SAVING LIVES
CHANGING LIVES

Fill the Nutrient Gap
Bangladesh

FINAL REPORT

WFP
World Food Programme

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Table of Contents

List of Figures

List of Tables

List of Maps

List of Acronyms

ANC	Ante-natal care
BAN-HRDB	Bangladesh Applied Nutrition and Development Board
BARC	Bangladesh Agriculture Research Council
BARI	Bangladesh Agriculture Research Institute
BBF	Bangladesh Breastfeeding Foundation
BBS	Bangladesh Bureau of Statistics
BCSA	Bangladesh Civil Service (Administration) Academy
BDT	Bangladeshi Taka
BFSA	Bangladesh Food Safety Authority
BNNC	Bangladesh National Nutrition Council
BRRI	Bangladesh Rice Research Institute
BIRTAN	Bangladesh Institute of Research & Training on Applied Nutrition
BPATC	Bangladesh Public Administration Training Centre
CD	Cabinet Division
CotD	Cost of the Diet
DHS	Demographic and Health Survey
DSHE	Directorate of Secondary and Higher Education
FAO	Food and Agriculture Organization of the United Nations
FB	Fortified Biscuits
FNG	Fill the Nutrient Gap
FPMU	Food Planning and Monitoring Unit
GAIN	Global Alliance for Improved Nutrition
GBV	Gender-based violence
GMP	Growth Monitoring and Promotion
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
ICVGD	Investment Component of the Vulnerable Group Development Programme
ICTD	Information and Communication Technology Division
IFA	Iron and Folic Acid Tablets
INFS	Institute of Nutrition and Food Sciences
IPHN	Institute of Public Health Nutrition
IYCF	Infant and Young Child Feeding
MCBP	Mother and Child Benefit Programme
MDM	Mid-Day Meal
MICS	Multiple Indicator Cluster Survey
MMS	Multiple Micronutrient Supplement
MNP	Multiple Micronutrient Powder

MoA	Ministry of Agriculture
MoC	Ministry of Commerce
MoDMR	Ministry of Disaster Management and Relief
MoE	Ministry of Education
MoEFCC	Ministry of Environment, Forest and Climate Change
MoF	Ministry of Finance
MoFLS	Ministry of Fisheries and Livestock
MoFood	Ministry of Food
MoHFW	Ministry of Health and Family Welfare
MoInd	Ministry of Industries
MoInfo	Ministry of Information
MoLE	Ministry of Labour and Employment
MoLGRDC	Ministry of Local Government, Rural Development and Co-operatives
MoP	Ministry of Planning
MoPME	Ministry of Primary and Mass Education
MoPTCT	Ministry of Posts, Telecommunications and Information Technology
MoRA	Ministry of Religious Affairs
MoST	Ministry of Science and Technology
MoSW	Ministry of Social Welfare
MoWCA	Ministry of Women and Children Affairs
MoYS	Ministry of Youth and Sports
NNP	National Nutrition Program
NPAN2	Second National Plan of Action for Nutrition
NSSS	National Social Security Strategy
NCD	Non-communicable diseases
PLW	Pregnant and lactating women
PMO	Prime Minister's Office
PNC	Post-Natal Care
PO	President's Office
RDA	Recommended Daily Allowance
RNI	Recommended Nutrient Intake
SBCC	Social and Behaviour Change Communication
SDG	Sustainable Development Goals
SOP	Standard Operating Procedures
UHT	Ultra High Temperature
UNFPA	United Nations Populations Fund
UNICEF	United Nations Children's Fund
VGD	Vulnerable Group Development
WHO	World Health Organization
WFP	World Food Programme

Fill the Nutrient Gap - Bangladesh

1. Introduction

1.1. Background

Bangladesh has made significant progress over the last 20 years to reduce rates of malnutrition among its population. Yet, further progress is urgently needed to ensure all Bangladeshis have the opportunity to achieve their highest human and economic potential. Investments in nutrition interventions in Bangladesh have been estimated to provide a 1:10 return on investment (2), making nutrition a powerful tool to improve human capital development, and to accelerate growth and productivity.

A multi-sectoral policy framework to enhance nutrition interventions is largely in place. The National Nutrition Policy 2015 and the Second National Plan of Action for Nutrition 2016-2025, in tandem with the National Food Policy 2006, National Strategy on Prevention and Control of Micronutrient Deficiencies 2015-2024, Micronutrient Strategy and Second Country Investment Plan for Nutrition-Sensitive Food Systems 2016-2020, provide a comprehensive agenda for nutrition. A recent policy mapping has shown that in most relevant sector policies, food availability and access have been adequately addressed. Yet, food utilization, and thus food consumption and nutrient intake, is far less well-articulated in many sectors' policies. Particularly matters related to women's agency are identified as a common gap even in recent policies, like the new Agriculture Policy (July 2019). A recent World Bank study shows the need to re-examine the changing drivers of malnutrition to ensure programmes and policies address the triple burden of malnutrition (undernutrition, micronutrient deficiencies, overweight/obesity and non-communicable diseases) effectively (3). It is in this context that the Cabinet Division of Bangladesh and the World Food Programme decided to conduct a Fill the Nutrient Gap (FNG) analysis.

The FNG analysis combines a comprehensive nutrition situation analysis with a stakeholder engagement process. Its aims are to generate evidence for decision-making and to facilitate multi-sectoral collaborations to improve diets and prevent all forms of malnutrition. FNG assesses the extent to which consumers have choices, by examining whether nutritious foods are available, physically accessible and affordable, and if so, what other factors determine people's food choices (4). FNG is conducted to inform multi-sectoral decision-making by identifying context-specific barriers and entry-points for food, health and social protection systems to improve nutrition. It has been designed to contribute to national policy (re)design and intervention prioritization and operationalization, in particular of nutrition (e.g. of the National Nutrition Program (NNP) and the Second National Action Plan for Nutrition (NPAN2) in the case of Bangladesh) and

social protection, and to inform programme planning cycles. The analysis combines a review of secondary information in the form of reports and papers, an analysis of secondary data on food and nutrition, Cost of the Diet (CotD) analysis to assess the affordability of nutritious diets and CotD modelling analysis to estimate the impact that different multi-sectoral actions could have to improve the affordability of nutritious diets. The analytical process involves multiple stakeholders who, based on the results, identify which nutrition-specific and nutrition-sensitive interventions to implement across a country's food system.

By the end of 2019, FNG analyses had been finalized in more than 20 countries[1]. In many, the focus was on informing national policies and several had an additional focus on specific geographic or programming areas (e.g. Karamoja in Uganda for refugee operations). In middle-income countries where a substantial proportion of the population lives in urban areas, affordability and prices of nutritious foods relative to staple foods and low nutrient-density of many processed foods are important issues (as per FNG findings from Ecuador, Ghana, Sri Lanka, Philippines). Also, in middle-income countries, social protection mechanisms, including social safety nets and schools, can play an important role to improve access and choices amongst the poorest, and to target specific subgroups with higher nutritional needs, such as children aged 6-23 months, school children and pregnant and lactating women (e.g. Indonesia, Ecuador, El Salvador). Analyses of constraints posed to meeting nutrient intake recommendations by high staple food intake and consumption of snack foods with high energy but low nutrient content have also proven powerful to further the understanding of how the food environment must be adjusted in support of nutrition and achieving SDG 2.2 (e.g. Cambodia, Tajikistan and the Philippines).

Addressing the triple burden of malnutrition in Bangladesh will require coordinated efforts by all sectors. Only by understanding the main barriers and underlying drivers of inadequate diets is it possible to identify the most appropriate strategies and entry points for improved nutrition among all persons living in Bangladesh. With this in mind, the FNG in Bangladesh took place between January and December 2019 to generate the required evidence and create a space for cross-sectoral dialogue. The outcomes of the FNG are a set of recommendations formulated by the stakeholders that will inform the 8th Five Year Plan (2020-2025) of the Government of Bangladesh, the National Food and Nutrition Security Policy of Bangladesh and the new UN Sustainable Development Cooperation Framework Country Strategy. This report documents the FNG process and analysis in Bangladesh, provides the detailed findings, and presents the recommendations developed by the participating stakeholders.

[1] For summaries of FNG analyses, see: https://www.wfp.org/content/2017-fill-nutrient-gap?_ga=2.259054594.903629526.1545412196-1325315182.1507034485

1.2. Objectives

Based on discussion with government, academic, UN and NGO partners during a scoping visit by the FNG team from WFP Rome from 27-31 January, it was decided to conduct two FNG analyses in Bangladesh: one with a national scope and one for the affected Rohingya and Bangladeshi populations in Cox's Bazar. The national analysis is the focus of this report. For the Cox's Bazar analysis, please see the Fill the Nutrient Gap – Cox's Bazar Summary Report available on http://www.wfp.org/fillthenutrientgap

The national analysis had the objective of assessing to what extent people have access but do not make optimal choices and to what extent affordability and availability in fact limit people's ability to choose to consume nutritious foods. It was determined that the Cost of the Diet analysis would be done at a divisional level, distinguishing urban and rural areas and different target groups. The findings from the analysis were to be shared with relevant ministries and non-governmental agencies from different sectors in order for them to prioritize focus areas and strategies in the 8th Five Year Plan (2020-25), the Food and Nutrition Security Policy 2020 and the UNDAF Country Strategy, in order for the food, health and social protection systems to become more nutrition-sensitive by supporting improved consumption of nutritious foods in order to prevent malnutrition.

1.3. Process

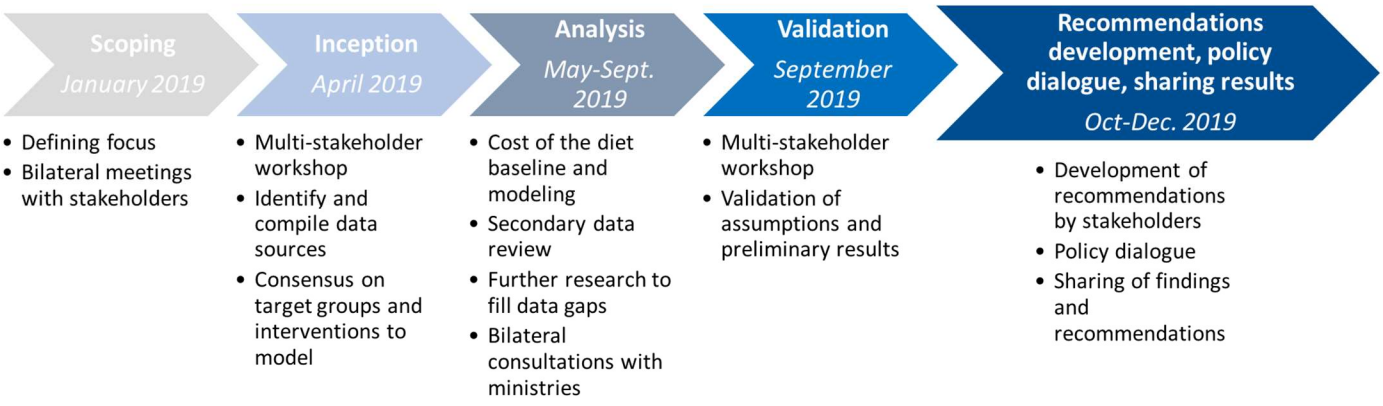
Malnutrition cannot be addressed by one sector alone. FNG is designed to inform multisectoral decision-making and therefore engages stakeholders from all sectors including food, health, agriculture, education, and social protection systems throughout the analysis.

It is the stakeholders who define the scope and focus of the FNG. They contribute data and sources of information for identification of context-specific barriers and entry points and develop a shared understanding of the issues and possible solutions. They then identify appropriate nutrition-specific and nutrition-sensitive interventions that can be implemented by different sectors using their existing delivery platforms. These could be social safety nets, food processing and markets, antenatal care, school feeding programmes and others.

In Bangladesh, the FNG began with a scoping exercise in January 2019 where bilateral meetings were held with a range of stakeholders, notably Minisrty of Planning, Ministry of Health and Family Welfare, Ministry of Food, Ministry of Finance, development partners,

academia etc, As a result of these meetings, it was determined that the Cabinet Division would lead the FNG. The Cabinet Division organized a Technical Working Group (TWG) consisting of representatives from government ministries and academia, who provided inputs and validated assumptions and results of the analysis throughout the process. During the course of the FNG analysis, the Technical Working Group met three times (April, July, September) to provide inputs and shape the analysis. The FNG was launched at an inception workshop in April, where the FNG process was introduced, secondary data sources were collated and possible interventions, entry points and transfer mechanisms were identified to test in the CotD modelling. The CotD analysis intervention modelling and the secondary data review were carried out over the next months: preliminary results were presented internally to all WFP programme staff and to the TWG in July. In addition, a series of meetings with individual ministries were held in August to discuss findings pertinent to their mandate. A further meeting was held with Bangladesh Bureau of Statistics (BBS) in August, confirming that the data sets used were indeed the most recent, up-to-date published data sets. Final results were reviewed and validated by the TWG in September. Based on the FNG findings, recommendations were developed by individual ministries and finalized through a policy round table under the leadership of the Cabinet Division in November 2019. The FNG process was finalized with a sharing event in December where results and recommendations were presented to a wide audience. A full list of the stakeholders who were engaged throughout the FNG process can be found in Annex 1. The detailed FNG process in Bangladesh is illustrated below.

The FNG process in Bangladesh



2. Methodology and Data Sources

Malnutrition – whether undernutrition, overweight and obesity, or micronutrient deficiencies – is determined by two direct causes: inadequate dietary intake and poor health. Dietary intake needs to be adequate, both in terms of quantity and quality. The latter requires consumption of a diverse diet so that all the nutrients required to keep the body healthy and to support growth and development are provided. That is, energy, protein, essential amino acids, essential fatty acids, vitamins, minerals, need to be consumed in appropriate amounts for different age groups.

Meeting nutrient needs is essential to be free from malnutrition. However, in many countries, the current local diet of vulnerable groups does not provide the nutrients required, resulting in a "nutrient gap". The nutrition situation analysis is key to increase the understanding of the magnitude and main causes, constraints and barriers to filling the nutrient gap among a particular target group in a particular context.

While households may have access to enough food to meet their energy needs, they may not be able to access enough variety of foods, especially nutrient-rich foods such as vegetables, fruits, animal-source foods, legumes and nuts, due to availability or affordability constraints, to prevent malnutrition among the different members of the family. If these foods are accessible and affordable, they still may not be chosen or consumed in amounts sufficient for different individuals, for other reasons, including preference, awareness of needs, individuals' agency or other structural causes. These are the premises on which the FNG analysis is based.

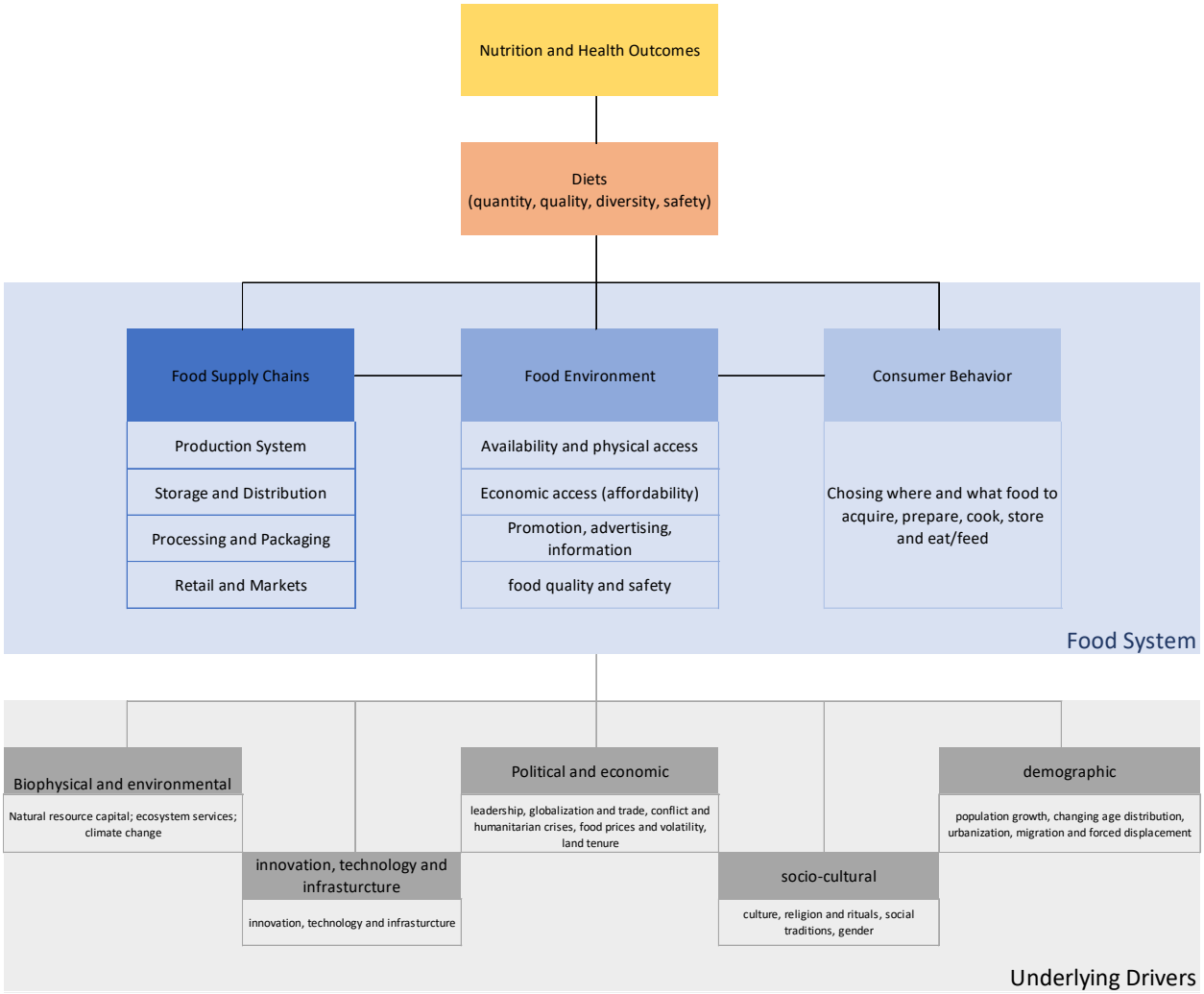
The FNG analysis takes a systems approach to identify context-specific barriers to accessing and selecting nutritious foods. The analysis comprises two components:

- A country-specific review of secondary data and information on factors that reflect or affect dietary intake. This includes malnutrition trends over time, characteristics of the food system and food environment, and population behaviour related to food and feeding. In Bangladesh, stakeholders recommended 220 reports, academic publications, non-academic reports, policies and national survey data, which were reviewed for the analysis.
- An assessment of the extent to which economic barriers prevent adequate nutrient intake. This uses the Cost of the Diet (CotD) linear programming software developed by Save the Children (UK) (5,6). The CotD analysis used data on food prices and household food expenditure from the HIES 2016 dataset (7) to estimate the minimum cost and the economic affordability of a nutritious diet as well as to model the impact of current and proposed interventions to reduce this cost and increase affordability.

2.1. Food Systems approach

FNG's theoretical framework is anchored in the 12th report by the High Level Panel of Experts on Food Security and Nutrition (8). FNG analyses the interplay between food supply chains, the food environment and consumer behavior that lead to dietary choices. This is done through the secondary data review and the Cost of the Diet linear programming. The FNG framework for analysis depicted in Figure 1 helps guide, consolidate, analyse and synthesise data from secondary data and Cost of the Diet in an integrated manner.

Figure 1: Diagram of food systems for diets and nutrition, adapted from HLPE 2017 (8)



Specifically, the FNG analysis focused on the following topics:

Nutrition and Health Outcomes: FNG seeks to gain an overview of the nutrition situation within a population, which includes the identification of vulnerable and disadvantaged groups. Prevalence data of malnutrition characteristics (stunting, wasting, anaemia, underweight, overweight) and available data on micronutrient deficiencies are reviewed, disaggregated as much as possible by sex, age, geographic distribution, quintile, and other factors as possible and as relevant.

Diets: FNG aims to understand the causes of malnutrition related to dietary intake (as opposed to the causes related to illness). Dietary patterns in the general population as well as particular target groups are analyzed. Information on food consumption per food group, dietary diversity, food security, adverse food-based coping mechanism, intake of supplements, and infant and young child feeding practices (IYCF) are reviewed. The status of access to and consumption of a sufficient quantity of food that is culturally acceptable, affordable, nutritious and healthy, sheds light on problematic or beneficial dietary patterns that require further analysis.

Supply chains: The complex food supply chains at work in a country are a central explanatory factor of dietary intakes. Food supply chains include all activities and actors that take food from production to consumption and the disposal of waste, with emphasis on roles, responsibilities and opportunities of men, women, girls and boys within the chains. Supply chain analysis includes analyses of production, processing and packaging, storage and distribution, retail and markets, and livelihood opportunities, with differing emphases depending on the specific objectives of an FNG in a country or area.

Food environment: The food environment refers to the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food. This includes reviewing food availability; physical access; cost and affordability; promotion, advertising, and information; and food quality and safety concerns. Cost of the Diet analysis is used to provide specific insights into the food environment, specifically with regards to food availability, cost and affordability.

Consumer behavior: The choices people make are a central determinant of dietary intake. Analysing how and why people choose where and what food to acquire, prepare, cook, store, eat, or feed to their children and families, can be important to understand those nutrient gaps that cannot be explained well by the food environment and the food supply chain. This includes analysis of food and feeding preferences, roles and responsibilities of household and community members with regards to food and nutrition, intra-household food allocation, knowledge of nutrition and self-efficacy.

To complete the understanding of the food system, underlying drivers are considered, in particular:

Biophysical and environmental drivers: The ways in which the current and predicted changes in natural resources and ecosystem services impact the food system.

Innovation, technology, and infrastructure drivers: How the use of research, infrastructure, new and existing technologies (in households, communities, production, etc.) impact the food system.

Political and economic drivers: How the political and economic situation (including existing policies and partnerships, leadership, globalization and trade, conflicts and humanitarian crises, food prices and volatility, land tenure, protection risks affecting different groups of children and/or adults) impacts the food system. This includes analysing whether the policy environment adequately facilitates the access and availability of nutritious foods for the population by identifying possible gaps in national policy and national legal or regulatory frameworks related to access and availability.

Socio-cultural drivers: The social and cultural specificities of the context that impact the food system, in particular gender inequalities, division of labor, education, social norms and traditions, food cultures, and other drivers of behaviors at individual, household, community, and institutional levels.

Demographic drivers: How fertility, migration, urbanization, mortality, and the population structure affect the food system, including fertility, adolescent pregnancies, demographic transitions and livelihoods opportunities for young people.

Cross-cutting considerations: In order to accurately focus the analysis of the food system on bottlenecks for the most nutritionally-vulnerable and disadvantaged groups, the analysis disaggregates indicators by relevant categories (gender, sex, age, urban and rural, wealth, etc.), compares indicators to national or international standards and analyses trends over time.

2.2. Secondary literature

Between April and November 2019, the secondary data analysis was carried out by the FNG team. FNG's data mapping template, which follows the structure of the theoretical framework presented above, facilitated the identification and review of different information sources relevant to the FNG analysis and to highlight areas where data had not been found.

Data sources were identified, mapped and reviewed over three main stages:

1. Consultation with National Stakeholders: Prior to and during the first two missions to Bangladesh, information about the data requirements for the FNG analysis and the FNG data mapping template were shared with the WFP country office and national stakeholders, who, in turn, recommended and shared relevant datasets, reports, articles and documents with the FNG team.

2. Literature Search: In addition to obtaining data through national stakeholders, a web-based literature search was carried out to identify any further articles or reports relevant to the FNG analysis and to provide a contextual overview of the nutrition situation. The search focused on identifying data from studies in academic journals, institutional reports and working paper series published in the last 10 years. Through the engagement with TWG and main stakeholders throughout the process further sources of information were also identified

3. Follow up on identified data gaps: Once the data mapping spreadsheet had been populated with information sources from stakeholders and the literature review, data gaps, in terms of themes, areas of the country or population groups, could be identified. The FNG team then shared this list with the TWG to inquire whether any additional information sources could be shared. A further, targeted literature search focusing on these specific gaps was also conducted.

Through consultation with national and international stakeholders and a review of relevant literature, over 220 data sources were identified and reviewed. The list of references can be found in the Bibliography.

2.3. Cost of the Diet

The CotD software runs linear programming analyses that contribute to build an understanding of the extent to which poverty, food availability and prices may affect the ability of people to meet their nutrient needs (6). Using price data collected from markets or from secondary sources, the software calculates the amount and combination of local foods that are needed to provide individuals or households with their estimated average requirement for energy and their recommended intakes of protein, fat and micronutrients[2]

[2] As defined by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). The RNI for 9 vitamins and 4 minerals is included.

at the lowest possible cost. These diets are calculated within defined constraints to prevent the inclusion of unrealistic types or amounts of food and the provision of excessive amounts of nutrients. At a national level, the CotD analysis was undertaken for each division at rural and urban levels. Intervention modelling was conducted for a subset of five divisions: Dhaka, Khulna, Chattogram, Sylhet and Rangpur, including both urban and rural levels for all, which were chosen in consultation with national stakeholders. Considering the relative homogeneity that was found with regard to access to and availability of nutritious foods in Bangladesh, the modeling results can be considered representative at national level.

Food Price and Household Expenditure Data

The CotD analysis was conducted with food price and household expenditure data from the Household Income and Expenditure Survey 2016, which was the most recent, complete and representative dataset available for a wide range of food prices and household food expenditure at the time of the analysis.

Household Size and Composition

Baseline calculations and modelling were done for a 5-person household to capture nutritionally-vulnerable individuals: a breastfed child 12-23 months of age, a lactating woman and an adolescent girl (14-15 years old) – the three primary target groups impacting or impacted by the critical window of the first 1000 days of life – as well as a child 6-7 years of age and an adult man. For this analysis, the 12-23-month-old child is to be used as a proxy for children aged 6-23 months; the 6-7-year-old child as a proxy for a school-aged child; and the lactating woman as a proxy for a pregnant and/or a lactating woman (PLW). This model household was chosen and validated by the TWG as it includes individuals at nutritionally critical stages throughout their lifecycle, although it does not reflect an average Bangladeshi household. Sensitivity analyses have shown that the per capita averages of the costs of the diet derived from this household is not very different from those derived from households of other compositions. While the nutrient-density requirements of the breastfed child, adolescent girl and lactating woman are relatively high and drive up the cost of a nutritious diet, the quantity requirements of the two young children are low and hence reduces the household costs for a nutritious diet.

Staple – Adjusted Nutritious Diet

The FNG approach defines the Staple Adjusted Nutritious Diet as the lowest-cost diet that meets recommended intakes for energy, protein, fat and 13 micronutrients, with inclusion of the main staple foods and excluding prohibited foods. Staple foods are defined as foods that are generally eaten every day by all household members. Prohibited foods are defined as foods which are not consumed for cultural or religious reasons but not due to not liking them. This diet is not intended to reflect what individuals or households are currently eating, nor should it be used to develop food-based recommendations or dietary

guidelines, as the foods selected are relatively few and their combination does not necessarily make nice dishes, they just provide required nutrients in the most cost-efficient way.

The HIES 2016 was used to determine staple preferences and these were reviewed and agreed on by stakeholders in the TWG. Rice was identified as the staple in all Divisions, coarse or medium depending on the area, see Table 1.

Table 1: Type of rice selected as the staple per Division and urban/rural area

Division	Medium	Coarse
Barisal	Both	
Chattogram	Urban	Rural
Dhaka	Both	
Khulna	Urban	Rural
Mymensignh	Both	
Rangpur		Both
Rajshahi	Both	
Sylhet		Both

Two portions of the staple foods were included for all household members per day, except for the child aged 12–23 months, who received one portion a day. No food prohibitions were identified and thus, no foods were excluded from the analysis. The nutritious diet was the diet that included those staples and other foods that together meet the nutrient needs.

Affordability Analysis

The cost of the nutritious diet becomes a more meaningful figure when compared with the money that households currently spend on food. This facilitates an understanding of what percentage of households within the population can or cannot afford the nutritious diet. To estimate affordability, percentiles of per capita monthly food expenditure data were generated at the Division level (including urban and rural) using HIES 2016 data. These per capita figures were multiplied by the number of individuals in the model household (5) to estimate monthly household food expenditure for a 5-person household.

Intervention Modelling

The CotD analysis is an economic analysis of diets based on reported availability of foods in the area. It serves to detect nutritional vulnerabilities, drivers of vulnerabilities and entry points for solutions. It does not necessarily reflect the foods people choose to eat, nor is it suitable to make food-based dietary guidelines. The modeling illustrates the potential impact of interventions on household cost and affordability of a nutritious diet based on

assumptions validated by research and stakeholders. It does not constitute a cost-benefit analysis as it does not take into consideration all input and implementation costs and these should be taken into consideration before implementing any policies and programs.

To improve affordability of the nutritious diet, a number of interventions were modelled targeting the key vulnerable groups: children aged 6-23 months, adolescent girls and PLW. Interventions were also modelled targeting school aged children and the household overall. These interventions were identified primarily through consultations with national stakeholders as well as from the analysis of the secondary data.

The models included:

- Improving access to local nutritious foods through kitchen gardens, fish ponds, and smallholder livestock interventions.
- Provision of specific complementary foods to young children, as per recommended recipes and as programmed for nutrition support.
- Different compositions of school meals for primary and secondary school children and adolescents.
- Provision of emergency food packages.
- Fortification and biofortification of staple foods.
- Cash transfers for vulnerable households targeted through social safety net programmes.
- Micronutrient supplementation and access to nutritious foods, and Specialised Nutritious Foods (SNF) for specific target groups.

The modelled interventions were theoretical and would need to be accompanied by complementary behaviour change interventions to stimulate nutritious choices. The modelling plans for the national level analyses can be found in Annex 2. The underlying assumptions made for all models can be found in Annex 3. The nutrient composition per 100g for the specialised nutritious foods, blended flours, nutritional supplements, fortified and biofortified foods modelled can be found in Annex 4. The nutrient requirements of modelled individuals can be found in Annex 5.

3. Overview of Malnutrition and Diets

Poor nutritional status continues to be one of the principal health and welfare challenges of Bangladesh (9). Inadequate dietary intakes and disease are the two direct causes of malnutrition, which in turn are caused by the interplay of numerous economic, socio-cultural, environmental, and institutional underlying and basic drivers (10). Inadequate or inappropriate eating and feeding practices and their causes are the focus of the FNG analysis presented in this report.

While poor nutrition may affect the entire population, women and children are particularly vulnerable to malnutrition because of their physiology. Adequate nutrition in the first two years of life of the child is crucial for optimal growth, health and development for the rest of its life (11), while a mother with poor nutritional status is more likely to have a poor birth outcome and increased pregnancy-related risks (12). It is well recognized that undernutrition is passed from one generation to the next (12), and increasingly, the importance of adolescent girls' nutrition is emerging as a major health concern to protect adult women's and their potential children's nutritional outcomes (13). While sex-disaggregated data for certain age groups, especially children aged 6-10, adolescents aged 11-14 and 15-19, and older persons aged 60 and above, are not available on a national level, the nutritional status of these groups are also a concern. Loss of productivity and illness related to malnutrition are a burden for families and society, whether they are experience by children, women, or men. Overall, poor nutrition adversely affects health and cognitive development of all children, adults, and the elderly, with associated economic costs at household, community, and national levels (2).

Bangladesh has made great strides in ensuring food security for its population over the past thirty years and is well on its way towards achieving SDG 2, to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" by 2030 (9,14). Yet, a large number of Bangladeshis are affected by malnutrition, in the forms of stunting and wasting, micronutrient deficiencies, and overweight and obesity. The country faces a triple burden of malnutrition that warrants a re-examination of structural barriers to adequate nutrient intakes and possible solutions.

Important improvements have been made in children's nutritional status. Stunting in children under 5 declined from 51 percent in 2004 to 28 percent in 2019, while wasting declined from 15 percent to 9.8 percent in the same time period (9,15). The prevalence of stunting and wasting vary depending on the child's socio-economic context. While disaggregated ata for 2018-19 is not yet available at time of writing, the Demographic and Health Survey (DHS) of 2014 sheds light on disparities (9). In 2014, stunting rates were higher for children in rural areas than in urban areas (38 percent versus 31 percent), for

those whose mothers had no education compared to secondary complete or higher education (47 percent versus 18 percent), and for children in the lowest quintile compared to the highest quintile (49 percent versus 19 percent). Likewise, wasting was higher in rural areas than in urban areas (15 percent versus 12 percent), in children whose mothers had no education compared to those whose mothers had secondary complete or higher education (15 percent versus 13 percent), and in children from the lowest quintile compared to the highest quintile (17 percent versus 12 percent). The challenges created by poverty, rural dwellings, and mother's limited educational opportunities therefore seem to impact children's likelihood of consuming adequately nutritious diets and being in good health.

Women's nutritional status has made similar progress. Underweight in ever-married women and girls aged 15-49 years nearly halved between 2004 and 2014, falling from 34 to 19 percent (9). In 2014, undernourishment was highest among ever-married girls aged 15-19 (31 percent) compared to older age groups. Girls and women in rural areas had higher rates of underweight than those in urban areas (21 percent compared to 12 percent), as did those with no education compared to those with secondary complete or higher education (24 percent compared to 10 percent), as well as those from the lowest quintile compared to those of the highest quintile (32 percent compared to 7 percent) (9).

While undernutrition is decreasing, overweight and obesity are a growing concern. Overweight and obesity are a serious nutrition risk that predispose men, women and children to several adverse health problems, including increased risk of non-communicable diseases (NCD) (16). Between 2004 and 2014, overweight and obesity in ever-married girls and women aged 15-49 steeply increased from 9 percent to 24 percent (9). Overweight is higher in urban areas than in rural areas (36 versus 19 percent), in the highest quintile compared to the lowest quintile (47 versus 8 percent), and in girls and women with secondary complete or higher education than those with no education (40 compared to 16 percent) (9). The lack of data on overweight and obesity in men impedes an understanding of the nutritional risks faced by men, and a comparison of the situation for men and women of different ages.

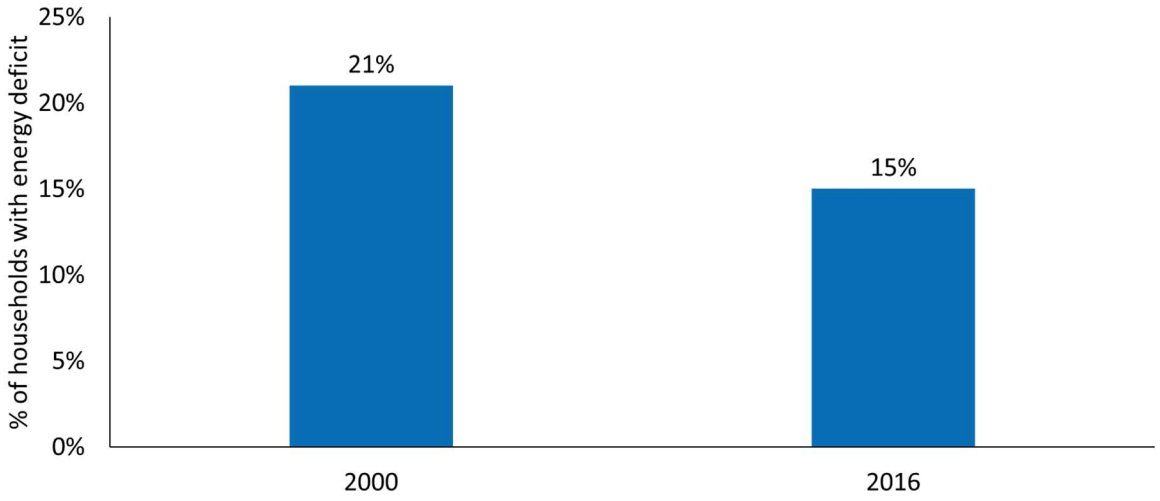
Micronutrient deficiencies are a further nutritional risk. While more recent data was not available at time of writing, in 2011-12 the prevalence of subclinical vitamin A deficiency was 20 percent in preschool-aged children, 21 percent in school-aged children and 5 percent in non-pregnant non-lactating (NPNL) women (17). The prevalence of anemia in preschool-aged age children aged 6 to 5i months was 33 percent, 19 percent in school-aged children aged 6-11 and 17 percent in adolescents aged 12-14, while it was 26 percent for NPNL women (17). The national prevalence of zinc deficiency was 45 percent in preschool-aged children, and 57 percent for NPNL women (17). Folate deficiency was 9 percent and B12 deficiency was 23 percent for NPNL women (17). The 2011-12 National Micronutrient

Survey also found that these micronutrient deficiencies were significantly worse in slums than in more affluent urban as well as rural areas (17).

Diets

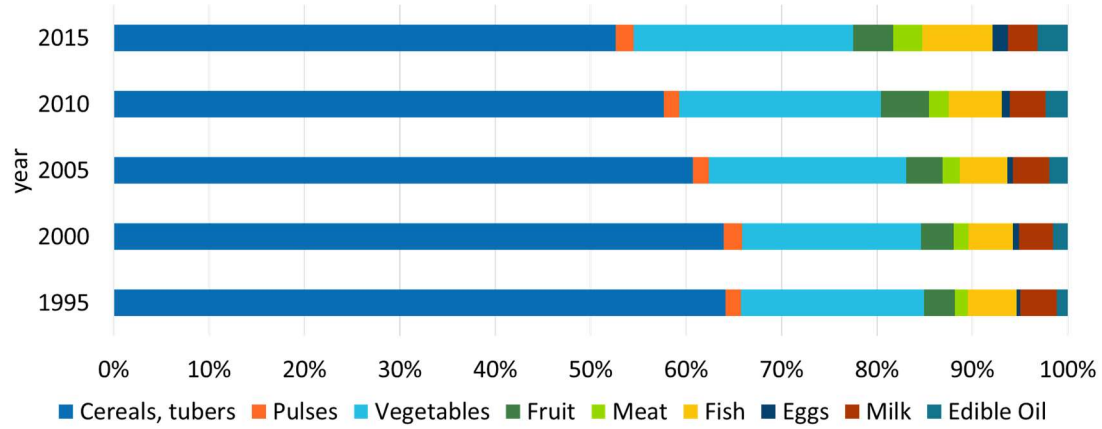
The quality of Bangladeshi diets has improved since 1995. In the past twenty years, the proportion of food-deficit households has decreased remarkably, from 21% in 2000 to 15% in 2016 (Figure 2) and likely even further by 2019, though updated data is not yet available.

Figure 2: Percentage of households with energy deficit in 2000 and 2016 (18)



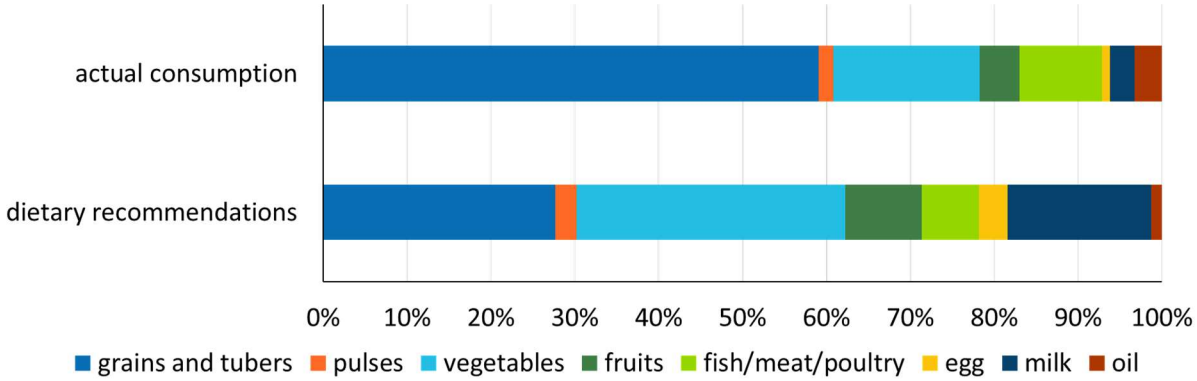
Malnutrition data suggests shortcomings with regards to dietary intakes and diets. The share of dietary energy from rice has reduced from 83% in 1991 to 68% in 2016 (7,19), making room for greater consumption of other foods such as vegetables and fish in the diet, see Figure 3. However, recent research suggests that the recorded decrease in rice consumption is partially due to a measurement error induced by inadequately accounting for changes in consumption habits, especially the difficulty to capture rice consumption out of home (20). Furthermore, it should be noted that the weights shown in the graph are dry-weight for rice and wet-weight for the fresh foods. If the weights were instead shown as weight of food ready for consumption, the share of rice would increase substantially compared to the other foods. Also, if the weights of foods consumed were expressed as percentage share of energy, the contributions from the fresh foods would decline considerably compared to those of rice and oil. Finally, the chart does not include foods and drinks that are high in sugar, whether prepared at home or purchased, packaged or unpackaged.

Figure 3: Average consumption by weight over time for different food groups, as per HIES 1996-2016 data (7)



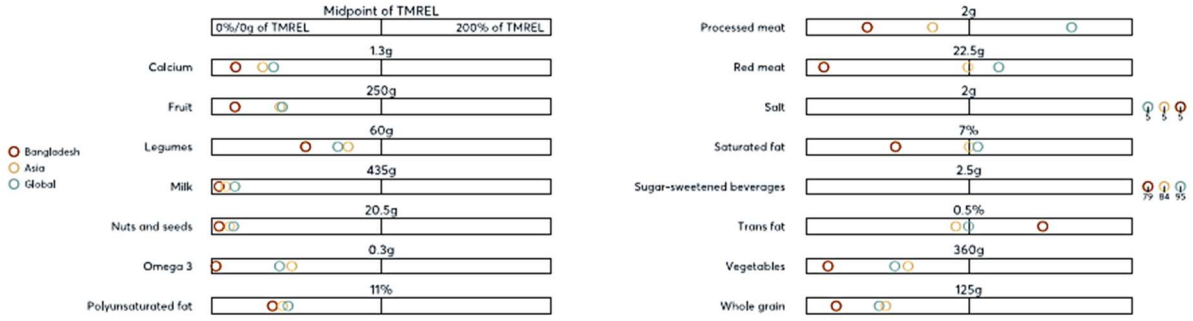
Despite the improvements, current levels of rice consumption are still high compared to Bangladesh's Food-Based Dietary Guidelines, which recommend only 55% of dietary energy from staple foods (21) (Figure 4). While consumption of rice is too high, consumption of nutrient-rich foods such as vegetables, fruits, pulses, egg and milk are too low compared to the recommendations (22,23).

Figure 4: Actual and recommended consumption by food group (percentage of total consumed food weight) (22,23)



These data are in line with IHME evidence of consumption of food groups and components by men and women aged 25 and over that finds that consumption of micronutrient-rich foods is too low in Bangladesh, especially fruits, milk, nuts and seeds, vegetables, red meat, and whole grains (Figure 5) (14). On the other hand, consumption of salt, sugar-sweetened beverages, and trans fats is too high for optimal health (14).

Figure 5: Consumption of food groups and components, 2016 (14)



Sources: Global Burden of Disease, the Institute for Health Metrics and Evaluation.

Notes: TMREL = theoretical minimum risk of exposure level. Men and women aged 25 and older.

With regards to the consumption of micronutrients from food, the population falls short of the Recommended Daily Allowance (RDA) for several key micronutrients (17). Daily median consumption of iron from food was 4.17, 5.21 and 6.64 mg in the preschool-aged children, school-aged children and NPNL women in 2012-13, respectively, well below the respective RDAs (17). The shares of animal source iron were scant at 23, 24, and 18 percent of total iron consumption in school-aged children, preschool-aged children and NPNL women, respectively (17). In 2014, 67 percent of children aged 6-23 months who were living with their mother consumed foods rich in vitamin A in the day or night preceding the survey, while 55 percent consumed foods rich in iron (9). The mother's educational status and household wealth correlated positively with the consumption of vitamin A-rich and iron-rich foods (9). Research by Dhaka University is currently ongoing to identify the current specific micronutrient gaps based on available food consumption datasets.

Infant and young child feeding practices (IYCF) and dietary diversity of women, adolescent girls and children will be discussed further in section 4.6.

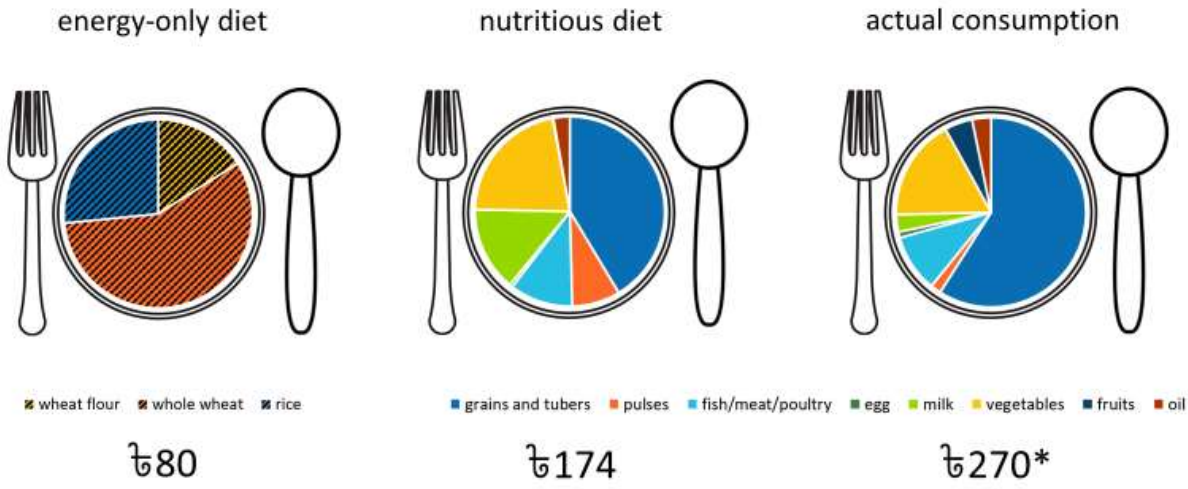
4. Findings

4.1. Food Environment: At least one in eight (13%) households cannot afford to meet their nutrient needs. Food safety concerns might jeopardize availability and affordability of nutritious foods.

Based on the 2016 food prices, the CotD found that the lowest-cost nutritious diet for the modeled 5-person household amounts to 174Tk per day. As such, it is more than twice as expensive as a diet that only meets energy needs ("energy-only diet"), which comes to 80Tk per day.

Energy needs can be met cheaply by a combination of wheat and rice; however, it will not allow individuals to meet their full nutritional needs. Consuming an "energy-only" diet would not be healthy nor desirable, and it is only presented for the sake of the cost comparison. The optimized nutritious diet would allow the household to meet its full nutrient needs, and to do so it includes a combination of about 10 different foods including staples (rice, wheat) as well as tubers, legumes, animal source foods (fish, milk), vegetables (including green leafy vegetables), fruits and oil. The cost of the nutritious diet is a cost optimization and does not provide a food-based dietary recommendation. It does, however, serve to illustrate the need for diversity and the consumption of various food items and food groups to ensure micronutrient needs are met. Figure 6 shows the composition of the energy-only diet and the nutritious diet compared with actual food consumption (7). The nutritious diet is composed of less rice and more vegetables, milk and pulses than what is currently consumed. Also, the nutritious diet does not include foods that contribute energy but no micronutrients, other than oil, such as high-sugar or high-fat snacks and drinks. Median food expenditure is also higher than the lowest-cost nutritious diet, at 270 Tk per day (average across modeling divisions) (7).

Figure 6: Compositions (by weight) of the energy-only and nutritious diets compared to actual consumption (22) by food group



The cost of the nutritious diet is driven by the interplay of micronutrient content, energy content and price of the foods available in local markets, as summarized in Figure XX. Depending on the nutritional content and price of nutritious foods on the market, the household will more or less be able to meets its nutrient needs cheaply.

Figure 7: Factors which explain the cost of the nutritious diet as calculated by the CotD software

Availability of nutritious foods and …

Micronutrient content		Energy content		Price		Cost of a nutritious diet	Example
High	+	Low	+	Low	=>	Low	Amaranth leaves
High	+	Low	+	High	=>	Middle	Fresh fish
High	+	High	+	High	=>	High	Meat

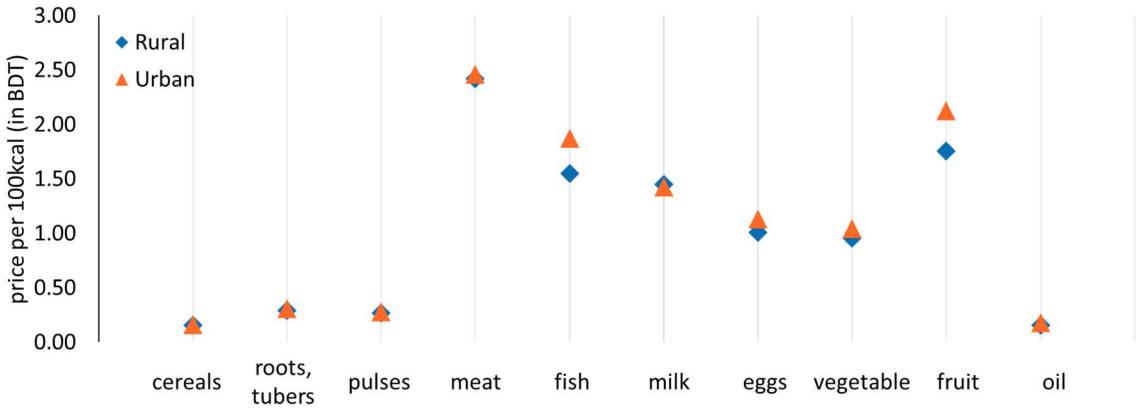
Overall, Bangladesh is relatively homogenous in terms of the cost of the nutritious diet by geographic areas. The cost of the nutritious diet is on average 8% higher in urban areas compared to rural areas across the modelling zones. It is highest in Sylhet and Dhaka, and lowest in Khulna and Rangpur, but overall does not vary greatly across the country (see Map 1, below).

The nutrients which are the most expensive to procure based on the foods available in local markets in Bangladesh are the B vitamins, calcium, iron and fat. These are known as

"limiting nutrients" in CotD analysis and are the main drivers of the cost of the nutritious diet. B vitamins, calcium and iron are most commonly found in animal source foods, such as fish, milk and meat, as well as in fresh vegetables (especially green leafy vegetables).

Food prices in Bangladesh vary considerably by food group, as presented in Figure 8. Staple foods with low nutrient density are cheapest per calorie, while nutrient-dense foods such as meat and fish are most expensive (7).

Figure 8: Food prices per 100kcal by food groups in urban and rural areas (7).

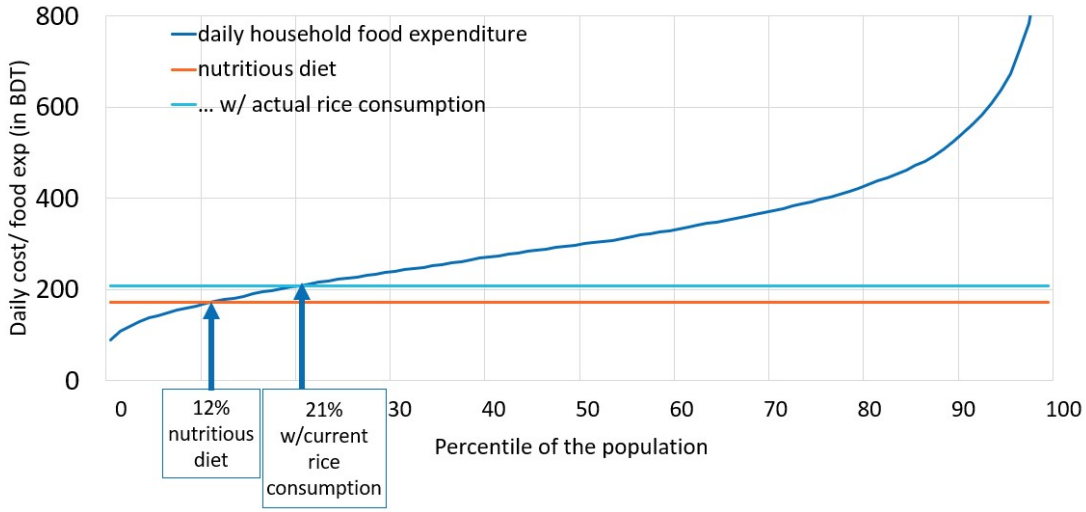


Comparing the cost of the energy-only or nutritious diet to 2016 actual food expenditure makes it possible to estimate the affordability. According to the analysis, all households (100%) could afford an energy-only diet. On the other hand, at least one in eight (13%) could not afford an optimized nutritious diet, which equates to about 21,5 million people. This figure is in line with the 2016 lower poverty line of 12.9% (while the higher poverty line was estimated at 24.3%) (22). The widespread affordability of foods, including nutrient-dense foods, is a major achievement in recent years and in large part due to the government's efforts to reduce poverty and promote agricultural production.

Hence, most Bangladeshi households can theoretically afford a nutritious diet. However, the nutritious diet, in-line with the food-based dietary guidelines, requires a considerable shift of food consumption patterns. Achieving such a shift may require efforts to address non-financial barriers (e.g. time, knowledge, food safety, food culture) and promoting healthy choices as well as ensuring that the food supply can provide for a change of demand, i.e. less rice and a greater diversity and quantity of plant and animal source foods. While nutritious choices need to be encouraged for all households, for those 13% of households that could not afford a nutritious diet, strategies to improve affordability and increase access to specific nutritious foods are key.

For an illustrative example of the food expenditure curve and affordability calculation see Figure 9 (shown for rural Chattogram). At national level, affordability is calculated from the average rural and urban division level affordabilities weighed by population size. Because the expenditure curve is relatively flat, a small increase in cost or a slight reduction of incomes could mean a large increase in non-affordability. Hence, households' access to nutritious foods could vary importantly with variations in food prices and incomes.

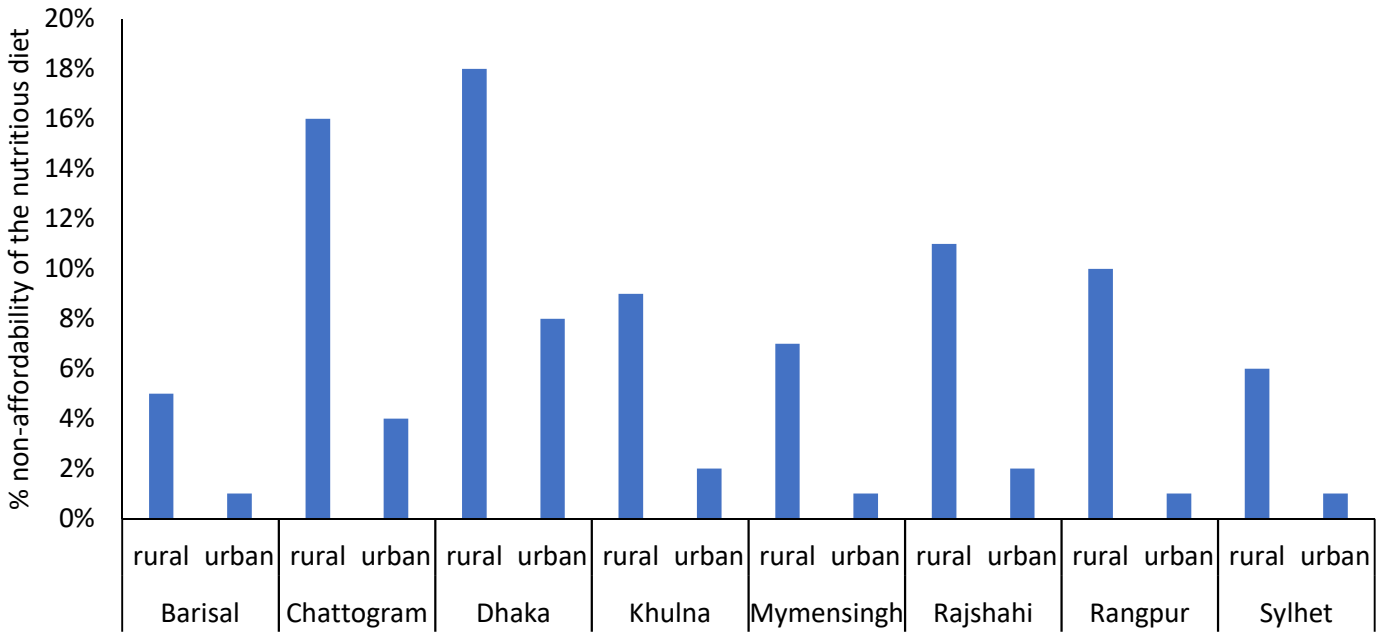
Figure 9: Food expenditure curve and affordability calculation in rural Chattogram



It is important to note that the 13% non-affordability is an optimistic estimate, as several factors can increase cost of a nutritious diet, or lower food expenditure. Factors that increase cost include buying of prepared foods, making less optimized choices from within healthy food groups, purchasing spices and flavourings that do not add nutrients but are necessary for cooking palatable recipes, as well as vitamin losses during cooking and uncounted costs, such as cost of clean water, storage costs, etc. Research has recently been conducted by the World Bank on affordability of diets, finding that the recommended diet (as per food-based dietary guidelines, and hence more diverse than the nutritious diet modeled by CotD analyses) would in-fact be unaffordable to 53 percent of the population (24).

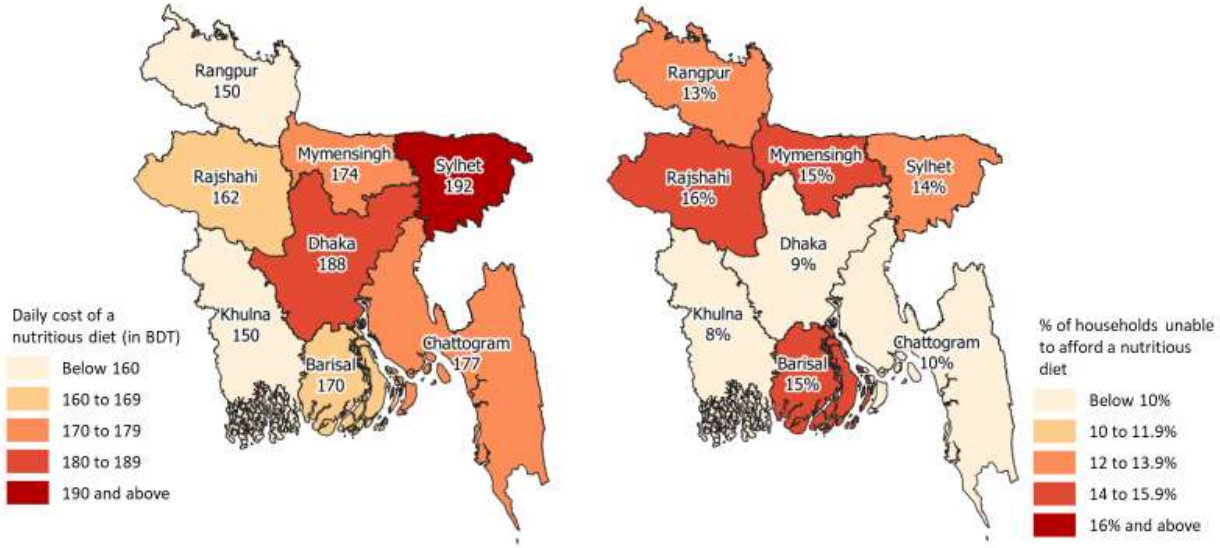
Non-affordability of the nutritious diet was found to vary somewhat by urban and rural areas, with consistently higher non-affordability in rural areas across the country due to lower household expenditures, see Figure 10. This is not surprising considering the higher poverty rates in rural compared to urban areas (22).

Figure 10: Non-affordability of the nutritious diet by division and area



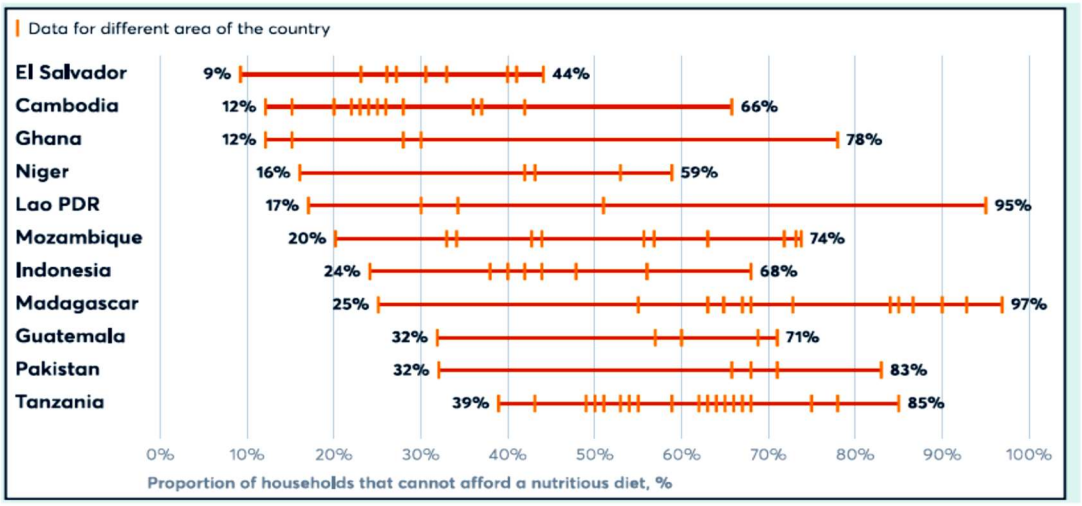
Non-affordability is highest in Rajshahi, Mymensingh and Barisal and lowest in Khulna and Dhaka, even though these are not the areas with the highest costs of the nutritious diet, see Map 1. Unsurprisingly, higher food prices are less of a barrier when household expenditures are higher, too. Hence, the relationship between cost of the nutritious diet and non-affordability depends on household incomes and expenditures.

Map 1: Cost of the nutritious diet and non-affordability by division



The range of non-affordability of the nutritious diet is relatively low in Bangladesh (1-18%) as compared to other countries in which the FNG has been conducted. Though data are not directly comparable across countries due to different data sources, data collection methodologies, and years and seasons of the different analyses, Figure 11 gives an overview of the range of non-affordability of the nutritious diet in selected countries. The low level of non-affordability in Bangladesh has opened the door for a deeper analysis of non-monetary barriers to consuming nutritious diets, presented in the following sections.

Figure 11: Range of non-affordability across different FNG countries (25)



The FNG analysis assumes that all foods included for analysis are not adulterated and are safe for human consumption. The limited evidence on the actual extent of food adulteration is mixed (26–30) and regulation was put in place to prevent food adulteration and inform public opinion. Yet, numerous reports of food adulteration have heightened public awareness of food adulteration and contamination in recent years. Evidence suggests that some food might be tempered with to preserve or increase its commercial value, for example by preserving fish with DDT, using calcium carbide for ripening mango, or use of unauthorized food colors such as textile dyes in food manufacturing and processing (29,31). Furthermore, drives to maximize profits in agriculture seem, in some cases, to be accompanied by inappropriate practices that create dangerous and sometimes fatal health risks, such as excessive use of pesticides in fruit production (24).

Since it appears that food adulteration or inappropriate agricultural practices are driven by economic reasons, supposedly allowing producers to keep prices low and increase profits, it is possible that efforts to ensure food is not adulterated throughout the supply chain might increase food prices, reduce availability of certain foods, and reduce affordability - unless mitigating actions are put in place. The current non-affordability calculations are based on foods produced in the current system, and if these prices misrepresent the real cost of safe foods, true non-affordability would actually be higher.

4.2. Consumer Choices: Food culture and market incentives lead to suboptimal food choices, which make nutritious diets less affordable. A healthy food environment underpins nutritious choices.

The reasons people make the food choices they do are complex and interrelated. Price and availability come into play, as do preferences, habits, and food culture, advertising, information and knowledge, and different peoples' agency and decision-making power. What someone chooses to eat depends not only on who they are, but on where they are, and what people, institutions and environment surrounds them. Figure 12 summarizes the theoretical approach to behaviors which informs the FNG.

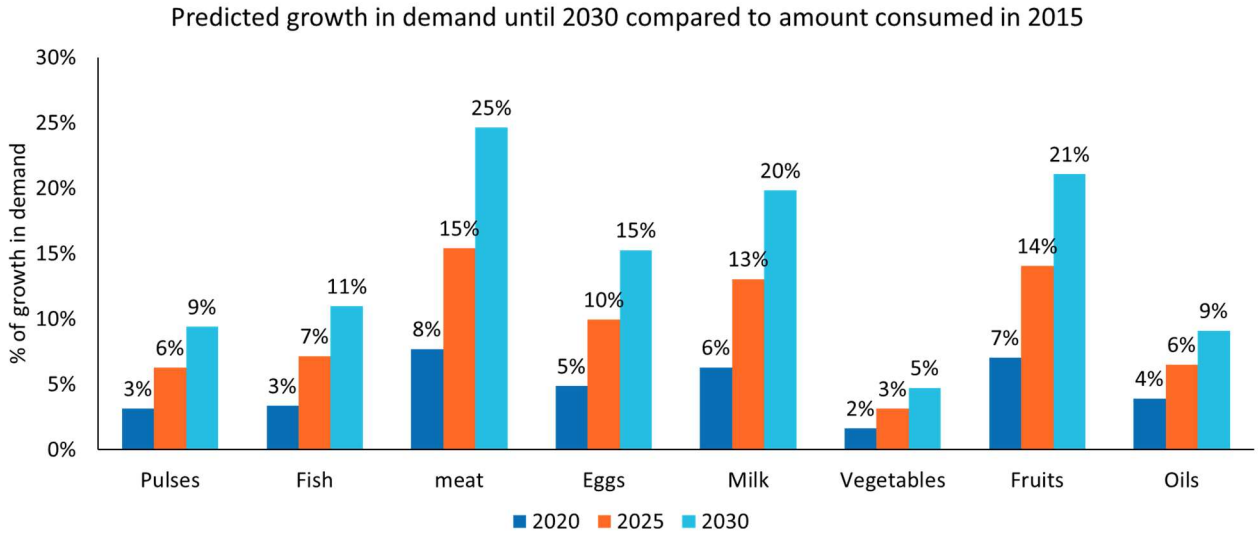
Figure 12: Theoretical framework for behaviors as a social construct determined at different individual, household, community and institutional levels (adapted from McKee et al 2002 (32))

Consumption patterns for different foods in Bangladesh give cause for concern. As seen in the section on Malnutrition and Diets as well as the finding on the Food Environment, above, actual food consumption is higher in staple foods (grains and tubers) than in an optimized nutritious diet, and lower in fresh nutritious foods such as vegetables, fruits and animal source foods. While the quality of diets has improved over the past 30 years, a combination of factors are still contributing to inadequate diets. To some extent, food choices are inadequate; it is, however, crucial to determine what factors limit consumers' ability to make nutritious choices.

Given the at-least 13% unaffordability of nutritious diets, and the many factors that can increase the cost or lower income and hence increase non-affordability, economic access to nutritious foods is still a constraint to healthy choices faced by many Bangladeshis. Yet, it is not the only explanation. Indeed, with increasing wealth, the demand for meat, milk and

fruit is predicted to increase by 20 to 25% over the next 10 years, while the demand for vegetables is predicted to grow by only 5% over the same period, see Figure 13 (33). Unless actively encouraged and enabled, an increase in wealth might not translate into consumers choosing healthier, balanced diets, which indicates a persisting risk to nutrition. As Bangladesh's economy grows and household incomes increase, vegetable consumption needs to be promoted and high rice consumption reduced, to ensure the adoption of healthy food habits.

Figure 13: Predicted growth in demand until 2030 compared to amount consumed in 2015 (33)

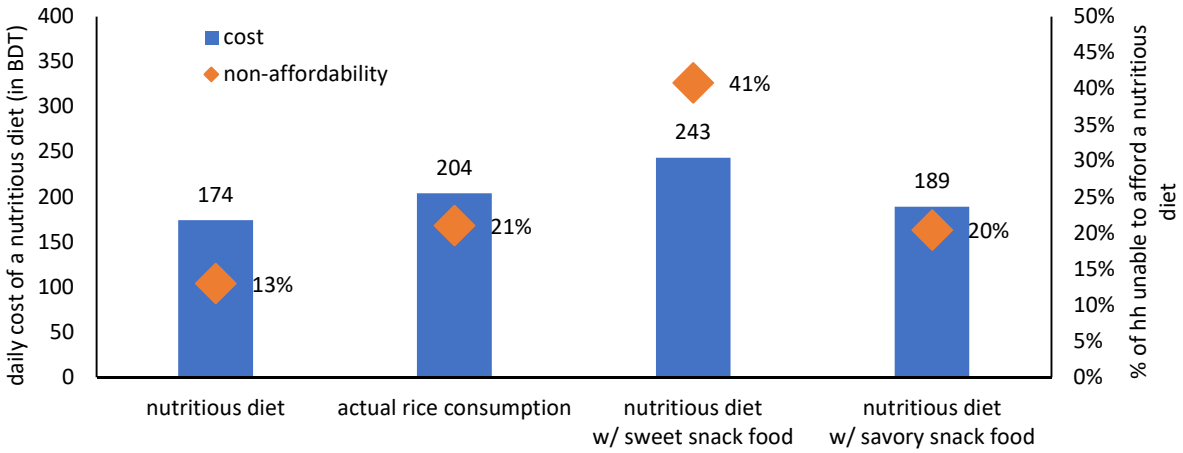


Food choices in Bangladesh, as elsewhere, are shaped by the environment. In Bangladeshi food culture, the consumption of rice and sugar are part and parcel of social life (34). In addition, increasingly urban lifestyles, marketing and advertising, as well as competing demands on time leading to time poverty, encourage higher consumption of convenience foods (34). Both aspects contribute to the overconsumption of salt, sugar, oil and rice. Unhealthy meals are therefore often consumed, not only outside of the home, but also within the home, based on current food preferences and habits.

Market incentives contribute in important ways to food choices. The higher relative prices (discussed above) and more time-intensive preparation of nutritious foods compared to staple and convenience foods, together with the concerns over contamination and adulteration of fresh and processed foods, are likely contributing to too-low consumption of fruits, vegetables and animal source foods (34). Furthermore, some of the most nutritious foods, such as green leafy vegetables, have a low social status and are considered to be "food of the poor" (34), which may discourage purchasing and consumption.

Unhealthy dietary habits increase the cost and reduce the affordability of a nutritious diet. In other words, they make it more challenging for individuals to meet their nutrient needs The FNG analysis modeled the implications of overconsumption of rice at the current level (367g per capita per day (22)) and daily snacking (sweet and savory), presented in Figure 14. Overconsumption of rice at the current level increases household's cost of a nutritious diet by 17%, and the proportion of households that cannot afford a nutritious diet to 21%. Reducing rice consumption would allow for a more nutritious, affordable and diversified diet that meets energy and all nutrient needs for the different members of the household. Daily snacking (of sweet or savory nutrient-poor foods) increases the cost of a nutritious diet by up to 40%, and the proportion of households that cannot afford a nutritious diet to 41%.

Figure 14: The cost of the nutritious diet and non-affordability when accounting for actual rice consumption or daily snacking.



Investing in both demand and supply for nutritious foods is essential to improve the quality of diets. To change behaviours, healthy choices must be facilitated by reducing barriers. Besides affordability, the FNG analysis identified barriers to consuming nutritious diets related to five overarching themes (34–38):

1) context-specific challenges: in particular, those faced in slums, remote rural areas, flood-prone and salination areas where poverty, service delivery, and livelihood-related shocks are more pronounced and conflate into an environment where nutritious choices and behaviors are especially difficult to adopt;
2) time scarcity: lack of time, including the disproportional amount of domestic and food preparation work borne by women, limit the time available to prepare nutritious foods and may promote the purchase of convenience foods. If convenience foods are healthy and nutritious, this is not necessarily a problem: on the contrary, they could help free up time and ease the time burden of caretakers

(often women) and households. The problem arises when convenience foods are unhealthy, low in nutritional content, and/or is affected by food safety and adulteration problems;

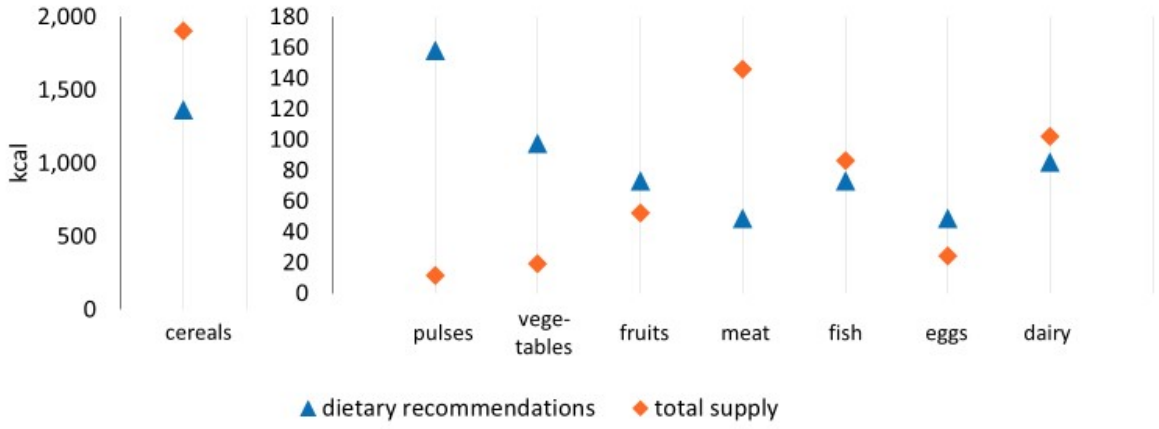
3) resource constraints: beyond foods, the cost and access to other goods and services that are required to prepare healthy and safe foods in the home were found to be a barrier to nutritious diets, especially limited access to cooking fuel, soap, water and food storage facilities;
4) incomplete knowledge to inform behaviors: there is space for improving knowledge on nutrition and IYCF among all household members, including adolescents and men, which could make nutritious practices be adopted more broadly. Knowledge is necessary but not sufficient: wider societal change around food culture will need to be further promoted to ensure healthy choices to accompany economic growth in coming years;
5) harmful gender-related practices: gender inequalities persist and affect women's and girls' agency and decision-making over health and nutrition. Women still eat last in some areas, despite their higher nutrient needs, which puts them at nutritional disadvantage compared to men (39). As will be discussed in detail below, limited women's and girls' empowerment, as is manifested for example by high rates of adolescent marriage and pregnancy, need to be addressed to ensure women have equal opportunities as men in private and public spheres. Men's role in nutrition is poorly understood and could be better recognized and used as an entry-point for promoting better nutrition behaviors and gender equality.

4.3.Supply Chains: For healthier diets, investment is needed to simultaneously increase demand and supply for all nutrient-dense foods with a focus on food safety and nutritional value.

Food supply chains – encompassing production, processing, distribution and retail – are a central element determining the availability and price of nutritious foods. Gender relations, government policies and differing geographies play into supply chains and contribute to determine what is produced, in what way, and who benefits – economically and otherwise – from food supply systems.

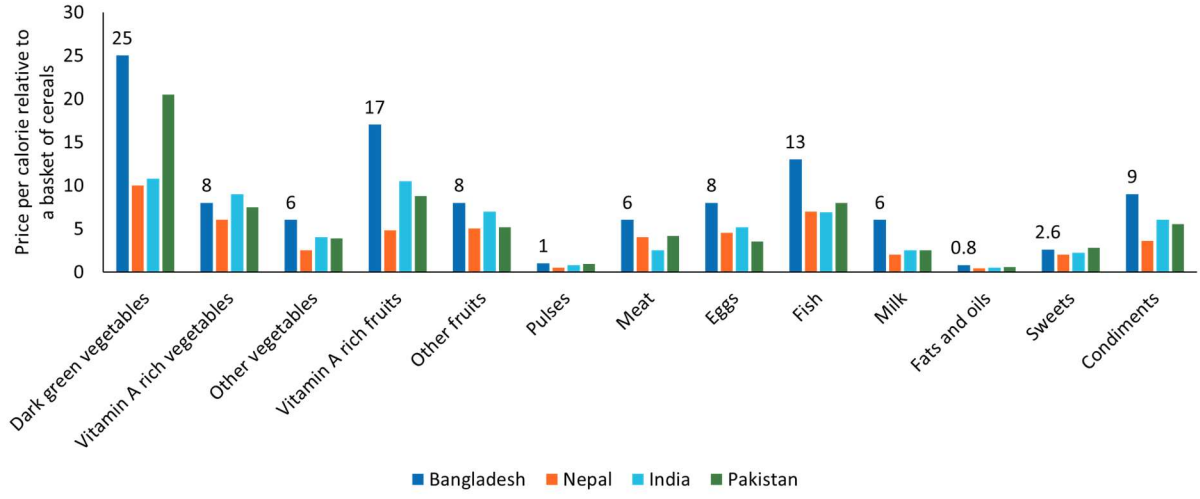
Government investments in agricultural production have paid off in important ways since the country's independence. Substantial efforts have been made to increase and diversify agricultural production. Bangladesh has achieved self-sufficiency in rice supply and most recently in meat and fish production (40). However, compared to recommended consumption based on the Bangladeshi Dietary Guidelines (21), the current supply is still low for vegetables, fruit, milk and other nutritious foods (41), see Figure 15. Building on the successful effort resulting in the increase in rice yields and overall rice production, simultaneous investments are needed to further shift consumer choices towards more nutritious foods and increase the demand for and availability of locally-produced nutritious foods, especially vegetables. The health, social, economic and environmental implications of promoting different nutritious foods need to be evaluated so that any possible negative consequences of their promotion can be appropriately mitigated. Furthermore, a 2012 IFPRI analysis projected that rice production could face a deficit compared to population growth by 2030 (33); updated projections could be conducted for rice and a wider range of nutritious foods to ensure adequate production, supply and affordability in the future.

Figure 15: Daily per capita supply and recommended demand for commodities (in kcal) (18,21)



The World Bank finds that the price of nutritious foods in Bangladesh has been increasing faster than staple foods over time, and that their price relative to staples is higher in Bangladesh than in other neighboring countries (24), see Figure 16. Calories from fresh foods are more expensive than calories from staples, and much more so in Bangladesh than in Nepal, India and Pakistan, which may be discouraging or even constraining the choice of nutritious foods by consumers.

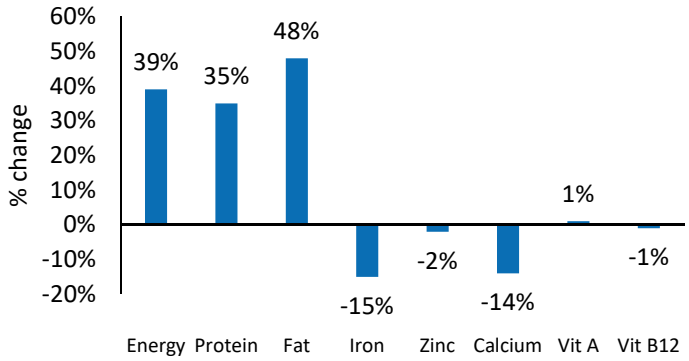
Figure 16: Price per calorie of different foods relative to a basket of cereals (24)



Nutrition-sensitivity of supply chain transformations

Transformations of food supply chains, including production and distribution, have significantly contributed to improving the availability and accessibility of nutritious foods in the past. Yet, not all improvements and transformations necessarily increase the nutrient availability. For example, micronutrient intake from fish has decreased over recent years, even though fish consumption has increased (42,43). This is mainly due to the variety of fish being farmed vs. captured and the way those are prepared and consumed (with or without bones, with or without eyes). Figure 17 illustrates that energy, protein and fat intake from fish has increased by 35% to 48% between 1991 and 2010, while intake of vitamin A and vitamin B12 remained constant and iron and calcium intake from fish reduced by 15% percent.

Figure 17: Change (%) in nutrient intakes from fish between 1991 and 2010 (42,43)



The farmed fish example draws attention to the fact that improvements and transformations of supply chains that increase availability of specific food types do not necessarily increase their nutrient availability. The type of agriculture, livestock and fisheries production that takes place can have widely different impacts in terms of environmental externalities, sustainability, resilience, economic viability, gender equality and nutrition.

Reducing food production inefficiencies for better nutrition

Existing inefficiencies in the food system open the door for several opportunities to improve nutrition. Post-harvest losses are significant, especially for more perishable produce such as fruit and vegetables. Nationally representative information on post-harvest losses exist only for staple foods and some spices and range between 5% (chili) and 9% (rice: Aus) (44). Several non-representative studies estimate the extent of post-harvest loss in fruit and vegetables to vary between 24% (orange) and 44% (jackfruit). Most post-harvest losses are incurred due to inadequate handling, transport and lack of storage facilities. The total direct economic loss due to postharvest spoilage of fruit and vegetable is estimated to be 3,442 Crore BDT in Bangladesh (approximately 400 million USD) (44).

This nutrient-dense fresh produce never reaches the consumer with implications on the quality of the diet. The Ministry of Agriculture has already taken important steps to try to address the challenge. Generating reliable local demand for fresh produce through social protection programs such as school meals could be another opportunity to reduce transport and storage needs and thus post-harvest loss. Reducing post-harvest losses could also contribute to reducing land constraints.

Furthermore, large price increases between farmgate and retail prices for food and vegetables could be reduced to increase earnings for farmers and/or bring down prices for consumers (45). Identifying power imbalances, bottlenecks, and which actors in the supply chain, including middle-men and road-checks, reap the most economic rewards could be an avenue to explore further, and a first step to develop strategies to limit cost increases along the value chain and attain more equitable, gender- and nutrition-sensitive value chains. Potential opportunities include providing better technical and marketing support to farmers, investing in generating local demand for nutritious foods, further empowering women in food value chains, and better aligning policies, incentives and regulation to nutrition priorities.

Food safety

The government is taking important steps to promote and ensure food safety. Building consumer trust and awareness on one side and creating private-sector incentives and accountability on the other are an essential part of the effort to create a conducive environment for improved diets. Evidence on levels of food contamination is mixed, as previously discussed in the findings on the Food Environment. Research recently recommended systematic checks throughout the supply chain to identify and eliminate sources of contamination (46).

Evidence suggests that some food might be adulterated to preserve or increase its commercial value, for example by preserving fish with formaldehyde or DDT or adding water to milk. The efforts to ensure that food is not adulterated throughout the supply chain might increase food prices, reduce availability of certain foods, and reduce affordability.

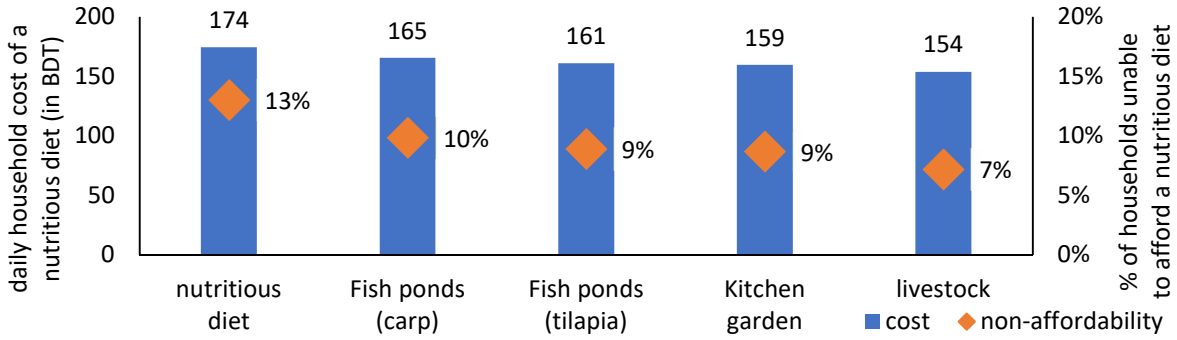
Several factors enable food adulteration: the challenges related to keeping food fresh, market pressures to keep prices low to ensure profits for producers, limited enforcement of standards and regulations, and poor knowledge on the part of poor and uninformed farmers and producers. Improving education and training for the women and men smallholder farmers who produce a large amount of the country's food could be a powerful avenue for improving farming practices and food safety (24). Greater accountability of private farm extension workers, who sometimes give advice promoting unsafe practices in a drive to maximize profits, is also required (24). Pesticide use has

grown by over 100% between 1997 and 2017, and several pesticides which are banned globally for their health hazards are still in use in the country (24). In addition to being applied in excess, pesticides applied at inappropriate times (e.g. too close to the time of harvest) can constitute a public health and nutrition risk. Use of banned substances (e.g. meat and bone meal and leather tanneries waste) is also found in meat production (24). Food fraud reportedly also takes place during processing, where intentional adulteration is driven by economic reasons (24).

The potential of livelihoods interventions to promote nutritious diets

As part of the FNG, different smallholder livelihood interventions were modelled to estimate their potential impact in terms of reducing the cost of the nutritious diet and increasing affordability for households. Figure 18 illustrates the potential of fish ponds, kitchen gardens and dairy livestock to reduce the daily cost of a nutritious diet by up to 12% (20 BDT) and reduce non-affordability by 5 percentage points. Livelihood interventions have the potential to increase the availability of fresh nutrient-dense foods at household level while putting some of the control over food safety and adulteration directly into the hands of consumers.

Figure 18: Cost and non-affordability of a nutritious diet with different livelihood interventions

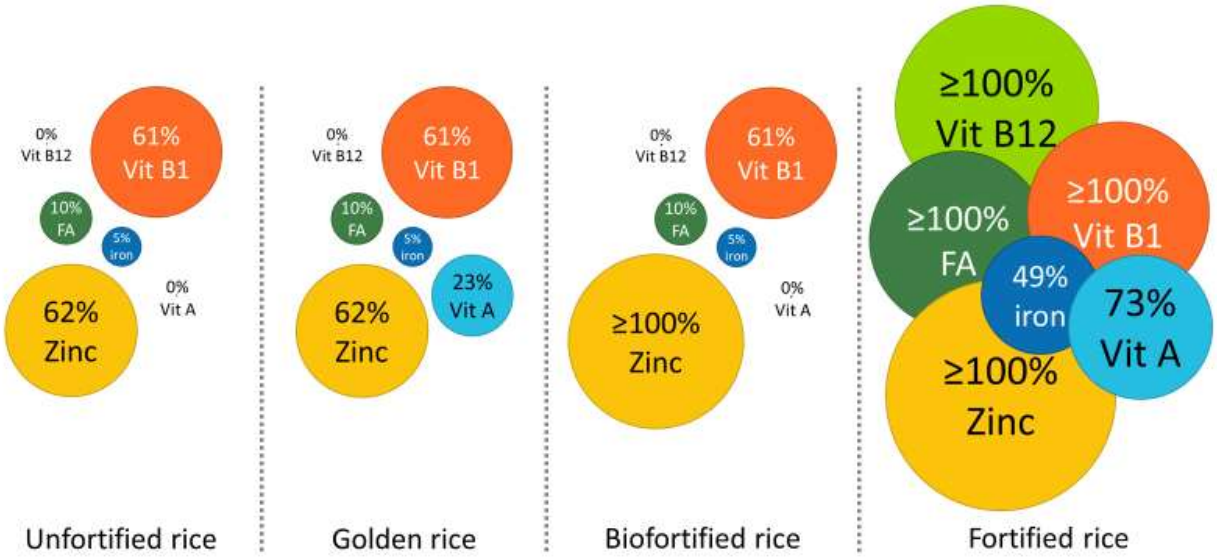


Livelihood programs have often seen challenges in sustainability because of floods and difficulties in procuring inputs for the next growing season, especially seeds. As discussed in the subsequent finding, disasters and floods destroy productive assets and have long-term adverse effects on livelihoods. The impact can be reduced either by preventing the loss of these assets or by supporting their rapid repair and replacement. Negative effects of disasters must be mitigated to ensure quick recovery of food availability and affordability following a shock.

Rice fortification

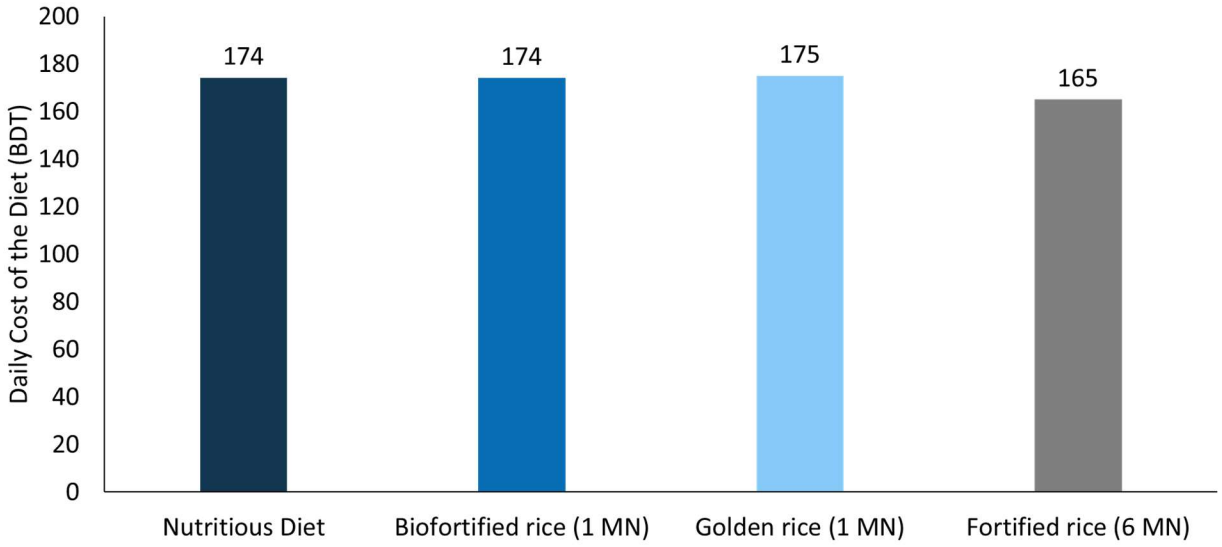
Food fortification could present cost-effective opportunities to improve nutrition. Currently, national fortified rice production capacity is still limited, but improving. The analysis compared three types of fortified rice, namely vitamin A bio-fortified Golden Rice, zinc bio-fortified rice and industrially (post-harvest) fortified rice with 6 micronutrients. CotD modelling demonstrates that different types of fortified rice could contribute to covering additional nutrient needs of the household compared to regular rice. Figure 19 shows how fortified rice contributes significantly to the nutrient requirements of the household.

Figure 19: Percentage of daily micronutrient requirements of the household met by different types of rice (assuming two portions per day for all household members, except the child under two who gets one)



These results are also reflected in the cost estimates from the modeling exercise, presented in Figure 20. Fortifying rice with six micronutrients shows the greatest potential to contribute to meeting household nutrient requirements, with the potential of reducing the household's cost of a nutritious diet by 5% if households purchase fortified rice instead of regular rice at the current market price of regular rice.

Figure 20: Daily cost of the diet (in BDT) of the household with different types of rice



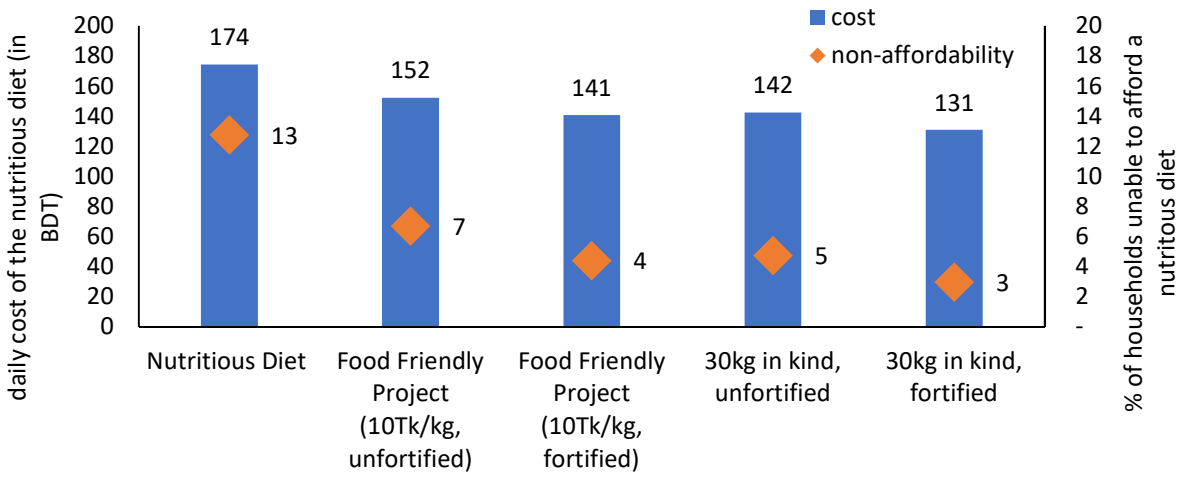
The contribution of fortified rice and its added value compared to regular rice is especially pronounced in social protection programs. Particularly as part of social safety net programs, but also for other households that are not able to diversify their diets enough for various reasons, fortified rice could play a crucial role to ensure nutrient intake. Households benefitting from these programs are already at higher risk than the rest of the population of not meeting their nutrient requirements. For example, the Food Friendly subsidized rice project with fortified rice and the Vulnerable Group Development Programme with fortified rice make significant contributions to reducing cost and non-affordability of a nutritious diet from 13% to 4% and 3% respectively (see Figure 21). In addition, distribution of fortified rice through these programs could contribute to creating awareness and promoting demand for fortified foods.

A BRAC, DSM and WFP study from 2014 of the acceptability of fortified rice suggests that there is much potential in Bangladesh to roll it out further in social protection programs, and potentially in markets. The study found that “Pushti chal” (fortified rice) was found acceptable in taste by 95% of surveyed VGD participants, and when asked to provide their overall rating of the fortified rice on a scale from excellent to very bad, it was rated as “excellent” or “good” by 95% of respondents (47,48).

As demand for post-harvest rice fortification in Bangladesh is increasing, efforts to produce fortified rice domestically are growing. Efforts should continue to ensure production rises sufficiently to meet demand. Fortification involves multiple steps, including the production of fortified kernels, testing the quality of the kernels, and blending the kernels with regular rice to create fortified rice, which requires coordination and

investments by multiple actors. Though the industry is young in Bangladesh, it is growing and showing potential.

Figure 21: Cost and non-affordability of a nutritious diet with rice provided at a subsidized rate or in kind



Fortified rice also has clear advantages compared to regular rice in other social protection programmes, in emergency response, in complementary feeding recipes for children under 2 and school feeding programs, which will be presented in subsequent sections.

4.4. Shocks and Emergencies

Bangladesh has a strong disaster management and relief capability with a shifting focus from relief to risk reduction and resilience. Its legal and policy frameworks for disaster management and relief are well-developed, and community-centered preparedness and early warning systems are in place and functioning (49–51). Significant challenges for disaster relief and recovery remain however, especially: poor infrastructure such as roads and bridges; water-borne diseases during emergencies; and medium and long-term negative impacts of disasters on livelihoods and credit markets. Experience shows though that food supply chains are not significantly disrupted by commonly experienced slow and rapid onset disasters such as floods, cyclones or salinity intrusion, offering an important entry point for delivering relief which is currently often underexploited. Furthermore, efforts to improve rapid recovery of infrastructure and livelihood assets could help bolster household purchasing power (52–56).

Disasters such as floods impact supply chains and decrease the affordability of nutritious diets in both the short and long run. The damage to infrastructure and productive assets drives up prices in the short term. If those assets are not recuperated quickly, disasters may set off vicious cycles of low agricultural production, low labor demand and low wages (52), which affect diets negatively over time.

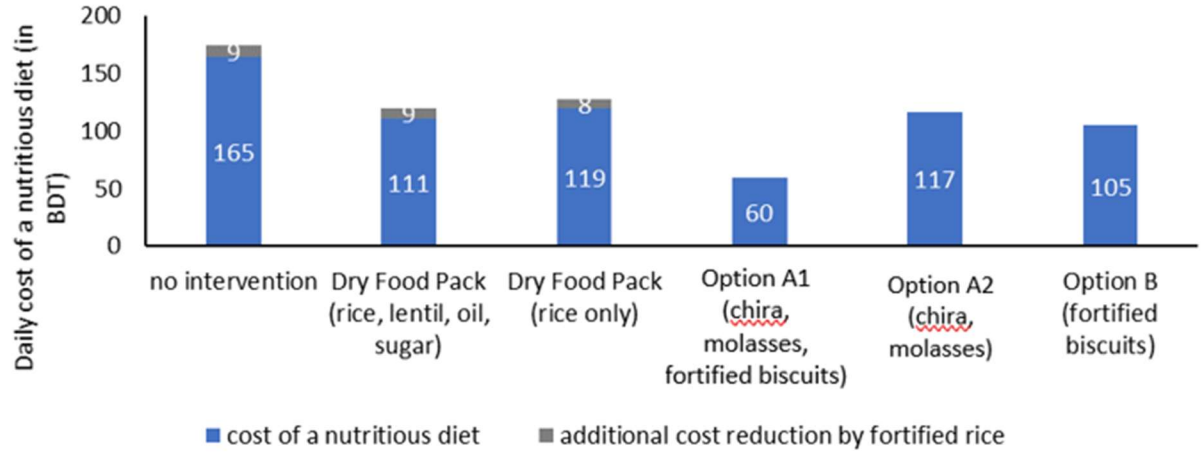
For short-term relief, MoDMR supports local authorities to provide lifesaving food aid. The FNG modeled and compared the potential impact of relief packages on meeting household nutrient requirements, see Table 2.

Table 2: Modelled weekly packages for a 5-person household (57)

Food	Current dry food packs	Dry food pack (rice only)	Option A1: Chira, molasses, fortified biscuits	Option A2: Chira and molasses	Option B: Fortified biscuit
Rice	10kg	10kg			
Chira			10.5kg	10.5kg	
Molasses/ sugar	1kg		3.5kg	3.5kg	
Potatoes	1kg				
Lentil	1kg				
Oil	1kg				
Fortified Biscuits			2.6kg		13.1kg

The Bangladesh Food Security Cluster identifies packages of chira (flattened rice), molasses, and fortified biscuits (Option A1) or fortified biscuits alone (Option B) (57) for immediate response when no cooking facilities are available. Figure 22 summarizes the results of the modelling. Option A1 covers nutrient needs the best, reducing the cost of the optimized nutritious diet of the household by about 70%. The analysis highlights the importance of combining chira, molasses and fortified biscuits to cover nutrients needs best. Government-mandated Dry Food Packages consisting of rice, sugar, lentils and oil reduce the daily cost of an optimized nutritious diet of the household by 31%. Replacing the rice with fortified rice achieves a 36% reduction.

Figure 22: Daily cost of the nutritious diet for the model household (in BDT) with different emergency food packages provided in kind



Supplementing these packages with fresh foods such as eggs and/or green leafy vegetables are likely to further enhance the nutritional value of the food packages, although logistics and food hygiene would need to be managed carefully. MoDMR has started to implement a shift in delivery modes from in-kind food to cash-based transfers where markets are functional. For activities to be efficient at delivering relief and improving nutrition, it is essential that 1) cash amounts be set at a level that enable households to purchase sufficient nutritious foods, 2) the supply of nutritious foods is ascertained, and 3) resources be accompanied by appropriate activities (e.g. SBCC) to ensure these are spent on nutritious foods. Considering the CotD finding that the fortified biscuit is the most cost efficient way to meet micronutrient requirements, it is important to consider either including a fortified item (rice or biscuits) in the ration, or ensuring they are available in markets. Fortified foods could be replaced by fresh foods, provided these are available on the market, that cash allocation is sufficient to cover their cost, and that SBCC activities be

carried out to promote their consumption. In-kind distribution of nutritious food in emergencies may stimulate consumption of those foods for vulnerable household members, especially young children and pregnant and lactating women. Children under 5 are particularly nutritionally vulnerable during a disaster, as they require frequent feedings of diverse and nutrient-dense foods. Lactating women also need support to prevent discontinuation of breastfeeding due to the emergency.

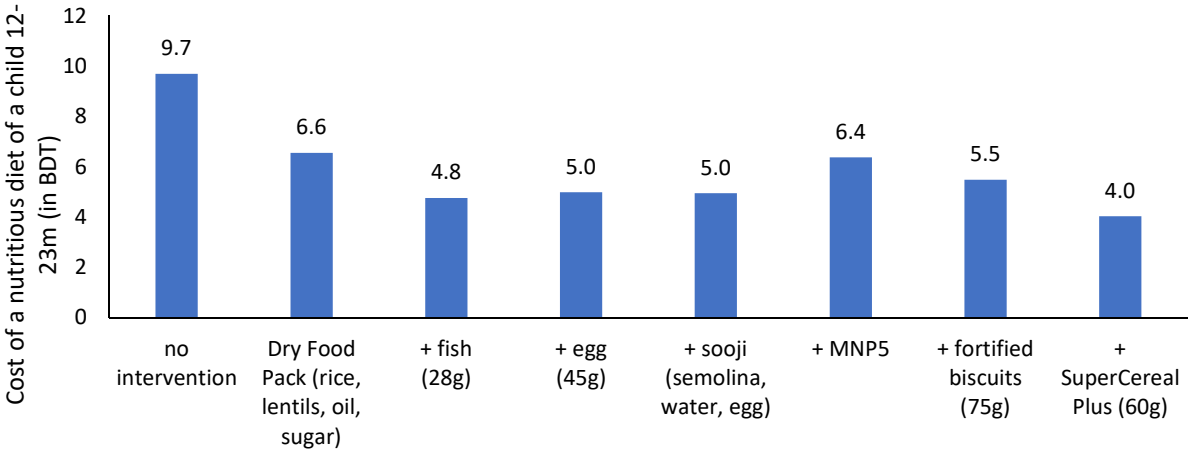
MoDMR is currently exploring options for a specialized food package for children under 5 to enhance the nutrient intakes of this age group during emergencies, see Table 3. FNG compared a range of complementary foods for children under 5 which could be added to the existing Dry Food Package to better meet young children's nutrient needs.

Table 3: Child (6-59 months) supplement ration scenarios

Market / Cooking facilities	**Functional market**	**Market impaired**
Household **have** cooking facilities	Cash Special child ration fresh food	Ration top up to HH ration Full child supplement ration
Household **do not** have cooking facilities	(Cash) • (if ready to use foods are available) Full child supplement ration	Full child supplement ration In case of L3 emergency • Wet feeding • Take home ration with specialised nutritious food

The results, presented in Figure 23, reveal that fresh foods (fish or egg) or a fortified porridge (SuperCereal Plus) best complement the existing household package and could support households to feed a more nutritious diet to their young children in times of crisis.

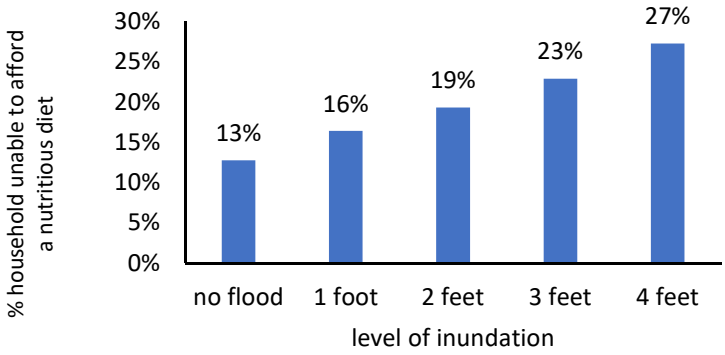
Figure 23: Daily cost of the nutritious diet for the child aged 12-23 months (in BDT) with different interventions



In the medium and long term, disasters may produce vicious cycles that impact the affordability of nutritious foods for a household even years after the disaster. The immediate impacts of disaster, which include harvest losses, lower demand for labour and damage to infrastructure, catalyse long-term negative impacts as purchasing power falls, loans are defaulted on, and new loans to rehabilitate damaged infrastructure become out of reach. This in turn perpetuates the cycle of low demand for labour and low purchasing power (52).

The long-term effects of floods on livelihoods are rarely documented in detail. The limited available evidence shows that wages might not recover for many years following a disaster. Five years after the 1998 floods, non-agricultural wages were 7% lower per one-foot increase in the flood level from normal conditions in areas worst affected by the floods (58). Given the centrality of farm and non-farm wages for lifting households out of poverty (59) and allowing households to access a nutritious diet, reduced wages would translate to a significant increase in the percentage of households being unable to afford a nutritious diet. For the households studied 5 years after the 1998 flood, non-affordability would have ranged from 13% to 16-27%, depending on the level of inundation (Figure 24). While this data is somewhat outdated and many improvements in disaster response and management have been implemented since then, newer data about the long-term impact of shocks is not available. Recent WFP data shows short-term spikes in food prices for some commodities immediately after the flood, but no long-term effect on food prices. However, further and more detailed analysis of wages is needed to update the 1998 study findings.

Figure 24: Percentage of households unable to afford a nutritious diet due to disaster-induced wage losses 5 years after floods (58)



4.5. Social Protection: Social services and safety nets could enable every household to access a nutritious diet. To be effective, they need to offer nutrition-sensitive services and ensure that household and programme resources are spent on nutritious foods.

Those households that cannot afford a nutritious diet – at least 13 percent of households nation-wide, as discussed in the Food Environment findings – require support through social services and safety nets to be able to purchase and consume nutritious diets. As previously explained, the choice of and consumption of nutritious diets is not only limited by economic access; hence, it is important that other barriers be addressed concurrently to allow the poorest households to reap the benefits provided by more adequate nutrient intakes. Multi-sectoral and integrated approaches are therefore essential.

There are several ways to improve a household's ability to afford a nutritious diet. Improving social services that allow households to save on their own spending is one strategy to improve purchasing power for nutritious foods. For example, Bangladesh's efforts to provide free, quality health care services as a part of an essential service package is important to support households to afford and consume nutritious diets. Out-of-pocket expenditure is still high, especially for medicines (60), partly due to a large proportion of (poor) households mainly attending pharmacies and unlicensed practitioners for health care. The at times overburdened public health system (9) also pushes households to seek private care that is relatively costly (60), taking up a part of household revenues which could otherwise be allocated to other ends, such as diverse, nutritious foods.

Social protection programmes could also directly seek to increase households' purchasing power. The FNG analysis scrutinized two social protection programmes, the Mother and Child Benefit Programme (MCBP) and the Vulnerable Group Development (VGD) programme, as well as the Investment Component of the VGD program, presented in Tables 4 and 5, which seek to improve the economic and nutrition situation of poor households with pregnant/lactating mothers and small children.

Table 4: Modelled packages of the Mother and Child Benefit Programme

Package	Cash (amount in BDT)	Supplement	Food
1	800		
2	800	IFA	
3	800	IFA	10 kg rice; 3.5 kg lentils; 1 liter of oil
4	1,600	IFA	

Table 5: Modelled packages of the Vulnerable Group Development and the Investment Component of the VGD programmes

Program	Food item	Added income from econ. activities
VGD	30kg unfortified rice	None
VGD	30kg fortified rice	None
VGD	30kg unfortified rice	৳363
VGD	30kg fortified rice	৳363
ICVGD	30kg unfortified rice	৳1,642
ICVGD	30kg fortified rice	৳1,642

The results of the modelling are presented in Figures 25 and 26. Assuming all households with low food expenditure have access to these programmes, the proportion of households unable to afford a nutritious diet would reduce from 13% to 6% (MCBP) and 4% (VGD), respectively. Households would additionally benefit if the transfer is paired with micronutrient supplementation or provided with fortified instead of unfortified rice. Likewise, providing high quality, accessible social services, such as health care and education, could reduce the amount households have to spend out of pocket on these services and hence increase their purchasing power for nutritious foods.

Figure 25: Non-affordability (%) of the nutritious diet with different iterations of the MCBP (NB: average for modelling areas only)

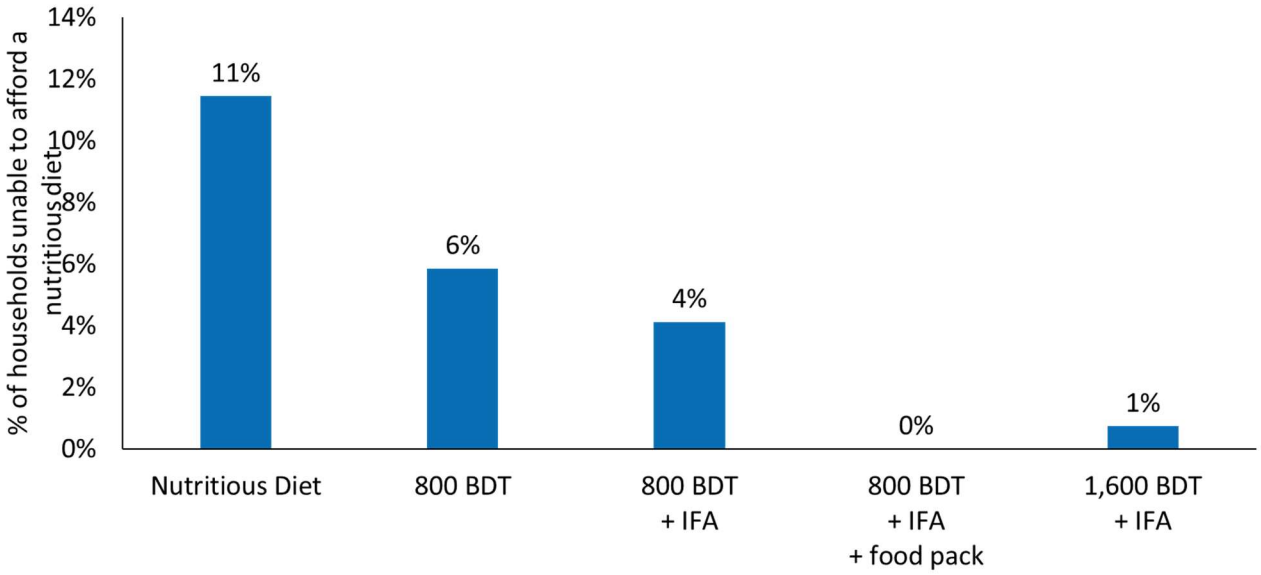
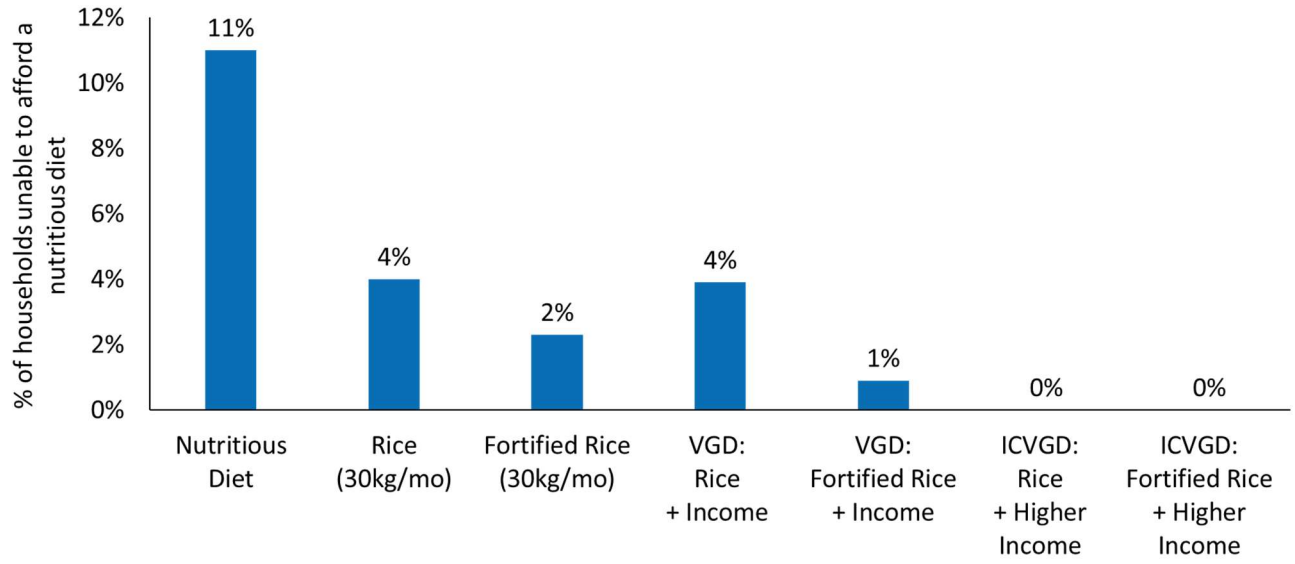


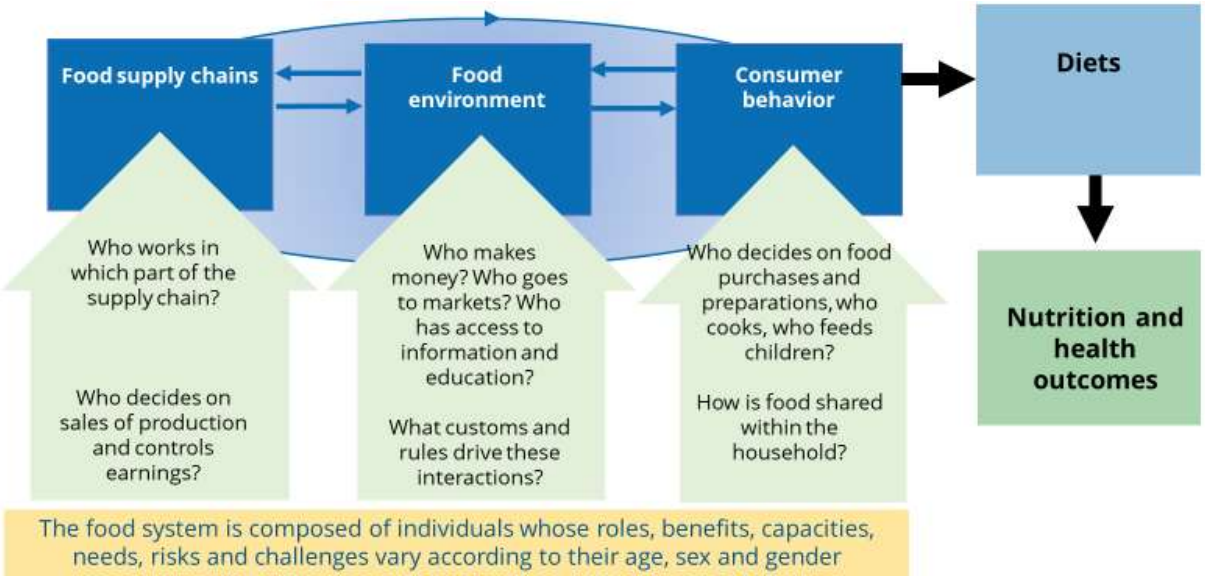
Figure 26: Non-affordability (%) of the nutritious diet with different iterations of the VGD/ICVGD programme (NB: average for modelling areas only)



The actual impact of social protection programmes on nutrition, however, depends on whether programmes: 1) are designed to channel additional household purchasing power to improved dietary choices, and 2) adequately address underlying contributing barriers to nutrition, especially gender equality, women and girls' empowerment, and knowledge gaps. Effective social protection requires household behaviour change as well as ensuring households have access to safe, affordable and culturally accepted nutritious foods.

With regards to women's empowerment, various gender inequalities were identified in the analysis as barriers to nutrition. On a global level, it is widely recognized that women's status relative to men has significant impact on their own and on children's nutritional status (61), and that improving gender equality is a prerequisite for improving nutrition and health outcomes (62–64). Figure 27 summarizes the FNG's approach to gender analysis, where gender inequalities are considered an underlying driver of the food system that influences the capacities and vulnerabilities of individuals in the food supply chains, food environment and with regards to consumer behaviour.

Figure 27: Framework for analysing gender inequality within the food systems approach



Gaps in women's and girls' agency in Bangladesh suggest that improvements in gender equality could contribute to better nutrition by enabling women and men to better care for themselves and others. Particularly relevant to nutrition are inequalities related to women's ability to make decisions, roles related to childcare and housework, women's mobility in public spaces and the overall status of women. Studies in Bangladesh show that women's disempowerment is associated with more inequitable calorie distributions within the household and that households with more empowered spouses are less likely to have household members suffering from malnutrition (65).

Overall, despite concerted government efforts to empower women, gender inequalities persist and jeopardise women's health and participation in economic life. At the same time, men's contributions to household nutrition and care activities remain limited. Gender inequalities contribute to an environment that hinders optimal nutrition for all household members (36–39,65–69). Notably, the DHS 2014 showed that 30 percent of girls and women aged 15-49 did not participate in decisions about their own healthcare, while 33

percent of girls aged 15-19 reported not to decide on their own healthcare, household purchases and child healthcare (9). At the same time, women spend more time on work (counting both housework and remunerated work) than men, working an average of 73 hours per week compared to 59 for men, and are, in general, the main caretakers of children as well as responsible for the majority of housework (70,71). Women's mobility remains curtailed, with 19% of women and girls aged 15-49 unable to go alone or with their children to health centres; this was also confirmed by a variety of qualitative data reporting women's limited movements in public spaces compared to men (9,70). Finally, gender-based violence (GBV) is an indicator of women's relative status; and the data is stark, with three out of five women reporting experiencing GBV in 2014, a number which may still be underreported (9). Government's efforts to empower women could continue at all levels of society and address perceptions of masculinities and femininities which may be hampering nutrition-sensitive practices and the equal enjoyment of human rights by all (69).

Social protection programmes could support an enabling environment for nutrition through increasing the affordability of a nutritious diet, empowering women and girls, and educating men and women in nutrition and care practices. Social protection programmes are a potentially powerful tool to encourage greater gender equality, involve men in nutrition trainings and activities, and empower women in the household, the community and society at large. In fact, social protection programmes such as the VGD programme in Bangladesh include women's empowerment objectives.

Though cash transfers and life-skills trainings directed at women do hold potential for women's empowerment, the evidence is mixed as to the empowerment impact of social protection programmes, including the ICVGD, for women and mothers (68,72,73). What comes out clearly from past experiences is the need to carefully design these programs to mitigate potential risks (e.g. increased tensions among men and women, gender-based violence, further curtailing of women's movement) and to draw on the benefit of involving all members of the household, including mothers-in-law, boys, men, and fathers to achieve women's empowerment objectives (37,65,66,68,72,74). Giving women training or a cash transfer can be an important tool, but it is not sufficient on its own to change entrenched gender inequalities; programmes where men are involved in trainings, and which accompany transfers with community-based behaviour change activities to reframe gender relations, are more likely to result in women's empowerment and better nutrition outcomes. Approaches to involve both men and women in social protection and nutrition programs have been adopted by Helen Keller International and IFPRI (through the ANGel project), with results showing that combining agriculture, nutrition and gender sensitization trainings together produced significant improvements in women's empowerment as well as improvements in production of nutritious foods which benefited both men and women (75). These experiences as well as past evaluations of VGD and cash-transfer programmes in Bangladesh should inform future programming. At worst, when insufficient attention is

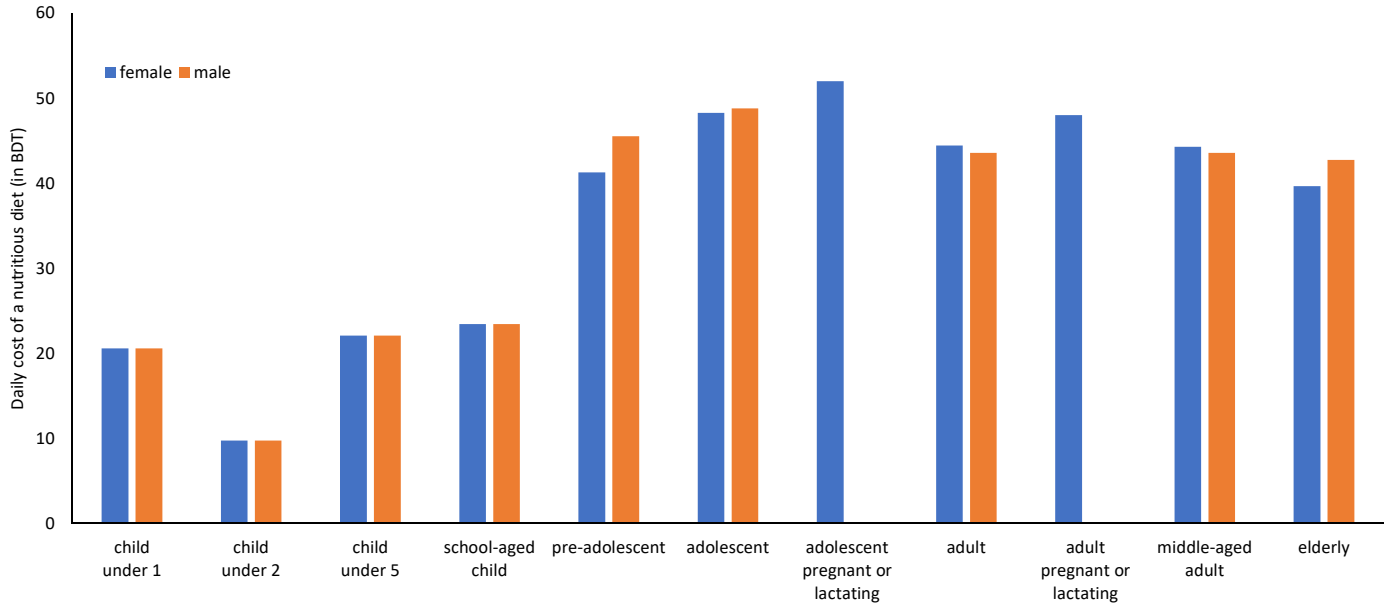
paid to social gender dynamics, programmes meant to empower women sometimes result in male retaliation and further curtailing of women's freedoms. There is great opportunity in Bangladesh to implement carefully designed social protection programmes, built on the long experience and plentiful research on promoting gender equality and women's empowerment in the country to draw full benefit from the synergies between women's empowerment and improved nutrition.

4.6. Vulnerable Groups: Adolescents are the most nutritionally vulnerable individuals due to their high nutrient requirements, particularly girls given adverse gender norms and practices. The nutrition needs of adolescents and the older people are currently largely unaddressed.

FNG considers not only the model household in its analyses of nutrient gaps. Crucially, attention is paid to the individuals who compose households and to their specific nutrition requirements. In addition, it is recognized that socio-economic factors affect different individuals in different ways, enabling or hindering their consumption of adequately nutritious diets. Not only are needs different, but individuals' ability to and likelihood of meeting these needs vary depending on their capabilities and opportunities in life, which in part are determined by prevailing gender norms.

The nutritional needs of individuals change across the lifecycle, depending on their sex and age. It follows that throughout the lifecycle, the cost of a nutritious diet varies accordingly, as shown in Figure 28.

Figure 28: Daily cost of the nutritious diet (in BDT) across the life-cycle by sex



Starting from birth, assuming the child under 1 (6-11 months) and under 2 are breastfed in line with WHO recommendations, children have relatively low costs of the nutritious diet compared to other household members. The small amounts of complementary foods

children need and are able to eat (low kilocalorie requirements and small stomachs), combined with their high needs for nutrients, mean that they need to consume small quantities of highly nutrient-dense foods (such as animal source foods, fresh fruits and vegetables or fortified foods) to meet their needs (see Table 6). For the child aged 6-11 months, this is more pronounced than for the older child aged 12-23 months: for example, the iron requirement per 1,000 kcal of the older infant is more than double that of the one year old child. The nutrient-dense foods required to meet these needs are relatively expensive in the Bangladeshi context, as examined above. This need for highly nutrient-dense foods explain the higher cost of the diet of the child under 1 compared to the child under 2.

Since the young child needs frequent feeding of small amounts of nutrient-dense foods, these needs to be available for the household regularly (which would require daily shopping and preparation if households do not have access to refrigeration). Time and resource constraints can make daily preparation of fresh, nutritious foods difficult – if not impossible – for caretakers of small children. Strategies to enable households to feed nutritious foods frequently to small children need to be devised and adapted to the context faced by caretakers. Affordable (or subsidized) nutritious foods that are convenient to prepare (e.g. pre-produced, healthy and safe complementary foods) could enable more households to meet their children's needs, especially in households where all adults work in formal or informal employment. Fortified foods are especially useful for small children when fresh foods cannot be procured or stored for daily consumption, as they can make a very good contribution to meeting children's nutrient requirements. Social protection supports could also be envisaged to enable working parents to have more time to feed their children, e.g. maternity and paternity leave, or childcare services, including in the rural sector.

Table 6: Kilocalorie, iron, and iron density requirements of different individuals (*for the child under 2 and 1, only counting energy from complementary foods, assuming recommended breastfeeding) (76)

NB: Ages of individuals are as follows: Child under 1: 6-11 months, Child under 2: 12-23 months, School-aged child: 6-7 years, Adolescent girl: 14-15 years, Adults: 30-59 years.

	Kcal requirement	Iron requirement	Iron requirement per 1,000 kcal
Adult man	2,420 kcal	1.2mg	0.5mg
Lactating woman	2,370 kcal	3.0mg	1.3mg
Adolescent girl	2,170 kcal	2.8mg	1.3mg
School-aged child	1,500 kcal	0.6mg	0.4mg
Child under 2* Child under 1*	555 kcal 242 kcal	0.6mg 0.9mg	1.1mg 3.7mg

The cost of the nutritious diet increases substantially in early adolescence, reaches its highest level in adolescence, and falls somewhat but remains high until old age. While females and males have comparable costs of the nutritious diet in Bangladesh, women need larger shares of nutrient dense foods in their diets than men do, because their total energy needs are lower. Pregnancy and lactation in adolescent girls and adult women increase nutrition requirements and the cost of the diet substantially.

The takeaway from the CotD analysis is the following: the higher the cost of the nutritious diet, the less likely is the individual to meet his or her full nutrient requirements to maintain good health. As women and girls have the highest micronutrient requirements in the household and highest costs of the diet, their nutrient needs are the most difficult to meet, requiring very nutrient-dense foods and putting them in a nutritionally vulnerable position.

In resource-constrained households, adolescent girls and boys are therefore at higher risk of not receiving a nutritious diet than their younger siblings. Adult women are at higher risk than adult men, especially if they are pregnant or lactating. Older men are at higher risk than elderly women. Though intra-household food distribution should be aligned with the nutrient needs of individuals, with attention to higher needs of adolescent girls and boys, pregnant or lactating women, and the child under 2 years old, this is not always the case.

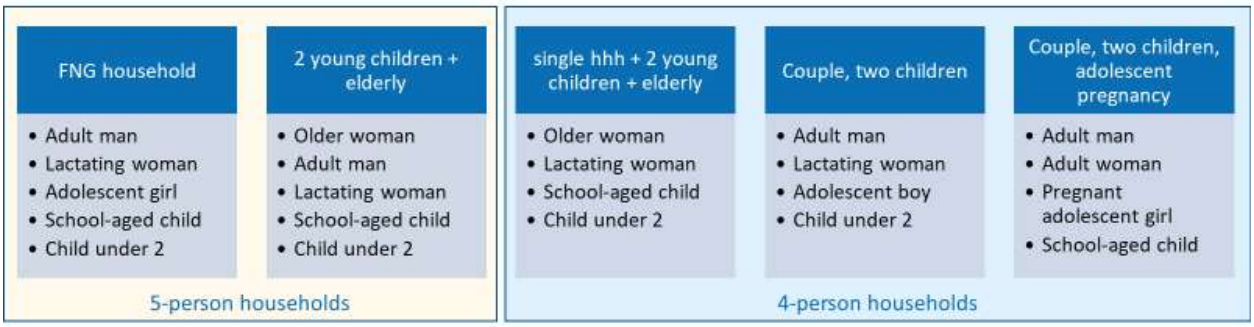
In addition, the nutritional vulnerability of several household members, especially girls and women, is compounded by protection risks, often exacerbated by poverty. Especially risks of early marriage (mostly affecting girls) (9) and/or of dropping out of school in favor of remunerated work put adolescent girls and boys at higher nutritional risk. Pregnancy further increases the already high cost of a nutritious diet of an adolescent girl by 8%. As children born to young and/or malnourished mothers are more likely to be stunted and wasted, adolescent pregnancy is both a social and nutritional risk, for the girl herself and for her future child (9,13,77).

Changing household compositions

Fertility has declined dramatically since the 1970s, falling from 6.3 children per woman in 1971-1975 to 2.3 in 2014 (9). Among some subsets of the population, notably in some urban areas and among higher wealth quintiles, the 2.0 fertility as per the policy objective had already been reached in 2014 (9). Declining fertility means that Bangladesh will undergo a demographic transition in coming decades. The population will become increasingly older, and there will be larger shares of high-cost individuals in household (more adolescents, adults and older persons compared to children). While currently one third of the population is under 15 and only six percent are over 65 (9), this will change over time. This means household income needs to increase over time to maintain the same level of affordability of a nutritious diet – since there will be a higher proportion of people of income-earning age, household incomes might increase and allow the cost of the diet to be met, provided there are jobs and income-earning opportunities available. Policy-making and social protection programmes will need to keep abreast with these developments and their implications for households' abilities to meet nutritional needs. Currently, few programmes include adolescents and older people as target groups.

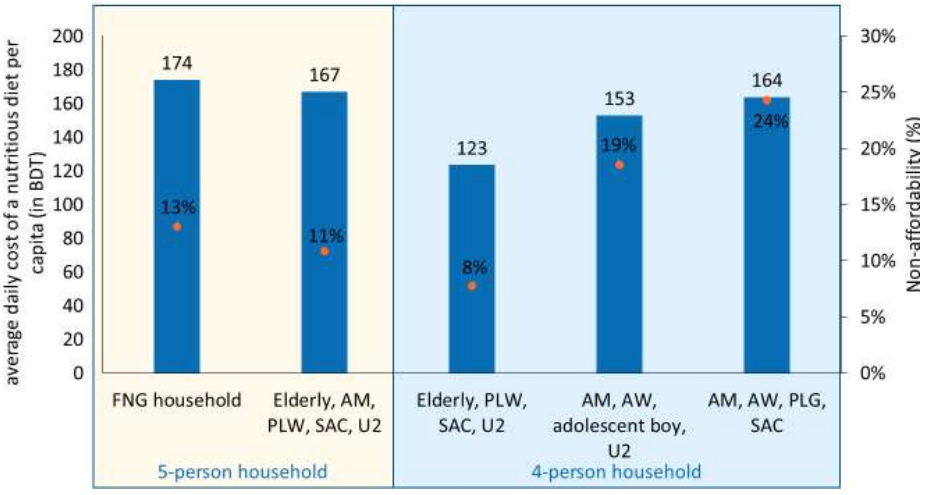
Household compositions are varied, comprised of individuals with different nutritional vulnerabilities and with differing opportunities and capabilities (including earning potential) to meet them. CotD modelling was done for a selection of household compositions to illustrate how cost and affordability of the nutritious diet varies for different households. Note, however, that the estimates do not account for differing purchasing power: they use the per capita average of household expenditures, hence do not reflect the different earning potential of different types of households (e.g. a household with two adults should have higher earning potential that a household with two children, but this is not reflected in the estimate). The modelled households are presented in Table 7.

Table 7: Modelling of various household compositions



The results, presented in Figure 29, show how cost and affordability change depending on which individuals are present in the household. Households with more adolescents, adults and elderly compared to children have higher costs of the nutritious diet; a household with an adolescent will be more nutritionally vulnerable than a household with a lower-cost individual (e.g. an elderly person or a child); and a household with more women and girls will be more nutritionally vulnerable than a household with more men and boys. Endless household compositions could be modelled – the purpose is to nuance the estimates of cost and non-affordability of the FNG model household. Since real households in Bangladesh have different compositions, their nutritional and socio-economic vulnerability will vary. These factors must be taken into account when designing nutrition and social protection programmes, for the present and the future.

Figure 29: Average daily household cost and non-affordability of the nutritious diet by household composition

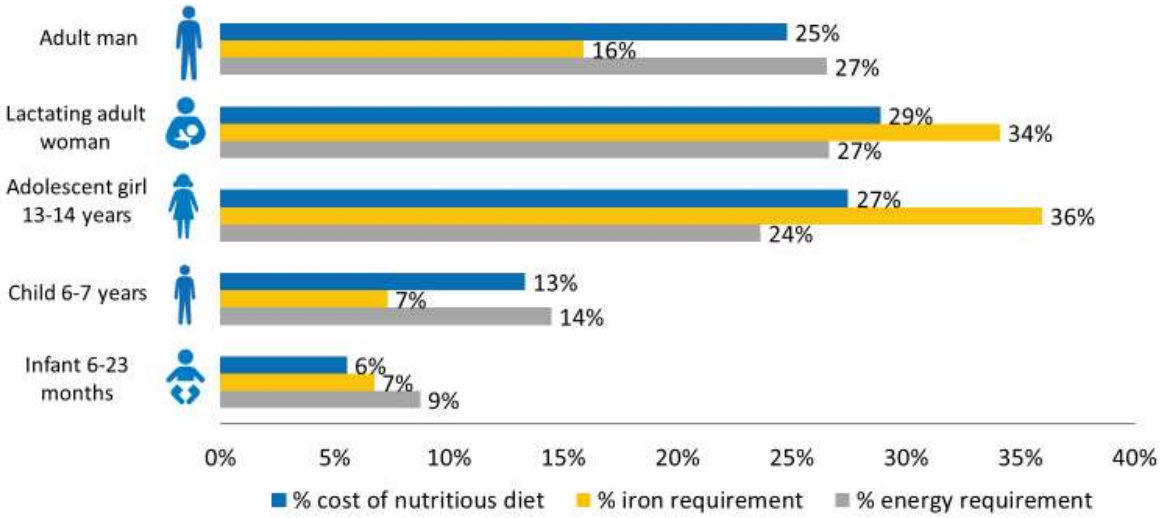


The subsequent sections will explore the specific nutritional and socio-economic vulnerabilities of different individuals in the household: children under 5, school-aged children, adolescents, pregnant and lactating women, and older persons.

4.6.1. Children Under 5

The breastfed child aged 6 to 23 months represents only a small share (6%) of the total household cost of the nutritious diet (see Figure 30). However, the foods selected do not necessarily make a nice recipe and fresh foods are typically not only bought in small quantities specifically for the young child. Therefore, the child's nutrient needs can be difficult to meet for both financial and behavioral reasons.

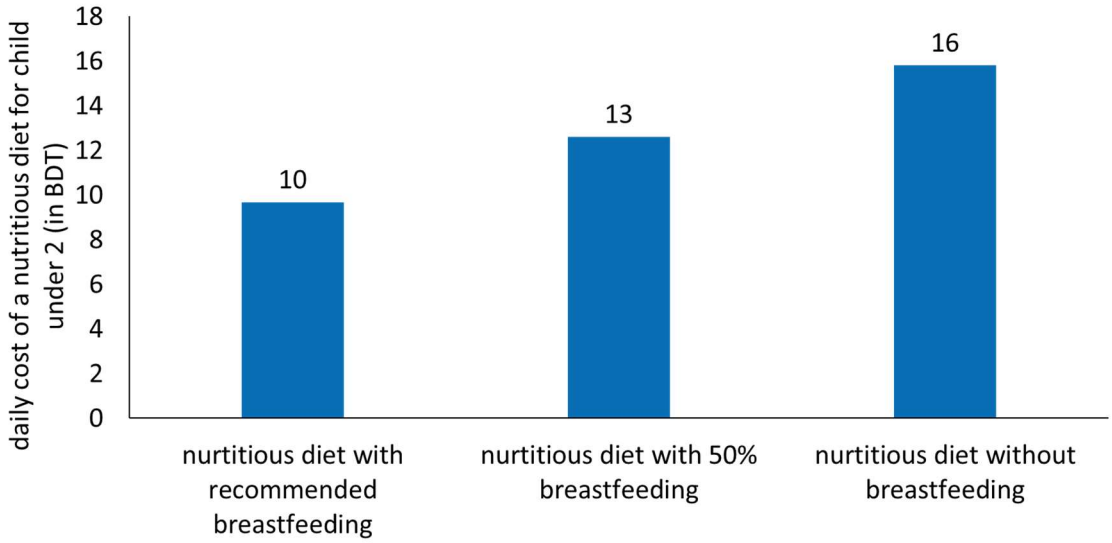
Figure 30: Percentage household cost of the nutritious diet, iron requirement, and energy requirement represented by each household member



In addition, this small cost is based on the assumption that the child is breastfed according to the recommendations. For various reasons, children under 2 do not always receive optimal breastfeeding. The data shows improvements in breastfeeding since 2012-13. In 2019, 63 percent of infants aged 0-5 months received exclusive breastfeeding (15), up from 57 percent. Predominant breastfeeding under 6 months was at 73 percent, prevalence of continued breastfeeding at one year was 93 percent and at two years was 84 percent. Overall, breastfeeding is good and on track to meet targets (14), but improvements are still needed in exclusive breastfeeding before 6 months.

If the child is not breastfed, nutrient requirements become more costly and challenging to meet. Removing breastmilk partially or fully from the diet of a child 6-23 months increases his/her cost of the diet by as much as 60%, see Figure 31.

Figure 31: Daily cost of a nutritious diet for the child under 2 (in BDT) with full, partial, and no breastfeeding



At six months of age, children start requiring complementary foods in addition to breastmilk to meet their nutrient requirements. Seventy-six percent of children begin receiving complementary foods at the appropriate time. However, only 28 percent of breastfed children (6-23 months) and 17 percent of non-breastfed children achieve a minimum acceptable diet, mostly due to low dietary diversity (15).

An enabling family, community and institutional environment is essential to allow mothers to breastfeed in line with recommendations and for households to feed children appropriate and diverse complementary foods in the correct frequency. The literature review uncovered the fact that suboptimal IYCF and WASH practices have several causes and are socially determined, unlike the often-held view that they are due mostly to mothers' knowledge (34,37,38,67). Knowledge is indeed a factor; adequate knowledge needs to be promoted among mothers, fathers, other household members, as well as in communities at large. Knowledge alone is not sufficient; for example, mothers' time poverty, exacerbated by low involvement of fathers and men in cooking and housework, reduces the time available to prepare specific meals for infants. Many Bangladeshi women suffer from low health and nutritional status, and the perception that their condition is poor may discourage breastfeeding. At the household level, decision-making on household purchases tends to lie with men, which makes it important to involve them in knowledge-sharing on IYCF. At the same time, this fact warrants attention to empower women and promote their agency, decision-making power, and freedom of movement – as a human rights issue, and to improve nutrition. There is also evidence that women are de-prioritized

in household food allocation, which will be explored further in the section on girls and women, which reduces their health status and may impede them in adopting ideal IYCF practices. Furthermore, in some households, mothers may be missing, or unable to breastfeed for a variety of reasons – in these cases, adequate support is required for the caretakers of the smallest children. At the community level, women's lack of mobility could be an obstacle to nutrition and health (e.g. going to markets and health centres with children). In addition, communities influence child feeding practices directly, as caretakers often seek advice from relatives, neighbors, mothers-in-law and community doctors. At the institutional level, the availability of services (including childcare for working mothers and parental benefits for men and women) and of basic infrastructure plays a role in facilitating or hindering optimal IYCF. It is also reported that traditional beliefs and food habits coexist with medical and nutrition knowledge to shape feeding decisions, which sometimes are in conflict with IYCF recommendations (e.g. feeding water or rice to young children before 6 months of age). Efforts to improve IYCF must take into consideration these individual, household, community and institutional contexts, which open many avenues for creating a more enabling environment for appropriate infant and child feeding.

In summary, non-financial, social, and cultural barriers to feeding young children a nutritious diet may include (i) the practical challenge of frequently purchasing, preparing and storing small quantities of diverse and highly nutritious foods, including when items would only be for the young child (76) and opportunity costs for the caregiver to procure, prepare and provide such meals, (ii) knowledge and attitudes towards IYCF from household members, (iii) the acceptability of these foods by the child, (iv) a lack of agency and empowerment of women and girls as well as (v) insufficient resources and infrastructure to cover basic needs (9,34–38,67,78,79). Furthermore, cooking methods impact nutrient content: for example, extensive cooking reducing vitamin content considerably. While cooking methods vary, the nutrients lost or gained through cooking have not been taken into account in the nutrient content estimations.

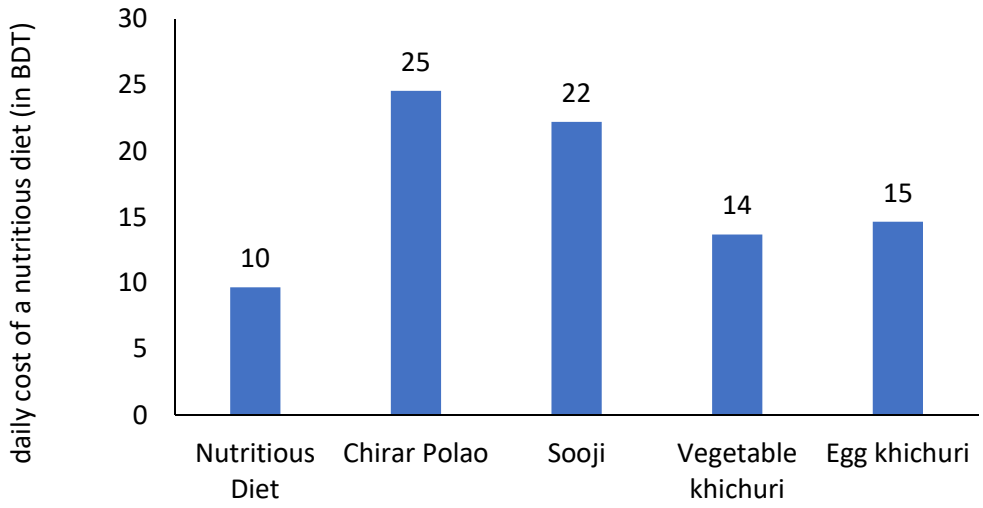
To support communities, the Bangladesh Breastfeeding Foundation (BBF) developed guidance for parents in the form of a recipe book. The FNG modeled three of these complementary feeding recipes: Chirar Polao, Vegetable Khichuri and Egg Khichuri (1) as well as sooji prepared with milk, oil, sugar and egg (Table 8).

Table 8: Modelled complementary feeding recipes (1) provided at market cost (daily amounts)

Sooji	Chirar Polao	Vegetable Khichuri	Egg Khichuri
• 35g semolina • 200ml UHT milk • 10ml oil • 20g sugar • 50g egg	• 30g rice flakes • 10g cowpea • 25g egg • 12.5g carrot • 10g onion • 5g spinach • 5g oil	• 13g rice • 7g lentil • 5g cowpea • 5g carrot • 7g onion • 5g spinach • 3g oil	• 15g rice • 6g lentil • 10g egg • 8g onion • 4g spinach • 4g pumpkin • 4g oil

The recipes are nutritionally sound, but since they are not an economic optimisation, implementing these recipes would raise the cost of the diet of the child significantly. In fact, if households purchased and fed these meals to their child daily, the cost of the nutritious diet of this child increases by as much as 150%. (Figure 32). This means that, theoretically, the cost to feed a nutritious diet to a child is low based on mathematical calculations; however, based on actual preferences for taste, convenience and culturally-accepted recipes, the actual cost to feed a child a nutritious diet is likely to be higher and cost might be a barrier, particularly for the poorest.

Figure 32: Daily cost of the nutritious diet of the child 12-23 months old with complementary food recipes included at market cost



Stunting prevention programs

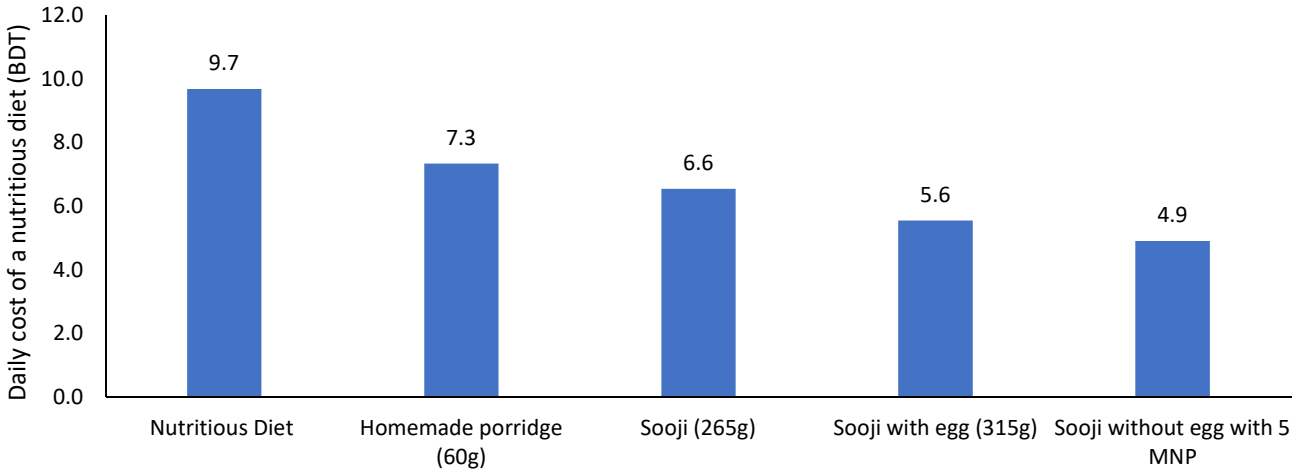
Several trials are currently ongoing to identify effective ways to improve complementary feeding for reducing child undernutrition, including stunting prevention, by including animal-source foods into commonly used recipes. For example, ICDDR,B is currently conducting research on the potential of sooji (semolina porridge) in stunting prevention, combining sooji (prepared with UHT milk, oil and sugar) with an egg (one whole egg every day) and micronutrient powder (MNP) with 15 micronutrients (3 times per week). Preliminary results of impact on stunting are very promising. CotD modelling was conducted to examine the cost reductions that could be achieved with the different recipes (that is, how well the recipes meet nutrient gaps). The modelled recipes are summarized in Table 9.

Table 9: Modelled complementary feeding recipes provided for free/in kind (daily amounts)

	Daily portion sizes (in g)								3x/ week
Complementary food	**Semolina**	**Milk**	**Oil**	**Sugar**	**Egg**	**Soybean**	**Corn**	**Wheat**	**MNP**
Sooji	35	200	10	20					
Sooji with egg	35	200	10	20	50				
Sooji with/without egg and MNP (5/15 MN)	35	200	10	20	0/50				1g
Homemade porridge						12.5	6.25	6.25	

As was seen above in Figure 32, sooji and other propagated complementary food recipes substantially increase the cost of a nutritious diet for a child if ingredients are purchased on the market. If the ingredients could be provided for free, e.g. through vouchers, and used as recommended, possibly in mothers peer support groups, sooji could reduce the cost of the nutritious diet of the child substantially, especially in combination with MNP (Figure 33), while ensuring the intake of essential micronutrients. Eggs would also enrich the meal with additional micronutrients.

Figure 33: Daily cost of the nutritious diet for the child under 2 (in BDT) with different complementary foods. NB: homemade porridge is in dry weight.



Since the free provision of ingredients could be diverted to other uses (or consumed by other individuals in the household), identifying possible community platforms such as parents' support groups to cook and share complementary foods may be one opportunity.

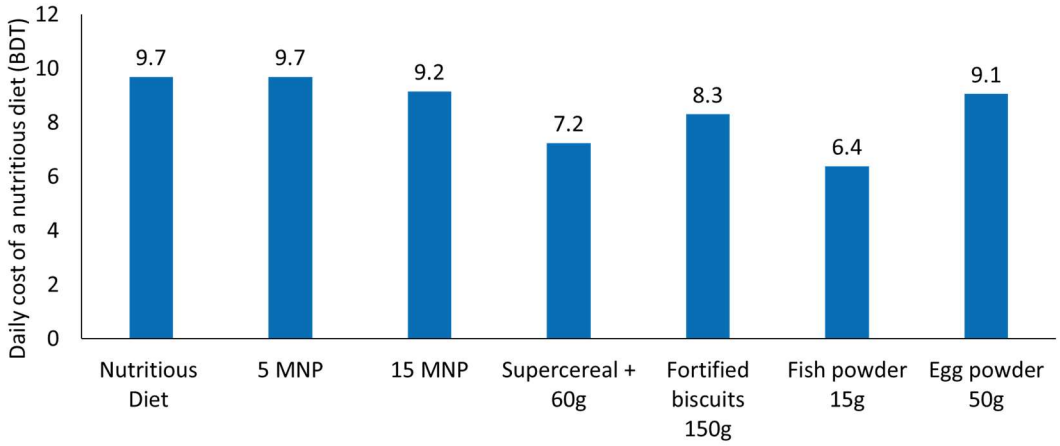
In addition to the analysis of complementary feeding recipes, the FNG also modeled and compared the potential contributions of different nutritious foods and supplements when provided in kind (for free), presented in Table 10. These foods are specifically designed to meet the nutrient needs of young children but should only be considered a short-term solution until IYCF practices have improved and affordability for all is or can be ensured.

Table 10: Modelling of different nutritious foods and supplements.

Nutritious foods or supplements	Daily portion size (in g)	Frequency (times per week)
5 MNP	1	3
15 MNP	1	3
Fortified infant cereal (Super Cereal Plus specifications were used as a proxy)	60	7
Fortified biscuits	150	7
Fish powder	15	7
Egg powder	50	7

The results are presented in Figure 34 and shows that small fish products or powder is the most effective at reducing the cost of the diet of the child, due to its high calcium content in combination with B vitamins.

Figure 34: Daily cost of the nutritious diet for the child under 2 (in BDT) with different nutritious foods and supplements provided in kind



4.6.2. School-Aged Children

School meals are a potentially powerful entry point for improving nutrient intake among children and adolescents. Bangladesh has recently mandated the increase in school meal coverage from three million students to cover the over sixteen million students currently enrolled in primary education. This could contribute to reducing widespread micronutrient deficiency among school-aged children. Though recent data is not available, in 2012 an estimated 11 million school-aged children were vitamin A deficient, 6 million suffered from iodine deficiency, and 1.4 million were iron deficient (17). By supporting families to better meet the nutrient needs of their children, school meals support children's cognitive and psycho-social development. Up until recently, school meals consisted of fortified biscuits – in 2019, the government approved a new policy which introduces fresh, diverse school meals. These offer an important opportunity to foster healthy food habits for life (17).

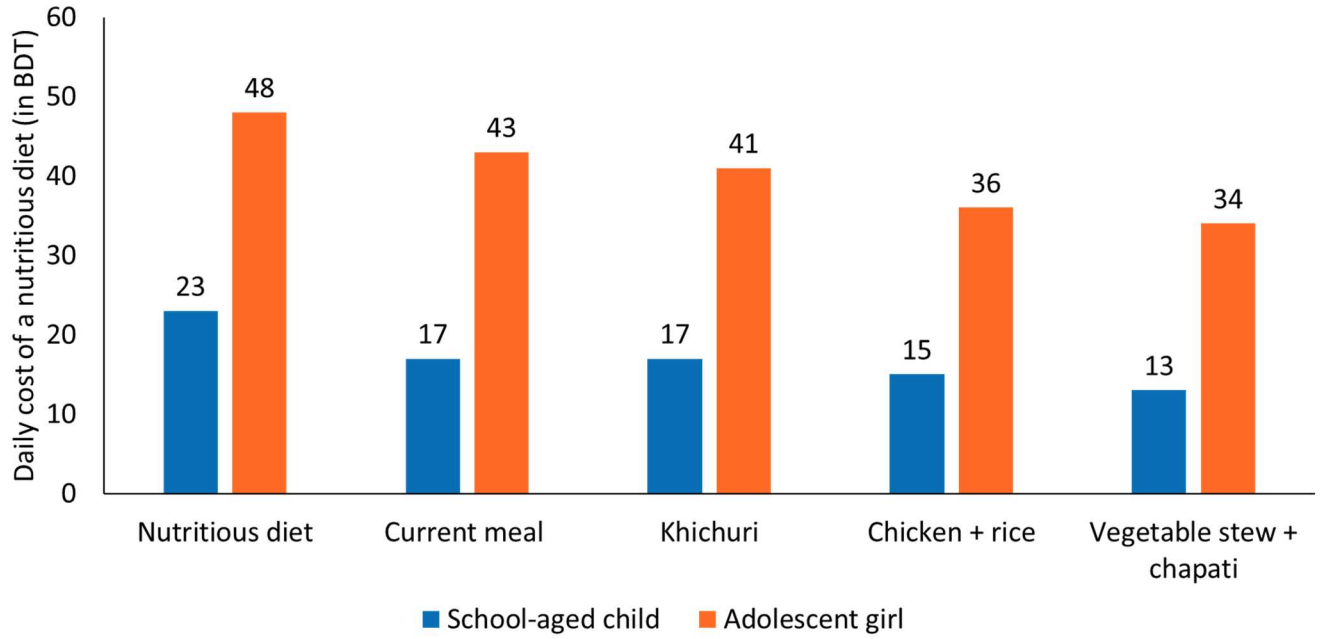
The extent of the nutritional impact of the school meal depends on whether they include a diverse range of fresh, plant-based, animal-source, and/or fortified foods. Different school meal rations, costing under 18 BDT per child per day (cost of ingredients only), were modelled, as presented in Table 11. The "current meal" model consists of three days of fortified biscuits and three days of fresh meals (khichuri); while the "fresh meals" model does not contain fortified biscuits. Although each recipe is modelled as if it were served every day of the 6-day school week, in reality, recipes would have to be changed during the week to ensure diversity of nutrients, foods and flavors – as well as to adapt to seasonal availabilities of fresh foods on the markets.

Table 11: Modelled school meal recipes

Food Item	Weekly grams			
	Current meal, 6d	Khichuri, 6d	Chicken Rice, 6d	Vegetable stew + chapati, 6d
Fortified biscuit	225			
Fortified Rice/Unfortified rice	270	540	600 (unfortified)	
Wheat flour				300
Lentil	75	150		
Vegetable oil	36	72	72	180
Pumpkin	40	80		300
Leafy vegetables (amaranth)	30	60	600	360
Cauliflower				300
Potato	45	90		360
Eggs	70	140		150
Chicken breast			420	

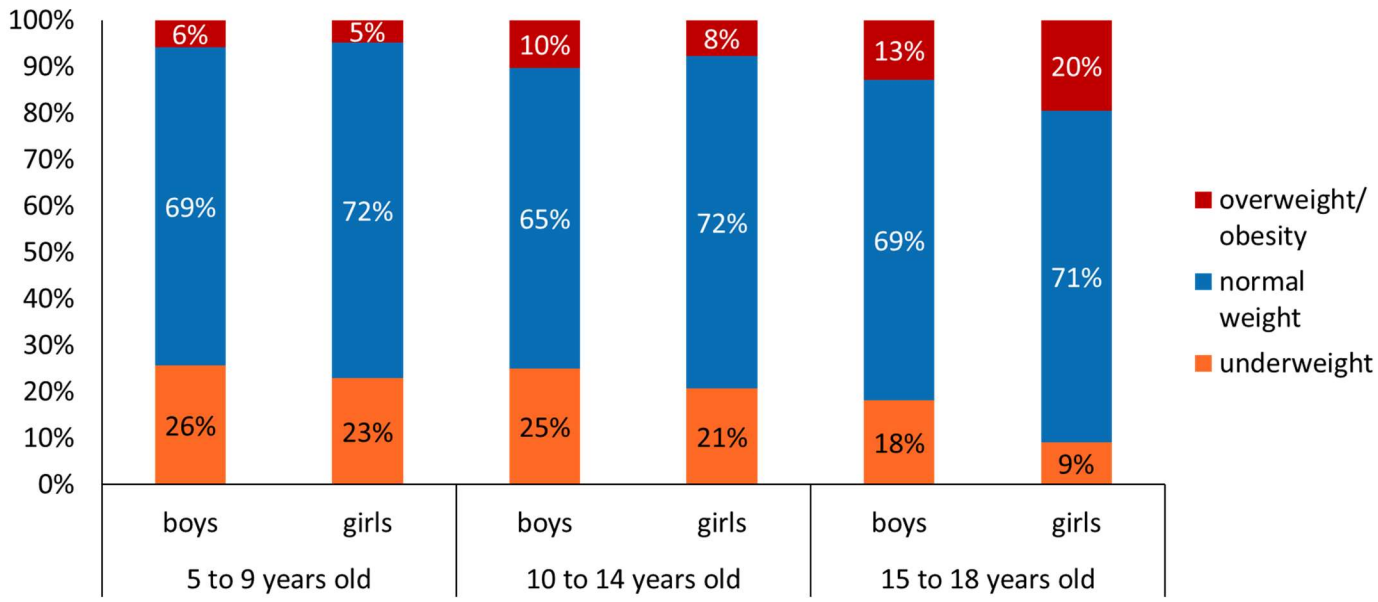
The results of the modelling are presented in Figure 35 for both the school-aged child and the adolescent girl. The modeled rations could reduce the cost to the household of the nutritious diet of the school-aged child by between 26% (khichuri with rice) and 33% (vegetable stew with chapati). For the adolescent girl, the cost reduces by between 10% and 29%.

Figure 35: Daily cost of the nutritious diet for the school-aged child and adolescent girl with different school meal rations



The expansion of primary education to grade VIII also means including students with a wider range of nutritional vulnerabilities, particularly adolescent girls. Figure 36 indicates that boys and girls of different ages groups are plagued by inadequate diets- underweight being particularly prevalent in boys and in younger age groups, while obesity and overweight are on the rise in older age groups and especially for girls (own calculation based on BIHS 2015, age and sex-specific BMI cutoffs applied as defined by WHO (80–82)). In early childhood, stunting and micronutrient deficiencies are of main concern in Bangladesh, while in later adolescence, overweight and obesity and the heightened risk of NCDs becomes an additional nutritional challenge (9,82,83).

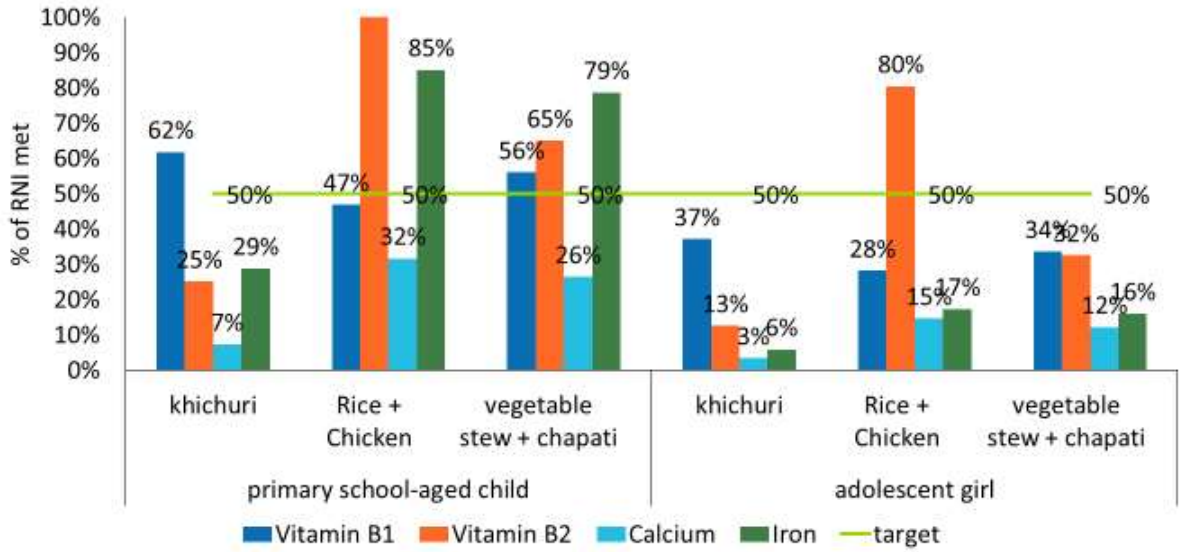
Figure 36: Percentage of prevalence of underweight, normal weight and overweight or obesity in boys and girls of different ages (own calculation based on BIHS 2015, age and sex-specific BMI cutoffs applied as defined by WHO (80–82))



School meals could be a powerful tool to reach adolescents in addition to children and help protect their nutritional status in this important life stage. However, as the modelling results show (Figure 37), if the same school meals are provided to the adolescent girl (also a close proxy to adolescent boy) as to the younger children, the cost of her nutritious diet does not decrease as much as it does for children. Due to their elevated nutritional needs, adolescents have the costliest nutritious diet in the household. The current school meal budget of 17 BDT per meal per child better covers the needs of the child than of the adolescent girl (i.e. reduces his or her cost of the diet by up to 33%, compared to 29% for the adolescent). It is not surprising then to conclude that in order to better meet nutrient requirements of adolescents, budgetary increases are necessary; adolescents' school meals cost more, due to the higher quantities and more nutrient-dense foods required to meet their nutrient needs.

A closer look at the percentage RNI targets met by the different school meal recipes for children and adolescents clarify the inadequacy of current rations for older children and adolescents (see Figure 37). If school meals aim to cover 50% of key micronutrients such as vitamins B1, B2, calcium and iron, the recipes do meet a fair amount of the targets for children but they are far from doing so for adolescents.

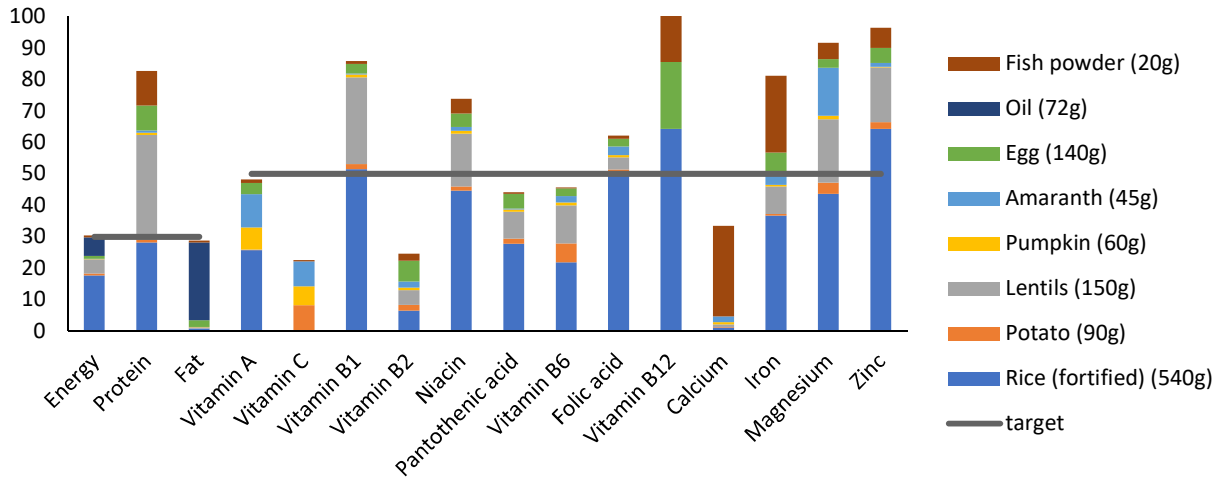
Figure 37: Percentage RNI met for limiting nutrients by school meal rations for school-aged children compared to for adolescent girls



Increasing the nutritional value of school meals through inclusion of nutrient-rich food and/or (bio)fortified foods

The 2019 school meal policy aims for school meals to provide 30% of the daily requirement of energy, protein and fat and 50% of micronutrient requirements, and states that they should include a minimum of four out of ten food groups. The modeling shows that adding different special (fortified) foods (eggs, fish powder or fortified rice) to the school meals could further enhance their nutritional content and help meet these targets. Figure 38 breaks down the nutrient contribution of the different foods included in an enhanced khichuri recipe, illustrating the need for a wide variety of foods from different food groups to supply a complementary range of micronutrients. Fortified rice is a potentially simple way to increase the nutritional content of meals without changing recipes. Widely available nutrient-dense foods such as green leafy vegetables (e.g. amaranth leaves) and eggs are also particularly cost-effective foods, suitable to be integrated in child-friendly and culturally-adapted recipes. In addition, serving a dish that includes whole wheat flour instead of rice could further increase the nutritional value of the meals. Fish powder, in particular, is a cost-effective source of calcium, a micronutrient that is not found in other foods currently included in the school meal recipes. As fish powder may not be widely considered palatable in recipes, alternative, calcium-rich foods such as small, dried fish (free of contaminants) could be considered for inclusion in school meals.

Figure 38: Nutrient content of fresh school meals (one week, 6 school days) by ingredient

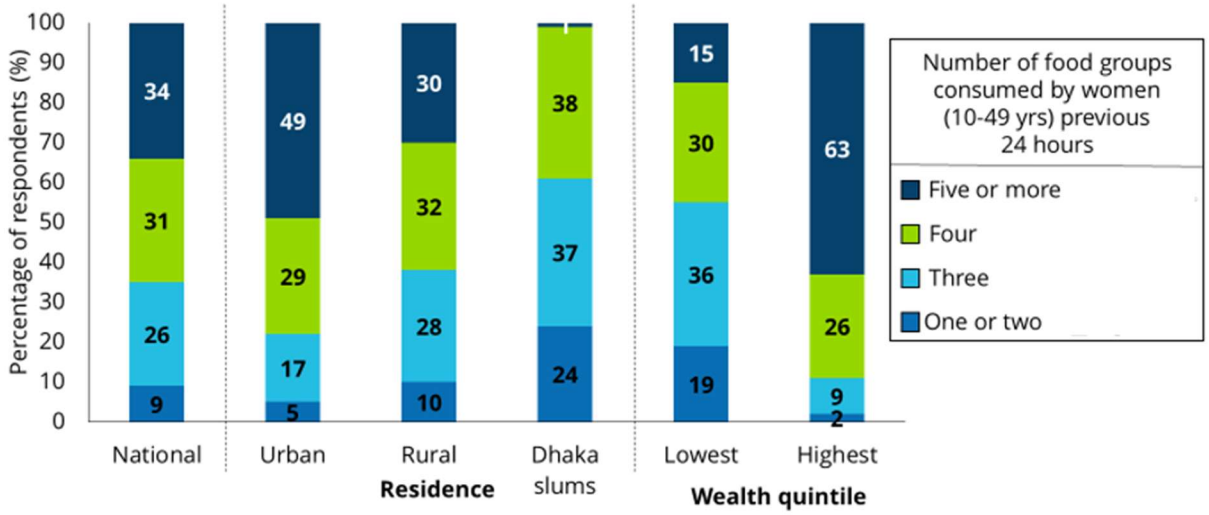


Diverse, fresh school meals have important nutritional benefits that could help allow a greater number of children and adolescents nationwide to reach adequate nutrient intakes. Fresh school meals have obvious cost and implementation implications: they are more costly to procure, store, handle and prepare than packaged fortified biscuits, and require concurrent efforts in procurement, school infrastructure and preparation to function. The added complexity could be seen as an opportunity for synergies that could contribute to more nutrition-friendly food systems. For example, purchasing fresh foods from local producers could create a stable market for smallholder farmers and cooperatives. Hiring staff and cooks could generate local non-farm employment, and have beneficial effects for surrounding communities. Investments in school meals could be seen as an investment in the future: creating healthy food habits from a young age, promoting future demand for nutritious foods and using the school to set healthy examples for households and communities.

4.6.3. Women and Adolescent Girls

The FNG analysis in Bangladesh found that inadequate diets at the household level are compounded for nutritionally and socially vulnerable groups, especially for women and girls. Indeed, measures of women's dietary diversity demonstrate that only one in three women (34%) and girls aged 10-49 are consuming adequately diverse diets (see Figure 39 (84)). The proportion is lower for women living in rural areas (30%), in the Dhaka slums (1%), and those who belong to the lowest wealth quintiles (15%). In these resource-constrained environments, women and households are more prone to facing constraints related to inadequate cooking and WASH facilities, fuel and cold storage, which could contribute to reducing consumption of safe and nutritious meals.

Figure 39: Percentage of women and girls having consumed specified numbers of food groups in the preceding 24 hours (five or more out of ten necessary for adequate dietary diversity).



In the FNG modeled household, discussed in previous sections, the woman and the adolescent girl represent over half of the total cost of the nutritious diet of the household. This is due to women's and adolescent girls' high micronutrient needs which require them to consume a greater share of nutrient-dense, fresh and animal-source foods in their diet compared to other household members. These foods can be a challenge for women and girls to consume due to their relatively high cost and due to lack of knowledge of their needs. Together, these factors lead to increased nutritional vulnerability of women and adolescent girls.

At the same time, gender norms and women's disempowerment seem to be contributing to women's poor diets. For example, women and girls tend to be disfavored in intra-household food allocations, and adult women are three times as likely to resort to negative

coping strategies (skipping meals or going to bed hungry) in times of food insecurity: 68 percent of women versus 22 percent of men report skipping meals or going to bed hungry (among households resorting to coping behaviors) (84). The same is valid for adolescent girls aged 10-16, who are four times as likely as adolescent boys to skip meals or sleep hungry in times of food insecurity (8 percent versus 2 percent) (84). Hence, women and girls are the individuals least likely to meet their nutrient needs, particularly in resource-constrained households.

Though Bangladesh has made noteworthy improvements in women's education and empowerment (9), further reductions in gender inequalities could create a more favorable environment for nutrition. Many women remain disadvantaged by their gender, warranting continued efforts, in particular with regards to:

- Intra-household food distributions that tend to favor men (65,66,85)
- Continued gender-based violence that disproportionally affects women (9)
- Decision-making on resources, food purchases and health issues skewed towards men (9,78).
- Women's limited mobility outside of the home (9)
- Responsibility for housework and cooking primarily assigned to women (9,70,71)

Efforts to empower women and engage men would require a rethinking of gender norms to help enable better nutrition practices.

Adolescent girls face a double risk

Adolescent girls' nutritional vulnerability is compounded by socio-economic vulnerability linked to her age and gender. Though data on adolescent girls' nutrition is scant, there is evidence that only 35% of girls aged 15-19 achieve adequate dietary diversity (84) and that as much as half are anemic (83).

Girls' standing in Bangladeshi society is low. In 2019, 24 percent of women aged 20-24 had had a live birth before age 18, 51 percent were married before age 18, and 16 percent were married before age 15 (15). Most often, girls are married to men who are several years older than them, putting them at a power disadvantage, especially considering that girls aged 15-19 have low independence in decision-making and mobility (9). Early marriage is associated with school drop-outs, early pregnancy and poverty (9), which work together as a threat to girls' empowerment and full enjoyment of their human rights.

The government's efforts to reduce high rates of child marriage and early pregnancy are essential to protect and promote the girl's empowerment, continued education and nutritional status (86). As discussed above, a pregnancy increases the already high cost of a nutritious diet of an adolescent girl by 8%. As children born to young, malnourished

mothers are more likely to be stunted and wasted, adolescent pregnancy is both a social and nutritional risk, for the girl herself and her future child (9).

School meals are a powerful existing platform which could be tailored to meet the specific needs of adolescents. As seen in the previous section, fresh school meals have the potential to contribute towards developing healthy food habits early in life and promoting nutritionally sound choices in adulthood. Schools could also serve as a platform for complementary interventions targeting adolescent girls and boys, especially those aiming to reduce early marriage and adolescent pregnancy, as well as for improving gender equality. Evidence suggests that school meals could contribute to keeping girls in school, potentially delaying age at first marriage and first pregnancy, which is important to break the intergenerational cycle of malnutrition (87). If the potential of school meals to improve the nutritional and socio-economic status is to be leveraged, school meal budgets and recipes need to be revised specifically with this group in mind.

Nutrition support for women and adolescent girls

Public services, including accessible, quality health services and social protection could support women, children and their families during the first 1000 days. Adolescent girls and adult women require specific attention warranted by their significant nutritional vulnerability. An appropriate food-based healthy diet along with supplementations can enable the girl and the pregnant and lactating woman to meet some of their most difficult to obtain nutrients, such as iron and calcium, in a cost-effective manner.

Supplementations are a potential cost-effective strategy to enable the girl and the pregnant and lactating woman to meet some of their essential nutrient needs. CotD modelling was done for a range of supplements, presented in Table 12.

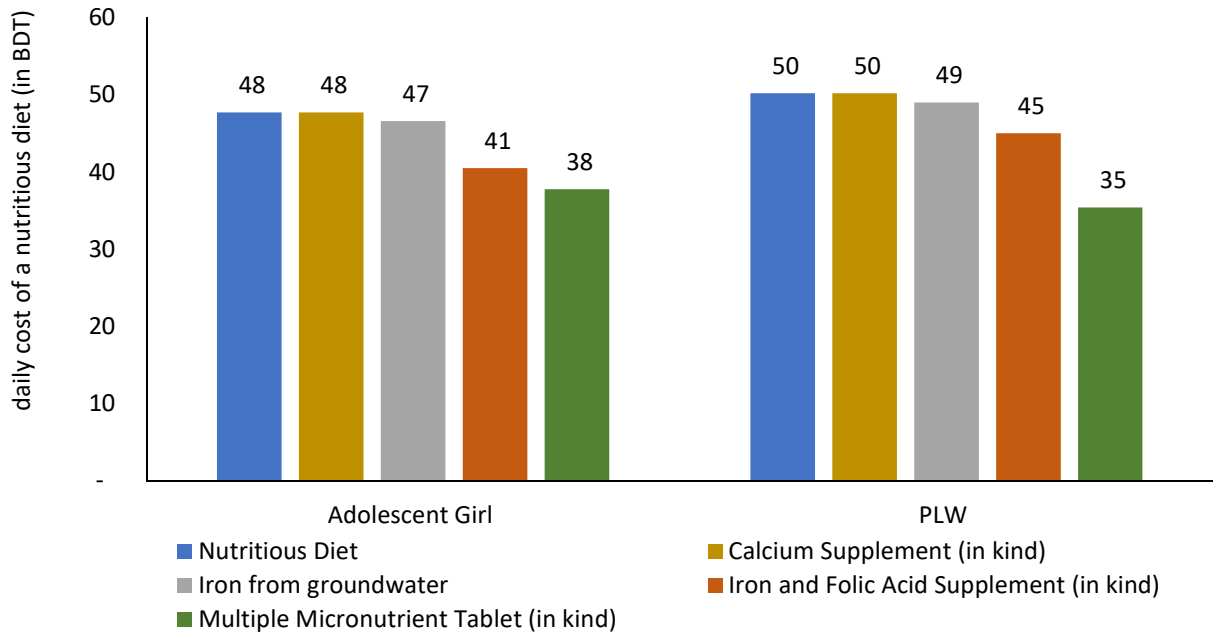
Table 12: Modelled supplements for the adolescent girl and pregnant or lactating woman

Target groups	Supplement	Portion size	Frequency
Adolescent girl, PLW	Multiple Micronutrient Supplement	15 micronutrients	daily
Adolescent Girl	Iron and Folic Acid Tablet	Folic Acid: 280µg Iron: 60mg	weekly
PLW	Iron and Folic Acid Tablet	Folic Acid: 400µg Iron: 60mg	daily
Adolescent girl, PLW	Calcium	1,500mg	daily

The results show that the multiple micronutrient supplement (MMS) has the greatest potential reduction in the cost of the nutritious diet for these groups (Figure 40). Though iron and folic acid supplementation (IFAS) is currently distributed to pregnant women

through the public health system, recent global evidence concludes that antenatal MMS is superior to IFAS in improving birth outcomes (88–93). In fact, in Bangladesh, transitioning from IFAS to MMS is expected to avert an additional 1 million disability-adjusted life years, prevent the death of an additional 12,640 children over the next ten years. Investing in transitioning to MMS is estimated to yield benefits nearly 300 times greater than the cost. The improvements in perinatal health outcomes and for preventing maternal anemia with no harm to the mother or baby have been demonstrated. MMS is cost-effective, providing high return on investments and long-term economic benefits. Considering the nutritional vulnerability of adolescent girls, platforms to introduce the supplement to this age group could also have large payoffs in terms of nutrition and the health of the girls themselves and future generations.

Figure 40: Daily cost of the nutritious diet for the adolescent girl and the pregnant or lactating women (in BDT) with iron from groundwater or with different supplements



4.6.4. Older people

Little data exists for older persons in Bangladesh aged 65 and over. Six percent of the population falls into this age group, which amounts to about 9.5 million men and women (9). Older persons often receive little or no attention in nutrition interventions, not just in Bangladesh but around the world (94). The health care costs of older persons is increasingly being recognized as a challenge of the 21st century as populations age due to demographic transitions and increased life expectancies (94). In Bangladesh, few data exist on the nutritional status and micronutrient intakes of older people. A recent study found that about 56 percent of the older population had an average health status, and 20 percent were in poor health (95). Another found that only 40 percent of older people had a Body Mass Index within the appropriate range, with at least half of older women being found as energy deficient (96). A small study conducted in a rural area found that rural elderly persons had lower levels of different vitamins and micronutrients as compared to their middle-aged counterparts (94).

Morbidity, malnutrition and illness in older populations in Bangladesh deserve attention. The lack of social services and nutrition support for older people is a human rights issue as well as a wider social issue, impacting not just older people themselves, but also their families and communities. If household resources (time and money) are directed to meet the needs of older persons, this can jeopardise the household's overall nutrition security and increase the non-affordability of nutritious diets. The review of policies and social protection programs undertaken in the context of the FNG has not identified interventions directed at the elderly. Efforts are encouraged to fill the data and programme gaps.

5. Conclusions and Recommendations

Based on the FNG findings, stakeholders developed the following multi-sectoral recommendations for action. These were discussed internally in the respective ministries involved in the FNG Technical Working Group and validated during the Policy Dialogue on 28 November 2019. Ten overarching recommendations, presented in Table 13, will guide necessary changes in the food system to enable better nutrition for all Bangladeshis, irrespective of wealth status, gender, age and geographic location. These overarching recommendations are complemented by a set of detailed recommendations, presented in Table 14, which identify required inter-sectoral coordination and are directed at addressing the most pressing needs identified in the food environment, food supply chains, consumer behavior, social protection and of underserved groups.

Table 13: Overarching recommendations

1. **Social and Behaviour Change Communication (SBCC)** interventions across sectors should aim to **generate social change** of cultural norms on food habits and consumption, not just change in individual behaviours.
2. Adequate **investment in public awareness on nutrition across different sectors** including nutrition SBCC is needed to inform public perception of nutrition.
3. Some households, including those below the poverty line, need support through targeted programmes to be able to afford a nutritious diet.
4. **Systematic food quality and safety assurance and control mechanisms** need to be implemented and enforced across all sectors to ensure availability of safe and nutritious foods.
5. Further **strengthen the production and supply chain of diverse nutrient-dense foods** like leafy vegetables and sustainable production of animal source foods to reduce food losses, enhance availability and food safety, and meet increasing demand.
6. Seek **collaboration of the private sector** to improve food quality and safety through **responsible food processing, packaging and marketing** which may need some regulation and enforcement.
7. FNG modelling shows a need to **reassess transfer values of selected social safety nets** to ensure affordability of nutritious diets (e.g. Mother and Child Benefit, School Meal Programme, and Elderly Allowance).
8. **Increase and strengthen government staff awareness and capacity on age- and gender-specific nutrition requirements** (e.g. young children, adolescents, women, elderly) and nutrition sensitivity across all sectors to improve programme planning and implementation.
9. Target interventions to better **serve the nutritional needs of the adolescent population** – boys and girls – through nutrition services such as family sensitisation, community youth groups, and school meals.
10. Further integrate and scale up multiple- micronutrient fortified foods, such as fortified rice and fortified oil, for vulnerable groups in social protection programmes, including school meals, and in emergency response.

Table 14: Detailed recommendations and required inter-sectoral coordination

1. Food Environment	
Recommendation	**Coordination required**
1.1. Coordination and alignment with National Nutrition Policy and NPAN2 must be further prioritized (and adjusted based on new evidence), with concrete actions including: • Formulate sector-specific and overarching recommendations for improving access to nutrients in specific situations • Increase availability of nutritious foods for key vulnerable groups • Identifying and strengthening nutrition sensitive and nutrition specific programmes of the sectoral ministries. • Coordination among sectoral ministries to identify the overlapping areas and complementarities of nutrition programmes for better collaboration	All sectors
1.2. Adequate funds should be allocated to ensure a healthy food environment.	All sectors
1.3. Additional research and evidence are needed to understand the extent, type and implications of food adulteration and contamination on affordability and consumers' selection, preference and convenience-related choice of nutritious foods. Establish an accredited laboratory.	MoFood BFSA BIRTAN
1.4. Ensure that adequate hygiene and sanitation facilities, as well as cooking facilities, are in place at the schools.	MoLGRD DPHE
1.5. Impose higher taxes for some fast foods and fizzy drinks of poor nutritional value.	MoHFW MoInd MoFin
2. Food Supply Chains	
2.1. Further invest in the diversification of agricultural production, particularly fruit and vegetables. Create better knowledge and production information on "under-utilized" (indigenous) species, their optimal cultivation methods, and nutritional benefits, for (commercial and homestead) producers, policy makers and consumers. This will require research, and demand creation, and platforms for dissemination.	MoA MoFLS BIRTAN BARC BARI BRRI
2.2. Policy interventions are needed to reduce post-harvest losses by developing agro-processing industry e.g. through vertical expansion of diversified agricultural products. In addition, investments are needed in establishment and strengthening of SMEs as part of the supply / value chain that produce value added products	MoInd MoA: BIRTAN
2.3. Collaborate with the private sector and assist them to create incentives to increase safe production and distribution of nutrient-dense foods.	MoInd MoA MoFLS
2.4. Increase and strengthen capacity and accountability on food quality and safety of all actors engaged in the food supply chain, both from the private sector and government and its institutions, to ensure quality across the food value chain and to promote consumer confidence.	MoFood MoInd MoA MoFLS
2.5. Support policy guidance to ensure adequate production of diversified, healthy, safe, nutrient-dense foods.	MoFood MoA MoFLS MoInd

	MoCommerce
2.6. Connect small-scale producers / farm-holders of fruit, vegetables, livestock, fish and eggs with demand generated through social protection programs (e.g. school meals) to incentivize investments into local production and reduce post-harvest losses.	MoFood MoA MoPME MoE MoH MoWCA
2.7. Continue support for the further increase in domestic production of fortified rice and other fortified foods (fortified oil, iodized salt, etc.), including for public consumption. Linkage with social protection, school meals, institutional canteens and public consumption will create a stable and guaranteed market for fortified rice, which is required to ensure a stable supply.	MoFood MoA MoPME MoWCA MoDMR
2.8. Identify suitable highly nutrient-dense food products for local nutrition-sensitive processing that can enrich school meals and analyze them for their cost-effectiveness. This should further promote preservation or even add commercial value to fruit and vegetables for off-season times.	MoA MoFLS MoInd
2.9. Assess the potential impact of innovations for production increase in supply chains on food safety and nutrient content prior to their rollout.	MoAgri MoFLS MoInd MoFood
2.10. Continue efforts to increase fish production in line with nutrition requirements: • Establishment of fish sanctuary will boost up the captured fish production, which species have a higher micronutrient content. • Expansion of poly culture of fish like Carp and Pangasalong with SIS (Small Indigenous Species) will pave the way to increase consumption of micronutrients (Calcium, Iron, Phosphorus, Zinc, Vit- A, D, E) etc. • Promote research on and production of small fish and other traditional or indigenous varieties of fish with high nutrient contents • Promote research on increasing the nutritional value of pond farmed fish to bring it closer to that of captured fish.	MoFLS
2.11. Increase awareness-building services, trainings and activities for farmers on nutrient-dense crop cultivation, integrated pest management, and Good Agricultural Practices, e.g. through farmer field schools (adapted to the needs of male and female farmers), public procurement of nutritious foods for school meals and other social protection programs.	MoAgri MoFLS BIRTAN MoI MoPTIT: DoICT
2.12. Research and promotion of innovation to establish nutrient-preserving product formulation, processing, packaging, transport and storage. Find strategies to reduce waste and increase technical and economic efficiency.	MoInd MoCom MoEFCC
2.13. Establish a knowledge HUB for producers, processors and consumers on nutrition, agriculture and food systems.	MoHFW: BNNC MoFood: FPMU, BFSA MoAgri MoFLS MoInd MoECFF MoPTIT: DoICT

2.14. Promote cooperation and identify strategies striving to quickly recuperate (household) productive assets after a disaster. Invest in agricultural rehabilitation, e.g. short-day yielding fruit and vegetables varieties for quick access to nutrient-dense foods after a disaster.	MoDMR MoFood MoInd MoAgri
2.15. Further enhance cooperation and identify strategies to enhance resilience to climate change, disasters and shock of vulnerable communities and households.	MoDMR MoEFCC
2.16. Revise food basket composition to enhance nutrient value, including child and pregnant and lactating women supplement options, depending on market context and cooking facilities, including options for fresh food	MoDMR
2.17. Explore ways to incorporate commodity-specific (e)vouchers in disaster response to stimulate supply and demand for nutritious foods in areas with resilient food markets.	MoDMR MoFood
3. Consumer Demand	
3.1. Social and Behavior Change interventions across sectors should aim to generate social change in cultural norms on food habits and consumption, not just change in individual behaviors.	MoInfo MoPTIT: DoICT MoHFW: DHE, DGHS, DGFP MoWCA MoPME MoFood MoDMR MoLGRDC
3.2. Adopt a household approach to improve both intrahousehold food distribution as well as the diets of the entire household with more nutrient-dense foods. This should especially enable an improved diet for children under 2 as they receive nutritious portions of the family diet.	MoHFW: DHE, DGHS, DGFP MoWCA
3.3. Seek out opportunities to create awareness and promote demand for nutritious foods, and healthy food habits, through for example schools, media, and/or price incentives.	MoFood MoAgri MoPME MoE
3.4. Advocate with the National Curriculum and Textbook Board (NCTB) to strengthen the food and nutrition part of the National School Curriculum and textbooks, including about the adverse effect of high-caloric foods with low nutrient density, as teaching children will have a multiplier effect.	MoPME MoE
3.5. The school feeding/meal programme should optimize the utilization of SBCC opportunities to help parents to understand their children's nutrition situation and nutritional requirements.	MoPME MoE
3.6. Awareness raising on healthy balanced diets and hygiene for the Cooks and the Suppliers of the homegrown school meal programme should be incorporated in the programme design and be adequately monitored and reinforced.	MoPME MoE
3.7. Explore the barriers and enablers to increase use of foods rich in iron and calcium, especially whole (small) fish and green leafy vegetables, in young children's diets, and evaluate the acceptability of fish products for inclusion into complementary feeding recipes.	MoHFW: DHE, BNNC
3.8. Promote and enable feeding for the young child with time-saving and convenient nutrient-adequate recipes and products, such as sooji with milk, egg and MNP with 5 - or 15	MoHFW MoWCA

– micronutrients.	
3.9 Critically evaluate the different nutrient-dense foods (especially meat, fish, eggs, milk products and green leafy vegetables) for their impact on nutrient intake, food habits, affordability by the poorest households and the environment prior to promoting certain commodities for their micronutrient content.	MoHFW INFS BIRTAN
3.10. Explore ways to implement necessary orientation and awareness interventions to encourage appropriate utilization of cash transfers during emergencies and recovery operations to enhance nutritious diets.	MoDMR MoHFW MoI / MoICT
4. Social Protection	
4.1. Social protection support to food insecure households with adolescent girls is essential to mitigate nutrition and protection risks.	MoWCA MoSW
4.2. Need for new data and evidence of status of gender equality and women's empowerment to document progress and identify gaps and strategies for how best to address them.	All sectors
4.3. Harmonize age and needs-specific nutrition messaging across all programs.	All sectors
4.4. IC-VGD should be scaled up and transformed into vulnerable women benefit programme as envisaged in NSSS with a view to reducing gender inequalities and malnutrition.	MoWCA MoSW Cabinet Division
4.5. Continue investing in designing and piloting recipes for school feeding that maximize the nutritional impact of school meals to fill the micronutrient gap and work with subnational authorities to disseminate recipes and support schools to make nutritious choices.	MoPME MoE MoHFW INFS BIRTAN
4.6. Advocacy to increase public funds per child for school meals should continue and will require additional research and evidence on the food consumption and nutritional status of school-aged children and adolescents.	MoPME MoE
4.7. Identify synergies between healthy school meals, the promotion of local demand for fresh produce and diversification of agriculture. Reducing post-harvest losses of fruit and vegetables, through increased demand from schools, can be a key element of this collaboration.	MoPME MoA MoFLS MoFood MoHFW
4.8. Establish a quality assurance mechanism, including SOPs (standard operating procedures), for school meals preparation to ensure the meals served to children are nutritious and safe for consumption and establish a quality control mechanism.	MoPME
4.9. Integrate gender-sensitive elements into health programmes and strengthen nutrition outcomes of social protection and safety nets, including during emergencies.	MoDMR
4.10. Develop both community and school-based approaches for school going adolescents (both boys and girls) to have more healthy and cheaper food options at and around the schools and support and guide different actors to make this shift.	MoE MoWCA Mo Food Private sector
4.11. Enhance impact on recovery of most affected households through food or cash for work programs for swift recuperation of infrastructure by increasing the transfer value and the number of working days per household. Create additional recovery mechanisms for most vulnerable household without availability of able-bodied laborers through adaptive social safety nets.	MoDMR MoDMR MoSW

5. Underserved Groups	
5.1. Policies, programs and interventions need to be sensitive to the different levels of nutritional vulnerability and identify ways to meet different target groups' needs, ways to reach them and to create demand for nutritious food. Strengthen understanding of and capacity on age-related nutritional needs across the lifecycle when designing programs and for decision making. Essential to efficiently and effectively target, identify, and enroll the most vulnerable, including adolescents.	MoHFW: IPHN INFS BIRTAN
5.2. All sectors should consider how to better serve the nutritional needs of older people and the adolescent population – boys and girls – with a view to improve their choices, behaviors, empowerment, and capabilities	All ministries
5.3. Transfer values for social protection need to be almost doubled to enable positive nutrition outcomes for all pregnant and lactating women and young girls.	Cabinet Division MoF MoSW, MoWCA
5.4. Ensure better inclusion of adolescent girls and pregnant and lactating women in health and nutrition programs tailored to the needs and priorities of these target groups. Enhance the platforms for reaching pregnant and lactating adolescent girls with mother and child health and nutrition (ANC/PNC/GMP) programming.	MoHFW MoWCA MoLGRDC
5.5. Form partnerships to improve secondary level completion in tandem with improved nutrition for vulnerable adolescents and food habit through an integrated school nutrition programme, providing home grown school meals, nutrition education, and physical activity routines.	MoE MoPME MoYS
5.6. Identify opportunities to reach adolescent girls and boys with nutrition and health services through schools, with a view to reducing gender inequalities, child marriage, child labour, and malnutrition in this age group. Identify strategies and alternative platforms to reach adolescent girls and boys that are not in school.	MoE MoPME MoSW MoLGRDC MoRA
5.7. Explore the possibility to provide MMS instead of IFA supplements for the adolescent girl and women during pregnancy and lactation, including investing in research to test the acceptability and effectiveness of MMS in the Bangladeshi population. Identify alternative ways to address calcium deficiency, as MMS do not (and cannot) include calcium.	MoHFW IPHN INFS

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Annexes

Annex 1: Members of the Technical Working Groups

Name	Designation	Organisation
Md. Alamgir Hossen	Deputy Director, Data Management; Member-Secretary, SDG Technical Working Committee	Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning
Dr. Md. Akhter Imam (Aadon)	Asst. Director, Monitoring, Evaluation & Research platform Bangladesh National Nutrition Council	Bangladesh National Nutrition Council
Dr. Nazmus Salehin	Assistant Director (SBCC, Finance and Audit)	Bangladesh National Nutrition Council
Dr. Shahnaz Arefin, ndc	Additional Secretary, Coordination Wing,	Cabinet Division
Choudhury Muazzam Ahmed	Deputy Secretary	Cabinet Division
Md. Ashfaqul Amin Mukut	Deputy Secretary	Cabinet Division
Ajay Kumar Chakraborty	Joint Secretary	Cabinet Division
Dr. Md Nurul Amin Chowdhury	Deputy Director, Plan & Development	Directorate of Primary Education
Assunta Testa	F.N.S Program Manager	EU Delegation
Richemont Seki	Food Systems and Nutrition Security Specialist	FAO
Dr. Sabiha Sultana	Technical Specialist, Knowledge Leadership	GAIN
Rahnuma Nahid	Deputy Chief	General Economics Division, Bangladesh Planning Commission
Mousumi Khanam	Senior Assistant Chief	General Economics Division, Bangladesh Planning Commission
Jillian Waid	Technical Director – National Information Platform for Nutrition, Bangladesh	Helen Keller International
Kazi Istiaque Sanin	Assistant Scientist , Maternal and Child Nutrition	Icddr.b, Nutrition and Clinical Services Division
M Mehrab Bakhtiar, PhD	Associate Research Fellow	International Food Policy Research Institute
A.K.M Manirul Alam	Additional Director	Ministry of Agriculture
Tasnima Mahjabin	Senior Scientific Officer	Ministry of Agriculture, BIRTAN
Syed Md. Nurul Basir	Deputy Secretary, Relief-1	Ministry of Disaster Management and Relief
Shyamol Chandra Karmakar	Additional Secretary (Fisheries)	Ministry of Fisheries and Livestock
Mostafa Faruq Al Banna	Associate Research Director	Ministry of Food
Dr. Golam Md. Faruk	Deputy Secretary	Ministry of Health and Family Welfare
Dr. Md. M. Islam Bulbul	Deputy Program Manager (DPM), National Nutrition Services (NNS) & Technical Specialist (Public Health & WH)	Ministry of Health & Family Welfare
Dr. Farzana Arjumand	Deputy Secretary	Ministry of Primary and Mass Education
Md. Monsurul Alam	Joint Chief	Ministry of Primary and Mass Education

Hasina Begum	Deputy Secretary	Ministry of Women and Children Affairs
Jagadish Chandra Debnath	Deputy Secretary	Ministry of Women and Children Affairs
Dr. Sheikh Shahed Rahman	Chief of Party/Team Leader - Suchana I Child Poverty Sector	Save the Children Bangladesh
Dr. Mohammad Raisul Haque	Senior Technical Adviser- Suchana	Save the Children Bangladesh
Firdousi Naher	Professor	University of Dhaka, Department of Economics
Dr. Nazma Shaheen	Professor	University of Dhaka, Institute of Nutrition and Food Science
Md. Ruhul Amin, PhD, MPH	Associate professor	University of Dhaka, Institute of Nutrition and Food Science

Annex 2: CotD Modeling Plan

Target group	Intervention	Modality	Platform/Sector
Children under 2 years	Multiple micronutrient powders	In kind	Health
		At cost	Market
	Subji, subji with egg, and subji + MNP (5 MN and 15MN)	In kind	Local home fortification
	Egg powder	In kind	
	Fish powder	In kind and cash	
	Fortified biscuits	In kind	
	Fortified blended flour (homemade porridge)	In kind	Health
		In kind	ECD centres/creches
		At cost	Market
	Complementary feeding recipes	At cost	Market
	Removing breastmilk from the diet		
	MoDMR supplemental rations for children	in kind	Social safety net
School aged child Primary school: 3-12 years Secondary school: 13-17 years	Fortified biscuits	In kind	In kind through schools
	Nutrition sensitive school meals (fresh/fortified foods)	In kind	Schools
Adolescent Girls	IFA	In kind	Schools
	Multiple micronutrient tablets	In kind	Schools
	Adolescent pregnancy and lactation		
Pregnant or lactating women	IFA	In kind	Health centres
	Multiple micronutrient tablets	In kind	
	Calcium supplements	In kind	
	Groundwater iron		
Household	Vulnerable Group Development (VGD) Programme	In kind	Social safety net
	Mother and Child Benefit Programme	In kind	Social safety net
	Food Friendly Project (fortified and unfortified rice)	In kind	Social safety net
	Biofortified Rice	In-kind	Market
	Golden Rice		
	Fortified Rice		
	Unhealthy food habits: excess (actual) rice consumption, savory snack food, sweet snack food		
	Nutrition sensitive kitchen garden	In kind	Own production
	Fish ponds (carp, tilapia)		
	Livestock (milk cows)		
	MoDMR food relief packages	in kind	Social safety net
Additional models	Lifecycle and household composition sensitivity analysis		

Annex 3: CotD Modelling Assumptions

This annex contains the assumptions used for CotD modelling that are not included in the body of the report. The assumptions for the remaining models are found within the text of the full report, in their respective sections.

Target Group	Intervention	Modality	Dosage (g)	Frequency	Price/100g
Household	**Food friendly project**	**Subsidy**	Same as unfortified/biofortified product as defined by CotD software	Up to 3 times a day	10 Tk/kg
		In kind	30kg per hh per month of fortifier or unfortified rice	Monthly	**0**
	Excess rice consumption	Market, at cost	367g per capita per day (1835g per household)	Daily	Market cost
	Snack food consumption - sweet	Market, at cost	Sweet recipe, weekly quantities: sugar (200g), milk powder (60g), flour (8g), milk (30g), oil (45g)	Weekly	15Tk per 100g
	Snack food consumption - savory	Market, at cost	"Singara" recipe, weekly quantities: cauliflower (150g), potato (70g), pea (225 g) onion (60g), flour (272g), oil (250g)	Weekly	15Tk per 100g
	Fortified/ biofortified/ golden rice	Market, at cost	Same as unfortified/biofortified product as defined by CotD software	Up to 3 times a day	4.35 tk per 100g
	Kitchen gardens		Fruit per week (edible weight, g per hh): banana 700 tamarind 200 tomato 633 Vegetables per week (edible weight, g per hh): carrot 700 onion 700 okra 700 pumpkin 1500 bottle gourd 700 cauliflower 700 Amaranth leaf 1513 NB: Yield estimates from Helen Keller International	Weekly	**0**
	Fish ponds (tilapia or carp)		Carp (edible weight): 946g per hh per week. Tilapia (edible weight): 3358g per hh per week Note: Yield estimates provided by the World Bank	Weekly	**0**
	Livestock		Milk (650g) per hh per week	Weekly	**0**

Annex 4: The Nutrient Composition per 100g of added foods or Supplements used in CotD Modelling

Table 1: Added micronutrients in different types of rice			
Type of rice	Fortified rice	Biofortified rice	Golden rice
Nutrient	Amount per 100g		
Iron absorption	7%	5%	5%
Vitamin A (ug RE)	150		125
Vitamin B1 (mg)	0.4		
Vitamin B12 (ug)	1		
Folic acid (ug)	130		
Iron (mg)	6		
Zinc (mg)	4	2.3	

Table 2: Nutrient composition of supplements and SNFs*				
Nutrient composition per 100g	**MNP (15 MN)**	**MNP (5 MN)**	**Super Cereal Plus**	**Fortified biscuits**
Iron absorption	7%	7%	5%	5%
Energy (kcal)	0	0	410	450
Protein (g)	0	0	16	9
Fats (g)	0	0	9	15
RAE (ug retinol)	40000	30000	1039.04	250
Vit C (mg)	3000	3000	90	20
B1 (mg)	50	0	0.2	0.5
B2 (mg)	50	0	1.4	0.7
Niacin (mg)	600	0	8	6
B6 (mg)	50	0	1	1
Folate (mcg)	15000	27200	110	136
B12 (mcg)	90	0	2	2
Pantothenic Acid (mg)	0	0	1.6	3
Calcium (mg)	0	0	362	250
Iron (mg)	1000	1250	6.5	11
Magnesium (mg)	0	0	128.8	150
Zinc (mg)	410	500	5	0
Portion size	1g	1g	60g	50g
Frequency	3 days per week	3 days per week	Daily	Various

Table 3: Nutrient specifications of supplements (per 1 g)				
	MMS	IFA (Adolescent Girl)	IFA (PLW)	Calcium supplements (WHO recommends 1.5–2.0g a day)
Iron absorption	7%	7%	7%	
RAE (ug retinol)	8000			
Vit C (mg)	700			
B1 (mg)	14			
B2 (mg)	14			
Niacin (mg)	180			
B6 (mg)	19			
Folate (mcg)	6667	4,667	6,667	
B12 (mcg)	26			
Pantothenic Acid (mg)				
Calcium (mg)				15,000
Copper (mg)	20			
Iron (mg)	300	600	600	
Magnesium (mg)				
Zinc (mg)	150			
Portion size	1g	1g	1g	1g
Frequency	Daily	Weekly	Daily	Daily

Annex 5: Recommended Nutrient Intake (RNI) of modelled individuals

Sex	Age (in years)	Energy (kcal)	Protein (g)	Minimum fat (g)	Maximum fat (g)	Magnesium (mg)	Vitamin B1 (mg)	Vitamin B2 (mg)	Niacin (mg)	Vitamin B6 (mg)	Pantothenic Acid (mg)	Folate (µg)	Vitamin B12 (µg)	Vitamin C (mg)	Vitamin A (RE)	Calcium (absorbed, mg)	Iron (absorbed, mg)	Zinc (mg)
Female	9-11	694	11	27	39	54.0	0.3	0.4	4.0	0.3	1.8	80.0	0.7	30.0	400.0	400.0	0.9	4.1
Female	12-23	865	13	29	38	60.0	0.5	0.5	6.0	0.5	2.0	150.0	0.9	30.0	400.0	500.0	0.6	4.1
Female	4-5	1,241	16	34	48	76.0	0.6	0.6	8.0	0.6	3.0	200.0	1.2	30.0	450.0	600.0	0.6	4.8
Female	6-7	1,428	18	40	56	76.0	0.6	0.6	8.0	0.6	3.0	200.0	1.2	30.0	450.0	600.0	0.6	4.8
Female	10-11	2,006	31	56	78	220.0	1.1	1.0	16.0	1.2	5.0	400.0	2.4	40.0	600.0	1300.0	1.4	7.2
Female	14-15	2,449	46	68	95	220.0	1.1	1.0	16.0	1.2	5.0	400.0	2.4	40.0	600.0	1300.0	3.1	7.2
Female, pregnant	14-15	2,731	60	74	106	220.0	1.1	1.0	16.0	1.2	6.0	400.0	2.4	50.0	900.0	1300.0	3.1	7.2
Female, lactating	14-15	3,017	65	81	117	270.0	1.1	1.0	16.0	1.2	7.0	400.0	2.4	65.0	950.0	1300.0	3.1	7.2
Male	9-11	752	12	29	42	54.0	0.3	0.4	4.0	0.3	1.8	80.0	0.7	30.0	400.0	400.0	0.9	4.1
Male	12-23	948	14	32	42	60.0	0.5	0.5	6.0	0.5	2.0	150.0	0.9	30.0	400.0	500.0	0.6	4.1
Male	4-5	1,360	16	38	53	76.0	0.6	0.6	8.0	0.6	3.0	200.0	1.2	30.0	450.0	600.0	0.6	4.8
Male	6-7	1,573	18	44	61	76.0	0.6	0.6	8.0	0.6	3.0	200.0	1.2	30.0	450.0	600.0	0.6	4.8
Male	10-11	2,150	29	60	84	230.0	1.2	1.3	16.0	1.3	5.0	400.0	2.4	40.0	600.0	1300.0	1.5	8.6
Male	14-15	2,990	47	83	116	230.0	1.2	1.3	16.0	1.3	5.0	400.0	2.4	40.0	600.0	1300.0	1.5	8.6
Male	18-29	2,750	40	61	107	260.0	1.2	1.3	16.0	1.3	5.0	400.0	2.4	45.0	600.0	1000.0	1.4	7.0
Male	30-59	2,750	40	61	107	260.0	1.2	1.3	16.0	1.3	5.0	400.0	2.4	45.0	600.0	1000.0	1.4	7.0
Male	60+	2,250	40	50	88	224.0	1.2	1.3	16.0	1.7	5.0	400.0	2.4	45.0	600.0	1300.0	1.4	7.0
Female	18-29	2,200	36	49	86	220.0	1.1	1.1	14.0	1.3	5.0	400.0	2.4	45.0	500.0	1000.0	2.9	4.9
Female	30-59	2,300	36	51	89	220.0	1.1	1.1	14.0	1.3	5.0	400.0	2.4	45.0	500.0	1000.0	2.9	4.9
Female, pregnant	30-59	2,582	50	57	100	220.0	1.1	1.1	14.0	1.3	6.0	400.0	2.4	55.0	800.0	1000.0	2.9	4.9
Female, lactating	30-59	2,868	55	64	112	270.0	1.1	1.1	14.0	1.3	7.0	400.0	2.4	70.0	850.0	1000.0	2.9	4.9
Female	60+	2,050	36	46	80	190.0	1.1	1.1	14.0	1.5	5.0	400.0	2.4	45.0	600.0	1300.0	1.1	4.9

Assumption for adults: moderately active; 50kg (men)/ 45kg (women) of body weight;

Annex 6: Concept Note of FNG Bangladesh

Concept Note
Achieving SDG2.2 in Bangladesh - Fill the Nutrient-Gap situation analysis
for multi-sectoral decision making to improve nutrition (FNGA)

Introduction

Bangladesh has achieved food security, i.e. most people have sufficient food to meet their energy requirements. However, undernutrition, including stunting, wasting and micronutrient deficiencies are still highly prevalent, causing substantial morbidity and mortality and also affecting cognitive development and future income earning potential. The costs of undernutrition in Bangladesh have been estimated to be 1 billion USD per year, due to increased health care costs and reduced income earning capacities. In addition, overweight and obesity are increasing, causing a rise in non-communicable disease such as diabetes, hypertension and cardiovascular disease.

The two direct causes of malnutrition, including both undernutrition and overweight/obesity, are inadequate dietary intake and poor health, i.e. inflammation and disease. Dietary intake needs to be adequate, both in terms of quantity and quality. The latter requires consumption of a diverse diet so that all the nutrients required to keep the body healthy and to support growth and development, i.e. energy, protein, essential amino acids, essential fatty acids, vitamins, minerals, are consumed in age-appropriate amounts. While households may have access to enough food to meet their energy needs, they may not be able to access enough variety of foods, i.e. vegetables, fruits, animal source foods, legumes, nuts etc, due to availability or affordability constraints, to prevent malnutrition among the different members of their family, or they may not make appropriate choices.

The Fill the Nutrient Gap situation analysis assesses the extent to which consumers have choices, e.g. are nutritious foods available, physically accessible (own production, markets, urban vs rural environment) and affordable, and if so, what food choices do people make and why[3]. The FNG is conducted to inform multi-sectoral decision making by identifying context-specific barriers and entry-points for food, health and social protection systems to improve nutrition. It has been designed to contribute to national policy (re)design and intervention prioritization and operationalization, in particular of nutrition (e.g. of NNP and NPAN2 in the case of Bangladesh) and social protection, and to programme planning cycles. The analysis combines review of secondary information in the form of reports and papers, analysis of secondary data on food and nutrition, Cost of the Diet analysis to assess the affordability of nutritious diets and Cost of the Diet modelling analysis to estimate the impact that different multi-sectoral actions could have to improve affordability of nutritious diets. The analytical

[3] Bose I, Baldi G, Kiess L, de Pee S. The 'Fill the Nutrient Gap' analysis: An approach to strengthen nutrition situation analysis and decision making toward multisectoral policies and systems change. Matern Child Nutr, in press.

process involves multiple stakeholders who, based on the results, identify which nutrition-specific and nutrition-sensitive interventions to implement, e.g. across a country's food system.

Examples from FNG analyses in other countries

By the end of 2018, FNG analyses had been conducted in almost 20 countries[4]. In many, the focus was on informing national policies and several had an additional focus on specific geographic or programming areas (e.g. Karamoja in Uganda or refugee operations). In middle income countries where a substantial proportion of the population lives in urban areas, affordability and prices of nutritious foods relative to staple foods and low nutrient-density of many processed food are important issues (as per FNG findings from Ecuador, Ghana, Sri Lanka, Philippines). Also, in middle-income countries, social protection mechanisms, including social safety nets and schools, can play an important role to improve access and choices amongst the poorest, and to target specific subgroups with higher nutritional needs, such as children aged 6-23 months, school children and pregnant and lactating women (e.g. Indonesia, Ecuador, El Salvador). Analyses of constraints posed to meeting nutrient intake recommendations by high staple food intake and consumption of snack foods with high energy but low nutrient content have also proven powerful to further the understanding of how the food environment must be adjusted in support of nutrition and achieving SDG 2.2 (e.g. Cambodia, Tajikistan and the Philippines).

FNG analyses in Bangladesh

Based on discussion with government, academic, UN and NGO partners during a scoping visit by the FNG team from WFP Rome from 27-31 January, it is proposed to conduct two FNG analyses in Bangladesh: one with a national scope and one for the Rohingya and host populations in Cox's Bazar

National FNG

Aim: Assess to what extent people have access but do not make optimal choices and to what extent affordability and availability in fact limit people's ability to choose to consume nutritious foods. The analyses will be done at a Divisional level, distinguishing urban and rural areas and different target groups, provided that the data are available at this level of disaggregation. The findings from the analysis will be shared with relevant ministries and non-governmental agencies from different sectors in order for them to prioritize focus areas and strategies in the 8th Five Year Plan (2020-25), the Food and Nutrition Security Policy 2020 and the UNDAF Country Strategy, in order for the food, health and social protection systems to become more nutrition-sensitive by supporting improved consumption of nutritious foods in order to prevent malnutrition.

[4] For summaries of FNG analyses, see: https://www.wfp.org/content/2017-fill-nutrient-gap?_ga=2.259054594.903629526.1545412196-1325315182.1507034485

Data requirements:

a) For the secondary data and literature review, the FNG uses a data mapping spreadsheet that distinguishes different components of the High Level Panel of Experts (HLPE) framework on food systems and food environment to map different aspects of food availability, physical access and choices, and that lists many possible indicators and data sources. Through literature searches and stakeholder interviews pertinent sources of data and information will be identified and reviewed according to the structure of the framework. The data mapping spreadsheet has been shared with BBS for their information.
b) The Cost of the Diet analysis requires food price data, collected either at household level or from markets, and household expenditure data (i.e. amount spent on food and non-food, but doesn't need to be itemized). Ideally, data are available for different seasons, by Division and separately for urban and rural areas. The best secondary source of both food price and expenditure data would be the 2016 Household Income and Expenditure Survey of which the data are expected to be released in March. Another source of food price data could be the 2018 DAM data that are collected for the CPI calculation, but this is a relatively short food list (48 items) from a limit number of areas, and there would still need to be source of household expenditure data to assess affordability. The 2018 Bangladesh Integrated Household Survey is another very good source of both food price and expenditure data, but is only conducted in rural areas. These data will become available in June/July 2019. Therefore, the 2016 HIES food price and expenditure data are the first choice (other data from the HIES would not necessarily be required).

Roles, responsibilities and governance: The stakeholders of the FNG analysis in Bangladesh are all government and non-government agencies that directly or indirectly contribute to preventing malnutrition, including actors from the health, social protection, agriculture, food processing, retail and education sectors. The 'anchor' for the FNG within the Government should have the convening power to bring the ministries from the different sectors together and to take next steps based on the analysis. To conduct the analysis and validate the findings, a Technical Working Group of 15-20 people will need to be formed that consists of people from the technical FNG team (WFP-HQ), WFP CO and RB, and of representatives from the key stakeholders in-country (government, academia and NGOs) who can conduct (part of) the analysis and critically review the results. The larger stakeholder group will decide on the goal and focus of the analysis, review the findings and based on the results prioritize focus areas for the policies and interventions. For more information refer to Table 1.

Timeline: In order to inform the Five Year Plan and the Nutrition Security Policy, main results should be available by September 2019, which means that most of the analytical work should be done before then. Between Feb – mid April, the governance structure for the national FNG Bangladesh should be set-up and the 2016 HIES data would need to be shared. The official start including the multi-stakeholder inception workshop and the bilateral stakeholder meetings to inform the analysis can take place in the second half of April, with most of the analysis being conducted between May – August. If possible, an additional visit will be scheduled in that period, to validate findings with the technical working group. The recommendation development workshop should take place in September, where the final results slidedeck and preliminary summary report will be presented to the technical working group for final validation before being presented in a multi-stakeholder recommendations development workshop. The finalized summary and report will be made available at the end of the year.

Annex 7: TOR of the Technical Working Group

Terms of Reference
Fill the Nutrient Gap (FNG) Technical Working Group (TWG)

A. BACKGROUND:

The Fill the Nutrient Gap (FNG) provides a framework for strengthened situation analysis and multi-sectoral decision making that identifies context-specific barriers to adequate nutrient intake among specific target groups and engages different sectors to propose cost-effective strategies to overcome them. The analysis leverages country and sub-national specific secondary sources of data and information on factors that directly or indirectly impact on whether people can access and consume nutritious foods, if so, what food choices do people make and why, and ultimately, whether they meet recommended nutrient intakes.

This consolidated information is reviewed by a multi-sectoral group of stakeholders, at relevant levels, to come to a shared understanding of the issues, context and solutions. Through this consultation process, context-specific optimal policy and programme actions including possible entry points for interventions are jointly identified for different sectors (e.g. health, social protection) and across the food system, and by stakeholders from both public and private sector.

FNG highlights nutrient gaps and identifies barriers to nutritious, healthy and safe foods in a specific context for specific target groups by combining an analytical framework and process involving all stakeholders relevant for nutrition. It uses innovative analysis such as Cost of the Diet (CotD) to assess non-affordability issues, combined with analyzing secondary data on malnutrition characteristic, markets and market access, local dietary practices to identify context-specific solutions. In other countries, the FNG results have proven very useful to enable stakeholders from different sectors to prioritize strategies and interventions towards enhancing nutrition security for inclusion in national policies (especially for nutrition [NNP] and for social protection), operationalization (e.g. of NPAN2 and NSSS), and programming planning cycles.

A. STEPS FOR IMPLEMENTATION (April - September 2019)

- Introduce the concept of the Fill the Nutrient Gap analysis and the process in Bangladesh
- Identify key secondary sources of data and information on malnutrition, food availability, physical and economic access to foods, food choices, preferences and taboos, regional differences in food availability and preferences etc.
- Formation of FNG Technical Working Group
- Requesting food price data, data on household expenditure, to assess the lowest cost of a nutritious diet in different states/regions as well as urban vs rural areas
- Agree on the depth of the analysis, target groups and geographical focus & identify interventions for modelling in the Cost of the Diet analysis to assess impact on improving affordability of a nutritious diet
- Conduct the FNG analysis, including CotD
- Review and validate the findings with the TWG through an iterative process
- Share findings with all stakeholders for review and input
- Stakeholders prioritize interventions based on FNG findings

To carry out these activities, a Technical Working Group (TWG) will be formed and will include representatives from the following members:

- Cabinet Division, BNNC, BBS
- WFP Country team and Rome-based FNG team
- NPAN and NSSS relevant Ministries,
- Academia, UN, INGOs and
- SUN Networks

While all stakeholders will be part of the Bangladesh FNG consultative team, which will review the findings and prioritize actions & formulate recommendations, the TWG is a subgroup of this FNG team. The TWG consists of 15-20 people, who shall be more regularly involved throughout the analytical process, to provide inputs and review and validate findings as the analysis progresses.

B. Objectives of the TWG (or Core Group)

- Validate findings of the WFP FNG team
- Contribute data and reports for analysis & review by the WFP FNG team
- Review and provide inputs to the analysis plan and review results of the analysis
- Provide suggestions for Cost of the Diet modelling
- Assist to identify possible funding sources for the FNG analysis, to complement the investment from WFP

C. Requirement of the TWG members

- Can commit time to respond to requests for information, and to review and validate the findings/data (total time commitment 5-10 days, mainly during FNG team visits and some responding to ad-hoc requests)
- Have technical background on nutrition or food security
- Have experience in analyzing data, which will aid the review of the findings and enable making suggestions for additional analysis
- Provide technical assistance to WFP FNG team as requested, e.g. to search for additional information, summarize some findings in a table etc.
- Seeking inputs from the stakeholder entity that he/she represents, e.g. for the CotD modelling
- Attending meetings and workshop related to FNG