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Investing in Nutrition Now: A Smart
Start for Our Children, Our Future.
Estimates of Benefits and Costs of a
Comprehensive Program for Nutrition
in Bangladesh, 2011–2021

PROFILES and Nutrition Costing
Technical Report

June 2012



স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়



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PROFILES and Nutrition Costing Technical Report

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Improvement of nutrition will move Bangladesh closer to achievement of all eight Millennium Development Goals, including targeted reduction of extreme poverty, hunger, and child mortality. Investment in this crucial area is needed to ensure that every Bangladeshi child develops to his or her full potential.

Let me take this opportunity to request all key sectors, organizations, agencies, and persons to use the findings and recommendations of the report in the preparation of their sectoral

projects on nutrition and to devote their concerted efforts to ensure the effective and timely implementation of the National Nutrition Services (NNS) under Bangladesh's Health, Population and Nutrition Sector Development Program.



Professor Dr. Md. Ekhlashur Rahman
Director, IPHN, and Line Director, NNS and Directorate General of Health
Services, MOHFW

Forewords

Nutrition is a foundation for health and development in any country, especially in Bangladesh. A staggering 7 million children under 5 suffer from malnutrition in Bangladesh, while nearly half of child mortality is attributable to malnutrition. This is in large part because malnutrition is a complex problem and the result of multiple causes. Effectively reducing malnutrition in Bangladesh, therefore, will require a coordinated, multisectoral approach.

While we have been successful in many arenas of health and family planning, it is clear that greater investment in nutrition is essential to further build on these past successes. Because health and nutrition outcomes are interdependent, moving forward, the Health, Population, and Nutrition Sector Development Program (HPNSDP) must seek to harness and build on the synergy between health, family planning, and nutrition sectors for sustained progress in achieving health for all. Our ability to achieve the Millennium Development Goals (MDGs) and the *Bangladesh Vision 2021* depends on our willingness to recognize that nutrition is central to health and development. Our success will be determined by our level of commitment to improving nutrition through increased resources to ensure quality nutrition services, strong multisectoral collaboration, and capitalizing on lessons learned from past successes.

I believe that the results in this document can sharpen our vision of how to achieve improvements in nutrition that will ultimately improve development outcomes in Bangladesh and will help us plan more effectively for the next 5 years. Bangladesh will greatly benefit from this investment, and the cost estimates indicate that the resources needed are within the means of the current national budget. I thank all of those that have contributed to its development. On behalf of the Ministry of Health and Family Welfare (MOHFW), I assure you that we will do all we can to strengthen and integrate nutrition into the Ministry's service delivery efforts. As we envision comprehensive reform to the health sector and plan for the next HPNSDP, we must ensure that nutrition is effectively integrated in our services that reach families and communities.

I call upon my colleagues in health and family planning, agriculture, hygiene and sanitation, education, and food and disaster management to join us and work collaboratively toward a Bangladesh free of malnutrition. Together we will succeed.



Professor Dr. Khandhaker Md. Shefayetullah
Director General of the Directorate of Health Services, MOHFW

Nutrition is critical for development in Bangladesh and sustained investment in nutrition will enable Bangladesh to become a middle-income country by 2021. As a core component of the health, population, and nutrition (HPN) sector, nutrition is essential to sustain gains in the other sub-sectors of health and family planning. Nutrition is also central to improved education outcomes. Well-nourished children perform better in school, enroll in school earlier, and stay in school longer; over the long term, more children will complete higher education, leading to higher wages and greater productivity for the economy as a whole. As such, eradicating malnutrition is one of the best investments government can make. But perhaps the most compelling reason is that health and adequate nutrition is a right for every Bangladeshi.

The results presented in this report make a compelling case for greater investment in nutrition and serve as a call to action. Bangladesh will greatly benefit from this investment and the cost estimates indicate that the resources needed are within the existing means. Strong multisectoral coordination and leadership are essential to ensure that nutrition interventions are integrated into programs in the health and family planning, agriculture, and education sectors.

We at the United States Agency for International Development (USAID) stand in support of the government and are greatly encouraged to see the highest levels of government commitment and support for improving nutrition. I urge our partners in government and development to allocate the necessary resources to implement proven nutrition interventions at scale and across sectors and to champion nutrition at national, regional, and district levels. I encourage our partners to use the results in this report to continue to advocate for continued commitment and investment in nutrition.



A handwritten signature in blue ink, appearing to read 'Richard L. Greene', written in a cursive style.

Richard Greene
Mission Director
USAID/Bangladesh

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Acronyms and Abbreviations

ABC	activity-based costing
AD	assistant director
AHI	assistant health inspector
AIDS	Acquired Immune Deficiency Syndrome
ARI	acute respiratory infection
BBS	Bangladesh Bureau of Statistics
BDHS	Bangladesh Demographic and Health Survey
CC	community clinic
CHW	community health worker
CSBA	community-based skilled birth attendant
CSP	community service provider
DG	Director General
DGFP	Director General Family Planning
DGHS	Director General Health Services
DH	district hospital
dL	deciliter(s)
EBF	exclusive breastfeeding
FP	family planning
FPI	family planning inspector
FWA	family welfare assistant
FWC	family welfare center
FWV	family welfare visitor
g	gram(s)
GDP	gross domestic product
GOB	Government of Bangladesh
HA	health assistant
HIV	human immunodeficiency virus
HKI	Helen Keller International
HPN	health, population, and nutrition
HPNSDP	Health, Population, and Nutrition Sector Development Program
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
IDA	iron deficiency anemia
IDD	iodine deficiency
IFA	iron-folic acid
IMR	infant mortality rate
IPHN	Institute of Public Health and Nutrition
IU	International Unit(s)
IYCF	infant and young child feeding

KF	capital fixed cost
kg	kilogram(s)
L	liter(s)
LBW	low birth weight
µg	microgram(s)
MDG	Millennium Development Goal
mg	milligram(s)
MIS	management information system
MMR	maternal mortality ratio
MO	medical officer
MOE	Ministry of Education
MOHFW	Ministry of Health and Family Welfare
MOLGRD	Ministry of Local Government and Rural Development
NIPORT	National Institute of Population Research and Training
NGO	nongovernmental organization
NNS	National Nutrition Services
RD	rural dispensary
RF	recurrent fixed cost
RUTF	ready-to-use therapeutic food
RV	recurrent variable cost
SACMO	sub-assistant community medical officer
SAM	severe acute malnutrition
SBCC	social and behavior change communication
SD	standard deviation
SEARO	WHO South-East Asia Regional Office
U.N.	United Nations
UHC	Upazila Health Complex
UHFPO	upazila health and family planning officer
UHFWC	union health and family welfare center
US\$	United States dollar(s)
USAID	United States Agency for International Development
VAD	vitamin A deficiency
WFP	World Food Programme
WHO	World Health Organization
WPRO	WHO Western Pacific Regional Office

1. Executive Summary

Imagine Bangladesh free of the scourge of malnutrition. What will it take to get there? What would be the benefit? How much would it cost to achieve this goal? Over the past year, national stakeholders and technical experts gathered in an attempt to answer these and other questions. This report presents the results of this consultative and consensus-building process and seeks to provide a better understanding of the value of investing in nutrition and the level of investment required to improve nutrition as a means of achieving the Millennium Development Goals (MDGs) and *Bangladesh Vision 2021*¹ goals. For the period 2011 to 2021, this report presents, first, projections of the benefits of investing in nutrition in terms of gains in development outcomes and, second, the cost of providing maternal and child nutrition services at scale nationally. PROFILES,² a data-based tool that provides estimates of economic and other benefits that would result from improved nutrition, was used to project the benefits of investing in nutrition in terms of improvements in development outcomes, specifically reduced maternal and child mortality and improved economic productivity. The cost of providing maternal and child nutrition services at scale nationally was estimated by developing a national costing model for nutrition programs. The objective of this report is to share estimates that were generated from these two models to guide policy makers on the scope of nutrition interventions and costs of nutrition programming for consideration as the operational plans for the health, population, and nutrition (HPN) sector program are implemented.

The PROFILES estimates (**Executive Summary Figures 1 to 6**) suggest that, over the 2011–2012 period, about 160,000 child deaths could be averted by reducing the prevalence of chronic malnutrition (stunting). Similarly, about 150,000 child deaths could be averted by reducing the prevalence of acute malnutrition (wasting).³ The cost of providing effective nutrition services at scale for Bangladesh (**Executive Summary Table 1**) is estimated in the range of Tk. 9,000–12,000 crore (US\$1.3–\$1.7 billion) for the period 2011 to 2021 (i.e., Tk. 900–1,200 crore per year [US\$130–\$170 million]). The net benefit of these investments in nutrition in terms of increased economic productivity alone exceeds Tk. 70,000 crore (US\$10 billion) by 2021. The total cost of providing nutrition services at scale is not high; the amount required for the nutrition program in an average year is only 11 percent of the total amount budgeted for the HPN sector. Overall, the amount required is small relative to, for example, the size of the proposed government budget for FY 2011–2012, which is Tk. 130,000 crore (US\$18.6 billion), of which 5.5 percent (Tk. 7,150 crore [US\$1 billion]) has been allocated to the HPN sector. To meet the required amount per year, the Ministry of Health and Family Welfare (MOHFW) could reallocate and reorganize cost centers and line items, or the government could increase its allocation for the HPN sector from 5.5 percent to 6.74 percent—an increase of only 1.24 percentage points.

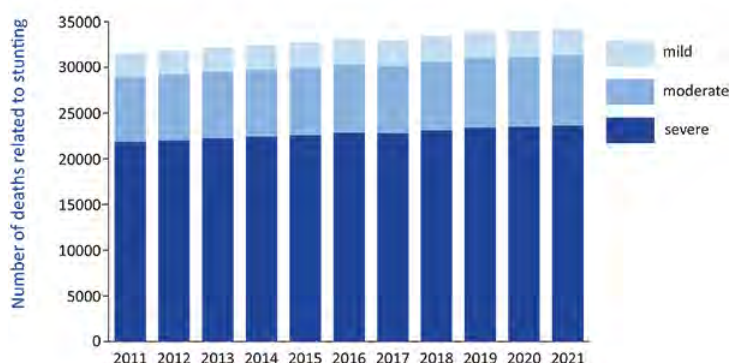
¹ http://www.cpd-bangladesh.org/Policy%20Brief/sub%20folders/downloads/Vision_2021_English.pdf.

² PROFILES is an advocacy tool and process for nutrition policy advocacy that builds on a series of models reflecting current nutrition knowledge, developed and maintained by FHI 360. This work has been supported by grants from many donors as well as internal FHI 360 resources.

³ There is some overlap in the deaths associated with stunting and wasting.

Executive Summary Figure 1.

Status Quo = Increasing* Number of Under-5 Child Deaths Related to Stunting from 2011 to 2021**

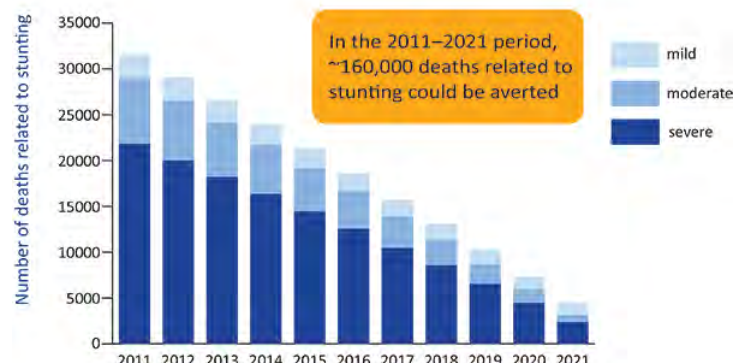


* Because of increase in annual number of births

** Mild, moderate, and severe stunting (low height-for-age)

Executive Summary Figure 2.

High Coverage of Effective Nutrition Interventions = Decreasing Number of Under-5 Child Deaths Related to Stunting* from 2011 to 2021**

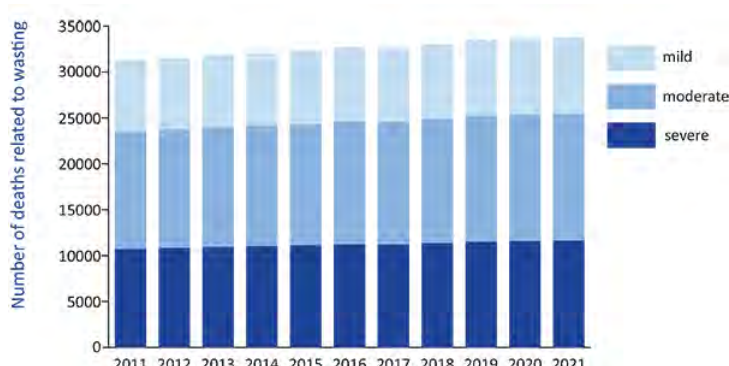


* Mild, moderate, and severe stunting (low height-for-age)

** In the 2011–2015 time period, ~28,000 deaths related to stunting could be averted

Executive Summary Figure 3.

Status Quo = Increasing* Number of Under-5 Child Deaths Related to Wasting from 2011 to 2021**

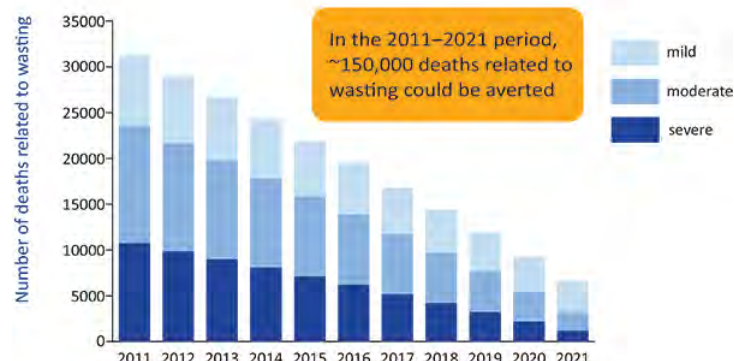


* Because of increase in annual number of births

** Mild, moderate, and severe wasting (low weight-for-height)

Executive Summary Figure 4.

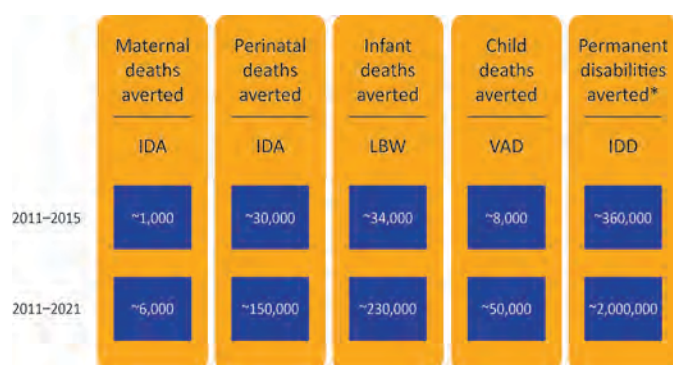
High Coverage of Effective Nutrition Interventions = Decreasing Number of Under-5 Child Deaths Related to Wasting* from 2011 to 2021**



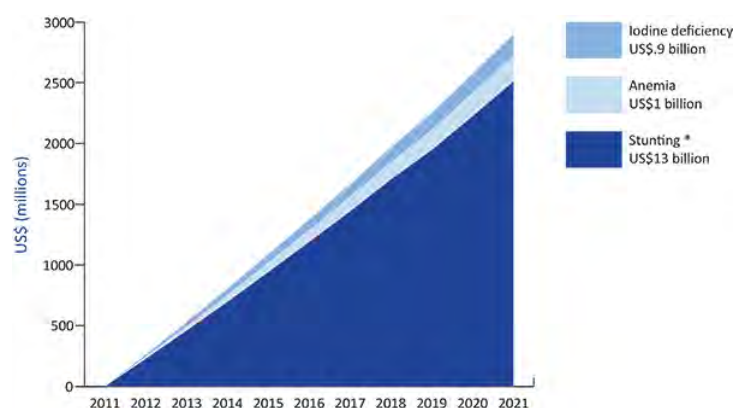
* Mild, moderate, and severe wasting (low weight-for-height)

** In the 2011–2015 time period, ~26,000 deaths related to wasting could be averted

Executive Summary Figure 5.
Saving Lives and Preventing Disabilities



Executive Summary Figure 6.
Productivity Gains by 2021



Executive Summary Table 1. Estimates of Cost for 2011–2015, 2016–2021, and 2011–2021, by Cost Center

Cost centers	Scenario 1						Scenario 2					
	Estimates of cost						Estimates of cost					
	2011–2015		2016–2021		2011–2021		2011–2015		2016–2021		2011–2021	
	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)
Direct costs												
Social and behavior change communication (SBCC) and community nutrition promotion	722	105	1,075	156	1,797	260	722	105	1,075	156	1,797	260
Management and coordination	142	21	223	32	366	53	142	21	223	32	366	53
Systems strengthening ¹	436	63	265	38	701	102	436	63	265	38	701	102
Micronutrient supplementation ²	1,161	168	1,935	280	3,095	449	1,161	168	1,935	280	3,095	449
Targeted food supplementation of pregnant and lactating women and children under 2 among bottom three quintiles							1,128	163	1,868	271	2,997	434
Management of severe acute malnutrition (SAM) in children ³	1,827	265	1,174	170	3,001	435	1,827	265	1,174	170	3,001	435
Deworming for children aged 2–5 years	9	1	17	3	25	4	9	1	17	3	25	4
Total	4,297	623	4,689	680	8,985	1,302	5,425	786	6,557	950	11,982	1,736
Indirect costs through public-private partnership												
Food fortification	1,126	163	1,919	278	3,045	441	1,126	163	1,919	278	3,045	441

¹ System strengthening cost includes training and management information system (MIS) cost.

² Micronutrient supplementation includes iron-folic acid (IFA) supplementation to pregnant and lactating women and non-pregnant adolescents, supply of vitamin A capsules to mothers and children, supply of multiple micronutrients to children 1–5 years of age, and supply of zinc to children under 5 during treatment for diarrhea.

³ Management of SAM children includes treatment of SAM children in a health facility and a supply of ready-to-use therapeutic food (RUTF) for them.

Today, malnutrition in Bangladesh affects almost half of all preschool children and women of childbearing age. In 2007, the prevalences of underweight, stunting, and wasting among children under 5 were 41 percent, 43 percent, and 18 percent, respectively (Bangladesh Demographic and Health Survey [BDHS] 2007). Trends in the prevalence of malnutrition in Bangladesh indicate that over time the rate of improvement has been variable. Underweight, stunting, and wasting declined rapidly between the 1996–1997 and 1999–2000 BDHSs, by approximately 10 percent. In contrast, in the period between 1999–2000 and 2007, the decrease in the prevalence of underweight was only around 1 percent, and for stunting about 8 percent over the same period; the prevalence of wasting actually increased by about 5 percent over that period.

Malnutrition is a major cause of childhood illness and mortality in Bangladesh. If malnutrition rates were reduced significantly, the returns on improved health, well-being, and productivity would be significant, and the child mortality rate would also be reduced substantially. Reducing the prevalence of malnutrition by half by 2015 is an explicit target under MDG 1 and improved nutrition is essential to achieving MDGs 2, 4, 5, and 6.⁴ However, at the current rate of improvement in the prevalence of underweight, Bangladesh is unlikely to meet the target for MDG 1 by 2015, which will likely have an effect on the rate of progress toward reaching the other MDGs as well. One of the goals of *Bangladesh Vision 2021* is to significantly reduce malnutrition, but achieving these targets requires rapid improvements in nutritional status in Bangladesh, especially of women and children.

Investing in nutrition is smart and sound: This critical investment saves mothers' and children's lives and improves children's education outcomes, which, in turn, boosts economic productivity. For Bangladesh, investing in nutrition today will result in short-, medium-, and long-term benefits. Increasing investment in nutrition now will enable Bangladesh to achieve and exceed all five of the country's MDGs and fulfill its *Vision 2021* goals. The results presented in this report show that investing now in nutrition programming will lead to a significant improvement in nutrition indicators, which, in turn, will result in substantial returns in terms of development outcomes in the future. The cost of this investment is feasible for Bangladesh over the next decade. Increasing health sector expenditure by a fraction and reallocating resources within existing funding over the next decade can ensure that Bangladesh will be a country free of the scourge of malnutrition in the near future.

As the Government of Bangladesh (GOB) begins the implementation of its next Health, Population, and Nutrition Sector Development Program (HPNSDP), it is hoped that the following recommendations, based on the analyses presented in this report, will be considered. These recommendations have been grouped into three sets. The first presents recommendations that are based on the results of the PROFILES and costing analyses. The second and third sets support the results presented in this report and focus on the enabling environment that would be needed to effectively implement nutrition services at scale, which is essential to ensuring reductions in the prevalence of chronic and acute malnutrition in Bangladesh.

⁴ MDG 2 refers to achieving universal primary education. MDG 4 refers to reducing child mortality. MDG 5 refers to improving maternal health. MDG 6 refers to combating HIV/AIDS, malaria, and other diseases.

Results-Based Recommendations

The PROFILES estimates show that while there are many nutrition problems, because the prevalences of chronic and acute malnutrition are high in Bangladesh, implementing effective nutrition interventions that will target and reduce these two more intractable forms of malnutrition will result in the greatest benefit—in terms of significant reductions in child mortality and gains in economic productivity mediated through improved education outcomes resulting from improved nutrition. This suggests that the next nutrition program should focus on these two nutrition problems and, because evidence shows that the best window of opportunity to intervene is in the first 1,000 days, that effective nutrition interventions focus on this period.

- **Focus nutrition efforts on the more intractable nutrition problems.** The gains that could be achieved through effective implementation of health and family planning interventions at scale have largely been achieved. Achieving the next level of improvement will likely depend on and benefit from greater investment in and focus on the implementation of effective nutrition interventions. Sustained improvements across all three HPN subsectors will depend on harnessing the synergy between these three subsectors. Within nutrition programming itself, efforts should focus on tackling adolescent nutrition, maternal nutrition, low birth weight (LBW) (less than 2,500 g at birth), stunting, and acute malnutrition, and on ensuring that nutrition services provide a continuum of care that crosses the spectrum from prevention of chronic malnutrition to treatment of acute malnutrition.
- **Focus nutrition programming on the first 1,000 days.** It is now well established that the period from pregnancy until a child turns 2 years of age is the window of opportunity for sustained reductions in the prevalence of malnutrition. In Bangladesh, this implies that nutrition programming should focus on four key areas: promoting adolescent nutrition and delaying marriage and first pregnancy to reduce the prevalence of LBW and to ensure adequate maternal nutrition at the onset of pregnancy; improving maternal nutrition during pregnancy to reduce the prevalence of LBW, and improving maternal and newborn care to improve birth outcomes; promoting exclusive breastfeeding in the first 6 months followed by appropriate and timely infant and young child feeding (IYCF) practices from 6 to 24 months to prevent chronic malnutrition; and preventing and treating moderate and severe acute malnutrition in children under 5.

The costing results provide an estimate of the cost of providing nutrition services at scale for Bangladesh. While the amount needed per year for nutrition services is within the means of the national budget, it is an increase over the level of funding nutrition has received in the past. This increase is needed to deliver results in reducing malnutrition in Bangladesh. Not only is the nutrition subsector under-invested, the HPN sector as a whole needs to be adequately funded to both deliver a return on that investment in each subsector and to reap the benefit of the synergy and efficiency gained by investing in each subsector.

- **Increase investment in nutrition as a subsector.** Increasing resource allocation to the nutrition subsector in tandem with efforts to strengthen integrated implementation of health, family planning (FP), and nutrition services at scale will help ensure that the nutrition subsector can achieve its stated targets.

- **Increase allocation for health expenditures from the national budget.** Adequate resource allocation for each of the three HPN subsectors will be important for further improvements in health, FP, and nutrition. The synergy across the three sectors working together in an integrated and coordinated manner will also result in greater cost-efficiency over the long term. Increasing resource allocation for the health sector as a whole can ensure that the nutrition subsector will have adequate resources to achieve the stated targets.

Creating an Enabling Environment for Improved Nutrition

Program-Based Recommendations

One issue that stakeholders reflected on throughout the process of developing the results presented in this report was how nutrition services should be implemented at scale. Three broad areas were identified; they focused on developing a plan for phasing implementation at scale, strengthening supervision and monitoring and evaluation of nutrition services, and revising job descriptions of government health sector providers to reflect the integration of nutrition.

- **Develop a plan for phasing the implementation.** As scaling up of nutrition services will likely take some time, it is recommended that the GOB develop a plan for phased implementation, selecting pilot upazilas for the first year to launch services and capture lessons learned for moving forward. As seen in Figure 6 (page 31), for the purposes of costing, it was assumed that the government would phase the scale-up of nutrition services, starting with providing services in 100 upazilas in Year 1, 204 upazilas in Year 2, and the remaining 204 upazilas in Year 3, such that by Year 3 nutrition services would be provided at scale across the country. Prioritizing upazilas in the first phase should take into account various factors, including malnutrition prevalence, geographic considerations, and existing infrastructure and personnel, among others.
- **Strengthen supervision, monitoring, and evaluation.** Effective supervision, monitoring, and evaluation will be important for delivering quality service and ensuring accountability among managers. Clear roles and responsibilities on nutrition integration for managers and each tier of staff will be essential to ensure effective implementation and oversight of integrated nutrition services. The current Director General Family Planning (DGFP) and Director General Health Services (DGHS) management information systems (MIS) and related reporting forms should be revised and updated to include key nutrition indicators to track progress on nutrition outcomes. At each level of service provision, staff should be adequately trained on reporting and collecting nutrition-related data. This includes community volunteers and community service providers (CSPs) in the community clinics (CCs), but also higher-level staff in the upazilas and districts.
- **Revise job descriptions and reallocate staff to positions that allow them to focus on nutrition.** Implementing the nutrition component through the HPN sector will require some changes to the existing service delivery structure, which also entails changes to the roles and responsibilities of personnel and service providers working in the HPN sector at different levels. Job descriptions should be revised to clarify the roles and responsibilities for each tier of staff in integrating nutrition in their day-to-day work. Revised job descriptions should be clear on what is required by position in

integrating nutrition and how every staff member will be held accountable for fulfilling these duties.

Policy-Based Recommendations

Part of having an effective enabling environment for the provision of nutrition services at scale is to have a policy environment that clarifies and guides government and nongovernment stakeholders on the expected results of nutrition interventions and that provides a framework with target outcomes, approaches, and target populations to be reached. As such, the three policy-based recommendations to support the scale-up of effective nutrition services are to develop an updated National Nutrition Plan of Action for Bangladesh, to develop a harmonized social and behavior change communication (SBCC) strategy and communication plan for nutrition, and to convene a high-level multisectoral steering committee within the GOB to provide oversight and guide the scale-up and implementation of nutrition services.

- **Develop an updated, evidence-based National Nutrition Plan of Action for Bangladesh.** The last update to the National Nutrition Policy was conducted in 1997. Since that time, the nutrition situation in Bangladesh has evolved, as has the field of nutrition itself. As such, a critical first step to guide both the GOB and its key partners, including international and local nongovernmental organizations (NGOs), is the development of a new National Plan of Action (or Policy) for Bangladesh. Given the efforts that are under way to implement a new national program for nutrition, through the National Nutrition Services (NNS), such a plan of action is essential to guide and build synergy between policy makers, program managers, and implementing partners in their efforts to improve the nutrition situation of Bangladesh. Such a document would strengthen the GOB's position by laying out its vision for the country in terms of being free of malnutrition, and it would identify a roadmap of how the GOB and its partners can better coordinate and leverage each other's resources to achieve this central goal of eradicating malnutrition. Without such a plan of action, the current efforts under way to tackle malnutrition can easily be lost.
- **Develop an SBCC strategy and communication plan linked with the National Nutrition Plan of Action.** In order to maximize the effectiveness of SBCC in Bangladesh, the GOB and implementing partners should have a unified and harmonized approach to SBCC and, based on that approach, develop a communication plan. A consultative workshop with the GOB and its partners to develop a comprehensive SBCC strategy, which would align with the priorities and outcomes outlined in the National Nutrition Plan of Action for Bangladesh, is needed. This process would focus on coordinating activities and resources for a multilayered SBCC approach, and creating linkage and reinforcing messages between existing and needed nutrition SBCC projects and campaigns. This would ensure less duplication of effort, greater harmonization of messaging, and increased synergy between SBCC activities, and would ensure that all stakeholders working on nutrition are “speaking the same language” in promoting key nutrition behaviors. In addition, a communication plan should be developed that addresses the four critical areas in the lifecycle approach: adolescents; pregnancy and birth outcomes; breastfeeding, IYCF, and the prevention of chronic malnutrition; and severe acute malnutrition (SAM) and moderate acute malnutrition. The communication plan developed collaboratively would specify target audiences, the desired change for each audience, barriers

inhibiting that change, communication objectives that address barriers, strategic approaches, key messages, channel mix (e.g., interpersonal, community-based, and mass media), activities, and materials.

- **Form a high-level multisectoral committee.** Effectively implementing a comprehensive nutrition program will involve several sectors, particularly health and family welfare, local government and rural development, education, information, and food and agriculture. As such, a high-level committee should be formed, preferably with the prime minister or the finance minister as the chair. This committee would establish the overarching agenda and guidelines for each sector to integrate nutrition, allocate the required resources, and monitor the performance of each at regular intervals. A committee at this level will promote high-level collaboration and dialogue across the sectors, which will further cultivate shared responsibility for nutrition for Bangladesh. It will also enable representatives from each of the sectors to resolve any issues that may arise in the course of implementation.

2. Introduction

Imagine Bangladesh free of the scourge of malnutrition. What will it take to achieve this? What would be the benefit? How much would it cost to achieve this goal? Over the past year national stakeholders and technical experts gathered to attempt to answer these questions. This report presents the results of this consultative and consensus-building process and seeks to provide a better understanding of the value of investing in nutrition and the level of investment required to improve nutrition as a means to achieve the MDGs and *Bangladesh Vision 2021* goals (GOB and United Nations [U.N.] 2005, GOB 2009). For the period 2011 to 2021, this report presents first, the projections on the benefits of investing in nutrition in terms of gains in development outcomes; and second, the cost of providing maternal and child nutrition services at scale nationally. PROFILES, a data-based tool that provides estimates of economic and other benefits that would result from improved nutrition, was used to project the benefits of investing in nutrition in terms of improvements in development outcomes, specifically reduced maternal and child mortality and improved economic productivity. Second, the cost of providing maternal and child nutrition services at scale nationally was estimated by developing a national costing model for nutrition programs. The objective of this report is to share estimates that were generated from these two models to guide policy makers on the scope of nutrition interventions and costs of nutrition programming for consideration as the operational plans for the health, population, and nutrition (HPN) sector program are implemented.

The Bangladesh HPN sector is widely recognized as having achieved significant improvements in health and population indicators as a result of several major interventions. This success is manifested in improvements in several indicators, including, among health indicators, prevalence and incidence of a number of deadly diseases, access to modern health care, sanitation, health infrastructure, maternal mortality ratio (MMR), child immunization rates, infant mortality rate (IMR), and life expectancy and, among population indicators, contraceptive prevalence rate, total fertility rate, and population growth rate. However, progress on nutrition indicators has been much slower, even after the implementation of two nationwide programs. Chronic malnutrition affects nearly 50 percent of children under 5, and the prevalence of acute malnutrition, both severe and moderate, among children under 5 is 18 percent. Recent studies conclude that the prevalence rates of malnutrition are high by any measure, and the rate of improvement in nutritional status over the past decade has been slow. Malnutrition remains a serious public health problem in Bangladesh today and the nutrition interventions that have been implemented during the last decade have had little impact (Rahman and Biswas 2009). Nonetheless, targeted nutrition interventions implemented at scale are needed to significantly reduce the prevalence of malnutrition. For Bangladesh, implementation of a comprehensive national program focusing on nutrition is urgently called for.

- First, improvement in health and population indicators of the HPN sector, which was rapid over the period from the late 1970s to the 1990s, has almost halted in recent years. This trend is consistent with the neoclassical economic law of diminishing marginal productivity and, under these circumstances; further improvement requires a shift from the status quo. Shifting HPN sector programming to include a comprehensive nutrition program will give the sector the next big push to realize further improvements. Investment in and improvement of nutrition will enable the

government to boost the performance of the sector to achieve its stated health targets for “Health for All,” the Millennium Development Goals (MDGs), and the *Bangladesh Vision 2021* goals.

- Second, it is now well established that implementing effective nutrition interventions at scale generates significant benefits that greatly surpass the cost of implementing the nutrition interventions themselves; these are highly cost-effective interventions for a resource-poor country.

The GOB is currently in the process of determining the scope of and approach for its next HPN sector program. This report is timely, as it was undertaken when the Bangladesh Ministry of Health and Family Welfare (MOHFW) was preparing the fourth 5-year health sectoral plan (the Health, Population, and Nutrition Sector Development Plan [HPNSDP]) for the period of 2011–2016, and it seeks to inform and support the planning for one component of the HPN sector in particular: nutrition. It is hoped that the findings presented in this report will be useful to those directly or indirectly involved in the formulation and implementation of the plan so that they may attach the required emphasis to its nutrition component.

To lay the groundwork for the national nutrition services in Bangladesh, in partnership with the MOHFW, and supported by United States Agency for International Development (USAID), FHI 360’s Food and Nutrition Technical Assistance II Project (FANTA-2) conducted this study with two objectives: to estimate the benefits of investing in nutrition and the total cost of a comprehensive national program for nutrition; and to disseminate the results of the estimates to policy makers, program managers, and key stakeholders to advocate for investment in and implementation of a comprehensive national program for nutrition. While cost-benefit analyses of nutrition interventions have been conducted in other nutrition-poor countries, no such effort has been undertaken in Bangladesh. This analysis is important because cost-benefit analysis remains the best method of assessing the prospective net return of any investment activity.

To achieve these objectives, this assignment:

- Used PROFILES⁵ to project the effects of malnutrition on health, education, and productivity and to estimate the monetary value that would result from improved nutrition.
- Estimated the cost of implementing a comprehensive national program for nutrition in Bangladesh: The estimation exercise itself involved a number of tasks, including identifying an appropriate structure for the program, selecting the necessary interventions and activities, determining a management structure and a method of service provision, identifying the inputs and obtaining the unit costs of each activity and input, and, finally, estimating the program cost for 11 years (2011–2021).

⁵ PROFILES is a tool and a process to support nutrition advocacy for policy change that uses spreadsheet models to estimate the functional consequences of malnutrition in terms that policy makers understand and care about.

- Presented the results to a range of key stakeholders to discuss the implications of the resulting estimates and to agree on recommendations for action, including a way forward to develop and disseminate key advocacy materials.

The report is organized as follows.

- **Section 3** discusses the impact of nutrition generally and specifically describes the nutrition situation in Bangladesh.
- **Section 4** describes the approach taken to arrive at the PROFILES and cost estimates.
- **Section 5** presents the methods used for both models.
- **Section 6** presents the results of the analyses.
- **Section 7** discusses the results and implications.
- **Section 8** presents concluding remarks.
- **Section 9** presents recommendations for action.

3. The Impact of Nutrition and the Nutrition Situation in Bangladesh

3.1 Why Invest in Nutrition and Why Now?

Nutrition is one of the foundations of health and development, and specifically in Bangladesh, malnutrition is one of the major causes of childhood illness and mortality (World Bank 2006). If malnutrition rates were reduced significantly, the returns on improved health, well-being, and productivity would be significant, and there would be a concurrent substantial reduction in the child mortality rate. A well-nourished Bangladeshi population will be more capable of fulfilling its aspirations in education, health, and economic well-being. In fact, an expert panel at the 2012 Copenhagen Consensus identified nutrition interventions as the best investment, noting that “the educational benefits as well as the health benefits should be taken into consideration. Even in very poor countries and using very conservative assumptions, each dollar spent reducing chronic undernutrition has at least a [US\$]30 payoff.”

Health is a basic human right and improving the nutritional status of a population fulfills in part the right to health, but also several of the human rights covenants. As published in *Bangladesh Vision 2021*, the GOB has declared a set of goals to be achieved by 2021, with a view to achieving middle-income status for the country. One of the *Vision*’s goals is to significantly reduce malnutrition, but achieving this goal requires rapid improvements in nutritional status in Bangladesh. In addition, reducing the prevalence of malnutrition by half by 2015 is an explicit target under MDG 1, and improved nutrition is essential to achieving MDGs 2, 4, 5, and 6.⁶ However, at the current rate of improvement in the prevalence of underweight, Bangladesh is unlikely to meet the target for MDG 1 by 2021, which will likely affect the rate of progress toward reaching other MDGs as well. The high prevalence of malnutrition in its various forms will be a limiting factor for further improvement in the health sector. Increasing investment in nutrition now will enable Bangladesh to achieve and exceed all five of these MDGs.

Poverty and malnutrition are intimately interrelated: Poverty exacerbates malnutrition and malnutrition exacerbates poverty. Poverty increases the risk of malnutrition in various ways. Poor households have lower purchasing power, which results in inadequate food access, leading to inadequate diets and food intake. Poor households are also more likely to have large family size with high dependency ratios, frequent pregnancies and infections, and unhealthy environments; members in these households also frequently engage in hard physical labor. Together, these factors contribute to an increased risk of malnutrition. Conversely, malnutrition that underlies poor health status, poor cognitive development and schooling, and increased health care expenditures results in productivity losses, which further exacerbates poverty. This cyclical relationship perpetuates poverty within and across generations, because malnutrition is intergenerational in nature, passing from mother to child.

⁶ MDG 2 refers to achieving universal primary education. MDG 4 refers to reducing child mortality. MDG 5 refers to improving maternal health. MDG 6 refers to combating HIV/AIDS, malaria, and other diseases.

Therefore, investing in nutrition is the right thing to do, because all children, regardless of where they are born, deserve the opportunity to reach their full potential. Improving early child nutrition is a precondition to achieving the MDGs. More than 35 percent of annual preventable deaths among children under the age of 5 are associated with malnutrition (Black et al. 2008). And the increased burden of disease caused by malnutrition in developing countries adds to the human and economic impact. It is estimated that investing in nutrition can increase a country's gross domestic product (GDP) by at least 3 percent annually.

Several studies have shown that malnutrition compromises economic productivity several ways, including lower wages, lower physical capability, and more days away from work as a result of illness (Hoddinott et al. 2008). One study showed that a 1 percent loss in adult height results in a 1.4 percent loss in productivity (Haddad and Bouis 1991). Other studies have shown that a 1 percent loss in adult height results in a 2–2.4 percent loss in productivity (Caulfield et al. 2006, Strauss and Thomas 1998). Iron deficiency anemia (IDA) has also been shown to reduce adult productivity. Horton and Ross (2003) estimate that eliminating IDA would result in a 5–17 percent increase in adult productivity. Malnutrition costs developing countries, including Bangladesh, billions in lost revenue through reduced productivity (Alderman and Behrman 2004, World Bank 2006, AED 2003).

In contrast, the costs of effective nutrition interventions are low; various approaches have been used to ascertain the cost of nutrition interventions (including Fiedler 2003, Fiedler 2008, and Horton et al. 2010). The World Bank (2006) estimates that the unit costs of community-based growth promotion is between US\$1.60 and US\$18.00; food supplementation between US\$36.00 and US\$172.00; nutrition education, US\$2.50; vitamin A fortification of sugar, US\$0.69–\$0.98; iron supplementation, US\$0.55–\$3.17; and salt iodization US\$0.20–\$0.50. From an economic perspective, any benefit-cost ratio greater than 1 is considered worthwhile. Behrman et al. (2004) estimate the benefit-cost ratio for integrated child care programs to be between 9 and 16; for iodine supplementation of women, between 15 and 520; for vitamin A supplementation of children under 6 years, between 4 and 43; for iron supplementation per pregnant woman, between 6 and 14; and for iron fortification per capita, between 176 and 200.

On average, the GOB has consistently allocated about 4.4 percent of the national budget to health expenditure; this level has remained relatively constant, even though GDP has grown over time (DGHS 2009). Overall, this is well below the level of investment required for a developing country. It is widely acknowledged that health expenditures should be in the range of 10–15 percent of the national budget to achieve sustained gains in the health and well-being of the Bangladeshi population. This would, in turn, fuel sustainable development for Bangladesh through higher productivity that leads to greater competitiveness in the global economy (WHO/SEARO and WHO/WPRO 2008). Within the HPN sector itself, each subsector—nutrition, health, and family planning—is equally important, and they are synergistic. Investing in any one of these sectors alone will not lead to the same return as investing adequately in all three sectors at scale. There is widespread agreement among experts within Bangladesh, however, that nutrition has not received the necessary level of investment.

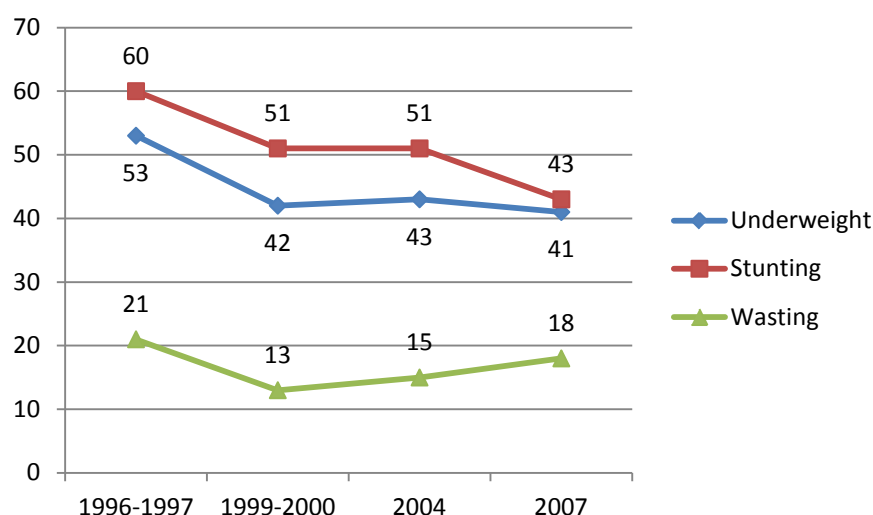
Nutrition is a critical component of the HPN sector, and investment in nutrition is essential to sustain the gains from the other subsectors of health and family planning. For example, as reductions in overall infant and child mortality are achieved as a result of successful health interventions, such as Integrated Management of Childhood Illness (IMCI), the greatest proportion of infant and child deaths remaining will be neonatal deaths. And neonatal deaths are often a result of low birth weight (LBW)—an outcome of poor maternal nutrition. Nutrition is also essential for improved education outcomes. Well-nourished children perform better in school, enroll in school earlier, and stay in school longer. Over the long term, this results in more children reaching and completing higher education, leading to higher wages and greater productivity for the economy as a whole. As such, eradicating malnutrition is one of the best investments a government can make. Clearly, the manifold benefits from improved nutrition far outweigh the costs.

3.2 What Is the Scale of the Problem?

In 2007, the prevalences of underweight, stunting, and wasting among children under 5 were 41 percent, 43 percent, and 18 percent, respectively (NIPOORT, Mitra and Associates, and Macro International 2009). Trends in the prevalence of malnutrition in Bangladesh indicate a downward trend over time, but the rate of improvement has slowed significantly in recent years. **Figure 1** presents the prevalence of malnutrition based on World Health Organization (WHO) growth standards for each BDHS survey year.⁷ Underweight, stunting, and wasting declined rapidly between the 1996–1997 and 1999–2000 surveys, by approximately 10 percent. In contrast, in the period between 1999–2000 and 2007, the decrease in the prevalence of underweight was only around 1 percent, and for stunting about 8 percent over the same period; the prevalence of wasting actually increased by about 5 percent over that period. Other surveillance data for Bangladesh are also consistent and show similar trends (HKI and IPHN 2006). The National Nutrition Program baseline survey in 2004 found the prevalence of stunting to be 36 percent; wasting, 14 percent; and underweight, 41 percent (Hossain and Bhuyan 2009). According to the 2005 Child and Maternal Nutrition Survey of Bangladesh, the prevalence of stunting among children under 2 was 35 percent; wasting, 20 percent; and underweight, 36 percent (BBS and UNICEF 2007). Together, these recent studies further substantiate that the prevalence of malnutrition is not only high, but that the rate of improvement in nutritional status over the past decade has slowed significantly.

⁷ The prevalence of malnutrition reflected in each BDHS has been reanalyzed by WHO to reflect the updated WHO growth standards (WHO Multicentre Growth Reference Study Group 2006).

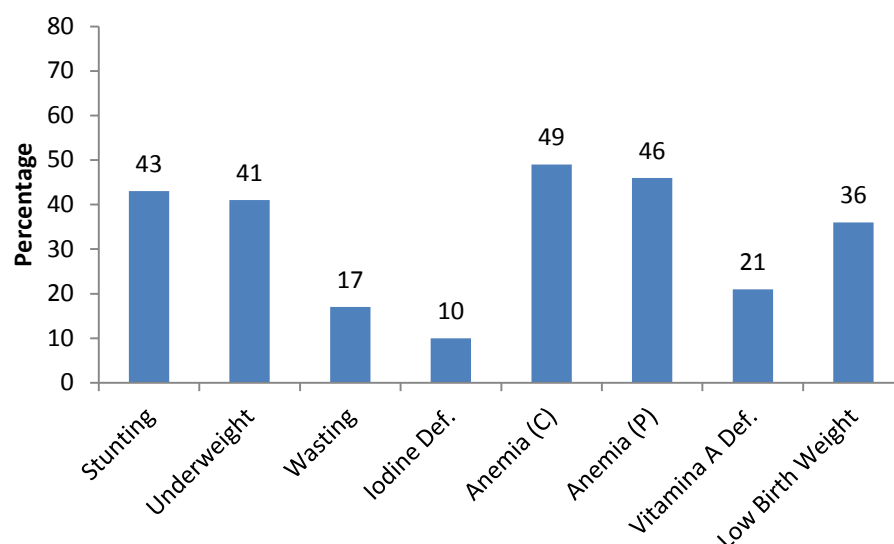
Figure 1. Trends in Malnutrition in Bangladesh
(BDHS data reanalyzed using WHO growth standards) (less than -2 SD)



Source: WHO global database on child growth and malnutrition.

Further, as shown in **Figure 2**, in addition to persistently high prevalence of stunting, underweight, and wasting, other forms of malnutrition, including IDA, vitamin A deficiency (VAD), iodine deficiency (IDD), and LBW, remain high.

Figure 2. Malnutrition Rates in Bangladesh

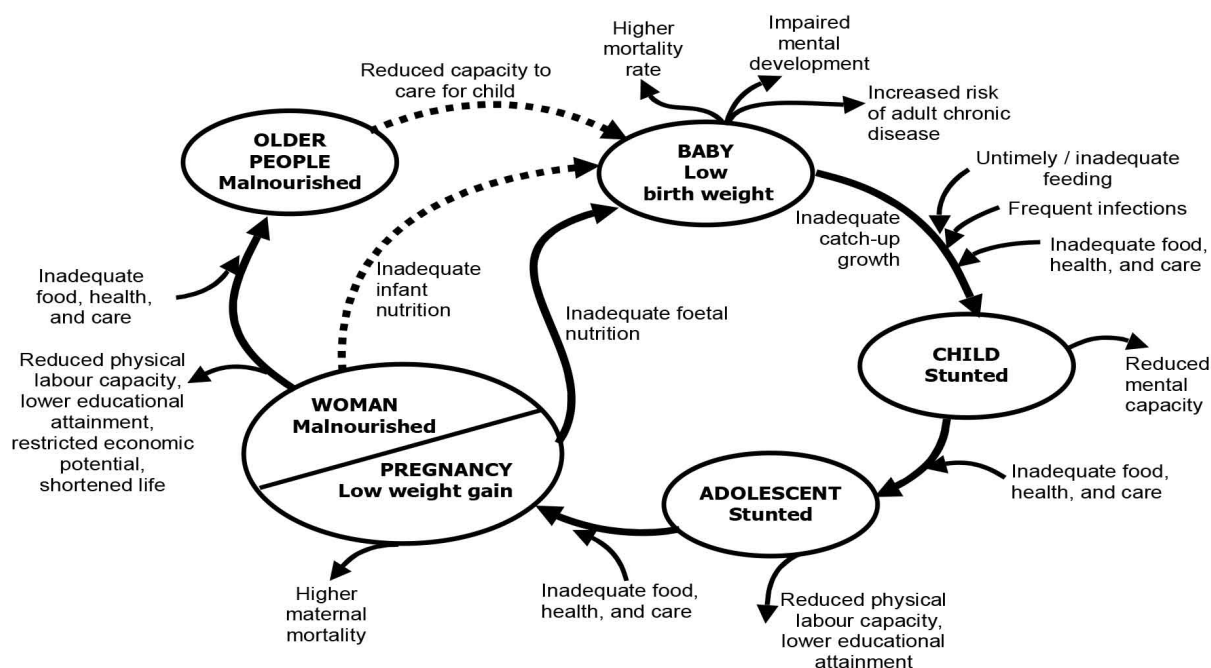


Source: NIPORT, Mitra and Associates, and Macro International 2009; Bangladesh Bureau of Statistics (BBS)/UNICEF 2005; HKI and IPHN 1999; IPHN 2007; BBS/UNICEF 2004.

3.3 What Are the Consequences of Malnutrition?

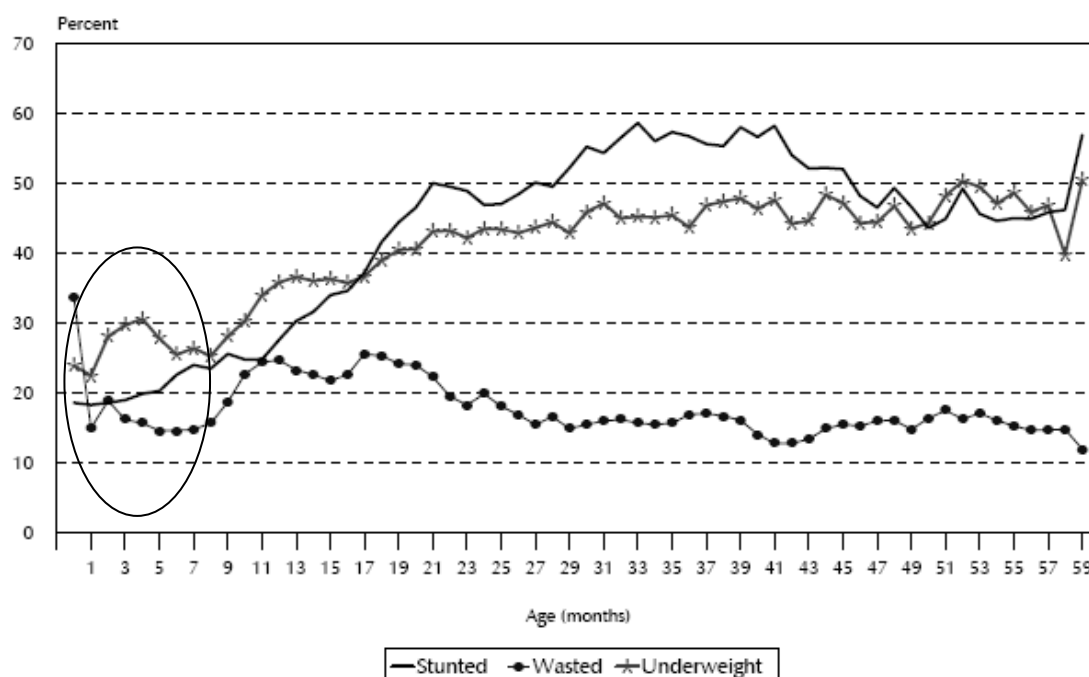
Malnutrition in Bangladesh is intergenerational in nature. Infants that are born with LBW go on to become malnourished children and adolescents. Then, adolescent girls are married early and many begin childbearing during their adolescent years while they themselves are malnourished. During their pregnancies, women and girls often gain inadequate weight, which results in the birth of a LBW infant. This lifecycle of malnutrition (**Figure 3**) is a hallmark of the nutrition situation in Bangladesh. Even when infants are born with normal birth weights, malnutrition begins early in life as shown in **Figure 4**. It is well established that preventing malnutrition among children under 2 should be the focus of nutrition interventions, and this is a main focus of the Scaling Up Nutrition Initiative (Scaling Up Nutrition Road Map Task Team 2010), of which Bangladesh is a member. Data for Bangladesh increasingly suggest that there are four critical points early in the lifecycle during which malnutrition has the most significant consequences: children under 2 years of age, children under 5 years of age affected by acute malnutrition, adolescence, and pregnancy and the postpartum period.

Figure 3. Lifecycle of Malnutrition



Source: U.N. Standing Committee on Nutrition.

Figure 4. Percentage of Children 0–59 Months of Age That Are Malnourished, Bangladesh, 2007



Source: NIPORT, Mitra and Associates, and Macro International 2009.

3.3.1 Malnutrition in Children under 5

It is well established that malnutrition is a leading underlying cause of infant and child mortality and is implicated in about 35–55 percent of deaths among children under 5 (Pelletier et al. 1994, Black et al. 2008, Hossain and Bhuyan 2009). Further, Mason et al. (2003) estimate that the global burden of disease (1990 figures) in developing countries could be reduced by 32 percent by eliminating malnutrition alone. A malnourished child is also at increased risk of infection, which in turn leads to a higher risk of mortality (Alam et al. 1989, Rahman and Biswas 2009). Compared to normal birth weight infants, LBW infants—which results from intrauterine growth retardation and can be a result of short birth intervals—are 2–10 times more likely to die and they are at higher risk for childhood malnutrition and chronic diseases, such as diabetes and cardiovascular diseases in adulthood (Allen and Gillespie 2001, Rutstein 2008, Behrman et al. 2004, World Bank 2006). Globally, VAD causes the deaths of about 1 million children each year.

Malnutrition in children delays child development, undermines school performance, and has profound and irreversible effects on children’s ability to learn (Dewey and Begum 2011). Undernourished children learn to sit, walk, and talk later than their well-nourished peers. They are more likely to enroll in school later, have more days out of school due to illness, and perform worse in school compared to their well-nourished peers (Behrman et al. 2004). Anemia in children under 2, IDD in the womb, and growth failure under the age of 2 all adversely affect children’s ability to learn (Berhman et al. 2004). Early childhood malnutrition results in children having lower activity levels; reduced attention spans; and worse test results of psychomotor function, cognitive function, and fine motor skills

(Behrman et al. 2004, Pollitt 1990, World Bank 2006). In addition, productivity losses resulting from poor cognitive development and schooling are indirectly a result of malnutrition in childhood. Studies have shown that lower IQ is associated with various forms of malnutrition. LBW is associated with a lower IQ by 5 percentage points, stunting is associated with a lower IQ by 5–11 points, and IDD is associated with a lower IQ by 10–15 points (Grantham-McGregor et al. 1999, World Bank 2006).

Improved nutrition has far-reaching impacts, both on the well-being of a population and on development outcomes, including improved educability and human productivity, health, and socioeconomic outcomes.

3.3.2 Malnutrition in Adolescence

Relative to their older peers, adolescent girls are persistently more undernourished (NIPORT, Mitra and Associates, and Macro International 2009). In Bangladesh, a third of all childbearing begins in adolescence, which contributes to the high prevalence of poor pregnancy outcomes and LBW that in turn contribute to the high prevalence of chronic and acute malnutrition among children under 5 (NIPORT, Mitra and Associates, and Macro International 2009).

3.3.3 Malnutrition in Pregnancy and the Postpartum Period

Malnutrition in pregnancy is a result of low pre-pregnant weight, young maternal age at onset of pregnancy, and inadequate weight gain during pregnancy (Allen and Gillespie 2001). This in turn contributes significantly to poor outcomes such as increased risk of maternal, neonatal, and child deaths, and LBW.

Micronutrient malnutrition during pregnancy can result in mental retardation and neural tube defects in the baby, and anemia in pregnancy is a risk factor for maternal mortality. About 18 million infants are mentally impaired each year as a result of maternal IDD in pregnancy (Micronutrient Initiative 2009). Almost a quarter million severe birth defects occur each year as a result of maternal folate deficiency, and 60,000 maternal deaths in pregnancy and childbirth are attributable to severe IDA (World Bank 2006, UNICEF and Micronutrient Initiative 2004).

Maternal nutritional status during the postpartum period is of critical importance to support optimal breastfeeding and allow the mother to restore nutritional status, which is depleted during pregnancy and lactation, for improved maternal health and subsequent pregnancies.

3.4 How Nutrition, Health, and Family Planning Are Linked

Increasing investment in the HPN sector and particularly in nutrition as a subsector is essential for progress on reducing the prevalence of malnutrition in Bangladesh. The subsectors of the HPN are synergistic and interdependent. Success in one sector contributes to success in the others. Investing in any one of the subsectors alone will not yield the same result that investing adequately in all three subsectors will yield.

There is a clear synergistic affect between nutrition, health, and family planning. Family planning interventions, through adequate birth spacing, have been shown to decrease risk for LBW and stunting and to decrease infant and maternal mortality (Rutstein 2008, Conde-Agudelo et al. 2005, Conde-Agudelo et al. 2006). As birth weights increase in a population,

nutritional status improves and mortality decreases. As children's nutritional status improves, cognitive development improves and so does children's performance in school, leading to higher educational attainment and improved earning capacity in adulthood (Grantham-McGregor 1995, Hoddinott et al. 2008). Consequently, those with higher educational attainment are more likely to use family planning and, often, marry at a later age and delay childbearing (NIPORT, Mitra and Associates, and Macro International 2009).

In Bangladesh, where the average age of marriage is 15 years old for girls (NIPORT, Mitra and Associates, and Macro International 2009), access to young couples and newlyweds is still limited for family planning providers because of cultural and religious norms. Nutrition counseling is therefore a way to reach these adolescent girls with family planning messages. Pre-pregnancy nutritional status of women is also crucial to a healthy pregnancy and birth, as well as future nutritional status of the child.

While the three subsectors are tightly linked, many of the gains that could be achieved in the HPN sector as a result of other health sector programming have already been achieved. For example, the possible gains from increased coverage in childhood immunizations have largely been reached. The HPN sector has now reached a critical stage that is fast approaching a limit, and economists in Bangladesh agree that to overcome this limit a major shift is needed for the next wave of sustained improvement. This shift should include:

- Increased coverage of health and family planning services in underserved areas and among the underserved population in all parts of the country
- Considerable improvement in quality of services
- Drastic improvement in nutritional status

4. The Approach to Developing the PROFILES and Cost Estimates

There is a strong evidence base that links malnutrition to adverse outcomes such as mortality, morbidity, poorer school performance, and lower productivity, and it is therefore possible to estimate the gains in these same outcomes that can be achieved through investment in improving the nutrition of women of childbearing age and children under 5. This is precisely what the PROFILES model does. However, while PROFILES quantifies the benefits of investing in nutrition—in terms of numbers of lives saved and gains in economic productivity in currency amounts—it does not shed much light on what it would cost a country to provide nutrition services at scale to achieve those gains. This is what the costing model does: estimate what it will cost to provide nutrition services at a national level.

Importantly, these two models are not linked. PROFILES calculates benefits that result from investing in nutrition based on global evidence, because the adverse consequences of malnutrition on development outcomes have been shown fairly consistently across multiple countries and settings. Costing models, however, must inherently rely on local data, because the costs of goods and services vary from one country context to another. As such, linking these two models is neither feasible nor appropriate because the models answer different questions and present results in different areas. However, the resulting estimates from the two models are complementary, and together are useful to inform both policy and planning in a given country context. Together, they can help advance the dialogue on nutrition, convincing policy makers that investment in nutrition is critical because it leads to multiple beneficial returns and the cost of that investment is relatively low.

Because these estimates can inform the national planning process for investment in nutrition, it is important to obtain general agreement and consensus on the data sources to use to populate the models and that the data used in the models are deemed the most representative and acceptable by national experts. It is equally important to have an accepted set of key assumptions, based on the current country context.

PROFILES requires data on the current prevalence of various nutrition indicators, mortality rates, and projected population growth, and assumptions are made about what the targets for improvement in nutrition should be. It is also assumed that the necessary interventions will be implemented at scale to achieve those stated targets. The costing model, on the other hand, requires data on local unit costs of goods and services and projected population growth, and assumptions are made about the structure of the nutrition program, the scale at which services are provided, and the types of interventions or services that will be provided.

The primary objective of deriving estimates from these two models is to support a policy advocacy process. As such, it is important that stakeholders build a consensus on what were the best inputs to be used in the models. The steps in the PROFILES and cost estimate process are presented in **Figures 5** and **6**. To begin, a steering committee was formed with key officers in the GOB's MOHFW. The chair for the steering committee was Professor Dr. Fatima Chowdhury, Director of the MOHFW Institute of Public Health Nutrition. By engaging and getting buy-in from national experts and key stakeholders from the beginning, when the estimates are presented to government, the estimates carry greater credibility. This

approach also serves as an opportunity to identify and promote a shared vision and responsibility for nutrition among both government and nongovernment stakeholders.

Figure 5. Approach to Developing the PROFILES Estimates

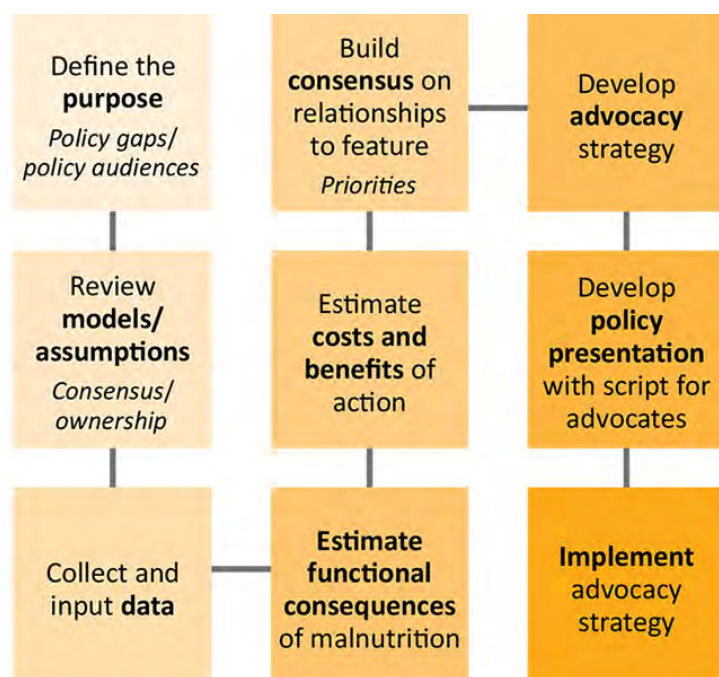
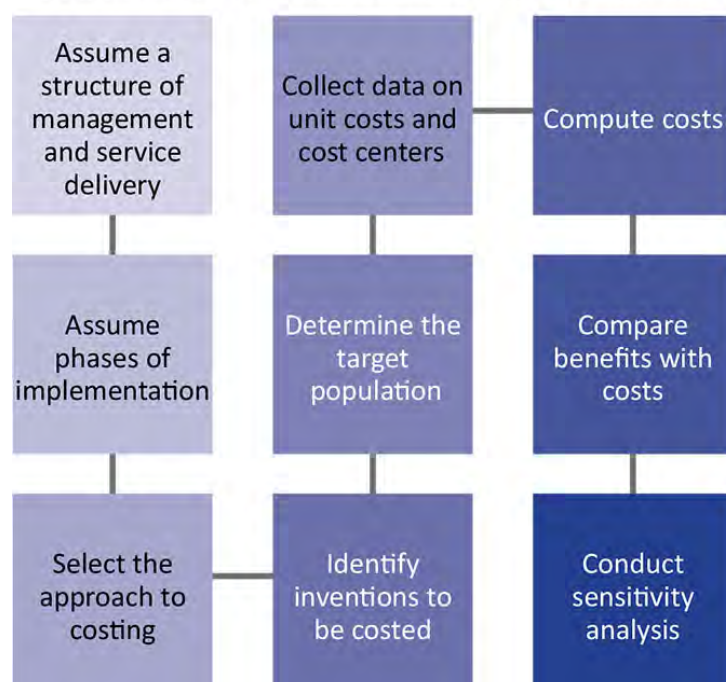


Figure 6. Approach to Develop the Costing Model

Using a consultative process with key stakeholders and various national data sources



5. The Methods for Generating Data for the PROFILES Model and Developing and Populating the Costing Model

This section is presented in two parts. The first part presents the methods, data sources, assumptions, and targets used to generate data for the PROFILES model; for PROFILES, national and district-level estimates were derived. Because PROFILES consists of a set of spreadsheets that are ready to use, the main task is working with stakeholders to agree on the data and targets to populate the model and obtain the results. The costing model on the other hand, is a new model, and this required first the development of the model followed by populating the model to obtain the estimates. The second part of this section presents the methods, data sources, and assumptions used to develop and populate the costing model. The specific unit costs used in the model, and detailed description of how and what costs were considered by cost center are provided in **Annex A**.

5.1 Methods for Generating Data for the PROFILES Model

PROFILES is a computer-based model that serves as a tool to support nutrition policy advocacy. First developed in the early 1990s, it consists of a set of spreadsheets reflecting current scientific nutrition knowledge and is designed to estimate the functional consequences of malnutrition to support advocacy and communication with policy makers, program implementers, and other stakeholders.

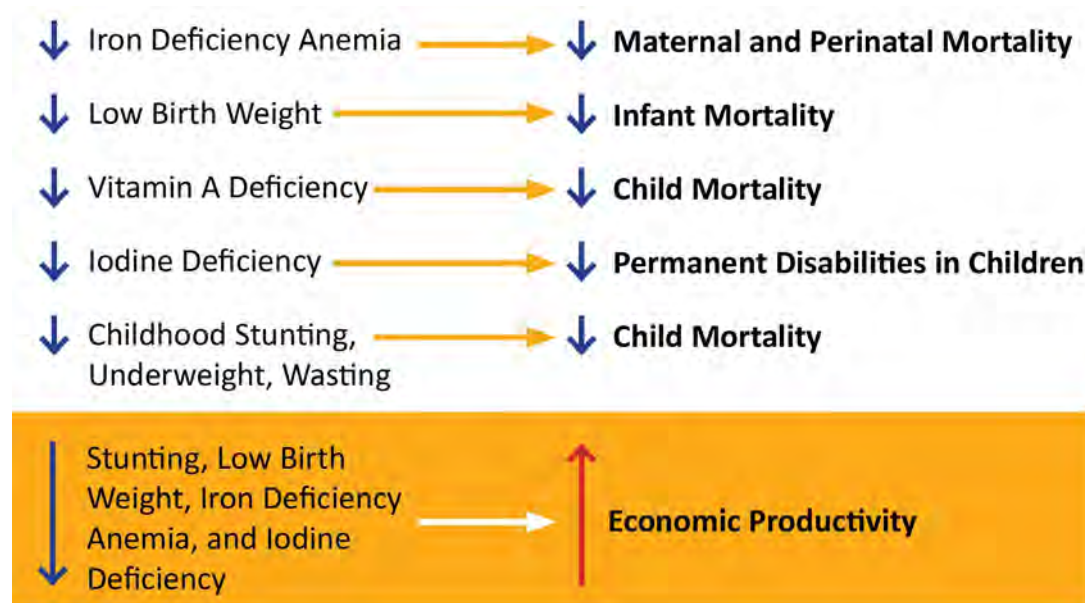
This section presents the methods that were used to derive the estimates for Bangladesh in relation to each of the nutrition problems addressed in the Bangladesh PROFILES 2011.⁸ The basic approach in PROFILES is to provide two scenarios, contrasting a so-called *status quo* scenario that assumes there will be no change from the current situation throughout the chosen time period (aside from projected changes in population growth) to an *improved* scenario. The *improved* scenario—with results estimated for the same time period—assumes that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems. In the *status quo* scenario, consequences are expressed, e.g., in terms of lives lost and economic productivity losses. When contrasting the results from the *status quo* and the *improved* scenarios, the differences reflect benefits expressed as lives saved and economic productivity gains.

In addition to the national-level estimates, district-level estimates were also derived, based on the proportional size of each district's population. Section 6 presents the results/estimates for selected nutrition problems and their consequences.

⁸ The PROFILES model contains a Microsoft Excel spreadsheet workbook with user sheets for entering information. Additionally, a series of sheets that contain model coefficients using relationships obtained from the nutrition literature carry out calculations to provide estimates of the functional consequences of undernutrition during a time period specified by the user.

5.1.1 Nutrition Problems and Consequences Addressed in Bangladesh PROFILES 2011

Bangladesh PROFILES 2011 calculates estimates of reduction in permanent disabilities and mortality and gains in economic productivity that can result from reductions in the prevalence of several nutrition indicators, namely, IDA; LBW; VAD; IDD; and childhood stunting, underweight, and wasting. For the economic productivity estimates, part or all of the economic productivity losses attributed to stunting, LBW, IDA, and IDD are considered for poor cognitive development, which affects school performance and, later in life, earning potential. The impacts derived for each of the nutrition indicators are given in the diagram below.



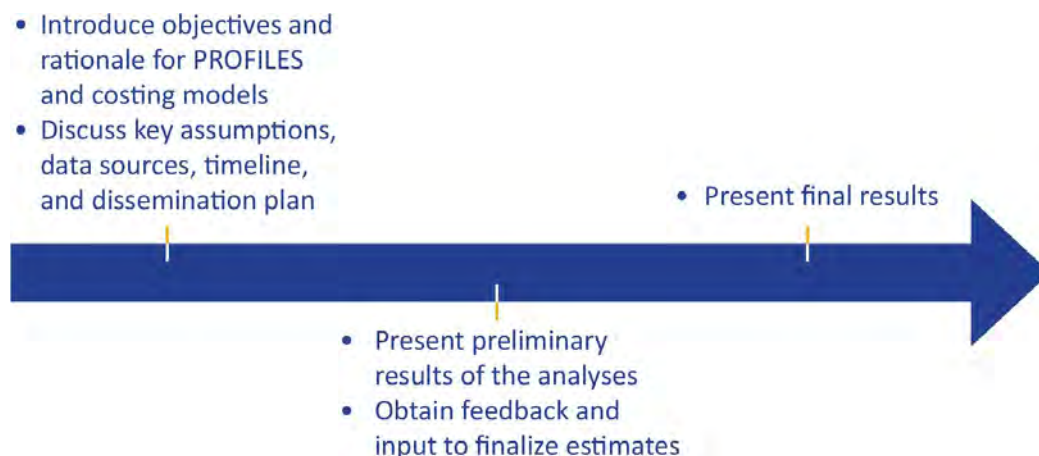
5.1.2 Time Period for Projections

At the first stakeholder meeting in October 2010, stakeholders selected the time period for the projections to be 2011–2021 for the Bangladesh PROFILES 2011 estimates, as this period would provide estimates up to 2021, which is consistent with the *Bangladesh Vision 2021*, which envisions Bangladesh as a middle-income country in 2021, when food insecurity will be removed (“food deficiency will be removed”). *Bangladesh Vision 2021* also expects the MDGs to be met in the 2015–2017 time frame. In addition, stakeholders recommended developing estimates for the time period up to 2015, when the MDGs are to be met. While the 2011–2021 time period is the focus of the results described here, the estimates for the shorter time period up to 2015 are also presented.

Figure 7 shows the timeline of the PROFILES and costing model process. Three stakeholder meetings and a series of small group consultations were conducted with key stakeholders to develop and finalize the estimates from the PROFILES and costing models. The first stakeholder meeting, held in October 2010, served to introduce the objectives and rationale for the two models and as an opportunity to discuss the key assumptions for the models, the data sources, the timeline, and the dissemination plan. The second stakeholder meeting, held in January 2011, was to present the preliminary results of the analyses and obtain feedback and input to finalize the estimates. The third and final meeting, held in May 2011, presented the final results. Stakeholders played an advisory role on a way forward in the policy

advocacy process for nutrition, identifying key audiences that needed to be targeted with the results, and discussing the tone and content of advocacy among these key audiences. In addition to the third stakeholder meeting, a series of meetings were held in May 2011 with the MOHFW and the Ministry of Local Government and Rural Development (MOLGRD) to obtain their input and feedback on the estimates. A complete list of participants for each stakeholder meeting can be found in **Annex B**.

Figure 7. PROFILES and Costing Process Timeline



5.1.3 Targets and Related Assumptions

The 2021 targets for reduction in the prevalence of various nutrition indicators were discussed by participants at the stakeholder meetings. Stakeholders at the first meeting generally agreed that the effort to generate estimates on the benefits of investment in nutrition should be visionary and aim high—not only to spur greater investment in nutrition but also to foster hope for a Bangladesh free of malnutrition. Based on this vision, they assumed that if all that needs to be invested to reduce the prevalence of malnutrition significantly is invested over the next decade, these targets could be achieved. While some may argue that these targets are ambitious, stakeholders agreed that being ambitious was essential to jump-start greater investment in nutrition.

The PROFILES model assumes a linear reduction from 2011 until the end of the specified time period, in this case 2021. For all the anthropometric indicators (based on children’s height-for-age, weight-for-age, and weight-for-height), a decrease of 90 percent was agreed on. However, because a 90 percent decrease would result in an implausibly low percentage (compared to the reference population) of children in the “mild” category for the three indicators (stunting, wasting, and underweight), the final PROFILES estimates assumed that the prevalence of “mild” growth deficit would be reduced by only 50–60 percent. This resulted in the percentage of children in the “mild” category being about the same as in the reference population. For the same reason, “moderate” wasting was reduced by 85 percent (rather than 90 percent). Hence, by 2021, the level of stunting would be 10 percent of the present level. (For example, if at present 27 percent of children were in the “moderate” stunting category, the target for 2021 would be 2.7 percent). For VAD (including sub-clinical deficiency) among children 6–59 months old, a 90 percent reduction was also chosen. Night blindness among pregnant women (a symptom of VAD) was considered but ultimately not included in the final PROFILES estimates because research, including a recent study from

Bangladesh, has not shown a consistent correlation between vitamin A supplementation and improvement in maternal health/reduction in maternal mortality. A 99 percent reduction was used to reflect virtual elimination of IDD. IDA (which accounts for 50 percent of all anemia) was also targeted for virtual elimination.

During the second stakeholder meeting, participants reviewed the targets proposed during the first meeting. Some of the targets were revised; for example, the suggested reduction in the occurrence of LBW was changed to 70 percent.

The targets for 2015 were prevalence of anthropometric indicators reduced by 22–36 percent; VAD among children 6–59 months old reduced by 36 percent; LBW reduced by 28 percent; and anemia reduced by 20 percent. These reductions were relatively close to what had been discussed during the consultative process. For prevalence of goiter, the difference was greater because originally—at the stakeholder meetings—it was envisioned that this would be targeted for elimination by 2015. In the final PROFILES estimates, IDD was targeted to be reduced by 40 percent.

5.1.4 Data Sources for Nutrition Indicators

To quantify reductions in mortality and gains in economic productivity as a result of reduced malnutrition, PROFILES needs prevalence data for each of the nutrition indicators. For the anthropometry indicators in particular, the risk of mortality varies by the degree and severity of malnutrition. Similarly, for productivity gains, data on stunting by severity for children aged 24–35 months are needed.

Stakeholders at the first and second meeting played an integral role in identifying and agreeing on the best data sources to use for each nutrition indicator in the model. Anthropometry results were based on the nationally representative 2007 BDHS, as stakeholders agreed these data were representative for Bangladesh.

- Stunting and underweight levels among children under 5 years of age are above 40 percent.
- The wasting level—a reflection of acute malnutrition—of 18 percent among children under 5 is one of the highest in the world.
- IDD was reflected in a goiter rate of 10 percent based on a national IPHN survey from 2004 to 2005.
- Anemia levels were also high: 49 percent among children under 5 and 46 percent among pregnant women (both based on findings from HKI/IPHN 2006, BBS/UNICEF 2004).
- VAD (including sub-clinical deficiency) was about 20 percent, according to a survey of vitamin A status throughout the life cycle in rural Bangladesh (HKI/IPHN 1999).
- LBW was estimated to be 36 percent based on the National Low Birth Weight Survey of Bangladesh 2003–2004.

Participants from the two stakeholder meetings recognized that some information was not very recent and that assumptions would need to be made for some of the data required by the spreadsheet model (e.g., for anemia among certain age groups).

Indicators	Data Source	Year	Prevalence*
Nutrition			
Anthropometry (under 5 years) Breastfeeding	BDHS 2007 (NIPORT, Mitra and Associates, and Macro International 2009)	2007	43% Stunting 41% Underweight 18% Wasting
LBW	National LBW Survey (BBS/UNICEF 2005)	2003/4	36% below 2.5 kg
Vitamin A deficiency (6–59 months)	National Vitamin A Survey 1997–1998 (HKI/IPHN 1999)	1997– 1998	22%
Iodine deficiency	Core group consultation and IPHN National Survey	2004/5	10%
Iron (anemia among pregnant women)	Anemia Prevalence Survey (BBS/UNICEF 2004)	2004	46%

* Further information is included in **Tables 1 and 2**.

5.1.5 Demographic Information

The PROFILES workbook requires demographic information with projections into future years corresponding to the time period selected by the team. Usually, PROFILES teams use information from the United Nations Population Prospects online database. However, for Bangladesh, it was possible to be more specific by primarily using the Bangladesh 2001 National Census and other information from a report published by the National Institute of Population Research and Training (NIPORT) in 2005 (NIPORT 2005). The population information from the NIPORT report was used in conjunction with a PROFILES demographic utility tool to generate the various demographic estimates required by PROFILES for each year of the model.

Information on under-5, infant, and neonatal mortality came from the 2007 BDHS. The MMR of 194 deaths per 100,000 live births was based on the Bangladesh Maternal Mortality and Health Care Survey 2010⁹ (NIPORT 2011), a representative household survey.

Economic data were obtained from the Bangladesh Bank Bulletin, the BBS Bulletin, and the 2005 Laborforce Survey.

Mortality Indicators	Data Source	Year	Value/Rate
MMR	Maternal Mortality Survey, NIPORT	2010	194/100,000
Under-5 Mortality Rate	BDHS	2007	65/1,000
Infant Mortality Rate			52/1,000
Neonatal Mortality Rate			37/1,000

⁹ The MMR from this survey was incorporated into the Bangladesh PROFILES 2011 model when the results were published. The initial preliminary PROFILES model used the previous MMR which was considerably higher.

5.1.6 Methods for Division- and District-Level Estimates

To provide an idea of the magnitude of the nutrition problem at the division and district levels, it was decided to use the relative population size of each of the 6 divisions and 64 districts in Bangladesh to calculate the approximate number of lives lost and economic productivity losses for the 2011–2021 time period, i.e., for the *status quo* scenario, if there are no improvements and no change (aside from population changes). Using the district population size based on the last census to calculate the percentage of the population that lived in each district, and then applying this percentage to the number of lives lost and the productivity losses estimated by Bangladesh PROFILES 2011 for the whole country, estimates were generated for each district. The number of lives that could be saved and the productivity gains for each district were calculated in a similar way, reflecting the expected gains if effective nutrition interventions are implemented at scale and they succeed in reaching the targets in terms of reduction in the prevalence of various nutrition problems. In addition, division-level information is shown reflecting the sum of the information for the districts within each division.

This approach does not consider the fact that there are some differences among divisions (and among districts within each division) in terms of fertility, mortality, and prevalence of nutrition problems. However, it was felt to be of value to provide these figures, recognizing that they are not exact, to allow their use for advocacy purposes on the district level.

Table 1. Nutrition Indicators, Rationale/Assumptions, Data Sources, and Prevalence Targets Used in PROFILES to Estimate Reductions in Mortality and Permanent Disability

Nutrition problem	Rationale/assumptions	Data source	Current prevalence (used for <i>status quo</i> scenario) (%)	Targeted reduction in prevalence by 2021 as a proportion reduction in current prevalence	Projected prevalence in 2021 (%)	Targeted reduction in prevalence by 2015 as a proportion reduction in current prevalence	Projected prevalence in 2015 (%)
Mortality							
Stunting among children 0–59 months associated with under-5 child mortality	<p>PROFILES was updated and expanded in 2008 and calculates mortality estimates for each anthropometric indicator (stunting, underweight, and wasting) by degree of severity. Black et al. (2008) calculated the odds ratios of mortality for each grade of malnutrition related to:</p> <p>Stunting Mild 1.2 Moderate 1.6 Severe 4.1</p> <p>Wasting Mild 1.5 Moderate 3.0 Severe 9.4</p> <p>Underweight Mild 1.8 Moderate 2.5 Severe 9.7</p> <p>The PROFILES workbook uses this information to calculate the population-attributable fraction and the number of deaths (among children 6–59 months) related to each of the three indicators of growth deficit by severity category. Because many children with malnutrition can have more than one form of malnutrition at any given time (e.g., concurrent stunting and wasting or concurrent underweight and wasting), deaths related to each of these indicators cannot be totaled, because some children will be included in more than one indicator of malnutrition /growth deficit.</p>	Percent of children in the severe and moderate categories are based on the 2007 BDHS Country Report. The percent of children in the mild categories are from data analysis by the Bangladesh PROFILES team of the data file from the 2007 BDHS.	Stunting Mild 30 Moderate 27 Severe 16	Stunting Mild 0.55 Moderate 0.90 Severe 0.90	Stunting Mild 14 Moderate 3 Severe 2	Stunting Mild 0.22 Moderate 0.36 Severe 0.36	Stunting Mild 24 Moderate 17 Severe 10
Underweight among children 0–59 months associated with under-5 child mortality			Underweight Mild 35 Moderate 29 Severe 12	Underweight Mild 0.60 Moderate 0.90 Severe 0.90	Underweight Mild 14 Moderate 3 Severe 1	Underweight Mild 0.24 Moderate 0.36 Severe 0.36	Underweight Mild 27 Moderate 19 Severe 8
Wasting among children 0–59 months associated with under-5 child mortality			Wasting Mild 35 Moderate 15 Severe 3	Wasting Mild 0.60 Moderate 0.85 Severe 0.90	Wasting Mild 14 Moderate 2 Severe <1	Wasting Mild 0.24 Moderate 0.34 Severe 0.36	Wasting Mild 27 Moderate 10 Severe 2

Nutrition problem	Rationale/assumptions	Data source	Current prevalence (used for <i>status quo</i> scenario) (%)	Targeted reduction in prevalence by 2021 as a proportion reduction in current prevalence	Projected prevalence in 2021 (%)	Targeted reduction in prevalence by 2015 as a proportion reduction in current prevalence	Projected prevalence in 2015 (%)
Anemia during pregnancy related to maternal and perinatal mortality	Anemia during pregnancy is an important contributor to maternal mortality, including through an increased risk of death from postpartum hemorrhage. Anemia during pregnancy also contributes to perinatal mortality, e.g., through increasing the risk of preterm delivery. The PROFILES spreadsheets calculate the contribution of IDA to maternal and perinatal deaths based on the work by Stoltzfus et al. (Stoltzfus 2004), presuming that 50% of anemia is due to iron deficiency (an assumption that was also made in the chapter by Stoltzfus et al.).	A 2004 anemia prevalence survey (BBS/UNICEF)	46	0.50	23	0.20	37
VAD associated with child mortality	Vitamin A-deficient children are at risk of blindness resulting from xerophthalmia and corneal ulceration. They also have a higher risk of dying, from, e.g., diarrhea and measles. The PROFILES model that estimates child deaths attributable to VAD uses coefficients from the scientific literature Ross (2008).	Information for children 6–59 months from the HKI/IPHN survey (1999). In the survey, VAD was defined as a serum retinol level < 20 µg/dL.	22	0.90	2	0.36	14
LBW related to mortality	LBW, defined as a weight of < 2,500 g at birth, can be caused by preterm birth and/or intrauterine growth retardation. Using information from the literature (Alderman and Behrman, 2004, Ashworth, 1998) on increased risk of neonatal or post-neonatal mortality among infants with a LBW and country-specific LBW rate and mortality rates, PROFILES calculates the population attributable fraction and excess number of deaths related to LBW.	National Low Birth Weight Survey 2003–2004 (BSS/UNICEF, 2005)	36	0.70	11	0.28	26
Permanent disability							
IDD associated with brain damage and disability as a result of deficiency in utero	IDD is the main cause of preventable brain damage worldwide. IDD among pregnant women and during the first few months of infancy leads to irreversible brain damage of various degrees of severity in the infant.		10	0.99	0.1	0.40	6

Table 2. Nutrition Indicators, Rationale/Assumptions, Data Sources, and Prevalence Targets Used in PROFILES to Estimate Gains in Economic Productivity

Nutrition problem	Rationale/assumptions	Data source	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2021 as a proportion reduction in current prevalence	Projected prevalence in 2021 (%)	Targeted reduction in prevalence by 2015 as a proportion reduction in current prevalence	Projected prevalence in 2015 (%)
Stunting related to future productivity	Growth deficit early in life is related to productivity loss in adulthood. The PROFILES workbook estimates the impact of growth deficit in children on future labor productivity based on the facts that stunting developed during the first 2 years of life is generally maintained throughout life and that the productivity of adults is related to their stature. Reduced adult stature due to stunting is a proxy indicator for various nutritional and other insults that can affect physical and mental development (the issue is not short stature per se). Using coefficients based on published scientific literature, PROFILES estimates reduced adult productivity related to both decreased physical capacity and reduced intellectual ability (affecting school achievement). The calculations use the “economic activity rate” (the population actually working) discounting future wages at 3% per year, and adjusts for normal mortality. The lifetime discount factor is the sum of all the adjusted annual discounted years from age 15 through age 64 years. The lifetime discount factor is used to calculate the present day value of future economic productivity losses related to childhood stunting, based on the proportion of children 24–35 months old that were classified as stunted. The percentage of children classified as having severe, moderate, and mild stunting are considered, after subtracting the proportion of children expected in each of these categories (according to reference population values).	Stunting among children 24–35 months Percent of children in the severe and moderate categories are based on the 2007 BDHS Country Report. The percent of children in the mild category is from data analysis by the Bangladesh PROFILES team of the data file from the 2007 BDHS.	Stunting (24–35 months) Mild 29 Moderate 32 Severe 21	Stunting (24–35 months) Mild 0.50 Moderate 0.90 Severe 0.90	Stunting (24–35 months) Mild 15 Moderate 3 Severe 2	Stunting (24–35 months) Mild 0.20 Moderate 0.36 Severe 0.36	Stunting (24–35 months) Mild 23 Moderate 21 Severe 13

Nutrition problem	Rationale/assumptions	Data source	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2021 as a proportion reduction in current prevalence	Projected prevalence in 2021 (%)	Targeted reduction in prevalence by 2015 as a proportion reduction in current prevalence	Projected prevalence in 2015 (%)
LBW related to future economic productivity	Infants born with LBW are more likely to become stunted and to have reduced cognitive ability as they grow up. Both of these will contribute to reduced future economic productivity. Based on published literature, PROFILES calculates future economic productivity losses separately for stunting and for reduced cognitive ability related to LBW. As for productivity losses related to stunting and to IDD, future productivity is discounted at 3% per year, and normal mortality is taken into account for each year.	National Low Birth Weight Survey from 2003–2004 (BSS/UNICEF 2005)	36	0.70	11	0.28	26
Anemia among men and women related to productivity losses	Anemia among the working age adult population contributes to reduced productivity for those engaged in physical labor, especially heavy physical labor. The PROFILES model uses the coefficients developed by Ross and Horton (1998) for the effects of IDA on reduced capacity to carry out any type of physical labor and heavy physical labor.	The 2004 anemia prevalence survey carried out by BBS/UNICEF included information for women. For men, the PROFILES team estimated a minimum prevalence of anemia of 25%.	33 (women) 25 (men)	0.50	16.5 (women) 12.5 (men)	0.25	26 (women) 20 (men)
Intrauterine IDD related to future productivity losses	The PROFILES workbook uses information from the scientific literature (including the finding of a community-wide average reduction of 13.5 IQ points in iodine deficient environments) for the coefficients used to estimate the negative impact of IDD (as reflected in the goiter rate in a population) on future economic productivity. To estimate the future economic productivity losses among children born to iodine deficient mother, PROFILES discounts the children's future wages at 3% per year, after adjusting for normal mortality at each year of life (as described for productivity losses related to childhood stunting).	National 2004–2005 survey conducted by IPHN	10	0.99	0.01	0.40	6

5.2 Methods for Costing the Nutrition Program of Bangladesh

“Cost” in economics refers to the value of inputs or expenditure incurred, at the highest level of economic efficiency of an activity. Cost regarded in this sense is the opportunity cost. Any and every expenditure is not cost. According to the theory of production, the highest level of economic efficiency occurs at the point of equilibrium, where the iso-cost line is tangent to the iso-quant of the producer. The conditions for achieving the equilibrium are: highest technical efficiency (where each input produces maximum possible output), most appropriate input-mix, and procurements/purchasing of inputs at the competitive market prices.

The objective of this costing analysis was to calculate the cost of an effective, comprehensive national program for nutrition for Bangladesh under different scenarios. Estimation of costs requires identifying:

- An approach for costing
- Appropriate interventions to be included
- Service delivery mechanisms
- Possible implementation scenarios
- The scope, scale, and level of coverage of services

The cost centers or activities and interventions that a proposed program for nutrition would include were identified and agreed upon through the consultative process described in **Section 4**. Based on the collaborative stakeholder discussions, the costing of the proposed nutrition program involved the steps to identify:

- The activities/interventions (“cost centers”) to be undertaken under the program to rapidly improve the nutrition status of children and mothers in Bangladesh
- An assumed structure of the nutrition component of the HPN sector and the service delivery mechanisms
- Information on unit costs of objects (items to be costed) and the number of target population
- Specific costs of objects by level of service delivery as well as cost centers (activities) (calculated using the unit costs of the objects referred to in the previous bullet)
- An assumed plan for phasing the implementation of the program
- A method of estimating different types of costs to be incurred in the program years; alternative scenarios were assumed for conducting the sensitivity analysis and cost-effectiveness (or at least cost-minimization) analysis

Data for computation of costs were gathered from document review and consultations. The main documents reviewed were the 2001 Population and Housing Census and 2007 BDHS. The group and individual consultations were held through stakeholder meetings; discussions at IPHN, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), and other research organizations; core group meetings; bilateral discussions with experts and managers; and meetings with the steering committee on PROFILES and Costing, headed by the Line Director (Nutrition) Professor Dr. Fatema Chowdhury.

5.2.1 General Approach to Costing of the Proposed Program

There are three commonly used approaches to developing a costing model.

- **Ingredient approach.** This approach is used when the program does not exist or exists very inadequately. In this approach, the program to be implemented is divided, based on a priori reasoning and limited experience, into its components and subcomponents by the activities to be undertaken (Fiedler 2003, Matz and Usry 1984, Baker 1998). The inputs are identified for each activity and the input coefficients and the amounts of inputs required to produce the target outputs are appropriately assessed. The information on the price of inputs is collected from the competitive markets (or the shadow prices are imputed if the market prices are not available) and finally the total cost is estimated by component and cost center.
- **Adaptation approach.** This approach is used when a program similar to the proposed one already exists. Under this approach, most of the cost data of the existing program are used after properly adjusting them for the new program (Baker 1998, Horngren et al. 1994).
- **Mark-up approach.** This is the most widely used approach, but also the crudest of the three. In this approach, the entire data set of cost incurred in the previous year (for a program that already exists and remains unchanged) is escalated using a rule of thumb. The rate of escalation includes the rate of inflation (Baker 1998, Layne 1984).

These approaches can be used independently or in combination, depending on what is known about the proposed activities of the program, method of implementation, coverage, inputs, and the resource envelope. As no individual approach will be able to capture all the relevant aspects of such a huge program, a composite approach should be used, combining all standard approaches.

Cost should normally be estimated at the efficiency level; however, we could not use the usual economic costing procedures for this analysis for two reasons.

- Effective costing requires the existence of an economically efficient program on a large scale. Without such a program, the necessary data for costing cannot be obtained. The experiences of the earlier Bangladesh national programs for nutrition are mixed: successful in some respects, but unsuccessful in others. Hence, actual costs of these programs cannot be used. One option in this situation is to use the linear/non-linear programming techniques to obtain the shadow prices,¹⁰ which are deemed as

¹⁰ When a competitive commodity market does not exist or exists inappropriately, shadow prices can be computed to obtain the correct signal for policy formulation. As a very simple example, consider that a government official resides in government housing for which he has to pay a relatively small amount of rent. But in the actual market, the rent for that type of house is much higher. That market rent will be considered as the shadow rent for the government housing. When a market does not exist at all, shadow prices can be computed by considering an appropriate objective function and the equations for the important constraints, through a programming exercise. Sometimes simpler techniques are also employed to obtain the approximate values: We can compute demand for a commodity by assessing the willingness to pay and cost of production through use of an ingredients approach to costing. In that case, the higher of the two values will be considered as the shadow price (dual).

good as the market price. But use of programming techniques also requires data on a large number of variables, which do not exist at this moment.

- The objective in this exercise is to estimate the cost of a prospective program, in contrast with estimation of costs in which cost is estimated retrospectively. The structure and functioning of a prospective program are usually determined based on the field data of an existing program and the normative assessment of how the program is meant to function. It is difficult to test the efficiency of a program that is yet to be implemented.

Apart from showing the efficiency level, costing has another important objective, which is purely financial: to predict how much pressure the program will exert on the budget of the government and other funding sources. Policy makers and managers in all countries, let alone the resource-poor ones, have to know before starting implementation of a new program how much it will cost in the year of inception and how much it will cost in each year of its life.

In this analysis, a composite approach of costing, combining some elements of both economic and financial costing has been used. The main emphasis is on financial costs and budgeting implications. At the same time, the unit costs were identified or computed to the extent possible at the level of efficiency. In essence, costing loses much of its importance when efficiency is not considered. Some experiences of the earlier programs in Bangladesh, lessons from other countries, findings of relevant studies in Bangladesh, and opinions of reputed experts and senior managers were used to obtain the optimal input coefficients, unit costs, and targets, which resulted in estimates of costs at a close-to-efficiency level.

The easiest method of estimating costs is to use the accounting ledgers of the MOHFW and the development partners that contribute funds for the nutrition program. But this was not a suitable approach for this analysis for several reasons.

- There are several “off-budget” items not shown in the ledgers, such as donor funding to the health sector, as this is not a direct cost to the MOHFW. But these costs have to be taken into account and estimated because they constitute a real cost for the program and are borne by the people or government of some countries. Hence, exclusion of these items would lead to underestimation of costs. Besides, funding currently received (or proposed) from donors may gradually be reduced or stopped altogether. Therefore, inclusion of these items in costing is also needed for judging the financial sustainability of the program.
- Payments made to volunteers and other peripheral providers are also an off-budget item. It is often assumed that volunteers will work using the spirit of voluntarism and they need not be paid. But the reality is that they need to be paid at least some amount of “honorarium”; hence, this item should be considered in costing.
- Accounting ledgers usually show the estimates of costs that have already been incurred, but not necessarily at the efficiency level. The estimates shown in the ledgers are basically expenditures and not costs and, hence, not appropriate for costing a future program.

Given these limitations, it was reasonable to use a composite approach. An ingredients approach is usually useful for a costing program that does not exist at all or does not operate with high efficiency. This approach embodies a “bottom-up” method of costing, in contrast to the accounting-based approach, which is essentially “top-down” (Fiedler 2008, Fiedler 2003).

It requires first identifying all of the outputs or activities of the program, and then identifying, quantifying, and costing all of the inputs required to produce each activity (Fiedler 2003). As the HPN sector of Bangladesh is planning to implement a comprehensive national program for nutrition, using an ingredients approach seemed appropriate.

At the same, Bangladesh has gathered some experiences from implementation of earlier nutrition and health/family planning (FP) programs. The country can also use some lessons from the experiences of other countries in effectively implementing nutrition program (e.g., the Honduras model), and it is possible to adapt and incorporate experiences of other programs into Bangladesh's new program. For some cost items, such as the salary of officials, training, interpersonal communication, and prices of supply, the mark-up approach of costing was used, since similar items exist in the current health/FP components of the HPN sector.

For this analysis, the proposed composite approach to costing combined the appropriate elements of all the three major costing approaches—ingredients, adaptation, and mark-up—although it mainly used the ingredients approach. In addition, in the cases of joint inputs or shared resources, when the same inputs are simultaneously used for several programs, including the nutrition program, a top-down method was adopted.

Only direct costs were considered. Costs of line items, such as time spent by mothers or children in visiting a facility or holding discussions with volunteers, time spent by community leaders, and space/premises temporarily donated by some households to be used as satellite clinics or for holding cluster meetings, are indirect costs of the program and they have been excluded.

The direct costs of all the sectors to be involved in the nutrition program have been estimated. This includes the costs of such sectors as HPN, agriculture, food, education, information, and local government and rural development.

There are two ways of organizing the inputs in the costing exercise: object or input-wise costing and activity-based costing (ABC). In the former, all inputs used for implementing the program are identified and their costs computed. The estimate gives a lump-sum cost of the entire program, as well as the total amount spent on each type of input (or, in accounting nomenclature, each object of expenditure). While these cost estimates can adequately show the financial implication of the program for the government, it is not useful for planners and managers that want to assess the cost-effectiveness of activities and are concerned with cost minimization, that want to examine whether substitution of less costly inputs for more costly ones is possible, and that want to increase effectiveness of activities through monitoring.

The activity-based way is managerially and programmatically more relevant. In a program that is still evolving and will have to modify its structure in response to cost constraints, ABC provides a potentially much more powerful approach to cost analysis (Fiedler 2003). ABC estimates the costs of an organization's activities so that they can be analyzed independently, and the method of modifying the program, if necessary, can be easily identified. To apply ABC, it is necessary to identify specific activities that are to be costed. The activities are referred to as "cost centers." Cost centers are a particular way in which the resources used to produce an organization's activities—and the costs of those resources—are grouped. Cost centers must be defined in such a way that the sum of the cost centers is comprehensive and

so that it shows the cost of the entire program. Therefore, they must be mutually exclusive, so that there is no double counting (Fiedler 2003, Fiedler 2008).

Since the objective of this analysis is to estimate costs for a nutrition program that is yet to fully emerge and that will require frequent modifications, the ABC approach was used for costing of the program.¹¹ The estimated cost for an average upazila/thana was multiplied by 508 to obtain the annual cost of the program.

5.2.2 Basic Assumptions about the Program and Costing

This costing analysis requires that some assumptions be made about the type and scale of the proposed program. The assumptions about the scope and content of a program were agreed upon through a consultative process that consisted of discussions with the steering committee chaired by the GOB, small group meetings, individual consultations with key experts, and a literature review, and drawing on the experience of nutrition programming from within Bangladesh and from other countries, such as Honduras. Based on these consultations, the key assumptions that were made for costing purposes about a comprehensive nutrition program for Bangladesh were that:

- A comprehensive nutrition program for Bangladesh will be integrated into the health system, expanding the current service delivery structure to also include nutrition.
- The proposed program will be a comprehensive community-based program that provides nutrition services to children and mothers along the spectrum from prevention to treatment, and these services will be integrated with child health care services, safe delivery, and newborn care (given this already exists within the current health/FP service structures).
- Community involvement will be essential, and community volunteers will provide basic nutrition services, information, and referrals at the community level (this has proven essential in both Bangladesh and other country settings to reach households to provide targeted services).
- There will be an emphasis on the spectrum of nutrition services, from prevention to treatment, to both prevent and treat malnutrition.
- Nutrition services will be integrated with health/FP services, as these sectors are interdependent and synergistic: success and improvement in one sector support success and improvement in the other two sectors and integration in this manner can increase both implementation efficiency and cost efficiency; in particular, integration and coordination of services between nutrition, newborn care, safe delivery, child health, hygiene and sanitation, and FP are essential to promote good nutrition, but also to health and well-being.
- The program will be coordinated across sectors and ministries, specifically health, education, agriculture, food and disaster management, and local government and rural

¹¹ The administrative unit of a rural area is designated as an upazila while the administrative area of an urban area is designated as a thana. The total number of upazilas and thanas is 508 as of December 2011 in Bangladesh.

development, given that nutrition depends on households being food secure, having adequate diet diversity, and having higher levels of education in general and specific knowledge about nutrition.

Importantly, all the identified aspects of the program seek to build on the existing infrastructure in the country. For example, nutrition services that are integrated into the health system will build on the existing health infrastructure. For the agriculture sector, this will involve adding nutrition activities to its mandate and services (which already exist). For the education sector, it will involve adding nutrition to school curricula, again building on existing infrastructure.

5.2.3 The Current Health and Family Planning Infrastructure and the Structure of the Proposed Nutrition Program of Bangladesh

In assuming a structure of how nutrition services will be integrated into the HPN structure, it was agreed, through the consultation process, that nutrition services would build on the existing health infrastructure to gain from both the economies of scale and synergy across sectors. Coordination across, within, and outside of the health sector; integration of services in the three sectors (nutrition, health, and FP); and clear service delivery mechanisms were also identified as parts of a critical foundation for the integration of nutrition services in the existing system. Finally, both management and governance of the health service delivery system were identified as essential. It is assumed that management of nutrition services would fall under the authority of the MOHFW, which will have responsibility for managing and coordinating within and across ministries and sectors and will serve as the steward of the HPN sector, including nutrition. Similarly, it is assumed that governance of the health sector, including nutrition, would be the responsibility of a high-level steering committee headed by the Minister of Health and representatives from other relevant ministries and stakeholder institutions.

The following sections describe how the current management infrastructure is set up and how the management and governance of the proposed nutrition program would work.

Management

Below the national level, in the current system, the delivery of health and FP services is managed by divisional directors, followed by civil surgeons for health and deputy directors for FP for each district. These two officers serve as the chief managers for services in the health and FP sectors, respectively, at the district level. The civil surgeon supervises and monitors the activities of the Upazila Health Complexes (UHCs) and the district deputy director for FP does the same for the upazila-level FP services. These managers are responsible for coordination between the line directors (Director General [DG] Office) and the district-level managers.

At the upazila level, the upazila health and family planning officer (UHFPO) serves as the chief manager overseeing upazila-level activities. Most upazilas have a family welfare center or rural dispensary (RD) staffed with one family planning inspector (FPI), one sub-assistant community medical officer (SACMO), one family welfare visitor (FWV), one assistant health inspector (AHI), one pharmacist, and two support staff. Some family welfare centers (FWCs) also have medical officers (MOs). Each upazila is to have three community clinics (CCs), one for each ward. In turn, each CC is currently staffed with a family welfare assistant

(FWA) and a health assistant (HA), and community service providers (CSPs) will be hired for each clinic soon.

CCs serve as the front line for community-level health and FP services and are viewed as one-stop shops for health. These clinics provide basic services, including social and behavior change communication (SBCC), contraceptives, basic health care, and referrals to higher-level facilities. The HAs organize satellite clinics for immunization of mothers and children, and both FWAs and HAs also visit the units to discuss health and FP issues and collect information on the issues from the households. The FWCs provide some basic and maternal health care. Each upazila has one health complex that provides outpatient and inpatient care for uncomplicated cases; complicated cases are referred to district hospitals (DHs) (under the civil surgeon) or tertiary facilities located mostly in Dhaka.

Given this existing infrastructure for health and FP, it was assumed that for the integration of nutrition, one line director could be assigned the responsibility of implementing the nutrition program at central level. At the divisional level, the divisional director for health could be entrusted with the additional task of coordinating the district-level nutrition activities. No additional human resources manpower would be needed for the nutrition program at the division level. In each district, the civil surgeon would be the chief manager of the district nutrition activities as well. However, it was assumed that to assist him/her in this activity, one person at the assistant director (AD) level, preferably a nutrition graduate, and two support staff would be hired. In addition, one gynecologist and one pediatrician from the DH should be trained to manage cases of severe acute malnutrition (SAM) in children that are referred to the DH. In each UHC, it was assumed that one upazilla nutrition officer, one assistant nutrition officer, and three support staff would be hired to supervise, monitor, and coordinate the nutrition activities at the upazila level. At the FWC level, no additional human resources would be needed to supervise activities for the nutrition component. For example, the AHIs from each upazila could do this job.

At the CC level, no additional staffing would be required, as the FWAs, HAs, and CSPs could be trained in nutrition, and, for each CC (covering 6,000 population or 1,200 households), six nutrition volunteers (one each for 200 households) would be needed to intensify and sustain SBCC activities for nutrition, safe delivery, and newborn care. The services of volunteers were deemed crucial for the program. The volunteers would be recruited from within the community, preferably through nongovernmental organizations (NGOs), and would work under the supervision of the HA of the CC. The volunteers would visit households at regular intervals, organize cluster meetings of mothers, hold meetings of community leaders, participate in the satellite clinics, supply the micronutrients and fortified food items, report to the HA about cases of severely acutely malnourished children, and support the health management information system (MIS) and monitoring and reporting efforts.

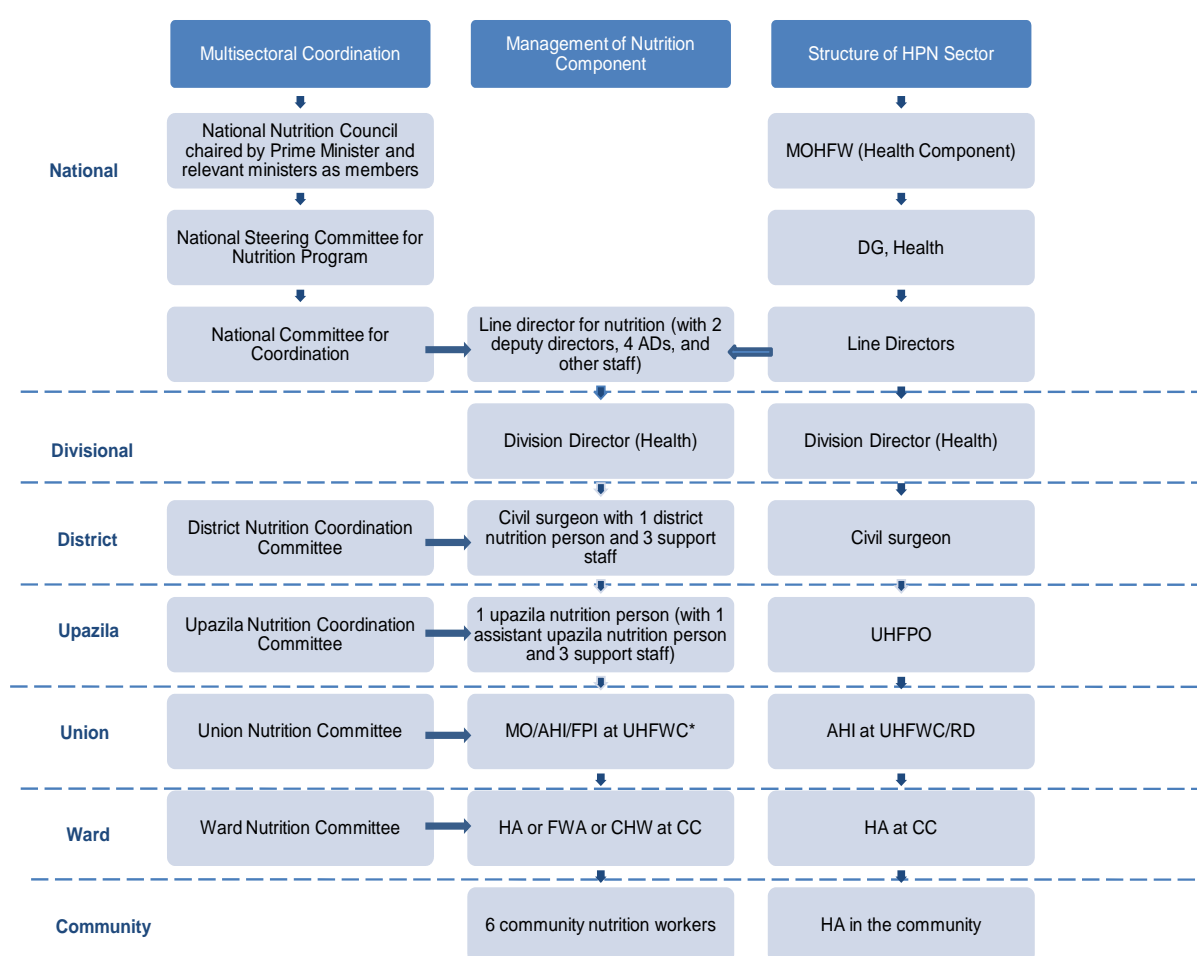
Governance

It was assumed that a structure of governance for the nutrition program would be created. As noted earlier, a high-level national steering committee for nutrition would be formed.

The committee would be headed by the Minister of Health. Senior-level officials of the relevant sectors, such as DGs of MOHFW, four components of agriculture (crop, livestock, poultry, and fishery), food, education, finance, and planning, as well as representatives of

development partners, NGOs, civil society, and researchers/experts, would also be members. It was assumed that the committee would meet twice a year to discuss nationwide progress on program implementation, constraints, and measures needed to accelerate the rate of progress. In addition to the steering committee, one national coordination committee for nutrition should be constituted under the chairmanship of the DG of health. The committee would discuss specific issues in detail and would suggest measures for quick implementation. Coordination committees would also be formed at the district, upazila, union, and ward levels as a means to involve community leaders and gatekeepers.

Figure 8. Assumed Structure of the Nutrition Component of the Bangladesh HPN Sector



* Union Health and Family Welfare Center

In Bangladesh, the MOHFW is responsible for health service provision to the rural population. However, in urban settings, the services are provided by the city corporations or the municipalities, which belong to the MOLGRD. The city corporations and the municipalities deliver the services through a network of NGOs. The financing of these services also differs between the MOHFW and the MOLGRD. The MOHFW services are funded through the government's internal revenue, while the city corporations and the municipalities depend mostly on external donor funding. It is true that the MOHFW runs some tertiary hospitals (including the well-reputed Dhaka Medical Hospital) and specialized

centers in the cities to deliver health care. But the services of these facilities are meant for the population of the entire country, that is, the people from the country's rural areas have equal access to them. As a result, these facilities suffer from excessive workload and they cannot meet the huge demand for their services. The urban poor have little access to them; instead, they have to depend on the NGO facilities funded through the city corporations. But the city corporations are yet to devise a stable structure and system for providing health and FP services to the urban poor.

Against this backdrop, it was assumed that the above structure also applies to the cities, disregarding whether the services are provided by the MOHFW or the MOLGRD. The implication is that the structure of service provision in urban areas was assumed to be similar to that in rural areas: A CC would be established in each para (part of a mahalla); a union health and family welfare center (UHFWC)-type facility would be established for each mahalla; a UHC-type facility would be set up for each thana; and two DHs in Dhaka City and one DH for all other big cities would be established to provide health, FP, and nutrition services exclusively to the urban poor. Up to the thana level from the para level, the services would be provided by the MOLGRD, and service provision would be coordinated at the district and higher levels by the deputy directors and directors of the MOHFW.

In estimating the costs of the nutrition program, it was assumed that the structure under the MOHFW that exists at present for the rural population and the hypothetical (but realistic and likely) structure under the MOLGRD for the urban population would be the same. Any difference with the actual structure to be established from the one assumed here would not change the estimate of costs considerably because the population and level of inputs required have been included in the model.

5.2.4 Activities (Interventions) of the Program

Table 3 presents the eight sets of interventions/activities or cost centers that were identified through the consultation process. Stakeholders agreed that these eight components were essential to a new nutrition program. The details of the unit costs for all the items included in the model are given in **Annex A**.

- The SBCC and community nutrition promotion cost center includes interpersonal communication, community-based activities, and mass media. Interpersonal communication includes peer education and provider-client communication, such as regular household visits by program workers, cluster meetings of households, and discussions in the satellite clinics. Community-based activities would include community meetings and orientation meetings with key local leaders. A community-based, long-term, preventive measure is to also include nutrition in the curricula of all classes above grade 3 in primary and secondary schools. Mass media includes messages on broadcast media, such as radio, TV, and mobile phones, as well as in print media, such as newspapers, job aids, and billboards. SBCC was included as a cross-cutting approach

- Targeted food supplementation for pregnant and lactating women and children under 2 for the lowest three quintiles of the population includes the costs of food supplements and service delivery.¹²
- Management of SAM cases includes the cost of ready-to use therapeutic foods distributed to children under 5, training, and service delivery. The model assumes, however, that the number of cases of SAM will decrease over the 10-year period assuming the prevalence of malnutrition will be reduced significantly over the same period.¹³
- Micronutrient supplementation includes the cost of multiple micronutrients, iron-folate tablets, zinc supplementation for management of diarrhea, and vitamin A capsules, following the MOHFW protocols for distribution.
- Systems strengthening includes the cost of reallocating staffing and training of staff at all levels; for example¹⁴:
 - Reallocating staff to positions that allow them to focus on nutrition
 - Training trainers at the central level
 - Providing training on basic nutrition and anthropometric measurements to all staff at the primary levels (upazila and below)
 - Training one gynecologist and one pediatrician from each UHC and DH on managing SAM in children under 5
 - Training one nutrition officer for each upazila on nutrition and management and coordination
 - Developing and implementing a system of record keeping and maintaining service statistics
 - Developing and implementing an effective system of supervision and monitoring of the program activities to track progress on nutrition activities and indicators over time
 - Analyze systems and implement appropriate recommendations based on lessons learned
 - Providing training on tracking budget utilization
 - Planning and allocating adequate resources for the proposed nutrition activities, including SBCC

¹² Cost associated with supply chain has not been included, considering that the additional cost will be negligible, since these outputs can be supplied across the country using the existing supply mechanism of the sector.

¹³ This information was collected from potential producers in the private sector that cited particular prices for these commodities, which include all factor costs (even overhead charges/profit, since profit is the remuneration for one input: entrepreneurship). The value of all factors were included in the cost of production. As such, these costs include the cost of the supply chain as well.

¹⁴ Systems strengthening includes the cost of developing training materials, but pre-service training cost has not been included.

- The management and coordination cost center includes the costs of meetings at various levels several times a year.
- The deworming cost center includes the costs of providing deworming services to children 2–5 years of age two times a year.
- The food fortification cost center includes the cost of fortifying foods¹⁵ and the cost for the government to play a role in developing policy, monitoring quality, and implementing subsidy policies to promote access of fortified foods for the poor.
- The household food security cost center includes the costs of working with the Ministry of Agriculture to provide knowledge on nutrition and diet diversity, inputs for farming, and extension services for farmers to promote household food security.

Table 3. Costing Based on Key Activities for Each Cost Center

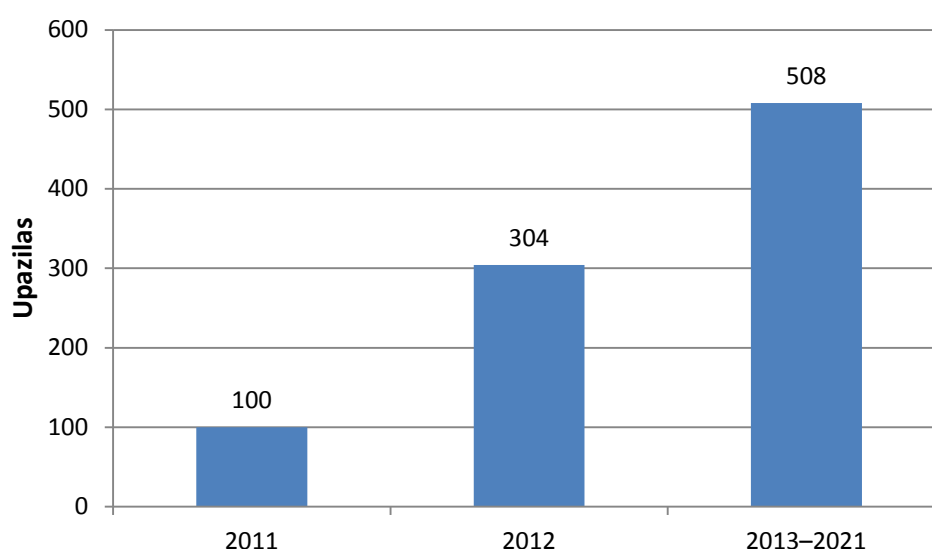
Cost centers (interventions)	Key activities for which costs were calculated under each cost center
SBCC and community nutrition promotion	<ol style="list-style-type: none"> 1. Interpersonal communication 2. Growth monitoring and promotion 3. Mass media 4. Integrating nutrition education in primary and secondary curricula 5. Community mobilization 6. Advocacy
Targeted food supplementation	Food supplementation for pregnant and lactating women and children under 2, poorest three quintiles
Management of SAM in children	Community- and facility-based treatment of SAM in children 6–59 months
Micronutrient supplementation	<ol style="list-style-type: none"> 1. Iron-folic acid (IFA) supplementation to pregnant and lactating women and non-pregnant adolescents 2. Vitamin A supplementation for mother and children 3. Multiple micronutrient supplementation to children aged 1–5 years 4. Zinc supplementation during diarrhea treatment to children under 5
Systems strengthening	Human resource development, MIS, surveillance, and evaluation
Management and coordination	Governance, management, and coordination
Deworming	Children 2–5 years of age two times a year
Food fortification	Developing policies, monitoring quality, ensuring accessibility through government subsidies
Promote household food security through agriculture	<ol style="list-style-type: none"> 1. Increasing men's and households' knowledge of nutrition 2. Extension services and inputs to support livestock and farming for increased household food security

¹⁵ The cost of marketing and promotion has not been separately considered because, in the private sector, total food fortification cost by definition includes cost of promotion and marketing.

5.2.5 Phasing of the Program

To achieve the nutrition-related MDGs by 2015, the government should start implementing the nutrition program across the country at scale immediately. However, in reality, it is likely that scaling up of nutrition services will take some time. Recruitment and training of staff at every level, procurement of supplies, and forming committees for management and coordination cannot all be properly achieved at scale in the first year. As such, for the purposes of costing, it was assumed that the government would phase the scale-up of nutrition services (**Figure 9**), starting with providing services in 100 upazilas in Year 1, in 204 upazilas in Year 2, and in the remaining 204 upazilas in Year 3, such that by Year 3 nutrition services would be provided at scale across the country (that is, all 508 upazilas).

Figure 9. Assumed Phases of Program Coverage: Number of Upazilas That Will Be Covered over Time, 2011–2021



6. Results

6.1 Results from the PROFILES Model

The results from the PROFILES model are presented in **Tables 4–6** and **Figures 10–15**. As noted in the methods sections, to generate the PROFILES estimates for the 2011–2021 and 2011–2015 time periods, it was assumed that, by 2021, stunting, underweight, and wasting would be reduced by 90 percent of current prevalence rates; LBW would be reduced by 70 percent of the current prevalence rate; VAD and IDD would be virtually eliminated (a reduction of 99 percent); and anemia would be reduced by 50 percent of current prevalence rates, since about half of all anemia is attributable to iron.

Table 4 presents the results for the various nutrition indicators for which estimates can be generated. This includes estimates of lives lost, in the case of no additional investment in nutrition, and lives saved, as a result of increased investment in nutrition. The specific indicators for which results are presented include wasting, stunting, underweight, LBW, IDA, and VAD, for the 2011–2021 and 2011–2015 time periods. These are the indicators for which there is a strong evidence base linking these forms of malnutrition to mortality; hence, investment in reducing these forms of malnutrition will result in reductions in maternal and child deaths—or lives saved.

Table 4 shows that reducing LBW by 70 percent over the 2011–2021 time period (from 36 percent to about 11 percent of live births) could save the lives of 230,000 children in the first year of life (and about 34,000 lives in the 2011–2015 time period, assuming a steady decrease in the occurrence of LBW) and that, if VAD were virtually eliminated by 2021, about 50,000 lives of children under 5 could be saved over the 2011–2021 period (about 8,000 lives by 2015, assuming a steady decline in the percentage of children with vitamin A deficiency). Table 4 also shows that reductions in the prevalence of maternal IDA by 2021 could save about 6,000 women’s lives and avert about 150,000 perinatal deaths over the 2011–2021 time period (and, assuming a steady reduction in the prevalence of maternal IDA from 2011 to 2021, save about 1,100 women’s lives and avert 30,000 perinatal deaths from 2011 to 2015).

Table 5 presents the results for IDD’s impact on permanent brain damage in children. The table shows that virtual elimination of maternal IDD by 2021 could result in the prevention of permanent brain damage in about 2 million children over the 2011–2021 time period (permanent brain damage could be prevented in about 360,000 children from 2011 to 2015, assuming steady decrease in the percentage with IDD).

Table 6 presents the economic productivity losses that will result if the current nutrition situation continues unchanged, and the economic gains that will result if investment in nutrition is increased over the next decade. The specific indicators for which results are presented include stunting, LBW, IDA, and IDD, for both the 2011–2021 and 2011–2015 time periods. These are the indicators for which there is strong evidence on the link between nutrition and productivity. Some of this loss is a result of poor nutrition affecting education outcomes that subsequently results in lower economic productivity.

Table 4 and **Figures 10** and **12** show that if stunting and wasting levels remain unchanged until 2021, the number of deaths related to stunting (low height-for-age) and wasting (low weight-for-height) in children can be expected to increase yearly, because the annual number of births will continue to increase. However, if high coverage of effective nutrition interventions (**Table 4** and **Figures 11** and **13**) are implemented, reducing stunting and wasting levels to their targets, children’s lives could be saved from stunting- and wasting-related deaths. In the 2011–2021 time period, assuming a steady reduction in stunting levels, the lives of about 160,000 children could be saved; about 28,000 lives could be saved in the 2011–2015 time period. Similarly, assuming a steady reduction in wasting levels over the 2011–2021 time period, the lives of about 150,000 lives of children could be saved, while about 26,000 lives could be saved in the 2011–2015 time period.¹⁶

Figure 14 graphically depicts the information from **Tables 4** and **5**. Reductions in the prevalence of maternal IDA by 2021 could save about 6,000 women’s lives and avert about 150,000 perinatal deaths over the 2011–2021 time period (and, assuming a steady reduction in the prevalence of maternal IDA from 2011 to 2021, save about 1,100 women’s lives and avert 30,000 perinatal deaths from 2011 to 2015). Maternal anemia increases the risk of maternal and perinatal deaths related to pregnancy and delivery. Similarly, as shown in Table 5, the virtual elimination of maternal IDD by 2021 could result in preventing permanent brain damage in about 2 million children over the 2011–2021 time period (permanent brain damage could be prevented in about 360,000 children from 2011 to 2015 assuming steady decrease in the percentage with IDD). Globally, brain damage from intrauterine IDD is the leading cause of preventable brain damage.

Figure 15 shows the economic productivity gains that could be achieved if the prevalence of stunting, LBW, IDA in adults, and IDD could be significantly reduced over the 2011–2021 time period. Overall, economic gains through increased productivity as result of improved nutrition exceed Tk. 70,000 crore (US\$10 billion) for Bangladesh by 2021.

¹⁶ There is some overlap in the deaths associated with stunting and with wasting.

Table 4. Lives Lost Attributable to Various Nutrition Problems and Lives Saved Related to Improved Nutrition

Indicators	Time Period			
	2011–2021		2011–2015	
	Number of deaths that would result if the current situation continues	Number of lives saved that would be saved through increased investment in effective nutrition interventions implemented at scale	Number of deaths that would result if the current situation continues	Number of lives saved that would be saved through increased investment in effective nutrition interventions implemented at scale
	<i>Status quo scenario</i>	<i>Improved scenario</i>	<i>Status quo scenario</i>	<i>Improved scenario</i>
Anthropometric indicators				
Deaths/lives saved attributable to wasting among children 0–59 months				
Mild (weight-for-height –1 to < –2 SD)	88,478	26,970	39,254	4,751
Moderate (weight-for-height –2 to < –3 SD)	146,620	63,315	65,049	11,153
Severe (weight-for-height < –3 SD)	123,161	56,313	54,641	9,919
Total	358,260	146,597	158,944	25,822
Deaths/lives saved attributable to stunting among children 0–59 months				
Mild (height-for-age –1 to < –2 SD)	30,298	8,466	13,442	1,491
Moderate (height-for-age –2 to < –3 SD)	81,564	37,293	36,186	6,569
Severe (height-for-age < –3 SD)	250,361	114,472	111,074	20,164
Total	362,223	160,231	160,703	28,224
Deaths/lives saved attributable to underweight among children 0–59 months				
Mild (weight-for-age –1 to < –2 SD)	88,806	27,070	39,399	4,768
Moderate (weight-for-age –2 to –3 SD)	137,738	62,977	61,108	11,093
Severe (weight-for-age < –3 SD)	322,834	147,609	143,228	26,001
Total	549,378	237,656	243,735	41,862
Low birth weight				
Neonatal deaths/lives saved	783,494	182,527	357,602	26,535
Post-neonatal deaths/lives saved	161,930	48,830	71,842	7,902
Total	945,425	231,357	429,444	34,437
Iron deficiency anemia				
Maternal deaths/lives saved	12,075	6,281	5,364	1,145
Perinatal deaths/lives saved	282,114	154,757	125,314	31,557
Vitamin A deficiency				
Child deaths/lives saved	120,913	52,237	53,644	8,706

Source: Bangladesh PROFILES 2011.

Table 5. Number of Children with Permanent Brain Damage (Mild to Severe) as Result of IDD during Fetal Development and Number of Children where Permanent Brain Damage Would Be Averted Related to Virtual Elimination of IDD

Indicators	Time Period			
	2011–2021		2011–2015	
	Number children that would have mild to severe permanent brain damage if the current situation continues	Number of children for whom disability as a result of IDD would be prevented through increased investment in effective nutrition interventions implemented at scale	Number children that would have mild to severe permanent brain damage if the current situation continues	Number of children for whom disability as a result of IDD would be prevented through increased investment in effective nutrition interventions implemented at scale
Iodine Deficiency	<i>Status quo scenario</i>	<i>Improved scenario</i>	<i>Status quo scenario</i>	<i>Improved scenario</i>
IDD-related child disability	4,109,862	2,066,180	1,825,586	364,734

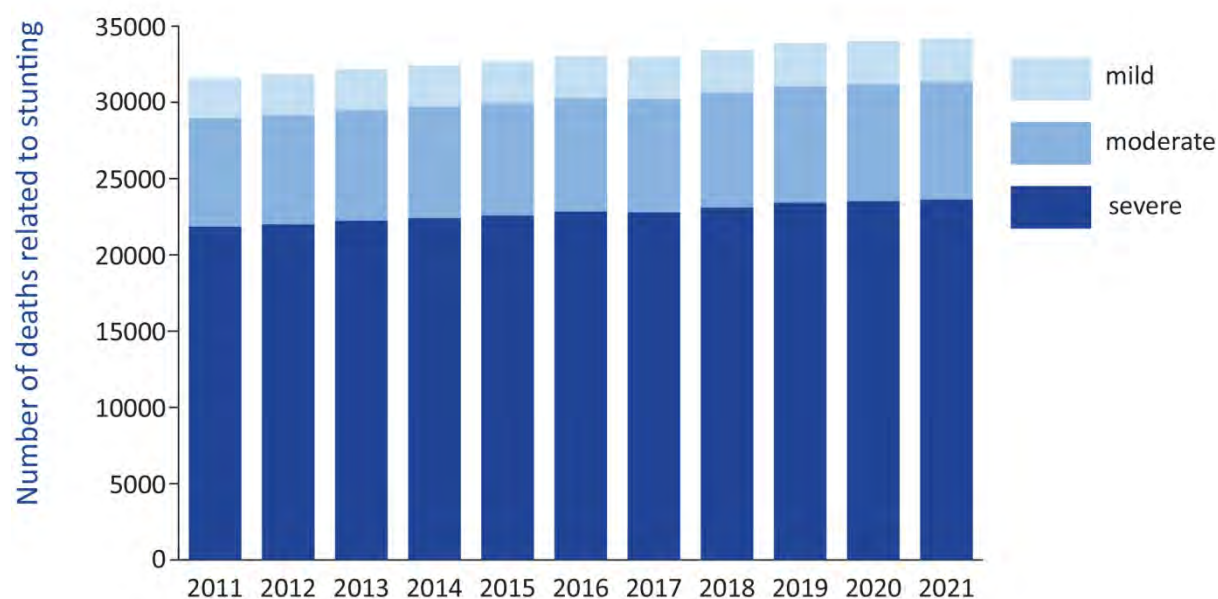
Source: Bangladesh PROFILES 2011.

Table 6. Economic Productivity Losses Related to Various Nutrition Problems and Economic Productivity Gains Related to Improvement in Various Nutrition Conditions

Indicators	Time Period			
	2011–2021		2011–2015	
	Economic productivity losses if the current situation continues	Economic productivity gains through increased investment in effective nutrition interventions implemented at scale	Economic productivity losses if current situation continues	Economic productivity gains through increased investment in effective nutrition interventions implemented at scale
	(US\$ million)	(US\$ million)	(US\$ million)	(US\$ million)
	<i>Status quo scenario</i>	<i>Improved scenario</i>	<i>Status quo scenario</i>	<i>Improved scenario</i>
Stunting	27,914	13,340	12,294	2,327
Low birth weight	4,343	1,544	1,929	273
Iron deficiency anemia	4,448	1,149	1,255	196
Iodine deficiency	1,838	924	816	163

Source: Bangladesh PROFILES 2011.

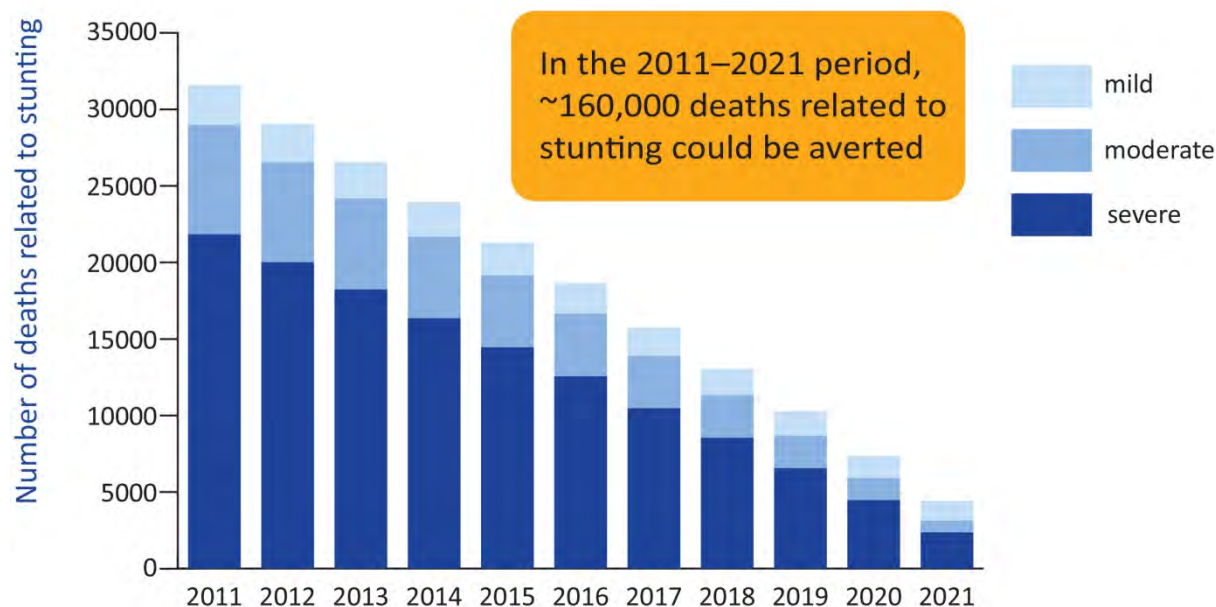
Figure 10. Status Quo = Increasing* Number of Under-5 Child Deaths Related to Stunting from 2011 to 2021**



* Because of increase in annual number of births

** Mild, moderate, and severe stunting (low height-for-age)

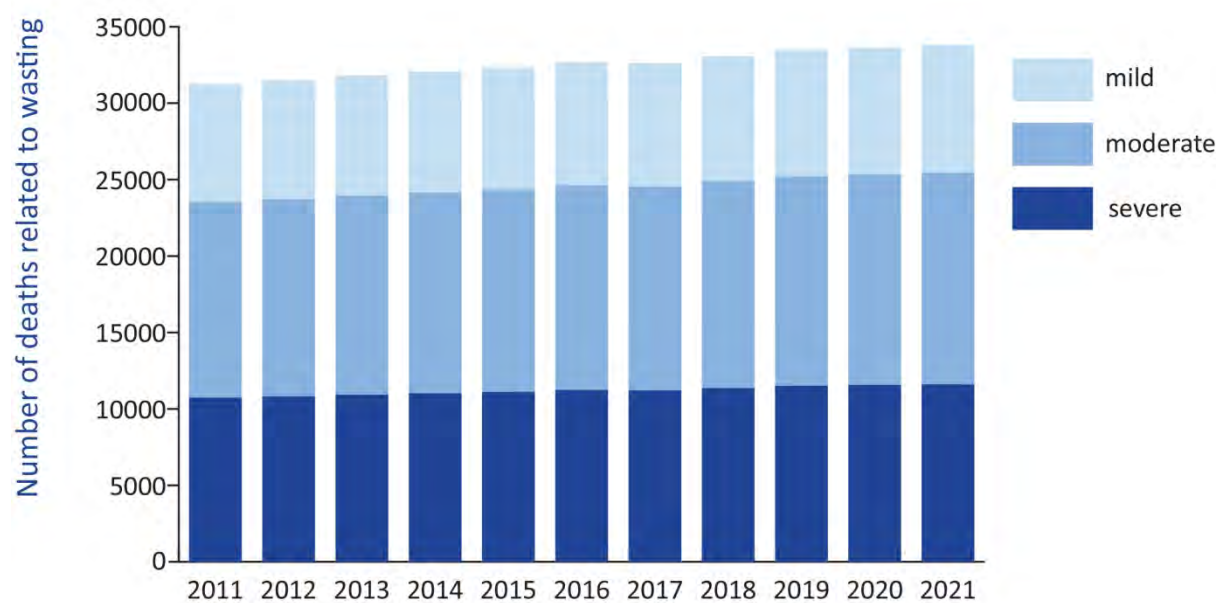
Figure 11. High Coverage of Effective Nutrition Interventions = Decreasing Number of Under-5 Child Deaths Related to Stunting* from 2011 to 2021**



* Mild, moderate, and severe stunting (low height-for-age)

** In the 2011–2015 time period, ~28,000 deaths related to stunting could be averted

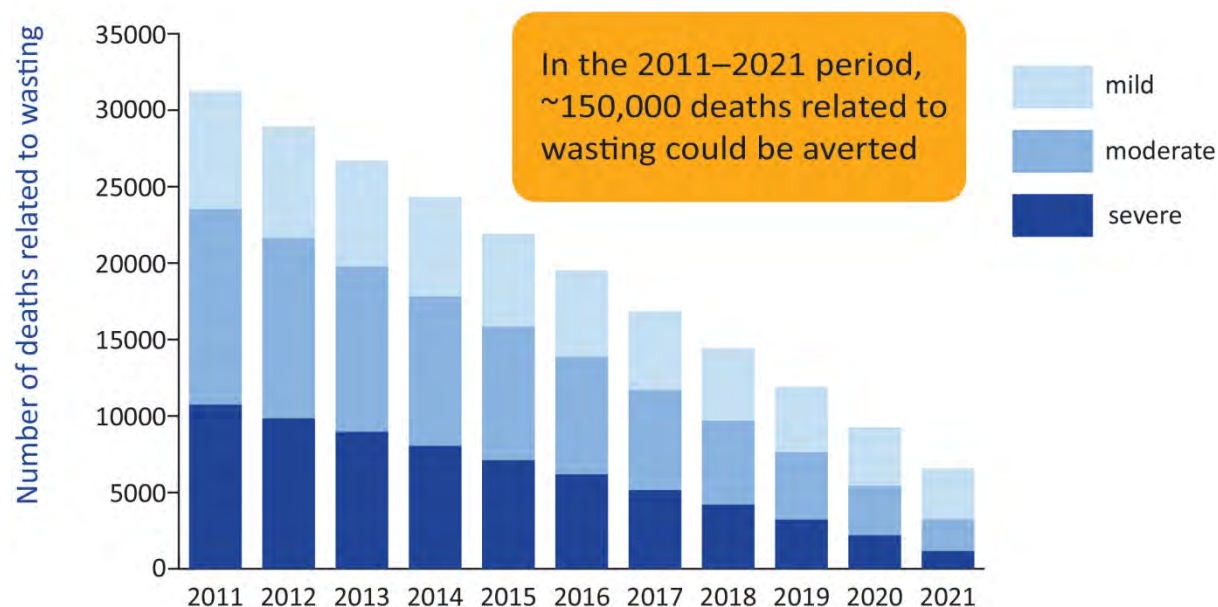
Figure 12. Status Quo = Increasing* Number of Under-5 Child Deaths Related to Wasting from 2011 to 2021**



* Because of increase in annual number of births

** Mild, moderate, and severe wasting (low weight-for-height)

Figure 13. High Coverage of Effective Nutrition Interventions = Decreasing Number of Under-5 Child Deaths Related to Wasting* from 2011 to 2021**



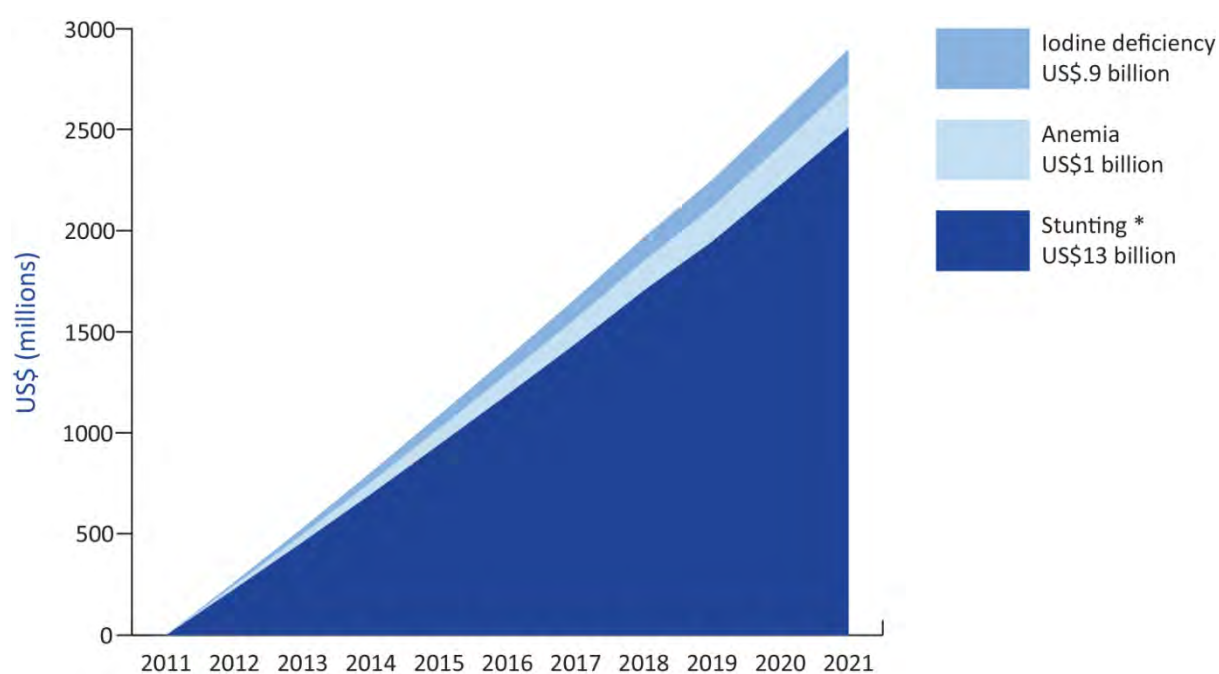
* Mild, moderate, and severe wasting (low weight-for-height)

** In the 2011–2015 time period, ~26,000 deaths related to wasting could be averted

Figure 14. Saving Lives and Preventing Disabilities



Figure 15. Productivity Gains by 2021



* Productivity gains from stunting also include gains that would result from reduced LBW

6.1.1 Results from PROFILES for the Divisions and Districts of Bangladesh

Once the national estimates were derived, division- and district-level estimates were generated based on the relative population size of each of the 6 divisions and 64 districts in Bangladesh. The following two tables show the district- and division-level information.

Table 7 shows the number of deaths attributable to various nutrition problems (underweight, stunting, and wasting; VAD; maternal IDA; and LBW), under the *status quo* scenario if the current situation continues and the number of lives saved under the *improved* scenario if the prevalence of malnutrition, in its various forms, could be reduced significantly through increased investment in and implementation of effective nutrition interventions at scale. Economic productivity losses (related to stunting, IDD, IDA, and LBW) are shown in **Table 8**. This table also shows the potential economic productivity gains that could be achieved through reductions in the prevalence of the nutrition problems.

Table 7. Lives Lost Attributable to Various Nutrition Problems and Lives Saved Related to Improved Nutrition, by Division and District

Divisions and Districts	2011–2021													
	Status quo: Lives lost							Improved: Lives saved						
	Child				Maternal	Perinatal	Child	Child				Maternal	Perinatal	Child
	underweight	stunting	wasting	VAD	IDA	IDA	LBW	underweight	stunting	wasting	VAD	IDA	IDA	LBW
Bangladesh	549,378	362,223	358,260	120,913	12,075	282,114	945,425	237,656	160,231	146,597	52,237	6,281	154,757	231,357
Rangpur Division	61,174	40,334	39,893	13,464	1,345	31,414	105,275	26,463	17,842	16,324	5,817	699	17,232	25,762
Panchagarh	3,694	2,436	2,409	813	81	1,897	6,357	1,598	1,077	986	351	42	1,041	1,556
Thakurgaon	5,365	3,537	3,499	1,181	118	2,755	9,232	2,321	1,565	1,432	510	61	1,511	2,259
Dinazpur	11,676	7,698	7,614	2,570	257	5,996	20,093	5,051	3,405	3,116	1,110	133	3,289	4,917
Nilphamari	6,943	4,578	4,528	1,528	153	3,566	11,949	3,004	2,025	1,853	660	79	1,956	2,924
Lalmonirhat	4,901	3,231	3,196	1,079	108	2,517	8,434	2,120	1,429	1,308	466	56	1,381	2,064
Rangpur	11,232	7,406	7,325	2,472	247	5,768	19,329	4,859	3,276	2,997	1,068	128	3,164	4,730
Kurigram	7,917	5,220	5,163	1,742	174	4,066	13,624	3,425	2,309	2,113	753	91	2,230	3,334
Gaibanda	9,446	6,228	6,160	2,079	208	4,851	16,256	4,086	2,755	2,521	898	108	2,661	3,978
Rajshahi Division	72,252	47,638	47,117	15,902	1,588	37,102	124,339	31,256	21,073	19,280	6,870	826	20,353	30,427
Joypurhat	3,741	2,466	2,439	823	82	1,921	6,437	1,618	1,091	998	356	43	1,054	1,575
Bogra	13,311	8,776	8,680	2,930	293	6,835	22,907	5,758	3,882	3,552	1,266	152	3,750	5,606
Nagoaon	10,565	6,966	6,889	2,325	232	5,425	18,181	4,570	3,081	2,819	1,005	121	2,976	4,449
Natore	6,721	4,431	4,383	1,479	148	3,451	11,566	2,907	1,960	1,793	639	77	1,893	2,830
Nawabganj	6,297	4,152	4,106	1,386	138	3,233	10,836	2,724	1,837	1,680	599	72	1,774	2,652
Rajshahi	10,103	6,661	6,588	2,224	222	5,188	17,386	4,370	2,947	2,696	961	116	2,846	4,255
Sirajganj	11,901	7,847	7,761	2,619	262	6,111	20,480	5,148	3,471	3,176	1,132	136	3,352	5,012
Pabna	9,614	6,339	6,270	2,116	211	4,937	16,545	4,159	2,804	2,566	914	110	2,708	4,049
Khulna Division	64,965	42,834	42,365	14,298	1,428	33,360	111,798	28,103	18,948	17,335	6,177	743	18,300	27,358
Kushtia	7,688	5,069	5,013	1,692	169	3,948	13,230	3,326	2,242	2,051	731	88	2,166	3,237
Meherpur	2,613	1,723	1,704	575	57	1,342	4,496	1,130	762	697	248	30	736	1,100
Chuadanga	4,449	2,934	2,901	979	98	2,285	7,657	1,925	1,298	1,187	423	51	1,253	1,874
Jhenaidah	6,978	4,601	4,550	1,536	153	3,583	12,008	3,019	2,035	1,862	663	80	1,966	2,939
Magura	3,642	2,401	2,375	801	80	1,870	6,267	1,575	1,062	972	346	42	1,026	1,534
Narail	3,086	2,034	2,012	679	68	1,585	5,310	1,335	900	823	293	35	869	1,299
Jessore	10,919	7,199	7,120	2,403	240	5,607	18,790	4,723	3,185	2,914	1,038	125	3,076	4,598
Satkhira	8,238	5,432	5,372	1,813	181	4,230	14,177	3,564	2,403	2,198	783	94	2,321	3,469
Khulna	10,510	6,929	6,854	2,313	231	5,397	18,086	4,546	3,065	2,804	999	120	2,961	4,426
Bagerhat	6,843	4,512	4,463	1,506	150	3,514	11,777	2,960	1,996	1,826	651	78	1,928	2,882

Divisions and Districts	2011–2021													
	Status quo: Lives lost							Improved: Lives saved						
	Child				Maternal	Perinatal	Child	Child				Maternal	Perinatal	Child
	underweight	stunting	wasting	VAD	IDA	IDA	LBW	underweight	stunting	wasting	VAD	IDA	IDA	LBW
Barisal Division	36,110	23,808	23,548	7,947	794	18,543	62,142	15,621	10,532	9,636	3,433	413	10,172	15,207
Pirojpur	4,908	3,236	3,201	1,080	108	2,521	8,447	2,123	1,432	1,310	467	56	1,383	2,067
Jhalakati	3,067	2,022	2,000	675	67	1,575	5,278	1,327	895	818	292	35	864	1,292
Barisal	10,408	6,862	6,787	2,291	229	5,345	17,912	4,503	3,036	2,777	990	119	2,932	4,383
Bhola	7,524	4,961	4,907	1,656	165	3,864	12,948	3,255	2,194	2,008	715	86	2,119	3,169
Patuakhali	6,453	4,255	4,208	1,420	142	3,314	11,106	2,792	1,882	1,722	614	74	1,818	2,718
Barguna	3,749	2,472	2,445	825	82	1,925	6,451	1,622	1,093	1,000	356	43	1,056	1,579
Dhaka Division	172,492	113,730	112,485	37,964	3,791	88,577	296,842	74,619	50,309	46,028	16,401	1,972	48,590	72,641
Netrokona	8,783	5,791	5,728	1,933	193	4,510	15,115	3,800	2,562	2,344	835	100	2,474	3,699
Mymensingh	19,835	13,078	12,935	4,365	436	10,185	34,134	8,580	5,785	5,293	1,886	227	5,587	8,353
Sherpur	5,653	3,727	3,686	1,244	124	2,903	9,728	2,445	1,649	1,508	537	65	1,592	2,381
Jamalpur	9,309	6,138	6,071	2,049	205	4,780	16,020	4,027	2,715	2,484	885	106	2,622	3,920
Tangail	14,538	9,585	9,480	3,200	320	7,465	25,018	6,289	4,240	3,879	1,382	166	4,095	6,122
Kishoreganj	11,464	7,559	7,476	2,523	252	5,887	19,728	4,959	3,344	3,059	1,090	131	3,229	4,828
Manikganj	5,677	3,743	3,702	1,250	125	2,915	9,770	2,456	1,656	1,515	540	65	1,599	2,391
Dhaka	37,601	24,792	24,520	8,276	826	19,309	64,708	16,266	10,967	10,034	3,575	430	10,592	15,835
Gazipur	8,977	5,919	5,854	1,976	197	4,610	15,448	3,883	2,618	2,395	854	103	2,529	3,780
Narsingdi	8,376	5,523	5,462	1,843	184	4,301	14,414	3,623	2,443	2,235	796	96	2,360	3,527
Narayanganj	9,604	6,332	6,263	2,114	211	4,932	16,528	4,155	2,801	2,563	913	110	2,705	4,045
Munshiganj	5,717	3,769	3,728	1,258	126	2,936	9,838	2,473	1,667	1,525	544	65	1,610	2,407
Faridpur	7,760	5,116	5,060	1,708	171	3,985	13,354	3,357	2,263	2,071	738	89	2,186	3,268
Rajbari	4,205	2,773	2,742	926	92	2,160	7,237	1,819	1,227	1,122	400	48	1,185	1,771
Gopalganj	5,148	3,394	3,357	1,133	113	2,644	8,859	2,227	1,501	1,374	489	59	1,450	2,168
Madaripur	5,064	3,339	3,303	1,115	111	2,601	8,715	2,191	1,477	1,351	482	58	1,427	2,133
Shariatpur	4,781	3,153	3,118	1,052	105	2,455	8,228	2,068	1,395	1,276	455	55	1,347	2,014
Sylhet Division	35,075	23,126	22,873	7,720	771	18,011	60,360	15,173	10,230	9,359	3,335	401	9,880	14,771
Sunamganj	8,896	5,866	5,801	1,958	196	4,568	15,310	3,848	2,595	2,374	846	102	2,506	3,746
Sylhet	11,290	7,444	7,362	2,485	248	5,798	19,429	4,884	3,293	3,013	1,073	129	3,180	4,755
Moulvibazar	7,123	4,697	4,645	1,568	157	3,658	12,258	3,081	2,078	1,901	677	81	2,007	3,000
Habiganj	7,765	5,120	5,064	1,709	171	3,987	13,363	3,359	2,265	2,072	738	89	2,187	3,270

Divisions and Districts	2011–2021													
	<i>Status quo: Lives lost</i>							<i>Improved: Lives saved</i>						
	Child				Maternal	Perinatal	Child	Child				Maternal	Perinatal	Child
	underweight	stunting	wasting	VAD	IDA	IDA	LBW	underweight	stunting	wasting	VAD	IDA	IDA	LBW
Chittagong Division	107,310	70,753	69,979	23,618	2,359	55,105	184,670	46,421	31,298	28,635	10,203	1,227	30,229	45,191
Brahmanbaria	10,595	6,986	6,909	2,332	233	5,441	18,233	4,583	3,090	2,827	1,007	121	2,985	4,462
Comilla	20,302	13,386	13,240	4,468	446	10,426	34,938	8,783	5,921	5,418	1,930	232	5,719	8,550
Chandpur	10,034	6,616	6,543	2,208	221	5,153	17,267	4,341	2,926	2,677	954	115	2,826	4,226
Lakshmipur	6,582	4,340	4,292	1,449	145	3,380	11,327	2,847	1,920	1,756	626	75	1,854	2,772
Noakhali	11,386	7,507	7,425	2,506	250	5,847	19,594	4,925	3,321	3,038	1,083	130	3,207	4,795
Feni	5,480	3,613	3,573	1,206	120	2,814	9,430	2,371	1,598	1,462	521	63	1,544	2,308
Chittagong	29,211	19,260	19,049	6,429	642	15,000	50,270	12,636	8,520	7,795	2,777	334	8,229	12,302
Cox's Bazar	7,836	5,166	5,110	1,725	172	4,024	13,485	3,390	2,285	2,091	745	90	2,207	3,300
Khagrachhari	2,322	1,531	1,514	511	51	1,193	3,996	1,005	677	620	221	27	654	978
Rangamati	2,245	1,480	1,464	494	49	1,153	3,864	971	655	599	213	26	632	945
Bandarban	1,317	868	859	290	29	676	2,266	570	384	351	125	15	371	555

Source: Bangladesh PROFILES 2011.

Table 8. Number of Children with Permanent Brain Damage (Mild to Severe) as the Result of IDD during Fetal Development and Number of Children Where Permanent Brain Damage Would Be Averted Related to Virtual Elimination of IDD, by Division and District

Divisions and Districts	2011–2021	
	<i>Status quo</i> : Number of children with permanent brain damage	<i>Improved</i> : Number of children where permanent brain damage would be averted
	IDD	IDD
Bangladesh	4,109,862	2,066,180
Rangpur Division	457,639	230,072
Panchagarh	27,636	13,894
Thakurgaon	40,134	20,177
Dinazpur	87,345	43,911
Nilphamari	51,943	26,114
Lalmonirhat	36,663	18,432
Rangpur	84,026	42,243
Kurigram	59,227	29,776
Gaibanda	70,666	35,526
Rajshahi Division	540,513	271,736
Joypurhat	27,983	14,068
Bogra	99,580	50,062
Nagaoan	79,033	39,733
Natore	50,279	25,277
Nawabganj	47,106	23,682
Rajshahi	75,580	37,997
Sirajganj	89,029	44,758
Pabna	71,924	36,159
Khulna Division	485,998	244,329
Kushtia	57,511	28,913
Meherpur	19,547	9,827
Chuadanga	33,285	16,734
Jhenaidah	52,201	26,243
Magura	27,243	13,696
Narail	23,083	11,605
Jessore	81,683	41,065
Satkhira	61,627	30,982
Khulna	78,623	39,527
Bagerhat	51,194	25,737
Barisal Division	270,136	135,807
Pirojpur	36,720	18,461
Jhalakati	22,944	11,535
Barisal	77,863	39,145
Bhola	56,287	28,298
Patuakhali	48,278	24,271
Barguna	28,044	14,099
Dhaka Division	1,290,403	648,733
Netrokona	65,708	33,034

Divisions and Districts	2011–2021	
	<i>Status quo</i> : Number of children with permanent brain damage	<i>Improved</i> : Number of children where permanent brain damage would be averted
	IDD	IDD
Mymensingh	148,383	74,597
Sherpur	42,288	21,260
Jamalpur	69,642	35,012
Tangail	108,755	54,675
Kishoreganj	85,762	43,116
Manikganj	42,471	21,352
Dhaka	281,291	141,415
Gazipur	67,153	33,760
Narsingdi	62,661	31,502
Narayanganj	71,848	36,120
Munshiganj	42,765	21,500
Faridpur	58,050	29,184
Rajbari	31,460	15,816
Gopalganj	38,512	19,361
Madaripur	37,886	19,047
Shariatpur	35,769	17,983
Sylhet Division	262,390	131,913
Sunamganj	66,553	33,459
Sylhet	84,460	42,461
Moulvibazar	53,288	26,790
Habiganj	58,090	29,204
Chittagong Division	802,782	403,588
Brahmanbaria	79,261	39,847
Comilla	151,880	76,356
Chandpur	75,063	37,737
Lakshmipur	49,240	24,755
Noakhali	85,176	42,821
Feni	40,994	20,609
Chittagong	218,527	109,862
Cox's Bazar	58,620	29,470
Khagrachhari	17,373	8,734
Rangamati	16,795	8,444
Bandarban	9,853	4,953

Source: Bangladesh PROFILES 2011.

Table 9. Economic Productivity Losses Related to Various Nutrition Problems and Economic Productivity Gains Related to Improvement in Various Nutrition Conditions, by Division and District

Name of Division and District	2011–2021							
	Status quo: Economic productivity losses (in US\$)				Improved: Economic productivity gains (in US\$)			
	child stunting	IDD	adult IDA	LBW	child stunting	IDD	adult IDA	LBW
Bangladesh	27,914	1,838	4,448	4,343	13,340	924	1,149	1,544
Rangpur Division	3,108	205	495	484	1,485	103	128	172
Panchagarh	188	12	30	29	90	6	8	10
Thakurgaon	273	18	43	42	130	9	11	15
Dinazpur	593	39	95	92	284	20	24	33
Nilphamari	353	23	56	55	169	12	15	20
Lalmonirhat	249	16	40	39	119	8	10	14
Rangpur	571	38	91	89	273	19	23	32
Kurigram	402	26	64	63	192	13	17	22
Gaibanda	480	32	76	75	229	16	20	27
Rajshahi Division	3,671	242	585	571	1,754	121	151	203
Joypurhat	190	13	30	30	91	6	8	11
Bogra	676	45	108	105	323	22	28	37
Nagaoan	537	35	86	84	257	18	22	30
Natore	341	22	54	53	163	11	14	19
Nawabganj	320	21	51	50	153	11	13	18
Rajshahi	513	34	82	80	245	17	21	28
Sirajganj	605	40	96	94	289	20	25	33
Pabna	489	32	78	76	233	16	20	27
Khulna Division	3,301	217	526	514	1,578	109	136	183
Kushtia	391	26	62	61	187	13	16	22
Meherpur	133	9	21	21	63	4	5	7
Chuadanga	226	15	36	35	108	7	9	13
Jhenaidah	355	23	56	55	169	12	15	20
Magura	185	12	29	29	88	6	8	10
Narail	157	10	25	24	75	5	6	9
Jessore	555	37	88	86	265	18	23	31
Satkhira	419	28	67	65	200	14	17	23
Khulna	534	35	85	83	255	18	22	30
Bagerhat	348	23	55	54	166	12	14	19
Barisal Division	1,835	121	292	285	877	61	76	101
Pirojpur	249	16	40	39	119	8	10	14
Jhalakati	156	10	25	24	74	5	6	9
Barisal	529	35	84	82	253	18	22	29
Bhola	382	25	61	59	183	13	16	21

Name of Division and District	2011–2021							
	Status quo: Economic productivity losses (in US\$)				Improved: Economic productivity gains (in US\$)			
	child stunting	IDD	adult IDA	LBW	child stunting	IDD	adult IDA	LBW
Patuakhali	328	22	52	51	157	11	13	18
Barguna	190	13	30	30	91	6	8	11
Dhaka Division	8,764	577	1,397	1,364	4,189	290	361	485
Netrokona	446	29	71	69	213	15	18	25
Mymensingh	1,008	66	161	157	482	33	41	56
Sherpur	287	19	46	45	137	10	12	16
Jamalpur	473	31	75	74	226	16	19	26
Tangail	739	49	118	115	353	24	30	41
Kishoreganj	582	38	93	91	278	19	24	32
Manikganj	288	19	46	45	138	10	12	16
Dhaka	1,911	126	304	297	913	63	79	106
Gazipur	456	30	73	71	218	15	19	25
Narsingdi	426	28	68	66	203	14	18	24
Narayanganj	488	32	78	76	233	16	20	27
Munshiganj	290	19	46	45	139	10	12	16
Faridpur	394	26	63	61	188	13	16	22
Rajbari	214	14	34	33	102	7	9	12
Gopalganj	262	17	42	41	125	9	11	14
Madaripur	257	17	41	40	123	9	11	14
Shariatpur	243	16	39	38	116	8	10	13
Sylhet Division	1,782	117	284	277	852	59	73	99
Sunamganj	452	30	72	70	216	15	19	25
Sylhet	574	38	91	89	274	19	24	32
Moulvibazar	362	24	58	56	173	12	15	20
Habiganj	395	26	63	61	189	13	16	22
Chittagong Division	5,452	359	869	848	2,606	180	224	302
Brahmanbaria	538	35	86	84	257	18	22	30
Comilla	1,032	68	164	161	493	34	42	57
Chandpur	510	34	81	79	244	17	21	28
Lakshmipur	334	22	53	52	160	11	14	18
Noakhali	579	38	92	90	276	19	24	32
Feni	278	18	44	43	133	9	11	15
Chittagong	1,484	98	237	231	709	49	61	82
Cox's Bazar	398	26	63	62	190	13	16	22
Khagrachhari	118	8	19	18	56	4	5	7
Rangamati	114	8	18	18	55	4	5	6
Bandarban	67	4	11	10	32	2	3	4

Source: Bangladesh PROFILES 2011.

6.2 Results from the Costing Model

Table 10 presents the estimates of cost for a national program for nutrition implemented at scale by cost center for the program periods 2011–2021, 2011–2015, and 2016–2021 in two alternative scenarios. Under Scenario 1, the cost of targeted food supplementation to pregnant and lactating women and children under 2 has been excluded. In Scenario 2, this cost has been included for the bottom three quintiles of the population. **Table 10** shows, under Scenario 1, that the total cost of the national program for nutrition for the period 2011–2015 is Tk. 4,297 crore (US\$623 million); for the period 2016–2021, the cost is Tk. 4,689 crore (US\$680 million). Under Scenario 2, for the period 2011–2021, the cost is Tk. 5,425 (US\$786 million), and for the period 2016–2021, the cost is Tk. 6,557 (US\$950 million). The total cost is higher for the period 2016–2021 because this period is longer by 1 year and the number of upazilas that will be covered in the first 2 years of the program from 2011–2015 is much lower than in the period 2016–2021, when the program is assumed to operate at scale. The total direct cost of nutrition programming during next plan period will be in the range of Tk. 9,000 crore (US\$1.3 billion) to Tk. 12,000 crore (US\$1.7 billion), depending on the interventions that are selected to be implemented (Scenario 1 or Scenario 2 in **Tables 10** and **11**), with an average annual cost in the range of Tk. 900 crore (US\$130 million) to Tk. 1,200 crore (US\$170 million). These estimates do not include the cost of the office of the line director for nutrition (**Figure 9**).¹⁷

The purpose of the cost estimate is to assess the present value of the cost and the financial implication of implementing the program for the government. All costs in future years have been estimated at current market prices; neither inflation nor an escalation factor has been used to obtain the costs in the future years. Many of the costs that are included in the model are recurrent costs, but some cost saving can be generated over time if high coverage of effective nutrition interventions is achieved. If these interventions are effective, this will likely reduce the prevalence of all forms of malnutrition, which will over time result in less expenditure for such interventions, such as targeted food supplementation or the management of SAM in children. Of note, over time, for both Scenarios 1 and 2, the cost of managing and treating SAM is assumed to diminish significantly. Reductions in the cost of managing and treating SAM, however, depend on sustained implementation of effective interventions to prevent and reduce the overall prevalence of malnutrition. With or without targeted food supplementation, implementation efforts to prevent malnutrition will need to be highly effective to reduce the costs of the management and treatment of SAM. If such implementation efforts are not sustained, the cost of managing and treating SAM cases will remain high in each subsequent year.

Under Scenario 1, management of SAM children and micronutrient supplementation are the two largest cost centers, accounting for more than 66 percent of the total program cost. Under Scenario 2, targeted food supplementation to pregnant and lactating women and children

¹⁷ The cost of the office of the line director has not been included in the estimate because this office is expected to continue to exist even if the proposed nutrition program is not implemented. The estimate includes only the additional costs that will be incurred if the proposed nutrition program is implemented.

under 2 is also a large cost center. Under both scenarios, total cost will vary over the years for three reasons.

- The number of covered upazilas increases up to the third year (2013).
- The capital costs (for example, the cost of training) will be incurred only in the first 3 years.
- As noted above, it is assumed that the number of SAM children to be targeted will decline over time and therefore the cost of managing cases of SAM children will rapidly decline after the third year.

For these reasons, the total cost increases in the first 3 years up to 2013, and then gradually and continually declines.

The estimated cost per client (considering women and children) and per person (considering entire population) are shown in **Table 13**. The cost per client in an average year is only Tk. 404. This cost also increases up to year 2013 and then declines over time for the same reasons as cited above.

As noted earlier, the estimated benefit of investing in nutrition exceeds Tk. 70,000 crore (US\$10 billion), while the cost is estimated to be in the range of Tk. 9,000–12,000 crore (US\$1.3–US\$1.7 billion) by 2021. The benefit-cost ratio exceeds five and the net benefit (benefit minus cost) is more than Tk. 56,000 crore (US\$8 billion).

Table 10. Estimates of Cost for the 2011–2015, 2016–2021, and 2011–2021 Time Periods, by Cost Center

Cost centers	Scenario 1						Scenario 2					
	Estimates of cost						Estimates of cost					
	2011–2015		2016–2021		2011–2021		2011–2015		2016–2021		2011–2021	
	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)	Tk. crore	US\$ (millions)
Direct costs												
SBCC and community nutrition promotion	722	105	1,075	156	1,797	260	722	105	1,075	156	1,797	260
Management and coordination	142	21	223	32	366	53	142	21	223	32	366	53
Systems strengthening ¹	436	63	265	38	701	102	436	63	265	38	701	102
Micronutrient supplementation ²	1,161	168	1,935	280	3,095	449	1,161	168	1,935	280	3,095	449
Targeted food supplementation of pregnant and lactating women and children under 2 among bottom three quintiles							1,128	163	1,868	271	2,997	434
Management of SAM in children ³	1,827	265	1,174	170	3,001	435	1,827	265	1,174	170	3,001	435
Deworming for children aged 2–5 years	9	1	17	3	25	4	9	1	17	3	25	4
Total	4,297	623	4,689	680	8,985	1,302	5,425	786	6,557	950	11,982	1,736
Indirect costs through public-private partnership												
Food Fortification	1,126	163	1,919	278	3,045	441	1,126	163	1,919	278	3,045	441

¹ System strengthening cost includes training and MIS cost.

² Micronutrient supplementation includes IFA supplementation to pregnant and lactating women and non-pregnant adolescents, supply of vitamin A capsules to mothers and children, supply of multiple micronutrients to 1–5 years children, and supply of zinc to children under 5 during treatment for diarrhea.

³ Management of SAM children includes treatment of SAM children in health facility and supply of RUTF to them.

Table 11. Cost per Year by Cost Center for Scenario 1

Scenario 1																		
Year	SBCC and community nutrition promotion		Management and coordination		Systems strengthening		Micronutrient supplementation		Targeted food supplementation of pregnant and lactating women and children under 2 among bottom three quintiles		Management of SAM in children		Deworming of children 2–5 years of age		Total		Food fortification	
	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$
2011	48	7	10	1	65	9	59	9			137	20	1	0.07	319	46	57	8
2012	123	18	22	3	144	21	180	26			364	53	2	0.22	835	121	174	25
2013	192	28	37	5	139	20	304	44			526	76	2	0.23	1,199	174	294	43
2014	179	26	37	5	72	10	307	44			443	64	3	0.38	1,041	151	299	43
2015	179	26	37	5	15	2	310	45			357	52	3	0.39	901	131	303	44
2016	179	26	39	6	73	11	314	46			314	45	3	0.39	922	134	308	45
2017	179	26	37	5	15	2	317	46			269	39	3	0.39	820	119	313	45
2018	179	26	37	5	72	10	321	47			223	32	3	0.40	835	121	317	46
2019	179	26	37	5	15	2	324	47			177	26	3	0.40	735	107	322	47
2020	179	26	37	5	72	10	328	47			116	17	3	0.41	735	107	327	47
2021	179	26	37	5	16	2	331	48			76	11	3	0.41	642	93	332	48
Total	1,797	260	366	53	701	102	3,095	449			3,001	435	25	4	8,985	1,302	3,045	441

Table 12. Cost per Year by Cost Center for Scenario 2

Scenario 1																		
Year	SBCC and community nutrition promotion		Management and coordination		Systems strengthening		Micronutrient supplementation		Targeted food supplementation of pregnant and lactating women and children under 2 among bottom three quintiles		Management of SAM in children		Deworming of children 2–5 years of age		Total		Food fortification	
	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$	Tk. Crore	Million US\$
2011	48	7	10	1	65	9	59	9	57	8	137	20	1	0.07	376	55	57	8
2012	123	18	22	3	144	21	180	26	174	25	364	53	2	0.22	1,009	146	174	25
2013	192	28	37	5	139	20	304	44	294	43	526	76	2	0.23	1,493	216	294	43
2014	179	26	37	5	72	10	307	44	297	43	443	64	3	0.38	1,339	194	299	43
2015	179	26	37	5	15	2	310	45	306	44	357	52	3	0.39	1,207	175	303	44
2016	179	26	39	6	73	11	314	46	296	43	314	45	3	0.39	1,218	177	308	45
2017	179	26	37	5	15	2	317	46	298	43	269	39	3	0.39	1,118	162	313	45
2018	179	26	37	5	72	10	321	47	312	45	223	32	3	0.40	1,147	166	317	46
2019	179	26	37	5	15	2	324	47	317	46	177	26	3	0.40	1,052	152	322	47
2020	179	26	37	5	72	10	328	47	321	47	116	17	3	0.41	1,056	153	327	47
2021	179	26	37	5	16	2	331	48	325	47	76	11	3	0.41	966	140	332	48
Total	1,797	260	366	53	701	102	3,095	449	2,997	434	3,001	435	25	4	11,982	1,736	3,045	441

Table 13. Estimated Amount of Nutrition Program Cost per Client and per Person, by Year

Year	Scenario 1		Scenario 2	
	Total cost per client	Total cost per person	Total cost per client	Total cost per person
2011	167	21	197	25
2012	432	54	522	66
2013	613	77	763	95
2014	526	66	677	84
2015	451	56	604	75
2016	456	56	602	74
2017	401	49	547	67
2018	404	49	555	68
2019	352	43	504	61
2020	348	42	500	61
2021	301	36	453	55
Total	404	50	539	66

6.2.1 Efficaciousness of the Estimated Costs

The previous methods section and **Annex C** present in detail the concepts and theories of costing that formed the basis of the method used in estimating costs and analyzing cost behavior for the nutrition program in Bangladesh. The estimated costs are efficacious if:

- The estimates are equal or closer to that at the maximum efficiency level of production
- Average cost is closer to that at the optimal level of production
- The estimates reflect that the program is feasible, replicable, and sustainable

These criteria were applied to test the level of efficaciousness of the estimated costs of the nutrition program. It is a challenge to assess whether cost estimates are at the maximum level of economic efficiency in a situation where any market, far less than a competitive market, does not sufficiently work. Like most of the health sector activities, nutrition programming is a case of market failure. For this type of public sector program, using a suitable economic evaluation technique is the only way to assess the efficiency of the cost estimates.

Cost-effectiveness analysis is the simplest and most useful technique of economic evaluation. Use of this technique requires that several methods for producing the program output are available. This analysis basically considers a single package of interventions. Despite this, the cost-effectiveness of the program can be assessed tentatively. The estimates were obtained through a consultative process that engaged experts, managers, and stakeholders, and through observations of market prices of inputs needed for the production. In the course of identifying the interventions and inputs needed for production, and computing unit costs of line items, the expert and managers considered various available options in detail and then chose the best interventions and least costly inputs. Thus, a cost minimization analysis, which is also a technique of economic evaluation, was intensively used and, hence, it can be said that the package of interventions is the most cost-effective one among the feasible alternatives available. A sensitivity analysis conducted by changing the amount of certain inputs (such as community volunteers) also shows that the identified package is more cost-effective than any other alternative available at present. In addition, a cost-benefit analysis, the most ideal

technique of economic evaluation, was undertaken and the results show that the monetary value of benefit per unit of cost is much higher than unity. This also clearly indicates that the estimated costs are closer, if not equal, to the costs at the maximum level of economic efficiency.

The level of efficaciousness can also be judged using other criteria.

- The amount of total cost of the program is not high. For example, the size of the proposed government budget for the fiscal year 2011–2012 is Tk. 130,000 crores, of which 5.5 percent (Tk. 7,150 crores) has been allocated to the HPN sector. The required amount of expenditure for the nutrition program in an average year is Tk. 808 crores, which is only 11.30 percent of the budgeted amount of the HPN sector. The MOHFW can allocate this amount by reorganizing the cost centers and line items, or the government has to increase allocation for the HPN sector from 5.5 percent to 6.74 percent—an increase of only 1.24 percentage points.
- The total average cost will decline in both the short run and the long run, as Figure 15 shows for Scenario 1. This indicates that the average cost has the tendency to move toward optimal capacity level of the program and generate returns at scale over time.
- The average cost (cost per client) is low, as is the marginal cost.
- Capital cost and fixed cost are lower than recurring cost and variable cost.
- The average cost curves for Scenario 1 and Scenario 2 do not intersect.
- The trends of the different types of costs are appropriate.

The total cost was divided into the following types: capital fixed cost, recurrent fixed cost, and recurrent variable cost. **Tables 13a** and **13b** show the breakdown of these costs by year for the two scenarios. **Figure 17** displays the trend for each type of cost under Scenario 1. The program does not have any capital variable cost. The capital cost is very low in the first few years and then approaches zero. The recurrent fixed cost is low in each year. The recurrent variable cost is high and much higher than any other type of cost. Overall, however, it appears that the estimates of costs of the national program for nutrition are highly efficacious.

Table 13a. Estimated Amount of Program Cost (in taka), by Type of Cost and Year (Scenario 1)

Year	KF*	RF**	RV***	Total
2011	657,427,988	566,317,400	1,968,425,089	3,192,170,477
2012	1,274,892,756	1,622,808,845	5,453,755,670	8,351,457,271
2013	1,297,812,156	2,386,377,640	8,309,052,020	11,993,241,817
2014	57,073,800	2,826,709,515	7,530,973,753	10,414,757,068
2015	57,073,800	2,255,854,040	6,698,837,920	9,011,765,760
2016	92,073,800	2,826,709,515	6,303,865,333	9,222,648,648
2017	57,073,800	2,255,854,040	5,883,561,165	8,196,489,005
2018	57,073,800	2,826,709,515	5,466,622,127	8,350,405,442
2019	57,073,800	2,255,854,040	5,038,660,578	7,351,588,418
2020	57,073,800	2,826,709,515	4,467,896,701	7,351,680,016
2021	67,073,800	2,255,854,040	4,092,099,460	6,415,027,300
Total	3,731,723,300	24,905,758,105	61,213,749,817	89,851,231,222

Table 13b. Estimated Amount of Program Cost (in taka), by Type of Cost and Year (Scenario 2)

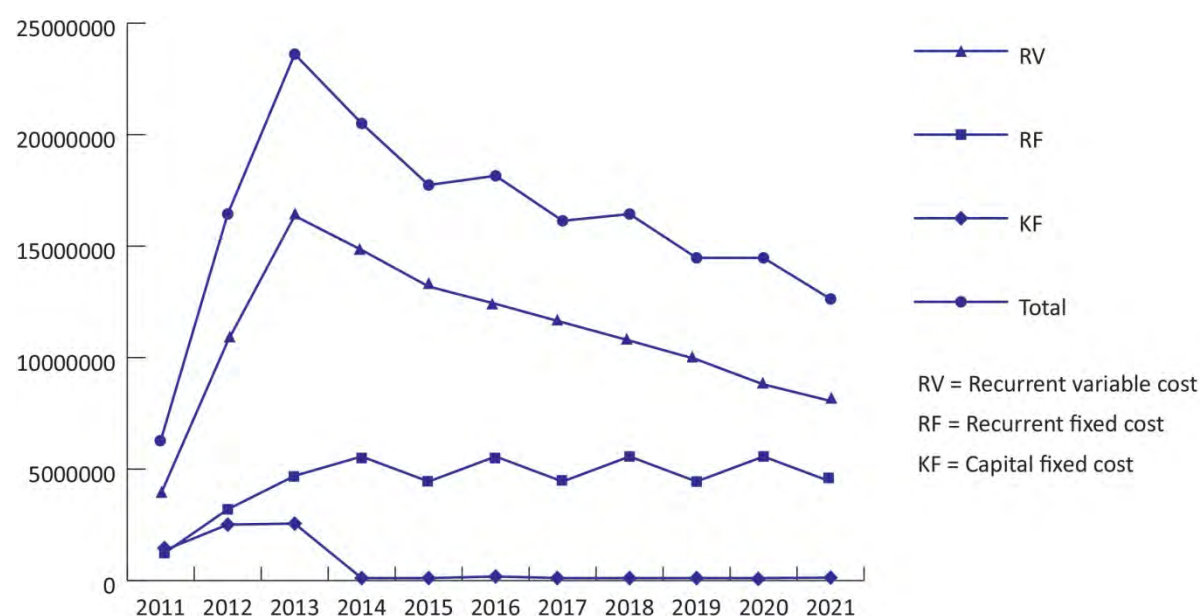
Year	KF*	RF**	RV***	Total
2011	657,427,988	566,317,400	2,541,192,566	3,764,937,954
2012	1,274,892,756	1,622,808,845	7,191,942,930	10,089,644,531
2013	1,297,812,156	2,386,377,640	11,244,581,998	14,928,771,794
2014	57,073,800	2,826,709,515	10,505,934,414	13,389,717,729
2015	57,073,800	2,255,854,040	9,759,978,468	12,072,906,308
2016	92,073,800	2,826,709,515	9,260,550,883	12,179,334,198
2017	57,073,800	2,255,854,040	8,865,967,468	11,178,895,308
2018	57,073,800	2,826,709,515	8,584,761,934	11,468,545,249
2019	57,073,800	2,255,854,040	8,207,005,085	10,519,932,925
2020	57,073,800	2,826,709,515	7,679,295,214	10,563,078,529
2021	67,073,800	2,255,854,040	7,339,734,681	9,662,662,521
Total	3,731,723,300	24,905,758,105	91,180,945,639	119,818,427,044

* KF = capital fixed cost

** RF = recurrent fixed cost

*** RV = recurrent variable cost

Figure 17. Trend of KF, RF, and RV of Nutrition Program per Upazila during 2011–2021 (Scenario 1)



The figures below more clearly show the expected behavior of cost over the years. Figure 17 shows the cost trend under Scenario 1 for an *upazila*. It is evident from the figure that capital fixed cost (KF) will be incurred only in the initial three years and that recurring fixed cost (RF) and recurring variable cost (RV) will rise in the initial few years and then decline continuously, so that the total cost will increase only for a few years and then continuously fall. **Figure 18** shows the same under Scenario 2 and depicts the same pattern of cost behavior. **Figures 19** and **20** exhibit the trend of costs per client and the pattern emerging from the two figures is also the same as in the earlier two figures. The trends meet the criteria of efficacious cost estimates mentioned above: the average cost has a declining trend, capital fixed cost is low, and recurrent variable cost is low.

Figure 18. Trend of KF, RF, and RV of Nutrition Program per Upazila during 2011–2021 (Scenario 2)

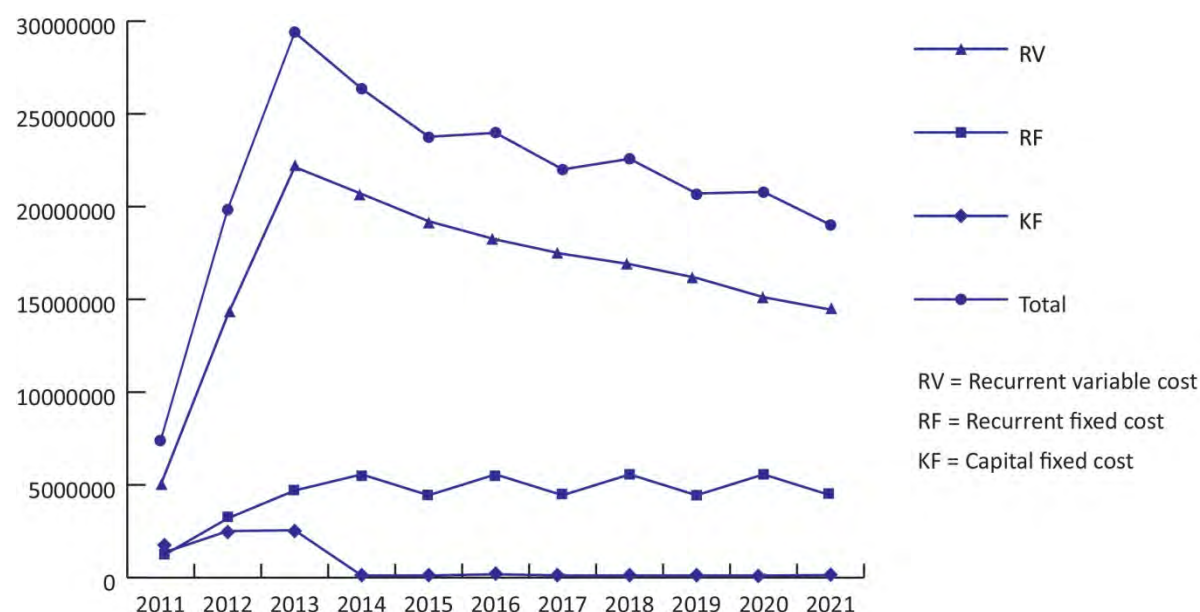


Figure 19. Trend of KF, RF, and RV Cost of Nutrition Program per Client during 2011–2021 (Scenario 1)

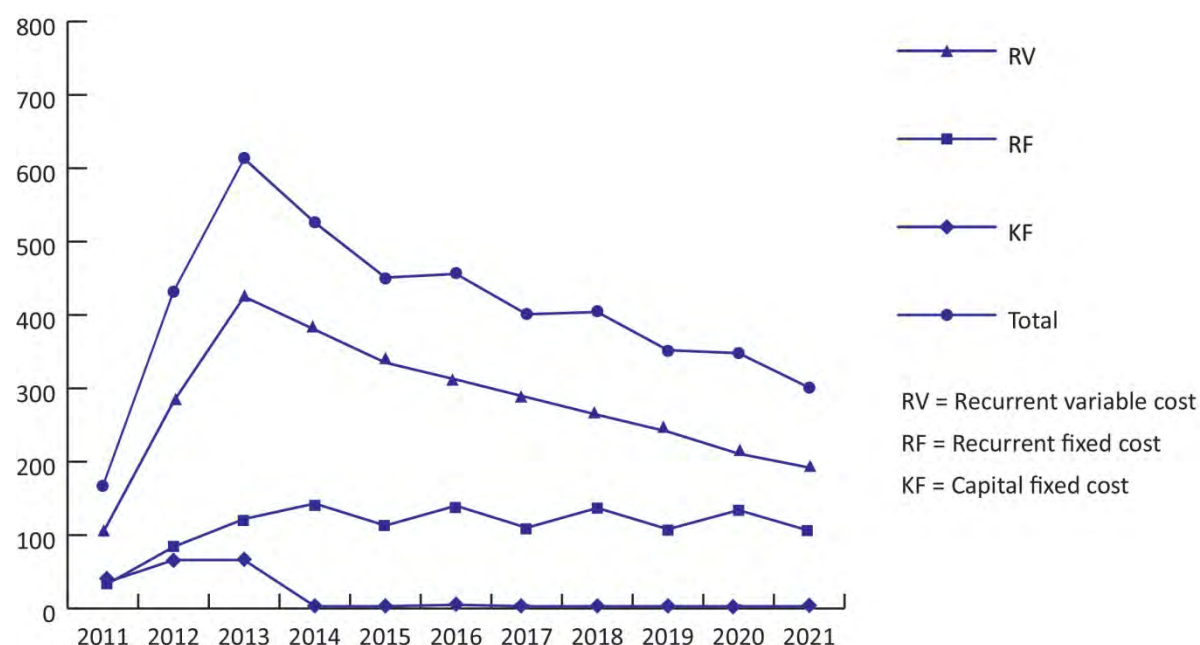
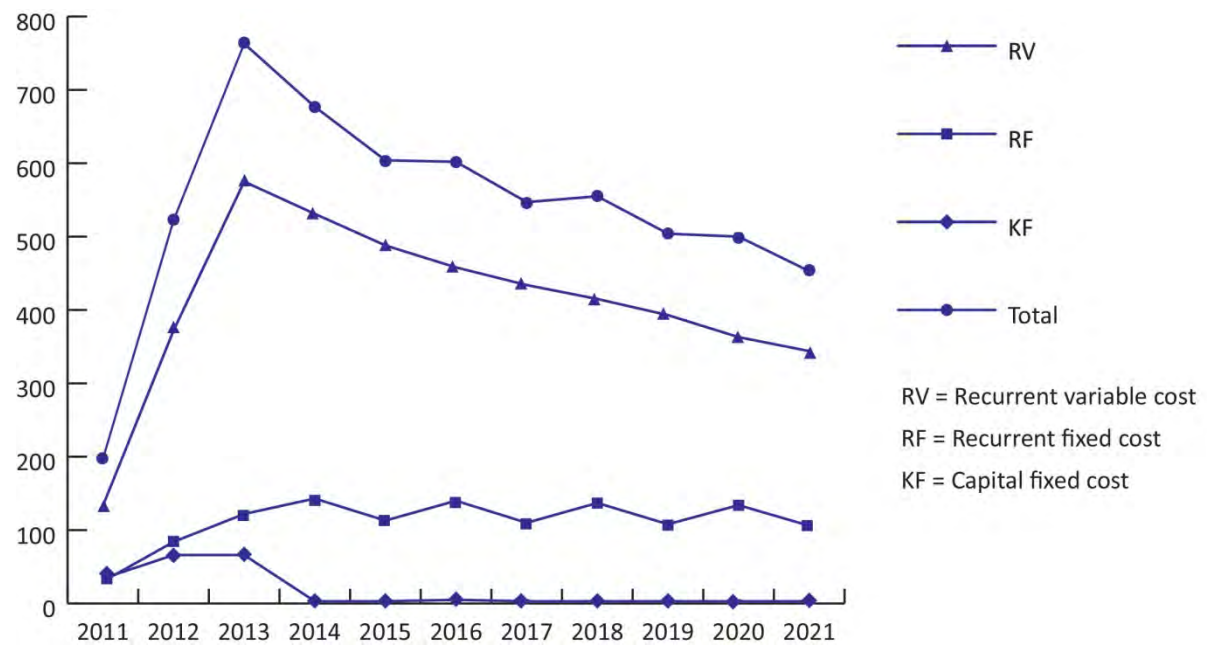


Figure 20. Trend of KF, RF, and RV Cost of Nutrition Program per Client during 2011–2021 (Scenario 2)



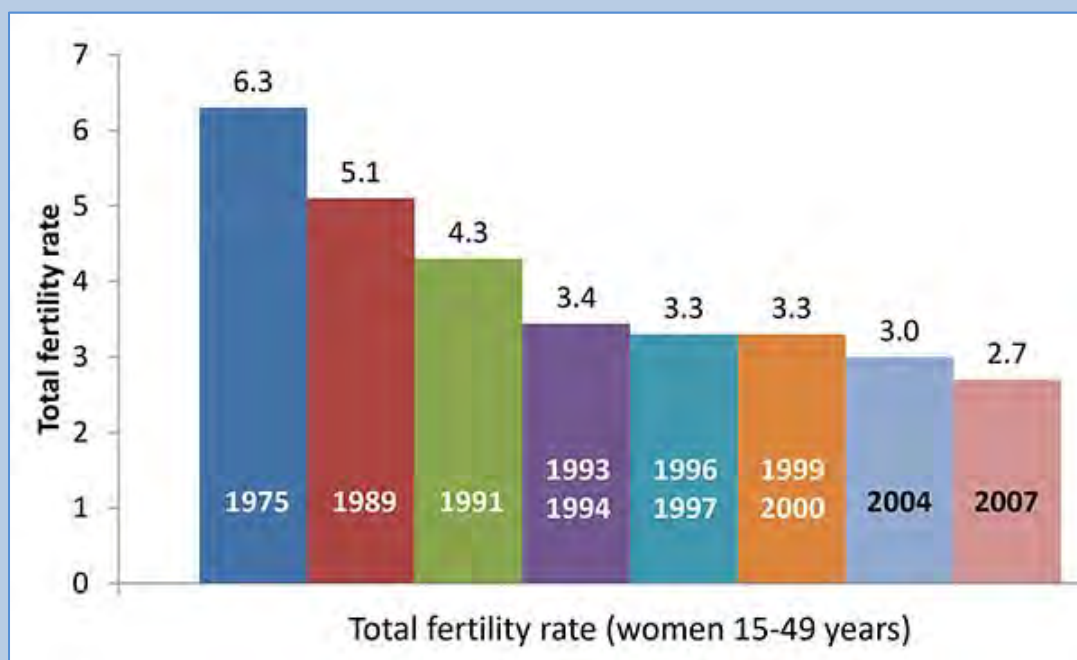
Four Critical Nutrition Interventions for Bangladesh

Malnutrition in Bangladesh is intimately linked to the life cycle and is intergenerational in nature. In Bangladesh, a third of all childbearing begins in adolescence, which contributes to the high prevalence of LBW that in turn contributes to the high prevalence of chronic and acute malnutrition among children under 5. Data for Bangladesh increasingly suggest that there are four critical points early in the life cycle during which targeted nutrition interventions are needed. Going forward, the four critical nutrition interventions for Bangladesh must focus on improving adolescent nutrition, maternal nutrition during pregnancy and the postpartum period, nutrition of children under 2 years of age, and treatment and prevention of severe and moderate acute malnutrition among children under 5 years of age. Focusing nutrition interventions on these four critical points will address the majority of malnutrition in Bangladesh.

Improving Adolescent Nutrition

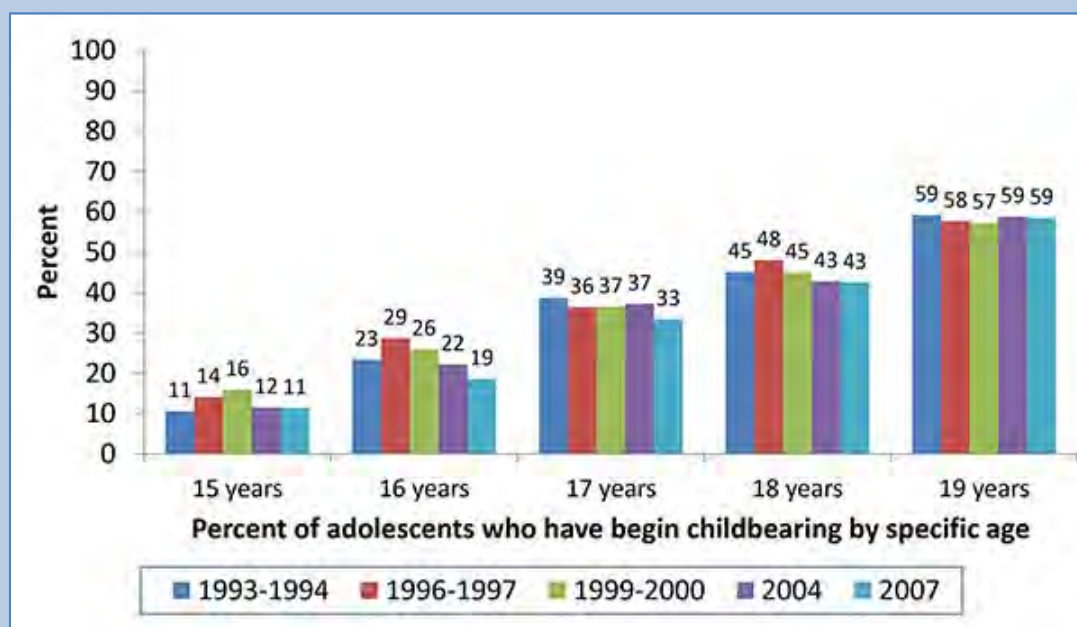
Although fertility rates have dropped dramatically over several decades in Bangladesh, and though there are concerns that further reductions in the fertility rate have slowed significantly in recent years (**Figure A**), one group among which fertility has remained virtually unchanged are adolescent girls 15–19 years of age. Consistently, each subsequent DHS survey shows that the pattern has remained unchanged (**Figure B**): 60 percent of girls 19 years of age have begun childbearing, putting them and their children at increased risk of malnutrition.

Figure A. Trends in Total Fertility Rate, 1975–2007



Source: FANTA-2 Bridge Project (January 2012) based on publicly available information from Measure-DHS. NOTES: TFR by survey year (Bangladesh surveys).

Figure B. Trends in Adolescent Childbearing by Specific Age, 1993–2007



Source: FANTA-2 Bridge Project (January 2012) based on publicly available information from Measure-DHS.

NOTES: % of adolescent (by single year of age at time of survey) who have initiated childbearing by survey year (Bangladesh DHS surveys).

Relative to their older peers, adolescent girls are persistently more undernourished, further contributing to the high prevalence of maternal malnutrition, poor pregnancy outcomes, and LBW, ultimately leading to young child malnutrition. Data also show that adolescent mothers struggle to provide optimum care for their infants relative to their older peers and that they need more support from family. Enabling adolescent girls to complete secondary education carries multiple benefits, including delaying marriage and first pregnancy; ensuring better nutritional status for them at the onset of pregnancy; and reducing malnutrition in their children in part through greater knowledge, capabilities, and caring capacity.

To improve adolescent nutrition, Bangladesh should focus on:

- Improving the nutritional status of adolescent girls, including pre-pregnant weight and iron-folate status
- Delaying marriage
- Promoting secondary education completion for girls and boys
- Delaying first pregnancy
- Increasing use of contraception among married adolescents

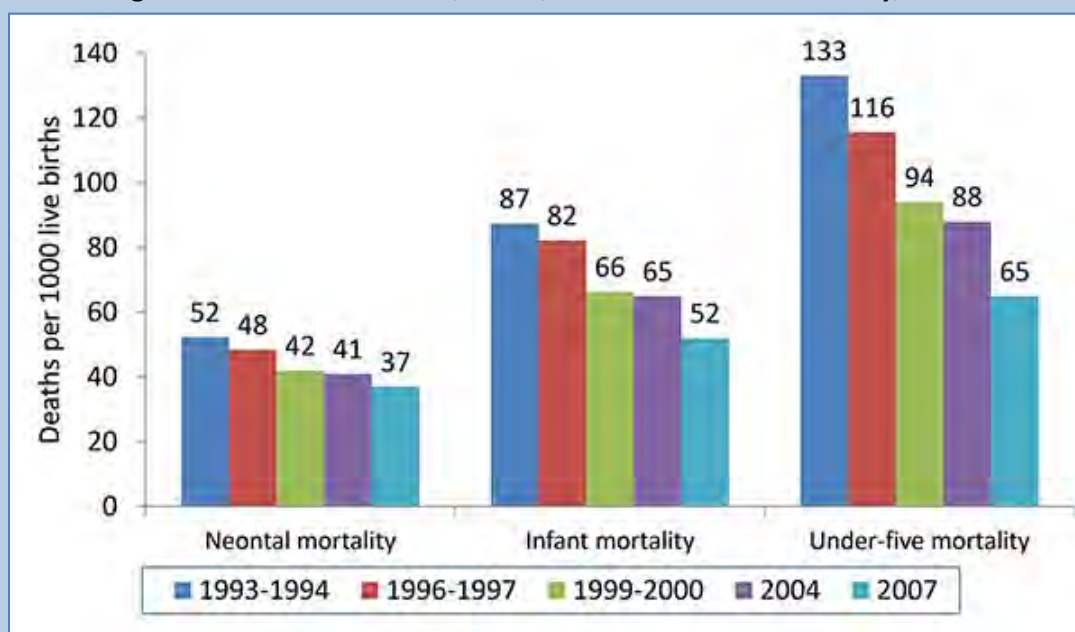
Improving the nutritional status of adolescent girls and delayed childbearing will ensure better nutritional status during pregnancy and better birth outcomes for newborns. It will also ensure that the mothers are older and better prepared to provide optimum care to their children.

Improving Maternal Nutrition during Pregnancy and the Postpartum Period

The prevalence of LBW has fallen significantly in Bangladesh, but LBW is still widely prevalent and continues to affect one-third of births. LBW is a risk factor for neonatal deaths, which is estimated to be 37 per 1,000 live births (BBS/UNICEF 2005). This is an important consideration for Bangladesh at this stage, because between 1993 and 2007 reductions in overall under-5 child mortality far outpaced reductions in infant and neonatal deaths (**Figure C**). Increasingly, nutrition efforts in Bangladesh will need to focus on reducing neonatal and infant deaths. LBW in Bangladesh is not only a result of young

maternal age and poor pre-pregnant nutritional status, but also of poor birth spacing, poor dietary intake (quality, quantity, and diversity), inadequate weight gain, high workload, and inadequate rest in pregnancy. In addition, maternal nutritional status is of critical importance during the postpartum period to support optimal breastfeeding and allow the mother to restore her nutritional status, which is depleted during pregnancy and lactation, for subsequent pregnancies. For example, anemia in pregnancy is a risk factor for maternal mortality. Improving maternal nutritional status during pregnancy and the postpartum period is therefore a critical nutrition intervention.

Figure C. Trends in Neonatal, Infant, and under-5 Child Mortality, 1993–2007



Source: FANTA-2 Bridge Project (January 2012) based on publicly available information from Measure-DHS.
 NOTES: Neonatal, infant, and under-five mortality by survey year (Bangladesh DHS surveys).

To improve maternal nutrition during pregnancy and the postpartum period, Bangladesh should focus on:

- Involving men and families to ensure mothers get adequate antenatal, delivery, and postpartum care
- Integrating nutrition into Essential Maternal and Newborn Care services
- Improving dietary intake during pregnancy and the postpartum period, with an emphasis on increased quantities and improved quality and diet diversity to improve pregnancy weight gain and support optimal breastfeeding
- Improving iron-folate status during pregnancy and the postpartum period through intake of iron-folate supplements
- Promoting adequate rest and reducing workload in pregnancy and the postpartum period
- Promoting adequate birth spacing through use of contraception in the postpartum period
- Improving vitamin A status in the postpartum period through intake of vitamin A supplements

Improved maternal nutrition during pregnancy will improve birth outcomes and reduce the prevalence of LBW, and improved maternal nutrition during the postpartum period will support optimal breastfeeding and restore maternal nutritional status.

Improving Nutrition of Children under 2

Malnutrition begins in infancy in Bangladesh. This a result not only of LBW but also of inadequate feeding practices. Yet malnutrition in infants and young children is preventable. Evidence shows that investing in improving and supporting optimal breastfeeding and complementary feeding practices can

go a long way in preventing chronic malnutrition in children. While a majority of infants are breastfed, optimal and exclusive breastfeeding is practiced by less than half of all mothers in Bangladesh, and this has not improved over the last decade (**Figure D** and **Figure E**). In 1993, 31 percent of infants were still exclusively breastfed by the age of 4–5 months, while in 2007, that number decreased to 23 percent of infants—despite widespread efforts to promote exclusive breastfeeding.

Figure D. Breast Milk Only in the Last 24 Hours by Age of Infant, 1993–1994

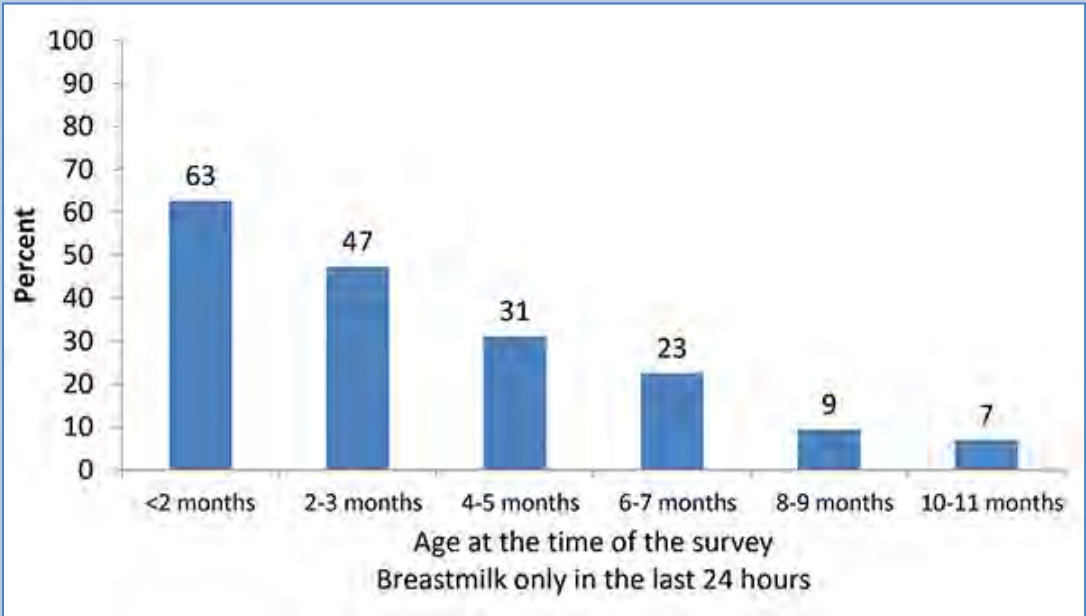
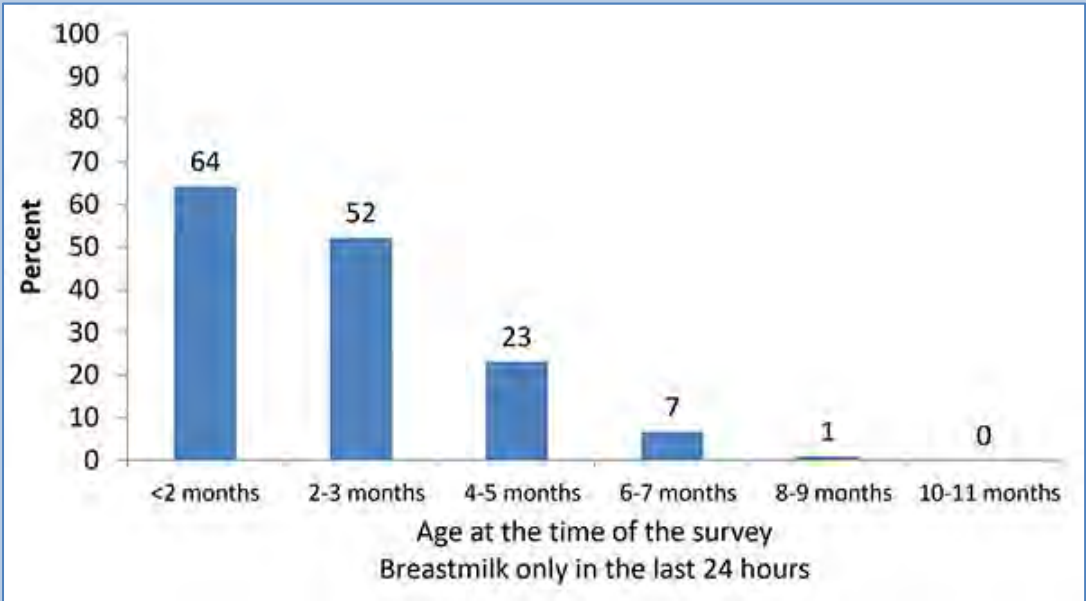


Figure E. Breast Milk Only in the Last 24 Hours by Age of Infant, 2007

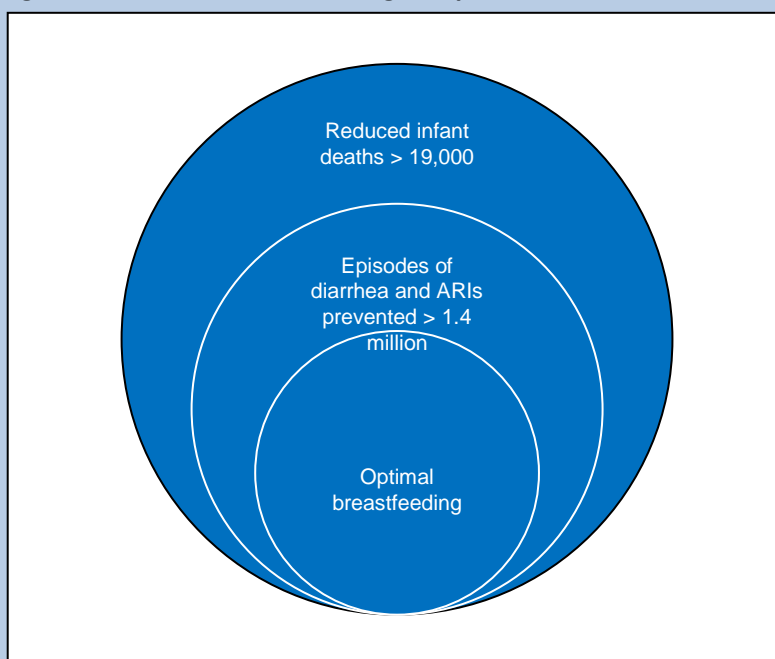


Source: FANTA-2 Bridge Project (January 2012) based on publicly available information from Measure-DHS.
 NOTES: Breastmilk only by child’s age at time of interview Bangladesh DHS 1993-4 (figure D) and Bangladesh DHS 2007 (figure E).

Figure F provides a snapshot of some benefits that result from mothers breastfeeding their infants and young children for a period of 1 year (i.e., the number of infant deaths and illness episodes that could be averted through optimal breastfeeding.) At the national level, supporting mothers to exclusively breastfeed for 6 months—with continued breastfeeding and appropriate complementary feeding thereafter—would prevent 19,000 infant deaths and more than 1.4 million episodes of diarrhea and acute respiratory infections (ARIs). Breast milk is estimated to be worth approximately US\$2.5 billion in a given year in Bangladesh. This estimate is the cost saving from not purchasing milk substitutes or

spending on health care costs for infant illnesses related to inappropriate feeding practices. Given these benefits, continued support to enable mothers to optimally breastfeed their infants and children is imperative.

Figure F. Exclusive Breastfeeding: Snapshot of Benefits for 1 Yearⁱ



Source: Benefits of Breastfeeding, 2011, FHI 360/PROFILES

Mothers, especially adolescent mothers, need family support, time, adequate rest, and nutrition to optimally breastfeed their infants.

While a majority (74 percent) of infants 6–9 months of age in Bangladesh do receive solid foods, the frequency of feeding and diet diversity remains low. In 2007, only 42 percent of infants and children under the age of 2 were fed frequently enough and had adequate diet diversity. Preventing undernutrition among children under 2 is a shared family responsibility and a critical nutrition intervention for Bangladesh, given the persistent high prevalence of stunting among children under 5.

To improve nutrition of children under 2, Bangladesh should focus on:

- Involving men and families to promote shared responsibility for young child nutrition at the family and community level
- Promoting family support for the mother, with an emphasis on time and resources to feed the child
- Promoting adequate dietary intake for the mother during the postpartum period, with an emphasis on increased quantities and improved quality and diet diversity to support optimal breastfeeding
- Promoting adequate rest and reducing workload for the mother in the postpartum period to support optimal breastfeeding
- Promoting exclusive breastfeeding of children under 6 months, with continued emphasis on early initiation (within 1 hour of birth), giving colostrum,¹⁸ and discouraging the use of pre-lacteal

¹⁸ Colostrum is the first milk that comes in when breastfeeding is initiated. It is nutrient dense, easy to digest, and has all the essential nutrients to meet the needs of newborns.

feeds, and increased emphasis on provider, family, and peer support to help the mother establish her breast milk supply within the first few weeks of birth

- Promoting timely and appropriate introduction of complementary foods at 6 months, emphasizing diversity and quality, quantity, age-appropriate frequency and consistency, hygiene and sanitation, and responsive feeding
- Promoting the use and addition of multiple micronutrient powders to complementary foods for children 6–23 months
- Promoting timely use of health services for immunizations, vitamin A supplementation, deworming, early treatment for illnesses, and screening and tracking infant growth
- Promoting optimal nutrition care of sick children, including continued feeding and increased fluids during illness; increased feeding after illness; and appropriate treatments, such as zinc and ORS for diarrhea
- Improved nutritional care and feeding practices for children under 2 can prevent the onset of malnutrition in this age group and will, over time, contribute to a significant reduction in chronic malnutrition (stunting) among children under 5.

Improving Treatment and Prevention of Severe and Moderate Acute Malnutrition among Children under 5

The prevalence of moderate and severe wasting in children in Bangladesh is extremely high, affecting nearly 3 million children under 5 each year. The prevalence of severe acute malnutrition is considered to be at emergency levels. Yet there are few services available for severely and moderately acutely malnourished children at the community or district level in Bangladesh. Despite Bangladesh's long-standing experience in treating severe acute malnutrition in hospital settings, greater efforts are needed to make services available at the community level. Over time, the prevalence of severe and moderate wasting in children under 5 has actually increased, and now the global acute malnutrition rate (moderate plus severe) is almost 18 percent. Severe and moderate acute malnutrition contribute significantly to the child and infant mortality rates, disease burden, and chronic malnutrition rates. As such, treating and preventing acute malnutrition is a critical nutrition intervention for Bangladesh.

To treat and prevent severe and moderate acute malnutrition among children under 5, Bangladesh should focus on:

- Developing approaches for community-level management of acute malnutrition
- Providing regular screening at the community level for detection, referral, and treatment of severe and moderate wasting cases
- Promoting optimal breastfeeding and complementary feeding to prevent wasting
- Promoting early treatment seeking for infections
- Providing ready-to-use therapeutic food (RUTF) for the treatment of SAM in children under 5
- Developing community-level approaches to prevent and manage moderate wasting using food supplements

Treatment and prevention of severe and moderate wasting among children under 5 years of age will significantly contribute to reducing the child and infant mortality rates, infections, and chronic malnutrition.

7. Discussion

Investing in nutrition is smart and sound: This critical investment saves mothers' and children's lives and improves children's education outcomes, which, in turn, boosts economic productivity. For Bangladesh, investing in nutrition today will result in short-, medium-, and long-term benefits. Virtually eliminating malnutrition is an essential prerequisite for Bangladesh to achieve its *Bangladesh Vision 2021* goals. The results presented in this report show that investing now in nutrition programming will lead to a significant improvement in nutrition indicators, which, in turn, will result in substantial returns in terms of development outcomes in the future, and the cost of this investment is feasible for Bangladesh over the next decade. Increasing health sector expenditure by a fraction and re-allocating resources within the existing resources over the next decade can assure that Bangladesh will be a country free of the scourge of malnutrition in the near future.

These estimates are an optimal indication of how much such development outcomes as child mortality and economic productivity can be improved in the future through significant reductions in malnutrition and how much a comprehensive national program for nutrition would cost. However, these results should be interpreted with some caution. In *PROFILES*, because mothers and children often have multiple, concurrent malnutrition problems (for example, a child can be simultaneously underweight and stunted or stunted and anemic), there is likely to be some double counting in these estimates. Similarly, the costs estimates depend on current unit costs and an assumed program structure; changes to either the actual unit costs or the assumptions could change the cost of the program. However, to the extent possible, assumptions are based on what is anticipated in the near future for nutrition programming, and all costs have been carefully sourced and verified.

Over the next decade, it is estimated that increasing investment in and implementation of effective nutrition interventions at scale would result in averting the deaths of more than 250,000 children under 5. Economic productivity gains as a result of the reduced prevalence of malnutrition, particularly stunting, would exceed Tk. 70,000 crore (US\$10 billion). The cost of implementing a comprehensive nutrition program at the national level within the existing and expanding health infrastructure is in the range of Tk. 9,000–12,000 crore (US\$1.3–US\$1.7 billion) over the next decade, with an annual average cost of Tk. 900–1,200 crore (US\$130–\$170 million) per year. This level of investment can be achieved by either reallocating the existing health sector budget or by increasing expenditure on health from the current 5.5 percent to 6.8 percent. The benefit-cost ratio of investing in nutrition exceeds five and the net benefit (benefit minus cost) is more than Tk. 56,000 crore (US\$8 billion).

On average, the GOB has consistently allocated about 4.4 percent of the internal revenue in the national budget to the HPN sector; this level has remained relatively constant, even though gross domestic product had grown over time (DGHS 2009). Yet health expenditures should be in the range of 10–15 percent of the national budget to achieve sustained gains in the health and well-being of the Bangladeshi population, which will, in turn, fuel sustainable development for Bangladesh through higher productivity that leads to greater competitiveness in the global economy (WHO/SEARO and WHO/WPRO 2008). Within the HPN sector itself, each subsector—nutrition, health, and FP—is equally important, and they are synergistic. Investing in any one of these sectors alone will not lead to the same return as investing equitably in all three sectors at scale. There is widespread agreement among experts

within Bangladesh however, that nutrition as a sector is under-funded. Yet greater investment in nutrition is essential, because gains that could be achieved through the health sector more generally, such as high immunization coverage, have largely been achieved.

Because Bangladesh has invested in health infrastructure and human resources in the past in the health and FP subsectors, much of this existing infrastructure can be leveraged to integrate nutrition services within this infrastructure. However, specialized services for nutrition are needed, and training, capacity strengthening, and overall system-strengthening are essential components to provide quality nutrition services at scale. It is extremely encouraging that the MOHFW has already incorporated some elements of the nutrition program as proposed in this study into the National Nutrition Services (NNS) operation plan, such as a phased plan for scale-up of NNS each subsequent year, an assigned person for the NNS program in each district, and the use of volunteers at the community level. However, there is much more to accomplish, both in terms of planning and implementation at the national, district, community, and household levels.

Importantly, the interventions that were included in the costing exercise are evidence based and based on what works. Proven interventions, such as vitamin A capsule distribution, iron-folate supplementation, micronutrient powders, and fortified foods, such as iodized salt, are both effective and cost-effective when implemented at scale. Similarly, there is growing evidence that SBCC that is implemented as an integral part of quality health services will result in the adoption of new and improved practices. And finally, the international community has rallied around the prevention of malnutrition in the first 1,000 days. A national program for nutrition in Bangladesh will not only need to focus on maintaining gains achieved through increased micronutrient supplementation, but will also need to ensure that nutrition services provide a continuum of care, to prevent malnutrition from occurring in young children, while providing treatment for young children that still become malnourished. SAM still affects a staggering number of children under 5 in Bangladesh, yet there are virtually no national efforts to provide these children with proven effective treatments.

Nutrition is a critical component of the HPN sector because reducing the prevalence of malnutrition significantly over the next decade will be essential to sustain gains in the other subsectors of health and FP. Nutrition has multiple benefits for health and development. Investing in nutrition will directly lead to reductions in maternal, infant, and child mortality. Importantly, as reductions in overall infant and child mortality are achieved as a result of successful health interventions, such as Integrated Management of Neonatal and Childhood Illnesses, the greatest proportion of infant and child deaths remaining will be neonatal deaths. And neonatal deaths are often a result of LBW—an outcome of poor maternal nutrition. In fact, this transition is already under way; increasingly, the majority of child deaths are infant and neonatal deaths. A similar transition is under way for nutrition indicators, for example, as coverage of vitamin A and iodine reach a peak and prevalence of micronutrient deficiencies fall, the more intractable nutrition problems, such as stunting under the age of 2, LBW, poor maternal nutrition, poor adolescent nutrition, and newborn care, will remain outstanding. Not only is the prevalence of stunting among children under 2 high, stunting also begins very early in life in Bangladesh, even in utero, indicating that sustained efforts on promoting and supporting adolescent nutrition, maternal nutrition, and optimal IYCF practices is imperative. Therefore, the national program for nutrition will need to place greater emphasis on tackling these more intractable problems and will need to focus on the first 1,000 days, when chronic and acute malnutrition are the greatest threat. Importantly, service provision will need to

place greater emphasis on services to prevent chronic and treat acute malnutrition while maintaining efforts on reducing micronutrient deficiencies, and the intensity of services will also need to be greater.

Beyond the health sector, nutrition is an essential prerequisite for education. Well-nourished children perform better in school, enroll in school earlier, and stay in school longer. Over the long term, this results in more children reaching and completing higher education, leading to higher wages and greater productivity for the economy as a whole. As such, eradicating malnutrition is one of the best investments a government can make. The findings presented in this report reinforce the understanding that the manifold benefits from improved nutrition far outweigh the costs. But perhaps the most compelling reason for investment in nutrition is that health and nutrition is a right for every Bangladeshi.

Achieving Lasting Success for Nutrition: Building on Bangladesh's Legacy with Community Health Workers

For nearly 35 years, Bangladesh has been a leader in using community health workers (CHWs) to extend the reach of the nation's health system to the community level. In the past, CHWs in Bangladesh have provided services to families in health and FP, water and sanitation, immunizations, and nutrition. These past experiences are a rich foundation for Bangladesh to draw on moving forward in implementing the new NNS within the HPNSDP. Evidence shows that preventing and treating malnutrition requires a low beneficiary-to-provider ratio to achieve sustained gains in reducing malnutrition. Frequent interaction between families with young children and providers is necessary to promote the adoption of key behaviors and to identify and support vulnerable households in need. This level of interaction can mitigate risks of malnutrition and promote early treatment seeking to reduce the prevalence of malnutrition at the community level. In essence, tackling malnutrition requires at least the same level of effort as that which has been invested in promoting FP for population control. The NNS can and should draw on this to engage communities and help Bangladesh move toward the *Bangladesh Vision 2021* goals.

Family Planning

In the mid-1970s, Bangladesh launched a FP program that trained young, married women to serve as CHWs (or FWAs) in rural areas to conduct home visits with women and to offer contraceptive services and information, effectively promoting behavior change in favor of contraception. FWAs eventually numbered 25,000 in the public sector; another 12,000 were from NGOs and an additional 4,500 male outreach workers were also recruited. Each FWA covered an area of about three to five villages, visiting each household once every 2 months. One FWA served about 850 rural women. The reach of the program was staggering: Virtually all Bangladeshi women were contacted at least once by a FWA and more than one-third were reached at home every 6 months. These sustained efforts over several decades have had a major impact on knowledge of contraceptive options, use of contraception, and fertility rates. Between 1975 and 1997, the contraceptive prevalence rate increased more than six times from around 8 percent to 49 percent, and fertility declined from 6.3 births per woman in the early 1970s to about 2.7 births in 2007 (Center for Global Development 2012).

More recently, CHWs engaged in the Healthy Fertility Study are using an integrated, community-based service delivery strategy to increase family planning use.¹⁹ Since 2007, the study, supported by USAID, has delivered a package of maternal and newborn health services, including postpartum FP through female CHWs. By including simple counseling messages on pregnancy risks during the first year postpartum, the importance of exclusive breastfeeding, and the benefits of healthy pregnancy spacing, together with the provision of pills and condoms, these CHWs have had a substantial impact on enabling women to better care for themselves and their families. First year results show a 20 percent increase in contraceptive use in the intervention area compared to a neighboring site. In addition, through the promotion of effective use of the lactational amenorrhea method, the study showed an additional 10 percent increase in the practice and duration of exclusive breastfeeding (Global Health Magazine 2011).

Nutrition

CHWs in Bangladesh have also been successful in the area of nutrition. One of the primary goals of the program *Jibon O Jibika* (Life and Livelihoods), a Title II program of Save the Children, funded by USAID, was to reduce stunting among children under 2. The program, which used CHWs to screen for undernourished children and make referrals, reduced both moderate and severe stunting between the 2004 baseline and 2009 (Save the Children 2009).

These are just two of the many examples from Bangladesh, but they clearly show that Bangladesh's past experience in providing health services at the community level is a legacy that can be built on to eradicate malnutrition in Bangladesh.

¹⁹ The Healthy Fertility Study is a collaboration of the MOHFW, JHPIEGO, two local NGOs, and the Johns Hopkins Bloomberg School of Public Health

8. Recommendations

As the GOB begins the implementation of its next HPNSDP, it is hoped that the following recommendations, based on the analyses presented in this report, will be considered. These recommendations have been grouped into three sets. The first presents recommendations that are based on the results of the PROFILES and costing analyses. The second and third sets support the results presented in this report and focus on the enabling environment that would be needed to effectively implement nutrition services at scale, which are essential to assuring reductions in the prevalence of chronic and acute malnutrition in Bangladesh.

8.1 Results-Based Recommendations

The PROFILES estimates show that while there are many nutrition problems, because the prevalences of chronic and acute malnutrition are high in Bangladesh, implementing effective nutrition interventions that will target and reduce these two more intractable forms of malnutrition will result in the greatest benefit—in terms of significant reductions in child mortality and gains in economic productivity mediated through improved education outcomes resulting from improved nutrition. This suggests that the next nutrition program should focus on these two problems and, because evidence shows that the best window of opportunity to intervene is in the first 1,000 days, that effective nutrition interventions focus on this period.

- **Focus nutrition efforts on the more intractable nutrition problems.** The gains that could be achieved through effective implementation of health and family planning interventions at scale have largely been achieved. Achieving the next level of improvement will likely depend on and benefit from greater investment in and focus on the implementation of effective nutrition interventions. Sustained improvements across all three HPN subsectors will depend on harnessing the synergy between these three subsectors. Within nutrition programming itself, efforts should focus on tackling adolescent nutrition, maternal nutrition, LBW, stunting, and acute malnutrition, and on ensuring that nutrition services provide a continuum of care that crosses the spectrum from prevention of chronic malnutrition to treatment of acute malnutrition.
- **Focus nutrition programming on the first 1,000 days.** It is now well established that the period from pregnancy until a child turns 2 years of age is the window of opportunity for sustained reductions in the prevalence of malnutrition. In Bangladesh, this implies that nutrition programming should focus on four key areas: promoting adolescent nutrition and delaying marriage and first pregnancy to reduce the prevalence of LBW and to ensure adequate maternal nutrition at the onset of pregnancy; improving maternal nutrition during pregnancy to reduce the prevalence of LBW, and improving maternal and newborn care to improve birth outcomes; promoting exclusive breastfeeding in the first 6 months followed by appropriate and timely IYCF practices from 6 to 24 months to prevent chronic malnutrition; and preventing and treating moderate and severe acute malnutrition in children under 5.

The costing results provide an estimate of the cost of providing nutrition services at scale for Bangladesh. While the amount needed per year for nutrition services is within the means of the national budget, the amount proposed it is an increase over the level of funding nutrition has received in the past. This increase is needed to deliver results in reducing malnutrition in Bangladesh. Not only is the nutrition subsector under-invested, the HPN sector as a whole

needs to be adequately funded to both deliver a return on that investment in each subsector and to reap the benefit of the synergy and efficiency gained by investing in each subsector.

- **Increase investment in nutrition as a subsector.** Increasing resource allocation to the nutrition subsector in tandem with efforts to strengthen integrated implementation of health, FP, and nutrition services at scale will help ensure that the nutrition subsector can achieve its stated targets.
- **Increase allocation for health expenditures from the national budget.** Adequate resource allocation for each of the three HPN subsectors will be important for further improvements in health, FP, and nutrition. The synergy across the three sectors working together in an integrated and coordinated manner will also result in greater cost-efficiency over the long term. Increasing resource allocation for the health sector as a whole can ensure that the nutrition subsector will have adequate resources to achieve the stated targets.

8.2 Creating an Enabling Environment for Improved Nutrition

8.2.1 Program-Based Recommendations

One issue that stakeholders reflected on throughout the process of developing the results presented in this report was how nutrition services should be implemented at scale. Three broad areas were identified; they focused on developing a plan for phasing implementation at scale, strengthening supervision and monitoring and evaluation of nutrition services, and revising job descriptions of government health sector providers to reflect the integration of nutrition.

- **Develop a plan for phasing the implementation.** As scaling up of nutrition services will likely take some time, it is recommended that the GOB develop a plan for phased implementation, selecting pilot upazilas for the first year to launch services and capture lessons learned for moving forward. As seen in **Figure 8**, for the purposes of costing, it was assumed that the government would phase the scale-up of nutrition services, starting with providing services in 100 upazilas in Year 1, 204 upazilas in Year 2, and the remaining 204 upazilas in Year 3, such that by Year 3 nutrition services would be provided at scale across the country. Prioritizing upazilas in the first phase should take into account various factors, including malnutrition prevalence, geographic considerations, and existing infrastructure and personnel, among others.
- **Strengthen supervision, monitoring, and evaluation.** Effective supervision, monitoring, and evaluation will be important for delivering quality service and ensuring accountability among managers. Clear roles and responsibilities on nutrition integration for managers and each tier of staff will be essential to ensure effective implementation and oversight of integrated nutrition services. The current DGFP and DGHS MIS and related reporting forms should be revised and updated to include key nutrition indicators to track progress on nutrition outcomes. At each level of service provision, staff should be adequately trained on reporting and collecting nutrition-related data. This includes community volunteers and CSPs in the CCs, but also higher-level staff in the upazilas and districts.

- **Revise job descriptions and reallocate staff to positions that allow them to focus on nutrition.** Implementing the nutrition component through the HPN sector will require some changes to the existing service delivery structure, which also entails changes to the roles and responsibilities of personnel and service providers working in the HPN sector at different levels. Job descriptions should be revised to clarify the roles and responsibilities for each tier of staff in integrating nutrition in their day-to-day work. Revised job descriptions should be clear on what is required by position in integrating nutrition and how every staff member will be held accountable for fulfilling these duties.

8.2.2 Policy-Based Recommendations

Part of having an effective enabling environment for the provision of nutrition services at scale is to have a policy environment that clarifies and guides government and nongovernment stakeholders on the expected results of nutrition interventions and that provides a framework with target outcomes, approaches, and target populations to be reached. As such, the three policy-based recommendations to support the scale-up of effective nutrition services are to develop an updated National Nutrition Plan of Action for Bangladesh, to develop a harmonized SBCC strategy and communication plan for nutrition, and to convene a high-level multisectoral steering committee within the GOB to provide oversight and guide the scale-up and implementation of nutrition services.

- **Develop an updated, evidence-based National Nutrition Plan of Action for Bangladesh.** The last update to the National Nutrition Policy was conducted in 1997. Since that time, the nutrition situation in Bangladesh has evolved, as has the field of nutrition itself. As such, a critical first step to guide both the GOB and its key partners, including international and local NGOs, is the development of a new National Plan of Action (or Policy) for Bangladesh. Given the efforts that are under way to implement a new national program for nutrition, through the NNS, such a plan of action is essential to guide and build synergy between policy makers, program managers, and implementing partners in their efforts to improve the nutrition situation of Bangladesh. Such a document would strengthen the GOB's position by laying out its vision for the country in terms of being free of malnutrition, and it would identify a roadmap of how the GOB and its partners can better coordinate and leverage each other's resources to achieve this central goal of eradicating malnutrition. Without such a plan of action, the current efforts under way to tackle malnutrition can easily be lost.
- **Develop an SBCC strategy and communication plan linked with the National Nutrition Plan of Action.** In order to maximize the effectiveness of SBCC in Bangladesh, the GOB and implementing partners should have a unified and harmonized approach to SBCC and, based on that approach, develop a communication plan. A consultative workshop with the GOB and its partners to develop a comprehensive SBCC strategy, which would align with the priorities and outcomes outlined in the National Nutrition Plan of Action for Bangladesh, is needed. This process would focus on coordinating activities and resources for a multilayered SBCC approach, and creating linkage and reinforcing messages between existing and needed nutrition SBCC projects and campaigns. This would ensure less duplication of effort, greater harmonization of messaging, and increased synergy between SBCC activities, and would ensure that all stakeholders working on nutrition are “speaking

the same language” in promoting key nutrition behaviors. In addition, a communication plan should be developed that addresses the four critical areas in the lifecycle approach: adolescents; pregnancy and birth outcomes; breastfeeding, IYCF, and the prevention of chronic malnutrition; and SAM and moderate acute malnutrition. The communication plan developed collaboratively would specify target audiences, the desired change for each audience, barriers inhibiting that change, communication objectives that address barriers, strategic approaches, key messages, channel mix (e.g., interpersonal, community-based, and mass media), activities, and materials.

- **Form a high-level multisectoral committee.** Effectively implementing a comprehensive nutrition program will involve several sectors, particularly health and family welfare, education, information, and food and agriculture. As such, a high-level committee should be formed, preferably with the prime minister or the finance minister as the chair. This committee would establish the overarching agenda and guidelines for each sector to integrate nutrition, allocate the required resources, and monitor the performance of each at regular intervals. A committee at this level will promote high-level collaboration and dialogue across the sectors, which will further cultivate shared responsibility for nutrition for Bangladesh. It will also enable representatives from each of the sectors to resolve any issues that may arise in the course of implementation.

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ⁱ **Estimating the benefits of breastfeeding.** A spreadsheet model called the Benefits of Breastfeeding, used in conjunction with PROFILES, provides a 1-year estimate of the crude monetary value of breast milk. This value reflects the cost that would have been incurred from using milk substitutes as a substitute for breast milk after subtracting the cost of providing food to the mother to support lactation. Before considering the elements that are used in the calculations, it is important to keep in mind that breastfeeding also has enormous benefits beyond its monetary value. To calculate the cost of infant formula as a breast milk substitute, the following information was used: amount of breast milk consumed based on the percentage of children with various breastfeeding patterns in the age groups under 6 months, 6–11 months, 12–23 months, and 24–35 months; information—from the literature—on the volume of breast milk production for each of these breastfeeding patterns/age groups; and cost of infant formula bought in the market. An equivalent approach can be used to estimate the value assuming optimal breastfeeding patterns for all children: exclusive breastfeeding to 6 months and partial breastfeeding thereafter up to 2 years of age and beyond.

Feeding mode is an important determinant of the risk of illness and mortality among young children. Exclusive breastfeeding during the first 6 months of life has many benefits, including antibodies and other anti-infection properties of breast milk, as well as reducing the risk of infection (particularly diarrhea and acute respiratory tract infection) through decreased exposure to disease-causing microorganisms. Breastfeeding—with appropriate complementary foods and feeding practices—continues to afford protection against infection (as well as valuable nutrients) beyond 6 months of age. Using information on the feeding mode according to the child’s age (from the 2007 BDHS) and risk estimates from the literature, the model illustrates breastfeeding benefits by calculating the number of lives saved and illness episodes averted.

Annex A. Description of Assumptions and Unit Costs by Level of Service Delivery and Cost Center

1. Social and Behavior Change Communication and Community Nutrition Promotion

Social and behavior change communication (SBCC) is a crucial cost center for the proposed program. The cost center comprises the following major activities: interpersonal communication, community mobilization, nutrition education, and mass media and materials. **Table A1** shows costs of the line items of each activity.

Interpersonal Communication

Interpersonal communication is a critical activity of the SBCC cost center. Interpersonal communication has been shown to be the most effective SBCC activity in many situations, but also the most labor- and cost-intensive. Interpersonal communication includes peer education and provider-client communication, such as regular household visits by program workers, cluster meetings of households, and discussions in satellite clinics (where immunization meetings are held) to address the barriers to changing behavior, the benefits of improved nutrition, and measures needed for improving nutrition.

A group of people needs to be deployed at the community level to do the tasks involved. It is proposed, based on the experiences of some Latin American countries, such as Honduras (Fiedler 2003), as well as of the experience of the earlier nutrition program in Bangladesh, that in each ward or catchment area of a community clinic (CC) six community nutrition volunteers (CNVs)—one for each 200 households—would need to be recruited. Each CNV would be expected to visit 10 households every day, conduct a few cluster meetings with the clients and community leaders, and participate in the satellite clinics every month. A CNV would be paid an allowance of Tk.1,000/- per month. An amount of Tk.72,000/- would be paid to six volunteers of a ward per year.

An average union consists of 28,000 people. The Ministry of Health and Family Welfare (MOHFW) assumes that one CC would cover 6,000 individuals (or 1,200 households). Then, one union should have at least four CCs in it: three CCs and the family welfare center (FWC) itself (wherein one CC can work as well). The average union should have 24 CNVs and Tk. 288,000/- would be required as allowances for the CNVs. An average upazila has nine unions. Hence, payment for the CNVs in the average upazila would involve an expenditure of Tk. 2,592,000/- per year.

The second line item or object of cost of the interpersonal communication activity would be the performance award for the CNVs. It is expected that a performance award would be provided to the top-performing 10 percent of CNVs, which would provide an incentive for increased effort and create competition among the CNVs. Each award would cost Tk. 3,000/-. Of the 216 CNVs in the upazilas, only 22 would get the award. The total cost for the award would be Tk.66,000/- per upazila per year.

The third item of this activity is the tea and snacks to be offered to the participants of the cluster meetings. In a ward, 20 persons would participate in the monthly cluster meeting. Tea and snacks for one participant would cost Tk.10/- and for one meeting will cost Tk. 200/-.

There would be 12 meetings in the year. The annual cost of this line item would be Tk. 2,400/- for a ward, Tk. 9,600/- for a union, and Tk. 86,400/- for one upazila.

The CNVs would participate in the satellite clinics and discuss key nutrition issues with the mothers. Since the satellite clinics already exist in the system, no additional cost would be incurred for the nutrition activities in the clinics. The CNVs would require a few logistics items, including a bag and an umbrella. A lump sum of Tk. 600/- would be spent for each CNV for this item per year, so that the cost for this item in one ward would be Tk. 3,600/- and for the upazila would be Tk. 14,400/-.

Community Mobilization

The community mobilization activity would include holding community meetings at regular intervals, strengthening counseling skills of CNVs, and organizing orientation meetings with local leaders. Households that do not have any pregnant woman or lactating mothers at present would be covered by the volunteers through regular home visits and would participate in community meetings. In each meeting, the CNVs would discuss important nutrition issues and participants would be encouraged to discuss their views and what they perceive as barriers to improving nutrition. The participants would then jointly find solutions and identify the nutrition promotion activities that they should undertake immediately. The CNVs would organize and conduct the meetings. Approximately 20 persons would participate in each meeting to be held in each quarter of the year, so that there would be four such meetings in the year with a total of 80 participants. The only item that would cost anything for these meetings would be the tea and biscuits to be served. For each participant, Tk. 10/- would be required for tea and light snacks/biscuits, and the total cost for each CC area in a year would be Tk. 10 x Tk. 80 = Tk. 800/-. The cost for community mobilization in the union would be Tk. 800 x 4 CCs = Tk. 3,200/-, and in the upazila would be Tk. 28,800/-. The whole country would require Tk. 14,630,400/- in each year for community mobilization.

The capacity and skills of the CNVs have to be strengthened so that they can properly perform the counseling and advocacy activities in the community meetings. This would require monthly orientation and coordination meetings with the CNVs held at the union health and family welfare center (UHFWC). All 24 CNVs would participate in these meetings once a month. The union nutrition coordinator would coordinate the meetings. Each participant (CNV) would be provided with tea and snacks on the meeting day. This would cost Tk. 50/- per person, Tk. 1,200/- for all CNVs each month, Tk. 14,400/- per year for each union, and Tk. 12,600/- per year for one upazila. The entire country would need Tk. 65,836,800/- for this line item.

In addition, it is proposed that the community nutrition workers (CNWs) of each CC area organize an orientation meeting with key local leaders (school teachers, religious leaders, village doctors, etc.) to discuss nutrition issues and seek leaders' involvement in the nutrition campaign. In each CC area, two biannual meetings would be held and 30 persons would participate in each meeting. Tea and snacks would cost Tk. 40/- per person, Tk. 1,200/= for all persons in one meeting, and Tk. 2,400/- for two meetings in the year in each CC area. One union would require Tk. 9,600/-, one upazila Tk. 86,400/-, and the country Tk. 43,891,200/- per year for this line item.

Nutrition Education

Providing nutrition education to students in primary and secondary schools is another activity of the SBCC cost center. Nutrition education in schools can be considered a long-term

investment activity of the program. Nutrition knowledge and skills imparted in schoolchildren will not only improve the nutritional status of their current households but will also ultimately improve the nutritional status of their families in the future.

The UHFWC would be the center of this activity. The main components of the activity are to teach nutrition issues in Class IV and V of the primary level and in Class VI to Class X of the secondary level. The medical officer (MO) or assistant health inspector (AHI) of the union would coordinate the activity. The major cost items for this activity would be preparation of curricula of the school students (for 7 school years), adding two chapters on nutrition in the book of health science for the secondary-level class (VI to X) and inclusion of 2–3 pages on nutrition in any book of the Class IV and Class V students, and training at least one teacher of each school in nutrition. The cost for the first three items would be incurred at the central level, in the office of Director General (DG) of Ministry of Education (MOE). The MOHFW will play active role in involving the MOE in this intervention, provide support to the MOE, and coordinate the activity. An amount of Tk. 200,000/- would be paid as an honorarium to the experts that prepare the curricula for the school classes. This is a one-time cost, which will be incurred in the initial year. This assumes that each class in a secondary school has an average of 50 students and a school has a total of 250 students. The nutrition chapters will constitute approximately 10 pages of one book of a secondary-level student. The cost of publication/production of one page would be Tk. 1/-. The book of each student would cost Tk. 10/-, and the total cost for this item in one secondary school would be Tk. 2,500/-.

An average union has three high schools, and it would require Tk. 7,500/- for the nutrition education line item. A upazila would require Tk. 67,500/- for 27 high schools. The whole country would need to spend Tk. 34,290,000/- every year. A primary school has on average 40 students in each class (BANBEIS and BBS 2009). The cost of adding three pages in a book would be Tk. 3/-, and the total cost for 80 students would be Tk. 240/- for one primary school in one year. There are 161 primary schools (in four types: government; registered non-government; non-registered, non-government; and informal education) in a upazila (BANBEIS and BBS 2009). One union has on average 17 primary schools. Hence, the cost of adding the nutrition portion in the books of Class IV and V for all primary schools in one union would be Tk. 4,080/-, in one upazila Tk. 36,720/-, and in the whole country Tk. 18,653,760/-.

Training of schoolteachers would be another object of cost. Each union would train 20 teachers—3 teachers from 3 high schools and 17 teachers from 17 primary schools. The training would be held at the UNFWC (or in a high school) for 1 full day. The AHI of the union would organize the training and the MO of the UHFWC and the Upazila Nutrition Officer would be the resource persons. The participants would be served tea and snacks, which would cost Tk. 1,000/- (Tk. 50/- per person). In addition, the trainees would be supplied with a notebook, presentation materials, a pen, etc., which would cost Tk. 500/- (Tk. 25/- per person). In total, Tk. 1,500/- would be spent for training of teachers in one union. The amount to be spent in the upazila would be Tk. 13,500/-. The country would require Tk. 6,858,000/- per year for this line item of cost.

Mass Media and Materials

Delivery of nutrition messages through mass media is the last item of activity under SBCC. The cost would be incurred at the central level of the nutrition program. The mass media to be utilized would be: television and radio channels, newspapers, and mobile phones. The television and radio channels would broadcast nutrition messages; the newspapers would

publish editorials, articles, and advertisements/messages on nutrition; and some key messages would be delivered through the mobile phone network. A block amount of Tk. 68,800,000/- is assumed for broadcasts on the television and radio channels, and Tk. 2,400,000/- is assumed for newspaper publications each year.

Preparation of materials would also be included in the SBCC cost center. The activity would include printing of job aids and billboards with nutrition messages. Printing of one job aid would require Tk. 200/-. One job aid would be provided to each community clinic, for all CNVs and three workers of the CC, in each ward: to 9 persons of a ward and to 324 nutrition persons in 36 CCs of an average upazila. Job aids would also be given to the MO, family health volunteer (FWV), AHI, and sub-assistant community medical officer (SACMO) of each union FWC and to the union health and family welfare officer, gynecologist, pediatrician, upazila nutrition officer, and assistant nutrition officer of the upazila. In total, 365 personnel would be supplied with job aids, and it would cost Tk. 73,000/- for one upazila per year. A total of 46 billboards would be installed: 36 in front of union-level facilities (including FWCs), 1 in front of the Upazila Health Complex (UHC), and another 9 in major market/meeting places in 9 unions of the upazila. Preparation of one billboard would cost Tk. 10,000/-, and the total cost for this item in the upazila would be Tk. 460,000/-. The costs of these two items of SBCC, printing of job aids and installation of billboards, would belong to the capital cost category. These would be incurred once, in the beginning of the implementation period.

2. Management and Coordination of the Nutrition Program

The nutrition program would be implemented by the office of the Line Director of Public Health Nutrition component of the DG (Health Services). The office of the Line Director, including the building and a large staff, has been in existence for a long period of time. The government has been bearing all costs of the office every year, and it is assumed here that the office would continue to exist, whether the nutrition program is implemented or not. The government would not have to incur additional expenditure for the office. The same is true for the office of the Divisional Director (Health) and that of the District Civil Surgeon. Considering the super-fixed nature of the expenditure, as well as its permanently continued recurrence, this expenditure has not been included in the estimate of costs of the program.

We have considered only the major management items of cost that would be incurred by the government if the proposed program is implemented. The new line items follow from the proposed structure of management of the program as described in an earlier subsection. The line items include the salary and allowances of the Assistant Director for the nutrition program at the district level (in the office of the Civil Surgeon) and staff of the Assistant Director, salary and allowances of the Upazila Nutrition Coordinator (UNC) and the support staff at the upazila level, and the costs for tea and logistics for holding meetings at different levels. The salary and allowances of the Assistant Director at the district level is assumed to be Tk. 17,000/- and that of the three staff to be Tk. 25,000/- per month. For one district, the office of the Assistant Director would cost Tk. 504,000/- per year. The cost for the whole country would be Tk. 32,256,000/- per year for these line items. The UNC would get the same salary as that of the Assistant Director of the district, namely, Tk. 204,000/- per year. The salary and allowances of the Assistant UNC would be Tk. 12,500/- per month and that of three staff in the Upazila Nutrition Office (within the office of Upazila Health and Family Planning Office) would be Tk. 25,000/month. These three line items would cost Tk. 654,000/- for one upazila and Tk. 332,232,000/- for the country per year.

Every year a number of meetings would be held at various levels for multisectoral and intrasectoral coordination and proper governance of the program. The central governing body, comprising 30 personnel, would meet every quarter of the year. The central coordination committee, consisting of 20 personnel, would meet once in every 2 months. Similarly, the divisional coordination committee, district coordination committee, and upazila committee, each with 20 persons, would meet every 2 months—6 times in the year. Tea and snacks to be served in all these meetings would cost Tk. 2,958,600/- in total per year. In addition, the UNC would have to regularly visit the unions for supervision and to impart refresher training to the field staff. These visits would involve travel allowance and daily allowance for the UNCs. Each UNC would require Tk. 1,500/- per month (Tk. 150/- per day for 10 days). The whole country would require Tk. 762,000/- per year for this line item.

The national infant and young child feeding (IYCF) operational guidelines should be distributed to the field staff in all upazilas. Each upazila office, UHFWC, and CC should get at least one copy of the guidelines. We assume that a upazila would get 50 copies, and printing and distribution of one copy would cost Tk. 1,000/-. Therefore, this item would cost Tk. 50,000/- for one upazila and Tk. 25,400,000/- for the country. However, this cost would be incurred only once in the entire program period.

Table A2 shows the unit costs of line items under management and governance cost center.

3. Systems Strengthening

The systems strengthening as a cost center would include three major activities: training of providers, staff, and volunteers; a surveillance and management information system; and evaluation of the program. To ensure high efficacy and effectiveness of the program, training would be imparted to a large number of persons involved in the program. Two types of training would be provided: basic training once at beginning of program implementation and refresher training once every year. The training courses would discuss, for example, the harmful effects of malnutrition and the significant benefits of improved nutrition, measures to be adopted for improving nutrition, methods of treatment of severely malnourished children and mothers, management issues, method of counseling, and so on. The surveillance and management information system would include regular collection of relevant data, management of data, analysis of data, and facilitation monitoring of program activities. This activity would involve a continuous process and would include the tasks of program persons at all levels, from the central office down to the CCs. Evaluation of the program would include the following specific activities: undertaking a baseline survey in the initial year (preferably before implementation begins), conducting a mid-term evaluation in the middle of a 5-year period, and carrying out a final evaluation at the end of each 5-year period. A total of five surveys would be conducted.

Tables A3.1 to A3.16 show the costs to be incurred for the systems strengthening activities. The following groups of persons would conduct basic training: district civil surgeons, gynecologists and pediatricians of the district hospitals (DHs) and UHCs, district- and upazila-level nutrition officers, maternal and child health MOs and upazila health and family planning officers, family welfare assistants (FWAs), health assistants (HAs), FWVs, SACMOs, AHIs and family planning inspectors (FPIs) of the UHFWCs, statisticians of DHs and UHCs, community-based skilled birth attendants (CSBAs) and traditional birth attendants (Dais), and community health workers (CHWs) and CNVs. Refresher training will be given to CNWs, CNVs, FWAs, HAs and CHWs, and district- and upazila-level nutrition officers. The issues of discussion, venue, duration, etc. would vary from participant group to

participant group, as would the costs. **Tables A3.1 to A3.16** display the information about the costs and other aspects of all training courses.

4. Micronutrient Supplementation

The micronutrient supplementation cost center includes the following activities: supplying iron-folic acid (IFA) to mothers and non-pregnant adolescent girls, supplying vitamin A to pregnant and lactating women and children, supplying multiple micronutrients to children, and supplying dispersible zinc to children. **Table A4** shows the assumptions regarding the supplies and the unit costs.

Each dose of IFA would comprise 400 µg of folic acid and 60 mg of iron, and each mother would use one tablet per day for 6 months of pregnancy and for another 6 months postpartum. One tablet (Aristofeol or Beximco) would cost Tk. 0.20. The cost of this supplementation for one mother, for both periods—pregnancy and lactating—would be Tk. 72/-. The target population (mothers) would increase from 3,200,686 in 2011 to 3,406,304 in 2015 and to 3,727,757 in 2021. Accordingly, the annual cost for supplying IFA tablets to all the target women in the country would increase from Tk. 380,241,553/- in 2011 to Tk. 442,857,605 in 2021. Non-pregnant adolescent girls would also be supplied with IFA tablets. One girl would consume one tablet per week and 52 tablets in one year. The annual cost for one girl would be Tk. 10/-. The target population would increase from 16,783,076 in 2011 to 19,565,914 in 2021. The annual cost of the tablets for adolescent girls would increase from Tk. 167,830,763/- to Tk. 195,659,148/- in 2021 for the whole country. Pregnant and lactating mothers would be supplied with one vitamin A tablet each. One dose of a vitamin A tablet contains 60,000 µg, which would cost Tk. 1.66. The target population for the vitamin A tablet is the same as that for the IFA tablets. The annual cost for the country would be Tk. 5,313,139/- in 2011, Tk. 5,654,465 in 2015, and Tk. 6,188,077/- in 2021.

Children would also be supplied with vitamin A tablets. Each child would be given a first dose at the age of 12 months, and subsequently one dose would be given at 6-month intervals. A total of nine doses would be given to a child during his or her first 5 years. Each dose would cost Tk. 1.66. The total annual cost of the tablets for children in the country would increase from Tk. 49,278,848/- in 2011 to Tk. 57,449,882/- in 2021.

The children would also be supplied with multiple micronutrients. One micronutrient packet would contain 300 µg of vitamin A, 30 mg of vitamin C, 160 mg of folic acid, 12.5 mg of iron, and 5 mg of zinc. Each child would consume one packet per day for 365 days in a year during the first 5 years of life. One packet would cost Tk. 2.00 and the cost for one child would be Tk. 730/- per year. The total cost of these tablets for the country would increase from Tk. 9,254,373,520/- in 2011 to Tk. 10,229,538,180/- in 2021.

In addition, dispersible zinc would be supplied to children suffering from diarrhea. Each dose would contain 20 mg of zinc, and a child would consume 10 tablets for each episode of diarrhea. The price of one table would be Tk. 1.5. Hence, the cost for one child would be Tk. 38.25, assuming that each child suffers from 2.14 episodes of diarrhea every year. The annual cost of the zinc tablets would increase from Tk. 609,082,749/- in 2011 to Tk. 672,763,988/- in 2021.

5. Food Fortification

Some food items would be fortified with nutrients. For example, salt would be iodized, flour would be fortified with iron, and edible oil would be fortified with vitamin A. **Table A5**

shows the costs of food fortification. One dose of salt would contain 90 µg of iodine. One person would consume 2 grams of iodized salt per day. The cost of fortification of one kg salt would be Tk. 0.12. The cost of fortification of salt for one person would be Tk. 0.09 per year. The entire population would be the target for supplying iodized salt. The total cost would increase from Tk. 13,646,505/- in 2011 to Tk. 15,893,736/- in 2021, since the size of population will increase during the period.

Flour would be fortified with iron, thiamine, riboflavin, niacin, folic acid, zinc, and vitamin A, and then supplied to people through the marketplace. One person would consume 50 kg of fortified flour per year. The cost of fortification of 1 kg of flour would be Tk. 0.35 and the cost of one person's consumption would be Tk. 17.5 per year. The total cost of fortified flour would increase from Tk. 2,653,487,235/- in 2011 to Tk. 3,090,448,673/- in 2021, since the size of population of the country will increase during the period.

Edible oil would be another item to be fortified; it would be fortified with vitamin A. One person consumes 5,475 L of oil per year. The cost of fortifying 1 L would be Tk. 0.22 and the cost of the item for one person would be Tk. 1.20 per year. Based on these assumptions, the total cost of fortified oil for the entire population of the country has been estimated at Tk. 181,953,410/- in 2011, which would increase to Tk. 211,916,480/- in 2021 with the increased size of the population.

6. Management of Severe Acute Malnutrition in Children

Under the program, appropriate curative care will be provided to severely malnourished children between 1 and 5 years old at the UHCs and DHs. The curative care would be expensive. Treatment of one child would cost Tk. 11,130/-. The total cost of this line item would increase from Tk. 1,410,975,031 in 2011 to Tk. 1,559,654,246 in 2021, given the assumed number in the target population in each year from 2011 to 2021.

7. Deworming

Deworming tablets would be supplied to each children 2–5 years of age. Every child would be given two doses per year. The price of one dose is Tk. 1.00; hence, the cost for one child would be Tk. 2.00 per year. The total cost of deworming tablets for the country would increase from Tk. 25,555,190 in 2011 to Tk. 28,168,410/- in 2021.

Description of Unit Costs by Cost Center, Level of Service Delivery, and Type

Table A1. SBCC and Community Nutrition Promotion

Method of conducting activities	Persons responsible	Item/object of cost	Rate (Tk.)	Quantity/amount	Total cost for one CC/year	Cost per client	Total cost for a union per year (col. 8 x 4)	Total cost for an upazila per year (col. 10 x 9)	Total cost for a district per year (8 upazilas in each district)	Total cost for Bangladesh per year (64 districts)	Remarks
3	4	5	6	7	8	9	10	11	12	13	14
1. SBCC											
1.1 Interpersonal Communication			Level of Service Delivery: Community Clinic/Ward								
Household Visit	CNVs	Honorarium of CNV	1,000 per month (12,000 per year)	6 CNVs for a CC/ward	72,000/- (= 12,000/- x 6)		288,000/-	25,92,000/-	20,574,000/-	1,316,736,000/-	
Cluster meeting		Performance award to 10% of the best-performing CNVs Tea, etc. for cluster meeting (once a month)	3,000 per CNV per year 10 per participant of one meeting with 20 participants in one meeting	22 CNVs per upazila 12 meetings in a year with 240 participants in 1 ward	2,400/- (= 240/- x 10)		9,600/-	66,000/- 86,400/-	523,875/- 685,800/-	33,528,000/- 43,891,200/-	
Satellite clinics		4 other items (bag/umbrella for CNV)	600/- (lump sum for one person)	6 CNVs in a ward	3,600/- (= 600/- x 6)		14,400/-	129,600/-	1,028,700/-	65,836,800/-	
Subtotal									222,812,375/-		
1.2 Community Mobilization			Level of Service Delivery: Community Clinic/Ward								
Holding community meetings	CNV	Tea, etc.	10 per participant	20 persons in one meeting, 4 meetings in a year = 80 persons	800/- (= 10/- x 80)		3,200/-	28,800/-		14,630,400/-	
Strengthening counseling skills of CNVs for enforcing practices on exclusive breastfeeding (EBF), complementary feeding, maternal and neonatal health etc.	CNV	Union-level orientation and performance assessment on monthly basis	50 per CNV	24 participants in a union	(60/- x 40) = 2,400/- per meeting		14,400/- (1,200/- x 12)	129,600/-		65,836,800/-	
Orientation meeting with social leaders (schoolteachers, imams, village doctors, etc.)		2 times per year	60 per participant	30 participants in one meeting in one ward	3,600/- per year per ward (60 x 30 x 2)		14,400/- (3,600/- x 4)	129,600/-		65,836,800/-	

Method of conducting activities 3	Persons responsible 4	Item/object of cost 5	Rate (Tk.) 6	Quantity/amount 7	Total cost for one CC/year 8	Cost per client 9	Total cost for a union per year (col. 8 x 4) 10	Total cost for an upazila per year (col. 10 x 9) 11	Total cost for a district per year (8 upazilas in each district) 12	Total cost for Bangladesh per year (64 districts) 13	Remarks 14
1.3 Nutrition Education											
Level of Service Delivery: FWC/Union											
Teaching nutrition in high schools from Class VI to X	AHI	Payment to experts for preparation of curricula (for both secondary and primary)	1 per page and 10 pages for each student	50 students in one class, 5 classes	2,500/- for one high school (in one ward)		7,500/- (for 3 high schools in one union)	67,500/- (Assuming 27 schools in one upazila)		200,000/- 34,290,000/-	Details in Table A3. 15
		Addition of two chapters on nutrition in book on Health Science of 5 classes						78,900/-		40,081,200/-	
Teaching nutrition in primary school from Class IV to V		Training of one teacher from each high school									
		Addition of 3 pages on nutrition in any book	1 for each page and 3 pages for each student	40 students in each of Classes IV and V	240 for one primary school		4,320 for 1 union (240 x 18 schools)	38,880/-		19,751,040/-	
		Training of one teacher of each primary school						33,450/-		152,933,400/-	
1.4 Materials											
Level of Service Delivery: Community Clinic/Ward											
Printing of job aids (IYCF) for all service providers		Printed materials for counseling	200	324 per upazila				73,000/-	584,000/-	37,084,000/-	
Printing of billboard with messages for all facilities		Billboard	10,000	46 per upazila				460,000/-		234,320,000/-	
1.5 Mass Media											
Level of Service Delivery: Centre											
Delivery of messages through mass media	Line Director	Electronic media: television (government and private channels) and radio (national and FM)			1 year of rates for both: (a) prime time on BTV, ATN Bangla, Channel –I, etc.; (b) rates for national and FM radio					68,800,000/-	Variable for messages (but fixed for clients and facilities)
		Newspaper inserts, editorial, articles			1 page inserts in 4 highly circulated newspaper every 3 months					2,400,000/-	
		Messages through mobile phone			Messages through mobile phone						

Table A2. Management and Coordination

1. Cost centers and specific activity	Management of nutrition program								
2. Level of service delivery	All levels, from center to CC								
3. Method of conducting activities	Planning, supervision, coordination, monitoring (surveillance), and evaluation								
4. Persons responsible	Line Director, Divisional Director, District Manager, Assistant Director at district UNC, AHI of union, and HA of CC								
Item/object of cost 5	Rate (Tk.) 6	Quantity/Amount 7	Total cost for one CC/year 8	Cost per client 9	Total cost for a union per year (col. 8 x 3) 10	Total cost for an upazila per year (col. 6 x 12) 11	Total cost for a district per year (col 6 x 12) 12	Total cost for Bangladesh per year (col 12 x 64) 13	Remarks 14
Personnel already exist									
Salary and allowances of Assistant Director of Nutrition at district level	Basic: 11,000/- Total: 17,000/- per month	1 for 1 district					204,000/-	13,056,000/-	
Salary and allowances of 3 staff at district level	Basic: 6,400/- + 5,100/- + 4,500/- (total 25,000/-, including allowances) per month	3 for 1 district					300,000/-	19,200,000/-	
Salary and allowances of UNC in upazila	Basic: 11,000/- Total: 17,000/- per month	1 for 1 upazila				204,000/-		103,632,000/-	
Salary and allowances of Assistant UNC	Basic: 8,000/- Total: 12,500/- per month	1 for 1 upazila				150,000/-		76,200,000/-	
Salary and allowances of 3 staff in upazila	Total: 25,000/- per month	3 for 1 upazila				300,000/-		152,400,000/-	
High tea for governing body meeting at central level	100/- per person	30 persons in one meeting/ 3 meetings per year						9,000/-	
High tea for central coordination meeting	60/- per person	20 persons in one meeting/ 6 meetings per year						7,200/-	
Tea for divisional coordination meeting	60/- per person	20 persons in one meeting/ 6 meetings per division per year						43,200/-	
Tea for district coordination meetings and community meeting	60/- per person	20 persons in one meeting/ 6 meetings per district per year					7,200/-	460,800/-	
Tea for upazila coordination and community meeting	40/- per person	20 persons in one meeting/ 6 meetings per upazila per year				4,800/-		2,438,400/-	
Monitoring, supportive supervision, and refresher training of the CC/ward staff by UNC (TA and DA)	150/- for each field visit of UNC	10 days per month				18,000/- (150 x 10 x 12)		9,144,000/-	
Design, printing, and distribution of national IYCF operational guideline	1,000/-	50 copies per upazila				50,000/- (50/- x 50 copies)		25,000,000/-	

Tables A3. Systems Strengthening

Table A3.1. Training of Civil Surgeons

Type of participants:		Civil Surgeons						
Number of participants:		64						
Trainers:		Central training of trainers						
Coverage of one course:		Full	Venue:		IPHN			
Duration:		3 days						
Number of this course to be required to cover the entire country: 1								
Objectives		To orient about nutrition program						
Issues of training		Basic nutrition issues and management and coordination of the program						
Type of resources created:		Human Capital	Approach to costing:		Top-down			
Type of expenditure:		Capital	Type of cost:		Fixed			
Estimates of costs of training								
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	5	1	10,000	147
		Resource Persons' Allowance	1,250	4	3	1	15,000	221
2	Venue	3,000		3	1	9,000	132	
3	Food	Lunch and refreshments	300	64	3	1	57,600	847
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	2,500	64	1	1	160,000	2,353
		Accommodation	500	64	4	1	128,000	1,882
		Training allowance	1,000	64	3	1	192,000	2,824
5	Logistics	Training team logistics						
		Multimedia	3,000	1	3	1	9,000	132
		Banners	2,000	1	1	1	2,000	29
		Bags	300	64	1	1	19,200	282
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	9,600	1	1	1	9,600	141
		Photo copies/printing	4,000	1	1	1	4,000	59
		Computer/laptop	2,000	1	3	1	6,000	88
		Dhaka-based logistics						
		Reporting and documentation	Lump sum				6,000	88
		Stationery	1,000	1	1	1	1,000	15
6	Communication	Team communication cost (pre-training and during training)	2,000	1	1	1	2,000	29
Total						631,900	9,158	

Table A3.2. Training of Gynecologists and Pediatricians (Upazila- and District-Level)

Type of participants:		Gynecologists and pediatricians of DHS and UHCs						
Number of participants:		36 (for two districts and all upazilas of two districts)						
Trainers:		Central training of trainers						
Coverage of one course:		two districts	Venue:		IPHN			
Duration:		7 days						
Number of this course to be required to cover the entire country: 32								
Objectives		To increase capacity to treat severely malnourished children and mother						
Issues of training		Complicated case management and coordination of the program, nutrition of pregnant and lactating mothers, breastfeeding, complementary feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, nutrition care of newborn, and school curricula						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost:		Quasi-fixed			
Estimates of costs of training								
		Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1	Staff cost	Training Coordinator	2,000	1	9	1	18,000	265
		Resource Persons' Allowance	1,250	4	7	1	35,000	515
2	Venue		3,000		7	1	21,000	309
3	Food	Lunch and refreshments	300	36	7	1	75,600	1,112
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	2,500	36	1	1	90,000	1,324
		Accommodation	500	36	8	1	144,000	2,118
		Training allowance	1,000	36	7	1	252,000	3,706
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	7	1	21,000	309
		Banners	2,000	1	1	1	2,000	29
		Bags	300	36	1	1	10,800	159
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	5,700	1	1	1	5,700	84
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	7	1	14,000	206
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
		Stationery	800	1	1	1	800	12
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
		Total						701,900
Total training costs for 32 trainings							22,460,800	325,519

Table A3.3. Training of ADs, UNCs, and Assistant UNCs (AUNCs)

Type of participants:		AD, UNCs, and AUNCs						
Number of participants:		17 (for all Upazila of the district)						
Trainers:		Central trainers and district-level trained gynecologists and pediatricians						
Coverage of one course:		1 district	Venue:		District Hospital			
Duration:		15 days						
Number of this course to be required to cover the entire country: 64								
Objectives		Management and coordination of the nutrition program						
Issues of training		Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, nutrition care of newborn, complicated case management and coordination of the program, and school curricula						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost:		Quasi-variable			
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	17	1	34,000	500
		Resource Persons' Allowance	1,250	4	15	1	75,000	1,103
2	Venue		3,000		15	1	45,000	662
3	Food	Lunch and refreshments	250	17	15	1	63,750	938
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	500	17	1	1	8,500	125
		Accommodation	200	17	16	1	54,400	800
		Training allowance	600	17	15	1	153,000	2,250
5	Logistics	Training team logistics						
		Multimedia	3,000	1	15	1	45,000	662
		Banners	2,000	1	1	1	2,000	29
		Bags	300	17	1	1	5,100	75
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	6,000	1	1	1	6,000	88
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	15	1	30,000	441
		Dhaka-based logistics						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						534,550	7,861	
Total training costs for 64 trainings						34,211,200	495,814	

Table A3.4. Training of MO-MCH and UFPO

Type of participants:		MO MCH and UFPO						
Number of participants:		16 (for all Upazila of the district)						
Trainers:		Central trainers and district-level trained gynecologists and pediatricians						
Coverage of one course:		1 district	Venue:		District Hospital			
Duration:		2 days						
Number of this course to be required to cover the entire country: 64								
Objectives		Management and coordination of the nutrition program						
Issues of training		Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, nutrition care of newborn, complicated case management and coordination of the program, and school curricula						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
		Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue		3,000		2	1	6,000	88
3	Food	Lunch and refreshments	250	16	2	1	8,000	118
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	500	16	1	1	8,000	118
		Accommodation	200	16	3	1	9,600	141
		Training allowance	600	16	2	1	19,200	282
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	16	1	1	4,800	71
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	6,000	1	1	1	6,000	88
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total							104,400	1,535
Total training costs for 64 trainings							6,681,600	96,835

Table A3.5. Strengthening Training Facilitation Skills of Master Trainers from District and Upazila on IYCF

Type of participants:		UNCs, AUNCs, Gynecologist and pediatrician						
Number of participants:		32 (for all upazilas of the district)						
Trainers:		Central trainers						
Coverage of one course:		1 district	Venue:		District Hospital			
Duration:		2 days						
Number of this course to be required to cover the entire country: 64								
Objectives		Management and coordination of the nutrition program						
Issues of training		Counseling techniques on EBF and CF						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
		Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue		3,000		2	1	6,000	88
3	Food	Lunch and refreshments	250	32	2	1	16,000	235
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	500	32	1	1	16,000	235
		Accommodation	200	32	3	1	19,200	282
		Training allowance	600	32	2	1	38,400	565
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	32	1	1	9,600	141
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	6,000	1	1	1	6,000	88
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total							154,000	2,265
Total training costs for 64 trainings							9,856,000	142,841

Table A3.6. Strengthening Counseling Skills of FWAs, HAs, FWVs, SACMOs, AHIs, and FPI on IYCF-Related Counseling at Community and Clinic Levels

Type of participants:		FWAs, HAs, FWVs, SACMOs, AHIs, and FPI						
Number of participants:		36 (for 3 unions of an Upazila)						
Trainers:		UNCs, AUNCs, gynecologists, and pediatricians						
Coverage of one course:		One-third of Upazila	Venue:		UHC			
Duration:		2 days						
Number of this course to be required to cover the entire country: 1,524								
Objectives		Strengthening counseling skills						
Issues of training		Counseling techniques on EBF and CF and supervision						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue	3,000		2	1	6,000	88	
3	Food	Lunch and refreshments	250	36	2	1	18,000	265
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	500	36	1	1	18,000	265
		Accommodation	200	36	3	1	21,600	318
		Training allowance	600	36	2	1	43,200	635
5	Logistics	Training team logistics						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	36	1	1	10,800	159
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	6,000	1	1	1	6,000	88
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	2	1	4,000	59
		Dhaka-based logistics						
		Reporting and documentation	Lump sum				6,000	88
		Stationery	800	1	1	1	800	12
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						166,400	2,447	
Total training costs for 1,524 trainings						253,593,600	3,675,270	

Table A3.7. Training of Senior FWVs, AHIs, SACMOs, HAs, and FWAs

Type of participants:		Senior FWVs, AHIs, SACMOs, HAs, and FWAs						
Number of participants:		45 (for all unions of an Upazila)						
Trainers:		Upazila-level UNC, AUNC, gynecologists, and pediatricians						
Coverage of one course:		One Upazila	Venue:		Upazila Health Complex			
Duration:		2 days						
Number of this course to be required to cover the entire country: 508								
Objectives		Orientation on nutrition issues						
Issues of training		Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, MIS of nutrition, nutrition care of newborn and coordination of the program, and school curricula						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue	3,000		2	1	6,000	88	
3	Food	Lunch and refreshments	250	45	2	1	22,500	331
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	200	45	1	1	9,000	132
		Accommodation	300	45	2	1	27,000	397
		Training allowance	2,000	1	4	1	8,000	118
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	45	1	1	13,500	199
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	5,400	1	1	1	5,400	79
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
		Stationery	800	1	1	1	800	12
		6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1
Total					126,200	1,856		
Total training costs for 508 trainings						64,109,600	929,125	

Table A3.8. Training of Statisticians of DHs

Type of participants:		Statisticians of DHs						
Number of participants:		64						
Trainers:		Central training of trainers						
Coverage of one course:		Full	Venue:		IPHN			
Duration:		2 days						
Number of this course to be required to cover the entire country: 1								
Objectives		Orientation on nutrition issues						
Issues of training		MIS of nutrition, child feeding, postpartum vitamin A capsule supplementation, and nutrition care of newborn						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons’ Allowance	1,250	4	2	1	10,000	147
2	Venue	3,000		2	1	6,000	88	
3	Food	Lunch and refreshments	300	64	2	1	38,400	565
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	2,500	64	1	1	160,000	2,353
		Accommodation	500	64	3	1	96,000	1,412
		Training allowance	600	64	2	1	76,800	1,129
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	64	1	1	19,200	282
		Photography	1,500	1	1	1	1,500	74
		Workshop aids, flipchart, VIPPCard, etc.	5,000	1	1	1	5,000	74
		Photo copies/printing	3,000	1	1	1	3,000	44
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						444,200	6,532	

Table A3.9. Training of Statisticians of UHC and CHSP of CCs

Type of participants:		Statisticians and CHSP						
Number of participants:		37 (for all unions in an Upazila)						
Trainers:		District-level statistician						
Coverage of one course:		One Upazila	Venue:		Upazila Health Complex			
Duration:		2 days						
Number of this course to be required to cover the entire country: 508								
Objectives		Orientation on nutrition issues						
Issues of training		MIS of nutrition, child feeding, postpartum vitamin A capsule supplementation, and nutrition care of newborn						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue		3,000		2	1	6,000	88
3	Food	Lunch and refreshments	300	37	2	1	22,200	326
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	2,500	37	1	1	92,500	1,360
		Accommodation	500	37	3	1	55,500	816
		Training allowance	600	37	2	1	44,400	653
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	37	1	1	11,100	163
		Photography	1,000	1	1	1	1,000	15
		Workshop aids, flipchart, VIPPCard, etc.	4,500	1	1	1	4,500	66
		Photo copies/printing	2,000	1	1	1	2,000	29
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						277,500	4,081	
Total training costs for 508 trainings						140,970,000	2,043,043	

Table A3.10. Training of CSBAs/Dais

Type of participants:		CSBAs and Dais						
Number of participants:		20 (for all wards in a union)						
Trainers:		Upazila-level UNC, AUNC, gynecologists, and pediatricians						
Coverage of one course:		One union	Venue:		UHFWC			
Duration:		2 days						
Number of this course to be required to cover the entire country: 4,072								
Objectives		Orientation on nutrition issues						
Issues of training		EBF, early initiation of breastfeeding, positioning and attachment, postpartum vitamin A capsule supplementation, nutrition care of newborn, reporting births, and record birth weights at delivery						
Type of resources created:		Human Capital	Approach to costing:					
Type of expenditure:		Capital	Type of cost: Quasi-variable					
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	2,000	1	4	1	8,000	118
		Resource Persons' Allowance	1,250	4	2	1	10,000	147
2	Venue	3,000		2	1	6,000	88	
3	Food	Lunch and refreshments	250	20	2	1	10,000	147
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	200	20	1	1	4,000	59
		Accommodation	300	20	2	1	12,000	176
		Training allowance	2,000	1	4	1	8,000	118
5	Logistics	<i>Training team logistics</i>						
		Multimedia	3,000	1	2	1	6,000	88
		Banners	2,000	1	1	1	2,000	29
		Bags	300	20	1	1	6,000	88
		Photography	1,000	1	1	1	1,000	15
		Workshop aids, flipchart, VIPPCard, etc.	4,500	1	1	1	4,500	66
		Photo copies/printing	2,000	1	1	1	2,000	29
		Computer/laptop	2,000	1	2	1	4,000	59
		<i>Dhaka-based logistics</i>						
		Reporting and documentation	Lump sum				6,000	88
	Stationery	500	1	1	1	500	7	
6	Communication	Team communication cost (pre-training and during training)	1,000	1	1	1	1,000	15
Total						83,000	1,221	
Total training costs for 4,072 trainings						337,976,000	4,898,203	

Table A3.11. Training of CNVs

Type of participants:		CNVs						
Number of participants:		24 (for 1 union of an upazila)						
Trainers:		UNCs, AUNCs, and Senior FWVs						
Coverage of one course:		One union	Venue:	UHFWC				
Duration:		30 days						
Number of this course to be required to cover the entire country: 4,072								
Objectives		To increase capacity for delivering services at the household level						
Issues of training		Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, and nutrition care of newborn						
Type of resources created:		Human Capital	Approach to costing: Bottom-up					
Type of expenditure:		Capital	Type of cost: Variable					
Estimates of costs of training								
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$	
1	Staff cost	Training Coordinator	1,000	1	32	1	32,000	471
		Resource Persons' Allowance	400	4	30	1	48,000	706
2	Venue	500		30	1	15,000	221	
3	Food	Lunch and refreshments	150	24	30	1	108,000	1,588
4	Travel, transportation, and per diem	Transportation cost of participants - Two way	100	24	30	1	72,000	1,059
		Accommodation	100	24	30	1	72,000	1,059
		Training allowance	1,000	1	32	1	32,000	471
5	Logistics	Training team logistics						
		Multimedia	3,000	1	30	1	90,000	1,324
		Banners	2,000	1	1	1	2,000	29
		Bags/Folders	200	24	1	1	4,800	71
		Photography	1,500	1	1	1	1,500	22
		Workshop aids, flipchart, VIPPCard, etc.	3,600	1	1	1	3,600	53
		Photo copies/printing	2,000	1	1	1	2,000	29
		Computer/laptop	1,000	1	30	1	30,000	441
		Dhaka-based logistics						
		Reporting and documentation	Lump sum				3,000	44
	Stationery	500	1	1	1	500	7	
6	Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						485,900	7,146	
Total training costs for 4,072 trainings						1,978,584,800	28,675,142	

Table A3.12. Refresher Training of CNWs

Type of participants:		CNWs					
Number of participants:		24 (for 1 union of an upazila)					
Trainers:		UNCs, AUNCs, and Senior FWVs					
Coverage of one course:		One union	Venue:		UHFWC		
Duration:		1 week					
Number of this course to be required to cover the entire country: 4,072							
Objectives		To increase capacity for delivering services at the household level					
Issues of training		Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, and nutrition care of newborn					
Type of resources created:		Human Capital	Approach to costing: Bottom-up				
Type of expenditure:		Capital	Type of cost: Variable				
Estimates of costs of training							
Budget Items		Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1 Staff cost	Training Coordinator	1,000	1	7	1	7,000	103
	Resource Persons' Allowance	400	4	5	1	8,000	118
2 Venue		500		5	1	2,500	37
3 Food	Lunch and refreshments	150	24	5	1	18,000	265
4 Travel, transportation, and per diem	Transportation cost of participants - Two way	100	24	5	1	12,000	176
	Accommodation	100	24	5	1	12,000	176
	Training allowance	1,000	1	7	1	7,000	103
5 Logistics	<i>Training team logistics</i>						
	Multimedia	3,000	1	5	1	15,000	221
	Banners	2,000	1	1	1	2,000	29
	Bags/Folders	200	24	1	1	4,800	71
	Photography	1,500	1	1	1	1,500	22
	Workshop aids, flipchart, VIPPCard, etc.	3,600	1	1	1	3,600	53
	Photo copies/printing	2,000	1	1	1	2,000	29
	Computer/laptop	1,000	1	5	1	5,000	74
	<i>Dhaka-based logistics</i>						
	Reporting and documentation	Lump sum				3,000	44
	Stationery	500	1	1	1	500	7
6 Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						98,400	1,447
Total training costs for 4,072 trainings						400,684,800	5,807,026

Table A3.13. Refresher Training of FWA, HA, and CHW

Type of participants:	FWA, HA, and CHW						
Number of participants:	36 (for 3 union of an Upazila)						
Trainers:	UNOs, AUNOs, and Senior FWVs						
Coverage of one course:	One-third of an Upazila	Venue:	UHC				
Duration:	1 day						
Number of this course to be required to cover the entire country: 1,524							
Objectives	To increase capacity for delivering services at the household level						
Issues of training	Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, and nutrition care of newborn						
Type of resources created:	Human Capital	Approach to costing: Bottom-up					
Type of expenditure:	Capital	Type of cost: Variable					
Estimates of costs of training							
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1 Staff cost	Training Coordinator	2,000	1	3	1	6,000	88
	Resource Persons’ Allowance	1,250	4	1	1	5,000	74
2 Venue		3,000		1	1	3,000	44
3 Food	Lunch and refreshments	250	36	1	1	9,000	132
4 Travel, transportation, and per diem	Transportation cost of participants - Two way	200	36	1	1	7,200	106
	Accommodation	300	36	1	1	10,800	159
	Training allowance	2,000	1	3	1	6,000	88
5 Logistics	Training team logistics						
	Multimedia	3,000	1	1	1	3,000	44
	Banners	2,000	1	1	1	2,000	29
	Bags	300	36	1	1	10,800	159
	Photography	1,500	1	1	1	1,500	22
	Workshop aids, flipchart, VIPPCard, etc.	5,400	1	1	1	5,400	79
	Photo copies/printing	3,000	1	1	1	3,000	44
	Computer/laptop	2,000	1	1	1	2,000	29
	Dhaka-based logistics						
	Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12
6 Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						77,000	1,132
Total training costs for 1,524 trainings						117,348,000	1,700,696

Table A3.14. Refresher Training of District Nutrition Officer, Upazila Nutrition Officer, and Assistant Upazila Nutrition Officer

Type of participants:	District Nutrition Officer, Upazila Nutrition Officer, and Assistant Upazila Nutrition officer						
Number of participants:	17 (for 1 district)						
Trainers:	Gynecologist and pediatricians						
Coverage of one course:	One district	Venue:	DH				
Duration:	1 day						
Number of this course to be required to cover the entire country: 64							
Objectives	To increase capacity for delivering services at the household level						
Issues of training	Nutrition of pregnant and lactating mothers, breastfeeding, child feeding, anemia control in positive direction, postpartum vitamin A capsule supplementation, and nutrition care of newborn						
Type of resources created:	Human Capital	Approach to costing: Bottom-up					
Type of expenditure:	Capital	Type of cost: Variable					
Estimates of costs of training							
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1 Staff cost	Training Coordinator	2,000	1	3	1	6,000	88
	Resource Persons' Allowance	1,250	4	1	1	5,000	74
2 Venue		3,000		1	1	3,000	44
3 Food	Lunch and refreshments	250	17	1	1	4,250	63
4 Travel, transportation, and per diem	Transportation cost of participants - Two way	200	17	1	1	3,400	50
	Accommodation	300	17	1	1	5,100	75
	Training allowance	2,000	1	3	1	6,000	88
5 Logistics	Training team logistics						
	Multimedia	3,000	1	1	1	3,000	44
	Banners	2,000	1	1	1	2,000	29
	Bags	300	17	1	1	5,100	75
	Photography	1,500	1	1	1	1,500	22
	Workshop aids, flipchart, VIPPCard, etc.	5,400	1	1	1	5,400	79
	Photo copies/printing	3,000	1	1	1	3,000	44
	Computer/laptop	2,000	1	1	1	2,000	29
	Dhaka-based logistics						
	Reporting and documentation	Lump sum				6,000	88
	Stationery	800	1	1	1	800	12
6 Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						57,050	839
Total training costs for 64 trainings						3,651,200	52,916

Table A3.15. Training of High School Teachers for the Program

Type of participants:		Health science teachers of high school					
Number of participants:		27 participants (1 from each school)					
Trainers:		District ADs and UNC					
Coverage of one course:		25% of one upazila	Venue :	UHC			
Duration:		3 days					
Number of this course to be required to cover the entire country: 508							
Objectives		To enhance capacity of school teachers to teach nutrition issues in class VI-X					
Issues of training		Nutrition issues described in the curricula					
Type of resources created:		Human Capital	Approach to costing:				
Type of expenditure:		Capital	Type of cost:				
Estimates of costs of training							
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1 Staff cost	Training Coordinator	1,000	1	3	1	3,000	44
	Resource Persons' Allowance	600	4	3	1	7,200	106
2 Venue		1,000		3	1	3,000	44
3 Food	Lunch and refreshments	200	27	3	1	16,200	238
4 Travel, transportation, and per diem	Transportation cost of participants - Two way	100	27	1	1	2,700	40
	Training allowance	200	27	3	1	16,200	238
5 Logistics	Training team logistics						
	Multimedia	3,000	1	3	1	9,000	132
	Banners	2,000	1	1	1	2,000	29
	Bags/Folders	150	27	1	1	4,050	60
	Photography	1,500	1	1	1	1,500	22
	Workshop aids, flipchart, VIPPCard, etc.	4,050	1	1	1	4,050	60
	Photo copies/printing	2,000	1	1	1	2,000	29
	Computer/laptop	1,000	1	3	1	3,000	44
	Dhaka-based logistics						
	Reporting and documentation	Lump sum				3,000	44
	Stationery	500	1	1	1	500	7
6 Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
Total						78,900	1,160
Total training costs for 508 trainings						40,081,200	580,887

Table A3.16. Training of Primary School Teachers for the Program

Type of participants:	Health science teachers of primary school						
Number of participants:	18 participants (1 from each school))						
Trainers:	District UNC and AUNC						
Coverage of one course:	One union	Venue:	UHFWC				
Duration:	1 day						
Number of this course to be required to cover the entire country: 9 x 508 = 4,572							
Objectives	To enhance capacity of school teachers to teach nutrition issues in Class IV–V						
Issues of training	Nutrition issues described in the curricula						
Type of resources created:	Human Capital	Approach to costing:					
Type of expenditure:	Capital	Type of cost:					
Estimates of costs of training							
	Budget Items	Rate	Person	Day	# of Training	Amount in BDT	Amount in US\$
1 Staff cost	Training Coordinator	1,000	1	1	1	1,000	15
	Resource Persons' Allowance	600	2	1	1	1,200	18
2 Venue		1,000		1	1	1,000	15
3 Food	Lunch and refreshments	200	18	1	1	3,600	53
4 Travel, transportation, and per diem	Transportation cost of participants - Two way	100	18	1	1	1,800	26
	Training allowance	200	18	1	1	3,600	53
5 Logistics	Training team logistics						
	Multimedia	3,000	1	1	1	3,000	44
	Banners	2,000	1	1	1	2,000	29
	Bags/Folders	150	18	1	1	2,700	40
	Photography	1,500	1	1	1	1,500	22
	Workshop aids, flipchart, VIPPCard, etc.	4,050	1	1	1	4,050	60
	Photo copies/printing	2,000	1	1	1	2,000	29
	Computer/laptop	1,000	1	1	1	1,000	15
	Dhaka-based logistics						
	Reporting and documentation	Lump sum				3,000	44
	Stationery	500	1	1	1	500	7
6 Communication	Team communication cost (pre-training and during training)	1,500	1	1	1	1,500	22
	Total					33,450	492
Total training costs for 4,572 trainings						152,933,400	2,216,426

Table A4. Micronutrient Supplementation for Children and Mothers

Items	Recommended Daily Allowance (RDA)/ Adequate Intake (AI)	Amount/quantity of 1 dose	Number of doses for 1 child/ mother	Price of 1 dose	Cost for 1 child/ mother	Target group	Target year	Number of target population	Cost per year
Micronutrient supplementation supply of iron folic acid (mother)	Folic acid	400 µg (folic acid)	1 tablet/day	Aristofeofol/	Tk. 59.4 during pregnancy	Pregnant women	2011	3200686.476	380241553.4
	Pregnancy: 600 µg	60 mg iron	(At least 180 tablets during pregnancy)	Beximco		Lactating women	2012	3251158.577	386237639
	Lactation: 500 µg		1 tablet/day during 6 months postpartum	(Tk 0.33/tablet) 1 tablet contains 100 mg iron and 350 µg folic acid	Tk 59.4 during lactation		2013 2014	3302374.617 3354081.163	392322104.5 398464842.1
	Iron:				Total: Tk. 118.8 total		2015	3406304.347	404668956.4
	Pregnancy: 27 mg						2016	3459280.8	410962559
	Lactation: 9 mg						2017 2018 2019 2020 2021	3511984.907 3565582.424 3619908.005 3674083.588 3727757.624	417223806.9 423591191.9 430045071 436481130.2 442857605.8
Supply of iron folic acid (non-pregnant adolescent)	Iron: Adolescent girls	400 µg (folic acid) 60 mg iron	4 tablets per month/once a week	Aristofeofol/ Beximco (Tk 0.33/tablet) 1 tablet contains 100 mg iron and 350 µg folic acid	Tk. 10 per person per year	Non-pregnant adolescent girls	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	16783076.3 17047731.13 17316286.86 17587414.6 17861251.39 18139038 18415396.54 18696439.75 18981300.64 19265374.99 19565914.84	167830763 170477311.3 173162868.6 175874146 178612513.9 181390380 184153965.4 186964397.5 189813006.4 192653749.9 195659148.4
	14.8 mg								
Supply of vitamin A	Pregnancy: 770 µg	60,000 µg	60,000 µg	Tk. 1.66 for 200,000 IU	Tk 1.66/mother	Lactating women	2011	3200686.476	5313139.55
	Lactation: 1300 µg	(200,000 IU)	(200,000 IU) postpartum				2012	3251158.577	5396923.238
							2013	3302374.617	5481941.864
							2014	3354081.163	5567774.73
							2015	3406304.347	5654465.216
							2016	3459280.8	5742406.128

Items	Recommended Daily Allowance (RDA)/ Adequate Intake (AI)	Amount/quantity of 1 dose	Number of doses for 1 child/ mother	Price of 1 dose	Cost for 1 child/ mother	Target group	Target year	Number of target population	Cost per year
							2017	3511984.907	5829894.945
							2018	3565582.424	5918866.823
							2019	3619908.005	6009047.289
							2020	3674083.588	6098978.756
							2021	3727757.624	6188077.656
Supply of vitamin A (children)	Newborn:	30,000 µg (100,000 IU)	30,000 µg (100,000 IU) every 6 months starting at 12 months; 9 doses total	Tk. 1.66 for 100,000 IU	Tk 1.66/capsule	Children 1–5 years	2011	14843026.72	49278848.72
							2012	15077088.62	50055934.21
	7–11 months: 500 µg				3.32/children		2013	15314600.49	50844473.64
	12–36 months: 400 µg						2014	15554387.07	51640565.06
	37–72 months: 500 µg						2015	15796569.52	52444610.82
							2016	16042245.23	53260254.16
							2017	16286657.94	54071704.37
							2018	16535213.8	54896909.82
							2019	16787146.03	55733324.8
							2020	17038382.63	56567430.35
							2021	17304181.4	57449882.26
Supply of multiple micro-nutrient, e.g., Sprinkles 5 (folic acid, vitamin A, iron, vitamin C, zinc) (children)		1 sachet containing vitamin A 300 µg, vitamin C 30mg, folic acid 160 µg, iron 12.5 mg, zinc 5 mg	1 sachet/day (365 days a year)	Tk. 2.00	Tk. 730 per child/year	Children 1–5 years	2011	12677224	9254373520
							2012	12817173	9356536290
							2013	12955567	9457563910
							2014	13084012	9551328760
							2015	13218038	9649167740
							2016	13368473	9758985290
							2017	13472889	9835208970
							2018	13640402	9957493460
							2019	13769874	10052008020
							2020	13889344	10139221120
							2021	14013066	10229538180
Supply of baby zinc	For children suffering from diarrhea	20 mg/tablet	10 tablets for each episode of diarrhea	Tk. 1.5	2.55 diarrheal episode/child/year	Children 0–5 years	2011	15923732	609082749
					Tk. 38.25/child		2012	16091026	615481744.5
							2013	16257980	621867735
							2014	16428034	628372300.5
							2015	16593223	634690779.8
							2016	16775617	641667350.3

Items	Recommended Daily Allowance (RDA)/ Adequate Intake (AI)	Amount/quantity of 1 dose	Number of doses for 1 child/ mother	Price of 1 dose	Cost for 1 child/ mother	Target group	Target year	Number of target population	Cost per year
							2017	16926232	647428374
							2018	17088775	653645643.8
							2019	17272317	660666125.3
							2020	17444922	667268266.5
							2021	17588601	672763988.3

Table A5. Food Fortification, SAM, and Deworming

Food fortification	RDA/AI	Amount/quantity of 1 dose	Number of doses for 1 person	Price of 1 dose	Cost for 1 person	Target population	Year	No. of Target population	Total cost
Supply of iodized salt	Child: 50-110 µg Adult: 130-150 µg	90 µg/g of iodized salt	2 g/day/person	Tk 0.12/kg salt	Tk. 0.09/person/year	All	2011	151627842	13646505.78
							2012	154018884	13861699.56
							2013	156445169	14080065.21
							2014	158894691	14300522.19
							2015	161368688	14523181.92
							2016	163878370	14749053.3
							2017	166375150	14973763.5
							2018	168914254	15202282.86
							2019	171487849	15433906.41
							2020	174054338	15664890.42
							2021	176597067	15893736.03
Fortification of flour with iron, thiamine, riboflavin, niacin, folic acid, iron, zinc, vitamin A		138 g/person/day	50 kg/person/year	Tk. 0.35/kg	Tk. 17.5/person/year	All	2011	151627842	2653487235
							2012	154018884	2695330470
							2013	156445169	2737790458
							2014	158894691	2780657093
							2015	161368688	2823952040
							2016	163878370	2867871475
							2017	166375150	2911565125
							2018	168914254	2955999445
							2019	171487849	3001037358
							2020	174054338	3045950915
							2021	176597067	3090448673
Fortification of edible oil (vitamin A)		15 mL/person/day	5.475 L/person/year	Tk. 0.22/L	Tk. 1.20/person/year	All	2011	151627842	181953410.4
							2012	154018884	184822660.8
							2013	156445169	187734202.8
							2014	158894691	190673629.2
							2015	161368688	193642425.6
							2016	163878370	196654044
							2017	166375150	199650180
							2018	168914254	202697104.8
							2019	171487849	205785418.8
							2020	174054338	208865205.6
							2021	176597067	211916480.4

Food fortification	RDA/AI	Amount/quantity of 1 dose	Number of doses for 1 person	Price of 1 dose	Cost for 1 person	Target population	Year	No. of Target population	Total cost
Other nutrition activities supply of deworming tablets for children 2–5 years of age		1 tablet/ children/year (400 mg Albendazole)	2 doses/year	Tk. 1.00	Tk. 2.00	Children 2–5-years of age	2011	12777595	25555190
							2012	12905989	25811978
							2013	13044231	26088462
							2014	13184339	26368678
							2015	13306581	26613162
							2016	13456249	26912498
							2017	13573648	27147296
							2018	13689038	27378076
							2019	13875825	27751650
							2020	13993614	27987228
							2021	14084205	28168410
Providing curative care to severely malnourished children (facility based)					Tk. 11130/child	Children 1–5 years of age	2011	461788.228	5139702978
							2012	408712.0604	4548965232
							2013	354423.964	3944738719
							2014	298990.2188	3327761135
							2015	240601.7335	2677897294
							2016	211372.7742	2352578977
							2017	181110.6824	2015761895
							2018	150381.22	1673742979
							2019	119178.9873	1326462129
							2020	78502.149	873728918.4
							2021	51006.9429	567707274.5

Source: IPHN, ICDDR,B, BIHS, NIPORT, Micronutrient Initiative, and government circular

Annex B. List of Participants at Stakeholder Meetings

Launch Meeting:
“Investing in Nutrition: Smart Power for Development in Bangladesh”
Venue: Windy Town, Bangabandhu International Conference Center
Date: October 19–20, 2010

Not listed according to seniority

	Name and Title
1.	Khadijat Mojidi, Team Leader OPHN&E, USAID
2.	Prof. Shah Monir Hossain, Director General, Directorate of Health Services (DGHS), Ministry of Health and Family Welfare (MOHFW)
3.	Ms. Dilruba Akhter, Director General, Directorate of Family Planning (DGFP), MOHFW
4.	Professor Abul Kalam Azad, Director, MIS, DGHS, MOHFW
5.	Prof. Dr. Fatima Parveen Chowdhury, Director, IPHN, DGHS, MOHFW
6.	Dr. S.A.J. Md. Musa, Assistant Director (Coordinator), DGHS, MOHFW
7.	Mr. Mainuddin Khandaker, Executive Director, National Nutrition Program (NNP), MOHFW
8.	Md. Helal Uddin, Deputy Chief, Planning Wing, MOHFW
9.	Dr. A M Zakir Hussain, Team Leader, PPT, MOHFW
10.	Mr. Md. Eshaque Ali, Secretary, Bangladesh National Nutrition Council (BNNC), MOHFW
11.	Dr. Mustafizur Rahman, Member, Member, Program Preparation Cell (PPC), MOHFW
12.	Dr. Md. Saikhul Islam Helal, Member (DGHS Representative), Program Preparation Cell, Planning Wing, MOHFW
13.	Dr. Sara Khanam, Assistant Director (IPHN), DFHS, MOHFW
14.	Mrs. Hosne Ara Begum, Director, Planning and Development, DGFP, MOHFW
15.	Dr. Sarah Banu, Deputy Chief (HIU) MIS, DGHS, MOHFW
16.	Mr. Md. Abul Hasim, Deputy Director (BCC), NNP, MOHFW
17.	Mr. Kamallesh Chandra Roy, Deputy Director (Finance and Account), NNP, MOHFW
18.	Ms. Sabrina Sharmin Jaman, Deputy Director (Field Service), NNP, MOHFW
19.	Dr. Jahiruddin Ahmed, Director General (In-charge), FPAB
20.	Dr. Jafar Ahmed Hakim, Former Director (MCH Services) & Line Director (MC&RH), Directorate General of Family Planning, MOHFW
21.	Dr. Taherul Islam Khan, Deputy Director (Admin.), National Nutrition Program (NNP), MOHFW
22.	Dr. Mohammad Abdul Mannan, National Food Utilization and Nutrition Advisor, National Food Policy Capacity Strengthening Programme Food Planning and Monitoring Unit, Ministry of Food and Disaster Management
23.	Mr. Abdul Kuddus. Deputy Director, Field Service Wing, Ministry of Food and Disaster Management
24.	Mr. Mukul Chandra Roy, Additional Director (Monitoring), Field Service Wing, Ministry of Food and Disaster Management
25.	Mr. Shohrab Hossain, Senior Research Officer, BBS
26.	Mr. Shahabuddin Sarker, Statistical Officer, Household Income and Expenditure Survey, BBS
27.	Dr. Ashek Ahmed, Clinical QA Services Specialist, SSFP
28.	Dr. Hans J Ebbing, Health and Nutrition Coordinator, ACF

	Name and Title
29.	Ms. Sheela Sinha Roy, Technical Specialist, HKI
30.	Ms. Britta Schumacher, Head of Program, World Food Programme (WFP)
31.	Dr. Lolita Bhattacharjee, Nutritionist, FAO
32.	Dr. MD. Shamim Hayder Talukder, Chief Executive Officer, Eminence
33.	Dr. Malay K Mridha, Research Associate, ICDDR,B
34.	Ms. Jillion L Waid, Research Fellow, HKI
35.	Dr. K M Jahan, Research Fellow, World Fish Center, Bangladesh
36.	Ms Shakuntala Thilsted, Senior Nutrition Adviser, World Fish Center, Bangladesh
37.	Dr. Mohammad Hussain Choudhury, General Manager (Services), Marie Stopes Clinic Society
38.	Dr. Ahmed Al Sabir, Consultant, Macro and North Carolina University
39.	Ms. Sushmita Hossain Khan, Senior Associate Coordinator, Eminence
40.	Dr. Kuntal Saha, Country Coordinator M&E, Alive & Thrive
41.	Dr. Khurshid Talukder, Pediatrician and Research Coordination, Center for Women and Child Health (CWCH)
42.	Dr. Jena Derakhshani Hamadani, Head, Child Development Unit, Scientist, Clinical Sciences Division, ICDDR,B
43.	Ms. Tina Sanghvi, Country Director, Alive and Thrive
44.	Mr. Kabir Ahmed, Fellow, R&P
45.	Dr. Rezaul Hasan, Program Officer, EngenderHealth
46.	Dr. Wahida Hasin, Co-ordinator, VCT Center, UPHCP-II
47.	Mr. Mohammad Shahjahan, CEO, Bangladesh Center for Communication Program (BCCP)
48.	Dr. Shabnam Shahnaz, Country Director, Pathfinder International
49.	Dr. Nazim Ahmed, Regional Director HIV Program, Save the Children, USA
50.	Dr. Zubayer Hossain, Country Director, MSH/SPS, H-28, R-63, Gulshan-2, Dhaka
51.	Ms. Diane Lindsey, Country Director, HKI Bangladesh
52.	Ms. Taniya Najmun Nahar, MIS Officer, Shimantik UPHCP-II
53.	Mr. Rezaul Karim, Advisor, BRAC
54.	Prof. Dr. Shushil Howlader, Dept of Health Economics, Dhaka University
55.	Mr. Real Admiral (Rtd.) Harunur Rashid Khan, Director, Special Initiative Unit, Research Training Management International (RTMI)
56.	Dr. S. M. Mohiuddin Kamal, Executive Director, Radda MCH-FP Centre
57.	Mr. Ram Chandra Das, Advisor, RTMI
58.	Md. Wazed Ali, Executive Director, Shimantik
59.	Dr. A Z M Zahidur Rahman, Head Disease Prevention-SMC
60.	Mr. Shamima Akhter, Executive Director, ASKIO Foundation
61.	Dr. Md Raisul Haque PhD, Senior Sector Specialist Health, BRAC Health Program, BRAC
62.	Dr. Ubaidur Rob, Country Director, Population Council
63.	Dr. Sayeeda Akter Begum, Program Officer, EngenderHealth
64.	Dr. Jena Derakhshani Hamadani, Head, Child Development Unit, Scientist, Clinical Sciences Division, ICDDR,B

	Name and Title
65.	Ms. Zahur Fatima, Executive Director, CWFD
66.	Dr. Farhana Ahmed, National Coordinator, White Ribbon Alliance for Safe Motherhood, Bangladesh
67.	Dr. Istiaq Mannan, Chief of Party (MCHP), MaMoni – Integrated Safe Motherhood, Newborn Care, FP Project, Save the Children, USA
68.	Ms. Taskeen Chowdhury, Senior Sector Specialist, BRAC
69.	Dr. Humaira Begum, Program Officer, RTMI
70.	Dr. Mustafiza Rushdi, Program Specialist, RTMI
71.	Ms. Rae Galloway, Nutrition Advisor, PATH
72.	Dr. Israt Nayer, Health Specialist, Plan Bangladesh
73.	Dr. Fatema Zannat, Country Director, University Research Co., LLC (URC)
74.	Md. Nazmul Huq, Assistant Professor, Dept. of Statistics, Jahangir Nagar University
75.	Ms. S. N. Shampa, Nutritionist, Shamorita Hospital, Dhaka
76.	Ms. Anwara Begum, Deputy Director (Training), NNP, MOHFW
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88.	Dr. S. K Roy, Chairman, Breastfeeding Foundation
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Second National Nutrition PROFILES Stakeholder Meeting:
“Investing in Nutrition: Smart Power for Development in Bangladesh”
Date: January 26, 2011
Venue: MIS Conference Room, DGHS, Mohakhali, Dhaka

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Third National Nutrition PROFILES Stakeholder Meeting:
“Investing in Nutrition: Smart Power for Development in Bangladesh”
Venue: MOHFW Conference Room, Building 3
Date: 2–4 May 2011

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Annex C. Theory of Behavior of Cost and Criteria of Efficaciousness of the Estimated Program Costs

It is pertinent to analyze whether and to what extent the estimated costs of the nutrition program are efficacious. The main criteria of efficaciousness are:

- Economic efficiency of resource use
- Expediency or feasibility of the program
- Financing

The efficacy of the estimated costs will be judged using these criteria. However, since economic efficiency is the most important criterion for analyzing the behaviors of costs, special emphasis will be attached to this criterion. An analysis of the behaviors and trends of the estimated costs is necessary to examine the efficaciousness using these criteria. The behavior of the estimated costs is analyzed using the standard concepts and theory about the cost function. It will, therefore, be appropriate to discuss first the relevant concepts and theory of costs and then analyze the behaviors of the estimated costs.

Cost refers to the value of the optimum amount of inputs used for producing an output. Defined thus, economic efficiency remains inbuilt in the cost. Economic efficiency as a concept is related to the value of money obtained from the use of resources. Highest efficiency is achieved at the level where highest value of money is ensured, i.e., where a particular amount of resources produces maximum possible output or a particular amount of output is produced at the minimum level of cost. Cost is to be estimated only for the output levels that yield the highest economic efficiency. Thus, cost greatly differs from expenditure, since expenditure denotes any amount of money spent, regardless of whether the money produces maximum output (or whether it produces any output at all) or not.

The cost function is derived in the theory of production in economics. In the theory, a producer is assumed to have a production function (or iso-quant) such that along each point of the function technical efficiency is highest—each input-mix produces maximum possible output. The producer has also a linear budget line (or iso-cost line) determined by the input prices and the desired amount of investment, which shows that the total amount of input expenditure is the same at all of its points. Given the production function and the iso-cost line, a producer's equilibrium is achieved at the point where the iso-cost line is tangent to the production function. The necessary condition to be fulfilled for obtaining this equilibrium is that the ratio of marginal productivities is equal to the ratio of input prices, and the condition is fulfilled if:

- Each input will produce maximum output
- The input-mix will be most appropriate
- Inputs will be purchased at minimum possible prices (or in competitive markets)

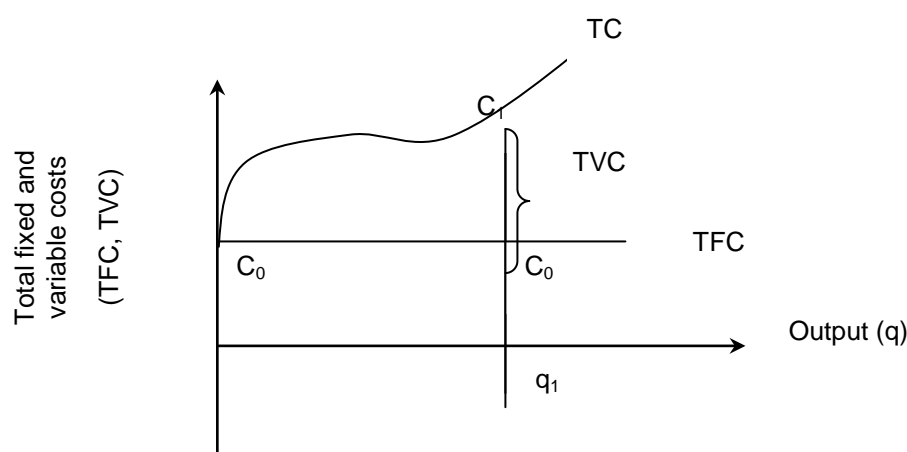
The cost function is derived from the comparative statics of production equilibrium. If the iso-cost line shifts upward (i.e., producer-desired expenditure for production increases), equilibrium points also move upward. The curve that joins the equilibrium is called the expansion path. The total cost curve is derived from the expansion path. Since the production equilibriums show the highest production efficiency at various levels of production expenditure, the points along the expansion path also show the highest level of production efficiency. Hence, the total cost curve also shows the costs at the highest levels of production efficiency.

Economic efficiency (also called production efficiency) is a higher level of efficiency than technical efficiency (and allocative efficiency is a still higher level of efficiency than economic efficiency). Economic efficiency is related to the cost function or the behavior of cost.

Total cost has two components: total fixed cost and total variable cost. In a production process, two types of inputs are used: fixed inputs and variable inputs. The inputs whose amounts remain fixed at all levels of output are the fixed inputs, while the inputs whose amounts vary as the volume of output changes are the variable inputs. Land, building, furniture, durable equipments, salary of managers, etc. are examples of fixed cost, and drugs, contraceptives, micronutrients, etc. are variable costs. Sometimes another type of input is used as well, which can be called quasi-fixed (or quasi-variable) inputs. The amount of this type of inputs changes at certain interval of outputs: It remains constant for some amount of output, but changes if the quantity exceeds that amount. Chairs in the reception room of the facility, vials of child immunization vaccine, field-level health workers, etc. fall into this type. The shapes of the different cost functions are illustrated below.

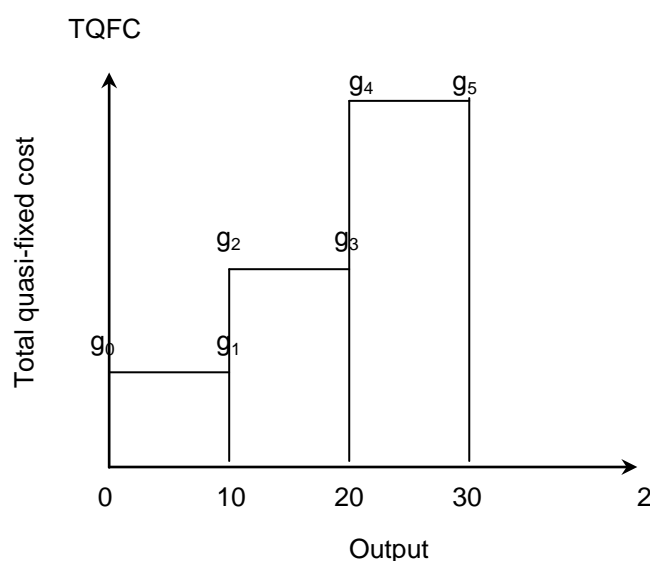
Figure C1 shows that the total fixed cost curve is horizontal (c_0c_0)—the total fixed cost remains at c_0c_0 for all levels of output (q). The total cost curve (TC) is the vertical sum of the fixed and variable costs. Total variable cost usually increases at a decreasing rate for some q in the early phase of production and then increases at an increasing rate as q increases. The total variable cost curve takes a cubic shape. As a result, the total cost curve also takes that shape. For output q_1 , q_1c_0 is the amount of total fixed cost, c_0c_1 is the total variable cost, and q_1c_1 ($q_1c_0 + c_0c_1$) is the total cost.

Figure C1. Total Fixed Cost and Total Variable Cost Functions



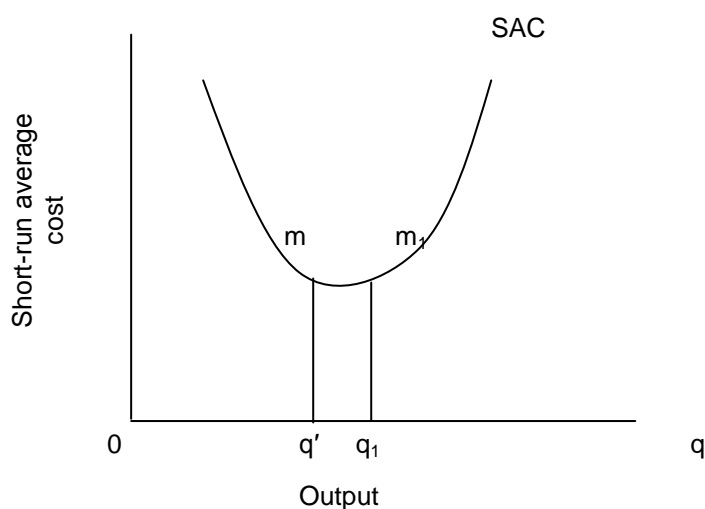
The quasi-fixed cost is shown in **Figure C2**. For 10 units of output, the amount of cost is fixed at g_0 (or $0g_0$) along the g_0g_1 line. As output increases to 11 and more, quasi-fixed cost increases to g_2 and remains there till 20 units of output are produced.

Figure C2. Total Quasi-Fixed or Quasi-Variable Cost Function



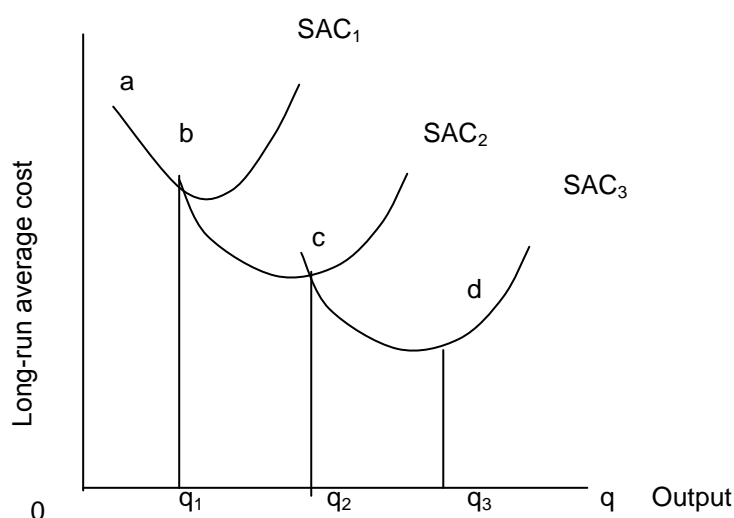
The average cost curve can be derived from the total cost curve. The average cost curve in the short run will be U-shaped, as in **Figure C3**. The shape of the short-run average cost curve is a result of the fact that the total cost function is cubic.

Figure C3. Short-Run Average Cost Curve



Economics of scale operates in production in the long run, so that the long-run average cost curve is the envelope of the short-run curves. In **Figure C4**, $abcd$ is the envelope of the short-run cost curves and hence it is the long-run average cost curve. In the long run, the average cost curve can be horizontal (constant cost), downward-sloping (decreasing cost), or even U-shaped.

Figure C4. Long-Run Average Cost Curve



Economic efficiency is directly related to the location of cost along the average cost curve (or curves). Economic efficiency of a production process is highest if output is produced at the lowest level of short-run average cost (m_1 in **Figure C3**). Even when the producer cannot achieve the optimum capacity level a (such as $0q_1$), economic efficiency is high if output is produced at a point closer to m_1 (such as m). Sometimes a producer has several methods for producing the same level of the same output. In that case, the producer faces several short-run average cost curves, all having highest level of production efficiency (under different production methods though). **Figure C5** shows the producer facing two average cost curves for each level of output. Obviously, economic efficiency will be highest at the lower cost, as at m_1 for q_1 of output.

Figure C5. Two Alternative Short-Run Average Cost Curves for Same Output

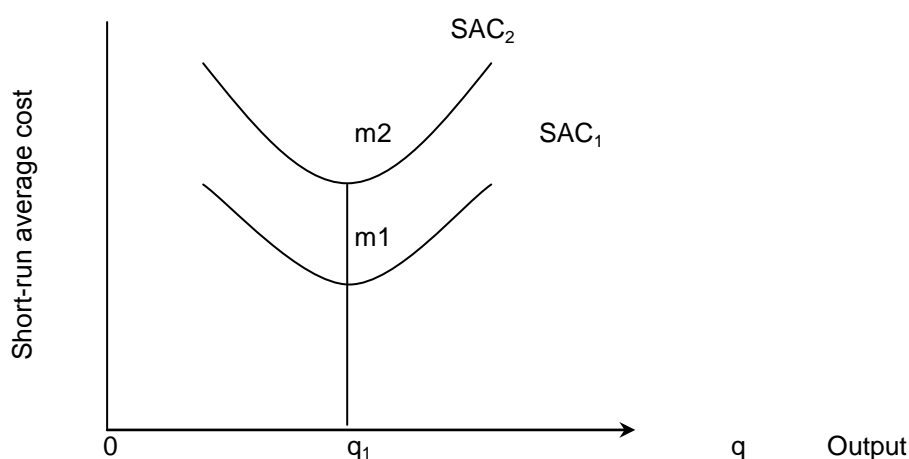
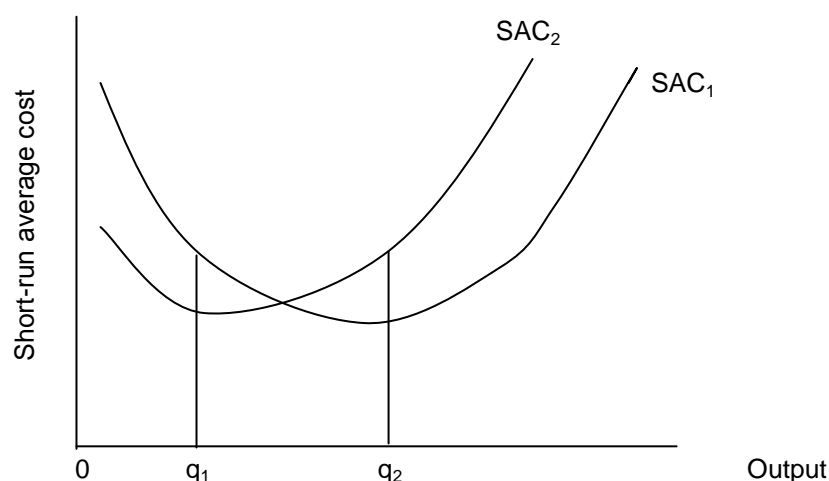


Figure C6 shows a peculiar situation. The producer has two average cost curves, SAC_1 and SAC_2 , such that average cost along SAC_2 is lower for a lower volume of output (such as q_1) but higher for a larger volume of output (as q_2). In this case, SAC_1 is more efficient, since the average cost is lower along the SAC_1 curve for higher amounts of output.

In the long run, as shown in **Figure C4**, economic efficiency is high if average cost declines as output increases. In the figure average cost q_2c for q_2 is lower than q_1b for q_1 and hence the long-run average cost curve shows high economic efficiency.

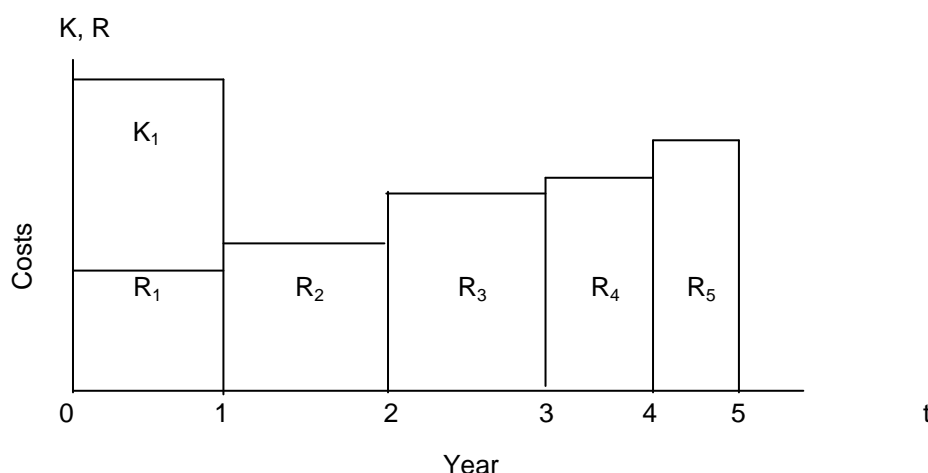
Figure C6. Conflicting Short-Run Average Cost Curves



For the managers, cost has to be divided into two other categories as well: capital cost and recurrent cost. Capital cost refers to the costs for the inputs that produce output over a long period, for a period of at least 1 year. The recurrent cost is to be incurred every year. Costs for land, building, equipment, etc. are capital costs, and costs for manpower, drugs, travel, etc. are recurrent costs. The distinction between fixed and variable costs is related to the behaviors of costs with respect to change in output, while that between capital and recurrent costs is related to the behavior of costs with respect to change in time (year). The program managers need to know the amounts of capital and recurrent costs in order to judge the expediency (feasibility) of the program as well the amounts to be incurred every year. In a capital-rich, labor-scarce country, a capital-intensive production process (in which the proportion of capital cost in total cost is very high) is preferred, because the marginal productivity of capital is much higher than that of labor and, secondly, management becomes easier, since the amount of labor (and number of laborers) is low. But in a country like Bangladesh, the reverse is likely to be true. It is usually very difficult for such economies to mobilize huge amount of capital in the initial year of a program, but they can collect larger amounts over the years. Therefore, a program with lower capital cost is preferable in such a country for its advantage in terms of expediency and financing. A lower capital-labor ratio can reduce productivity of inputs and, thus, production—and economic efficiency in production of some commodities. But the nutrition program is by nature labor-intensive; production of its output heavily depends on the activities of manpower. An increased capital-labor ratio cannot increase marginal productivity of the production function in this program.

The behavior of capital cost and recurrent cost is shown in **Figure C7**. In the bar of Year 1, total cost comprises recurrent cost (R_1) and capital cost (K_1). In the following years, only recurring cost is incurred (R_2 , R_3 , R_4 , and R_5); there is no capital cost. Total cost is quite high in the initial year because of the existence of capital cost.

Figure C7. Behavior of Capital Cost and Recurrent Cost



Comparisons between **Figure C1** and **Figure C7** can clearly show the difference between the two categories of total cost. In **Figure C1**, the horizontal axis shows output, while in **Figure C7**, the same axis shows time. Thus, in one presentation, the relationship between cost and output is considered, while in the other, the relationship between cost and time is depicted. The two relationships can be shown more neatly using symbols, as in the following equations:

$$(1). TC = TFC + TVC = c_1 0 + c_1((q)), c'' > 0, c''' \leq$$

$$(2). TC = KC + RC$$

$$= \frac{K_1 + R_1}{1+r+p} + \frac{R_2}{(1+r+p)^2} + \dots + \frac{R_n}{(1+r+p)^n}$$

The first equation shows the breakdown of total cost into fixed cost, c_0 , and variable cost, $c(q)$. The second equation shows the costs to be incurred in the future years. In the first year of the program, both capital cost (K_1) and recurrent cost (R_1) exist. In subsequent years, only the recurrent cost is incurred. The amount of cost is estimated at the market prices of each year.

Therefore, these amounts have been discounted using a discount factor $D = \frac{1}{1+r+p}$, where r = rate of interest and p = rate of inflation. However, if the future costs are calculated at the constant price, then discounting is not needed. Instead, if we want to know the cost at the market prices of the future periods, we have to multiply each annual cost by the escalator: $(1 + r + p)$.

The total cost of the national nutrition program of Bangladesh will have all the components shown in the two equations. It will have capital cost and recurrent cost in each program year. Both capital and recurrent cost will have fixed and variable costs as components. Hence, there will be four categories of cost: capital fixed cost, capital variable cost, recurrent fixed cost, and recurrent variable cost.

The two equations can be combined to bring all types of cost into one equation:

(3).

$$c = \frac{K_{01} + K_1(q) + R_{01} + R_1(q)}{1 + r + p} + \frac{R_{02} + R_2(q)}{(1 + r + p)^2} + \frac{R_{03} + R_3(q)}{(1 + r + p)^3} + \frac{R_{04} + R_4(q)}{(1 + r + p)^4} + \frac{R_{05} + R_5(q)}{(1 + r + p)^5}$$

where:

K_{01} = capital fixed cost in Year 1

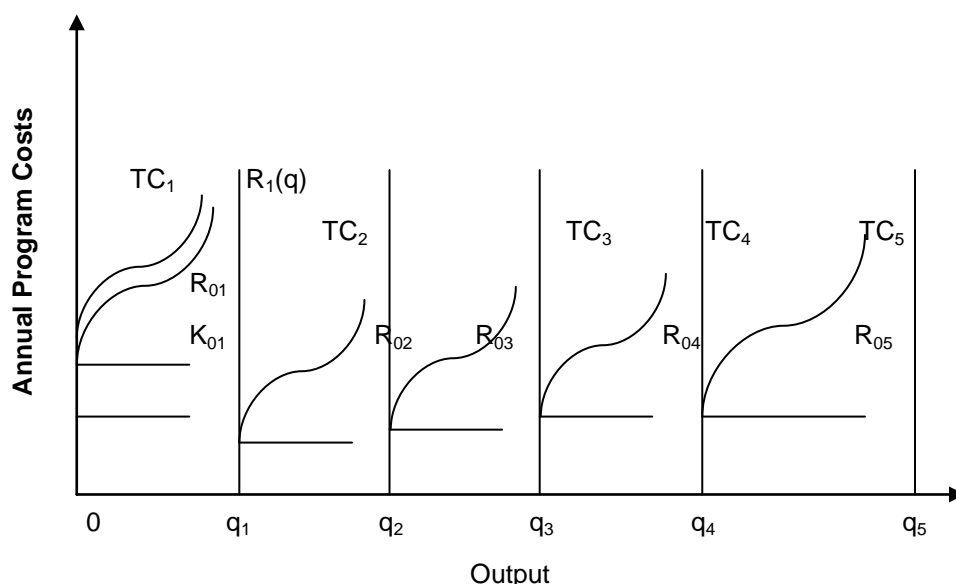
$K_1(q)$ = capital variable cost in Year 1

R_{01} = recurrent fixed cost in Year 1

$R_1(q)$ = recurrent variable cost in Year 1, and so on

The cost items of Equation #3 can be presented in a figure. **Figure C8** shows all types of costs—capital, recurrent, fixed, and variable—together. We assume that the nutrition program will be implemented in all areas of the country from Year 1 and will be implemented during a period of 5 years. We divide the entire program period into five yearly sections. Output q increases over the years, so that $q_2 > q_1$, $q_3 > q_2$, and so on. In Year 1, K_{01} and R_{01} represent the capital fixed cost and recurrent fixed cost, respectively, and the $R_1(q)$ curve shows the recurrent variable cost, while the vertical distance between total cost curve (TC_1) and the $R_1(q)$ shows the capital variable cost. In Year 2, only recurrent costs will be incurred; R_{01} is the recurrent fixed cost and the vertical distance between total cost curve (TC_2) and the R_{02} curve is the recurrent variable cost. The cost curves in the other years are similar to those of Year 2.

Figure C8. Annual Program Cost by Type



It emerges from the discussion that the efficaciousness of the cost estimates should be judged using the following criteria.

- The estimates are obtained at the maximum level of production efficiency, i.e., cost is the minimum for each level of output.

- In the short run, the average cost has the tendency to move toward the lowest point of the average cost curve as output increases in the short run (optimality).
- The average cost declines in the long run (showing returns to scale).
- If several methods can be applied to produce the output of the program and average cost curves corresponding to the methods intersect, then the curve that shows lower average costs at the higher level of output should be chosen.
- Capital cost is low and recurrent cost is high, so that the investment requirement in the initial years is low.
- Fixed cost is low and variable cost is higher. Fixed cost represents the public good character and externality of inputs; the fixed inputs are more susceptible to misuse and wastage. Moreover, fixed cost does not change as output increases and, hence, its amount is higher in the earlier years of the program. The variable cost represents the pure private good character of inputs and it is visible and divisible. These variable inputs are used more efficiently than are the fixed inputs.
- Average cost and marginal cost are low, so that the financial sustainability of the program is high.

