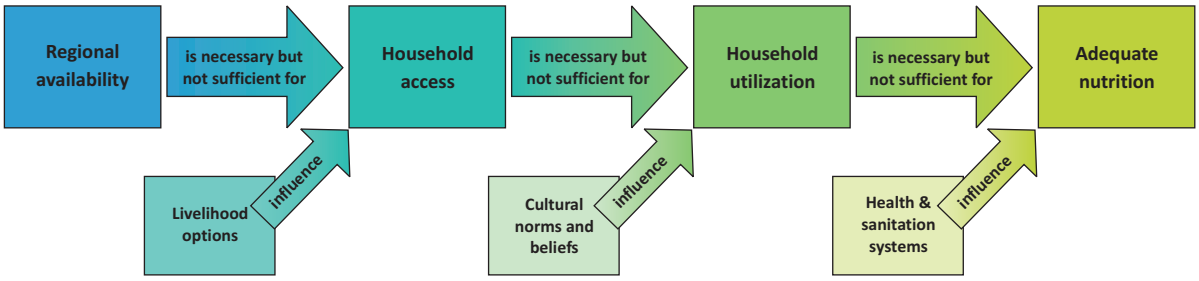
The proportion of households with poor or borderline food consumption patterns decreased from one-quarter in 2008/2009 to less than one-fifth in 2011.

In times of food scarcity, women and girls reduce consumption at a much higher rate than men and boys.

A household and its members are food and nutrition secure when: 1) food is present nationally, regionally, and/or locally (availability); 2) food can be purchased or produced (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 change in the near future (vulnerability) (33). The unit of reference for these components of food security becomes smaller over the first four conditions moving from regional indicators to household indicators to individual indicators. Additionally, each of these components is a necessary though not sufficient condition to achieve the subsequent aspect of food security (Figure 4.1). For example, if food is not available in local markets or through harvest of local fields, households will be unable to access sufficient food no matter their income or production capability. Similarly, in households without the purchasing or production power to access food, household members will not be able to obtain a balanced and adequate diet. Moreover, even within households, individual members will be food insecure if they do not receive an adequate proportion of the food prepared and will not be nutrition secure if illness prevents their body from utilising nutrients in the foods they eat.

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 (34).

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 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 along with previous national surveys.[1]

Availability

In line with goals laid out in the *National Food Policy: Plan of Action* and the *Country Investment Plan* (CIP), the Government of Bangladesh is committed to increasing and diversifying the foods available in all regions of Bangladesh through improving agricultural production and maintenance of trade relations (1; 2). Since 2008, the proportion of rice land cropped with high yielding varieties of rice has increased steadily, from 72% in 2008 to 76% in 2011 (35). As shown in Figure 4.2, the only crops with lower production levels in 2011 than in 2006 were pulses and bananas (35). This growth has not been limited to field crops; from 2007/2008 to 2010/2011, the production increase has been 7% for eggs, 11% for milk, and 48% for meat (35).

Figure 4.2: **Growth rates for selected crops 2006 to 2011**[2]

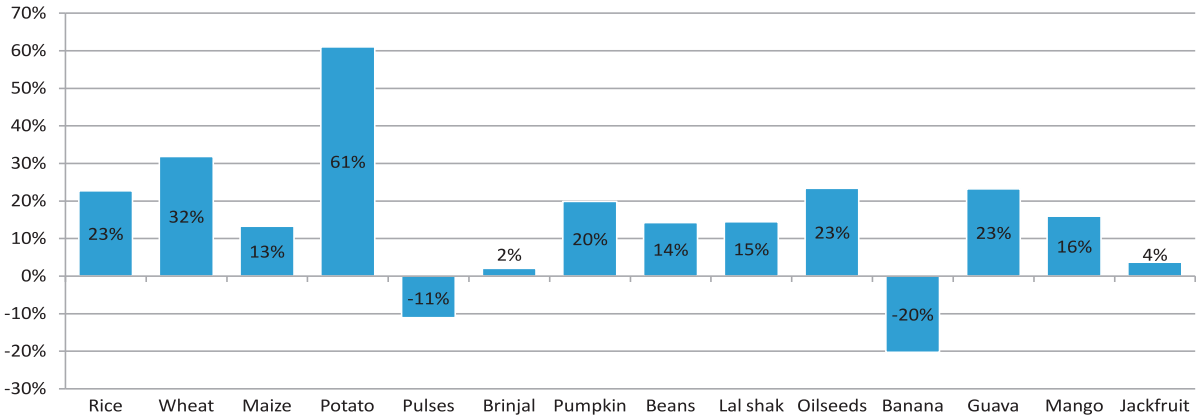
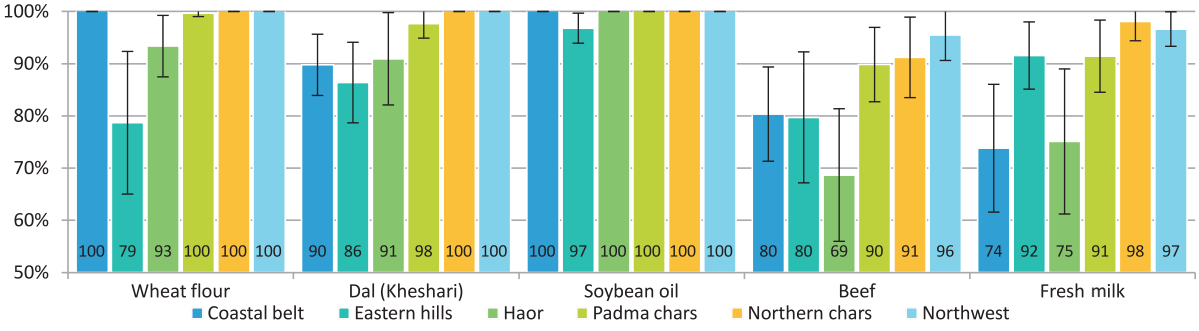


Figure 4.3: **Proportion of markets at which commodities are available**[3]



1. FSNSP does not focus on measuring directly whether levels of food insecurity are a consequence of low availability, low access, inadequate utilisation, a lack of stability in the food economy, or a combination of these factors. Instead, it relies on contextual information from other sources for this information, and directly measures household perceptions of and experiences with food insecurity. In subsequent years of surveillance, linkages with other external data sets, such as the Bangladesh Bureau of Statistics' *Household Income and Expenditure Survey* and *Agricultural Year Book* or IFPRI's *Bangladesh Integrated Household Survey*, may enable a closer examination of the determinants underlying variation in levels of household food insecurity.
2. This graph was constructed from Table 6 on page 30 of the *National Food Policy: Plan of Action and Country Investment Plan: Monitoring Report 2012* (35).
3. These estimates are only a proxy of the actual availability of commodities since items may be obtainable at the household through own production or barter, or not found on the market due to weak local demand and not due to regional availability.

Moreover, food availability through markets, barter-systems, and/or subsistence agriculture, is adequate to meet current levels of demand in most areas of Bangladesh (36; 37), hence, FSNSP does not seek to quantify market and production adequacy, focusing instead on household level indicators. However, in an effort to measure differences in food prices across regions of the country and over time, the surveillance system records the price at which common food items are available in every community visited.[4] The vast majority of these items were found to be ready for purchase in over 97% of the markets surveyed in the nation as a whole, with the exceptions of fresh milk (87%) and beef (88%). However, some regions of the country, such as the Eastern hills, lacked certain commodities as illustrated in Figure 4.2.[5]

Economic access

As noted in the outset of this chapter, the mere availably of foodstuffs in markets does not ensure household access as the cost of food items and purchasing capacity of households must be considered. Since 2007, global food prices have become increasingly volatile and in early/mid 2010 the price of many food commodities increased worldwide and remained high until late 2011, elevating levels of food insecurity during all three rounds of FSNSP in 2011. Sharp increases in the cost of food disproportionally affect households in South Asia, where food spending typically comprises 50% of household income (38). While it is heartening to note that Bangladesh has seen real wage growth in the past five years-between 2005 and 2011 the proportion of Bangladeshi households in poverty fell from 40% to 32% (39; 40)-the high food prices experienced in 2011 may have placed a balanced diet beyond the reach of many, particularly the urban poor and rural landless.

Figure 4.4: **Changes in the average price of rice over 2009-2011**

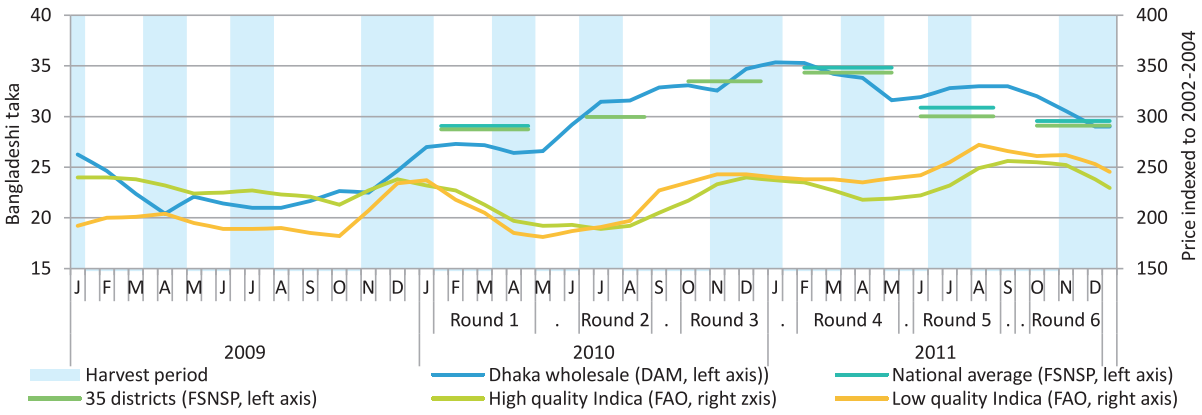


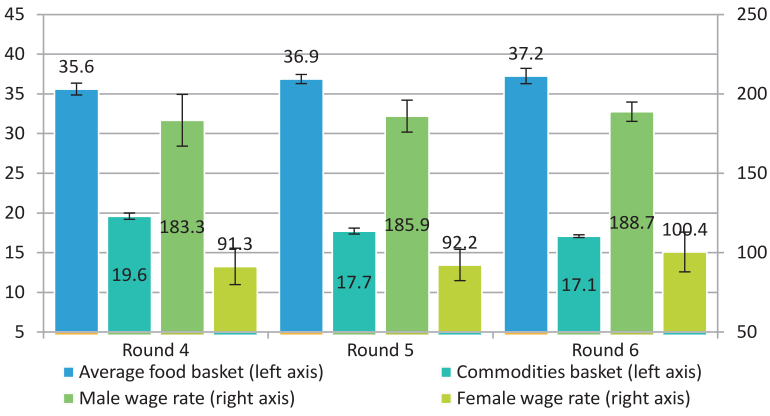
Figure 4.4 charts the price of rice on Dhaka's wholesale markets, the average price of rice in local markets as measured by FSNSP, and the relative price of South Asian rice in international markets (41; 42; 43; 44). Bangladesh experienced a general increase in rice prices from August 2009 until December 2010, followed by a slow reduction in prices during all of 2011 and continuing until June of 2012. During the periods in 2010 and 2011 in which both data sources are available, there was a close congruence between the wholesale rate and local market prices, with a sharp increase in the cost of rice evident in

4. 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, bananas, and sugar.
5. In addition to these items, sugar was only available in 95% of the markets in the Eastern hills in contrast to 99% of the markets nationally.

late 2009 and again in mid 2010. While the average local price of rice was 29 BDT in January-April 2010, it had risen 25% to 35 BDT by February-April 2011. However, sharp increases and decreases in national rice rates appear not to have been closely mirrored in international markets, unlike the 2008 food price crisis. Notably, the international price of rice continued to increase throughout early 2011, as the price was declining in Bangladesh. In contrast, throughout this period, Dhaka wholesale rates closely matched those in Kolkata when United States dollars to the metric ton is used as the unit of comparison (45).

Notably, the price of rice in the country as a whole was greatest during Round 4, the first round of data collection in 2011. These high prices no doubt impacted household perceptions of their access to food. The fall in rice prices during 2011 and the fact that the national, local market rice rate in 2011 was lower than the wholesale rate in Dhaka could be due to the Government's Open Market Sale (OMS), which disbursed 1.2 metric tons of rice at the rate of 24 taka a kilo from January 1, 2011 (46). This system is self-targeted, in that any person in Bangladesh can buy up to five kilograms of rice each day the sale is open at the set price. However, due to the time costs and coarse rice sold, the better off do not largely avail of this service. OMS rice was procured through import in order to avoid further price inflation in rural areas (35; 47). The Government of Bangladesh was much more prepared for this spike in prices than it had been for the 2008 increase (48). Additionally, by focusing on OMS rice using imported grains, the system was better able to supplement rural production and the other social safety nets that exist in Bangladesh and have beneficiaries predominantly in rural areas, such as the Vulnerable Group Development (VGD) and Vulnerable Group Feeding (VGF) programmes (48).

Figure 4.5 : **Seasonal variation in mean food price and daily labour wages**



Over the past two years, FSNSP has tracked the average price of several food commodities in local markets nationwide and the average wage rates earned by one of the most vulnerable populations in the country day labourers. Market prices of food commodities are collected from markets in every community. The cost of the average per-capita, daily amount of each item, as reported in the *Report of the Household Income & Expenditure Survey (HIES): 2010* (39), is added together to create the price of the average daily per capita Bangladeshi food consumption basket.[6] Two food baskets were constructed in 2011: one whose items match the commodities food baskets used in the 2010 report with the amounts updated using 2010 HIES and another that includes all items in the HIES report.[7] The method of calculating labour wage rates was refined between 2010 and 2011. In 2011, all households that reported that one or more

6. See page 48 of *HIES report: 2010*
7. The commodities food basket includes rice, wheat flour, lentils, and oil, while the full basket also includes potatos, milk, flesh foods (beef, chicken, and fish), eggs, onion, chili, fruit (bananas), sugar (refined and unrefined), and vegetables (leafy and non-leafy). For all items the cheapest variety available is recorded. In order to estimate the price of the food basket in areas where one or more items was not available for purchase on the date of data collection, values for missing items were imputed. If a food basket was missing five items or less (out of 19 items in the index), the mean price of the missing items in the division for that round of surveillance was substituted for the missing values. Around 20% of markets were missing one or more items, but less than 1% of markets were missing more than five items.

member worked for a daily wage in the month prior to the interview were asked about the cash wage a male and female household member received on the last day worked.

Figure 4.6 : **Cost of items in the average basket by season**

Figure 4.5 displays seasonal variations in the average costs of the two food baskets as well as the wage rates for men and women. Clearly, diets in Bangladesh are greatly dependent on commodities, and the commodity portion of the food basket contained around half of the total cost of food, though this proportion shrank over the year as a whole as the price of rice fell. Interestingly, the cost of an average Bangladeshi daily per capita commodity basket had returned to below January-April 2010 levels (18.1 taka) by Round 5 in June-August 2011.

The components of the food basket over the seasons of 2011 are further detailed in Figure 4.6. It is not clear if the variation seen in this graph is a normal seasonal pattern or a pattern unique to 2011. Notably the cost of onion and green chillies increased significantly and the cost of vegetables and milk increased slightly. While the overwhelmingly most expensive item in the average food basket was rice, this was followed distantly by fish, beef, and chicken. Comparing the costs of this basket to the one used in the 2010 report, which was based on the 2005 HIES, indicates that households in Bangladesh are now demanding more expensive food on average. The average cost of the 2005 food basket was 35.2 taka in comparison to 36.6 taka for the 2010 basket.

Also, apparent from Figure 4.5, women's daily wage rates are half that of men's. This difference is greater than has been reported elsewhere (35; 47), but this difference is most likely due to both differences in the spread of the FSNSP sample and the types of day labourers included in this assessment. FSNSP does not record any non-cash/in-kind component of the wage, such as rice or other food items, and these in-kind components of wage can be sizable. Additionally, FSNSP asks households throughout the country about their wage from any source, unlike other statistical systems that limit the review to particular industries or to more urban sections of the country (49). As such, it is likely that the labour for which men and women reported working is somewhat different and this may account for some of the difference in wage rates. For example, earth-moving, a more highly paid non-skilled job, likely makes up a larger portion of work for which men were paid compared to women, while household chores, generally poorly paid, likely make up a larger portion of work for which women were paid compared to men.

Figure 4.7 : **Ratio of daily wages to the cost of the average food basket**

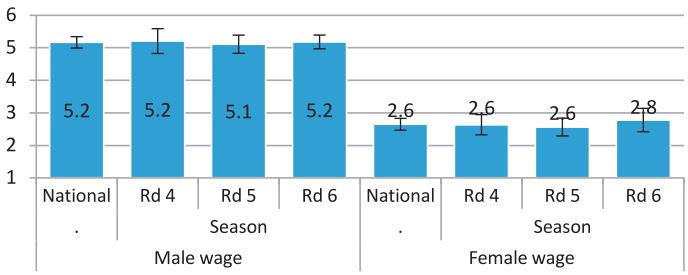
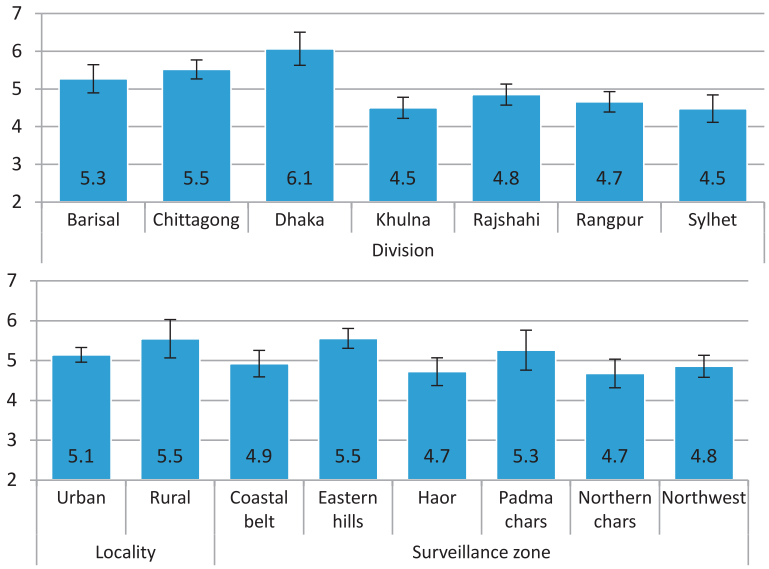


Figure 4.7 examines these figures as a ratio between the male and female daily wage rates and the cost of food. By both wage rates, the food-purchasing power of the daily wage stayed largely the same over the course of 2011, though falling slightly in the monsoon period (Round 5). This change is somewhat in line with longer term trends; since 2009 the ratio of wages to the price of rice has risen over 5% annually (three year moving average), and the wage to commodities food basket ratio increased from 9.4 to 11.1 for male earners in 2011 (35). However, this ratio also indicates the extent to which daily labour wage rates were inadequate in assuring optimal nutrition and health. Male wage rates do cover 116% of the cost of an average diet for a family of 4.5 members, which was the average size of households dependent on day labour in 2011, but only if the income earner is able to find work every day. In contrast, a household reliant on women's day labour wages can only afford around 72% of an average household's food needs in spite of a smaller average household size (3.6 members).

Figure 4.8 : **Ratio of male daily labour wages to the price of the average food basket**



Divisionally, wage rates and the average food basket cost are higher along the south-western coast and centre of the country. The price of both a kilogram of rice and average commodity food basket was highest in Dhaka division (32.8 taka and 18.2 taka, respectively). There was a significant difference in the price of rice between urban and rural areas but only a minor difference in the cost of the average food basket.

Figure 4.8 displays the variation in the ratio of male wages to the price of the commodity food basket across the regions of Bangladesh. Purchasing power appears to be greater in Barisal, Chittagong, and Dhaka than in the other divisions of the country. Rural daily wage labour appears to have had slightly more purchasing power than urban daily labour, but the difference was not significant.

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 before the interview. Food insecurity results in a typical range of responses independent of whether the episode of food insecurity is chronic or acute, or whether it is due to low availability of food stocks, a household's

limited access due to poverty, or inequitable utilisation within the household. 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 (50). 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 before the interview.

Figure 4.9: **Households reporting behaviours linked to food insecurity during the month prior to interview**

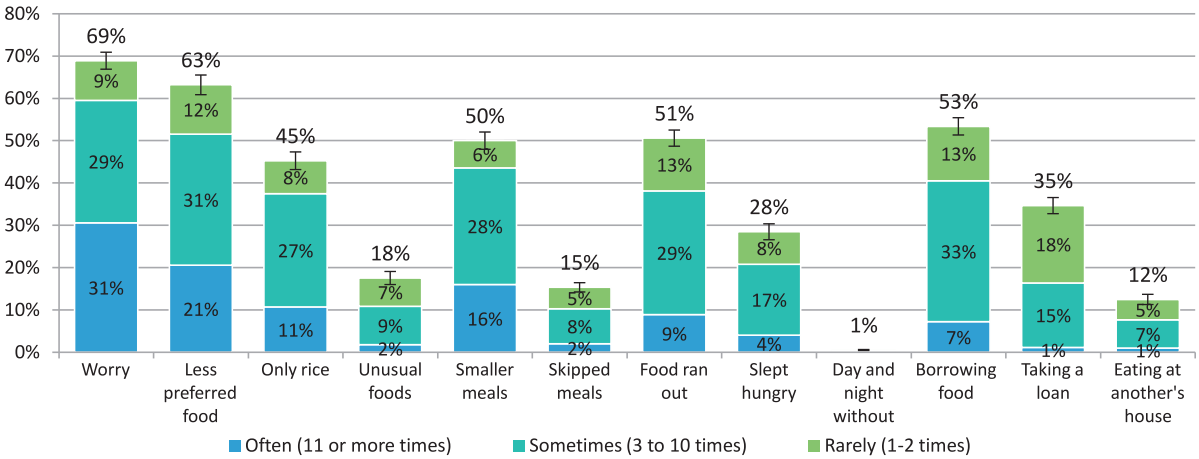


Figure 4.9 displays the national prevalence of selected behaviours in the month prior to interview averaged over all surveillance rounds of 2011. The overall height of the bars with the confidence interval indicates the proportion of households in which any member practiced the selected behaviour one or more times during the month long recall period. The shaded segments inside the bars without confidence intervals are estimates of the proportion of households who practiced the behaviour with a given frequency. Using the first bar as an example of how to read this graph: In 2011, an estimated 69%, or 67%, to 71% of household food managers worried about obtaining enough food, either immediately or sometime in the future, but for approximately 9% of these individuals the episode of worry was brief and only experienced once or twice during the month-long recall period. Additionally, around 29% of household food managers worried about procuring adequate food 3 to 10 times or around 10-30% of the month, a sizable problem. The remaining 31% of households had persistent and sustained worry about food provisioning, reporting worrying about food more than a third of the time. In this way, though over two-thirds of households experienced worry, this does not indicate that this was the regular condition for this entire group. The remainder of this section will tie these indicators to the types of responses to food insecurity listed in italics above.

There are two questions which capture the extent of household *uncertainty* or *anxiety* over food: 1.) worry about the amount of or source of food for the household, and 2.) food stored in the house ran out and there was no money to buy more that day. Worry can be either acute worry about not being able to

obtain food in the immediate future or long term, such as worrying about obtaining food if a shock occurs. The proportion of households which reported experiencing worry is detailed above. In addition, slightly over half of households completely ran out of food stocks and had been unable to purchase more that day at least once in the month before the interview. Food running out included instances where there was not money to buy more food that day, but food could be borrowed or taken on credit; this indicator did not imply that households had to go without food. Furthermore, a frequent lack of sufficient food or cash in the house with which food could be purchased was only experienced by around one-tenth of households nationally. These are likely the hardcore poor.

Three questions elicit the household food manager's perceptions of how food insecurity has affected the *quality* of food eaten by one or more household members in the month before the interview: 1.) inability to eat preferred foods such as whole instead of broken rice or vegetables instead of fish; 2.) meals limited to only rice or to rice and spices (chilli, salt, and onions); and 3.) eating foods that are usually not eaten such as water lily or small game. For all these questions, responses were only coded if the reason for the change in behaviour was a household food shortage. While almost two-thirds of households reported eating less preferred foods, only around one-fifth of households had to eat less preferred foods frequently and only just over one-tenth of households had to resort to eating less preferred foods once or twice. Nearly half of households contained a member or several members who were reduced to eating a meal of only rice, but only one-tenth of households resorted to this consumption practice often. The consumption of unusual foods was quite rare with less than one fifth of households reporting this behaviour even once in the past month, and the proportion of households which generally sought out these foods was only 2%.

Insufficient *quantity* of food or *reduction* in the intake of food are assessed through three questions that record if one or more household members has, due to food insecurity in the month before the interview: 1.) eaten a smaller amount of food at any meal time than they felt they needed; 2.) eaten fewer meals than usual (i.e. skipping meals); and 3.) gone day and night without eating. For all these questions, responses were only coded if the reason for the change in behaviour was a household food shortage, and not due to other reasons such as being ill or too busy to eat. Notably, the first behaviour, eating smaller meals, is in comparison to the amount of food the individual feels they need and not in comparison to typical practice; as such it does not imply a recent reduction in meal size but instead insufficiency of meal size. This indicator is the same as asking if the individual was unable to eat a full-stomach meal at any time in the last month. Half of households had members who had eaten insufficient meals in the month prior to interview and 16% of these households experienced this frequently. Far fewer households, only 15%, resorted to having members skip entire meals, and only 2% of households practiced this behaviour frequently. Only 1% of households contained members who had ever had to go the entire day and night without eating.

Only one question examined the *consequences* of inadequate diet in the food security module: the frequency with which any household member had to go to sleep at night hungry, even if they had eaten something before going to bed. Slightly over a quarter of households responded that one or more household members had experienced this in the month prior to the interview, and only 4% of households had experienced this frequently. The physical consequences of an insufficient diet are assessed using anthropometric measures and are reported in later chapters.

The final behavioural response type, resorting to *socially unacceptable* or *unsustainable* means to obtain food, is examined by assessing whether any of three actions occurred in the month before the interview: 1.) directly borrowing food/rice; 2.) taking a loan to purchase food; or 3.) sending household members to eat at others' houses. Of these three behaviours, households borrowing food directly was by far the most common response with over half of households borrowing food at least once in the month prior to interview, however, only 7% of households had to resort to this practice frequently. In contrast, only one third of households reported taking a loan of money to purchase food, and only 1% of these individuals borrowed money eleven times or more. Even less common, around one-tenth of households resorted to sending household members elsewhere to eat, but again only 1% of households practiced this behaviour frequently.

Figure 4.10: **Households reporting behaviours linked to food insecurity among households with children**

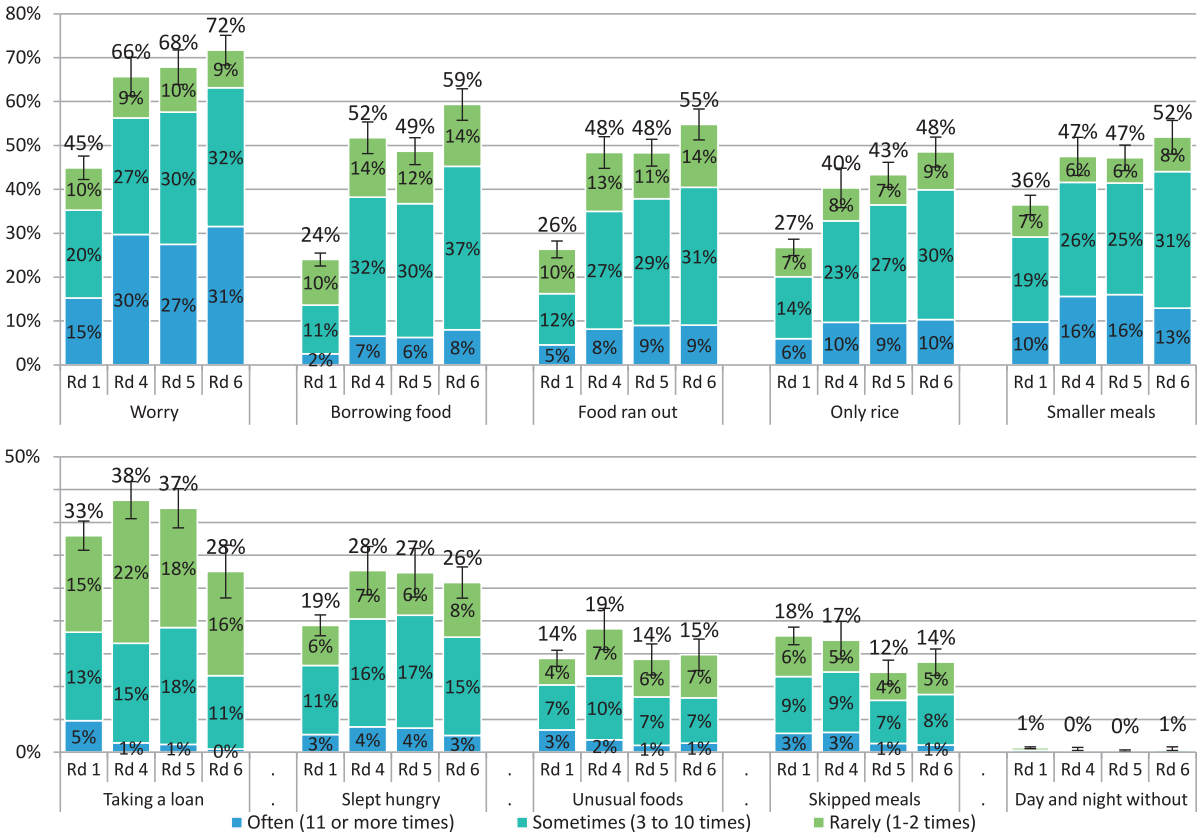


Figure 4.10 presents the proportion of households which reported practicing behaviours linked to food insecurity among households with children less than five years of age, the sub-group which is comparable to those surveyed in the 2010 FSNSP sample.[8] These behaviours are organised from those that were most commonly practiced in 2011 to those least practiced. Compared to 2010, the

8. As mentioned previously in the report and detailed in *State of Food Security and Nutrition in Bangladesh: 2010* (8), in 2010, the FSNSP system limited its surveillance to households with children. As such, comparisons between 2010 and 2011 must be made only including the households with children in 2011.

proportion of households who reported practicing many of these behaviours increased in 2011, but not for the least commonly practiced behaviours which are also often those that are the most severe. Many more households in 2011 experienced worry, or food running out, or borrowing food to make a meal, but fewer households resorted to taking a loan or skipping meals. Notably, in both years, almost no households had members go day and night without food. Interestingly, households with children reported having members skip meals more often than households without children and, conversely, households without children report members eating smaller meals more often than households without children. This difference is probably due to other household members sacrificing their own meal for small children (see Figure 4.22).

In addition, though the proportion of households that experienced these behaviours at least once in the month prior to interview, the proportion of households which frequently experienced these behaviours increased much less. For example, the proportion of households in which any member(s) ate smaller meals than they felt they needed at least once in the past month increased by about 15 percentage points but the proportion of households which frequently ate smaller meals than desired only increased by around 5 percentage points. It should also be noted that households are reactive to prices, basing their behaviour largely on recent events and not on forecasts for the future. As such, even though the prices of commodities fell throughout 2011, there was not a large reduction in the proportion of households which practiced these behaviours linked to food insecurity. This points to the fact that many of these indicators have lagged effects. Without forecast information, households cannot tell if a recent reduction in food costs or increase in wages signifies a long-term change, or is just a short-term variation. As such, because food prices remained higher than 2009 for most of 2011, it is not expected that these indicators would change much until the situation stabilised, as occurred in 2012.

Composite indexes

These responses to food insecurity 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.[9] HFIAS is based on the premise that some coping responses to inadequate food access are more severe than others and indicate a greater level of food insecurity; households are categorised based on the most “severe” coping mechanism they have employed.[10] HFIAS includes indicators that run the gamut from mild household stressors, such as worry about providing food, to severe coping behaviours, such as going day and night without eating. HFIAS includes the first nine indicators in Figure 4.9 with the order of these indicators being the same as their ranking in the HFIAS hierarchy from least

9. This measure is identical to the Household Hunger Score. In Bangladesh, the word hunger translates to a famine condition, and thereby does not accurately reflect the commonly reported items included in this indicator. Since so few individuals report the most severe HFIAS practice, going day and night without eating, the prevalence level of this indicator in Bangladesh is driven by lack of ability to purchase food after household food stocks run out (food running out) and inadequate evening meals (sleeping hungry). These two indicators are more closely related to a severe gap in household food provisioning or a household deficit of food, than to of hunger.

10. HFIAS deems a household food insecure if the food manager has worried about providing food more than twice in the month prior to interview.

to most severe. 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 (23; 22). In contrast, FDS is created from the most severe subset of questions in HFIAS (food running out, sleeping hungry, and day and night without food) and the indicators are not ranked for severity during scoring. FDS has been validated for comparing food access across cultures (23).

Figure 4.11: **Seasonal variation in food insecurity and food deficits among households with children**

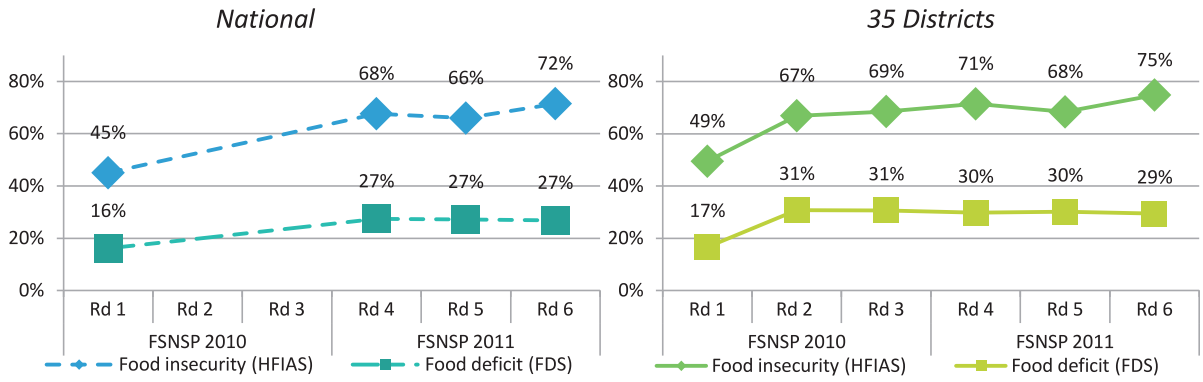
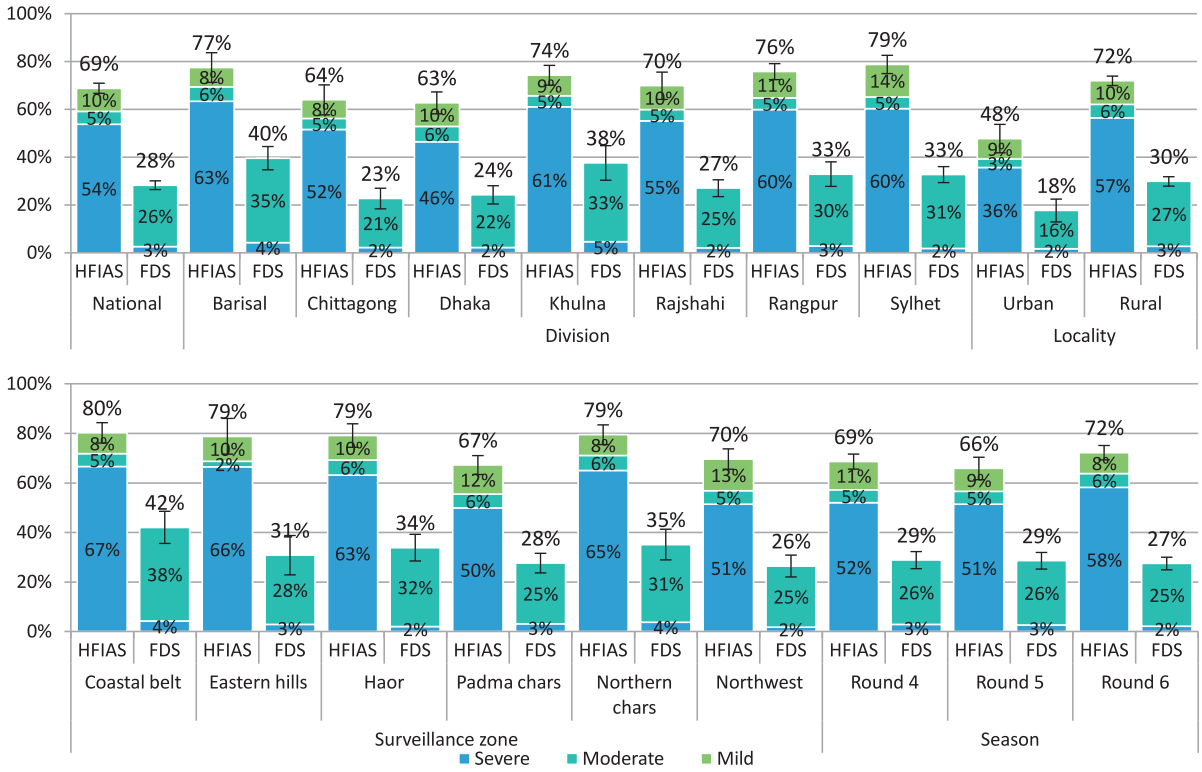


Figure 4.11 displays the seasonal prevalence of food insecurity and gaps in food provisioning among households with children, from the first to the sixth round of FSNSP. In the graph on the left, the dashed lines indicate national estimates (only available from the first round of FSNSP during 2010), while the solid lines in the graph on the right display the estimates from the 35 "food-insecure" districts that were included in all three rounds of data collection in 2010. Notably, the level of food insecurity and households with food deficits in the nation as a whole was very similar to that estimated in 35 districts. Because of this congruence, it can be assumed that the national change in the prevalence of food insecurity and food deficits reported between the fourth round of surveillance (2011) and the first round of surveillance (2010) actually occurred between Rounds 1 and 2 (both in 2010). The proportion of households who are food insecure or have a deficit in food provisioning remained relatively stable over 2011, though the proportion of households with a deficit in food provisioning decreased slightly in the winter of 2011 (Round 6) while the prevalence of overall food insecurity appears to have increased slightly. Furthermore, preliminary results from 2012 indicate that the proportion of households which are food insecure has decreased gradually across the seasons of 2012. By the eighth round of surveillance the level of food deficit approached that seen in 2010.

There were substantial regional variations in levels of food insecurity and food deficits. Food insecurity was significantly lower in the divisions of Chittagong and Dhaka than in the other five divisions. Rates of food insecurity and households with food deficits in rural areas were over 150% greater than the rates in urban areas. Variation in the rates of food insecurity and households with food deficits across the surveillance zones was noticeably less than that across divisions and variation across seasons in 2011 was much less than that observed in 2010. On average, food insecurity and food deficits in the surveillance zones were higher than in the rest of the country, suggesting that FSNSP is successfully targeting more food insecure areas for seasonal surveillance.

Figure 4.12: **Proportion of households food insecure or with deficits by area of residence and season**



The remainder of this section will focus on the prevalence rates for food insecurity (HFIAS) across household characteristics, as the patterns seen are very similar between the food insecurity (HFIAS) and food deficit scales (FDS). Figure 4.13 displays seasonal variation in food insecurity by surveillance zone. In most zones the difference in prevalence rates between seasons was not statistically significant. However, seasonal patterns varied greatly between areas. In the Northwest, there was a decrease in food insecurity in the monsoon season, while in the Eastern hills an increase in levels of food insecurity occurred in the same seasonal period. These differences underline the diverse seasonal and harvest patterns across the country, which are important in predicting when lean periods are experienced.

Figure 4.13: **Regional variation in household food insecurity by season (HFIAS)**

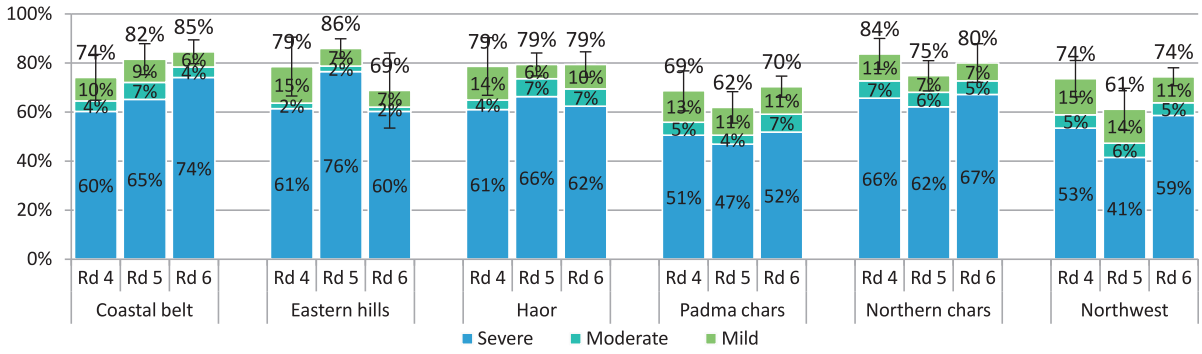
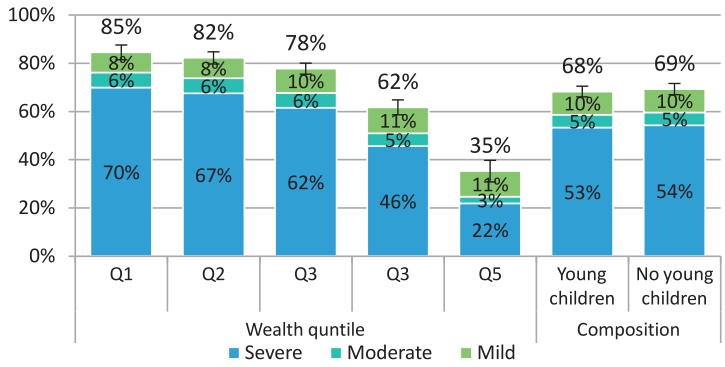


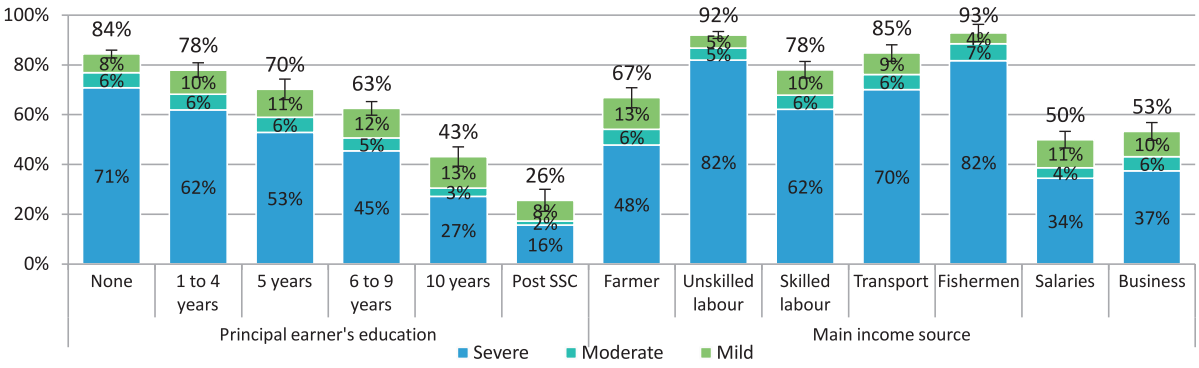
Figure 4.14: **Household food insecurity by household wealth and composition**



Similar to 2010 results, the proportion of food insecure households was much lower in wealthier quintiles in 2011. However, greater levels of food insecurity were noted across all wealth groups compared to 2010. Secondly, unlike 2010, in which the proportion of food insecure households declined steadily as wealth increased, in 2011, high levels of food insecurity were apparent in the poorest three quintiles and considerably lower levels observed in the upper two quintiles.[11] This trend suggests that the rising levels of food insecurity in 2011 have disproportionately affected the middle wealth quintile when food insecurity is measured though respondent reports of coping behaviours. Interestingly, the presence of an under-five child in the household had no impact on the rate of food insecurity either seasonally or annually, suggesting that the food security estimates from FSNSP 2010, which focused only on households with children under five, may have been relatively representative of the nation.

Similar to 2010 results, the proportion of food insecure households was much lower among households with more educated principal income earners in 2011. The relationship between occupational category and food insecurity was similar to that observed in 2010, though the relative difference in food insecurity rates between farmers and those involved in business or salaried work was much smaller in 2011. In 2010, households with unskilled labour as their main income source were food insecure at three times the rate of households earning income from business or salaried work, while in 2011, the difference was less than double.

Figure 4.15: **Household food insecurity by education and main income source of principal income earner**



11. However, a sizable proportion of household in the wealthiest quintile are classified as food insecure based on HFIAS methodology. While this could be due to weaknesses in the measure (HFIAS is strictly based on respondent perceptions and thereby is subject to response bias), it is more likely due to real constraints faced by individuals who have assets but limited income. A wealth index classifies household by the physical and not liquid assets they hold.

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. Poverty and culturally-based food preferences lead households to subsist on diets consisting mainly of rice, which provides an estimated 69% of food energy in Bangladesh but is low in fat, essential amino acids and micronutrients (51; 8). Animal source foods, which furnish high quality protein and bio-available iron and vitamin A, make up less than 2% of total energy intake (52). It is therefore not surprising that a large proportion of the population in Bangladesh suffers from the hidden hunger of micronutrient malnutrition even among those who have attained caloric sufficiency (2).

Beginning in 2011, FSNSP includes the food consumption score (FCS), an indicator developed by the World Food Programme (WFP) to capture the diversity of foods available in the household, thereby measuring household 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 (53).[12] To create the FCS, responses are weighted by a rough approximation of their nutritional content standardised across countries by WFP then summed (24; 54). 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.[13]

Figure 4.16: **Households with poor or borderline food consumption (2009-2011)**

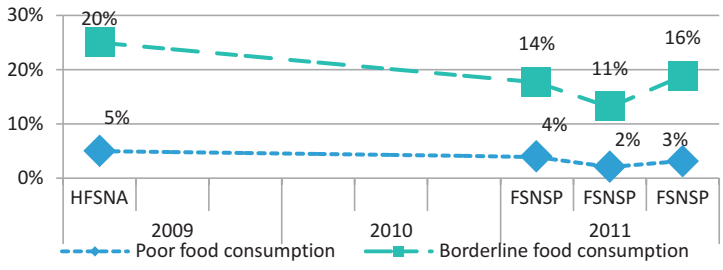


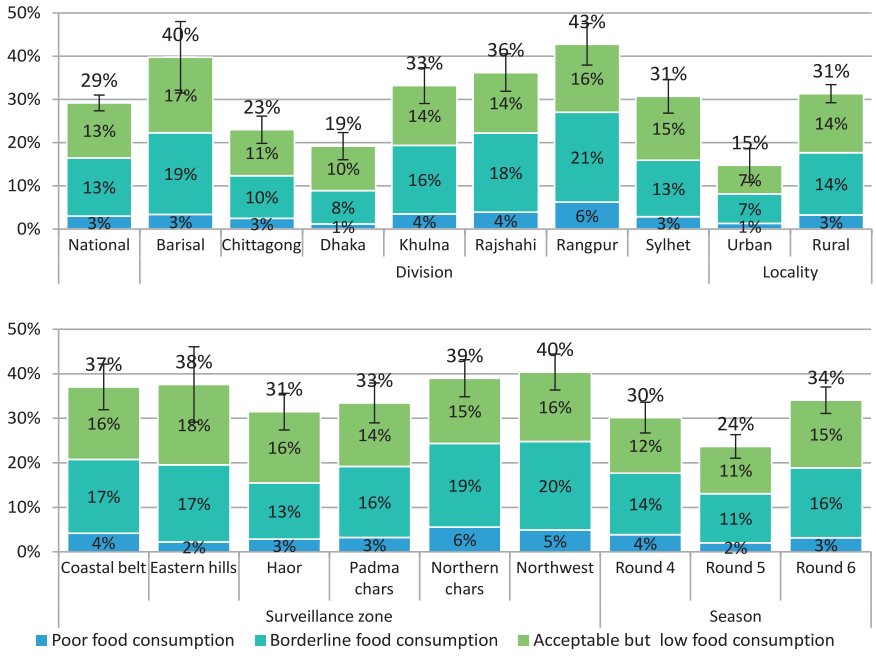
Figure 4.16 compares 2011 estimates of the proportion of households consuming poor and borderline diets to the results of the *Household Food Insecurity and Nutrition Assessment* (HFSNA) from 2009 (24). There is a clear decrease in the proportion of households with unacceptable food consumption patterns from one-quarter of households in 2009 to less than one-fifth in 2011. This pattern fits with observed changes in household diversity as reported through the HIES system (40; 39). However, this reduction was not consistent across all areas of the country (24). There has been little or no change in Barisal, Rajshahi, and Rangpur but a reduction to around half of 2009 rates in Dhaka and Chittagong.

Figure 4.17 depicts regional variation in the proportion of households with sub-optimal diets defined here as a diet categorised here as poor, borderline, and acceptable low. Nationally, around 30% of households consumed sub-optimal diets while Barisal and Rangpur had the highest proportion of

12. These items are included as these food groups do indicate access to a disposable income from which households can purchase food.
13. For FSNSP, cut-offs are drawn from the HFSNA survey (24).

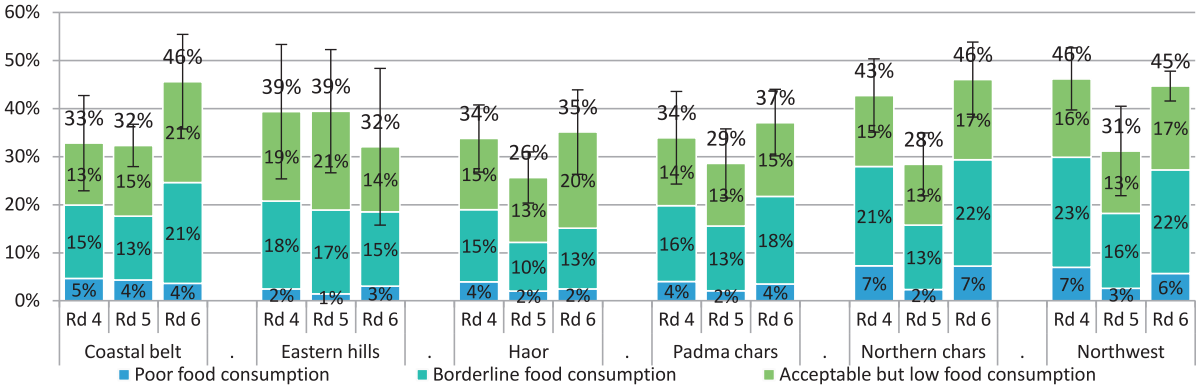
households with limited food consumption. Twice the proportion of households in rural areas had limited diets compared to urban areas. There was very little variation in the rates of households consuming sub-optimal diets across surveillance zones and the proportion of households with sub-optimal diets in these areas was higher than the national average.

Figure 4.17: **Regional variation in proportion of households with limited food consumption**



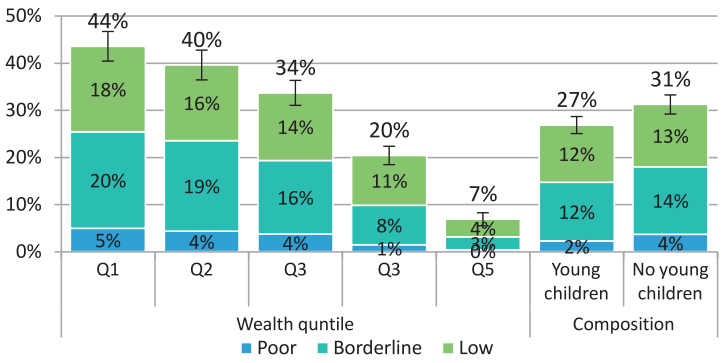
It is likely that some of this variation was indicative of real differences in food insecurity and some of the differences were the result of culturally-based differences in food habits. Even within Bangladesh, some populations eat more varied diets than other groups so that when examined at one time point across regions, these indicators may not indicate differences in food access but instead differences in food habits. For example, Sylhet and Barisal have similar high levels of food insecurity when coping measures are used but much greater variation in the proportion of households with sub-optimal diets. Similarly, Rangpur division, in the heart of the rice growing belt, has the highest proportion of households eating sub-optimal diets but a lower level of food insecurity.

Figure 4.18: **Seasonal and regional variation in proportion of households with limited food consumption**



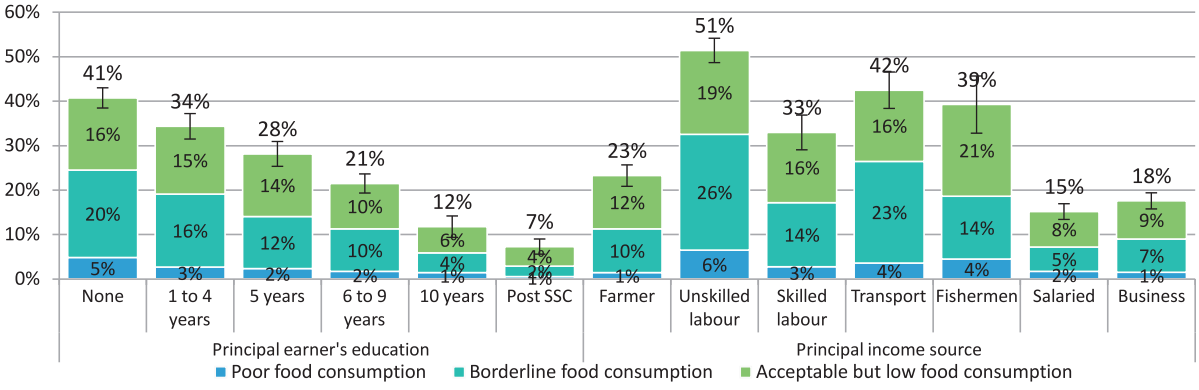
This difference becomes more apparent when this indicator is examined over seasons. Interestingly, the proportion of households with inadequate diets varied much more over the course of 2011 than did food insecurity or household hunger. Additionally, the pattern of change seems to be countercyclical 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 Eastern hills and Coastal belt. 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 (55; 56).

Figure 4.19: **Limited food consumption by household wealth and composition**



There was a stepwise decrease in levels of sub-optimal food consumption with increasing household wealth and educational attainment of the principal income earner (Figure 4.19 & 4.20). Households reliant on income from farming, business, or salaried employment had more diverse diets. However, in contrast to the food security (HFIAS) results, households without children consumed significantly less diverse diets than households with children in each season and annually. This may indicate that better-off households are self selecting to have children or, more likely, that households with children take greater care to provide a more diverse household diet.

Figure 4.20: **Limited food consumption by education of principal income earner and main income source**



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 secure as diet may vary among household members. For example, women and children are typically more food insecure and micronutrient-deficient than men, because societal norms dictate that higher value food, which is often more nutrient rich, be fed first and in greater quantities to men (57; 58). Additionally, 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, FSNSP requests respondents to identify up to five people in the household who practiced that behaviour the last time it was required. This enables the FSNSP system to identify who was disproportionately affected by household food constraints.

Figure 4.21: **Coping strategies by category of household members practicing**

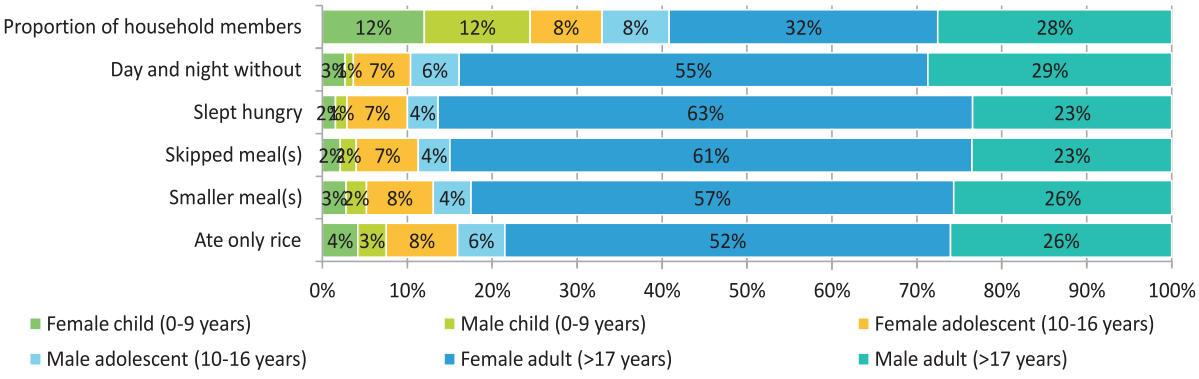
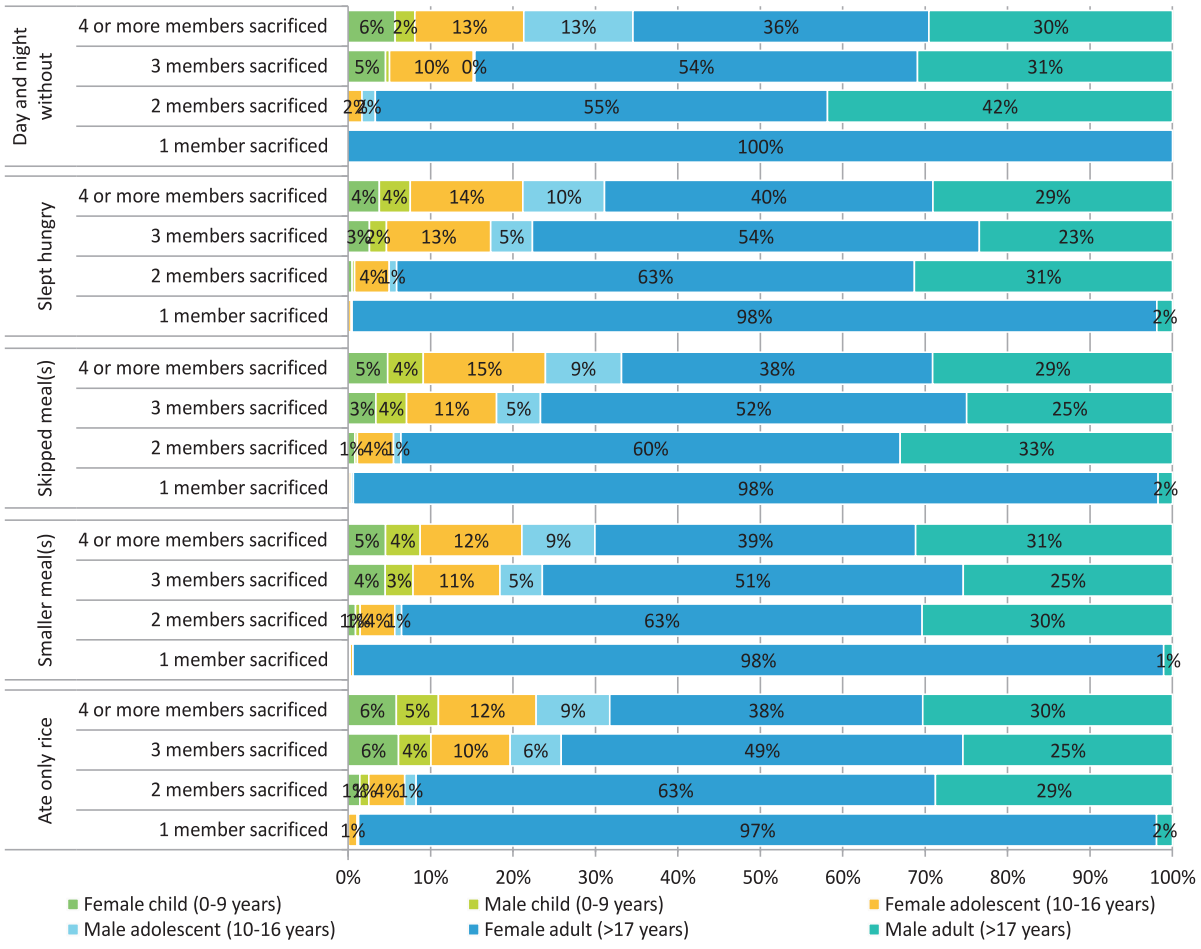


Figure 4.21 displays the proportion of household members by age and sex categories who undertook coping behaviours when the whole household did not reduce consumption. Notably, adults sacrificed their consumption in a much higher proportion than their underlying population proportion, implying that they protected younger individuals in the household. More troublingly, across all age groups, a greater proportion of women and girls sacrificed consumption compared to boys and men.

This pattern is even more apparent in households where only a few members had to reduce or change their consumption practices (Figure 4.22). If only one member of a household reduced consumption, it was virtually 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 3 or more members were affected. Even among children younger than 10 years of age, a much greater proportion of girls than boys changed their eating habits due to food insecurity.

Figure 4.22: **Coping strategies by number and category of household members practicing**



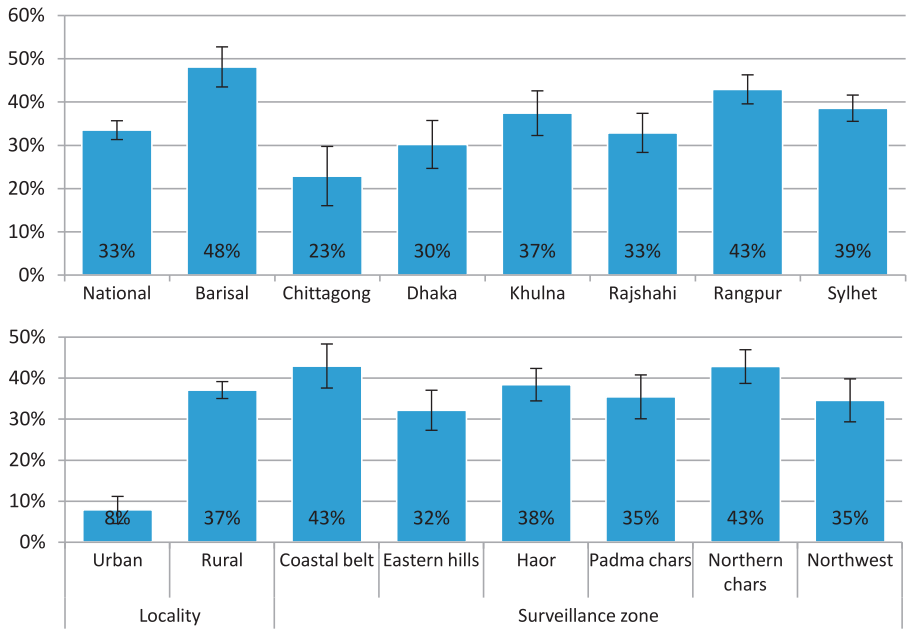
Vulnerability

As noted in the introduction to this section, the final element of food and nutrition security are 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 FSNSP have a short recall period in order to minimise recall bias, however, this short period enables the system to classify households only based on their situation at the time of the interview and not their "regular" food security situation.[14] As such, FSNSP cannot separate the population of the country into those who are food secure at the time of interview but food insecure seasonally or vulnerable to food insecurity when shocks occur.

14. Additionally, FSNSP does not revisit households due to concerns of response bias.

However, FSNSP is able to separate out groups that are more vulnerable to food insecurity based on occupational, educational, and wealth characteristics, as has been done throughout this chapter. In addition, starting in Round 5, FSNSP recorded if households had received a cash benefit from any governmental social safety net programme in the past six months.[15] 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 (59; 60).

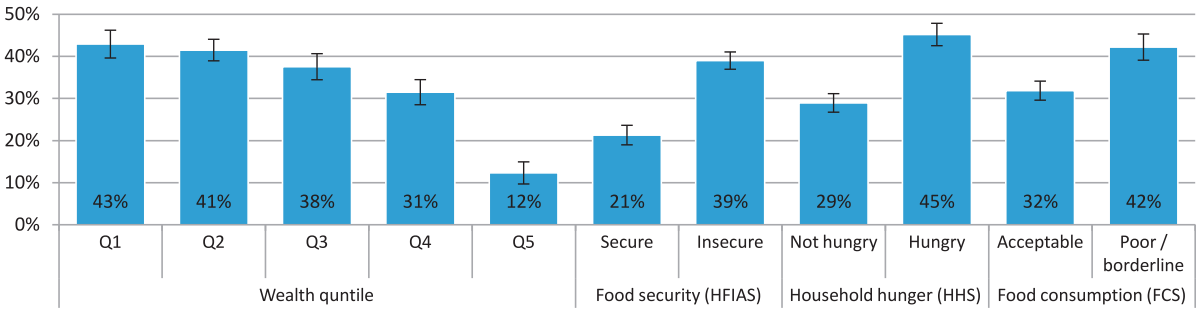
Figure 4.23: **Households who received cash from a social safety net programme by area of residence**



Encouragingly, one-third of households in Bangladesh reported receiving a cash benefit from a social safety net programme (Figure 4.23); the vast majority from the cash for education programme (27%) followed by the Old Age Allowance programme (5%). Interestingly, the proportion of households reporting access to social safety net programmes is greater than reported in the 2010 HIES where 25% received support from any social safety net, with 19% having received cash for education and 16% having received Old Age Allowance. This difference is likely due the fact that FSNSP only includes households containing women 10 to 49 years of age or children in its sample, leading to an increased proportion of households with school age children, thereby eligible for the Cash for Education programme, and a decreased proportion of households with older adults without other means of support, thereby fewer households eligible for the Old Age Allowance programme. Overall, a greater proportion of households in rural areas reported receiving benefits than in urban areas. This is expected as the Cash for Education programme targets poor, rural households in less wealthy areas of the country. Furthermore, households that are less wealthy and more food insecure, reported receiving cash benefits from a programme in a greater proportion than wealthier and food secure households (Figure 4.24).

15. FSNSP does not ask about any in-kind benefit programmes.

Figure 4.24: **Households who received cash from a social safety net programme by household characteristics**



Nutrition of Women and Adolescent Girls

In 2011, FSNSP interviewed and measured 27,073 women and girls aged 10 to 49 years throughout Bangladesh, providing the first ever nationally representative estimates of nutritional status and dietary patterns for women and adolescent girls

Between 2010 and 2011, consumption levels increased dramatically for sugar and dairy. In contrast, consumption of red, orange, or yellow (ROY) fruits and vegetables – those richest in vitamin A – fell dramatically

Over 60% of women consumed diets which did not provide adequate micro and/or macro nutrients. In the poorest wealth quintile, three out of four women att inadequately diverse diets

Nationally, 32% of adolescent girls were short for their ages and 12% were severely or moderately thin. Adolescent nutritional outcomes did not vary greatly over wealth category or area of residence, indicating similarly poor care for adolescent girls in diverse settings

Overweight is an escalating problem, with more women overweight than underweight nationally, and nearly half of adult women overweight in urban areas

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. Since FSNSP cannot feasibly monitor the nutrition security of all people in Bangladesh, the system quantifies the nutrition security of adults through the inclusion of one women from each 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 (58). Moreover, adolescents and women of reproductive age are a well studied population, for whom many standardised indicators have been developed, allowing comparisons across countries. Additionally, women's nutrition is important because it is closely linked to child nutrition and health outcomes; even before pregnancy takes place, woman's nutritional status and micronutrient stores can have a large impact on the health and well being of her future children. This chapter focuses on women's diet and nutritional status as a proxy for adult household members who are more vulnerable to food and nutrition insecurity, while women in their reproductive role will be covered in the next chapter.

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, FSNSP collects data on women's dietary habits and measures their height, weight, and Mid-upper Arm Circumference (MUAC). In 2011, FSNSP interviewed and measured over 27,000 women and girls aged 10 to 49 years throughout Bangladesh.

Table 5.1 : Women interviewed and measured by age

Age group in years	Interviewed		Measured (BMI)	
	Number	Weighted proportion	Number	Weighted proportion
10 to 14	1,887	10%	1,869	10%
15 to 19	4,499	19%	3,810	18%
20 to 24	5,593	18%	4,750	17%
25 to 29	5,313	16%	4,773	16%
30 to 34	3,659	13%	3,442	13%
35 to 39	2,729	11%	2,649	12%
40 to 44	2,062	9%	2,038	9%
45 to 49	1,331	5%	1,328	5%

This report provides the first ever nationwide estimates of the nutritional status and dietary patterns for two categories of women: adolescent girls, aged 10 to 18, and adult women, aged 19 to 49.[1] This information supplements the maternal indicators included in the 2010 report and covered in Chapter 6 of this report. As shown in Table 5.1, and consistent with recent BDHS reports, the sample distribution is uneven across age groups (26), with fewer women identified at both the upper and lower end of the age range. To enable comparisons between FSNSP and past survey results among slightly different populations of women, results for corresponding sub-groups of women are presented.

1. While the 2010 report and past BDHS and BBS reports have tracked the nutritional status of mothers (women with a child under five years of age) and the BDHS system currently records the nutritional status of ever-married women, FSNSP in 2011 is the first national system to record the nutritional status and dietary patterns of all women and adolescent girls 10 to 49 years of age.

Dietary assessment

In each household, one woman between the ages of 10 to 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 17 pre-coded food types (61; 62). These 17 food types 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 fizzy drinks or soda (63). This enables FSNSP to observe dietary patterns and estimate the quality and adequacy of women's diets in Bangladesh.

Dietary patterns and diversity

Figure 5.1 presents the proportion of all women who ate any items from the 17 food types by division. Though typical rural diets in Bangladesh are rice based and largely lack diversity, sizable differences in consumption patterns exist across divisions. In line with 2010 findings, the tea-producing areas of Chittagong and Sylhet had the highest levels of beverage consumption and items from the dairy and sugar food groups. Small fish were consumed by a greater proportion of the female population in Sylhet than in the rest of the country while consumption of large fish and other flesh foods and lentils were much more prevalent in Dhaka, Chittagong, and Khulna. Overall, diets were most monotonous in the "rice belt" that stretches through Rangpur and Rajshahi.

Figure 5.1 : **Divisional variation in dietary patterns**

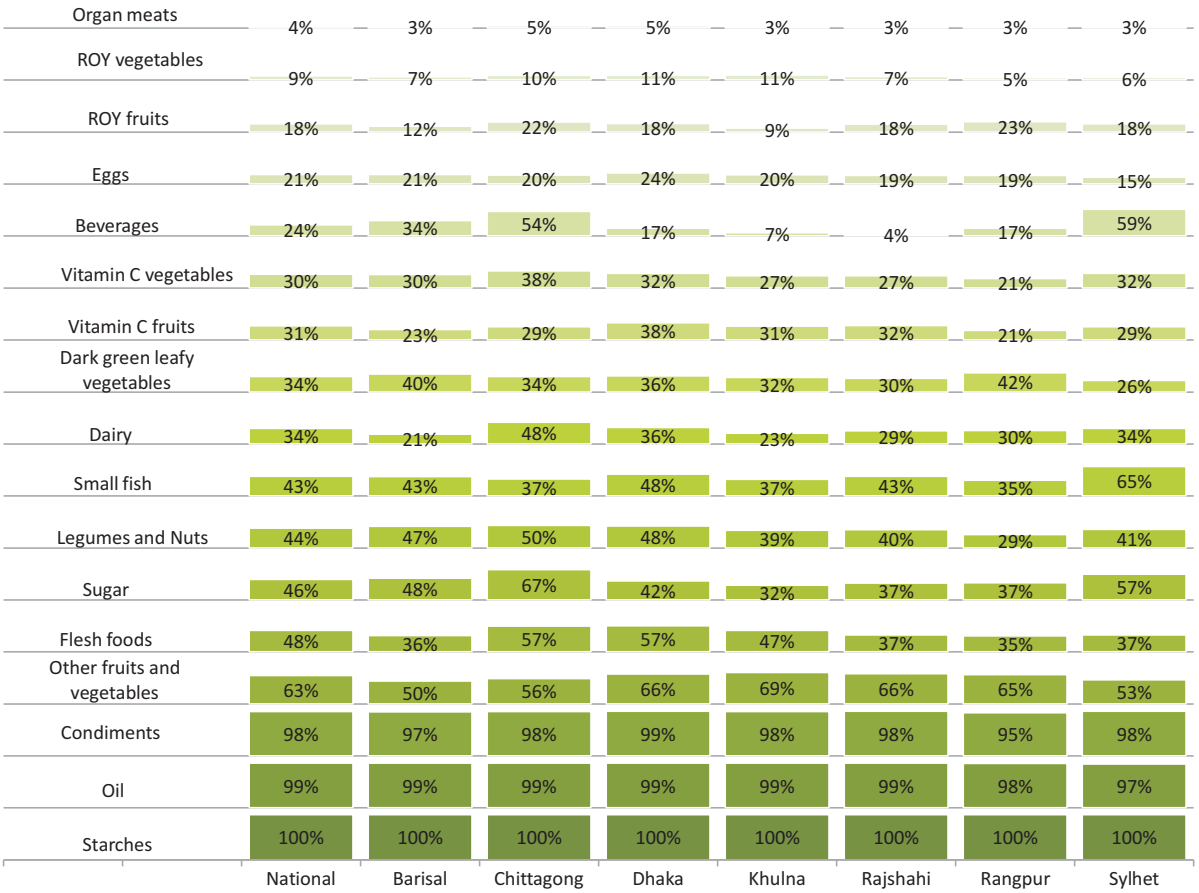


Figure 5.1, which includes all women aged 10-49, differs from Figure 32 in the 2010 report which assessed dietary variations only among mothers of children under five. Comparisons for mothers of children under five years of age across the two years of surveillance are provided in Figure 5.2 for all food groups included in both years and eaten by less than 90% of mothers. Between 2010 and 2011, consumption levels rose for sugar, dairy, and small animal protein excluding small fish. In contrast, consumption of red, orange, or yellow (ROY) fruits and vegetables rich in vitamin A fell dramatically and the proportion of mothers eating small fish decreased slightly.

Figure 5.2 : **Variation in maternal diets between January to April 2010 and February to April 2011**

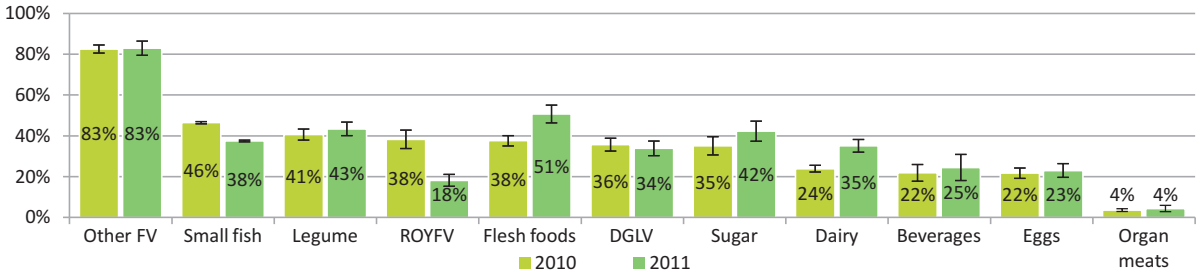
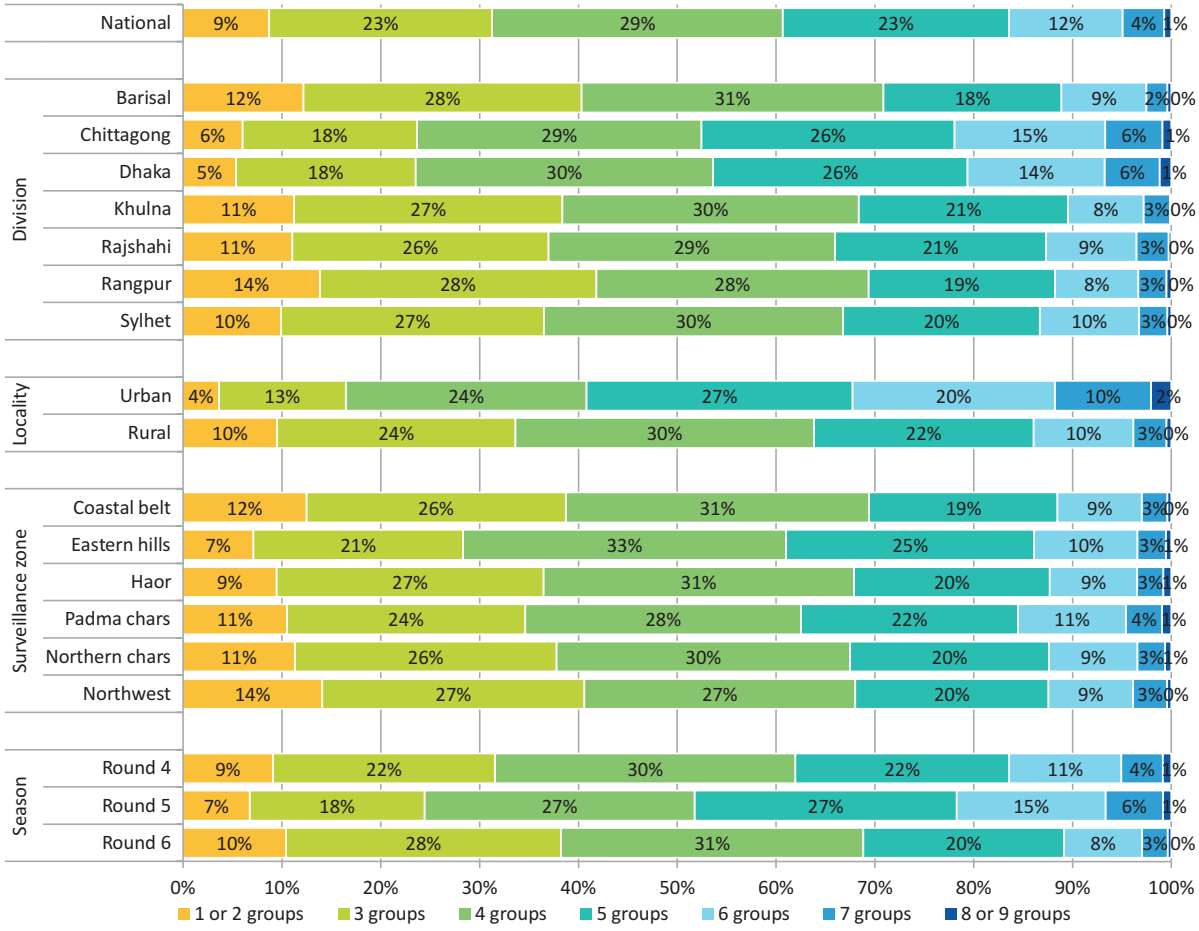


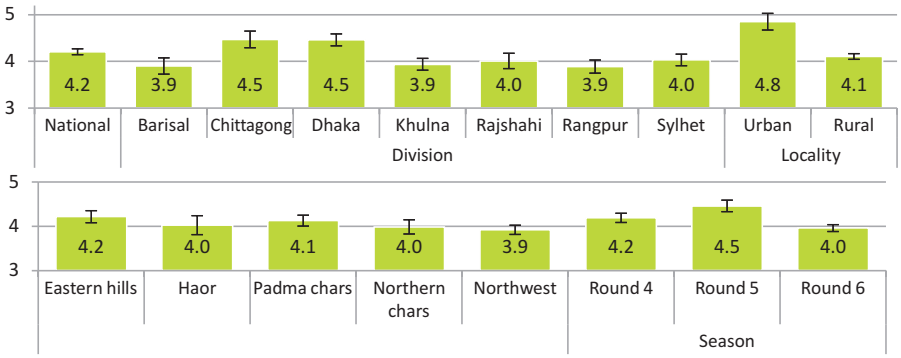
Figure 5.3 : **Regional variation in dietary diversity scores**



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 (61; 62; 64; 63). This measure of dietary diversity is derived by clustering the 17 questionnaire food types into a nine-item scale that has been validated for women in Bangladesh and was developed to ascertain the quality of a woman's diet in light of her nutritional needs (61). 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.

Figure 5.3 displays the distribution of dietary diversity scores among all women and adolescent girls nationally, regionally, and seasonally. Nationally, the greatest number of respondents (29%) report having consumed four food groups on the day before the interview with a greater number of women consuming more than four food groups than those consuming less than four food groups. Divisionally, women in Chittagong and Dhaka stand out for having diets more diverse than other areas, with half the proportion of women eating diets of only one or two food groups in these divisions than in the rest of the country. Urban women consumed a diet much more diverse than rural women, and only in urban areas did a plurality of women consume five food groups. Among the surveillance zones, women consumed slightly more diverse diets in the Eastern hills and Padma chars. Seasonally, the pattern is similar to the household food consumption score with more diverse diets consumed during the monsoon period.

Figure 5.4: **Regional variation in mean dietary diversity scores**



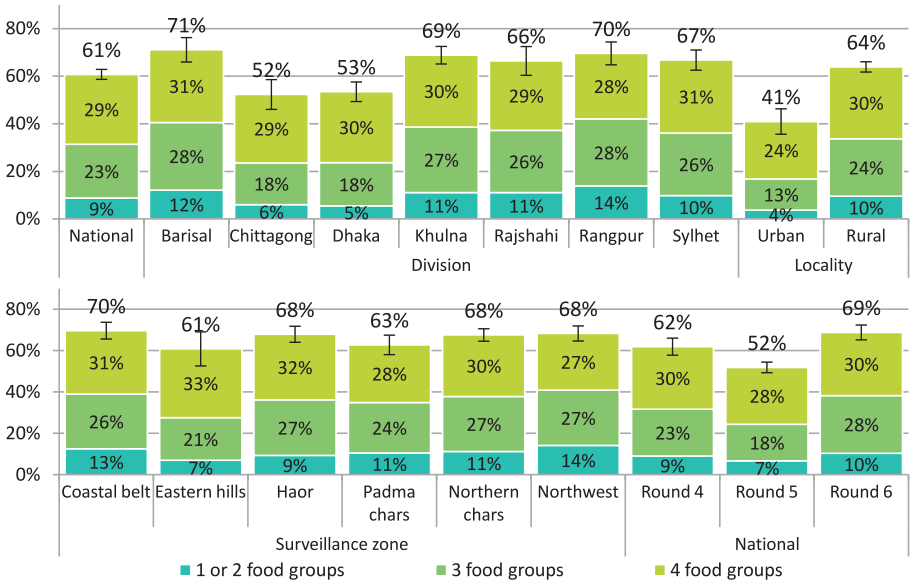
Regional differences in eating patterns remain apparent when dietary diversity is expressed as an average score (Figure 54). Chittagong and Dhaka have the highest average score, while the other divisions are around a half of a food group lower. The mean dietary diversity score of urban areas is nearly a whole food group higher than that of rural areas, and the dietary diversity scores of the surveillance zones are in line with the national average for rural areas.

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 of an average woman. Given the extent of micronutrient inadequacy in women's diets in Bangladesh, FANTA-2 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* (61).[2] FSNSP employs the FANTA-2 cut-off of fewer than five food groups as indicating a diet inadequate in micro- and/or macronutrients. 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 to girls less than 15 years of age.

Figure 5.5: **Women consuming inadequately diverse diets by residence**



Since the cut-off value is greater than the average number of food groups women consumed, it is not surprising that the majority of women in Bangladesh were eating inadequate diets. The proportion of women with inadequate diets appears to have stayed the same or decreased very slightly between 2010 and 2011. In 2010, 62% of non-pregnant mothers ate inadequately diverse diets while the proportion was 60% in 2011.[3] Women's dietary diversity in Chittagong and Dhaka was better than in other divisions, but even in these divisions around half of women consumed insufficiently diverse diets. The lowest rates of dietary inadequacy were reported in urban areas. Across surveillance zones, little variation was apparent and estimates were in line with the rural average.

While there appears to be a relationship between dietary inadequacy and season, it is unclear if this difference is due to real seasonal differences in the micronutrient content of diets that women were really eating better in the monsoon season or if this difference is due to shortfalls in the measure whereby the relationship between dietary diversity and dietary adequacy changed as seasonal diet patterns changed. However, as this measure of dietary inadequacy was validated over two seasons, and differences in the relationship between the measure and dietary adequacy between seasons was not found, it is more likely that the inadequacy of diets varies by season.[4] Diets may have improved during the monsoon due to changes in regular consumption patterns associated with the Ramadan

2. Because the overall micronutrient adequacy of women's diets was so poor in the FANTA-2 data set, the report was unable to identify a dietary diversity score above which dietary sufficiency was likely.
3. In 2010, FSNSP only collected information on the dietary habits of mothers of children under five years of age. As such, comparisons between 2010 and 2011 can only be made for this demographic.
4. The evaluation study utilised data from two seasonal periods (June-September and October to December), which align well with the FSNSP data collection rounds .

period such as the increased consumption of rich foods and/or the in greater variety of fruits, such as mangos, which are available during the monsoon. Additionally, households may diversify diets in the monsoon period to ensure that rice stores last until the next harvest, thereby increasing the micronutrient content of their diets.

Figure 5.6 : **Variation in the proportion of women consuming inadequate diets by season and zone**

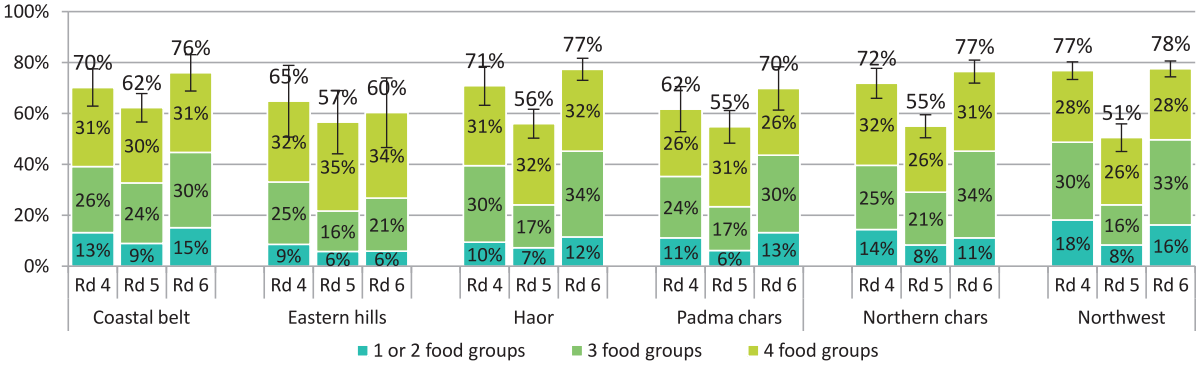
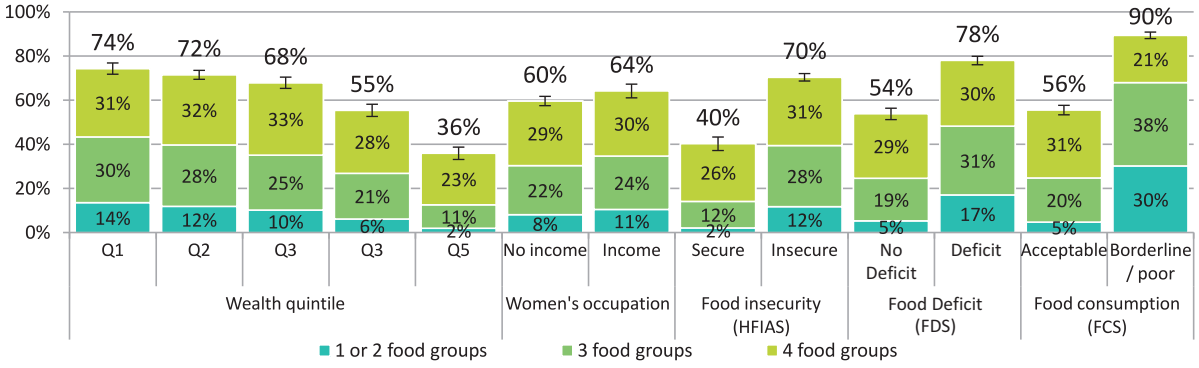


Figure 5.7 : **Proportion of women consuming inadequate diets by household wealth and food security status**



Consumption of inadequate diets was less common among women from households with greater wealth and better food security. However, even among the wealthiest households, over one-third of women consumed inadequate diets, underlying the need for intensified nutrition education activities nationwide. A strikingly large proportion of women from food insecure and food deficit households only consumed one or two food groups (12 and 17% respectively). For households with poor and borderline food consumption habits, almost one-third of women fell into this group. Notably, comparing 2010 and 2011, the proportion of mothers who ate adequate diets improved slightly only among those in food secure households (HFIAS, food secure: 52% to 42%; FDS, no deficit: 59% to 54%). There were no significant differences in women's dietary diversity by age group or motherhood status, however women earning income ate less diverse diets (64% inadequate) than women not earning income (60% inadequate). This is indicative of the nature of women's income earning in Bangladesh, where women are largely precluded from income earning unless there is economic need.

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 is different in rationale and methodology for the two populations. In the adolescent period, 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 directly. Additional details of the differences in these methods and their implications are described below.

Height of women and girls

Nutritional status indicators based on height are useful in capturing past 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 (65). 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 (65; 66).

Table 5.2: 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 the pattern of growth in a well-nourished population	Severely undernourished	Height-for-age z-score less than -3 S.D.
		Moderately undernourished	Height-for-age z-score less than -2 S.D. but greater than or equal to -3 S.D.
		Globally undernourished	Height-for-age z-score less than -2 S.D.
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 145cm

For girls, assessment of height is based on growth curves from the World Health Organization's 2007 growth reference for school aged children (67; 68). This reference is 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 inter-uterine growth restriction. FSNSP uses a cut-off of

145 cm since that is the benchmark used by the DHS system (69).[5] These methodologies result 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 5.2.

Figure 5.8: **Nutritional status of adolescent girls by height measures**

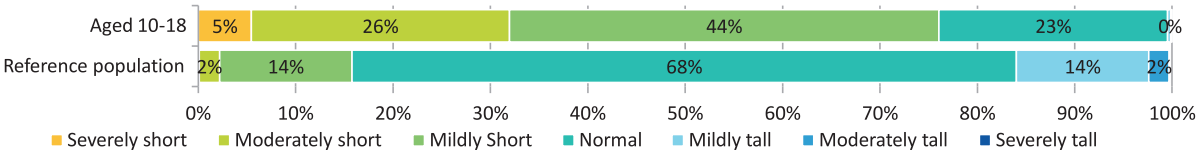
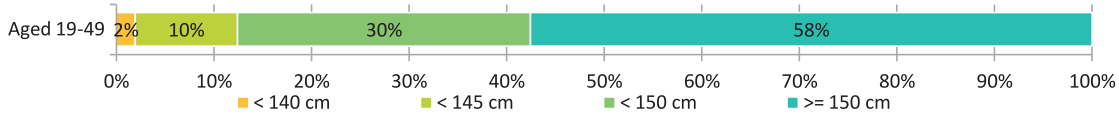


Figure 5.9: **Nutritional status of women by height measures**



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, almost one-third of adolescent girls are short for their age while only a little over one-tenth of adult women are at risk of difficulties during delivery or having low birth weight babies due to small stature. Figure 5.8 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, 5% of adolescent girls were severely short for their ages while 0% would be expected in a well-nourished population, and over a quarter were moderately short for their ages, 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, while 16% of the population should fall into these groups in a well- nourished population. For adult women, there is no “ideal” height structure; however, the proportion of women under 150 cm should approach 0%. For adult women in Bangladesh, 2% of the population was shorter than 140cm and around two-fifths of the population fell between 140 and 150 cm in height (Figure 5.9). Almost three in five women in the country were tall enough to experience no increased risk at delivery, and women's average height was nearly 151cm.

Over the past seven years there has been a very limited reduction in the proportion of ever-married women, or women who have been married at least once in their lives regardless of their current situation,[6] whose height is below 145 cm; the average height of ever-married women has changed by less than half a centimetre between 2004-2011 (graph not shown) (70; 26). Across divisions and zones there is very little variation in the proportion of women at risk during delivery due to small stature, but greater variation in the proportion of adolescents who are too short for their ages. Sylhet stands out with higher rates of adolescent stunting than the rest of the country, while Khulna contains a much

5. Due to the use of these two internationally standardised methodologies which measure different phenomenon, 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, because she has almost certainly suffered from malnutrition related growth retardation during her childhood (z-score<-2SD from the mean), among 19 year olds, her height would fall into the normal range because this woman's growth retardation was not so severe as to cause an increased risk during delivery (see).

6. This comparison group has been used because it is the population group targeted by the DHS system.

lower proportion of short adolescent girls, along with Chittagong and Barisal. Interestingly, the proportion of girls short for their age shows no difference between rural and urban areas unlike most other indicators included in this report. Between surveillance zones, only the Haor basin stands out for having very high levels of both stunted adolescent girls and adult women at risk.

Figure 5.10 : **Indicators of inadequate height by area of residence** [7]

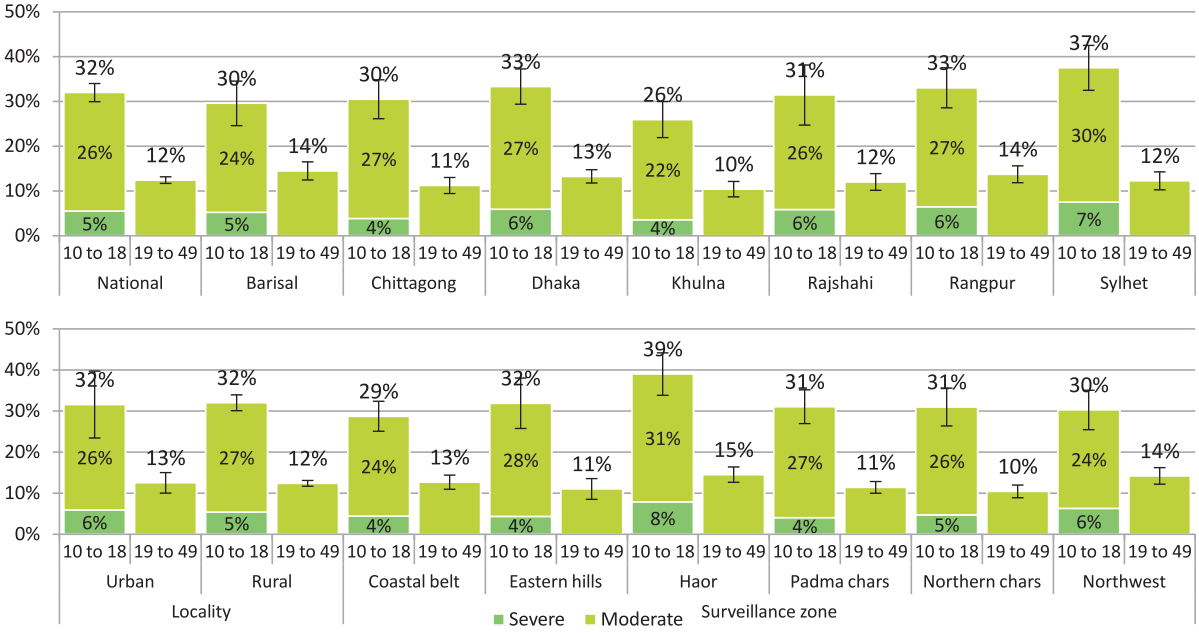
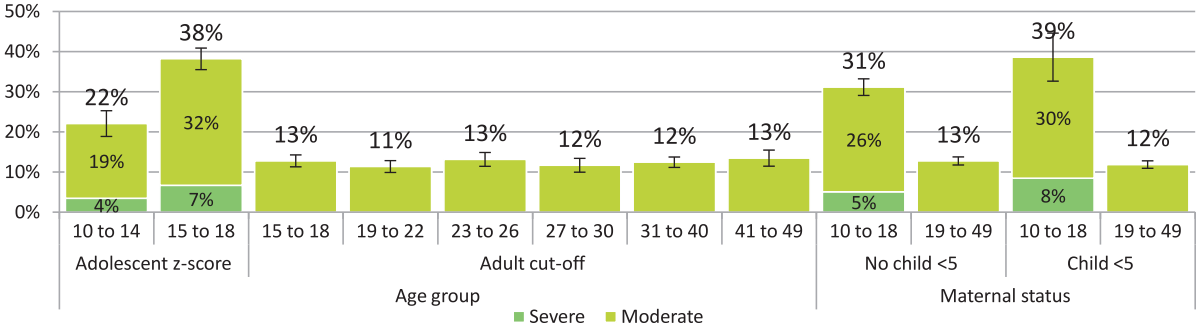


Figure 5.11: **Inadequate height by age and maternal status**

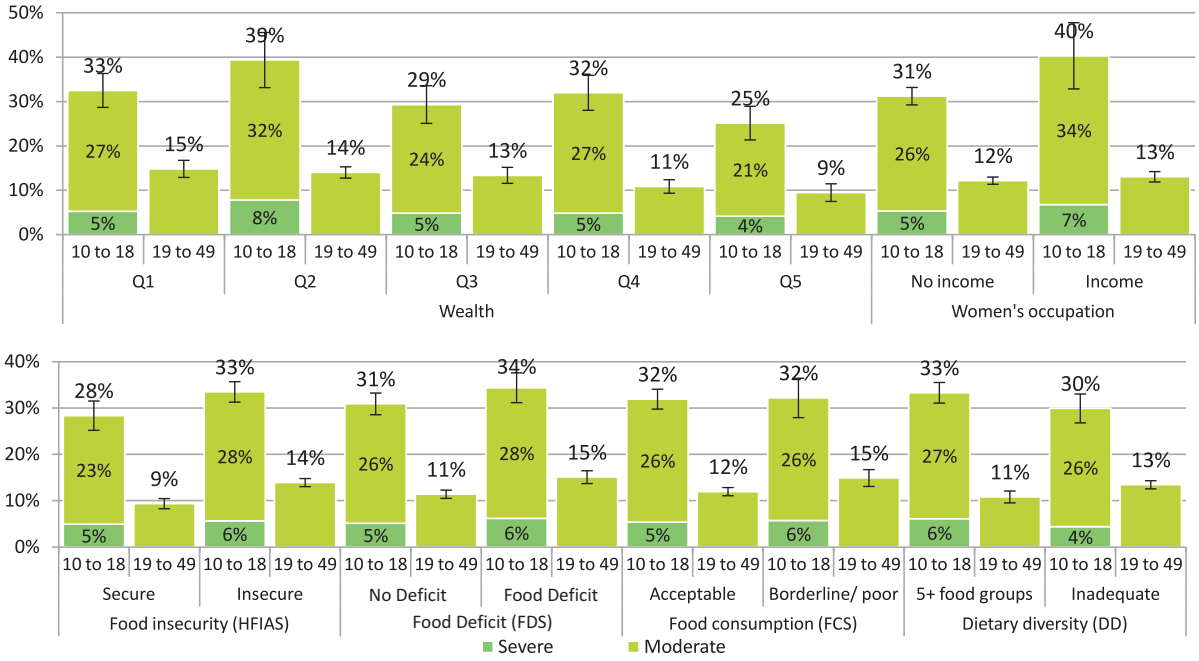


The proportion of women with short stature did not increase over the age range from 15 to 49 years, while adolescent girls over 15 are short for their age in much greater proportion than girls 10 to 14 (Figure 5.11). This could be due to an early cessation of growth, due, in part, to poor nutrition and early child bearing (71). Furthermore, adolescent mothers with children under five years of age are shorter than those without children, a likely consequence of the interrelationship between early marriage and

7. It is likely that the relatively large difference in the proportion of adult women shorter than 145cm between the 2011 FSNSP estimates and 2007 DHS, was due to methodological differences in addition to a slight increasing trend in women's height. As the height estimates from the 2011 BDHS were not available at the time of publication of this report, this supposition cannot be tested (180).

poverty and the effect of early pregnancy on linear growth. Figure 5.11 also illustrates the disconnect between the adolescent and adult measures. Around three times more 15 to 18 year olds are short for their age based on the WHO growth reference than are at risk during delivery due to small stature.

Figure 5.12 : **Indicators of inadequate height by household wealth, women's occupation, and food insecurity**



Women who earned income were slightly shorter than women who did not. This difference was significant for adolescent girls, probably due to underlying poverty and its relationship with child labour and height. The link between short term food security measures and height, a long-term measure of malnutrition, is most likely indicative of a low amount of social mobility in Bangladesh whereby women from food insecure households tend to marry into similarly food insecure households. Dietary diversity was also related to the height of adult women, but not of adolescent girls.

Body mass of non-pregnant women and girls

The nutritional status of non-pregnant women and adolescent girls is calculated using BMI (weight Kg/height m^2) (69). 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 (69).[8]

In FSNSP, two distinct approaches are used to classify the nutritional status of women and girls using BMI, as was done with height indicators. 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

8. All women who reported that they were pregnant and whose youngest measured child was less than 2 months of age are excluded from all estimates in this section in line with DHS recommendations (69). FSNSP uses the presence of no child less than 2 months of age for a woman as a proxy for no delivery in the last two months.

age, BMI-for-age z-scores are employed (68; 69; 72). 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 (73).

Table 5.3 : Rationale and definitions for the categories of malnutrition based on BMI

Population	*Rationale*	*Category*	*Definition*
Adolescent girls (10 to 18 years of age)	Comparing the growth the Bangladeshi population to that of a well-nourished population	Severely undernourished	Height-for-age z-score less than -3 S.D.
		Moderately undernourished	Height-for-age z-score less than -2 S.D. but greater than or equal to -3 S.D.
		Globally undernourished	Height-for-age z-score less than -2 S.D.
		Severely overweight	Height-for-age z-score greater than +3 S.D.
		Moderately overweight	Height-for-age z-score greater than +2 S.D. but less than or equal to +3 S.D.
		Globally overweight	Height-for-age z-score greater than +2 S.D.
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

For girls, growth curves provided by the World Health Organization for school aged children are employed as a reference population (68; 67). This reference categorises the BMI of the adolescents 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 (73). 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.[9] 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.

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 (72; 73). 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 (72). As was the case with the BMI under nutrition measures, these two approaches to BMI measurement are aligned but not entirely comparable. Firstly, 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.[10] 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 5.20).

Figure 5.13 : **Nutritional status of adolescent girls by BMI measures**

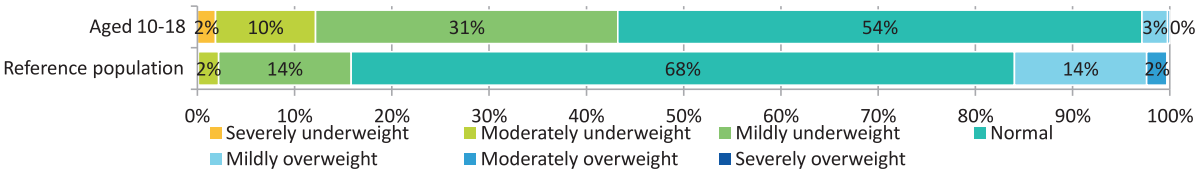
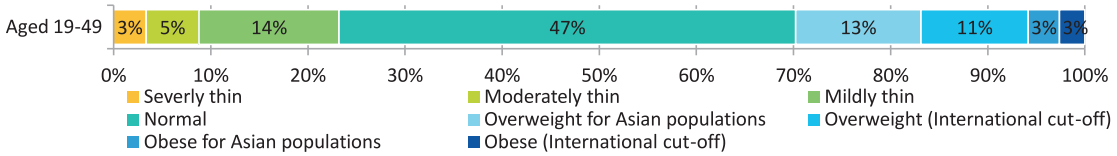


Figure 5.14 : **Nutritional status of women by BMI measures**



Illustrating these two systems of classification, Figure 5.13 presents national level data for adolescent girl's nutritional status. Using z-scores, figures for Bangladeshi girls aged 10 to 19 years of age (upper bar) are juxtaposed against the WHO reference group (lower bar). This reference suggests 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, girls in Bangladesh are overwhelmingly undernourished with over 42% of the population below -1SD from the mean, and only a small percentage measuring overweight (mild-3%, moderate-<1%, severe-no observations). For adult women, aged 19-49, international standards provide eight categories of nutritional status, but no guidance on what an “ideal” distribution should be (72; 73). as is seen in Figure 5.14, While 22% of the population are

9. 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 or 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.

10. 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.

undernourished, an even larger proportion are overweight based on Asian cut-offs (32%). This level of under nutrition clearly identifies Bangladesh as having a medium severity public health problem for women's underweight. Although alarming levels of overweight are also apparent, no international classification system currently exists that helps assess the public health risk of this growing problem (74).

These distributions have no doubt changed greatly in the last few decades, but past comparative information for the entire population of adult women or adolescent girls does not exist. However, trends in the nutritional status of ever-married women aged 15-49 using the adult cut-offs described above are available and are depicted in Figure 5.15.[11] can be seen that over the past seven years the proportion of women underweight has declined and the proportion of women overweight has grown steadily (70; 26; 8). A landmark finding in the first round of FSNSP was that mothers were undernourished and overweight in equal proportion. However, Figure 5.15 shows that for ever-married women this change occurred sometime between 2007 and 2011. As rates of child under nutrition have remained high, this worrisome trend towards a double burden of malnutrition requires urgent attention (75; 76).

Figure 5.15 : **Trends in ever-married women's nutritional status**[12]

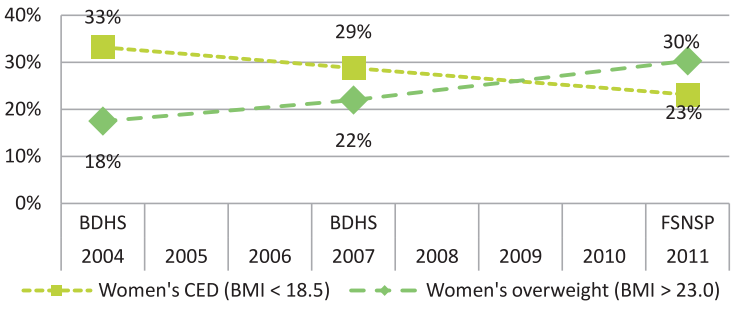
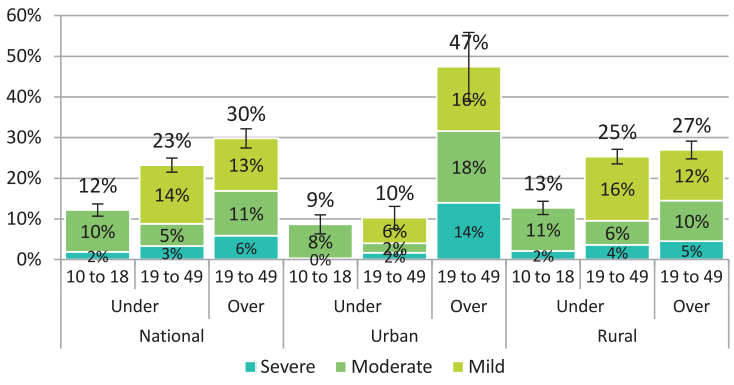


Figure 5.16: **Girls' and women's nutritional status by locality**[13]



11. In contrast, the 2010 report depicted the trends in maternal CED and overweight indicating that the proportion of mothers of under five years of age children overweight was equivalent to the proportion underweight in 2010. In 2011 the proportion of mothers underweight has increased slightly to 28% from 26% and the proportion of mothers overweight has decreased slightly from 25% to 22%. This change is likely due to seasonal variation and not a real change.

12. Not shown on this graph are the preliminary findings of the BDHS survey of 2011. The proportion of women underweight (BMI<18.5) was 24% and the proportion overweight by international standards was 17% (180). Both of these figures closely align to the FSNSP findings, especially when variation due to seasonality is accounted for.

13. 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

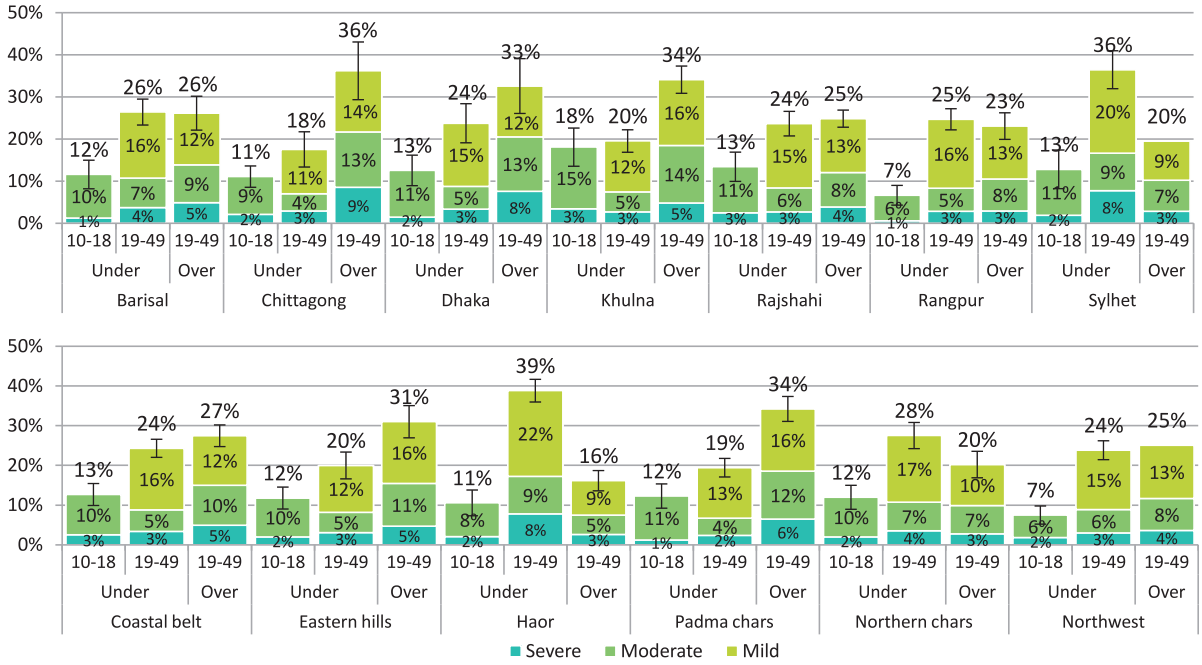
19 to 49 years underweight: Severe – BMI less than 16; Moderate – BMI greater than or equal to 16 but less than 17; Mild – BMI greater than or equal to 17 but less than 18.5

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

14. 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 5.13).

underweight. In contrast, rates of underweight among girls were similar between urban and rural areas, though more adolescent girls were severely malnourished in rural areas. Adolescent girls are moderately and severely malnourished in a greater proportion than adult women nationally and in both rural and urban areas

Figure 5.17: **Adolescent girls' and women's nutritional status by division and surveillance zone**[13]



As shown in Figure 5.17, there is substantial variation in rates of women's underweight and overweight by division of residence and surveillance zone. While the poorer and more rural divisions of Barisal, Rajshahi, and Rangpur have roughly equal proportions of women overweight and underweight, the more urban divisions of Chittagong, Dhaka, and Khulna have a far greater percentage of women overweight. Sylhet stands out as having a much greater proportion of women underweight compared to overweight, though the rates of adolescents undernourished is in line with the national average. Rates of underweight are highest among adolescents in Khulna which is surprising given the moderate level of adult women's malnutrition in that division.

Figure 5.18: **Seasonal variation in adolescent girls' malnutrition by surveillance zone**[13]

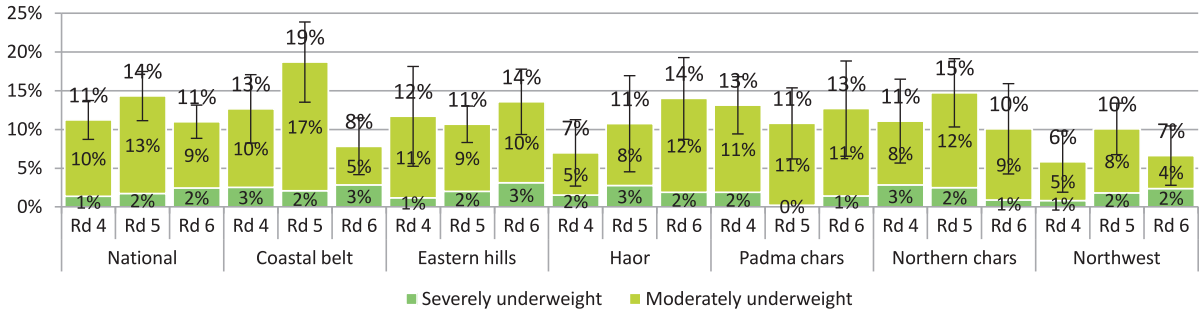
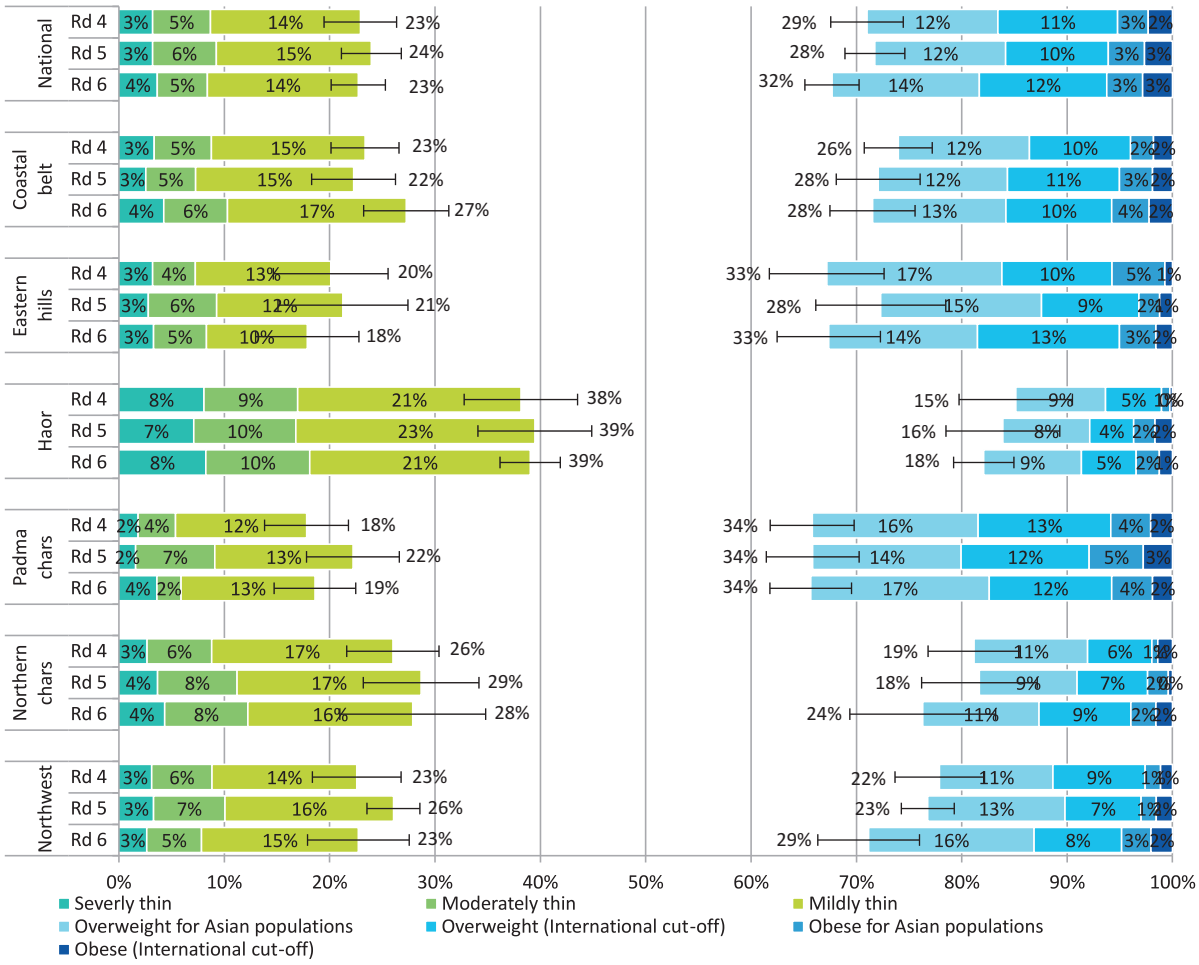


Figure 5.19: **Seasonal variation in women's nutritional status by surveillance zone**[16]



Among the surveillance zones, there is little variation in levels of adolescent under nutrition, but much higher variation in adult nutritional status. The Haor has a much greater level of adult malnutrition than other zones, while adult overweight is very prevalent in the Eastern hills and Padma chars. There was very little seasonal variation in the nutritional status of women nationally and variation was significant in only a few zones, as shown in Figure 5.19. In all surveillance zones except for the Coastal belt, a slightly greater proportion of women were CED during the monsoon months than at other times of the year, but the difference was not significant. For adolescents, a similar pattern held nationally and in the Coastal belt, Northern chars, and Northwest zones (Figure 5.18). [15]

Figure 5.20 clearly illustrates the discontinuity between z-score and cut-off methodologies using the 15 to 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. There was an almost stepwise increase in the proportion of women overweight as they age from 15 to 40 years, and a steeper decrease in the proportion of women underweight in younger age groups until age 23 when the prevalence of CED remained steady at around 20%.

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

Figure 5.20: **Nutritional status of women and adolescent girls by age**[16]

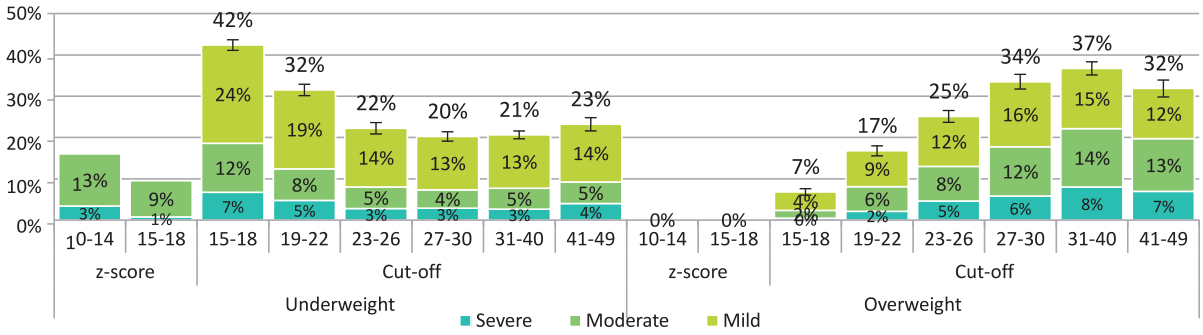


Figure 5.21: **Adult women's nutritional status by own education**[16]

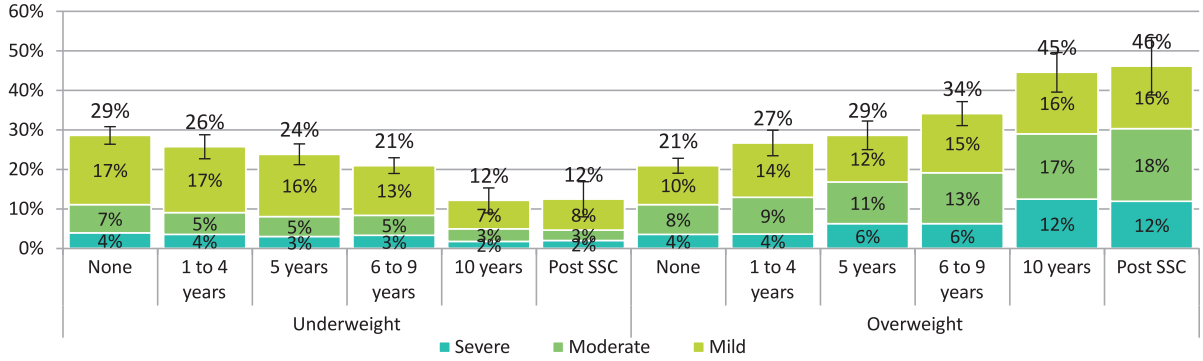


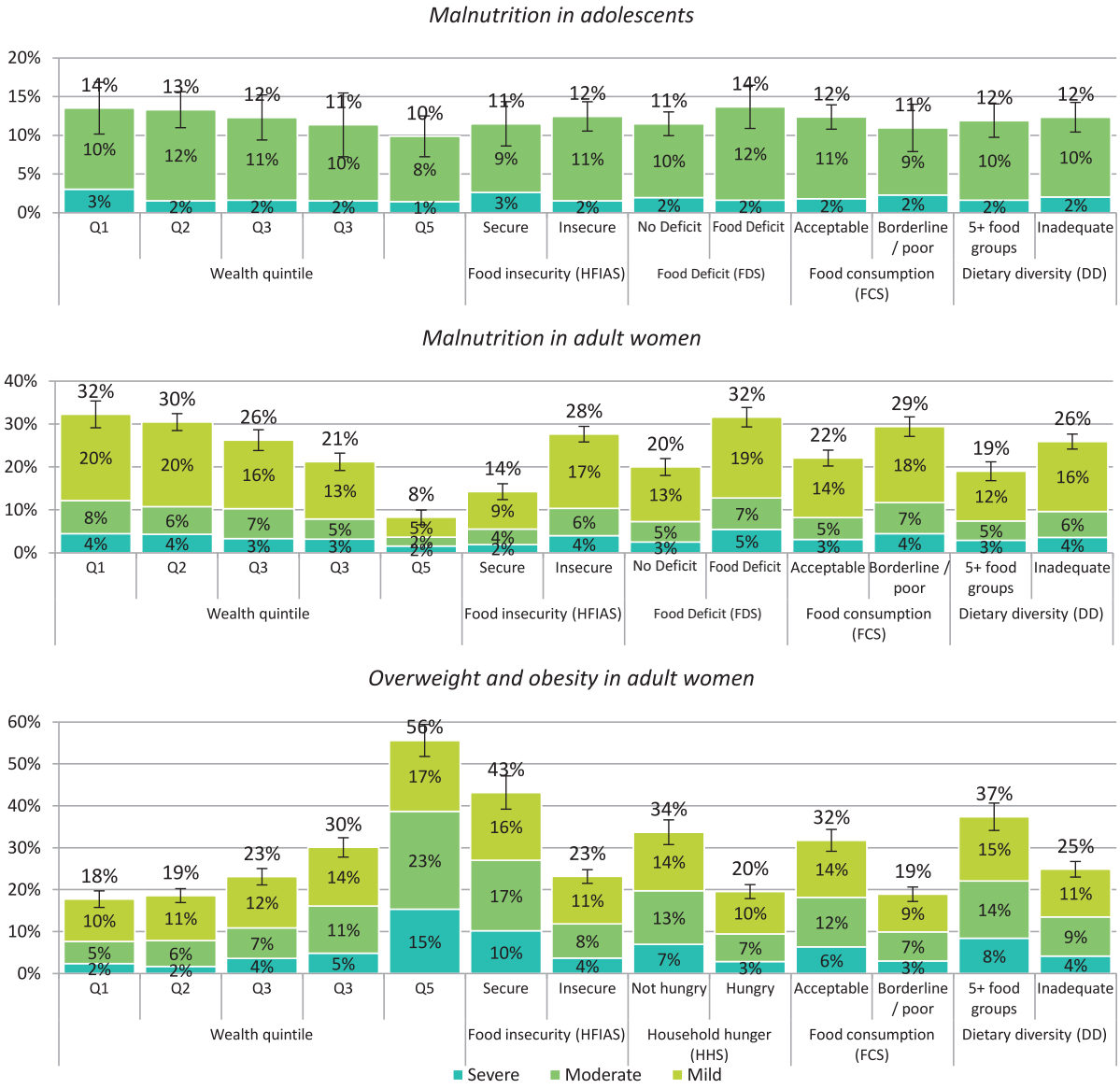
Figure 5.21 depicts the proportion of adult women underweight and overweight by the women's own educational level.[16] Rates of under nutrition are markedly less among the most educated women and rates of overweight are much greater compared to those with minimal education. This association is likely due to the correlation between wealth and greater educational attainment and wealth and better nutrition. Significantly, around half of the most educated women are overweight.

Figure 5.22 shows the association of under and overweight adolescent girls and adult women with household wealth quintile, food security status, and individual dietary inadequacy. Rates of malnutrition among adolescent girls vary little by weight quintile or household food security status. While lower proportions of girls from the wealthiest and most food secure households are underweight, the difference is not significant. In contrast, women's nutritional status is highly correlated with 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. This change is gradual until the wealthiest quintile, when the proportion of women overweight doubles compared to the next wealthiest quintile. A strong relationship between the nutritional status of adult

16. The proportion of adolescent girls undernourished by own education level is not depicted as it can be assumed that a significant portion of young women are still going to school. Additionally, the proportion of adolescent girls underweight by the educational attainment of the principal income earner in the household shows little variation across education categories and was therefore not presented (13% for girls from households with uneducated principal income earners to 10% for girls from households with post SSC educated main income earners.

women and measures of food security and dietary diversity is also apparent. Underweight is strongly associated with food insecurity, food deficit, and lack of diversity in diet, while overweight is more often found among women from food secure households who eat more diverse diets. For measures of under and overweight, the indicator that is correlated the most strongly with nutritional status is food security as measured through HFIAS.

Figure 5.22 : **Women's and adolescent girls' nutritional status by wealth, food security, and dietary diversity**[13]



Maternal Care and Nutrition

FSNSP interviewed and measured 2,071 pregnant women and 1,132 women who had given birth in the six months before the interview.

Median age of marriage remained below the legal age, with the result that half of first pregnancies occurred among adolescent girls (18 years and younger).

There has been a dramatic increase in antenatal care coverage from 1993-2011, however still only a quarter of recently pregnant women obtained at least four ANC visits.

Well over a third of women reported never taking iron folic acid during their recently completed pregnancy, and only one in three pregnant women reported taking it daily in the last week.

Diets remained poor during pregnancy. Dietary diversity was similar between pregnant and non-pregnant women, and three out of four pregnant women in their third trimester reported that they ate the same as or less than they did before their pregnancy.

One in four pregnant women were so thin that their foetus faces a moderate to severe risk of growth restriction. In spite of the weight gain that should accompany pregnancy, pregnant women were under-nourished in greater proportion than non-pregnant women when mid-upper arm circumference is used as the unit of measurement.

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 (77; 78; 79). This, in addition to the low nutritional status of women, results in 13-15% of children born preterm, over one-third born at a low birth weight (36%), and 20% of children stunted from birth (80; 81).

Table 6.1: Number of mothers interviewed

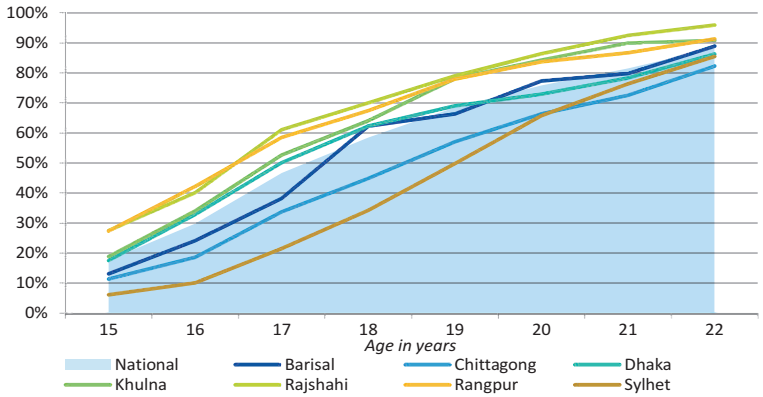
Age group in years	Pregnant at interview		With a child less than six months old	
	Number	Weighted proportion	Number	Weighted proportion
10 to 14	6	0%	1	0%
15 to 19	605	31%	258	26%
20 to 24	730	35%	427	37%
25 to 29	457	21%	307	24%
30 to 34	180	9%	95	9%
35 to 39	72	3%	32	3%
40 to 44	19	1%	10	2%
45 to 49	2	0%	2	0%

Care during pregnancy has multiple components, some requiring health professionals and some dependent on family. FSNSP measures aspects of both. In 2011, FSNSP interviewed and measured over 2,000 pregnant women and interviewed over 1,000 women with a child less than six months of age about the care they received during and immediately after their pregnancy (Table 6.1). This chapter will present findings in historical context whenever possible. Indicators for maternal care were refined over the course of 2011; hence some indicators are only available for part of the year, and whenever this occurred, it is indicated in the text.

Care during pregnancy

Ideally, pregnancy-related care should start before conception, ensuring women are healthy enough to conceive and carry a child to full term (80; 82). Pregnancy should be delayed until a woman's body has matured and pregnancies should not be timed too close together (83; 84; 82). Since independence, Bangladesh has made great strides in reducing the frequency of birth and increasing birth spacing. From 6.3 births per women in 1971-1975, the total fertility rate now stands at 2.3 - just slightly above the replacement rate, which is the rate of reproduction at which the population of the country will not grow (85; 86). The median birth interval has lengthened from 34.7 months in 1990-1993 to 43.6 months in 2002-2007, although the proportion of women with less than a 9 month gap between pregnancies has remained largely constant, from 8% in 1990-1993 to 7% in 2002-2007 (85; 86).

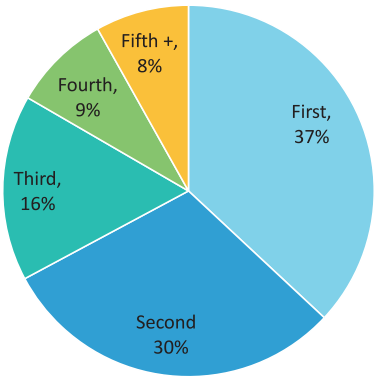
Figure 6.1: **Proportion of women and girls married by age in years by divisions**[1]



1. Because of a change in the way household listing was completed, age information from all members of the household was only available for the fourth and fifth rounds of surveillance in 2011. As such, the data presented in Figure 2 is from only these two rounds.

However, 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). The median age of first birth reported by women 20-24 years of age increased by only one year, from 18 years in 1992/1993 to 19 years in 2007 (85; 86). 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 of age for women). Nationally in 2011, around 50% of girls were married before 18 years of age (Figure 6.1). In some divisions, rates of early marriage are even greater, with around 60% of girls married by 17 years of age in Rangpur and Rajshahi, and over 50% of girls married by 17 years of age in Khulna and Dhaka. Notably, almost 30% of girls in Rangpur and Rajshahi were married by the time that they were 15 years old.

Figure 6.2: **Parity of pregnant 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 (86), the plurality of pregnant women over one-third were in their first pregnancy and two-thirds were in their first or second pregnancy (Figure 6.2). Less than one-fifth of women were in their fourth or fifth pregnancy. Due to the early age of marriage, around half of women pregnant for the first time were 18 years of age or younger (Figure 6.3). Even more alarming, over one-tenth of women in their second pregnancy were 18 or younger. While it is likely that the girls, 15 to 18 years of age, who reported being on their fourth or fifth pregnancy did not complete all previous pregnancies, frequent pregnancies and/or complications can compromise the nutritional status and health of mother and infant (83).

Figure 6.3: **Age group of pregnant women by number of previous pregnancies**

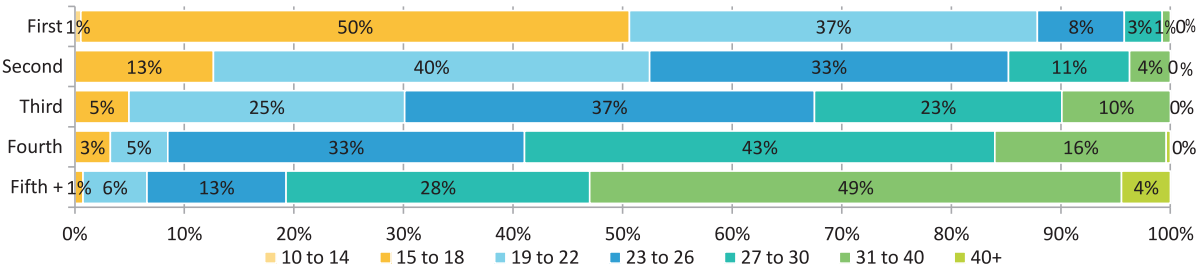


Figure 6.4: **Age of pregnant women by number of previous pregnancies**[2]

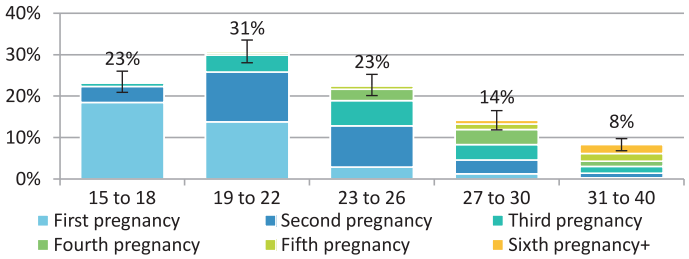


Figure 6.4 displays the age distribution of pregnant women. More than half of women were 22 years of age or younger and over half of these women were pregnant for the first time. While nearly one quarter of pregnant women were 18 years or younger, 10% of pregnant women were aged 18. The largest proportion of

2. This graph excludes six 14 year old pregnant girls and twelve pregnant women who were 41-46 years of age, due to the small number of pregnancies at these ages.

pregnant women almost one third was 19 to 22 years of age. This pattern is congruent with the most recent age-specific fertility rates from BDHS 2011 (86). Only 4% of currently pregnant women indicated a gap of less than 18 months between the birth of their last child and the estimated birth date of the current pregnancy.

Clinical antenatal care[3]

Clinical antenatal care (ANC) encompasses many different components, which together help ensure the health and safety of mother and baby during pregnancy and through delivery. FSNSP collects information on the coverage and types of care received by women during pregnancy and on the current coverage of iron and folic-acid (IFA) supplements.[4] The focus of FSNSP's indicators is to estimate the proportion of women who are meeting coverage recommendations of the World Health Organization's (WHO) Technical Working Group on Antenatal Care. 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 (87). The FSNSP system ascertains this information by interviewing mothers of children less than six months of age about care they received during their pregnancy. Because the number of ANC indicators included in FSNSP increased between the 4th and 5th rounds of data collection (2011), the complete list of indicators was available only for Rounds 5 and 6. To avoid confusion, all ANC variables included in this section are from these two rounds.

Figure 6.5: **Trends in ANC care for women who delivered in the six months before the interview (1993-2011)**[5]

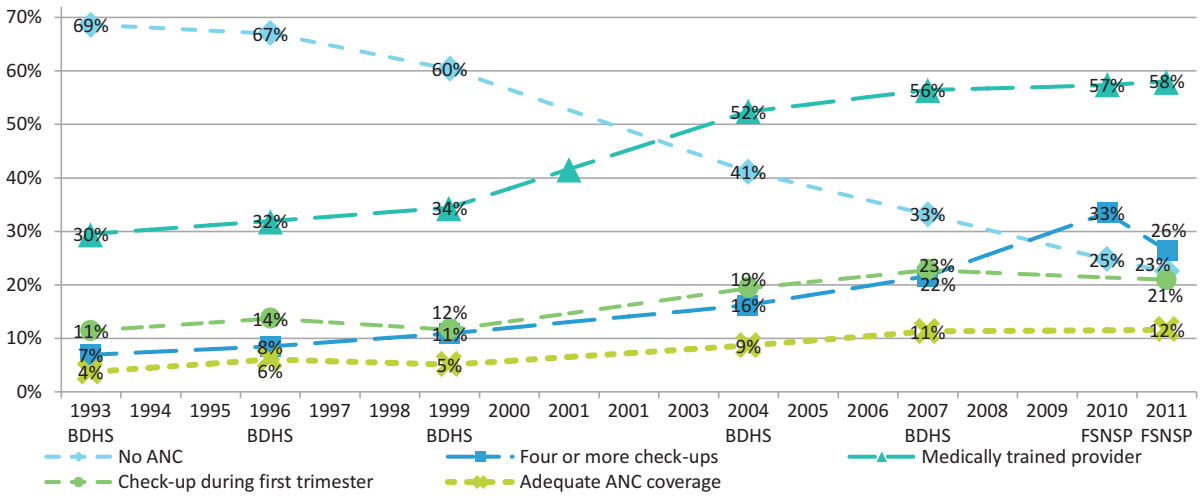


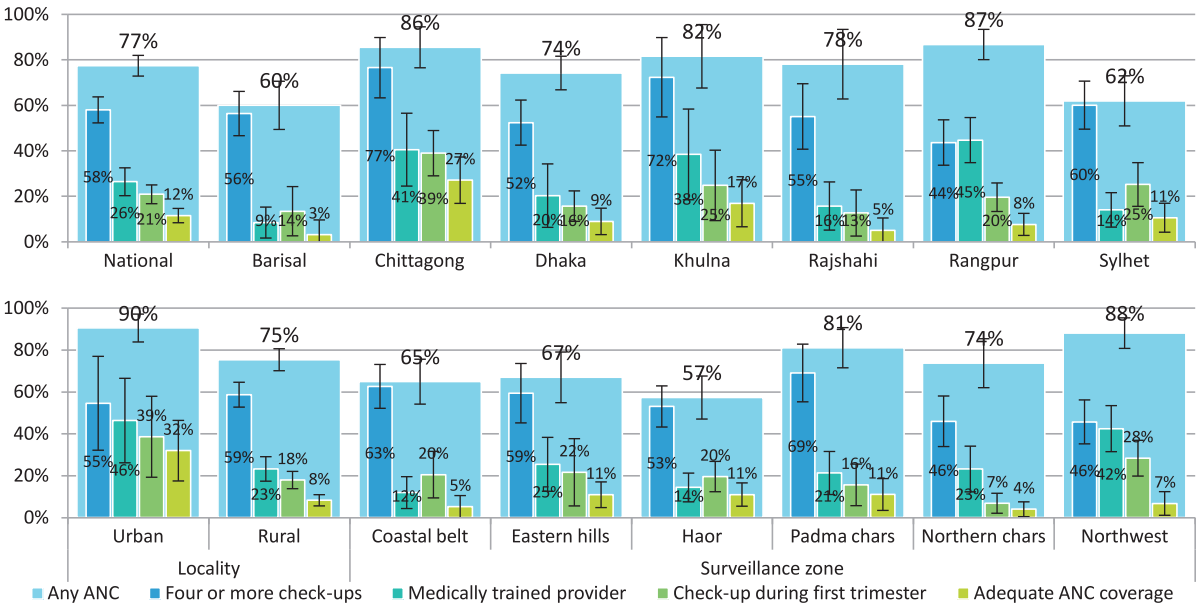
Figure 6.5 compares estimates of ANC coverage from past surveys with FSNSP estimates (85; 88; 89; 70; 26; 8). Since 1993, the proportion of women receiving no ANC dropped by over two-thirds, from almost 70% in 1993 to less than a quarter in 2011. The proportion of women visiting a medically trained ANC service provider increased significantly from 1993 until 2007, but there has been little progress since

3. These ANC estimates are drawn from the 5th and 6th rounds of surveillance due to improvements in the questionnaire after the fourth round.
4. Information about care components – such as extent of physical examination, counselling, TT immunisation, birth planning, early tests used in the identification of danger signs of pregnancy, and management of these dangers – can be found in complementary surveys such as the BDHS.
5. These estimates were re-calculated using the raw datasets to only include the women who delivered in the six months prior to the interview.

then. Over 40% of women in 2011 reported that they never visited a medically trained ANC service provider during their pregnancy. Two indicators, 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, increased slightly and in tandem over the period; around one-quarter of women are currently practicing each behaviour. Ultimately, only around 12% of pregnant women in Bangladesh 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, thereby receiving care in line with the coverage guidelines set out by the WHO Technical Working Group.

At the national level, over three-quarters of women complete at least one ANC check-up during their pregnancy and three-quarters of these women receive care from a medically trained provider. However, only around one-third of all women who obtained any ANC had their first ANC visit in the first trimester and received at least four check-ups. Furthermore, only one-sixth 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 suggest substantial variation in the knowledge level of mothers and their ability to access care. Figure 6.6 shows these patterns by area of 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 of the following: care from a medically trained provider; four or more ANC check-ups; an ANC check-up during the first trimester; and receipt of all three conditions.

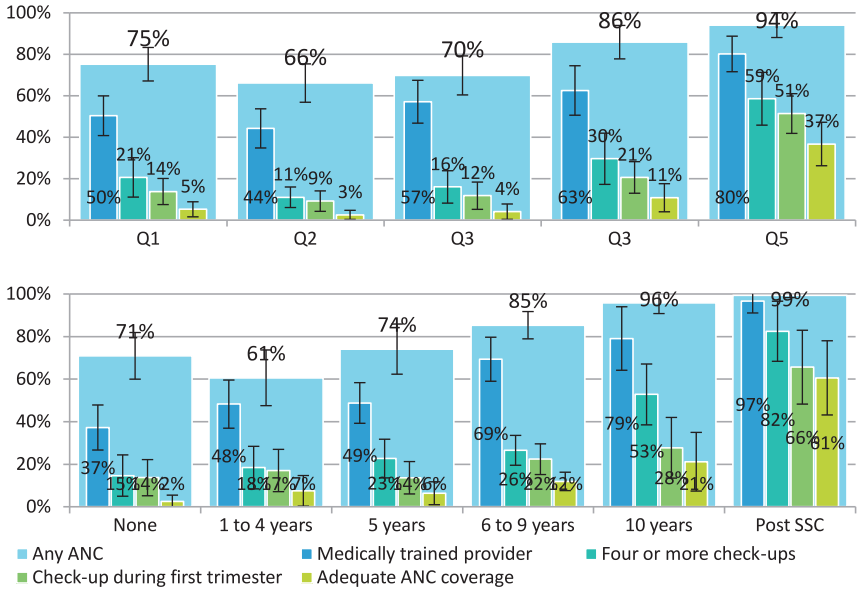
Figure 6.6: **Proportion of mothers who received ANC by division and locality**



Pregnant women in Barisal and Sylhet received ANC care in a much lower proportion than in other divisions. However, in these two divisions almost all women who received ANC did so from a medically trained provider, possibly indicating greater use of the formal health system. In Rangpur division, only half of women receiving ANC did so from a medically trained provider, suggesting substantial barriers to formal health services; nevertheless, over four-fifths of women received at least one ANC check-up, about half of whom completed four visits. This is considerably greater than the rates of women

completing four ANC visits in Sylhet, Rajshahi, Dhaka, and Barisal, suggesting that these areas may experience greater challenges in terms of women's mobility and ability to access health care. Chittagong was the only division in which more than a quarter of women obtained adequate ANC care. A higher proportion of women in urban areas, compared to those in rural areas, received ANC services, but individuals in urban areas went to a medically trained provider less frequently, perhaps due to the lack of government providers in urban areas. Across surveillance zones, access to medically trained ANC providers appears weakest in the Northern chars and Northwest. Shockingly only 57% of women in the Haor received any ANC check-up.

Figure 6.7: **ANC indicators by household wealth, women's own education**



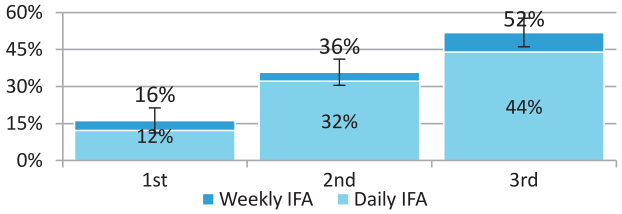
As shown in Figure 6.7, elements of care increased in an almost step-wise fashion by mother's education level and wealth quintile. Overall, ANC coverage was greatest among the most educated women and those belonging to the wealthiest quintile. However, overall rates of adequate ANC coverage (all conditions fulfilled) are alarmingly low regardless of wealth. In the poorest quintile, only 5% of pregnant women received adequate care, while even in the richest wealth quintile, less than one-half received adequate care. As predicted, households experiencing greater food security and higher food consumption scores tend to have better ANC (not shown). Also expected, women engaged in income earning activities also received ANC in a lower proportion than women who did not work, probably due to the relative poverty of this group (65% vs. 79% for any ANC and 40% vs. 60% for ANC with a medically trained provider, not shown).

Iron and folic acid supplementation

Iron and folic acid (IFA) 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 decreasing the risk of haemorrhage during delivery. Folic acid reduces the risk of serious neural tube defects in the infant while helping the mother fight anaemia (38; 39). In Bangladesh, these supplements are 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 (4). Compliance with an IFA regimen requires two elements: timely receipt of or access to IFA tablets and regular consumption of the tablets provided. FSNSP does not routinely record if and when IFA tablets are received by pregnant women, but it records two measures of women's consumption of IFA

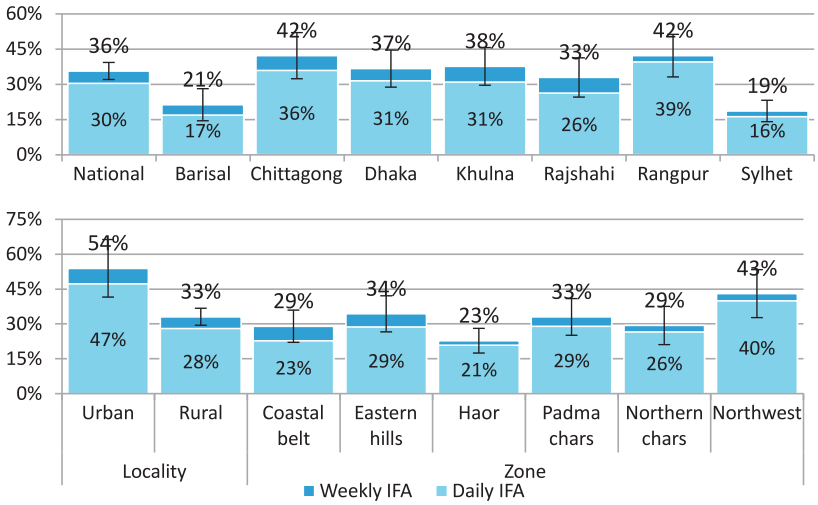
tablets: the reported frequency of consumption during past pregnancy for women with a child less than six months of age and the number of tablets taken in the last week for currently pregnant women.

Figure 6.8: **Pregnant women who took IFA by trimester**



Similar to 2010, 37% of women with deliveries in the six months before the interview reported never taking IFA tablets (2010: 39%). 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.[6] Figure 6.8 indicates that while less than one-fifth of women reported they had taken IFA tablets weekly in the first trimester, this rose to over half of women in their final trimester. The majority of women who took IFA weekly took it daily.

Figure 6.9: **Proportion of pregnant women who took IFA 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 (90; 91; 82). 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.

Consumption of IFA is lowest in Sylhet and Barisal, with minimal variation among the other divisions. Iron supplementation is much higher among women from urban areas compared to those from rural areas. Among surveillance zones, the Northwest had very high rates of IFA consumption while less than one in four women in the Haor had taken IFA in the last week.

6. Results form 2010 are closest to estimates in the 3rd trimester as women who have recently completed a pregnancy appear to report on their most recent level of consumption (their consumption during the final trimester). There was no discrepancy between the proportion of women currently pregnant who reported taking IFA in the last week (58% in the last trimester) and women who had recently delivered (59%). Because of this recall bias, this section will focus on women who were pregnant at the time of interview.

Figure 6.10: **Proportion of pregnant women who took IFA by household wealth and own education**

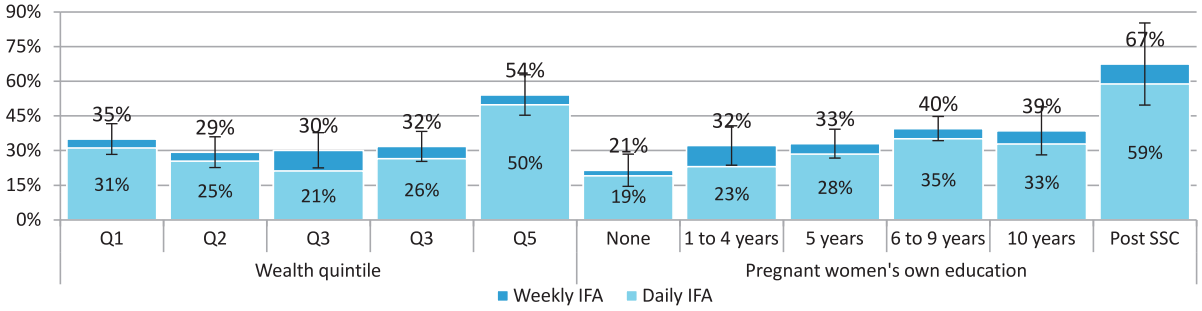
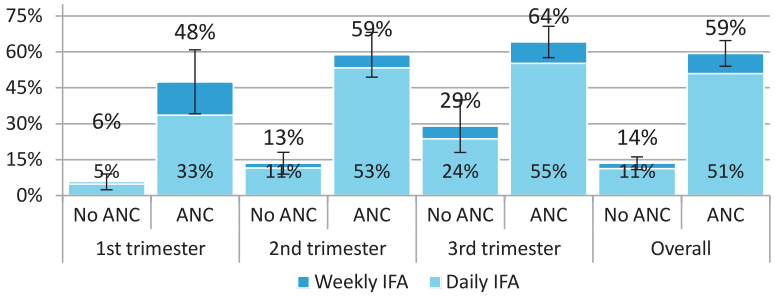


Figure 6.11: **Pregnant women who took IFA by ANC care and trimester**

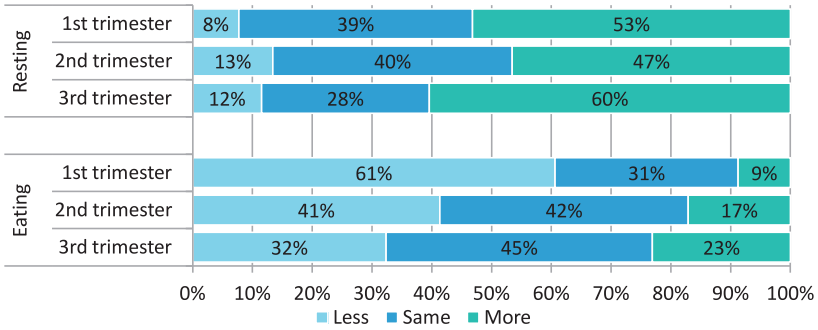


While there was limited association between women's age and adherence to an IFA regimen (not shown), expected patterns related to wealth and education were observed. As education increased, so did the proportion of women who reported taking IFA weekly, with a marked difference apparent between women who had only completed SSC (10 years) in comparison to those who had studied further. Wealth appeared to have little influence on IFA consumption, with the exception of the wealthiest class, where over two-thirds of women reported taking IFA on a weekly basis. Overall, four times more women took IFA weekly who had completed one ANC visit compared to those who had had no ANC visits (Figure 6.11); this difference was even larger during the early trimesters of pregnancy.

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 FSNSP measurements including diet composition, amount of rest taken, and amount of food consumed.

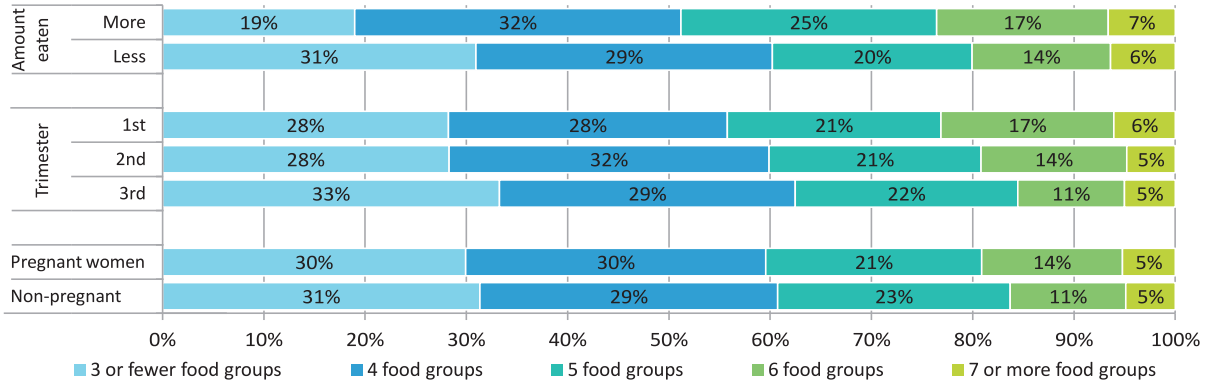
Figure 6.12: **Amount of rest and food during pregnancy compared to before**



Interestingly, most women report being able to rest more during pregnancy, but only a minority report a greater amount of food consumed. Strikingly, the majority of women actually report eating less during the first trimester of their pregnancy in comparison to before,

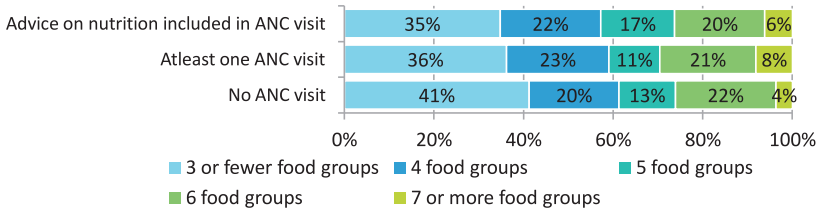
perhaps due to morning sickness. As the pregnancy proceeds, a higher proportion of individuals report eating more, however there is still an alarmingly high number of individuals who claim to be eating less than pre-pregnancy levels. This may be due to food taboos or a desire to have a smaller baby for ease of delivery (92).

Figure 6.13: **Dietary diversity scores by reported eating habits, trimester and pregnancy status**



This pattern of food consumption is consistent with information obtained on women's dietary diversity; women's self report of the amount of food they are eating during their pregnancy as opposed to the amount they ate before pregnancy corresponds to differences in dietary diversity scores (Figure 6.13). More troublingly, there are minimal differences in the diversity of diets consumed by pregnant and non-pregnant women; pregnant women in their final trimester eat less diverse diets than women earlier on in their pregnancy. In light of the increased nutritional needs of women during pregnancy, these findings raise serious concerns regarding the proper nutrition of women and unborn children.

Figure 6.14: **Dietary diversity scores by ANC visit**



Among the 50% of currently pregnant women who had an ANC visit before the interview, 70% reported that they had received counselling from the doctor on recommended eating habits. This counselling may have been somewhat effective, as women who reported receiving this information ate slightly but significantly more diverse diets than those who did not. Moreover, both groups ate more diverse diets than those who had not attended an ANC visit (Figure 6.14).

Nutritional status

Because women gain weight during pregnancy regardless of their nutritional well being, Body Mass Index (BMI) is not a useful indicator to assess the nutritional status of pregnant women unless data is available on the pre-pregnancy weight of the mother or the pattern of weight gain since pregnancy. Given that FSNSP is a cross sectional surveillance system, pre-pregnancy weights are not available. Instead, current nutritional status is assessed among pregnant women using MUAC while delivery risk among pregnant women is assessed using height. Additionally, clinical vitamin A deficiency is assessed

by asking a set of questions to women who were pregnant at the time of interview or during the six months prior to interview.

For pregnant mothers, *Sphere* standards recommend that women whose mid-upper arm circumference (MUAC) measurements fall under 230mm be included in emergency feeding programmes, as the foetus is at increased risk of intrauterine growth restriction at this point (93; 94). The nutritional status of pregnant mothers was analysed using this cut-off and two additional cut-offs intended for the general population; pregnant women with a MUAC less than 221mm are considered moderately malnourished while pregnant women with a MUAC of less than 214mm are considered severely malnourished (93; 73). Although obesity is also associated with negative pregnancy outcomes (95; 96), there is no standard to classify women's overweight or obesity based on MUAC.

Similar to non-pregnant women (see Chapter 5), an estimated 58% of pregnant women were above 150cm tall, while 12% were of short stature (height less than 145cm) and 3% were shorter than 140cm. For children for whom birth weight was taken, those with mothers shorter than 145cm were low birth weight (less than 2.5kg) in significantly greater proportion than those with taller mothers (32% and 13% respectively).

Prevalence of night blindness among pregnant women was less than one percent and all reported cases occurred in the third trimester. Among women with a child under 6 months of age, 1% reported to have experienced night blindness at some point in their pregnancy. These estimates are well below the 5% prevalence cut-off for a public health problem and the 3% reported in the 2004 BDHS (97; 98; 70; 74).

Figure 6.15: **Women malnourished by trimester and pregnancy status**

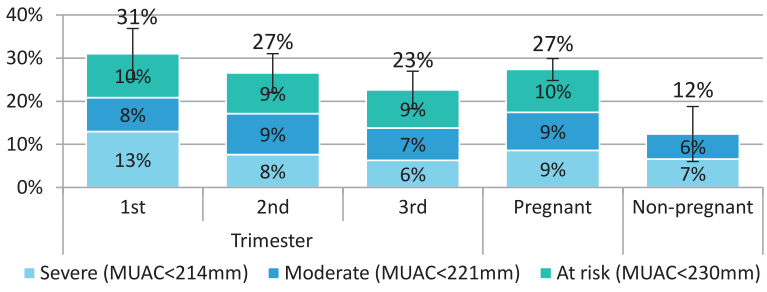
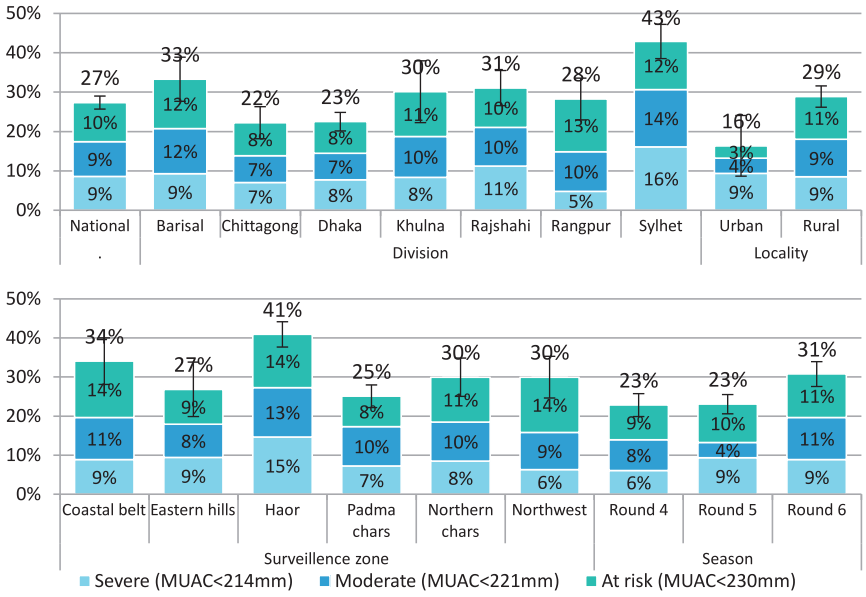


Figure 6.15 outlines the proportion of pregnant and non-pregnant women malnourished according to *Sphere* standards using MUAC as the assessment tool. Not surprisingly, women in their first trimester are thinner than women later in pregnancy. Contrary to what might be expected, there is no difference in the proportion of women moderately and severely malnourished comparing pregnant and non-pregnant populations despite the weight gain that should accompany pregnancy, when MUAC is used as the assessment tool. This difference is not simply due to the age difference between pregnant women and non-pregnant women; across all ages, the proportion of malnourished pregnant women equals or exceeds that of the non-pregnant women (see Figure 6.20).

Similar to patterns of under nutrition among non-pregnant women (See Figure 5.17), there were notable variations in the nutritional status of pregnant women across geographic areas. Sylhet had very high rates of malnutrition among pregnant women while Chittagong and Dhaka had the lowest. As expected, pregnant women in rural areas were far more likely to be at nutritional risk compared to urban areas; however, both areas had the same proportion of women who were severely thin. Mirroring these results, the Haor had the highest rates of malnutrition during pregnancy, followed by

Figure 6.16: **Pregnant women's nutritional status by area of residence and season**



the Coastal belt. Pregnant women in the Padma chars were malnourished at a lower rate than pregnant women in the other surveillance zones. The proportion of pregnant women malnourished varied across seasons, with a greater proportion of pregnant women at risk due to thinness during the post-*aus* harvest season (Round 6) in comparison to earlier in the year (Rounds 4 and 5).

Figure 6.17: **Pregnant women's nutritional status by household wealth and food security status**

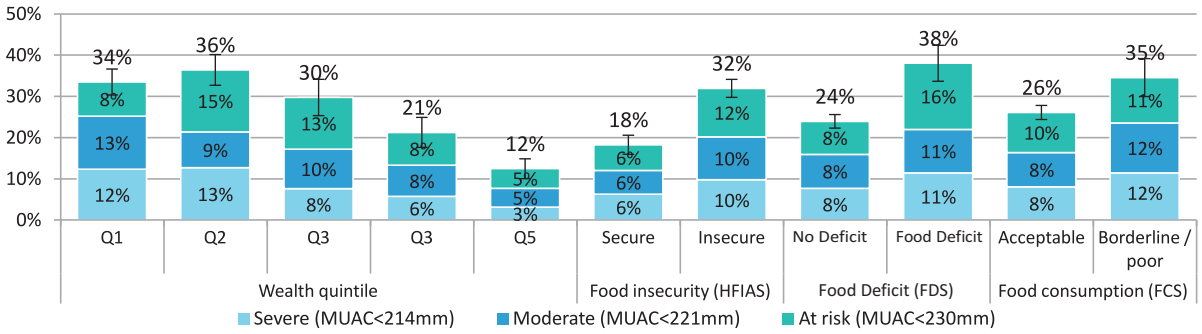
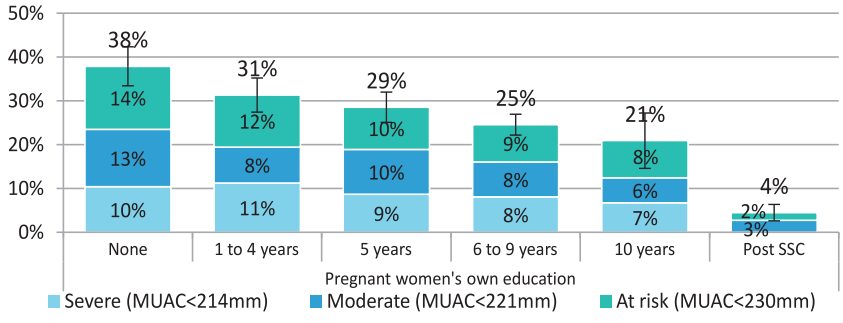
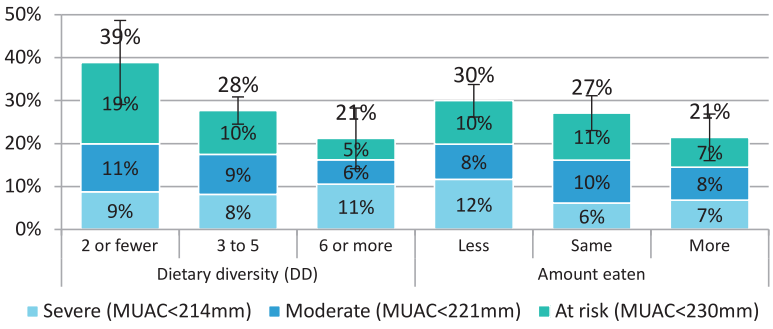


Figure 6.18: **Pregnant women's nutritional status by women's own education**



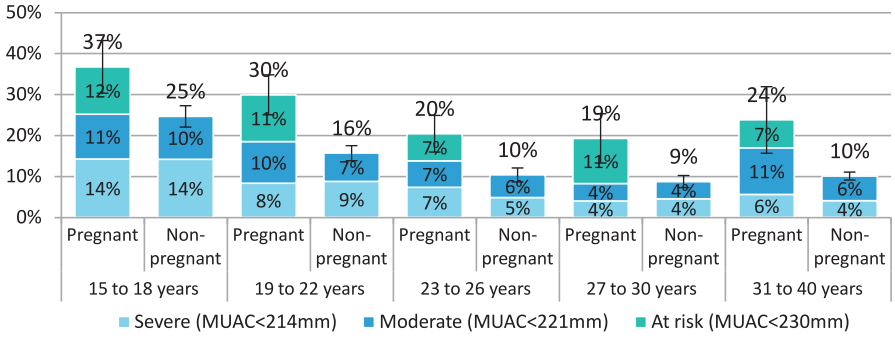
As expected, more educated pregnant women and those from wealthier and more food secure households were malnourished in a lower proportion than those less educated or from poorer and more food insecure households. However, even in the wealthiest quintile, over one tenth of pregnant women were at risk.

Figure 6.19: **Pregnant women's nutritional status by diet and rest**



Pregnant women who ate a more diverse diet the day before the interview were malnourished in lower proportion than those who ate a monotonous diet. Women who reported eating more while pregnant than they did before pregnancy were better nourished than those who reported eating the same or less. Interestingly, the amount of rest a pregnant woman took was not related to nutritional outcomes (not shown).

Figure 6.20 : **Proportion of women undernourished by trimester and pregnancy status**



As mentioned at the outset, across all ages, the proportion of undernourished pregnant women equals or exceeds that of the non-pregnant women. Not surprisingly, the youngest and oldest cohorts of women were undernourished in the greatest proportion. For the youngest cohort, the proportion moderately and severely malnourished was in line with that found in the non-pregnant population, while women who were pregnant and over 30 years of age were under nourished in a much greater proportion than non-pregnant women the same age.

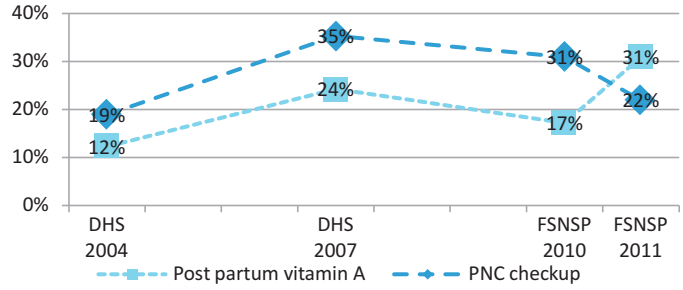
Care after delivery

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 at facilities 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 (69; 99). As such, FSNSP uses only three indicators to evaluate care after delivery: receipt of a vitamin A capsule (VAC) post delivery, PNC check-up with any 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 (5), which provides women who have recently given birth with high potency vitamin A capsules within 6

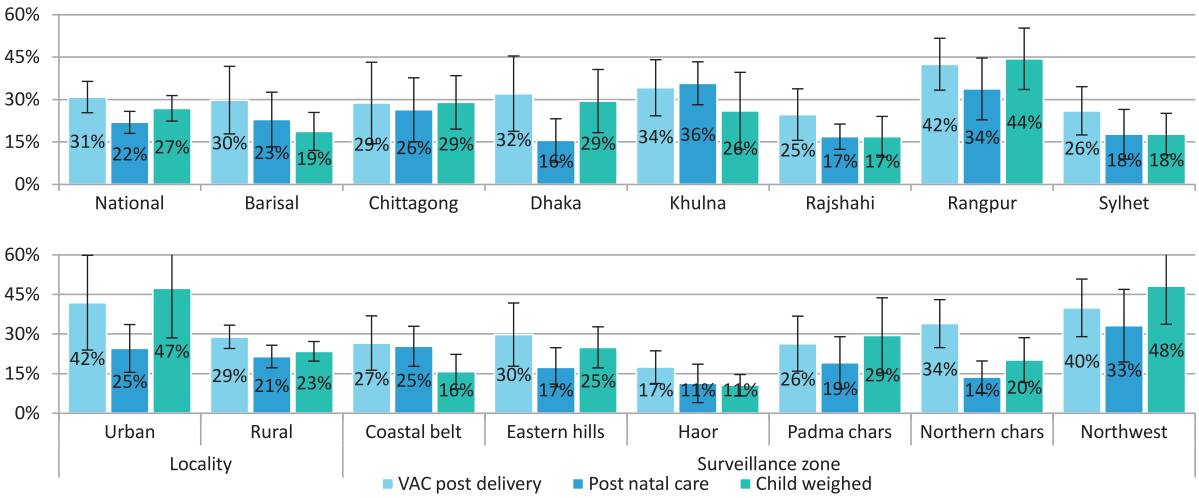
weeks of delivery.[7] Vitamin A given to the mother is passed to the child through breast milk and helps the child's immune system to develop (100).

Figure 6.21: **Post-natal care over time (2004 2011)** [8]



Between 2004 and 2007, there was some improvement in rates of post-partum vitamin A and PNC care (70; 26; 8). Overall, a little less than one-third of women nationally reported receiving a VAC within 6 weeks of delivery. Only 22% of women received a post natal check-up within 30 days after birth, and a little over a quarter of children were weighed at birth.[9] Across divisions, Rangpur stands out for having the highest rates of post-partum VAC. In general, however, rates of PNC are extremely low, and even when PNC was received, opportunities for relaying nutrition messages and supplementation appear not to have occurred. For example, among women who received PNC check-ups, only half had received VAC (46%), and less than two-thirds had received nutrition messages and/or support for breastfeeding. It is unclear if these gaps were due to supply gaps with VAC, or a lack of provider time or training.

Figure 6.22: **Post-natal care by area of residence**



7. Recently the World Health Organization has provided detailed recommendations for vitamin A supplementation programmes (30). These recommendations do not support supplementing women postpartum (31). The Government of Bangladesh has stated its intention to keep this programme component but to shorten the period of postpartum supplementation to 2 weeks (Shirin Afroz, personal communication) which was the initial guideline set in 2003 (29).

8. While the DHS system extends the PNC period to 42 days past delivery (69), FSNSP defines PNC as care during the 30 days past delivery. This difference is not expected to change results dramatically as the vast majority of PNC is received within 2 days of delivery.

9. 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 (LBW), or children with a weight at birth of less than 2.5 kgs. Because 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 (175), this figure cannot be used to estimate the extent of LBW in Bangladesh.

Child Feeding and Care

A minority of children are fed complementary foods from birth and before the sixth month more than 50% are fed family foods.

Less than half of infants are breastfed in the first hour of life (early initiation); this has changed little since 2007.

The proportion of children breastfed at two years of age decreased from 92% in 2010 to 86% in 2011. It is unclear whether this drop represents a trend or a random fluctuation.

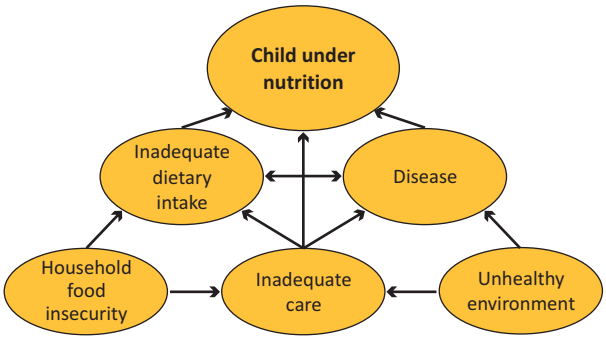
Even among children who are introduced to complementary foods on time and fed a sufficient number of meals per day, dietary diversity is poor. Less than half (44%) of children aged 6-23 months old are fed the minimally recommended number of food groups , and even among the wealthiest quintile only 36% of children received both timely initiation and adequate dietary diversity.

Taken together, data on breastfeeding practices and quality of complementary foods suggests that most children under-two years of age are not getting enough of the nutrients needed for optimal growth and development.

The level of coverage for Vitamin A campaigns in 2011 was around 80%, below the level obtained in recent years and the target of 90% set in the HDNPSP

Since independence, Bangladesh has experienced remarkable increases in child survival due in part to innovations like oral rehydration therapy (ORT), zinc therapy, and initiatives such as the Expanded Programme for Immunisation. As a result, Bangladesh will likely reach Millennium Development Goal (MGD) 4-a two-thirds reduction in child mortality (101). However, despite numerous initiatives to improve child feeding practices, the country remains slightly off track in reaching the MDG 1 goal of reducing child under nutrition (101), despite achieving the adult hunger (under nourishment) goal in 2006 (102). In line with Figure 7.1, a simplified rendition of the United Nations' Children's Fund (UNICEF) framework for the causes of child malnutrition (103), previous chapters of this report have discussed some of the underlying determinants of child malnutrition including unhealthy home environments, household food insecurity, and inadequate care practices for pregnant mothers and women. This chapter explores the direct causes of malnutrition including current feeding practices and use of health care services for prevention of and recuperation from child illness. These care practices are examined in their historical context, by connecting FSNSP findings to previous survey data. The next chapter details the level of child malnutrition in Bangladesh in 2011.

Figure 7.1**: UNICEF conceptual framework of child malnutrition**



To obtain estimates of care and feeding practices for infants and young children, FSNSP interviews the caregiver of the youngest child in each selected household.[1] As such, all estimates in this section should be interpreted as prevalence of the indicators for the youngest born child in the household.[2] This approach to data reduces the number of older children included in the surveillance system (Table 7.1).[3]

Table 7.1 : Children surveyed by age

Age group in months	*Number surveyed*	*Weighted proportion*
0 to 5	1,348	11%
6 to 11	1,360	12%
12 to 17	1,364	10%
18 to 23	1,267	10%
24 to 29	1,240	10%
30 to 35	1,249	11%
36 to 41	1,316	10%
42 to 47	1,188	10%
48 to 53	1,095	9%
54 to 59	897	7%

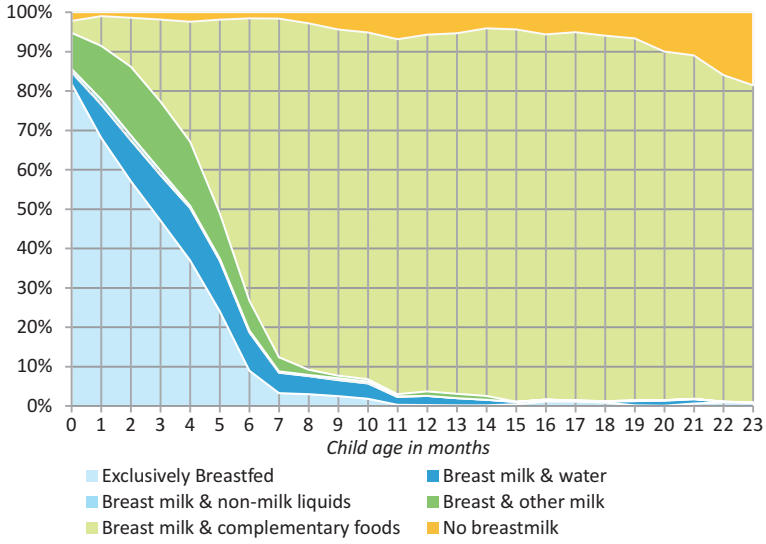
1. In the case of two children of equal ages, one of the children is randomly selected.
2. This selective approach is identical to that of the Demographic and Health Survey system for most infant and young child feeding indicators. However, this methodology differs with respect to illness and breastfeeding prevalence, which DHS calculates across all children born in the past five years and not just the youngest child. It is not known how IYCF indicators would vary if children with younger siblings were included.
3. While only 5% of children 0 to 5 months of age were measured but not included in the IYCF and care modules, over 30% of children in their fifth year of life were excluded from these modules. This will not impact estimates greatly as most indicators are focused on children in their first two years of life. However, if the prevalence of any indicator increases in frequency over the age range, estimates using this system will overstate overall prevalence, and if the prevalence of any indicator decreases in frequency over the age range, estimates using this system will understate overall prevalence.

Child feeding

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 2003 estimated that 13% of all deaths of children under the age of five could be prevented through universal coverage of appropriate breastfeeding and a further 6% of deaths could be reduced with appropriate complementary feeding practices (104). Appropriate IYCF practices also have long-term cognitive and health benefits (including prevention of chronic disease), all of which reduce the economic burden of disease and malnutrition and contribute to the achievement of the MDGs (105).

The package of World Health Organization (WHO) recommended and Government of Bangladesh endorsed IYCF practices 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 (105; 106). In addition to ongoing large-scale activities by civil society in support of improved IYCF practices, nutrition programming focused largely on maternal and child nutrition is currently being mainstreamed into the government health services.

Figure 7.2: **Child feeding practices in the first two years of life** [4]



IYCF practices in Bangladesh remained consistent between 2010 and 2011. The majority of children were breastfed through age two; the overall prevalence of exclusive breastfeeding was similar between 2010 and 2011. However, in 2011, compared to 2010, the rate of exclusive breastfeeding dropped more slowly between the fifth and sixth month of life. A more troubling development was an apparent drop in breastfeeding rates for young children over 18 months of age. In the section that follows, some of these feeding patterns are explored using the standardised set of indicators recommended by the WHO as a basis for assessing IYCF practices (27; 28).

Breastfeeding

Breast milk is the ideal food for infants and an important part of the diet of young children. Needing no preparation, breast milk is hygienic even in low-resource settings. The antibodies, living cells, and immuno-protective factors in milk help to ward off infections, reducing the risk of digestive and respiratory illnesses (107; 108; 109). Interventions to protect and promote breastfeeding can greatly improve child survival, averting over one-tenth of deaths among children less than five years of age

4. This figure is constructed using a three month moving average. As such, it is designed to show a pattern over age in months and not provide precise point estimates. The estimates given in the figure above will differ from point estimates given elsewhere in this report.

(65). Additionally, during illness, a child's appetite for food is often diminished but their demand for breast milk remains unchanged (107; 110). Thus during illness, breastfeeding helps to prevent dehydration and provides vitamins, minerals, and energy to aid recovery. In longitudinal studies, longer duration breastfeeding is associated with greater linear growth and thereby lower rates of childhood stunting (111; 112). A recent meta-analysis has shown that breastfeeding is associated with lower cholesterol, blood pressure, obesity, and type-two diabetes, and improved educational attainment (113). Some evidence also indicates a relationship between breastfeeding and a reduction in the risk of chronic conditions like allergies and serious digestive disorders (114).

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 important to the proper development of a child's immune system. Barriers to early initiation include traditional beliefs such as that breast milk is not ready until several days after birth or that children should not be breastfed before receiving ceremonial foods. In line with this, FSNSP records the proportion of living infants who are fed pre-lacteal foods in the first 3 days of life (115). 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.

Figure 7.3 : **Changes in child feeding practices during the first days of life** [5]

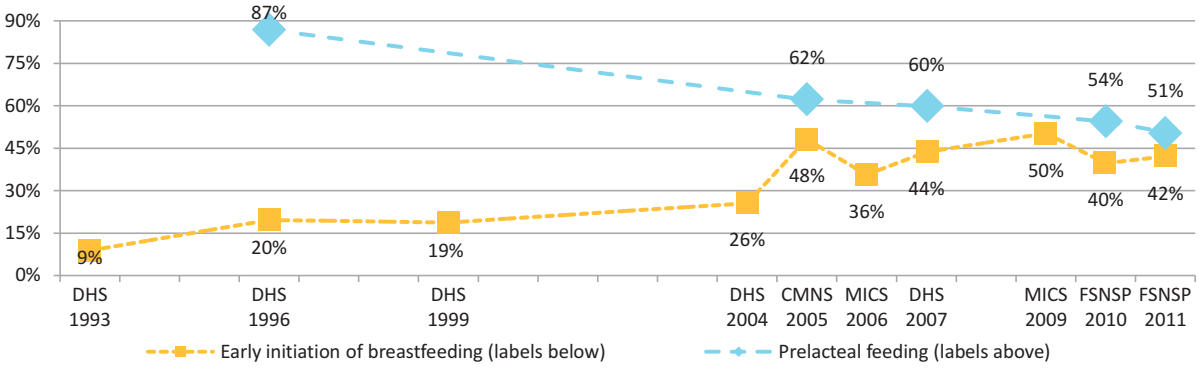


Figure 7.4 : **Association between prelacteal feeding and early initiation**

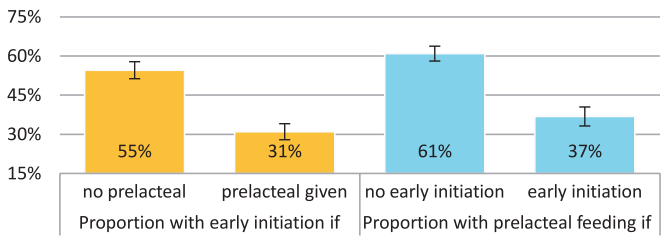
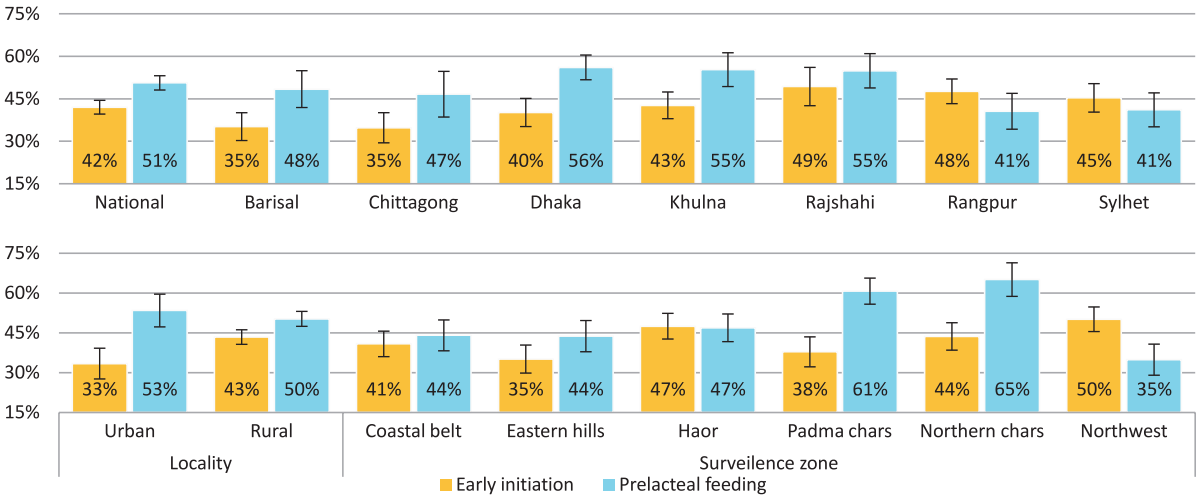


Figure 7.3 tracks the prevalence of these two behaviours over the past 18 years (85; 88; 89; 70; 26; 116; 117; 118; 8). As found in the 2010 report, early initiation of breastfeeding steadily increased between 1993 and 2007, but since 2007, there appears to have been no real or sustained change. Estimates in 2010 and 2011 were equivalent and far

5. While WHO and DHS guidelines ask these questions to all women who report having had a live birth in the 5 years before the survey about all their live births in the last five years irrespective of whether the child is still living, FSNSP asks these questions only to mothers of living children younger than 2 years in line with programmatic guidelines (181). This difference is not expected to bias estimates greatly; in BDHS 2007 only 2% of children with births in the two years prior to the survey were no longer living at the time of interview (26).

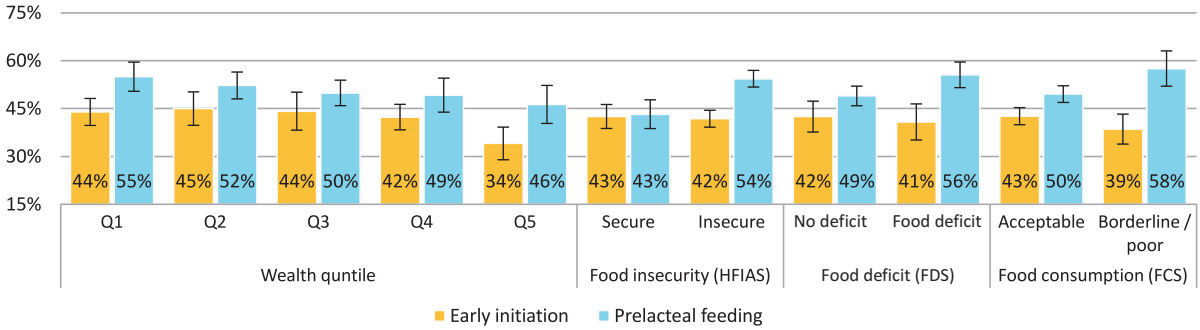
below those from the 2009 MICS survey. Sharp reductions in prelacteal feeding occurred between 1996 and 2005 (from 87 to 62%), coinciding with significant improvements in early breastfeeding in the same period. Since that time, improvements have been less dramatic; national rates of prelacteal feeding have decreased somewhat from 60% in DHS 2007 to 53% in 2010 and 51% in 2011. Prelacteal feeding and early initiation of breastfeeding are closely linked, as can be seen in Figure 7.4. Children who are given prelacteal feeds are breastfed within the first hour of life at a significantly lower rate than children who were not fed prelactally. Conversely, children who are breastfed within the first hour of life are fed prelacteal feeds in a lower proportion.

Figure 7.5: **Child feeding practices during the first days of life by area of residence**



Chittagong and Barisal have the lowest rates of early initiation while Dhaka, Khulna and Rajshahi have the highest rates of prelacteal feeding. The rate of early initiation is significantly lower in urban compared to rural areas, but smaller rural-urban differences were apparent for prelacteal feeding. Looking across surveillance zones, there were very high rates of prelacteal feeding in both char zones compared to very low rates in the Northwest. Early initiation of breastfeeding was less common in the Eastern hills and Padma chars.

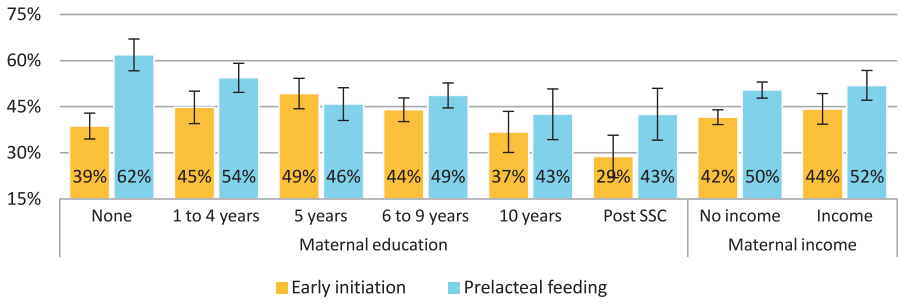
Figure 7.6: **Feeding during the first days of life by household characteristics**



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. This could be due to differences in place of delivery as some facilities separate mother and child. Maternal income at the time of the interview does not appear to be related to early breastfeeding

behaviours (Figure 7.7). There was little variation in the rates of early initiation or prelacteal feeding across wealth quintiles with the exception of the wealthiest groups where rates of breastfeeding within the first hour of life were much lower (Figure 7.6). A household's food security status was not associated with early initiation of breastfeeding, though a significantly greater proportion of food secure households fed their children prelacteal foods. This pattern was also evident when examining indicators of household food deficit and food consumption. There was a small but significant difference in rates of early initiation between male and female children (males: 44% and females: 40%), but there was no difference in rates of prelacteal feeding between the sexes (males: 51% and females: 50%).

Figure 7.7 : **Feeding during the first days of life by maternal characteristics**



Exclusive breastfeeding

Exclusive breastfeeding for the first six months provides all the nutrients required for the healthy growth of infants and protects them from consumption of food contaminants before their immune system has matured. Because of this, exclusive breastfeeding, feeding the infant 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 breasted) and two thirds lower odds than children who are breastfed and receive complementary foods or breast milk substitutes (65).

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. However, when a child is predominately breastfed there is reduced or non-existent protection from contamination. Unlike trends in prelacteal feeding and early initiation of breastfeeding, exclusive breastfeeding patterns changed little in the past 18 years until very recently (85; 88; 89; 70; 26; 116; 24; 8). Some improvements in exclusive breastfeeding practices are apparent, from 43% in 1993 DHS to over 50% in recent rounds of FSNSP. However, the rate of exclusive breastfeeding also varies by division. Chittagong had the highest rates of exclusive breastfeeding, although it had one of the lowest rates of early initiation to breastfeeding. Surprisingly, the proportion of urban children exclusively breastfed appeared greater than the proportion of rural children, but this difference was not statistically significant. The only division of the country where breastfeeding rates appear to have improved from 2010 to 2011 is Khulna division (44% from 30%).

Figure 7.8: **Changes in rates of exclusive and predominant breastfeeding since 1993** [6]

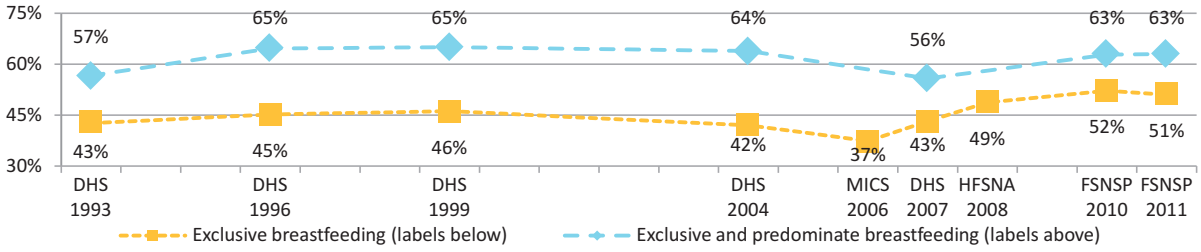
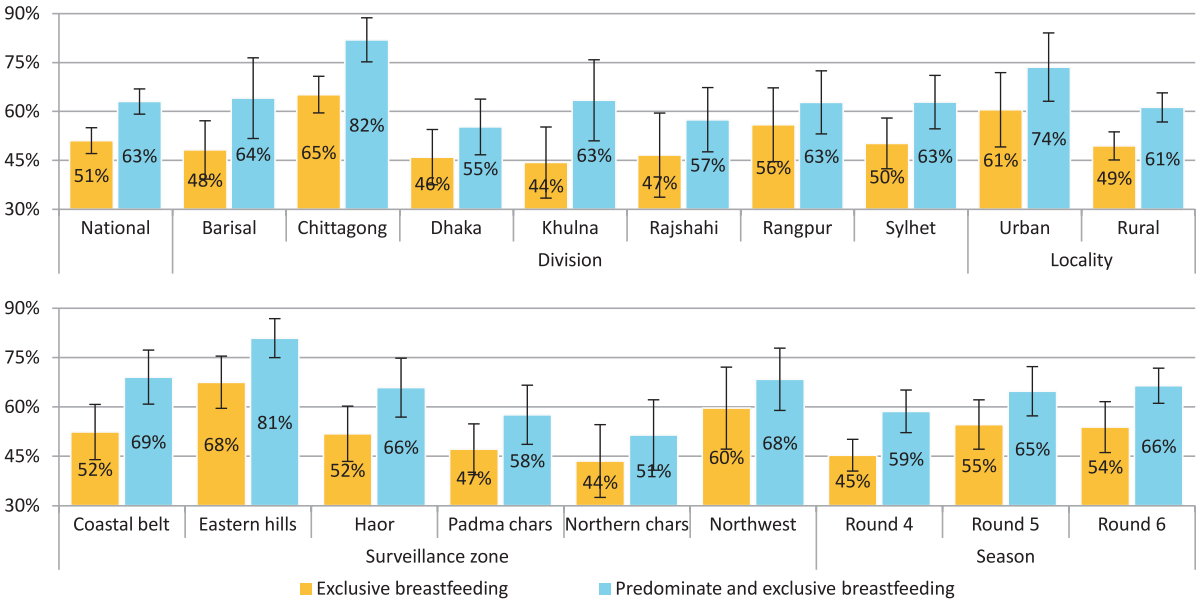


Figure 7.9: **Exclusive and predominant breastfeeding rates by area of residence**



While annual estimates of exclusive breastfeeding have not changed between 2010 and 2011, seasonal variations are apparent. The variation is due to both real changes in feeding practices throughout the year and differences in the ages of children during the different rounds of data collection. For example, though there is a large difference in rates of exclusive breastfeeding between Rounds 4 and 6 (Figure7.9), the difference in age-wise rates of exclusive breastfeeding is very small (Figure 7.10). In

6. Seasonal variation, differences in the age breakdown of children surveyed, and slight differences in the way child feeding questions were asked and analysed is the likely cause of the differences in exclusive breastfeeding rates between the findings of 2011 FSNSP (51%) and the preliminary results of the BDHS 2011 survey (64%). Unlike previous DHS surveys, the 2011 BDHS sample contained a much larger proportion of children below two months of age, due to fact that the season of survey implementation coincided with the season with the greatest proportion of births in Bangladesh. In contrast, the FSNSP sample was drawn from children throughout the year, including in seasons with fewer births, and thereby included a slightly lower proportion of children in the youngest age group. Because the rate of exclusive breastfeeding declines as children age, more young children in the sample results in a higher estimate of the proportion of children exclusively breastfed. Methodological differences are that FSNSP collects dietary information through a free-recall followed by list based probes while DHS uses only a list based system. It is possible that the two step system employed by FSNSP elicits respondents to recall additional foods/liquids given to their infants and thereby reduced the proportion of children exclusively breastfed. Additionally, FSNSP excludes observations in which the response is "does not know" from analysis for that indicator, while the DHS system includes these observations by assuming a "no" response for that indicator. As such, if the DHS data contained many "does not know" responses for items fed to children, this would increase the BDHS estimate of children exclusively breastfed.

contrast to Rounds 4 and 6, the pattern of breastfeeding discontinuation appears to change slightly during the monsoon (Round 5), with fewer children exclusively breastfed from infancy, but more children who are exclusively breastfed until 6 months of age (Figure 7.10).

Figure 7.10 : **Rates of exclusive breastfeeding by child age in month by round and in comparison to 2010** [7]

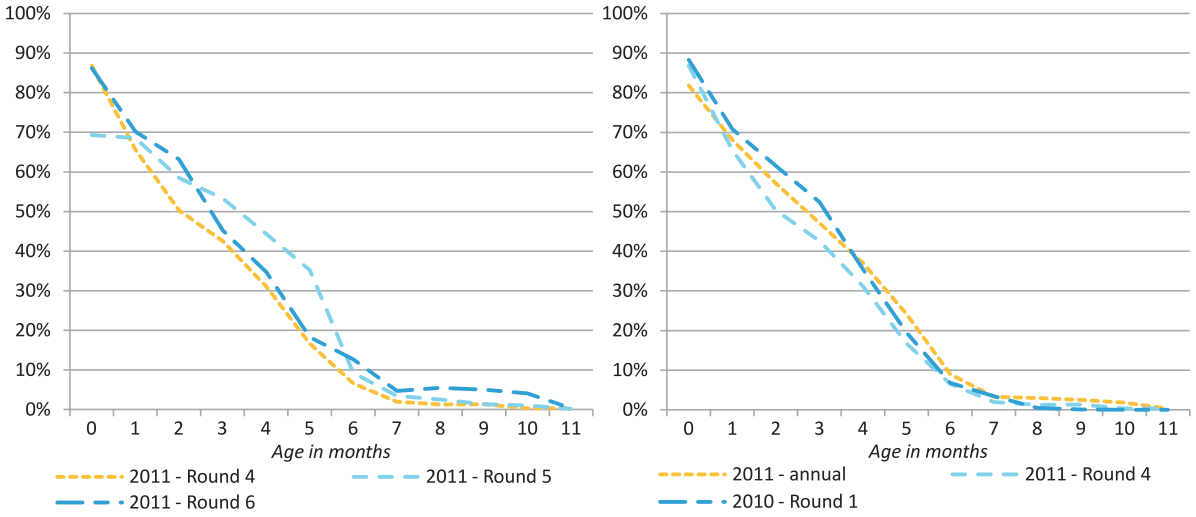


Figure 7.11 : **Exclusive and predominant breastfeeding rates by household wealth and food security**

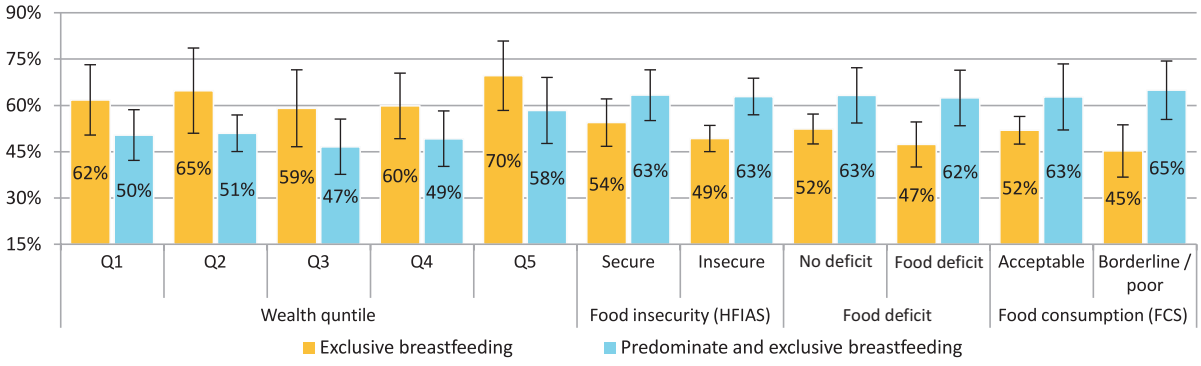
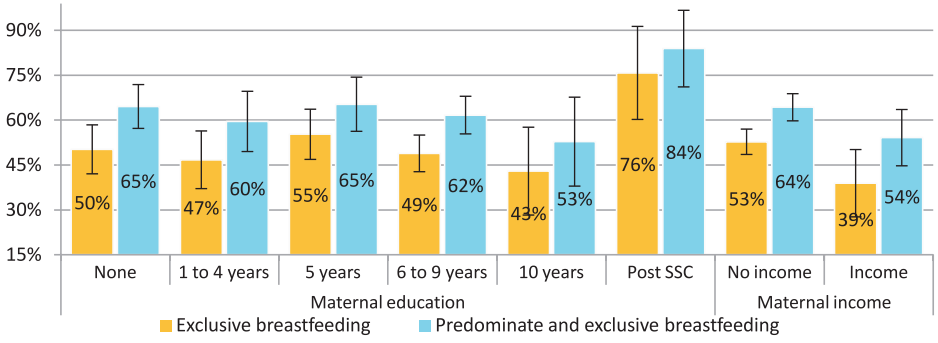


Figure 7.12: **Exclusive and predominant breastfeeding rates by maternal characteristics**

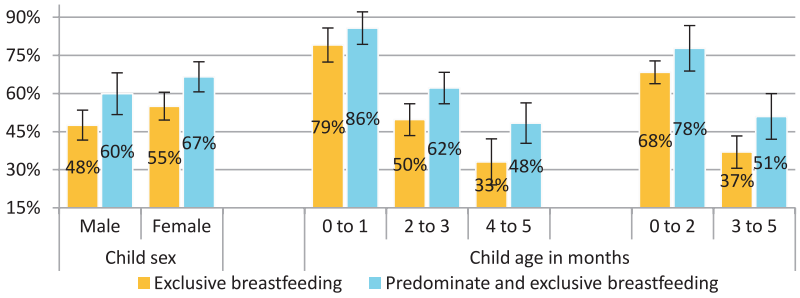


Women who had studied beyond their Senior Secondary Certificate (SSC) exclusively breastfed their children in a significantly higher proportion than their less educated peers. Involvement

7. This figure is constructed using a three month moving average. As such, it is designed to show a pattern over age in months and not provide precise point estimates. The estimates given in the figure above will differ from point estimates given elsewhere in this report.

in income earning was also found to have an impact, with women who are currently earning income exclusively breastfeeding in lower proportion than their non-working counterparts. There is little variation in exclusive breastfeeding rates between food secure and food insecure households or by wealth quintile, although the mothers from the wealthiest households reported exclusive breast feeding more often than the lower four quintiles.

Figure 7.13: **Exclusive and predominant breastfeeding rates by child characteristics**

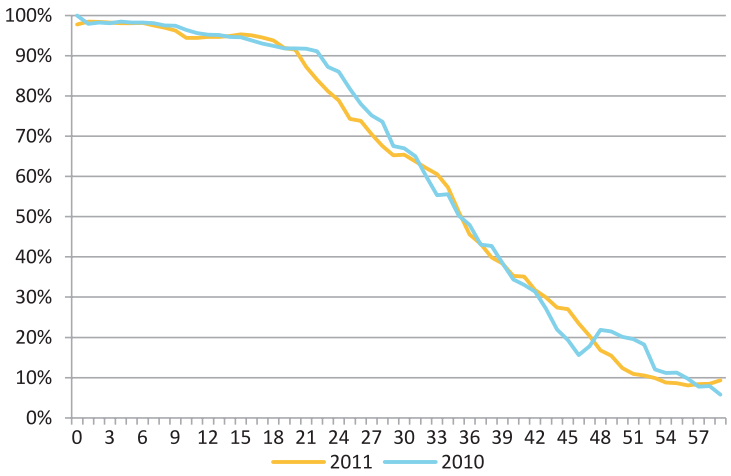


There is a slight but statistically insignificant association between a child's sex and rates of exclusive breastfeeding, with a greater proportion of female infants exclusively breastfed compared to male infants. As might be expected, rates of exclusive breastfeeding decline steadily with the age of a child. While over three-quarters of children are exclusively breastfed in the first two months of life, the rate decreases to one-third 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. Though more focus tends to be given to the choices parents make about complementary foods (see page 119), the importance of continued breastfeeding should not be overlooked. 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% of calories, 70% of vitamin A, 40% of calcium, and 37% of riboflavin required by the child during the second year of life (108; 109). Not only does the high fat content of human breast milk provide a key source of calories, essential fatty acids, and micronutrients, it assists in processing plant-based vitamin A precursors (109; 107).

Figure 7.14: **Continuation of breastfeeding by age in months**[8]



Bangladesh has consistently had very high rates of continued breastfeeding. Figure 7.14 shows the proportion of children who are breastfed by age in months in 2010 and 2011; between the two years,

8. This figure is constructed using a five month moving average. As such, it is designed to show a pattern over age in months and not provide precise point estimates. The estimates given in Figure 7.14 above will differ from point estimates given elsewhere in this report.

there has been very little change in rates of breastfeeding except in the range from 20 to 30 months of age. There is no apparent change in the median age of breastfeeding discontinuation (i.e. the point at which 50% of children are no longer breastfed), which held constant at 35 months of age. Over 10% of children in Bangladesh continue to be breastfed until the start of the fifth year of life. To more precisely measure this behaviour, two WHO-recommended indicators are used. 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 7.15 : **Rates of breastfeeding continuation over time (1993-2011)**[9]

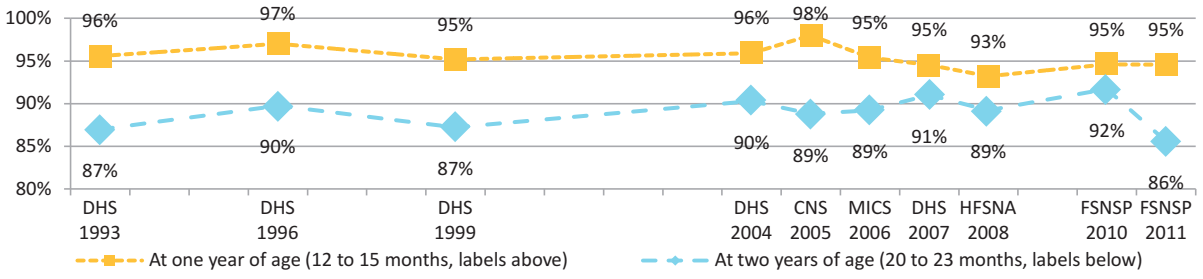
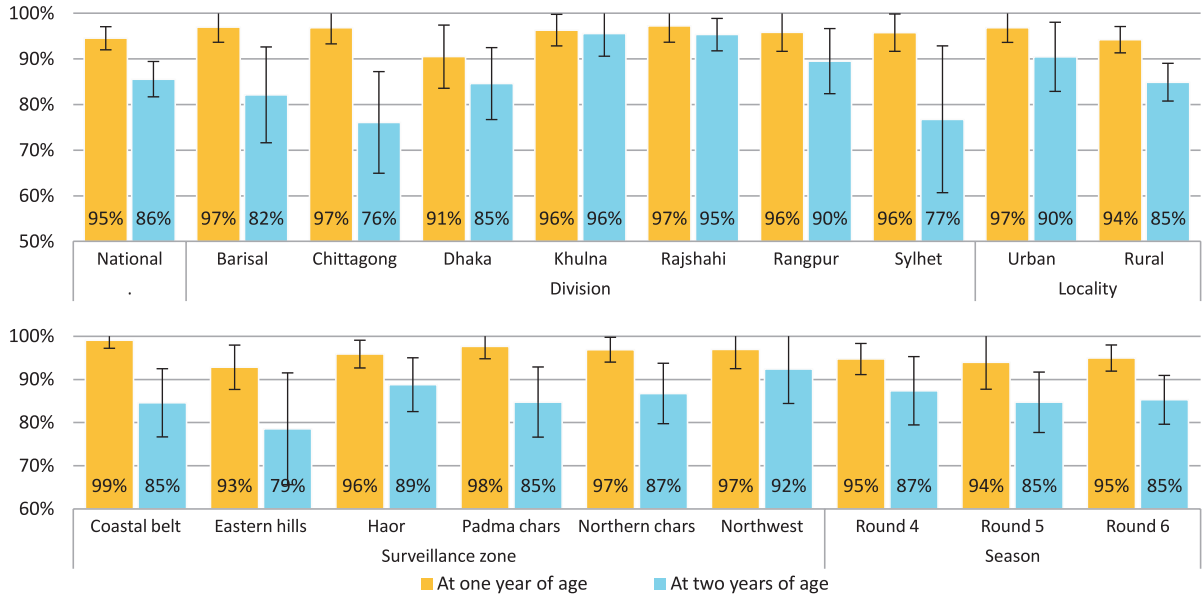


Figure 7.16 : **Continued breastfeeding by area of residence**



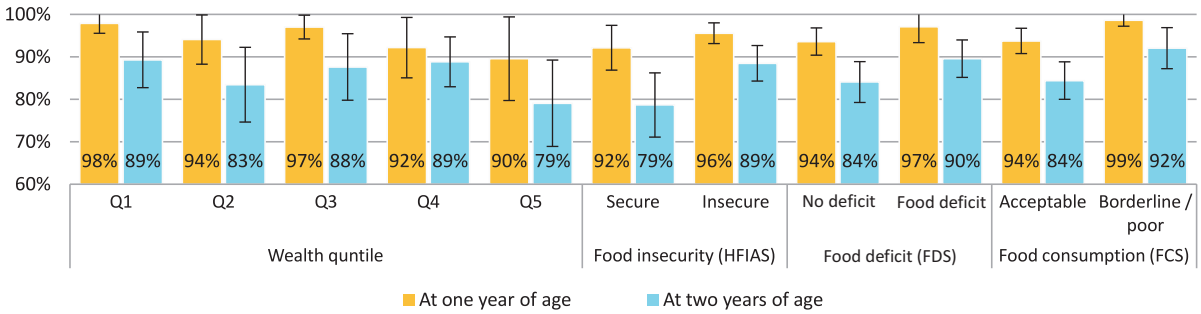
Since 1993, rates of continued breastfeeding for children at one year of age have been consistently greater than 90%, while rates of continued breastfeeding at two years have been greater than 85% (85; 88; 89; 70; 26; 116; 117; 24; 8). These rates have varied little over the years with the exception of a

9. Though not included in Figure 7.15, estimates from the preliminary BDHS 2011 report of are largely congruent (continuation at one year of age: 95%; continuation at two years of age: 90%).

dramatic drop in the proportion of children breastfed at two years of age from 92% in 2010 to 86% in 2011. It is unclear whether this drop represents a trend or a random fluctuation that is no cause for concern. As there was no variation in the seasonal rates of continuation of breastfeeding during 2011, this difference does not appear to be due to seasonality differences between the 2010 and 2011 FSNSP. With the exception of Chittagong and Sylhet divisions, where significantly lower rates of breastfeeding continuation at two years of age were apparent, there was limited geographical variation in these indicators and no significant differences by season.

There were no significant differences in maternal income earning status and child sex (not shown). There was only random variation across a rates of breastfeeding continuation by maternal educational attainment (not shown). The only background characteristics with a significant association with continuation of breastfeeding were the food security status and relative wealth of households. As shown in Figure 7.17, continuation rates of breastfeeding were higher in less wealthy and less food secure households, a finding consistent with the literature and known to confound studies that associate continued breast feeding with nutritional outcomes (119; 120; 121).

Figure 7.17 : **Continued breastfeeding by households food security and relative wealth**



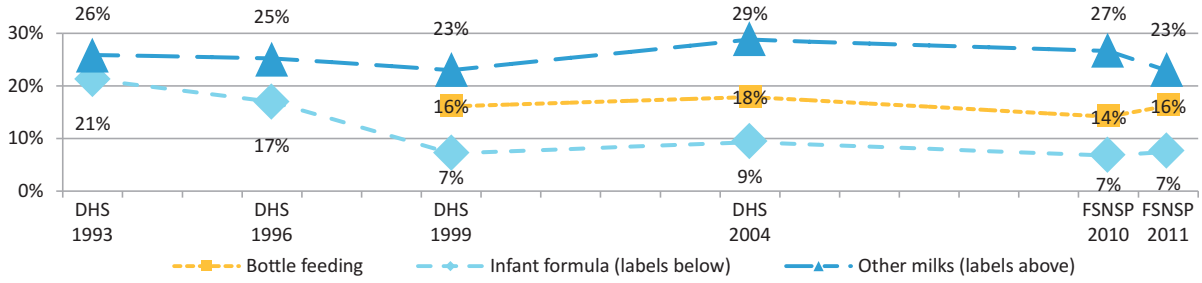
Threats to breastfeeding

In Bangladesh, despite high rates of breastfeeding, there is poor knowledge of the benefits and recommended duration of breastfeeding and widespread misconceptions of mothers being unable to produce milk sufficient to meet their baby's needs (105; 115). There is also limited understanding of the risks of bottle feeding and breast milk substitutes. Bottles are difficult to clean in resource poor settings, and thereby a frequent source of bacterial or viral contamination, especially when paired with liquid milk products (107; 27; 122). Moreover, the substitutes themselves are a source of calories and some micronutrients but do not provide increased immunity for the child and displace breastfeeding (107; 27). 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*, mandated maternity leave, health system support, and community support (105) the marketing of breast milk substitutes remains widespread.

To monitor use of breast milk substitutes, FSNSP 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. In line with the continued high rates of breastfeeding in Bangladesh, there has been no rapid increase in breastfeeding substitutes during the past 18 years (85; 88; 89; 70; 26; 8). The

proportion of children bottle fed did not change appreciably from 1999 to 2011, and the proportion of children receiving infant formula appears to have declined since the early 1990s. Fewer than one in five children less than two years of age were fed with a bottle, a proportion that has varied little in recent years.

Figure 7.18 : **Proportion of children bottle fed and fed with breast milk substitutes over time**



Not surprisingly, the proportion of infants and young children fed breast milk substitutes or with bottles varies greatly across the regions of Bangladesh. Sylhet stands out as having the lowest rates of both bottle feeding and use of breast milk substitutes, while Rajshahi and Dhaka have the highest rates. Little change is evident between 2010 and 2011, with the exception of an increase in the proportion of urban infants and young children fed with bottles (15% in 2010 and 25% in 2011). The proportion of children fed with a bottle did not vary over seasons, but the proportion fed breast milk substitutes decreased as the year progressed, particularly between the monsoon and winter season. This was caused by a reduction in the proportion of children fed animal milk and not due to a reduction in formula feeding.

Figure 7.19 : **Indicators of threats to breastfeeding by area of residence and season**

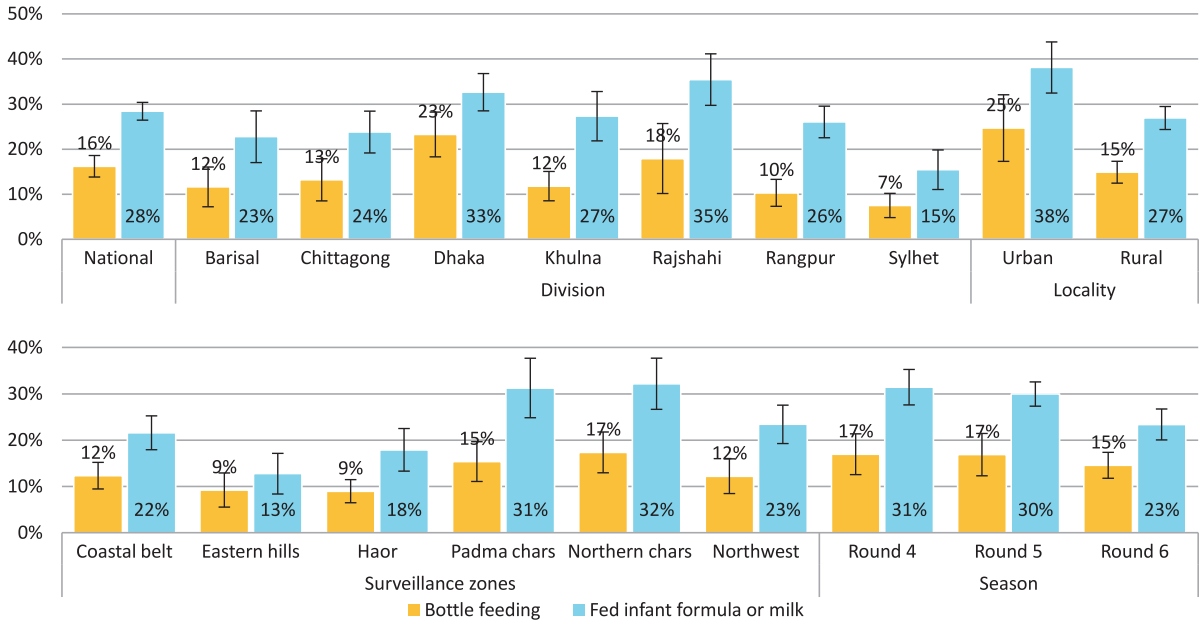


Figure 7.20 : **Indicators of threats to breastfeeding by household wealth and food security status**

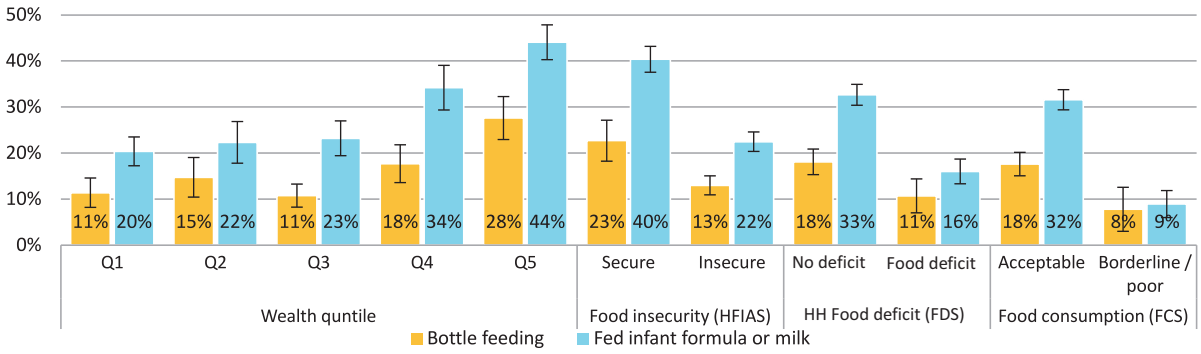
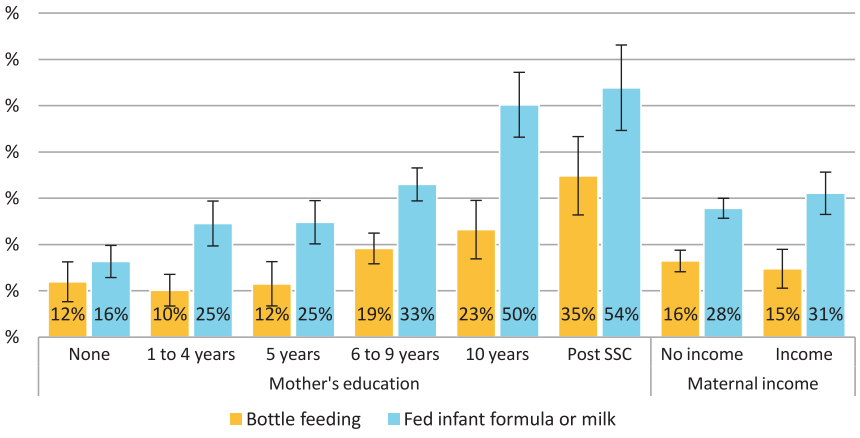
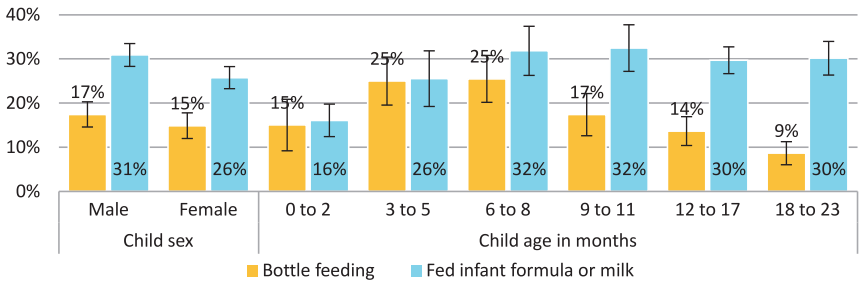


Figure 7.21: **Indicators of threats to breastfeeding by maternal characteristics**



More educated mothers fed their children with a bottle and breast milk substitutes in a greater proportion than less educated mothers; these women also tended to discontinue breastfeeding earlier (Figure 7.21). The increase in bottle and breast milk substitute feeding for more educated mothers may also be due to wealth effects, as more educated mothers were also often from wealthier households and children from wealthier households were also fed through these means in greater proportions. A mother's income earning status had little association with these practices. The proportion of children bottle fed in the wealthiest households increased significantly between 2010 and 2011 from 18% to 28%. As expected, food insecure households fed their children through these means less frequently (Figure 7.20).

Figure 7.22: **Indicators of threats to breastfeeding by child characteristics**



There are small but insignificant differences in the estimates of these practices between male and female infants and young children. The majority of bottle feeding takes place during the first year of life. Troublingly, one quarter of children three to five months of age were fed with a bottle and given breast milk substitutes instead of being exclusively breastfed. Almost one third of children received supplementary milk feedings from six to twenty-three months of age.

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 6 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 (105; 106). Appropriate complementary feeding can be difficult due to the complexity of the guidelines, caregivers' poor knowledge and time constraints, and the poor quality of usual household diets.

Figure 7.23 : **Child dietary patterns for complementary foods**

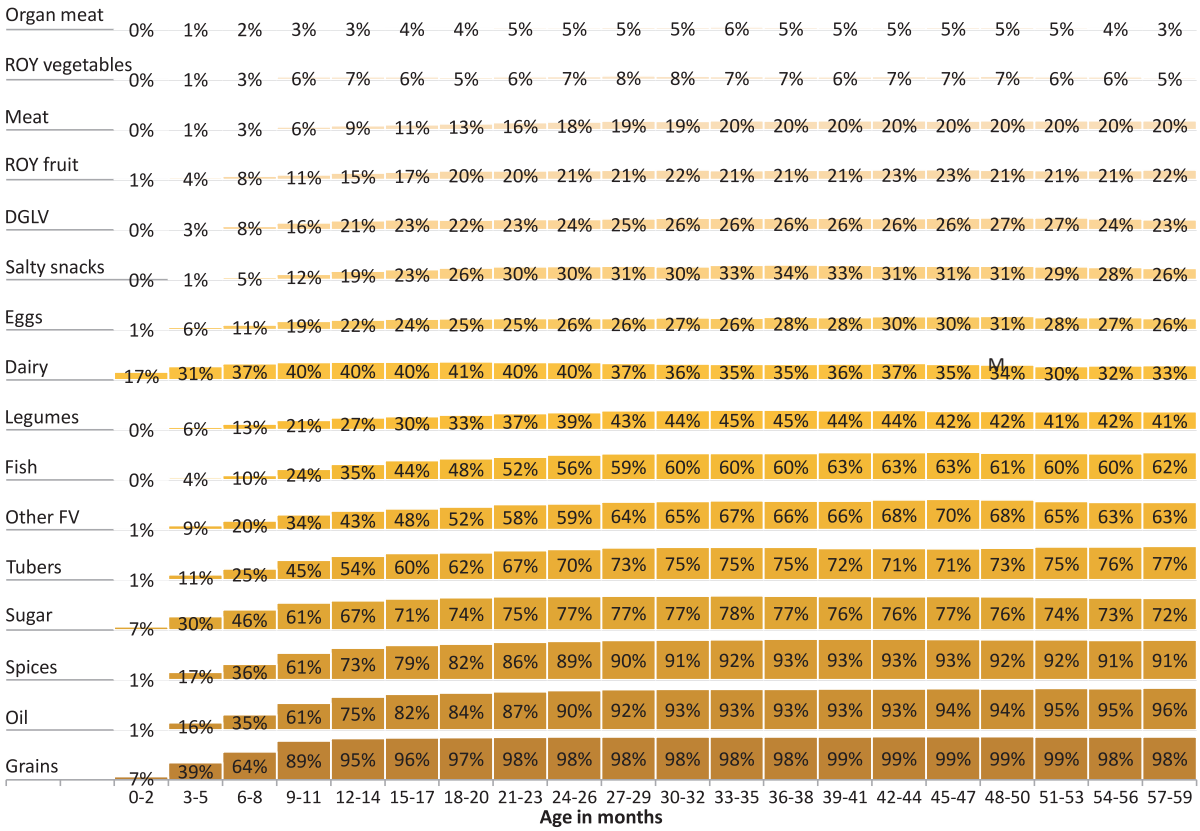


Figure 7.23 summarises the diets of infants and children in Bangladesh apart from human breast milk and non-milk liquids. In contrast to the complementary feeding guidelines listed above, a significant proportion of children were fed animal milk or breast milk substitutes from birth and from around three months of age, over a third of children eat rice and sugar. For older children, it is interesting that diets have mostly stabilised by about two years of age except for a slight increase in meat, fish, and tubers consumption and reduction in dairy products. This section will use five standardised indicators

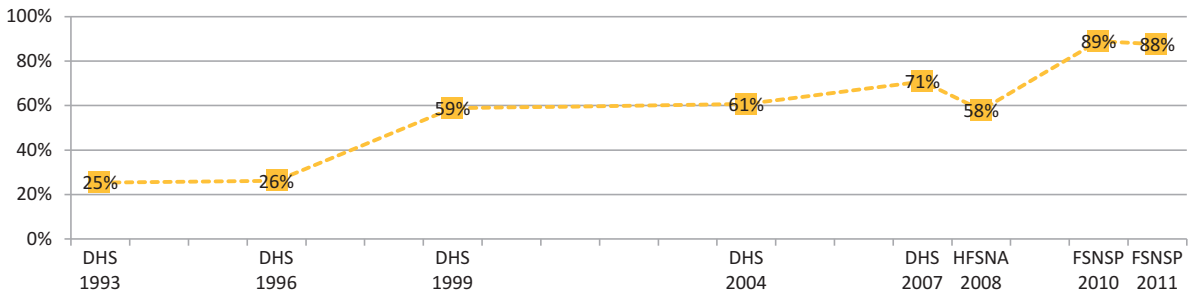
to examine complementary feeding practices in-depth and over targeted age ranges. The indicators in this section will focus on children six to twenty-three months of age, a critical period when inappropriate diets and nutritional deficiencies can retard growth and development for the remainder of the child's life (123). Additionally, a brief review of the dietary patterns of older children in comparison to that of women will be given at the end of this section.

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 (124; 107; 125). Waiting until six months to begin feeding a child solid or semi solid foods is supported by the fact that growth has not been shown to improve when complementary foods are introduced before six months and there are significant risks to the health of the child from early introduction to complementary foods, via food-borne pathogens or breast milk displacement (107; 126; 127). Additionally, a child's development and increased interaction with external objects which starts at six months of age makes this an ideal time to begin feeding (107; 128).

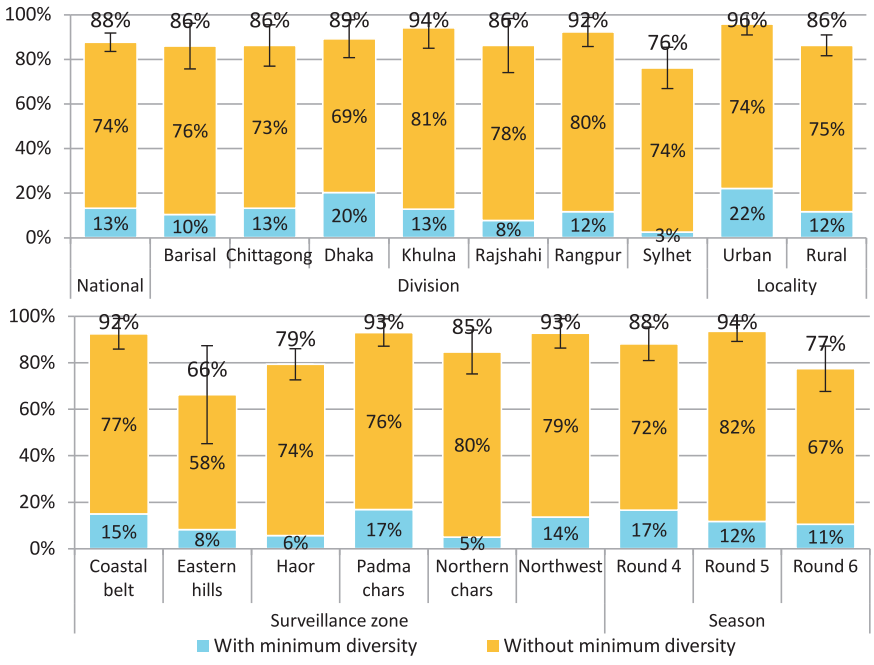
To estimate the proportion of infants who begin eating complementary foods at this ideal time, WHO recommends measuring the proportion of infants six to eight months old who ate any solid or semi solid food the day before the interview. This is referred to as timely introduction to complementary feeding. In the early 1990s only a quarter of children were introduced to complementary foods at six months, but from 1993 to 2010, there has been a large improvement in this indicator (85; 88; 89; 70; 26; 24; 8), though the level has not increased from 2010 to 2011.

Figure 7.24 : **Proportion of children six to eight months of age who were fed complementary food from 1993-2011** [10]



10. Though this indicator is not included in BDHS 2011 preliminary report (86), figures that are included indicate a lower estimate in the BDHS compared to FSNSP. This difference is most probably due to seasonal and methodological differences between the two systems. BDHS data were collected during the latter half of 2011 and lower rates of introduction to complementary feeding were observed at that time (Figure 7.25). Moreover, FSNSP collects dietary information through a free-recall followed by list based probes while DHS uses only a list based system. It is possible that the two step system employed by FSNSP elicits respondents to recall additional foods/liquids given to their infants. Additionally, FSNSP excludes observations in which the response is "does not know" from analysis for that indicator, while the DHS system includes these observations by assuming a "no" response for that indicator. As such, if the DHS data contained many "does not know" responses for items fed to children, this would decrease the estimate of this variable.

Figure 7.25: **Timely introduction to complementary foods by residence and season**



While this high rate of child feeding at six to eight months of age is heartening, the vast majority of children's diets are not diverse enough to provide adequate micronutrients. According to WHO, has indicated that a diverse diet should consist of at least four out of seven food groups every day.[11] Nationally, only around 13% of infants six to eight months of age are eating in line with this standard. Minimum dietary diversity at these ages ranged from 3% in Sylhet to 20% in Dhaka, while introduction to any complementary foods ranged from 76% in Sylhet to 94% in Khulna. In urban areas, the rates of timely introduction to complementary foods were a little over ten percentage points higher than in rural areas, but the proportion of infants fed with minimum diversity was nearly double. Of surveillance zones, the Eastern hills did the worst, with only two-thirds of children six to eight months of age being fed complementary foods at all. The estimates for these indicators varied over 2011. Overall rates increased slightly and insignificantly between Rounds 4 and 5, before falling significantly between Rounds 5 and 6. In contrast, adequate diversity was greatest in Round 4 and fell as the year progressed.

There was no significant relationship between maternal income and indicators of introduction to complementary foods, and only a very limited association between level of mother's education. In contrast, the relationship between maternal education and feeding with adequate dietary diversity is much stronger. Mothers who have at least partially completed secondary schools (over 5 years of education) fed their youngest child diverse diets in a much greater proportion than less educated mothers and almost half of women who had studied beyond SSC fed children diverse diets. As these women also exclusively breastfed in a much greater proportion than other women, this provides further evidence that education may have an independent effect on improved IYCF.

11. The seven food groups explained in greater detail in the next section (page 123) are starches (grains and tubers), legumes and nuts, dairy products (milk, yogurt, cheese), flesh foods (meat, fish, poultry, and liver/organ meats), eggs, vitamin-A rich fruits and vegetables (red, orange, and yellow fleshed), and other fruits and vegetables.

Figure 7.26: **Timely introduction by household wealth and food security status**

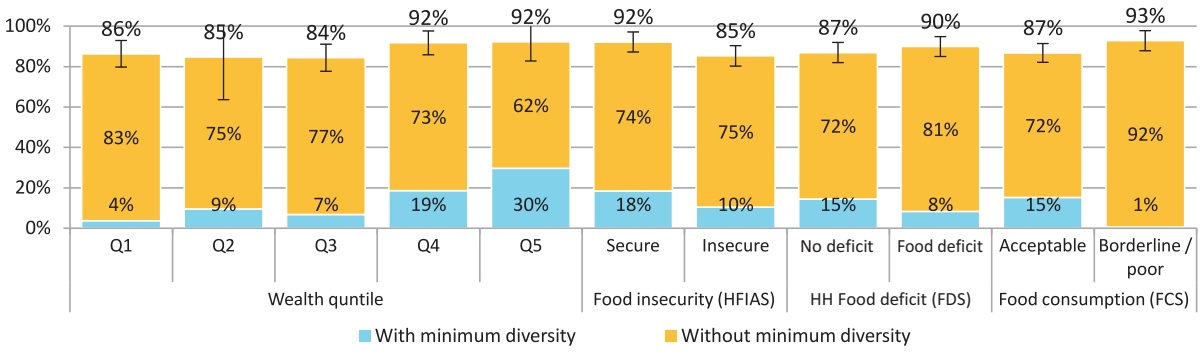
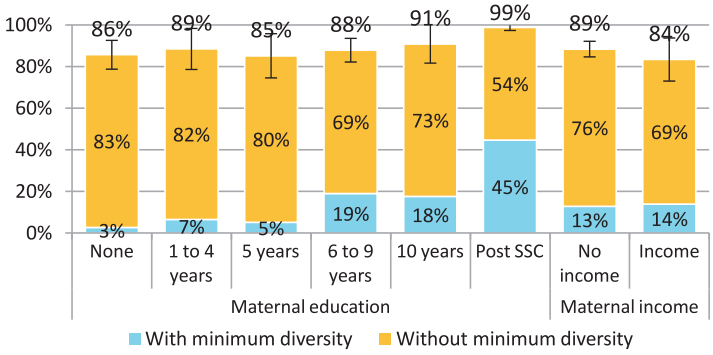
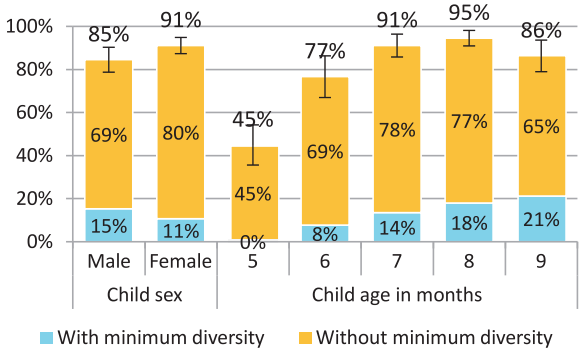


Figure 7.27: **Timely introduction by maternal characteristics**



The wealth and food security status of the household had only a limited association with the proportion of children who were introduced to foods at six to eight months of age, but a stronger association with the proportion of children receiving an adequately diverse diet. While only 4% of infants six to eight months old in the lowest wealth quintile had an adequately diverse diet, nearly a third of those in the wealthiest quintile did. Not surprisingly, food consumption score, itself a household dietary diversity measure, was highly associated with infants' adequately diversified diets; almost no children from households with poor or borderline food consumption habits had adequate diversity.

Figure 7.28: **Timely introduction by child sex and age in months**

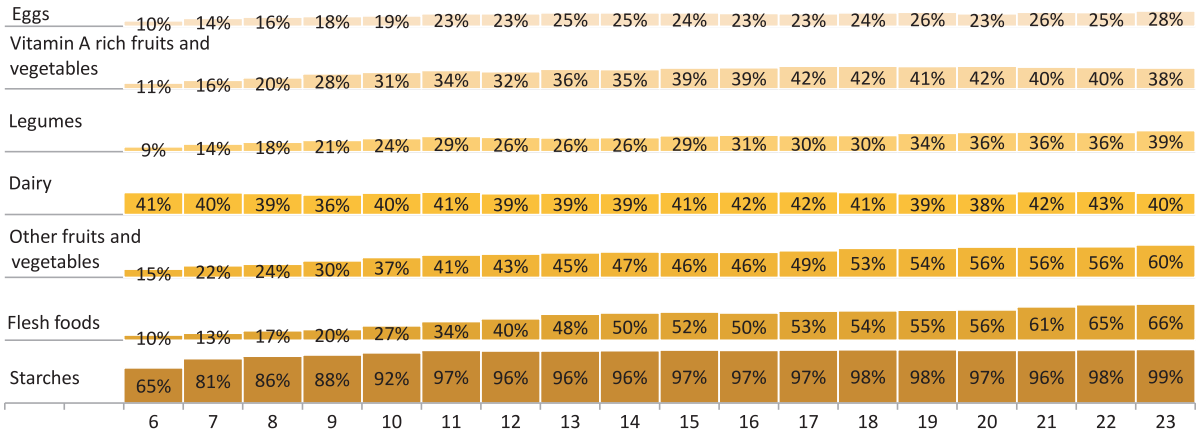


A significantly higher proportion of female infants are introduced to complementary foods on time compared to male infants, however, there was no significant difference in the proportion of male versus female children fed foods with adequate diversity. This is somewhat in contrast to historical patterns when male children would be fed first and with higher value foods (57). As child age increased, the proportion of children fed complementary foods and the diversity of their diets also increasesd. 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 (105; 107; 129). 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 they are able to eat in one sitting. Caregivers should ensure that meals contain sufficient fats and are nutrient and energy dense (107; 129). In addition, children should consume animal source foods and vitamin rich vegetables and fruits every day (130; 107; 129). A vegetarian diet is not recommended for young children unless specialty fortified products are used. Caffeinated and/or sugary beverages and even fruit juices are not recommended as these can displace the consumption of other nutritive foods (107; 129; 131). Particular attention should be paid to encouraging the consumption of local foods, for example indigenous small fish breeds (132), that provide nutrients which are less prevalent in breast milk such as iron, zinc, and vitamin B6 (124; 108). In resource poor settings liquid animal milk is not recommended due to the high possibility of contamination, except for non-breastfed children (129), but solid milk products are an important part of the diets of all young children (122; 107; 133).

Figure 7.29 : **Composition of childhood diets by WHO food group across age in months** [14]



Using the WHO methodology, dietary quality is measured through the use of a seven-item scale, which is constructed through the 16 food type categories included in WHO's standardised IYCF questionnaire (27; 28).[12] Figure 7.29 displays the proportion of children who were consuming foods from these groups by child age in months,[13] indicating that diets were not diverse. Troublingly, 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 fourteen months of age, fewer than half of children were consuming micronutrient-rich flesh foods.

12. These items are starches (grains, roots and tubers), legumes and nuts, dairy products (milk, yogurt, cheese), flesh foods (meat, fish, poultry and liver/organ meats), eggs, vitamin-A rich fruits and vegetables (red, orange, and yellow fleshed foods), and other fruits and vegetables.

13 See Figure7.23 for consumption patterns for all food types included in the questionnaire. The eggs, other fruits and vegetables, and legumes items are identical between Figure 7.23 and Figure 7.29. In contrast, the dairy item combines the results of Figure 7.23's dairy food type for solid foods information and liquid milk. The vitamin A rich fruits and vegetables item includes the ROY vegetables, ROY fruits group, and the dark-green-leafy vegetables food types. The starches item consist of both grains and tubers food types. The flesh foods item consist of fish, meat, and organ meats food types, but, of these three items, fish is by far the most commonly consumed. Spices, oil, salty snacks, and sugary foods types do not feature in this seven-item scale.

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. As can be seen from Figure 7.30, too few children are meeting this requirement in Bangladesh. Though virtually all children are being fed complementary foods by 11 months of age, 15% of these children are only consuming foods from one food group, usually micronutrient poor starches. Though the proportion of children meeting the standard for minimum dietary diversity increases relatively sharply from less than one-tenth of children at six months to over a third at one year of age, this increase was much more gradual after the first year of life. By two years, only slightly over half of children were eating a diet that is minimally diverse.

Figure 7.30 : **Number of food groups consumed by age in months** [14]

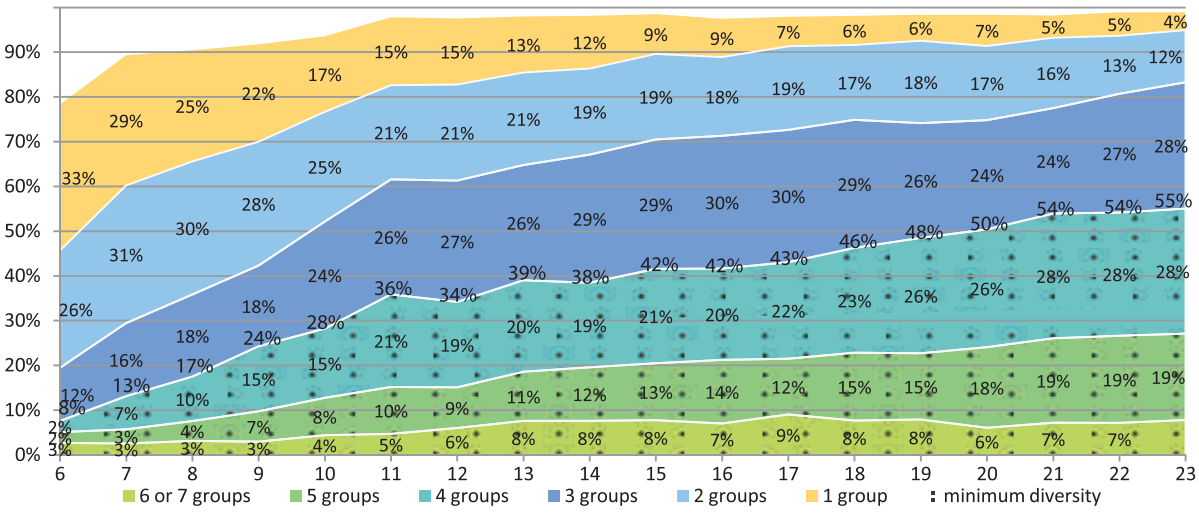
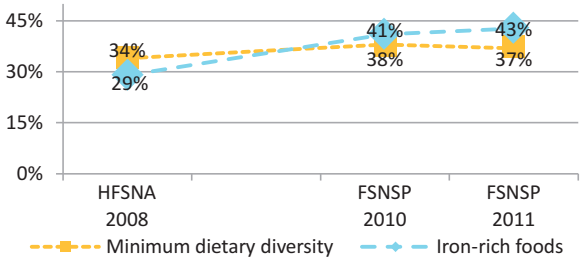


Figure 7.31 : **Trends in child dietary quality indicators** [15]



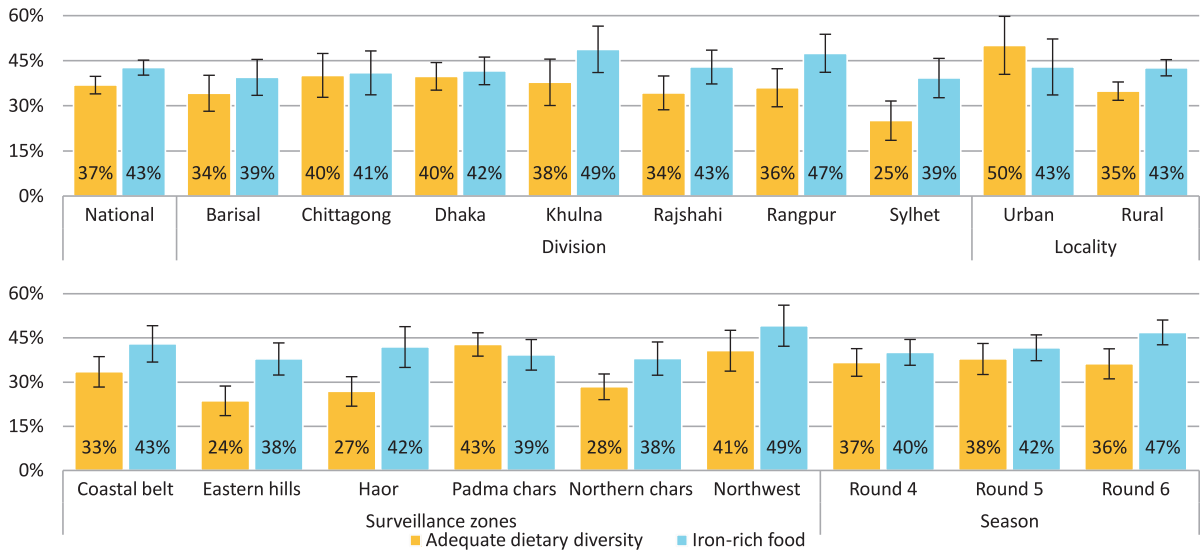
As shown in Figure 7.31, the proportion of children fed a minimally diverse diet has changed little since 2008, with only a little over one-third of children eating a minimally diverse diet in 2011 (24; 8). In addition to general dietary diversity, WHO recommends measuring the proportion of children six months to two years of age who ate an iron-rich food (any item in the flesh food category) or any

14. These graphs are constructed using a 3 month moving average. As such, it is designed to show a pattern over age in months and not provide precise point estimates.

15. In the BDHS 2011 preliminary report, the proportion of children with minimum dietary diversity, 25%, was much lower than this estimate (86). Since FSNSP did not find a large variation in this indicator over the course of 2011 (see Figure 7.32), this difference is most probably due to methodological differences between the two systems. As stated before, FSNSP collects dietary information through a free-recall followed by list based probes while DHS uses only a list based system. It is possible that the two step system employed by FSNSP elicits respondents to recall additional foods/liquids given to their infants. Additionally, FSNSP excludes observations in which the response is "does not know" from analysis for that indicator, while the DHS system includes these observations by assuming a "no" response for that indicator. As such, if the DHS data contained many "does not know" responses for items fed to children, this would decrease the estimate of this variable.

iron supplement or iron fortified food (including home fortified foods) the previous day.[16] Inclusion of iron-rich foods or iron supplementation into infant and child diets are needed to supplement breast milk around six months of age (133). In 2011, around two-fifths of children had diets that met this criteria; this figure is nearly identical to 2010 and considerably more than the figure given in HFSNA. The vast majority of these children met this requirement through the consumption of flesh foods, particularly fish, and only around 1% of children six months to two years of age had consumed an iron supplement or micro-nutrient powder packet in the week before the interview.

Figure 7.32: **Minimum dietary diversity and iron consumption by area of residence and season**



These indicators do not vary greatly across the divisions of Bangladesh, however Sylhet stands out with a very low proportion of children, only one-quarter, meeting the minimum diversity standard. On the other hand, Khulna and Rangpur stand out for almost half of the children in these areas having eaten 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 no difference in the proportion of children eating an iron-rich food. Across surveillance zones, the Eastern hills, Haor, and the Northern chars stand out for the low proportion of children who ate a minimally diverse diet, while the Northwest and the Padma chars have above average proportions of children with minimally diverse diets. Additionally, in the Northwest nearly half of children ate an iron-rich food the day before the interview, the highest proportion among the zones. Surprisingly, there is little seasonal variation in the proportion of children eating a minimally diverse diet nationally, which is in contrast to the pattern observed in women's diets, households' food consumption, and the pattern observed in children's diets in the food insecure zones in 2010. There were no significant patterns seen across zones (graphs not shown, see *Summary Statistics*).

16. In Round 4, the collection of this indicator did not include consumption of an iron supplement because the FSNSP recall period for taking an iron supplement was for the week before the interview instead of for the day before the interview. This omission is not expected to bias results greatly as less than half a percent of children had taken an iron supplement during the day before the interview in the fifth and sixth round.

Figure 7.33 : **Indicators of dietary quality by household wealth and food security status**

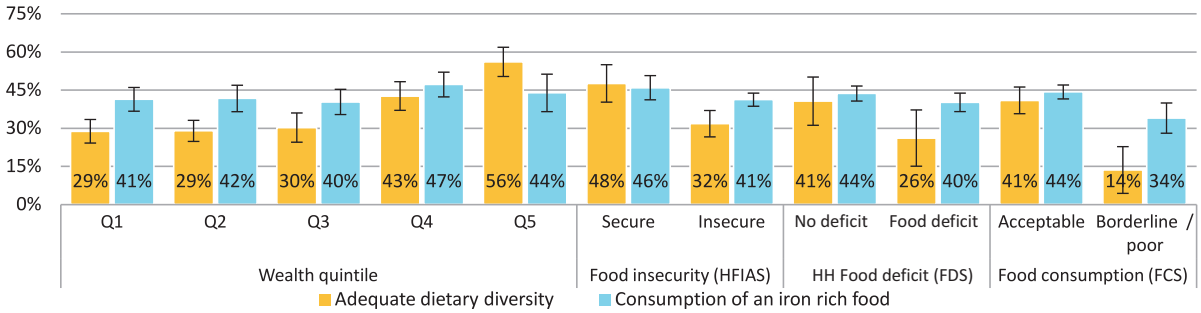
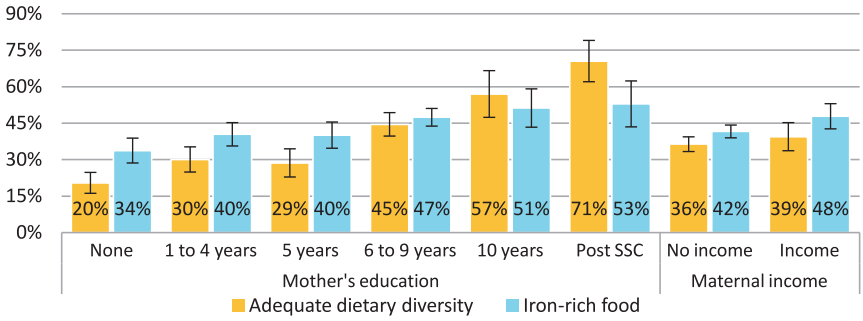
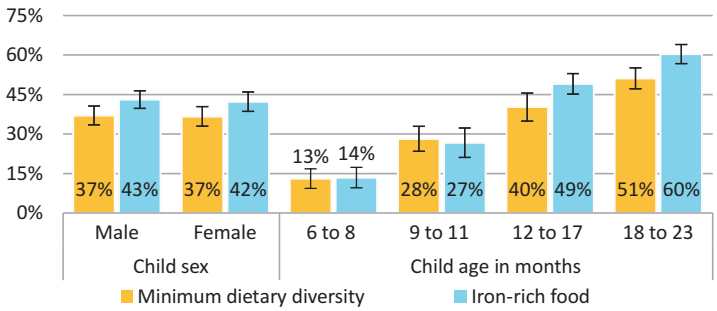


Figure 7.34 : **Indicators of dietary quality by maternal characteristics**



Children from households in the wealthiest two quintiles ate significantly more diverse diets than children from households in the lower three quintiles. This pattern was similar to that seen between categories of food security indicators, with the greatest variation between children of the two different food consumption categories. In contrast, there was much less variation across wealth and food security categories for consumption of iron-rich foods. Even more than wealth, maternal education was strongly associated with children's dietary patterns. Maternal income was associated with a significantly greater proportion of children eating iron-rich foods, but no difference in dietary diversity. The variation in the proportion of children consuming iron-rich foods over the seasons of 2011 is due to an increase in fish consumption primarily among children of less wealthy and more food insecure households and children of less educated and income-earning mothers. Among children from wealthier and food secure households, there was no systematic variation in the proportion of children eating iron-rich foods over the course of 2011.

Figure 7.35: **Indicators of dietary quality by child age and sex**



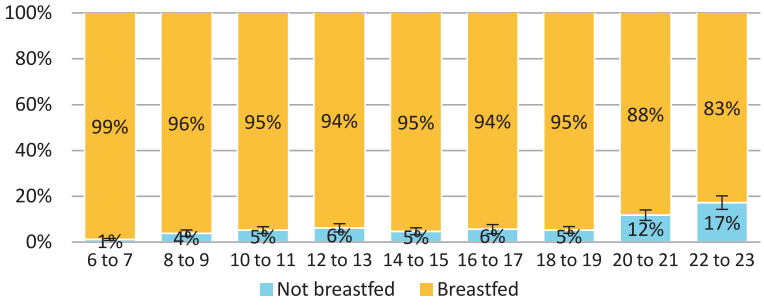
There was no difference in the proportion of male versus female children who ate minimally diverse diets or that had consumed an iron-rich food. However, age effects were observed; as age increased so did the proportion of children that ate in minimally diverse diets or iron rich foods. However, even among children 18 to 23 months of age, only half ate

minimally diverse diets and 60% an iron-rich food the day before the interview. There were no major seasonal trends by child sex or age except for a moderate and statistically significant reduction in the proportion of children 18 to 23 months consuming a minimally adequate diet during Round 6 (Round 4: 54%, Round 5: 55%, and Round 6: 45%).

Minimum acceptable diets

In addition to adequate dietary diversity, older infants and young children need to be fed sufficient amounts 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, particularly during the period between six months and one year of age. During this period, care must be taken so that complementary feeding does not replace breast milk and is in response to the child's hunger cues (107). Because children grow differently and have differing activity levels, the amount of food a child should eat at any given age cannot be precisely estimated. However, Bangladesh's IYCF guidelines, in line with the WHO complementary feeding guidelines, recommend feeding children six to eight months of age two to three meals of soft foods a day in addition to snacks, and children nine months to two years of age, three to four meals a day in addition to snacks (105; 107). By one year of age, it is expected that children will be able to eat the same types of solid and semi-solid foods as the family with a few supplemental feeds or snacks (108; 107). Snacks can be a vital part of responsive feeding as they are usually easy to prepare in response to hunger cues and are self-fed (107). Additionally, these ready-foods can prevent caregivers from holding prepared foods for children from one meal to the next which can increase the risk of microbial contamination (107).

Figure 7.36 **: Proportion of children breastfed by age in months**



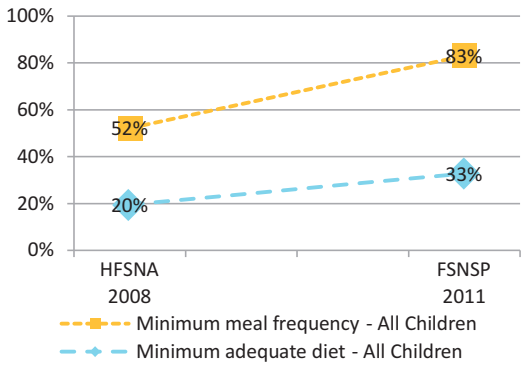
To measure the proportion of children consuming a minimum acceptable diet, FSNSP uses two indicators recommended by WHO: minimum meal frequency and minimum acceptable diet. Both of these measures require separate tabulation for breastfed and non-breastfed children, the results of which are combined into one indicator. Because the vast majority of children six months to two years of age are breastfed (93% overall ages, see Figure 7.36), the overall results of these indicators closely match the estimates for breastfed children. 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 (27; 28).

FSNSP directly asks caregivers the number of times they fed their child a meal or snack during the day before the interview.[17] For breastfed children, the indicator for minimum meal frequency is met when a child six to eight months of age ate meals or snacks at least two times the day before the interview or when a child nine months to two years of age ate meals or snacks at least three times the day before the

17. In line with WHO guidelines a few bites of another household member's food is not sufficient to count as a snack or meal.

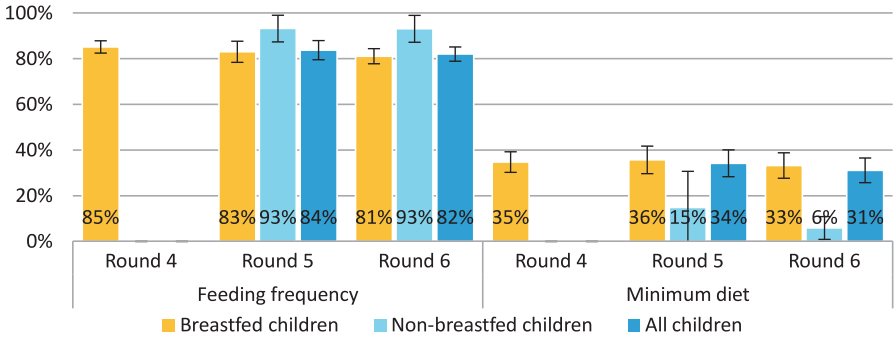
interview. For non-breastfed children, the frequency with which children were given milk feeds is also considered, and the indicator for minimum feeding frequency is met when a child six months to two years of age ate meals, snacks, and had milk-feeds a total of at least four times the day before the interview. Because FSNSP did not include the question on milk feeding frequency in Round 4, the full indicator is only available for the fifth and sixth rounds of surveillance in 2011. However, the proportion of breastfed children who were fed with minimal meal frequency is available for all three surveillance rounds of 2011. During Rounds 5 and 6, 83% of all children were fed with minimum frequency. This proportion of children is considerably greater than that estimated from the 2008/2009 HFSNA.

Figure 7.37 : **Indicators of adequate diets over time** [18]



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 the day before the interview. For non-breastfed children, the tabulation is more complicated. Non-breastfed children aged six months to two years old are classified as having had a minimum acceptable 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 not including dairy products. During Rounds 5 and 6, one-third of children were fed minimally adequate diets. This indicates a considerable increase in children eating minimally acceptable diets since 2008, but the current level is still far short of the target of 52% set in the HPNSDP.

Figure 7.38 : **Minimum meal frequency and adequate diet by season**



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 of 2011. However, Sylhet and Rajshahi stood out for the low proportion of

18. In the BDHS 2011 preliminary report, the proportion of children with minimum feeding frequency, 65%, and minimum acceptable diets, 21%, were much lower than these estimates (86). Since FSNSP did not find a large variation in these indicators over the course of 2011 (see Figure 7.38), this difference is most probably due to methodological differences between the two systems. As stated before, FSNSP collects dietary information through a free-recall followed by list based probes while DHS uses only a list based system. It is possible that the two step system employed by FSNSP elicits respondents to recall additional foods/liquids given to their infants and to recall additional meal times at which children were fed. Additionally, FSNSP excludes observations in which the response is "does not know" from analysis for that indicator, while the DHS system includes these observations by assuming a "no" response for that indicator. As such, if the DHS data contained many "does not know" responses for items fed to children, this would decrease the estimate of both of these variables.

children eating with minimum frequency and Khulna stood out for having over 90% of children eat with minimal meal frequency. Children in urban areas ate more frequently than children in rural areas. Most surveillance zones were in line with the rural average, but only three-quarters of children in the Northern chars ate meals with minimum frequency. Over regions of Bangladesh, there is much greater variation in the proportion of children fed minimally adequate diets than those fed with minimum frequency, but there was little difference among the seasons of 2011. Notably only around one-fifth of children in Sylhet, in the Eastern hills, and in the Haor ate a minimally adequate diet. While in rural areas, nearly half of children ate acceptably, this falls to less than a third in rural areas. In no division are greater than 40% of children eating in line with these minimum standards. There was little variation in these indicators over the seasons of 2011 (Figure 7.38).

Figure 7.39: **Minimum meal frequency by area of residence**

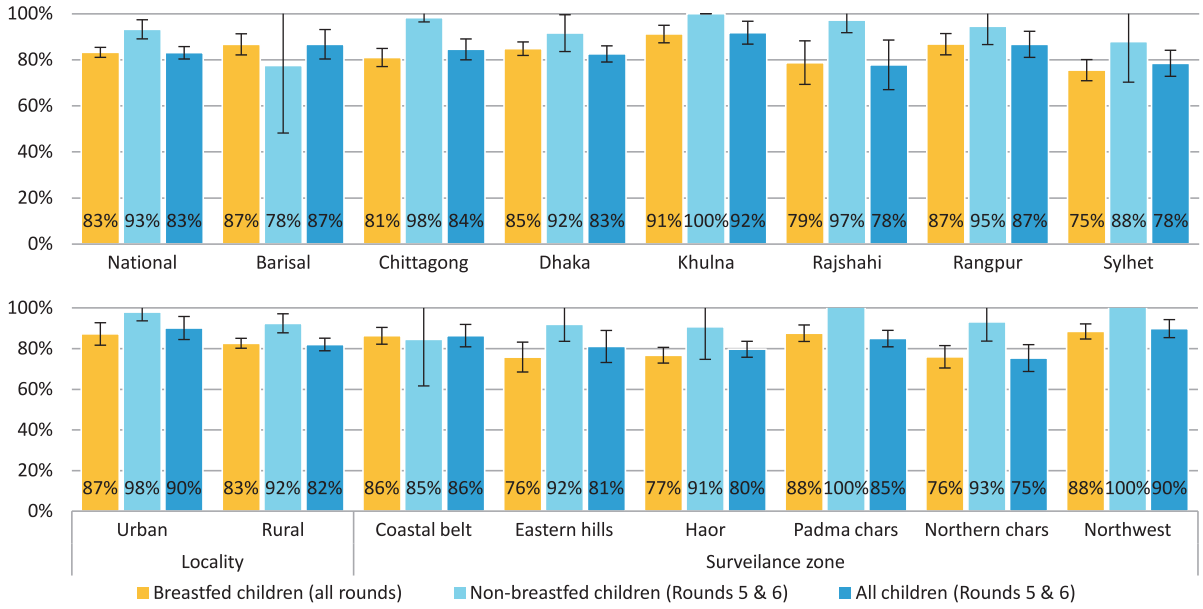


Figure 7.40: **Minimum adequate diet by area of residence**

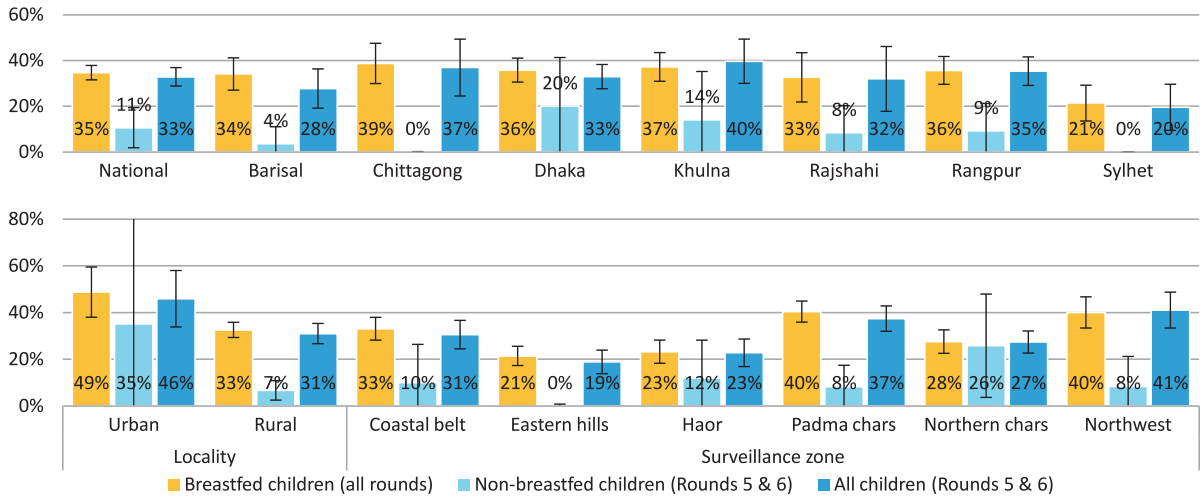


Figure 7.41 : **Minimum meal frequency and diet adequacy for breastfed children by wealth and food security**

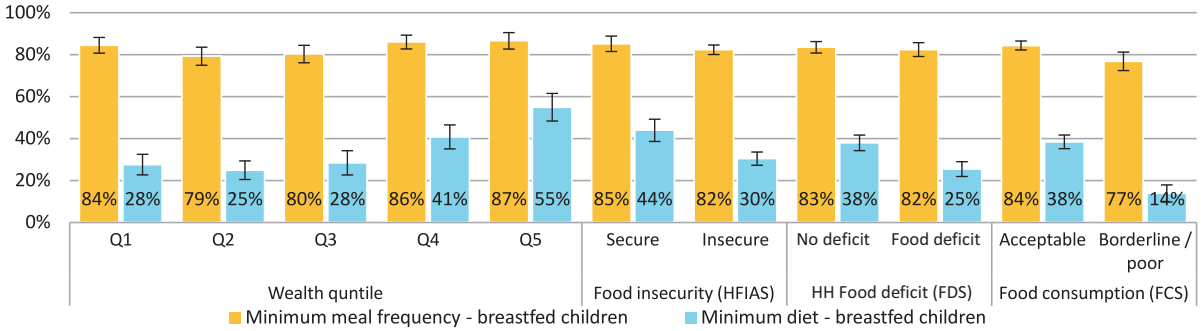
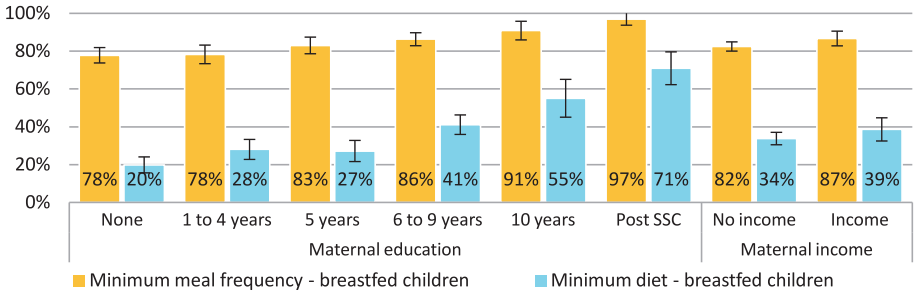
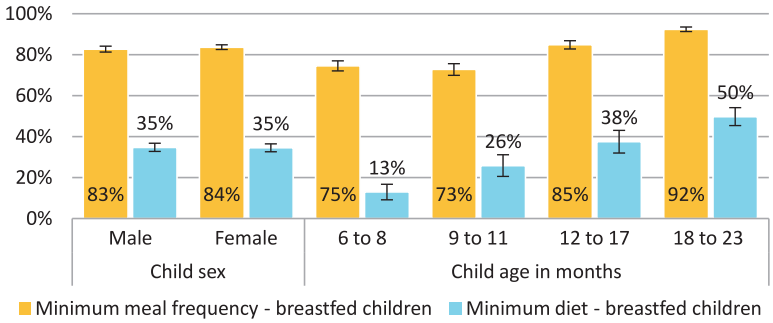


Figure 7.42 : **Minimum meal frequency and diet adequacy for breastfed children by maternal characteristics**



Because these indicators were not available for all children from all surveillance rounds of 2011, the examination of these indicators against household, maternal, and child characteristics will only be done for breastfed children. The proportion of children fed with adequate frequency and minimum acceptable diets was associated positively with the level maternal of education. Children of mothers who earn income had acceptable diets significantly more often than those who did not. The proportion of children receiving a minimum acceptable diet was greater in wealthier households compared to less wealthy households, but even in the wealthiest quintile only a little over half of children received the minimum diet. Although about the same proportion of children from food insecure households received minimum feeding frequency as children from food secure households, a significantly smaller proportion received the minimum diet, especially between households with different food consumption categories. Over seasons, there were no notable patterns in these indicators by wealth or food security characteristics (graphs not shown).

Figure 7.43: **Minimum meal frequency and diet adequacy by child sex and age**



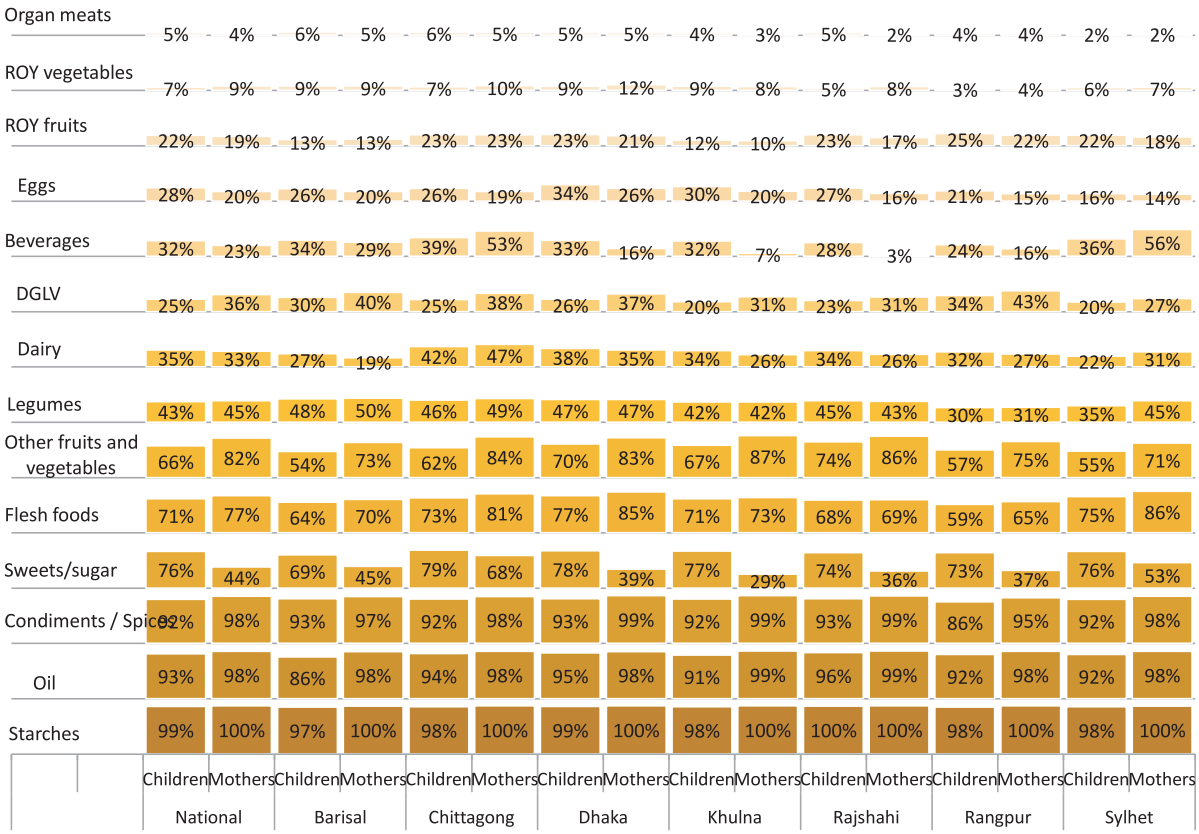
There was no difference in the proportion of children fed minimally acceptable diets between males and females, but, as with many of the complementary feeding variables, the proportion of children fed in line with these guidelines increased with age. While only one tenth of children six to eight

months of age were fed in line with minimum standards, this increased to half of children in the oldest age group. Over the seasons of 2011, there was a moderate but significant decrease in the proportion of boys fed with minimal frequency and thereby minimum acceptable diets over the year. This pattern did not hold for girl children (graph not shown).

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 (27; 28). The information on older children allows FSNSP to track changes in the dietary diversity and eating habits of this population and obtain information on the continuation of breastfeeding as was mentioned earlier in this chapter (27; 28; 69). Figure 7.49 compares the dietary patterns of mothers to their pre-school children. Foods types eaten by mothers and children are largely the same but there are some notable differences. Nationally, the only item consumed by a significantly greater number of children than mothers were eggs, beverages, and sweets. A lower proportion of children eat spices, oil, flesh foods, dark green leafy vegetables, and other fruits and vegetables than their mothers. This is troubling because of the nutrient rich nature of these food types and oil's use in aiding in metabolising nutrients from plant sources.

Figure 7.44: **Proportion of mothers and children (24 to 59 months of age) consuming food types by division**



In some divisions, the gap between mothers and children's diets is larger. Sylhet where lentils, flesh foods, dairy, and beverages were consumed by a considerably lower proportion of children compared to mothers showed the largest gap. In Rajshahi the gap was the smallest and a greater proportion of

children compared to mothers ate ROY fruits, eggs and dairy. Comparing children's diets by division reveals that children eat much less diverse diets in Rangpur, Sylhet and Barisal. The diversity of child diets also increased during the monsoon (Round 5), similar to what was seen in women's diets (Figure 7.45).

Figure 7.45 : **Mean dietary diversity scores and meals fed to children two to four years of age by residence**

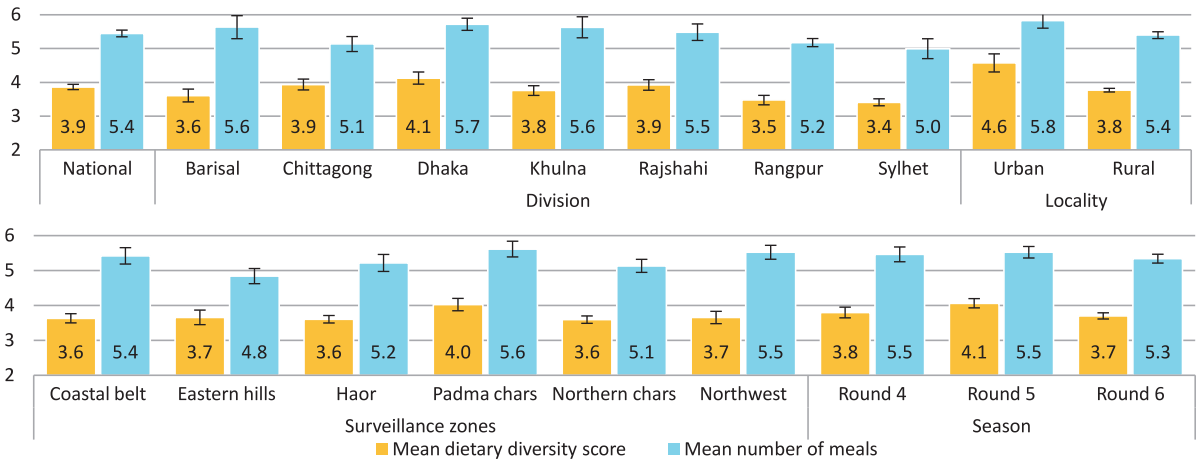
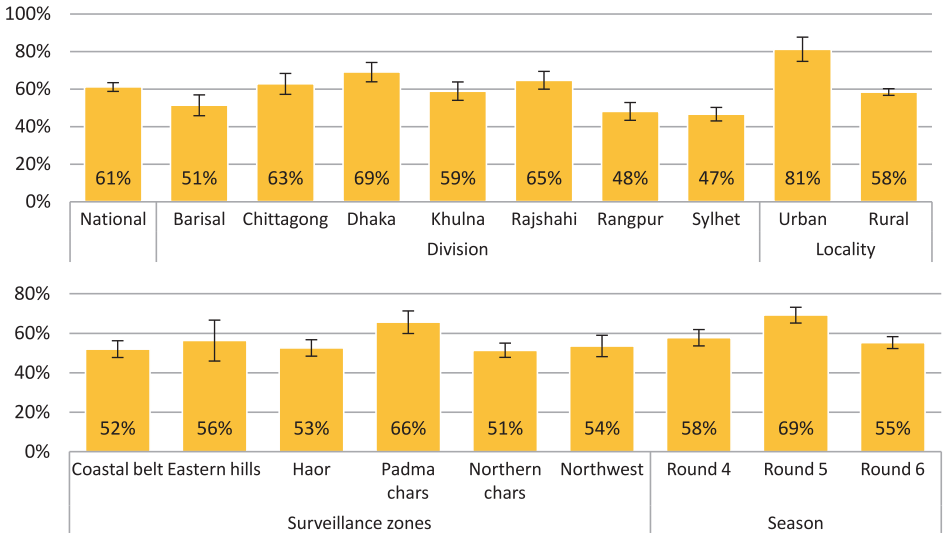


Figure 7.46 : **Proportion of children two to four years of age eating four or more food groups by residence**



By applying the IYCF indicator principals to older children, excluding the breast milk requirements, FSNSP estimates the proportion of older children who are eating an adequate diet. Nearly all children over two years of age are eating at least three meals or snacks a day (98%), and many are eating much more frequently than this. Nationally, on average children are fed standard meals plus two to three snacks a day (Figure 7.45). In contrast, many children still did not meet the requirement of eating four out of seven food groups the previous day. Only half of children in Sylhet, Rangpur, and Barisal ate diets which were minimally diverse (Figure 7.46). Significantly more children ate a diverse diet during the monsoon months (Round 5), which is consistent with the observed dietary diversity patterns of women (Figure 5.5) and households (Figure 4.17).

Figure 7.47: **Children two to four years of age eating four or more food groups by wealth and food security**

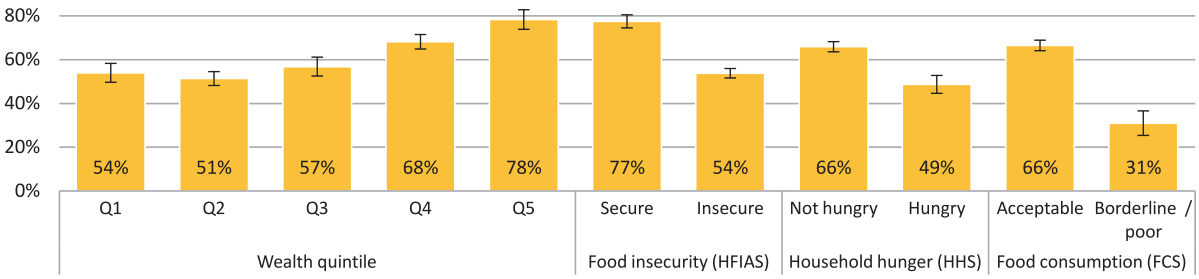
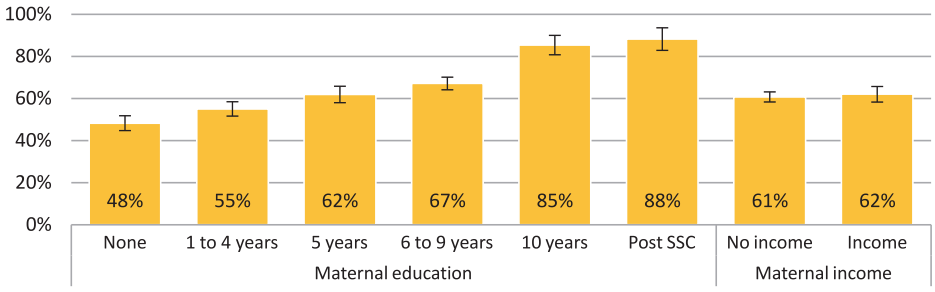
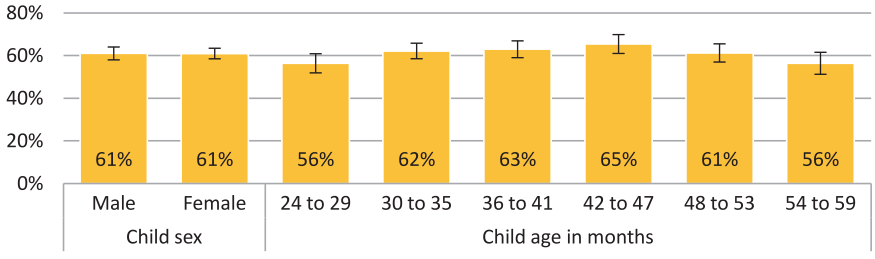


Figure 7.48: **Children two to four years of age eating four or more food groups by maternal characteristics**



Interestingly the proportion of children two to five years of age in the least wealthy quintiles was similar to the proportion of children six months to two years of age eating diverse diets in the richest quintile (compare Figure 7.33 with Figure 7.47). This indicates that even less wealthy households were able to manage more diverse diets for older children, but failed to do so for younger children. However, some households, such as the fifth of households with poor or borderline food consumption, were largely unable to meet the diversity requirements for children of this age as well. Maternal education continued to be associated with the diversity of the child's diet.

Figure 7.49: **Children two to four years of age eating minimally diverse diets by child age and sex**



There was no difference in the proportion of male and female children who ate a minimally diverse diet the day before the interview. However, the proportion of children eating four or more food groups increased until 42 to 47 months of age before decreasing for children in their fifth year of life.

Child illness

As mentioned previously, a frequently ill child is much more likely to become malnourished due to reduced appetite as well as a decreased ability to absorb nutrients consumed (34). Routine childhood illnesses can be prevented through adequate child care and feeding paired with preventative health care. Additionally, the potentially disastrous effects of child illness can be alleviated though timely and proper treatment of child illness both at home and through consultation with health care providers. 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 contributing to malnutrition (34). In Bangladesh, children as young as three months of age have been shown to have faltering growth related to chronic and acute infection (134). Furthermore, acute illnesses due to these infections result in significant but preventable costs to the health care system. Improving hygiene and reducing the parasite load in a country like Bangladesh can be expected to dramatically improve nutrition among infants and young children.

Preventative health care

Preventing illness in infants and young children begins with proper feeding and adequate household hygiene. In addition, 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 (135). 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 and 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 (136). Vitamin A deficiency leads to dry eyes, stunting, anaemia, and an increased risk of infection (137). 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 problems it causes for the visual system;[19] Vitamin A related blindness is responsible for bringing this micronutrient deficiency to the fore in the early 1990s (138). 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 (5).

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. Animal source foods such as fish oils, organ meats, and whole fat milk directly supply the vitamin, while dark green leafy vegetables and most red/orange/and yellow (ROY) fruits and vegetables supply vitamin A precursors. Because of the cost and high resource requirements of animal source foods, the majority of dietary vitamin A in low income communities is from plant sources, which are poorly metabolised, leading to deficiencies (136).

The Government of Bangladesh currently implements a large scale vitamin A supplementation programme coordinated out of the Ministry of Health, Directorate of Health Services (5). This programme provides low potency vitamin A supplementation (100,000 i.u.) to children six to eleven

19. In the initial stages of clinical vitamin A deficiency eyes become dry and they have difficulty seeing at night since vitamin A is an important component of rod production. At more advanced stages the cornea of the eye becomes affected, with ulceration and drying leading to scratching, scarring, and permanent blindness. Sub-clinical levels of vitamin A deficiency can only be measured by assessing levels of serum retinol in the blood (136).

months of age[20] 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 (NID) and national vitamin A campaign (NVAC) days. Recent WHO recommendations support this programme (139). 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 (5; 100; 139).

Figure 7.50: **Historical trends in VAC coverage for children 12 to 59 months of age (1993 to 2011)**[21]

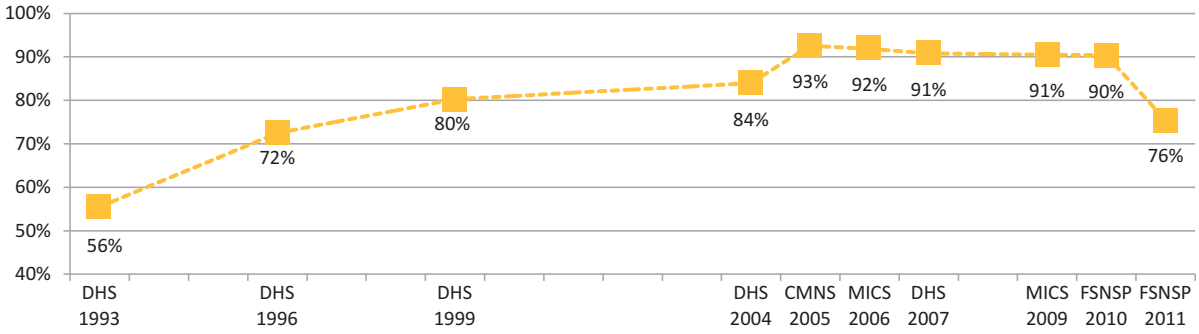
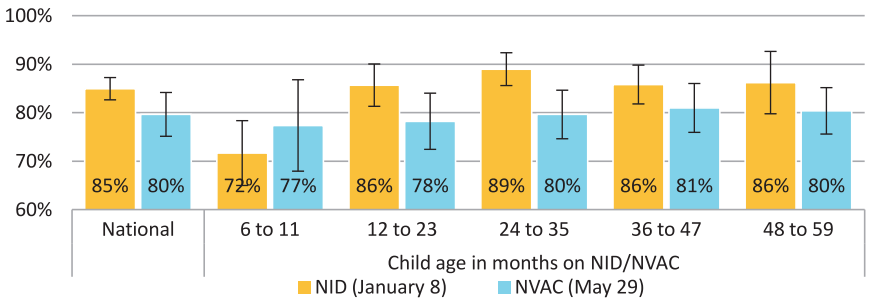


Figure 7.50 displays the proportions of children 12 to 59 months of age who had received vitamin A capsules (VAC) in the six-months prior to interview over several surveys completed in the last 18 years (85; 88; 89; 70; 26; 116; 117; 118; 8).[22] Notably, the level of coverage improved dramatically from 56% in 1993 to 80% in 1999. Between 1999 and 2005, coverage rates improved more slowly, but settled at over 90% consistently during the period 2005 to 2010, before falling to 76% in 2011. However, as has been noted elsewhere (86), the low coverage rate of the VAC campaigns in 2011 are due to both gaps in the scheduling of these programmes and to slight drops in programme coverage. In 2011, the NID (January 8th) and the NVAC day (May 29th) were both held in the first half of the year (only about four and a half months apart). The completion of the NVAC day in late May resulted in most children included in FSNSP during December having not received VAC in the six months prior to interview.[23]

Figure 7.51: **Coverage of the NVAC campaigns in 2011 by event**



Additionally, any measure of programme coverage must take into account the age of the child on the last VAC distribution date and not the child's age at interview. This is especially important for children under one year of age, as

20. This guideline was changed in February 2011. Prior to this, low dose VAC capsule was delivered with measles vaccination at around nine months of age.
21. Please note that the figure for 1993 DHS is taken from children only 12 to 35 months of age. Since the rates of VAC receipt do not change greatly over the older age cohorts in recent surveys, the figure for the entire group of 12 to 59 months was likely similar.
22. The younger age cohort of six to eleven months of age is not shown in this graph because recommendations for this age group have changed and thereby this age group is only included in a few past surveys. Moreover, due to ageing, many of the children who are six to eleven months at the time of interview were not eligible for inclusion in the past VAC programme due to being less than six months of age on the campaign day.
23. Some children, however, still reported having had a VAC in the prior six months due to supplementation that can occur at health facilities outside of the NID and NVAC days.

none of these children would be eligible for VAC if the capsule distribution had occurred more than six months in the past. Figure 7.51 looks at the coverage rate of the two VAC campaign days in 2011 by the age in months of the child on the VAC distribution day. This analysis indicates that the May NVAC did indeed have lower coverage for children overall but equal coverage for children six to eleven months of age compared to older children in line with the changed protocol between the two dates. Troublingly, the coverage for both of these events is lower than the HPNSDP target of 90% for 2016.

Figure 7.52 : **Coverage of the NVAC campaigns in 2011 by area of residence**

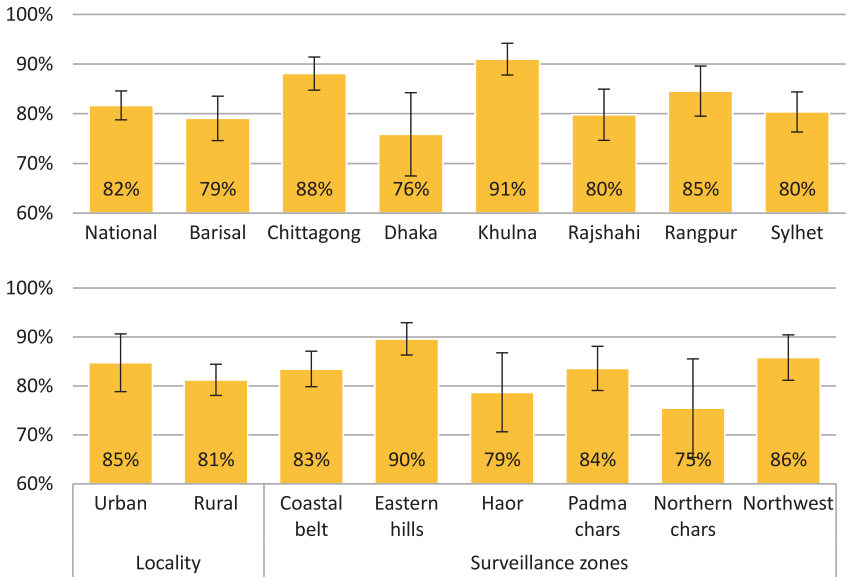


Figure 7.52 pools these two estimates to show overall coverage of the NVAC events during 2011.[24] There was only limited variation across areas of residence. The programme had higher coverage in Chittagong and Khulna than the rest of the country, but there was little difference between rural and urban areas. Similar to BDHS 2011 results, Dhaka had the lowest coverage rate (86). There was little difference in coverage rates between surveillance zones.

Figure 7.53 : **Coverage of the NVAC campaigns in 2011 by household characteristics**

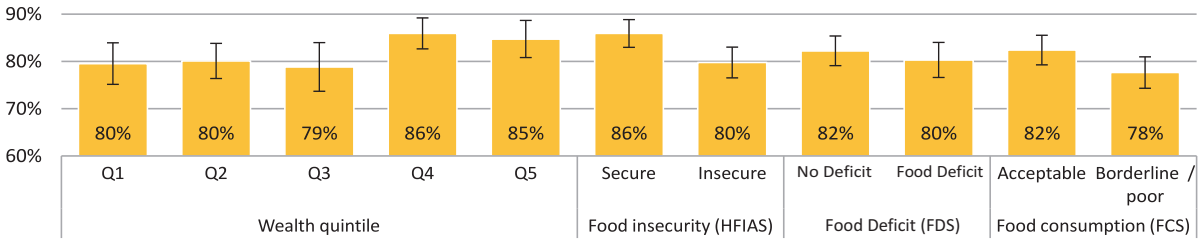
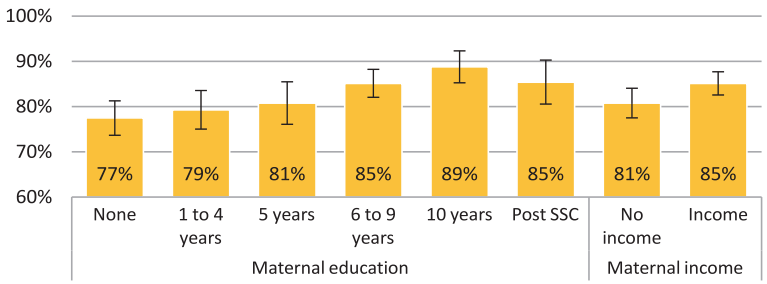


Figure 7.54 : **Coverage of the NVAC campaigns in 2011 by maternal characteristics**

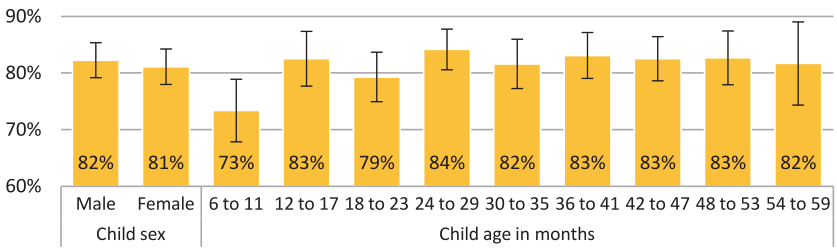


Unfortunately, there were small but significant differentials in coverage between children from wealthier and less wealthy households and by food security category. Additionally, children whose mothers had greater educational attainment had received VAC in a higher proportion. This is problematic because

24. This is in contrast to the coverage of children over the course of the year as was provided in the trend line of in Figure 7.50 above.

children from less wealthy and more food insecure households ate less diverse diets in greater proportion (See Figure 7.33) and thereby had less opportunity to obtain adequate vitamin A from their diet. Additionally, these differentials are harder to overcome than regional differences because these individuals are not concentrated in any one area and thus are more difficult to target.

Figure 7.55 **: Coverage of the NVAC campaigns in 2011 by child sex and age**

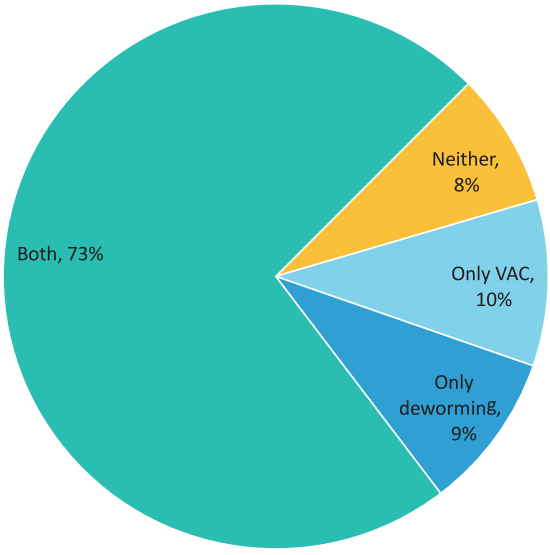


There was little variation in proportion of children who received VAC by age and no difference in coverage between male and female children. While the youngest children, aged six to eleven months, received VAC in a lower proportion, this is likely due to the change in NVAC campaign guidelines which occurred in February (see Figure 7.51).

Deworming

Another programme linked to preventive health care and the NVAC campaigns is mass provision of allopathic deworming to children in Bangladesh. Around 25% of the world's population is infected with one or more types of worms (roundworms, hookworms, whipworms, etc.), which are widely distributed in tropical and subtropical areas. By directly absorbing nutrients from the body, helminthes (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. Children with helminthes infections are also much more likely to be anaemic. Moreover the burden of these infections falls disproportionately on the poor living in areas with inadequate sanitation. Though the estimated prevalence for the country as a whole is not available from other sources, all estimates available from Bangladesh point to a combined helminthes prevalence above the 20% cut-off for intervention (140). In addition, the nearest available data from India also points to an infection level above this cut-off.

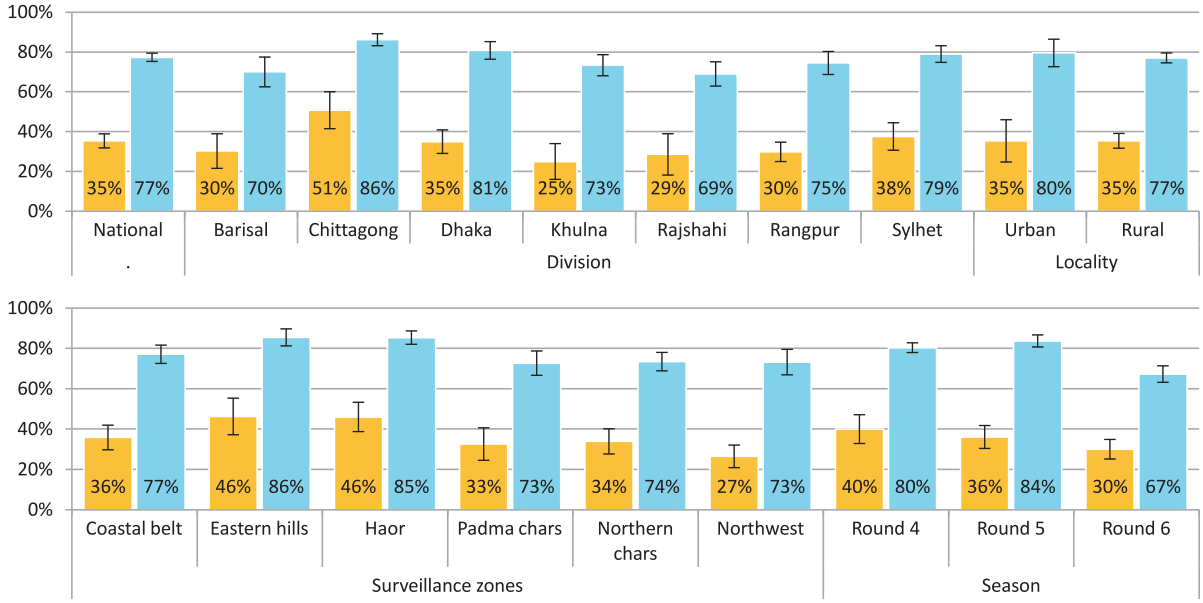
Figure 7.56**: Coverage of deworming and VAC (24 to 59 months)**



Treating helminthes infections is inexpensive and multiple effective drugs exist in the market and are provided via the government health services. As a country with endemic lymphatic filariasis, WHO recommends that preventative treatment be given for worm infections in addition to curative treatment after diagnosis (141). Most of these recommendations have been adopted by the Government of Bangladesh. The government recommends regular (six-monthly) receipt of allopathic anti-helminthes tablets by all children 24 to 59 months of age as part of the country's anaemia control programme (4), but does not extend the provision of these tablets to children aged 12 to 23 months as stated in WHO recommendations (142). These tablets are often distributed at the same time

as or shortly after the NID or NVAC days; as is seen in Figure 7.56, where of the children who have received an allopathic deworming tablet, only one-tenth had not received VAC.

Figure 7.57: **Coverage of allopathic deworming by area of residence**



Coverage of this programme was measured by the proportion of children who had received an allopathic anti-helminthes tablet in the last six months. In line with government guidelines, double the proportion of children two to four years of age were given allopathic anti-helminthes tablets in the last six months than children one year of age. Coverage rates were above 70% in almost all parts of the country. Round-wise estimates show a drop in coverage rates during Round 6; this is no doubt due to the scheduling of the NID and NVAC dates. The coverage rate for anti-helminthes showed much less variation than coverage for the VAC campaign, moreover, variation by households and maternal characteristics was in line with that given in the VAC campaign and thereby is not shown here.

Illness and recuperative health care

Government of Bangladesh endorse that infant and young child feeding practices (IYCF) include proper recuperative care when children fall ill (143; 105). One barrier to child growth and development is inappropriate feeding during illness, particularly during diarrhoea, which remains a leading cause of infant death. During and after illness, children have greater fluid and nutrient requirements to overcome the nutrient loss and mal-absorption that occurred during illness, however, sick children tend to have diminished appetites and may refuse food (129; 107). When the child has diarrhoea or vomiting, caregivers may have the misperception that feeding the child is counterproductive, as the child cannot retain food or liquids. As a result, caregivers traditionally decrease feedings, including breastfeeding, which contributes to insufficient nutrient and fluid intake, dehydration, and slower recovery (129; 107).

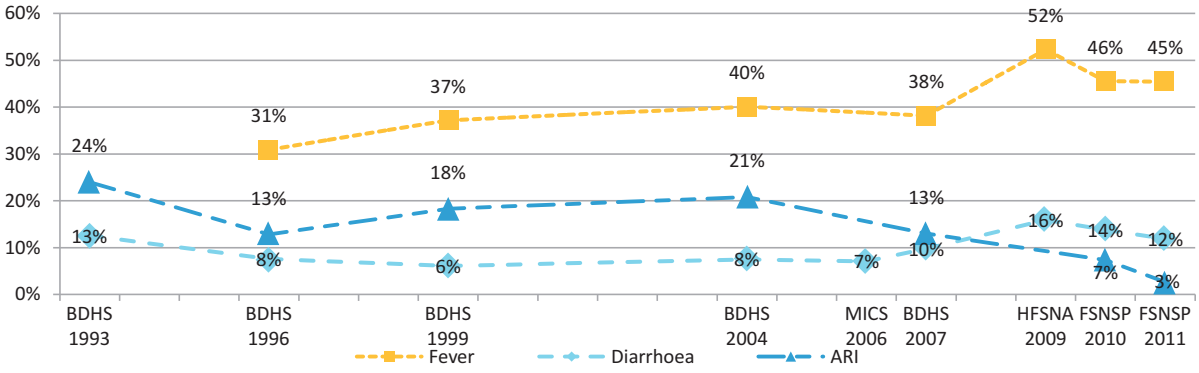
WHO and UNICEF recommend that caregivers continue feeding (or breastfeeding) the child throughout the illness and increase feeding immediately after the illness (129; 107). WHO guidelines for integrated management of childhood illness (IMCI) recommend that during treatment for

diarrhoea, children younger than six months should be given extra fluid; they should continue to be breastfed but breastfeed for longer at each feed and also receive ORS. Children older than six months who are not exclusively breastfed should be given extra fluids (including ORS, soup, other clear liquids) and they should continue to be fed complementary foods and breast milk as usual (144). Counselling and guidelines for appropriate sick child feeding should be provided to caregivers through 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 infection (ARI) for the two weeks prior to interview. FSNSP defines fever based on 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. Over past survey periods, the proportion of children suffering from fever appears to have increased slightly while the proportion of children suffering from ARI has decreased dramatically (85; 88; 89; 70; 26; 116; 117; 24; 8). The period prevalence for children suffering from diarrhoea appears to have remained relatively constant over the years, in spite of seasonal variations.[25]

Figure 7.58: **Trends in the proportion of children ill over recent years (1993-2011)** [26]



There is strikingly little variation in the proportion of children recently ill by area or season in 2011. Diarrhoea period prevalence is lower in Khulna than in other divisions while period prevalence of fever is somewhat higher in Chittagong, Rajshahi, and Sylhet. Children in rural areas have slightly higher period prevalence rates for fever, but there was no difference in rates of diarrhoea. Over seasons, the period prevalence of fever peaked in the monsoon period (Round 5) and the rate of diarrhoea was slightly greater in Round 4. Because of the very low period prevalence rates of ARI, nothing can be said about differences between areas or between households with different characteristics, thus, this indicator will not be included in the other graphs in the section.

25. These figures vary somewhat from those provided by the most recent BDHS (2011), however this variation may be due to seasonality. Diarrhoea rates listed above are much higher than that given in the DHS while FSNSP's ARI results are somewhat lower.

26. Please note that the figures given for BDHS 1993 are based only on children 0 to 36 months of age.

Figure 7.59: **Proportion of children ill by area of residence**

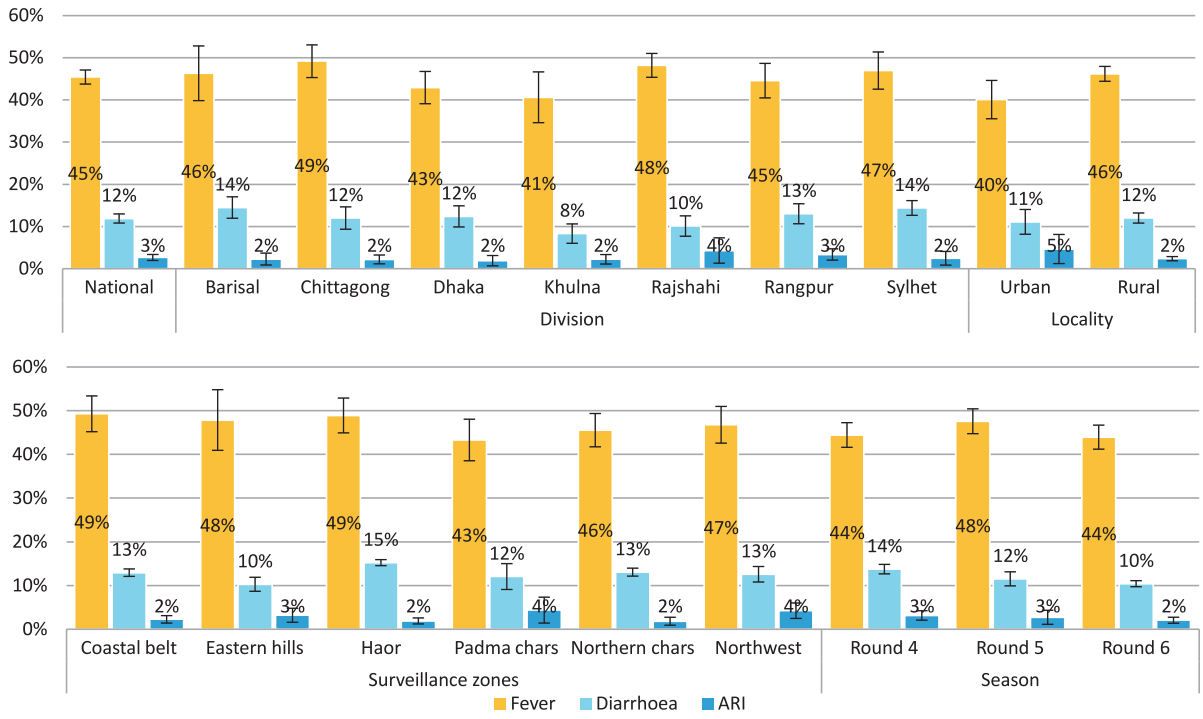
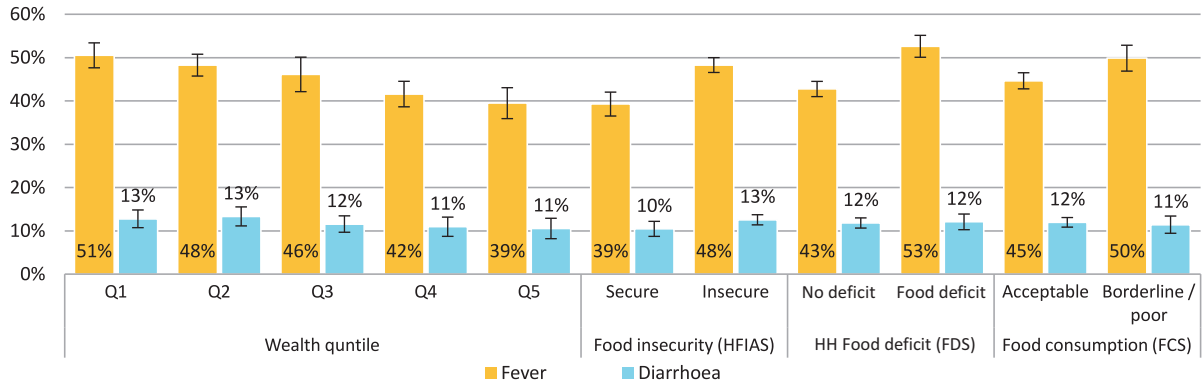
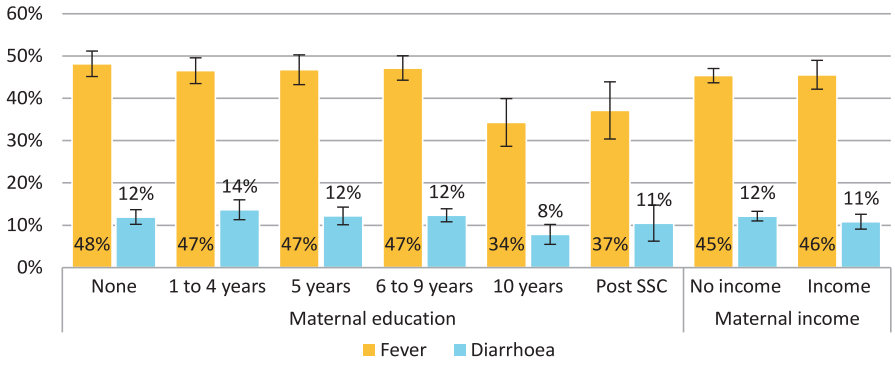


Figure 7.60: **Proportion of children ill by household characteristics**



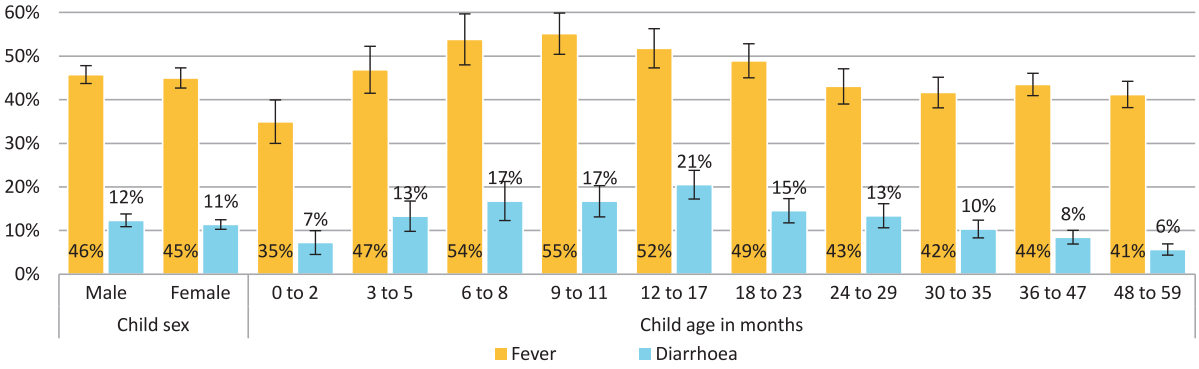
There was nearly no variation in period prevalence of diarrhoea over household wealth and food security categories, however, the proportion of children sick with fever decreased slightly in a step-wise fashion with increasing wealth quintile. Additionally, the proportion of children ill was significantly lower among food secure households and those with acceptable food consumption patterns compared to food insecure households or those with poor or borderline food consumption habits. Variation by maternal education and income earning status was also minimal. Children of mothers who had received ten or more years of education were sick with fever in a lower proportion than children of less educated mothers. There was no difference in the proportion of boys compared to girls who had

Figure 7.61 : **Proportion of children ill by maternal characteristics**



been sick, but the age of the child was associated with recent illness. Diarrhoea period prevalence peaked at 12 to 17 months of age while fever period prevalence peaked slightly earlier at nine to eleven months of age.

Figure 7.62 : **Proportion of children ill 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, FSNSP records the proportion of children who were taken to a health facility or provider, excluding pharmacies, shops, or traditional practitioners (26; 69; 86). As expected, the proportion of children who are taken to a medical provider when ill varies greatly by the illness from which the child suffers and characteristics which are related to the ability of the household to access care.

Nationally, only around a quarter of children with fever or diarrhoea were taken to a health care professional,[27] while 47% of children with ARI symptoms were taken to a provider. The proportions vary little by division, but sick urban children were taken to health care providers in a much greater proportion than their rural counterparts. Seasonally, a greater proportion of ill children were taken to providers in Round 5 for ARI and diarrhoea than other periods of the year. The proportion of children taken to health care providers for fever increased slowly but significantly over the course of the year.

27. The BDHS 2011 has similar results with 25% of children with diarrhoea being taken to a health care professional.

Figure 7.63 : **Proportion of children ill who were taken to a medical provider by area of residence**

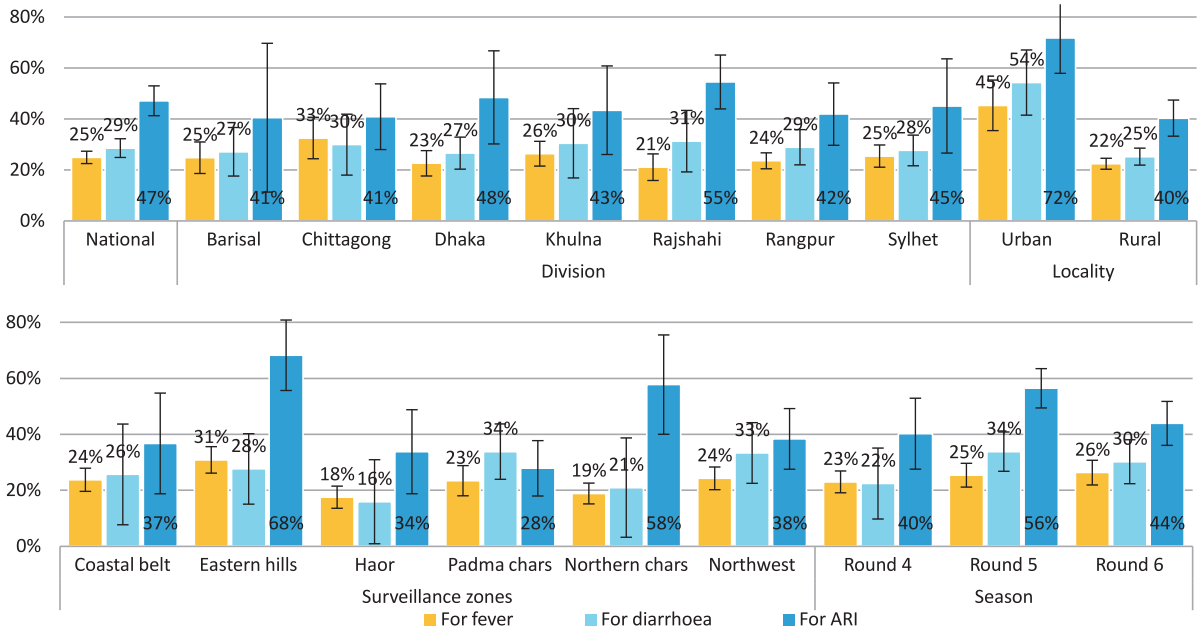


Figure 7.64 : **Proportion of sick children taken to a medical provider by household wealth and food security**

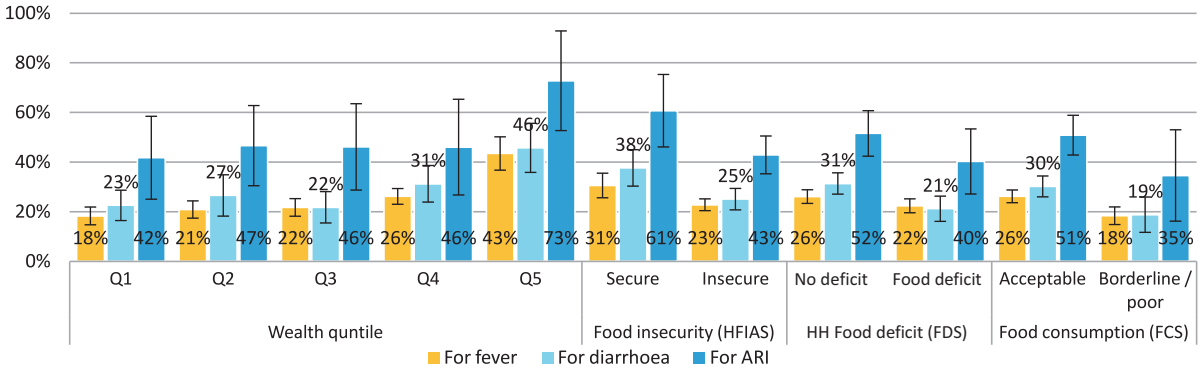
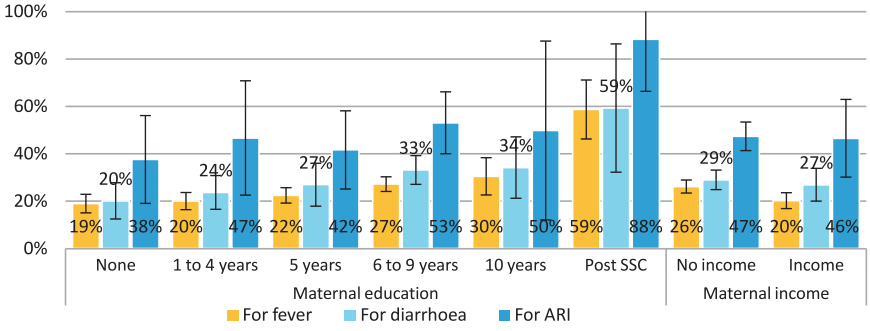
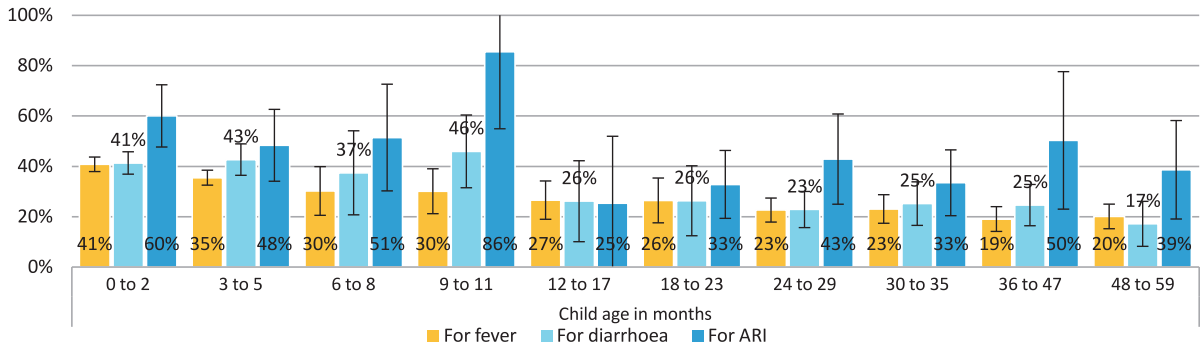


Figure 7.65 : **Proportion of sick children taken to a medical provider by maternal characteristics**



Not surprisingly, wealthier and more food secure households accessed medical care for their children in a greater proportion than less wealthy and food secure households. Additionally, professional medical care is sought more frequently for children in their first year of life. There was no difference in the proportion of male and female children who received care for any illness (not shown).

Figure 7.66: **Proportion of sick children taken to a medical provider by child age and sex**



Home care for diarrhoea

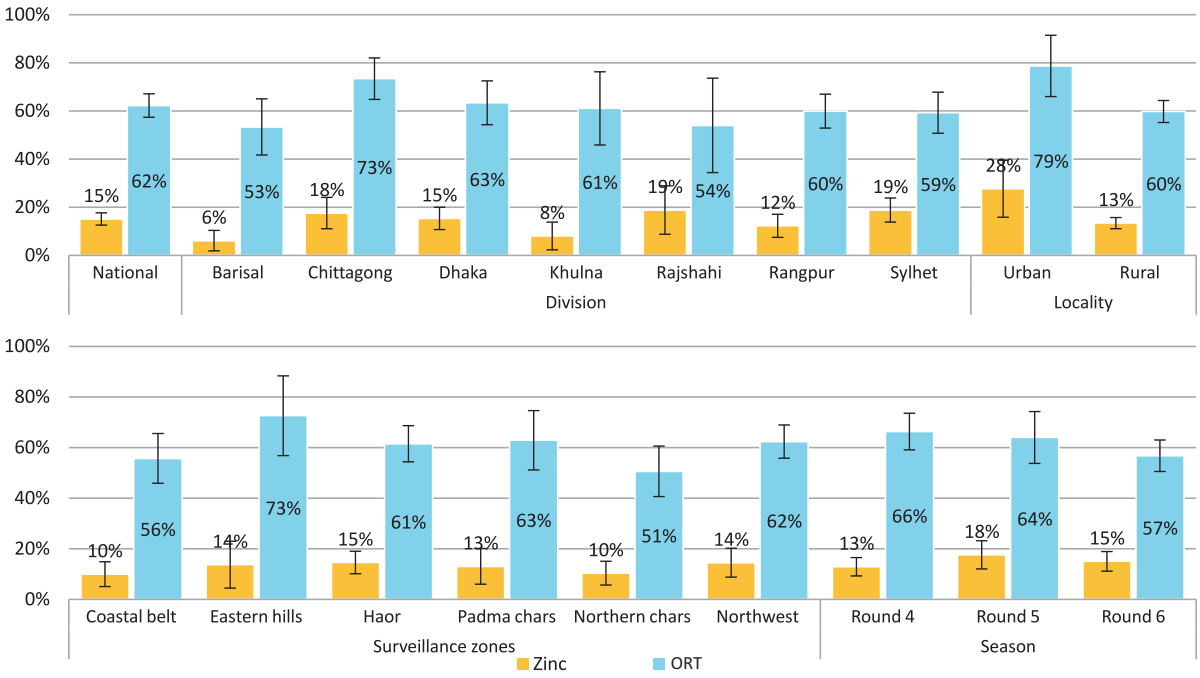
In addition to medical and facility based care, care at home can greatly improve recovery time for children, particularly those suffering with diarrhoeal illness. Effective treatment of children during diarrhoea can prevent over 90% of deaths due to this cause and advances in oral rehydration therapy have no doubt contributed to the reduction in under five mortality rates since 1980 (145). While (ORT) is effective at saving lives due to dehydration, zinc has been shown to reduce the time that children over six months of age suffer from symptoms of acute or persistent diarrhoea (146). In addition, many children in developing countries are zinc deficient. Research suggests that the provision of zinc has benefits for the immune system, appetite, cognition, and growth (147). Some evidence also points to additional benefits of supplementation of children with respiratory infection, however, the findings are not yet conclusive (148) and care must be taken, as zinc can have adverse effects if given in high doses (147). Though recommended as a treatment to lessen the duration of diarrhoea by both WHO and UNICEF as part of their programme for clinical management of childhood diarrhoea, guidelines are not yet available for this intervention (143).

The Government of Bangladesh has been an active proponent of zinc supplementation. The Ministry of Health and Family Welfare was a partner in the Scaling-up Zinc in Early Childhood (SUZY) public-private partnership. From 2003 to 2007 this partnership aimed to strengthen capacity for in-country production of zinc supplements, support the creation of distribution channels, and promote the use of zinc supplementation as a treatment to lessen the duration of diarrhoeal illness (149). 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 (150).

Focusing on home care for diarrhoea, FSNSP records the proportion of youngest children aged six to fifty-nine months among those ill with diarrhoea in the two weeks before 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. It appears that knowledge and use of zinc during diarrhoea episodes has increased since the end of a SUZY programme; nationally, 15% of children who had diarrhoea diagnosed by their caregiver were given zinc supplementation. FSNSP found that in rural areas, an estimated 13% of children with diarrhoea were identified as using zinc which is greater than the 10% estimate for rural areas obtained from a SUZY programme survey in

February-May 2009 (149). Moreover, over 60% of children were treated with ORT. The proportion of children treated varied somewhat between regions of the country and over the seasons of 2011, but most of these differences were not significant. However, urban areas had greater rates of both zinc and ORS provision.

Figure 7.67: **Proportion of children with diarrhoea given zinc or ORT therapy by area of residence**

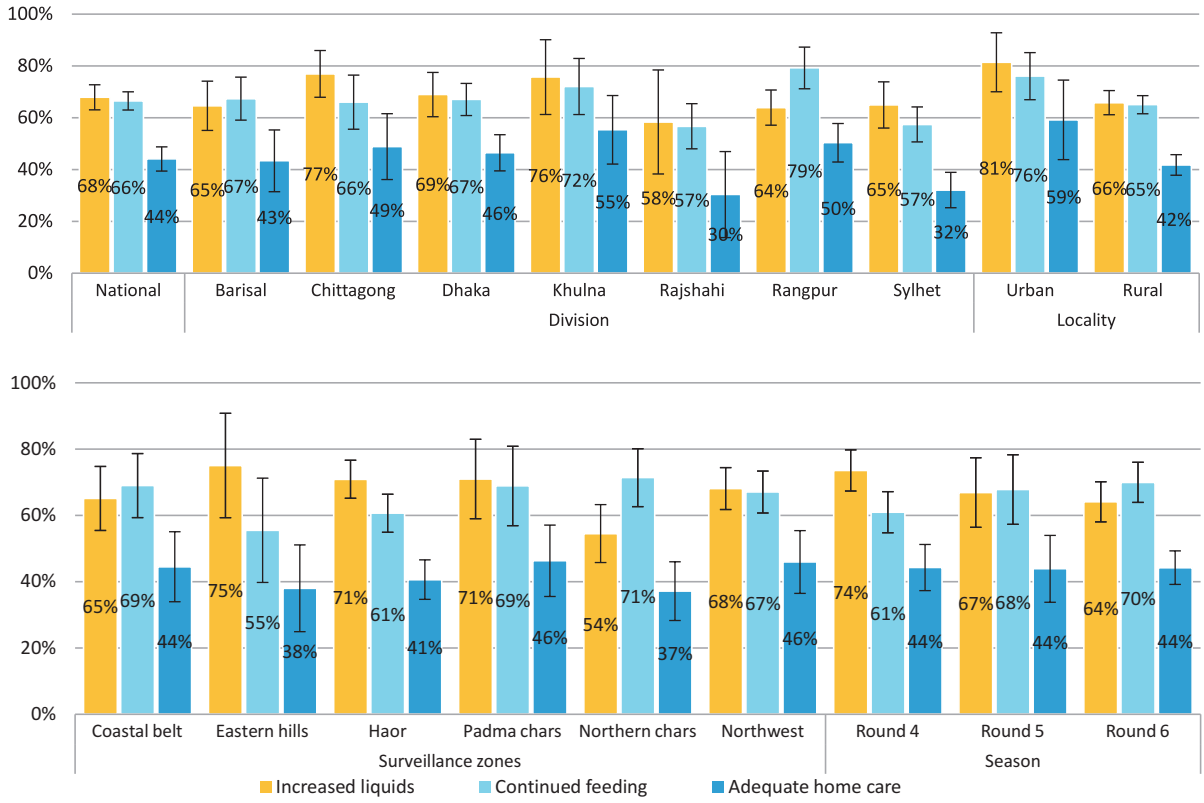


FSNSP also includes more general indicators of child feeding during illness. The caregivers of children six to fifty-nine months of age who were sick with diarrhoea were asked to provide a comparative assessment of the amount of food and liquids that had been given to the child during the recent illness 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. Finally, children recently sick with diarrhoea are classified as having received continued feeding if their care giver reported giving them the same or more food during their illness compared to normal practice.[28] Finally, children recently sick with diarrhoea are classified as having received adequate home care if they received both increased liquids and continued feeding.

As shown in Figure 7.68, nationally, over two-thirds of children recently ill with diarrhoea were given increased liquids and continued feeding during their most recent illness. However, less than half of recently ill children received both of these care practices.

28. This definition varies slightly from that used in the DHS system. In the DHS system a child is classified as having received continued feeding even if the amount of food offered to the child in "somewhat less" than the usual amount (31), while FSNSP does not include this category.

Figure 7.68: **Proportion of children with diarrhoea given increased fluids and continued feeding by residence**



Nutritional Status of Children

In 2011, FSNSP measured over 15,179 children.

Over 6 million children were stunted and an estimated 4.8 million children suffered from acute malnutrition at some point during 2011.

Household food security and wealth were only a few of the factors which were associated with chronic under nutrition. Even among the wealthiest quintile one in four children was stunted.

One in four children less than two months of age was stunted, indicating that chronic under nutrition begins before birth. Children of younger and shorter mothers were also stunted in greater proportion.

In the Northwest zone, dramatic seasonal spikes in childhood wasting were seen during 2010 and 2011, indicating a need for targeted programming in these areas.

Doubling efforts to reduce child underweight by 2% per year (versus 1% per year seen from 1990-2011) would put Bangladesh on track to reach MDG 1. Targeted efforts are particularly needed in areas with high rates of stunting (Sylhet) and seasonal peaks in wasting (Rangpur and Rajshahi).


Max 150kg d=0.1kg Max 330lb d=0.2lb Max 23st 8lb d=0.2lb
HD-318
kg

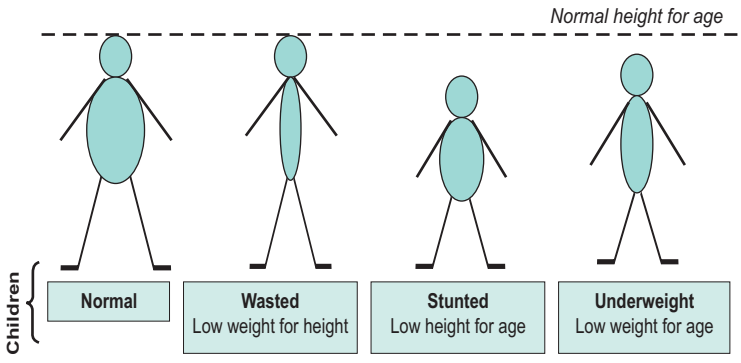
As stated in previous chapters, numerous shortcomings in child care, protection, and feeding have contributed to the high rates of child under nutrition seen in Bangladesh. Moreover, under nutrition has a staggering cost. As under nutrition and infection are closely interrelated, an under nourished child is more susceptible to disease, and a sick child is more likely to become under nourished. The *Lancet Nutrition Series* estimated that under nutrition contributes to at least 3.5 million deaths among mothers and children annually, about 11% of days lost to illness and disability, and around 35% of the global disease burden in children (65). Changes in levels of child under nutrition in developing countries tend to be closely related to mortality trends (151), making health interventions less effective unless nutrition is addressed concurrently (152; 153). In addition, under nutrition during critical periods of child development can result in lower worker productivity in adulthood (154). 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 (123).

Table 8.1: Children measured by age

Age group in months	Number	Weighted proportion
0 to 5	1,418	10%
6 to 11	1,450	10%
12 to 17	1,482	9%
18 to 23	1,401	10%
24 to 29	1,472	10%
30 to 35	1,513	11%
36 to 41	1,723	11%
42 to 47	1,646	9%
48 to 53	1,674	11%
54 to 59	1,400	9%

In order to estimate the nutritional status of children in Bangladesh, FSNSP records the height, weight, and MUAC measurements of all able-bodied children in interviewed households. In 2011, FSNSP measured over 15,000 children across the country (Table 8.1). 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 (155). Developed by the World Health Organization (WHO), this reference is valid for all populations as the seven-year study on which it is based indicated that children have the same growth potential up to age five, irrespective of their ethnic background.

Figure 8.1 **: Indicators of childhood malnutrition**

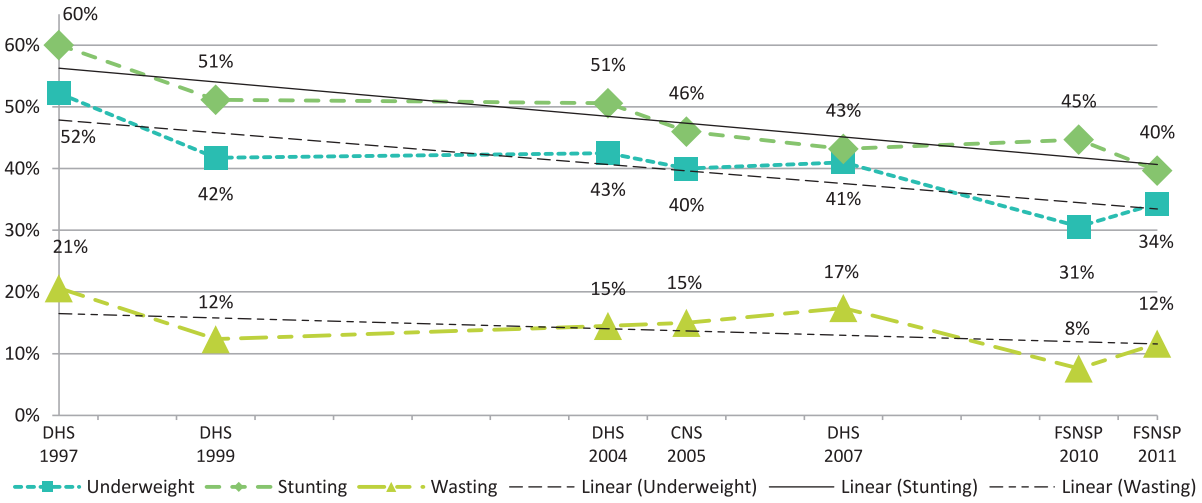


Using this WHO reference population as a basis for comparison, this report will examine multiple measures of childhood malnutrition. Comparisons between height/length by age will assess the cumulative effects of growth retardation and thereby estimate the level of chronic under nutrition. This measure is commonly called “stunting” or low

height/length-for-age. Another comparison is between the child's weight by height/length irrespective of the child's age. This measure of thinness estimates the levels of acute under nutrition in the population and is referred to as “wasting” or low weight for height/length. Other measures of acute under nutrition compare the circumference of a child's upper arm against that of a reference population by age or against a static international standard. The final measure of under nutrition, child underweight, compares the weight of children by their age. Child underweight, or low weight for age, is a composite measure of under nutrition and does not distinguish between children who are stunted or wasted, but may include children who are only mildly under nourished on both of these indicators. A depiction of the three main indicators is given in Figure 8.1.

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 under nourished. Children who are below negative three standard deviations (-3 SD) are classified as severely under nourished. Taken together, all children who fall below negative two standard deviations (-2 SD) are classified as globally under nourished (156). Children grow with slightly different trajectories, and lulls and spurts in growth occur even among well-fed children (157; 158). As such, nutritional status measures are based on population characteristics and not on a per child basis. 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 8.2: **Recent trends in the prevalence of child under nutrition (Global, 0 to 59 months)**[1]



Since independence, Bangladesh has greatly reduced levels of child under nutrition (88; 89; 70; 117; 26; 24; 8); Bangladesh is one of the few countries worldwide in which reductions in under nutrition have kept pace with reductions in poverty. Figure 8.2 tracks the three most common measures of child under nutrition from 1997 to 2011. Since 1997 there has been a small reduction in child wasting and more sizable declines in child stunting and underweight. Notably, a rapid decrease in rates of child under nutrition occurred between 1997 and 1999, followed by a long period of limited change from

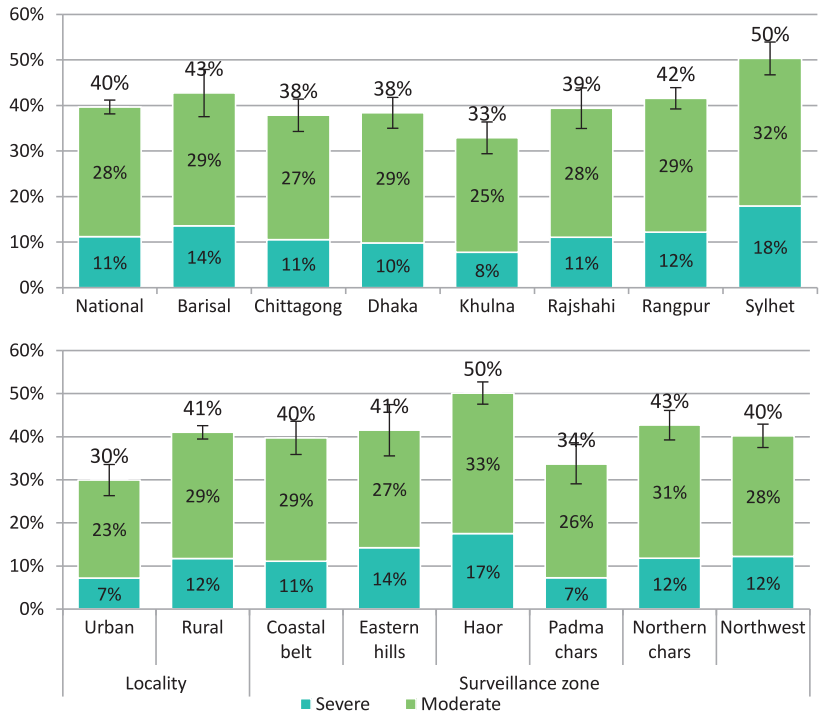
1. Though not included on the graph above, the 2011 preliminary BDHS results are congruent with FSNSP 2011 findings (86).

1999 to 2004, and then a subsequent period of small declines. However this trend should be examined while taking into account the different seasons in which the surveys took place.[2] For example, the small increase in wasting and child underweight between the 2010 and 2011 FSNSP reports is most likely due to seasonal effects and not real changes in the annual levels of acute malnutrition and child underweight. In addition, some of the sharp reduction in the stunting rate that occurred between 2010 and 2011 may be due to the slightly cyclical nature of stunting, which tends to spike in the winter when wasting is lower.

Chronic child under nutrition

Chronic child under nutrition is often invisible; when the majority of children in a population are growing sub-optimally, this pattern is regarded as normal and not warranting concern. However, children who suffer from chronic under nutrition will fail to fulfil their genetic potential, both mentally and physically. As such, prevention of stunting is often a goal of development programmes. As described in the UNICEF framework, chronic child under nutrition 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 (159; 160; 161).

Figure 8.3 : **Prevalence of chronic child under nutrition by area of residence**



As mentioned above, the most common way to measure chronic child under nutrition is to compare children's growth attainment to what is usual in a well-nourished population. As shown in Figure 8.3, rates of childhood stunting based on the WHO reference population dropped by around one-third in the 15 years between 1996 and 2011. This decline of around 1.4 percentage points a year is a little over double the worldwide annual reduction rate of 0.6 percentage points from 1990 to 2000 (162). However, current rates of stunting are still at the cut-off for the "very high" prevalence

2. The BDHS in 1999/1997 and 1999/2000 took place from November to March, the 2004 BDHS was from January to May, and the 2010 FSNSP took place from January to April – all periods of the year when wasting rates should be lower than in the monsoon and summer seasons, which was when the 2007 BDHS was carried out (March to August). In contrast the 2005 CMNS was conducted over the entire year as was 2011 FSNSP.

level as defined by WHO for describing a critical public health problem, and over six million children in Bangladesh were estimated to be chronically under nourished (74). As stunting during childhood has been associated with a 20% reduction in adult earnings, further declines in the current high rates of stunting would help produce faster and more equitable economic growth nationally (154).

As shown in Figure 8.4, levels of chronic child under nutrition vary greatly by area of residence. Similar to the results shown in 2010, rates of childhood stunting in Sylhet are much higher and rates in Khulna much lower than in the rest of the country. As expected, urban areas fare much better than rural areas. Estimates for all divisions except Sylhet declined between 2010 and 2011. 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 under nutrition.

Figure 8.4: **Prevalence of chronic under nutrition by household wealth and food security**

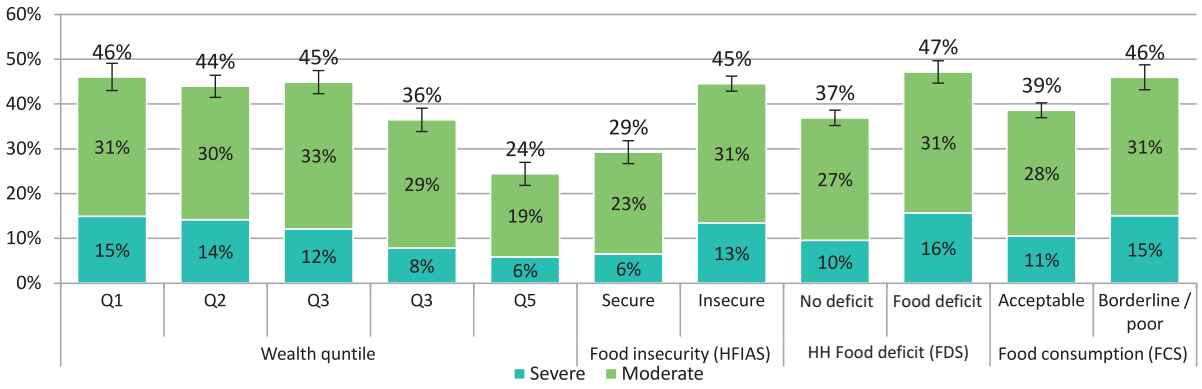
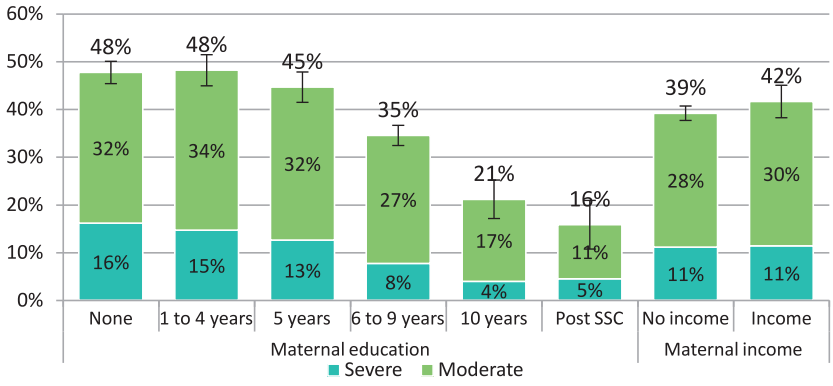


Figure 8.5: **Chronic under nutrition by maternal characteristics**



In line with 2010 results, a lower proportion of children from wealthier households and with more educated mothers were chronically under nourished compared to children from poorer households and those with less educated mothers. Interestingly, rates of stunting in the three lowest wealth quintiles were fairly uniform in 2011, whereas in 2010, higher rates were apparent in the poorest wealth quintile compared to other groups. No matter the metric of food security, children living in food insecure households were chronically under nourished in higher proportion than children from food secure households. Interestingly, the least restrictive food security measure (HFIAS), had the closest association with chronic child under nutrition. Food security, however, was not the sole determinate of chronic under nutrition. Even in food secure households, around one- third of children were stunted. Whether or not

mothers were engaged in earning income had a small but significant association with rates of child stunting. This could be due to the fact that mothers from poorer households, compared to mothers from wealthier households, are more often those who earn income due to the household's greater need.

Figure 8.6 displays rates of chronic under nutrition by child age and sex. There were no measureable differences in rates of under nutrition between male and female children, but some age-related patterns are apparent. Chronic under nutrition starts before birth with intrauterine growth retardation, and almost a quarter of children zero to two months of age in Bangladesh were already stunted. Rates of chronic under nutrition continue to increase over the first year of life and the proportion of children with chronic under nutrition peaks after the second year.

Figure 8.6: **Prevalence of chronic under nutrition by child's characteristics**

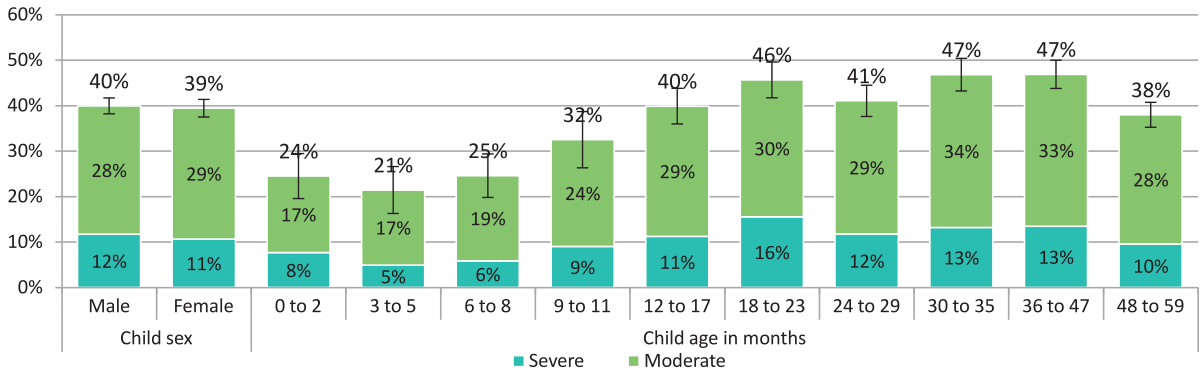
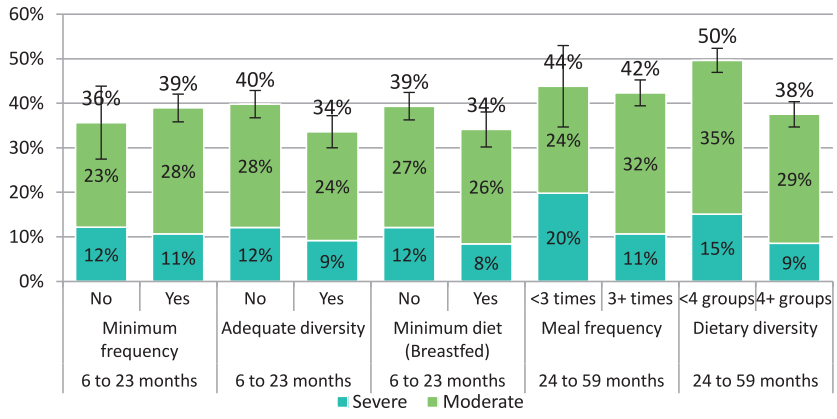
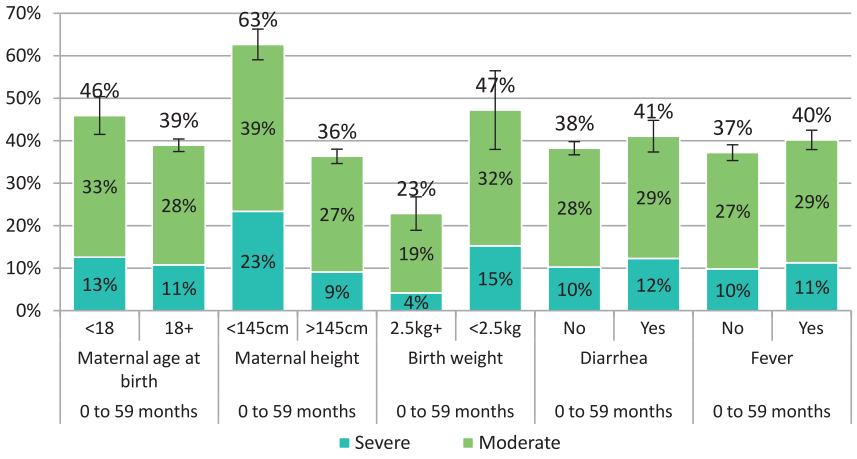


Figure 8.7: **Prevalence of chronic under nutrition by child feeding**



Complementary feeding practices, maternal age and height, child birth weight, and recent illnesses were also associated with child stunting rates. Early breastfeeding behaviours such as early initiation, no pre-lacteal feeding, and exclusive breastfeeding were not linked to reduced rates of stunting in children zero to six months of age (not shown). By contrast, children receiving a minimally diverse diet, or breastfed children consuming a minimum adequate diet were stunted at a lower rate than those that were not fed according to minimum standards. Mothers who were younger than 18 years old at birth had children that were stunted in greater proportion than mothers who gave birth at 18 or later. In line with the numerous studies that have documented the intergenerational nature of under nutrition (163; 79; 161; 81), women shorter than 145cm had children stunted in a much greater proportion than children of taller mothers. Among children for whom birth weight was recorded, children whose birth weight was below 2.5 kg (low birth

Figure 8.8 : **Prevalence of chronic under nutrition by maternal characteristics and recent illness**



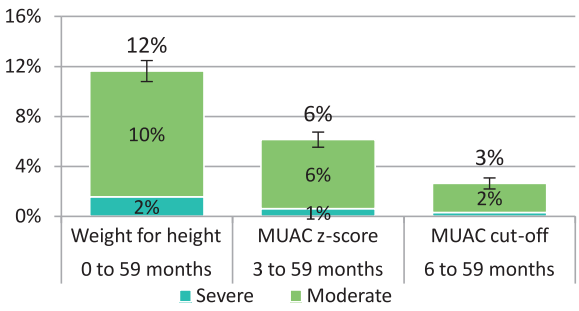
weight) were stunted at double the rate of children who were over 2.5kg at birth (23%). Additionally, children who had recently been ill were stunted in a slightly greater proportion. As a short term illness would not usually have an impact on rates of stunting, this observed difference was probably due to chronic illness. Children who were ill during the two weeks before the interview were generally more frequently ill, impacting the child's rate of linear growth.

Acute child malnutrition

In contrast to chronic child under nutrition, acute malnutrition is starkly visible to the observer. Children who are acutely malnourished are emaciated (marasmus) or have lost muscle mass while developing swollen limbs and bellies (kwashiorkor). Acute malnutrition is caused by a sharp reduction in the absorption of sufficient nutrients required for health, due to recent inadequate dietary intake or illness. Lacking essential calories and nutrients, a wasted child's body will begin to metabolise its own muscle to meet its need for protein, minerals and energy. A child who suffers from severe acute malnutrition has a risk of death up to 20 times greater than that of a healthy child. Wasting may result from severe food shortages, poor feeding practices, or infections. In Bangladesh, kwashiorkor is rare, and, in recent years, acute malnutrition is largely a function of infection or poor feeding practices, rather than failed harvests or famine (103). Emergency programmes usually focus on prevention and treatment of acute malnutrition, but in recent years, regular development programmes have begin to incorporate the control and treatment of acute malnutrition as part of health service delivery.

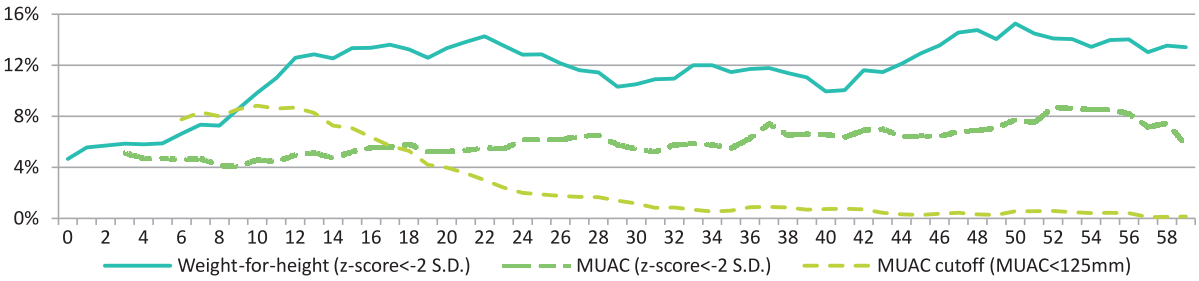
Acute malnutrition can often be prevented though adequate feeding practices and improved hygiene, assuming that households are food secure and able to access health care. Once acute malnutrition develops, it is usually treated through one of three services depending on the severity of the child's condition and available health programmes: 1.) community or home care for children with moderate acute malnutrition, which consists of a nutrient rich ration to be prepared and eaten at home; 2.) community or home care for children with severe acute malnutrition who have an appetite and no complications typically consisting of a simple medical evaluation, treatment for illness, and provision of a ready to use therapeutic food (RUTF), followed by visits to the medical provider at least once a week; and 3.) hospital care for severely or moderately acutely malnourished children with complications, involving close monitoring until stabilised and therapeutic care and feeding in line with standard WHO protocols.

Figure 8.9 : **Comparison of measures of acute malnutrition**



As mentioned at the outset of this chapter, acute malnutrition 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 malnutrition defined as a MUAC<125mm and severe acute malnutrition defined as a MUAC<115mm (164). These three indicators are often used by different stakeholders based on their needs and ability to collect and use data. While weight-for-height is considered the most accurate measure of acute child malnutrition and is used most frequently in nutrition studies and evaluations, MUAC measurements are much easier to collect and more widely applied in screening children for entrance into supplemental feeding programmes Screening staff with very low levels of education and literacy can identify cases of acute malnutrition using colour-coded MUAC tapes indicating MUAC cut-offs. In contrast, MUAC z-scores are rarely used as they are more accurate than MUAC measurement cut-offs but less accurate than weight-for-height measures and require a similar amount of time to collect as weight-for-height measures. The ages over which the three indicators are valid also differs. 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 (164; 156). In addition, the MUAC cut-off loses its value in older children because, after approximately two years of age, children commonly have MUACs above 125mm or 115mm in spite of very low weight-for-height.

Figure 8.10 : **Comparison of measures that estimate the prevalence of GAM by age in months**



Rates of acute malnutrition in Bangladesh vary considerably depending on what classification system is used. As shown in Figure 8.9, the prevalence of global acute malnutrition (GAM) in Bangladesh is halved when the MUAC z-score cut-off is used in contrast to weight for height z-scores (from 12% to 6%), and the prevalence was halved again, to 3%, when the MUAC cut-off criteria is used. These differences were also apparent when prevalence was examined over age in months (Figure 8.10). While the MUAC cut-off and weight for height prevalence rates are very similar from six to ten months of age, they diverge sharply after that period. Beyond 30 months of age, very few children are found to be acutely malnourished using the MUAC cut-off criteria. In contrast, the proportion of children identified as acutely malnourished 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 (165; 8). In

some countries and ethnic groups the proportion of children classified as acutely malnourished by MUAC derived criteria will be greater than that derived by weight for height z-scores (166). For the rest of this section, weight for height z-score criteria will be used to determine acute malnutrition.

Though harder to discern in Figure 8.2, it is likely that Bangladesh has experienced reductions in the proportion of children acutely malnourished, or wasted, in the period 1996 to 2011, after seasonality is taken into consideration. While survey results show that in the winter of 1996/1997 wasting rates were over 20%, in recent years wasting has been much less prevalent even in the monsoon months when acute malnutrition typically peaks. Additionally, the last annualised estimate, 2005 CNS, is slightly higher than the current level.[3] Finally, a review of wasting levels as recorded though the Nutritional Surveillance Project from 1998 to 2006, shows sizable reductions for the same season across years (165). However, in keeping with this moderate reduction, Bangladesh still ranked as having a serious public health problem with respect to acute child malnutrition, according to the WHO classification system (74). Moreover, in the monsoon months, rates of acute malnutrition rose and assumed the characteristics of a critical public health problem in regions of Bangladesh (74). Due to the transient nature of wasting, where children move into and out of this status over the year, it is estimated that over 4.8 million children suffered from wasting at some point during 2011 (167).

Figure 8.11: **Prevalence of acute malnutrition by area of residence and season**

There was some variation in the annualised rates of wasting across the regions of Bangladesh, but by division, few differences were statistically significant. Barisal and Dhaka had lower levels of wasting than Sylhet, and Barisal had lower levels of wasting than Rangpur. Wasting rates in urban areas were markedly lower than rural areas of the country and there was less variation in wasting rates across surveillance zones. Only the Northwest zone had significantly higher annual rates than the rest of the country. However, seasonal variations within regions of the country were more remarkable especially in the Northwest.

3. The longer term trend using the NCHS reference provides additional evidence that wasting in Bangladesh has reduced slowly over recent decades (Figure 8.23).

Like 2010, rates of wasting spiked during the monsoon months, especially in the Coastal belt and Northwest, but the variation was less than that observed in 2010.[4]

Figure 8.12: **Variation in prevalence of acute malnutrition by season**

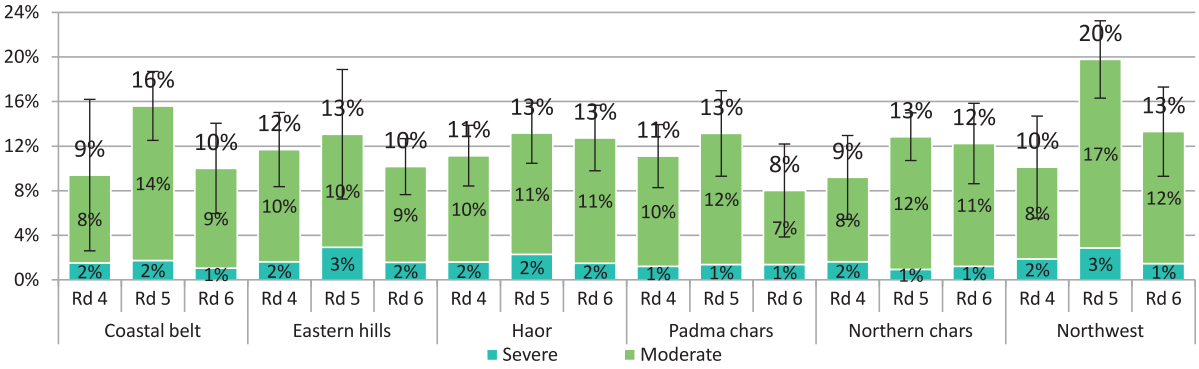


Figure 8.13: **Prevalence of acute malnutrition annually and seasonally by household wealth**

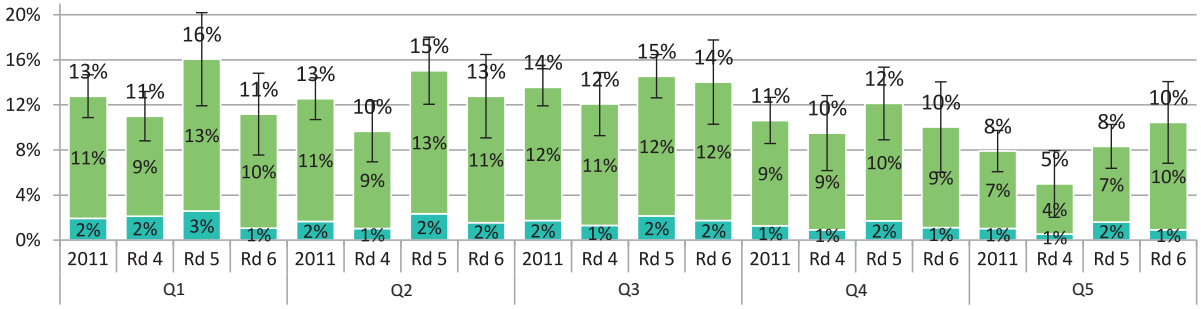
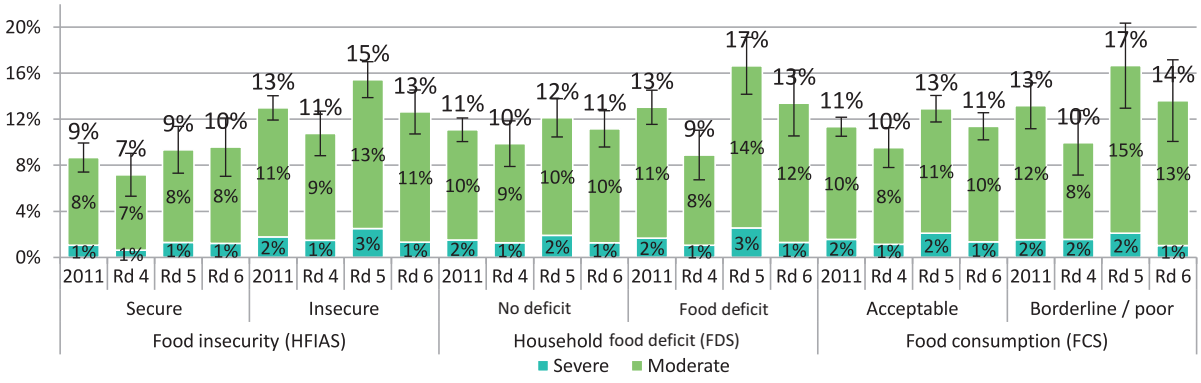


Figure 8.14: **Prevalence of acute malnutrition annually and seasonally by household food securitystatus**

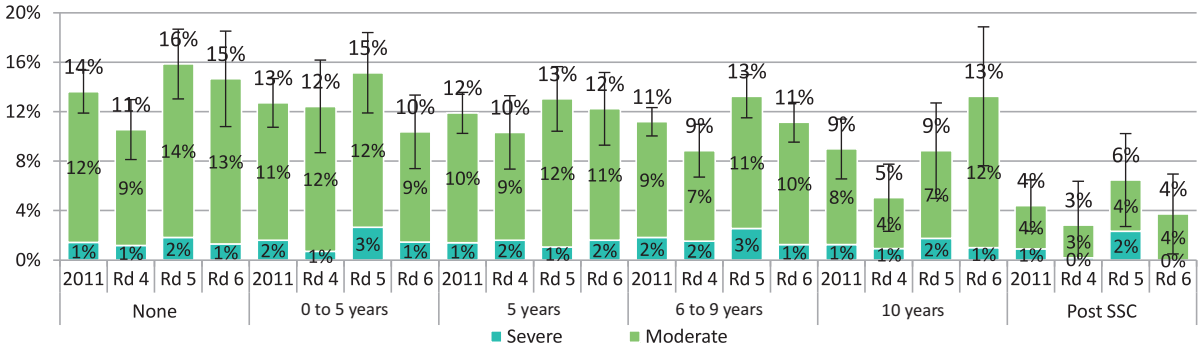


Patterns of acute malnutrition by household and maternal characteristics were similar to those for chronic under nutrition; a smaller proportion of children from wealthier households were wasted compared to children from poorer households. However, these trends are slightly different than 2010. While rates of wasting in 2011 were similar among the three lowest wealth quintiles, in 2010 a stepwise

4. In the food insecure zones as a whole (as defined in the 2010 report) the 2010 seasonal pattern was 8% in January-April, 16% in June-August, and 9% in October-December. In contrast, in 2011 the pattern was 10% in February-April, 14% in June-August, and 12% in October-December.

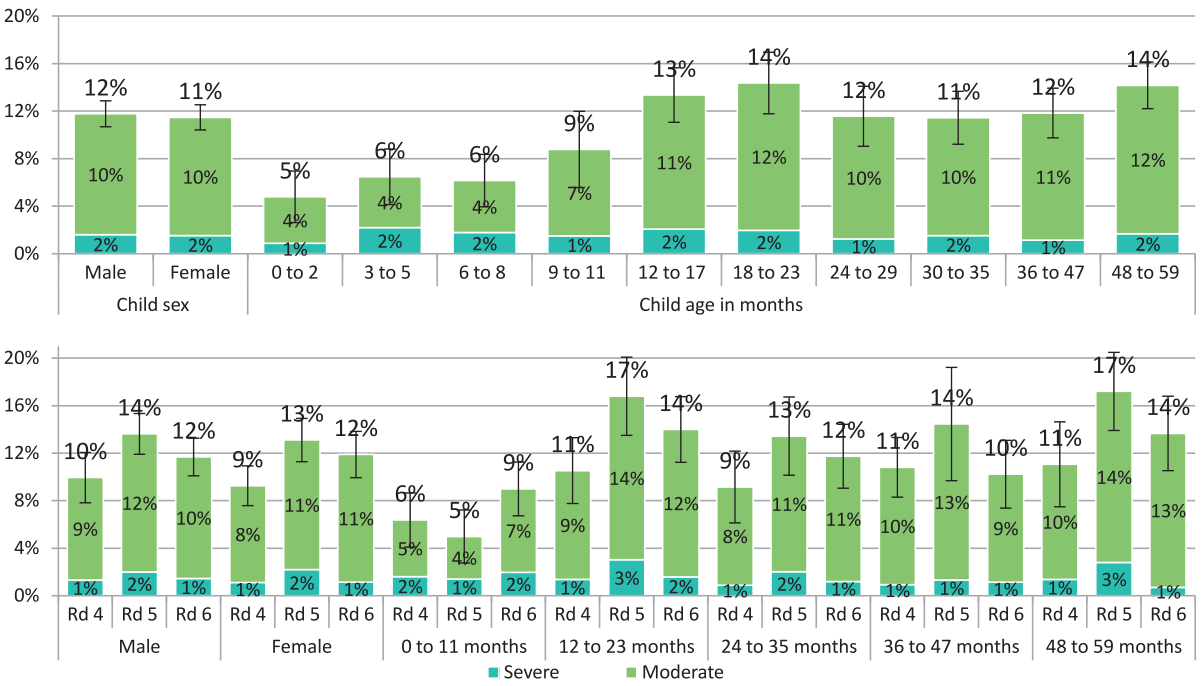
increase in wasting was apparent with decreasing wealth. Seasonally, children from households in the lower wealth quintiles showed a sharp peak in wasting rates in the monsoon months (Round 5), reaching critical levels, while this was not apparent in children from the wealthier quintiles. Children from food insecure households had notably higher rates of wasting annually than food secure households by every measure of food insecurity; these disparities became even more apparent during the monsoon season (Round 5).

Figure 8.15 : **Prevalence of acute malnutrition annually and seasonally by maternal education and income**



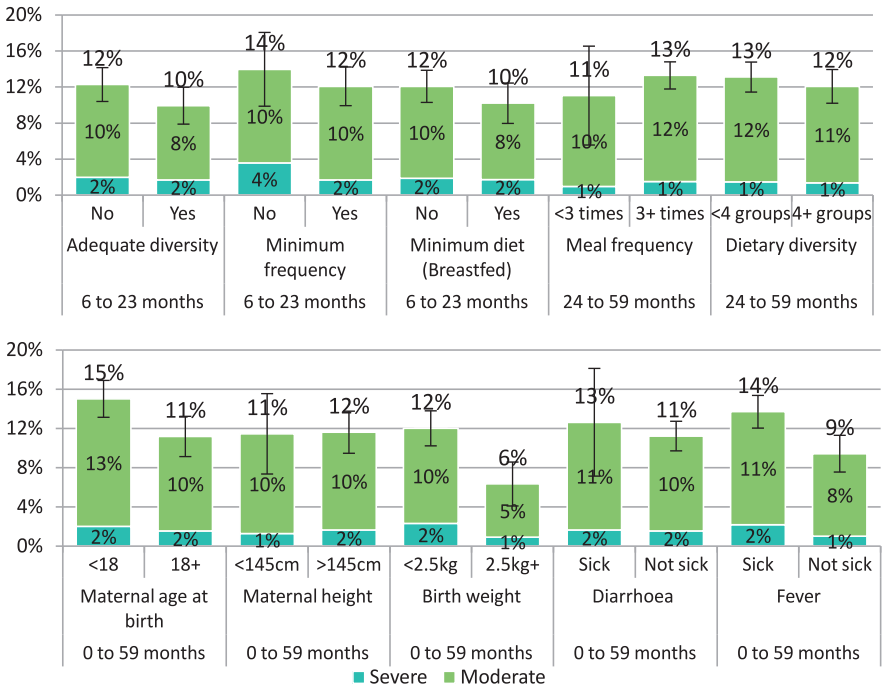
In line with the 2010 results, children with more educated mothers were wasted in a lower proportion than those with less educated mothers. For the year as a whole, maternal income earning status had no association with child wasting rates. However, seasonal differences were apparent, with higher rates of wasting recorded among children of income earning mothers in the monsoon months compared to children whose mothers did not work (not shown). This pattern was similar to that seen in less wealthy and more food insecure households above.

Figure 8.16: **Prevalence of acute malnutrition annually and seasonally by child sex and age**



While there were no differences in the proportion of male and female children wasted either annually or seasonally, considerable variation was apparent by age. Rates of wasting are lower before nine months and much greater after one year of age. There was seasonal variation in these estimates; wasting peaked during the monsoon season, Round 5, for every age group with the exception of the first year of life.

Figure 8.17: **Acute malnutrition by feeding, maternal characteristics, and recent illness**



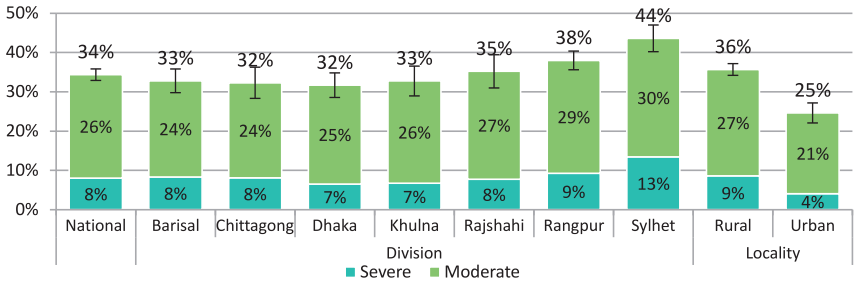
Rates of wasting were also compared by child birth weight categories as well as child feeding practices and illness indicators, but few of these indicators were significantly correlated with acute malnutrition. Early breastfeeding behaviours such as early initiation, no pre-lacteal feeding, and exclusive breastfeeding were 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. However, children born to mothers younger than 18 years of age were wasted in a greater proportion, and low birth weight babies were wasted at a much higher rate (Figure 8.17). Among the child illness indicators, fever was significantly associated with wasting but diarrhoea was not. Maternal height was not associated with children's wasting rates.

Child underweight, overweight, and obesity

Child underweight is a measure of child under nutrition 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. Prevalence rates for child underweight by regions of the country, child sex and age in months are presented in Figure 8.18 and Figure 8.19. Nationally, the rate of child underweight was 34%; using the WHO cut-off values for public health significance, this very high prevalence rate indicates a critical situation (74).

As with other indicators of child under nutrition (stunting and wasting), Sylhet had the highest proportion of children underweight. Only one quarter of children in urban areas was underweight while over one third of children in rural areas was underweight. In contrast to the indicators presented earlier in this chapter, rates of child underweight began to rapidly increase at around the ninth month

Figure 8.18: **Prevalence of child underweight by division and locality**



of age. Because child underweight is a composite measure, variations by household characteristics were very similar to those observed for wasting and stunting and are therefore not presented.

Figure 8.19: **Prevalence of child underweight by child age and sex**

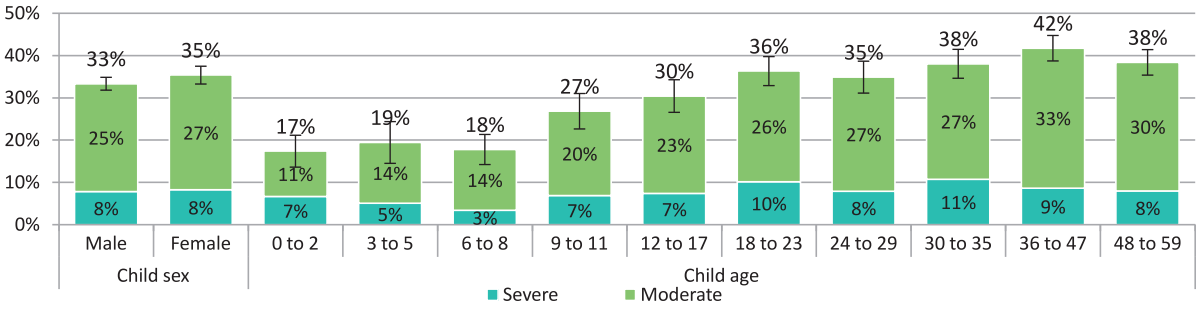
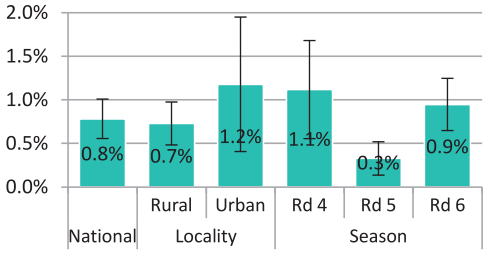


Figure 8.20: **Early childhood obesity**



Not included in the introduction to this chapter is the method used to determine the level of early childhood obesity in a population. This estimate 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.[5] 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 deviation (+3 SD) from the mean of the reference population. Children who are above positive three standard deviation (+3 SD) are classified as severely overweight (156).

As indicated in 2010 FSNSP and recent BDHS surveys, overweight and obesity among young children is not yet a concern in Bangladesh. In 2011, based on BMI for age, less than 1% of young children were moderately overweight and almost no young children were severely overweight.[6] Though higher in urban areas compared to rural, this difference was not significant. Overall, the level of obesity was well below the 2.2% expected in a well-nourished population.

5. BMI for age is the recommended indicator for determining childhood overweight and obesity according to the WHO (176; 177). However, survey systems, such as the DHS system, more commonly uses weight-for-height or weight-for-age measures

6. This proportion is similar to the proportion of children overweight using weight-for-age z-scores (0.3%) and weight-for-height z-scores (0.8%).

Tracking MDG 1: Child hunger

Given that the MDG goal to reduce child underweight was set in 1990, long before the 2006 WHO reference population was established, the older NCHS/CDC/WHO reference population was used in setting this goal in all countries.[7] As a result, the prevalence estimates presented here, 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 8.21 and Figure 8.22. Figure 8.21 examines the prevalence of global and severe under nutrition among all children less than five years of age using both reference groups, while Figure 8.22 shows global levels of child under nutrition 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.[8] These figures reveal that 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. Between the two age cohorts, children aged 6-59 months of age have slightly higher prevalence rates of child under nutrition than all children under five by every measure.

Figure 8.21: **Rates of child under nutrition based on WHO 2006 compared to NCHS/CDC**

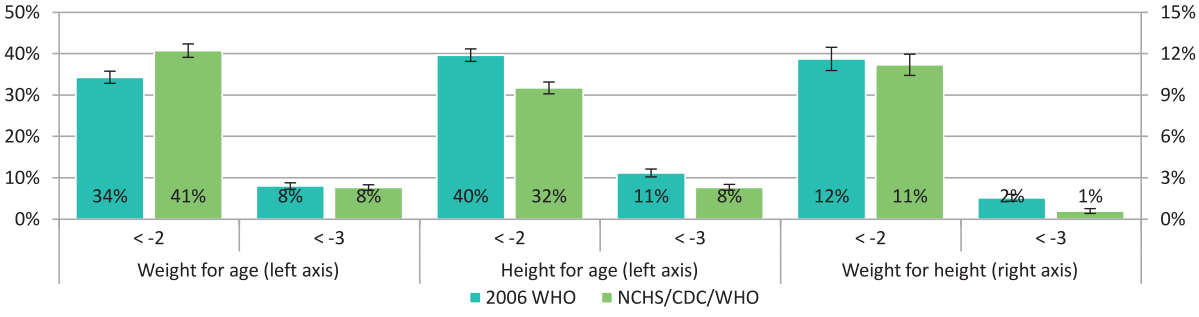


Figure 8.22: **Rates of global child under nutrition (6 to 59 months)**

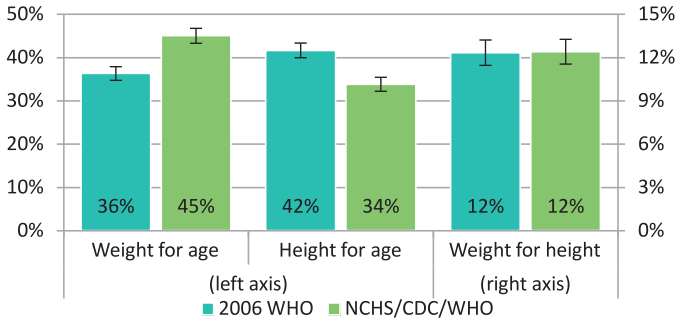


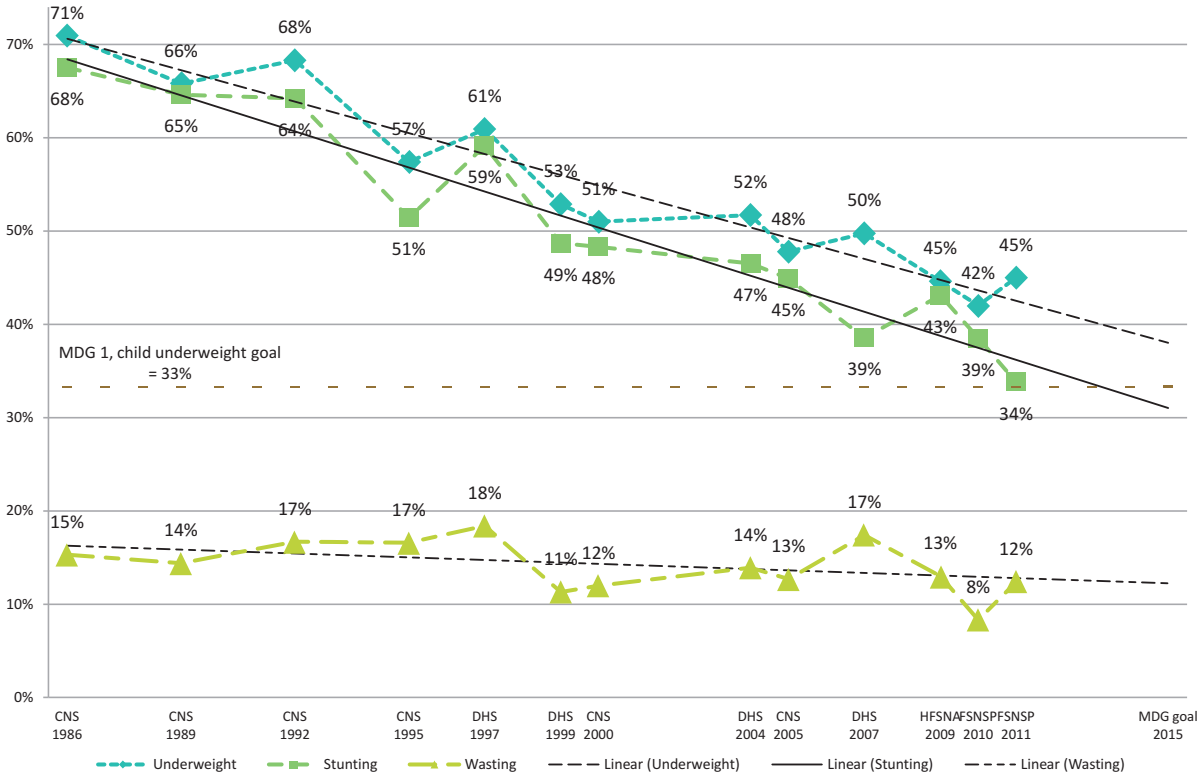
Figure 8.23 graphs FSNSP alongside past survey results in order to track Bangladesh's progress toward the MDG 1 child underweight goal to halve rates of child underweight from 66% in 1990 to 33% by 2015 (88; 89; 70; 117; 26; 168; 169; 170; 24; 8; 171; 172). Similar to trends based on the WHO reference group, the slight increase in child wasting and underweight between 2010 and 2011 was

7. Unlike the updated WHO child growth reference, the children upon which the NCHS/CDC/WHO reference group were all from the United States of limited ethnic diversity and, being primarily formula fed, were not fed in line with current WHO recommendations for child feeding (178, 179). The NCHS/CDC/WHO reference was used from 1977 until 2006.

8. Though the MDG goal refers to reducing child underweight for all children under 5, in Bangladesh this goal has been tracked only for the age group 6 to 59 months, because the MDG benchmark survey in 1990 only included children aged from 6 to 72 months (169).

likely to be a result of seasonal variation and not a real change in the level of under nutrition. Given that figures from the 1990 CNS and 2011 FSNSP represent national averages across seasons, a comparison of these two estimates is perhaps the most reliable means to assess progress. Results indicate a reduction of 1% per year in average child underweight in Bangladesh from 1990 to 2011. In order to reach the MDG goal, the rate of reduction would have to double to slightly over 2% per year for each of the next four years.

Figure 8.23: **Long-term trends in child under nutrition in Bangladesh (NCHS reference, 6-59 months)** [9]



9. Though the MDG goal refers to reducing child underweight for all children under five, In Bangladesh this goal has been tracked only for the age group 6 to 59 months, because the MDG benchmark survey in 1990 only included children 6 to 72 months (169).

Tackling Inequity:
The Last Frontier for the Achievement of the MDGs


CNG

Results from FSNSP surveillance in 2011, together with other sources of data and contextual information, indicate that Bangladesh continues on an upward trajectory in terms of advancing food security and nutrition alongside other areas of economic and social development. No doubt real wage growth in the past five years and a decrease in the percentage of households living in poverty have contributed to this progress, as indicated by a greater diversity in household diets even in face of fluctuating food prices.

Additionally, significant progress towards the MDGs and other development goals can be attributed to Bangladesh's commitment to resourcing and effectively implementing high-impact, scalable interventions such as immunisation and family planning. But despite the success of large-scale public health approaches, inequities in coverage and service utilisation constitute major barriers in further improving development indicators. This is particularly evident around persistent food security and nutrition challenges in certain geographic areas and population groups. The enduring nature of these problems despite standardised implementation approaches indicate the need for more targeted or context-specific intervention strategies due to complex social, geophysical, and economic factors.

In 2011, as in 2010, FSNSP data provides evidence of unremitting gendered inequities within households, beginning in childhood, when girls are more likely than boys to forgo food consumption in times of food constraints. This pattern of inequitable risk continues in adolescence and through to adulthood; young girls sacrifice food consumption and diversity at nearly the same rate as adult men, and adult women are the first in the household to curtail intake when food supplies are short. FSNSP also provides evidence of an abrupt increase in stunting among girls ages 15 and older, suggesting that girls' poor nutrition may prompt an early termination in growth, likely exacerbated by early childbearing. Women's nutritional risk has additional ripple down effects for future generations. Women's under nutrition is a key causal factor for children's poor health and nutrition, as evidenced by strong associations between small stature, low birth weight, and stunting. In addition, high stunting rates among children under two months of age suggests that poor growth outcomes begin before birth. At the same time, FSNSP data indicates that maternal education has a positive impact on behaviors which contribute to child nutrition, including exclusive breastfeeding and children's dietary diversity. These intergenerational effects call for a lifecycle approach to improving nutrition, moving focus beyond the “thousand days” that start with pregnancy to include interventions for adolescents before pregnancy (and ideally before marriage) along with non-pregnant girls and women.

In addition to targeting vulnerabilities based on gender and life-cycle, there is a need to redouble efforts among geographically vulnerable groups, adopting strategies that are effective in resource-poor areas without the infrastructure and human capacity to deliver readily at scale. FSNSP, with its focus on six vulnerable areas of the country, provides insight into the specific geographic and intervention areas where investments in nutrition are most urgent and will have the greatest impact. This includes addressing high peaks of seasonal wasting found in the northwest and limited dietary diversity in the hill tracts, especially among children. It suggests the need for intensive and comprehensive programmatic efforts in Sylhet division, especially the Haor basin, where virtually all indicators lag behind the rest of Bangladesh. This region experiences the country's highest rates of

stunting among women, adolescent girls, and children and the worst performance on indicators ranging from female education through to coverage of key antenatal care interventions. These efforts must be context-sensitive, simultaneously addressing the unique geography of the *Haor* region and the socio-cultural barriers to reaching vulnerable groups such as married adolescent girls.

Wealth also represents an important independent determinate of food security and nutrition requiring specialised attention. As might be expected, FSNSP data suggests that across most indicators of nutrition, and to an even greater extent food security, there is a stepwise improvement as wealth increases. However, the correlation between nutrition, food security and wealth is more complex than one might assume; stunting is still 30% among the wealthiest population and the most food insecure areas do not necessarily experience the worst nutrition indicators. These findings suggest that while Bangladesh must continue efforts to reduce poverty, economic growth alone does not guarantee improved nutrition. Findings also indicate that with investment in well-targeted service delivery and behavioral interventions, gains in nutrition can be made before the "poverty problem" is solved.

Additionally, while most indicators increase stepwise with wealth, the marked difference between the most wealthy and slightly less well-off group for some indicators imply that there may be a "gold standard" of care and well-being still available only to the wealthiest. Consistent with previous findings, in 2011, the proportion of women taking daily iron folic acid tablets during pregnancy and consuming an adequate, diverse diet increases dramatically among the wealthiest women versus those just slightly less well off. A similar pattern holds true for women's dietary diversity.

Alongside the continued challenge of under nutrition is the growing issue of overweight and obesity, with as many Bangladeshi women now overweight as underweight (even in rural areas). Thus while continuing efforts to pursue the MDGs with an equity focus, there is a need to address the overweight problem before its health effects paralyse the health care system. Reflective of changes in lifestyle associated with urban living, such as increasing sedentarism and shifting dietary preferences towards high-fat and processed foods, increasing overweight and its risks to health requires a completely different response which includes weight control programmes and improved screening and treatment for non-communicable disease.

FSNSP continues to be the only source of seasonal information on the food security status of Bangladeshi households at the national and divisional level, as well as the agro-ecological zones especially at risk of food and nutritional insecurity. As such, it offers insight and guidance on what geographic areas, socio-economic groups and types of interventions should be prioritised in efforts to target inequities that are holding up the country's progress toward meeting MDG goals. Not only do these data help ensure optimal use of resources in this "last lap" towards 2015, they also provide a window on the longer term challenges and risks to public health nutrition that need to be anticipated.

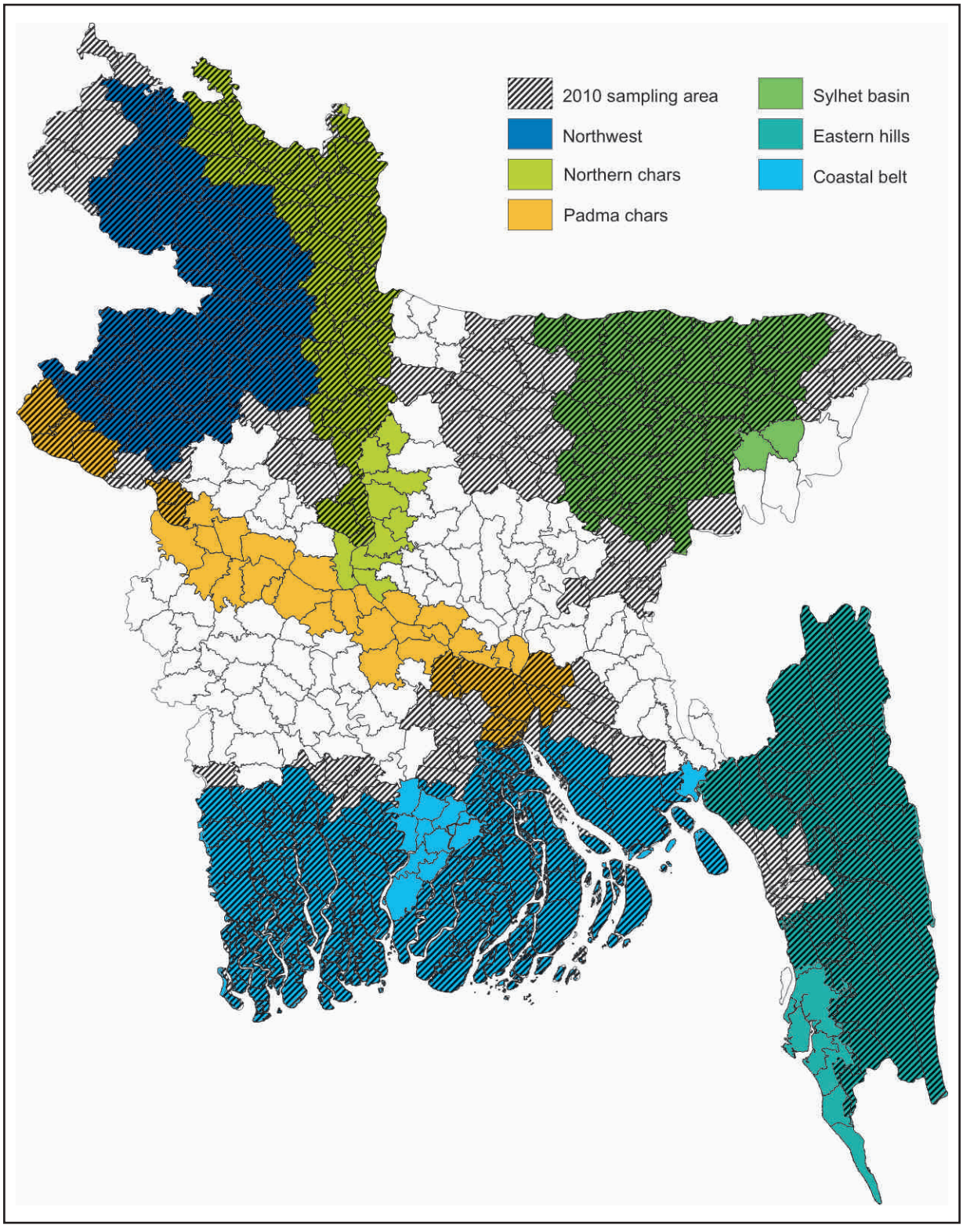
Appendices

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 (Banshkhali, Chandanaish, Fatikchhari, Lohagara, Mirsharai, Rangunia, Satkania); Cox's Bazar (Chakaria, Cox's Bazar Sadar, Maheshkhali, Pekua, Ramu, Teknaf, Ukhia); Khagrachhari (All 8 *upazilas*); Rang amati (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, Shibalaya); Munshigonj (Lohajang, Munshiganj Sadar, Sreenagar, Tongibari); Natore (Lalpur); Pabna (Ishwardi, Pabna Sadar, Sujanagar); Rajbari (All 4 *upazilas*); Rajshahi (Bagha, Charghat, Godagari); Shariatpur (Bhedarganj, Dam udya, Gosairhat, Naria, Zanjira)
Northern chars	Bogra (Dhunat, 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, Shibalaya); 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, Chirir bandar, 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)

Figure A.1**: Comparison of the 2010 and 2011 surveillance zones**



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List of acronyms

ANC	Antenatal care
ARI	Acute respiratory infection
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BDHS	Bangladesh Demographic and Health Survey
BMI	Body mass index
BRAC	Bangladesh Rural Advancement Committee
CDC	Center for Disease Control
CED	Chronic energy deficiency
CHT	Chittagong Hill Tracts
CIP	Country Investment Plan
CMNS	Child Mother Nutrition Survey
Dfid	Department for International Development
DGHS	Directorate General of Health Services
DHS	Demographic and Health Survey
EU	European Union
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organization of the United Nations
FCS	Food consumption score
FPMU	Food Planning and Monitoring Unit
FSNSP	Food Security and Nutrition Surveillance Project
FtF	Feed the Future
FWA	Family welfare assistant
FWV	Family welfare visitor
GAM	Global acute malnutrition
GoB	Government of Bangladesh
HA	Health assistant
HFIAS	Household Food Insecurity Assessment Scale
HFSNA	Household Food Security and Nutrition Assessment
HIES	Household Income and Expenditure Survey
HKI	Helen Keller International
HNPSSP	Health, Nutrition, and Population Sector Strategy Programme
ICDDR,B	International Diarrhoeal Disease Research - Bangladesh
IFA	Iron and folic acid tablets
IPHN	Institute of Public Health and Nutrition
IYCF	Infant and young child feeding
JPGSPH	James P. Grant School of Public Health
LBW	Low birth weight
MA	Medical assistant
MDG	Millennium Development Goal
MI	Micronutrient Initiative
MICS	Multiple Indicator Cluster Survey
MoFDM	Ministry of Food and Disaster Management
MoHFW	Ministry of Health and Family Welfare
MUAC	Mid-upper arm circumference
NCHS	National Center for Health Statistics
NFPCSP	National Food Policy Capacity Strengthening Programme
OMS	Open market sale
ORS	Oral rehydration salts
ORT	Oral rehydration therapy
PDA	Personal digital assistant
PSU	Primary sampling unit
REACH	Renewed Efforts Against Child Hunger and Malnutrition
SACMO	Sub-assistant community medical officer
SAM	Severe acute malnutrition
SBA	Skilled birth attendant
SD	Standard deviation
SMA	Statistical metropolitan area
SUN	Scaling up nutrition
SSU	Secondary sampling unit
TALC	Teaching aids at low cost
TBA	Traditional birth attendant
TCG	Technical consultative group
UN	United Nations
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

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Bangladesh Bureau of Statistics (BBS): The Bangladesh Bureau of Statistics is the national statistical organization of Bangladesh. BBS collects, compiles, analyses 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.


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