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Managing Acute Malnutrition: A Review of the Evidence and Country Experiences in South Asia and a Recommended Approach for Bangladesh

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Abbreviations and Acronyms

ACF	Action Contre la Faim
BCG	Boston Consulting Group
BPHS	Basic Package of Health Services
CCM	Community Case Management
CHW	community health worker
CMAM	Community-Based Management of Acute Malnutrition
CSB	corn-soy blend
DHO	District Health Officer
D/PHO	District Public Health Officers
ENN	Emergency Nutrition Network
FBF	fortified-blended food
FCHV	female community health volunteers
GMP	growth monitoring and promotion
IMAMI	Integrated Management of Acute Malnutrition, including Infants
IMCI	Integrated Management of Childhood Illness
IP	implementing partner
IPHN	Institute of Public Health Nutrition
IRD	Institute for Research and Development
IYCF	infant and young child feeding
LHW	lady health worker
LNS	lipid-based nutrient supplement
MAM	moderate acute malnutrition
MDG	Millennium Development Goal
MNP	micronutrient powder
MOH	Ministry of Health
MT	metric ton
NGO	nongovernmental organization
OTP	outpatient therapeutic program
RUSF	ready-to-use supplementary food
RUTF	ready-to-use therapeutic food
SAM	severe acute malnutrition
SC	stabilization center
SUN	Scaling Up Nutrition
SFP	supplementary feeding program
TFU	therapeutic feeding unit
TSFP	targeted supplementary feeding program

UN	United Nations
UNICEF	United Nations Children's Fund
UHC	Upazila Health Complex
WFA	weight for age
WFP	World Food Programme
WFH	weight for height
WHO	World Health Organization
WSB	wheat soy blend

Glossary of Terms

Term	Definition
Acute Malnutrition	Acute malnutrition is a form of undernutrition. It is caused by a decrease in food consumption and/or illness resulting in bilateral pitting edema or sudden weight loss. It is defined by the presence of bilateral pitting edema or wasting (low mid-upper arm circumference [MUAC] or low weight-for-height [WFH]). Note: The MUAC indicator cutoffs are being debated (see "Mid-Upper Arm Circumference [MUAC] Indicator" below). The WFH indicator is expressed as a z-score below two standard deviations (SDs) of the median (or WFH z-score < -2) of the World Health Organization (WHO) child growth standards (WHO standards), or as a percentage of the median < 80% of the National Centre for Health Statistics (NCHS) child growth references (NCHS references).
Anthropometry	Anthropometry is the study and technique of human body measurement. It is used to measure and monitor the nutritional status of an individual or population group.
Appetite	Appetite is the decisive criteria for participation in outpatient care. The test is done at admission and at all outpatient care follow-on sessions to ensure that the child can eat ready-to-use therapeutic food (RUTF). If the child has no appetite, s/he must receive inpatient care.
Bilateral Pitting Edema	Bilateral pitting edema, also known as nutritional edema, kwashiorkor or edematous malnutrition, is a sign of severe acute malnutrition (SAM). It is defined by bilateral pitting edema of the feet and verified when thumb pressure applied on top of both feet for three seconds leaves a pit (indentation) in the foot after the thumb is lifted. It is an abnormal infiltration and excess accumulation of serous fluid in connective tissue or in a serous cavity. The categories of bilateral pitting edema are: Mild: Both feet (can include ankles), Grade + Moderate: Both feet, lower legs, hands or lower arms, Grade + + Severe: Generalized bilateral pitting edema including both feet, legs, hands, arms and face, Grade + + +

Term	Definition
Community-Based Management of Acute Malnutrition (CMAM)	CMAM refers to the management of acute malnutrition through: 1) inpatient care for children with SAM with medical complications and all infants under 6 months old with SAM; 2) outpatient care for children with SAM without medical complications; 3) community outreach; and 4) services or programs for children with moderate acute malnutrition (MAM) that may be provided depending on the context. CMAM evolved from Community-Based Therapeutic Care (CTC), which is a community-based approach for the management of acute malnutrition in emergency settings, and comprises the key components of community outreach, supplementary feeding programs (SFPs), outpatient care programs (OCPs) and stabilization centers (SCs). Other variants of CMAM include ambulatory care or home-based care (HBC) for SAM.
Coverage	*Geographical coverage* refers to the availability of CMAM services (i.e. geographical access) through the decentralization and scale-up of CMAM services. *Service or program coverage* refers to the uptake of CMAM services (service access and use). *Geographical coverage* can be defined by the ratio of health facilities with CMAM services to health facilities per district, or by the ratio of children with SAM in treatment to children with SAM in the community (estimated with direct methods or indirect methods). *Geographical coverage*, defined by the ratio of children with SAM in treatment to the total number of children with SAM identified in the community at a particular time, is measured by a population survey in the study population (i.e., cluster survey; the study population is living in an area that can be larger than the catchment area of the health facilities with CMAM services). *Service or program coverage*, defined by the ratio of children with SAM in treatment to the total number of children with SAM identified in the community at a particular time, is measured by a population survey (e.g., centric systematic area sampling [CSAS] method, semi-quantitative evaluation of access and coverage [SQUEAC] method, the study population is living within the catchment area of the health facilities with CMAM services).
Coverage Ratio	Coverage ratio is expressed as the ratio of children with SAM under treatment (a) to the total number of children with SAM identified in the community at a particular time (a+b). Children with SAM identified in the community are calculated as children with SAM under treatment (a) plus children with SAM who are not under treatment (b). [Coverage ratio = a/(a+b)].

Term	Definition
Facility-Based Care for SAM	**Facility-based care for SAM** refers to the management of SAM with or without medical complications in inpatient care until weight recovery is achieved. Before the development of CMAM or in the absence of the CMAM approach, children with SAM were exclusively managed as inpatients receiving medical treatment and nutrition rehabilitation until weight recovery is achieved.
Fortified-Blended Foods (FBF)	**Fortified-blended food (FBF)** is a fortified blend of partially precooked cereals (wheat, corn, rice, and/or soy) fortified with vitamins and minerals. FBF may contain pulses, oil seeds, vegetable oil, milk powder, or whey protein concentrate. FBF is usually mixed with water and cooked as porridge. Examples of FBFs are corn-soy blend (CSB), now available as Supercereal (formerly CSB+) for children over 24 months old and adults, and Supercereal Plus (previously CSB++) for children 6–24 months old.
F75	Formula 75 (75 kcal/100ml) is the milk-based diet recommended by WHO for the stabilization of children with SAM in inpatient care.
F100	Formula 100 (100 kcal/100ml) is the milk-based diet recommended by WHO for the nutrition rehabilitation of children with SAM after stabilization in inpatient care and was used in this context before RUTF was available. Its current principal use in CMAM services is for children with SAM who have severe mouth lesions and cannot swallow RUTF, and who are being treated in inpatient care. Diluted F100 is used for the stabilization and rehabilitation of infants under 6 months of age in inpatient care.
Global Acute Malnutrition (GAM)	GAM is a population-level indicator referring to overall acute malnutrition defined by the presence of bilateral pitting edema or wasting defined by WFH < -2 z-score (WHO standards or NCHS references). GAM is divided into moderate and severe acute malnutrition (GAM = SAM + MAM).
Height-for-Age	A measure of linear growth. A child who is below minus two standard deviations (-2 SD) from the median of the WHO reference population in terms of height-for-age is considered short for his/her age, or stunted, a condition reflecting the cumulative effect of chronic malnutrition. If the child is below minus three standard deviations (-3 SD) from the reference median, then the child is considered to be severely stunted. A child between -2 SD and -3 SD is considered to be moderately stunted.
Inpatient Care for the Management of SAM with Medical Complications	Inpatient care is a CMAM service treating children with SAM with medical complications until their medical condition is stabilized and the complication is resolved (usually four to seven days). Treatment then continues in outpatient care until weight recovery is achieved. Inpatient care for SAM with medical complications is provided in a hospital or health facility with 24-hour care capacity.

Term	Definition
Integration of CMAM or CMAM Services	Integration of CMAM refers to the incorporation of CMAM into the national health system. Integration of CMAM services refers to the incorporation of the CMAM services of inpatient care, outpatient care and community outreach into the national health care system. It assumes that the health care system has the capacity and competence for providing, strengthening, adapting, and maintaining quality and effective CMAM services with minimal external support. Minimal external support refers to financial and technical support to the MOH for capacity strengthening and access to supplies.
Medical Complications in the Presence of SAM	The major medical complications in the presence of SAM that indicate the need for referral of a child to inpatient care are: anorexia or no appetite, convulsions, high fever, hypoglycemia or hypothermia, intractable vomiting, lethargy or not alert, lower respiratory tract infection (LRTI), severe anemia, severe dehydration, unconsciousness. (Other cases needing inpatient care besides severe bilateral pitting edema, marasmic kwashiorkor, SAM with medical complications and infants under 6 months with SAM include: infants 6 months or older with SAM and a weight below 4 kg, children with SAM in outpatient care and weight loss for three weeks or with static weight for five weeks, or upon mother/caregiver's request.)
Micronutrient Deficiencies	Micronutrient deficiencies are a consequence of reduced or excess micronutrient intake and/or absorption in the body. The most common forms of micronutrient deficiencies are related to iron, vitamin A and iodine deficiency.
Mid-Upper Arm Circumference (MUAC) Indicator	Low MUAC is an indicator for wasting, used for a child that is 6 to 59 months old. MUAC < 110 mm indicates severe wasting or SAM. MUAC ≥ 110 mm and < 125 mm indicates moderate wasting or MAM. MUAC cutoffs are being debated; for example, new suggestions could be MUAC < 115 mm for SAM and ≥ 115 and <125 for MAM. MUAC is a better indicator of mortality risk associated with acute malnutrition than WFH.
Moderate Acute Malnutrition (MAM) **Moderate Wasting**	MAM, or moderate wasting, is defined by a MUAC ≥ 110 mm and < 125 mm (the cutoff is being debated) or a WFH ≥ -3 z-score and < -2 z-score of the median (WHO standards) or WFH as a percentage of the median ≥ 70% and < 80% (NCHS references). MAM can also be used as a population-level indicator defined by WFH ≥ -3 z-score and < -2 z-scores.

Term	Definition
Outpatient Care for the Management of SAM Without Medical Complications	Outpatient care is a CMAM service treating children with SAM without medical complications through the provision of routine medical treatment and nutrition rehabilitation with RUTF. Children attend outpatient care at regular intervals (usually once a week) until weight recovery is achieved (usually two months).
Outreach Worker for CMAM	An outreach worker is a CHW, health extension worker (HEW) or community volunteer who identifies and refers children with acute malnutrition from the community to the CMAM services and follows up with the children in their homes when required.
Ready-to-Use Therapeutic Food (RUTF)	RUTF is an energy-dense, mineral- and vitamin-enriched food specifically designed to treat SAM. RUTF has a similar nutrient composition to F100. RUTF is soft, crushable food that can be consumed easily by children from the age of 6 months without adding water. Unlike F100, RUTF is not water-based, meaning that bacteria cannot grow in it and that it can be used safely at home without refrigeration and in areas where hygiene conditions are not optimal. It does not require preparation before consumption. Plumpy'Nut is an example of a commonly known lipid-based RUTF.
Ready-to-Use Supplementary Food (RUSF)	Ready-to-use supplementary foods (RUSFs) are also called medium-quantity lipid-based nutrient supplements (LNS) because they are given in smaller amounts than ready-to-use therapeutic foods (RUTFs). Most RUSFs contain oil, dried skim milk, peanuts, sugar, vitamin mineral premix, and maltodextrin. Brands of RUSF include Plumpy-Doz (in tubs containing a weekly ration) and Plumpy'Sup (in 1-day sachets).
Referral	A referral is a child who is moved to a different component of CMAM (e.g., from outpatient care to inpatient care for medical reasons) but has not left the program.
Severe Acute Malnutrition (SAM)	SAM is defined by the presence of bilateral pitting edema or severe wasting (MUAC < 110 mm [cutoff being debated] or a WFH < -3 z-score [WHO standards] or WFH < 70% of the median [NCHS references]). A child with SAM is highly vulnerable and has a high mortality risk. SAM can also be used as a population-based indicator defined by the presence of bilateral pitting edema or severe wasting
Severe Wasting	Severe wasting is a sign of SAM. It is defined by a MUAC < 110 mm (cutoff being debated) or a WFH < -3 z-score (WHO standards) or WFH < 70% of the median (NCHS references). Severe wasting is also called marasmus. The child with severe wasting has lost fat and muscle and appears very thin (e.g., signs of "old man face" or "baggy pants" [folds of skin over the buttocks]).

Term	Definition
Sphere Project or Sphere Standards	The Sphere Project Humanitarian Charter and Minimum Standards in Disaster Response is a voluntary effort to improve the quality of assistance provided to people affected by disaster and to enhance the accountability of the humanitarian agencies in disaster response. Sphere has established Minimum Standards in Disaster Response (often referred to as Sphere Standards) and indicators to describe the level of disaster assistance to which all people have a right. www.sphereproject.org
Stunting	Stunting, or chronic undernutrition, is a form of undernutrition. It is defined by a height-for-age (HFA) z-score below two SDs of the median (WHO standards). Stunting is a result of prolonged or repeated episodes of undernutrition starting before birth. This type of undernutrition is best addressed through preventive maternal health programs aimed at pregnant women, infants, and children under age 2. Program responses to stunting require longer-term planning and policy development.
Undernutrition	Undernutrition is a consequence of a deficiency in nutrient intake and/or absorption in the body. The different forms of undernutrition that can appear isolated or in combination are acute malnutrition (bilateral pitting edema and/or wasting), stunting, underweight (combined form of wasting and stunting), and micronutrient deficiencies.
Underweight	Underweight is a composite form of undernutrition including elements of stunting and wasting and is defined by a weight-for-age (WFA) z-score below 2 SDs of the median (WHO standards). This indicator is commonly used in growth monitoring and promotion (GMP) and child health and nutrition programs aimed at the prevention and treatment of undernutrition.
Weight-for-Height	Describes current nutritional status. A child who is below minus two standard deviations (-2 SD) from the reference median for weight-for-height is considered to be too thin for his/her height, or wasted, a condition reflecting acute or recent nutritional deficit. As with stunting, wasting is considered severe if the child is below minus three standard deviations (-3 SD) below the reference mean. Severe wasting is closely linked to mortality risk.
Weight-for-Age	A composite index of weight-for-height and height-for-age, and thus does not distinguish between acute malnutrition (wasting) and chronic malnutrition (stunting). A child can be underweight for his age because he is stunted, because he is wasted or both. Weight-for-age is a good overall indicator of a population's nutritional health.

Term	Definition
Z-scores	The WHO Global Database on Child Growth and Malnutrition uses a Z-score system to express the anthropometric value as a number of standard deviations (or Z-scores) below or above the reference mean or median value. WHO uses a cut-off point of <-2 standard deviations (SD) to classify low weight-for-age, low height-for-age and low weight-for-height as moderate and severe undernutrition, and <-3 SD to define severe undernutrition. The cut-off point of >+2 SD classifies high weight-for-height as overweight in children.

Executive Summary

Malnutrition remains a significant problem in South Asia, affecting nearly 80 million children under the age of 5. South Asia has the highest burden of malnutrition than any other region in the world. In this region, as in others, malnutrition manifests itself in different forms—chronic malnutrition or stunting (short for age), acute malnutrition or wasting (low weight for height), and micronutrient deficiencies. Each type of malnutrition carries different risks. For example, chronic malnutrition and acute malnutrition carry a risk of mortality, but the risk for chronically malnourished children is different from the risk for acutely malnourished children. The risk of mortality is greatest for children who are severely acutely malnourished; these children are on the brink of death and are 10 times more likely to die than their well-nourished peers. South Asia is home to 32 million acutely malnourished children under 5— higher than any other region—and the three countries with the greatest numbers of acutely malnourished children are India (26 million), Pakistan (3 million), and Bangladesh (2.2 million).

Trends in the prevalence of various forms of malnutrition in South Asia are improving but very slowly. In fact, while the prevalence of acute malnutrition in South Asia over the past 20 years has declined from 19 to 16 percent, as a result of population growth, the actual numbers of children affected is unchanged. So why does it matter? Because 42 percent of all malnourished children in the world reside in South Asia, the global community cannot eradicate all forms of malnutrition until the prevalence of malnutrition in South Asia is significantly reduced. In short, the world cannot meet its goals for children without South Asia meeting those goals first.

The high prevalence of chronic and acute malnutrition is in part a result of the weak nutrition policy and program framework in this region. Sustained programming on preventive nutrition that reaches all children in need has been limited in this region, and there has been little programming targeted at children who are moderately or severely wasted.

This report presents a review of the evidence and country experiences in the management of acute malnutrition—one of the most severe forms of malnutrition— in South Asia, followed by a recommended approach for the management of acute malnutrition in Bangladesh. This review focuses on the experiences and available evidence on the management of acute malnutrition in 11 countries in South and Southeast Asia: Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, Laos, Myanmar, and Vietnam.

In preparing this report, it became clear that there is a paucity of research on the efficacy and effectiveness of treatment approaches to manage severe and moderate wasting in South and Southeast Asia. Most studies have been undertaken in Africa. Of the malnutrition studies undertaken in South and Southeast Asia, most have focused on underweight, and few focused specifically on acute malnutrition. Only one pilot study from Bangladesh was found on the community-based management of acute malnutrition (CMAM). However, several countries have experience with CMAM programming, and some have experience with managing both moderate and severe wasting. The lessons from these experiences are important to guide the integration of the management and treatment of acute malnutrition within broader health systems in other countries in this region.

Although research on the efficacy and effectiveness of specialized foods to manage and treat acute malnutrition have been undertaken in sub-Saharan Africa and not South Asia, recent systematic reviews establish a few key facts that apply to the region. The use of specialized food, in the form of locally fortified corn-soy blended flours and lipid-based nutrient supplements, has proven effective for the

treatment of moderate acute malnutrition. Similarly, the use of ready-to-use-therapeutic food (RUTF) has proven effective for the treatment of severe acute malnutrition. Key considerations in the types of foods that should be used to treat acute malnutrition center not only on the nutrient composition, but also on whether the food is ready for consumption and carries minimal risk of infection. Particularly in the case of severely wasted children, infections can substantially heighten and precipitate the risk of mortality. For this reason, foods that are ready-to-use and pre-packaged carry significant benefits in treating severely wasted children. In South Asia, lack of hygiene and sanitation within households, especially with regard to food preparation, are significant risk factors in the prevalence of acute malnutrition generally and particularly for severe acute malnutrition. In addition, severely wasted children cannot digest home-cooked foods easily, as their physiological ability to absorb nutrients and digest food is severely impaired. Rehabilitating these children requires a specific formulation that is both nutrient-dense and micronutrient-rich—another reason why specialized foods are ideally suited to these children. The impetus to create RUTF stemmed from the fact that few severely wasted children were taken to facilities for inpatient treatment: To more effectively treat severely wasted children and reduce child mortality overall, a specialized food that could be provided safely in the home was needed. The development of specialized therapeutic foods combined with the need to reach higher levels of coverage led to the endorsement of the CMAM approach.

However, while CMAM was conceptualized as treating both MAM and SAM and as a component of the broader health system that in many respects depended on the broader health infrastructure to function effectively, the predominant focus of CMAM programs in the decade since the approach's inception has been on treating severely wasted children with RUTF foods. Moreover, these programs are often implemented as individual approaches rather than embedded within a broader set of preventive and curative services for reducing undernutrition. The singular focus on using RUTF for severe wasting has led many to criticize this approach and has also created a lot of confusion, especially among policymakers, about what type of treatment approaches should be used and when. While severely wasted children benefit greatly from RUTF, the majority of children with acute malnutrition are moderately wasted and can benefit from locally prepared fortified ready-to-use supplementary foods. This is a critical difference. This means that of South Asia's 32 million wasted children, 22 million could be treated with locally prepared fortified foods, while the 10 million children who are severely wasted would be treated with RUTF. As such, a broader approach to managing acute malnutrition is needed, particularly in South Asia.

A recommended approach for Bangladesh on the management of acute malnutrition is to integrate CMAM into the rollout of the National Nutrition Services such that screening, identification, referral, and treatment of acutely malnourished children could be effectively managed within the community-based health service delivery system. Given that the vast majority of children are moderately wasted and could be treated with locally prepared fortified foods, a significant emphasis of the CMAM approach in Bangladesh should be to screen and treat moderately wasted children. Over time, this would also result in fewer SAM cases. However, even with this approach, there would still be a small number of children who are severely wasted and ideally should be treated with specialized therapeutic foods. While the Government of Bangladesh is awaiting full-scale production of a local RUTF, an interim strategy is needed to effectively treat these severely wasted children on an outpatient basis.

1. Introduction

Malnutrition remains a significant problem in South Asia, affecting more than 80 million children under the age of 5. South Asia has the highest burden of malnutrition than any other region in the world and relatively few services to address this problem. In this region, as in others, malnutrition manifests itself in different forms—chronic malnutrition or stunting (short for age), acute malnutrition or wasting (low weight for height), and micronutrient deficiencies. Each type of malnutrition carries different risks. For example, while chronic malnutrition and acute malnutrition carry a risk of mortality, the risk for chronically malnourished children is different from the risk for acutely malnourished children. The risk of mortality is greatest for children who are severely acutely malnourished; these children are on the brink of death and are 10 times more likely to die than their well-nourished peers (Lenters et al. 2013). Trends in the prevalence of various forms of malnutrition in South Asia are improving but very slowly. So why does it matter? Because 42 percent of all malnourished children in the world reside in South Asia, the global community cannot eradicate all forms of malnutrition until the prevalence of malnutrition in South Asia is significantly reduced. The world cannot meet its goals for children, such as the Millennium Development Goal (MDG) targets for child undernutrition and child mortality, without South Asia meeting those goals first.

This report presents a review of the evidence and country experiences in the management of acute malnutrition—one of the most severe forms of malnutrition—in South Asia, followed by a recommended approach for the management of acute malnutrition in Bangladesh. This review focuses on 11 countries in South and Southeast Asia: Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, Laos, Myanmar, and Vietnam. These countries were identified based on experience with community-based nutrition programs, geographical representation, potential for cross-country learning, and availability of literature. The variety of approaches in the management of moderate and severe acute malnutrition were included to provide examples of how different countries in the region have tackled this form of undernutrition among children 6–59 months of age.

The review was conducted by scanning electronic databases (PubMed, Embase, and Ebsco Global Health database) using the keywords: acute malnutrition, severe acute malnutrition (SAM), moderate acute malnutrition (MAM), global acute malnutrition (GAM), wasting, marasmus, marasmus kwashiorkor, stunting, underweight, undernutrition, Community-Based Management of Acute Malnutrition (CMAM), Integrated Management of Acute Malnutrition (IMAM), ready-to-use therapeutic food (RUTF), supplementary feeding; and the countries: Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, Myanmar, Laos, Thailand, and Vietnam. This search generated 310 citations.

Abstracts of identified articles and reviews were scanned for relevance. Thirty-four published papers were selected and their information extracted. Additional documents (e.g., national policy documents, strategy documents, national guidelines, program evaluations, and presentations) were identified through online research. While reviews of efficacy and effectiveness trials on the management of acute malnutrition were included, no clinical trials were found in this region that compare the use of RUTF to other therapies. The studies and country experiences in this report reflect pilot projects and national implementation strategies; as such there are limited data on the effectiveness of these approaches, and it is difficult to make conclusions about the approaches. The final section of this report includes a recommended approach for the management of acute malnutrition in Bangladesh based more on the scale of the problem and best practices. Because there are so few trials on the management of acute malnutrition in this region, this review was supplemented with semi-structured key informant interviews conducted with selected key

partners for CMAM, including international nongovernmental organizations (NGOs), U.N. agencies, Ministry of Health officials, and academicians.

The sections that follow provide an overview of the nutrition situation in South Asia, a review of wasting in South Asia that presents research and country experiences, discussion, and a recommended approach for Bangladesh on the management of acute malnutrition.

2. Overview of the Nutrition Situation in South Asia

Undernutrition encompasses stunting, wasting, underweight, and deficiencies of essential vitamins and minerals (collectively referred to as micronutrients) and is caused by a combination of factors such as a diet lacking in sufficient nutrients and the occurrence of infectious diseases such as diarrhea.

While the past decade has witnessed many development successes—including worldwide reductions in child and maternal mortality, increased vaccination rates, and increasing education for women—levels of undernutrition have remained high, especially in South Asia. Based on current population and prevalence estimates, more than 80 million children in South Asia are chronically malnourished, and 32 million are moderately or severely acutely malnourished. Trends for this region show that while there has been improvement overall, the rate of improvement within the region varies. Most countries, excluding Sri Lanka, have a high prevalence of undernutrition, and the rate of improvement has been slowing in recent years.

Undernourished children are at a substantially increased risk of death. All forms of moderate and severe malnutrition account for 40 percent to 50 percent of all deaths in children under 5 years of age (Uauy et al. 2012). SAM is one of the top three nutrition-related causes of death in children under 5.

The underlying determinants of malnutrition in South Asia are manifold and in some respects multiplicative (Ikeda et al. 2013, Haddad and Gillespie 2003). For example, high population density combines with poverty, inadequate purchasing power that undermines food access, lack of hygiene and sanitation at the community and household level, and other factors to keep the prevalence of malnutrition (specifically stunting and wasting) virtually unchanged.

2.1 Characteristics of Malnutrition

Undernutrition mainly affects children under 5, who require a diet rich in protein, energy, and micronutrients due to their rapid growth. When households cannot access this diet, children under 5 are likely to suffer the most. For this reason, most interventions around undernutrition target this age group.

Undernutrition can take different forms represented by specific anthropometric indicators. These indicators are compared with anthropometric standards from a reference population and expressed in z-score values. For each indicator, z-score values <-3 indicate a severe status, while a z-score value <-2 indicates a moderate status. The two main forms of undernutrition are stunting and wasting.

- **Stunting** represents a low ratio of height divided by age (height for age [HFA] expressed in z-score). Stunted children are shorter than they should be for their age.
- **Wasting** (also referred to as acute malnutrition) represents a low ratio of weight divided by height (weight for height [WFH] expressed in z-score of the reference population) and/or a low circumference of the middle upper arm (middle upper arm circumference [MUAC] expressed in mm).[1] Both approaches to measure wasting provide a measure of extreme

[1] Edema in both feet and/or other clinical signs also classify a child as severely wasted (WHO 2005).

thinness and have been demonstrated to be closely associated with increased risk of death: When a child reaches WFH of <-3 z-score or a MUAC of <115 mm, his/her body has consumed most of its fat and muscles to produce energy for basic metabolic functions and does not have any more stores of energy for survival.

Stunting and wasting are often seen in the same areas, sometimes in the same households, and even in the same children. They result from deficiencies in essential micronutrients: Wasting is associated with an acute deficiency that occurred during a short period while stunting is the result of a less acute deficiency over a longer period. The amplitude, frequency, and intensity of the gap in his/her intakes in protein, energy, and micronutrients directly determine the form of malnutrition affecting a child. These intakes are determined by context-specific factors and depend on the interactions of a range of factors, such as the household's food security status, morbidity and access to health services, and care and nutrition practices. The acute deficiency seen in wasted children is not only a result of inadequate food intake in the short term but also is often triggered by a single infection or recurrent infections, such as diarrhea or acute respiratory infections (Bhaskaram 2002). Malnutrition and infection are highly synergistic, and preventing and reducing the risk of further infection is critical for survival, particularly for severely acutely malnourished children.

Table 1. Estimated Prevalence and Number of Children under 5 Affected by Stunting (Moderate or Severe) by MDG Region

	Prevalence Estimate (%)			Number (million)		
Region	1990	2010	2011	1990	2010	2011
Northern Africa	29.2	20.0	19.7	5.1	3.4	3.4
Sub-Saharan Africa	47.2	40.0	39.6	43.6	55.2	55.8
Latin America & Caribbean	22.6	12.2	11.8	12.6	6.6	6.3
Eastern Asia	36.7	9.2	8.5	47.8	8.1	7.5
Southern Asia	60.0	38.3	37.3	104.5	69.4	68.0
Southeastern Asia	47.3	28.6	27.8	27.0	15.4	14.8
Western Asia	29.9	18.3	17.9	5.8	4.4	4.4
Oceania	37.8	33.4	33.2	0.4	0.4	0.4
Caucasus & Central Asia	37.3	18.1	17.3	3.4	1.4	1.4
Developed	3.6	4.2	4.2	2.8	3.0	3.0
Global*	**39.9**	**26.3**	**25.7**	**253.1**	**167.1**	**164.8**

* Numbers of children affected may not sum to the global total due to differences in how countries were divided into regions.
Source: UNICEF, WHO, and World Bank 2012.

Table 2. Estimated Prevalence and Number of Children under 5 Affected by Underweight (Moderate or Severe) by MDG Region

	Prevalence Estimate (%)			Number (million)		
Region	1990	2010	2011	1990	2010	2011
Northern Africa	9.8	5.4	5.3	1.7	0.9	0.9
Sub-Saharan Africa	29.0	21.8	21.4	26.8	30.1	30.2
Latin America & Caribbean	7.3	3.2	3.1	4.0	1.7	1.6
Eastern Asia	15.0	3.4	3.1	19.5	2.9	2.7
Southern Asia	50.4	32.2	31.3	87.7	58.3	57.2
Southeastern Asia	31.3	17.4	16.8	17.8	9.4	9.0
Western Asia	15.1	5.0	4.7	2.9	1.2	1.2
Oceania	18.5	13.9	13.7	0.2	0.2	0.2
Caucasus & Central Asia	14.4	4.1	3.8	1.3	0.3	0.3
Developed	1.0	1.6	1.6	0.8	1.1	1.2
Global*	**25.1**	**16.1**	**15.7**	**159.1**	**102.3**	**100.7**

*Numbers of children affected may not sum to the global total due to differences in how the countries were divided into regions.
Source: UNICEF, WHO, and World Bank 2012.

Table 3. Estimated Prevalence and Number of Children under 5 Affected by Wasting (Moderate or Severe) by MDG Region

	Prevalence Estimate (%)			Number (million)		
Region	1990	2010	2011	1990	2010	2011
Northern Africa	3.9	6.9	7.1	0.7	1.2	1.2
Sub-Saharan Africa	10.3	9.4	9.4	9.5	13.0	13.2
Latin America & Caribbean	3.2	1.6	1.5	1.8	0.8	0.8
Eastern Asia	4.3	2.4	2.3	5.6	2.1	2.0
Southern Asia	18.4	15.4	15.3	32.0	27.9	27.8
Southeastern Asia	8.9	9.8	9.8	5.1	5.2	5.2
Western Asia	6.5	3.5	3.4	1.2	0.9	0.8
Oceania	5.2	4.3	4.3	0.0	0.1	0.1
Caucasus & Central Asia	9.3	4.2	4.1	0.8	0.3	0.3
Developed	0.9	0.7	0.7	0.7	0.5	0.5
Global*	**9.1**	**8.1**	**8.0**	**58.0**	**51.5**	**51.5**

*Numbers of children affected may not sum to the global total due to differences in how the countries were divided into regions.
Source: UNICEF, WHO, and World Bank 2012.

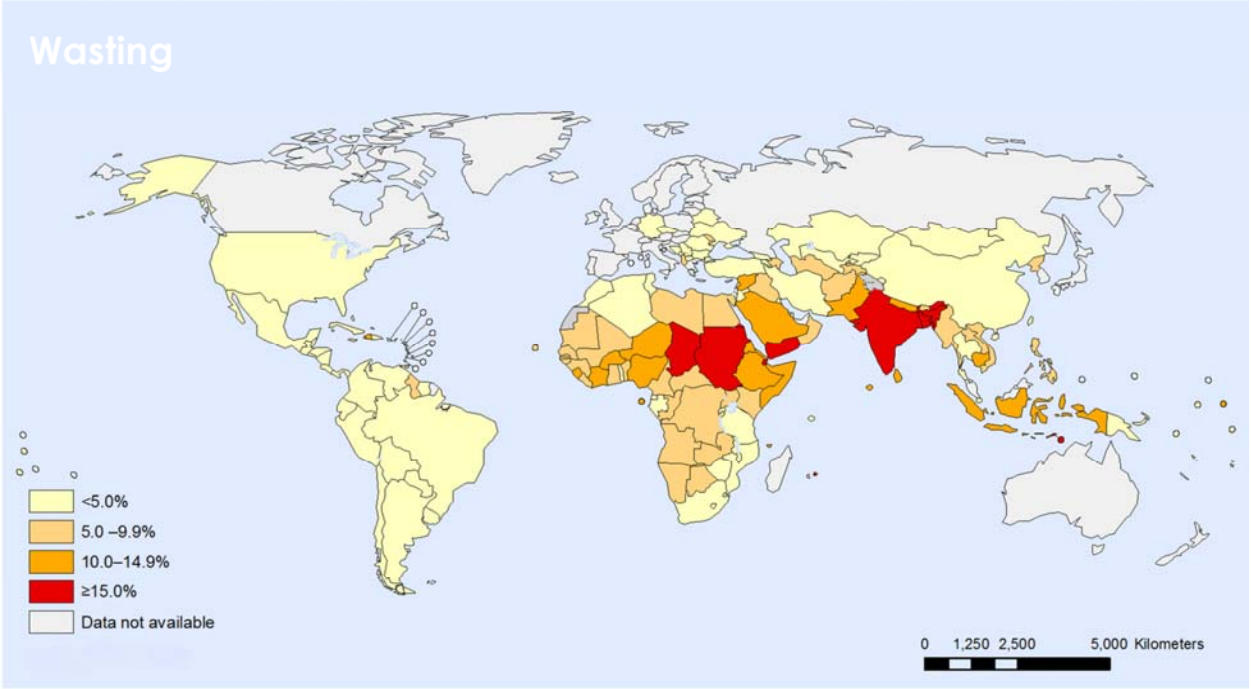
3. Wasting Situation in South Asia

The South Asia region has the world's highest prevalence of wasting. Recent joint estimates (Table 3) from UNICEF, the World Health Organization (WHO), and the World Bank show that globally 52 million children under 5 are moderately or severely wasted; 28 million of those children, or 54 percent, are in South Asia. However, based on current under-5 population estimates, that number is closer to 32 million. From 1990 to 2011, the prevalence of wasting in South Asia declined from 18 percent to 15 percent in 2011, but the actual number of children affected remains largely unchanged at 32 million.

It is disheartening that after 21 years, the same number of children are affected by wasting. This is partly attributable to the lack of both sustained programming on preventive nutrition that reaches all children in need and programming targeted at children who are moderately or severely wasted.

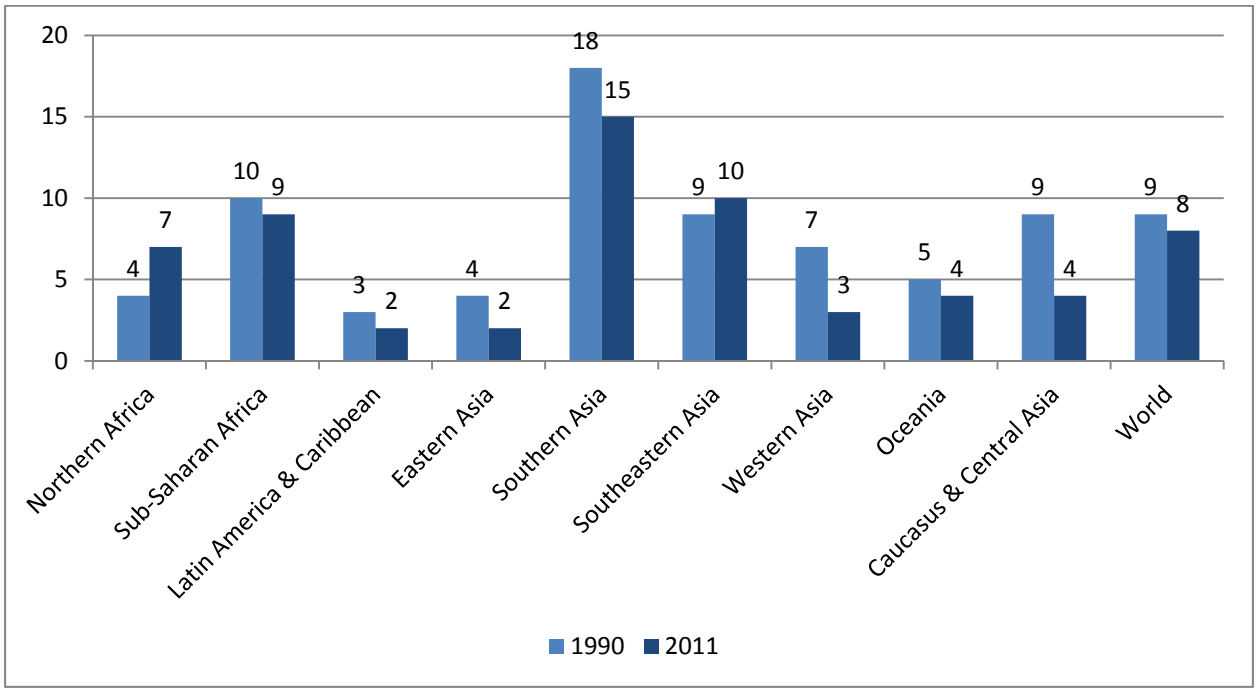
The different forms of malnutrition are present to varying degrees across all developing regions, but South Asia's pattern of malnutrition consists of a high prevalence of stunting and wasting. In other regions such as sub-Saharan Africa, the prevalence of wasting is significantly lower and has consistently been low compared to South Asia. Yet programs tackling acute malnutrition in sub-Saharan Africa have been reasonably successful, even when implemented on a small scale.

Figure 1. Global Distribution of Wasting



Source: UNICEF, WHO, and World Bank 2012.

Figure 2. Percentage of Children under 5 Who Were Wasted in 1990 and 2011



Note: The trend analysis based on a multilevel modeling method. To see detailed country-level data and fitted regional trend lines. Prevalence estimates are calculated according to the WHO Child Growth Standards. Error bars represent 95% confidence intervals of the estimated regional prevalence.
Source: UNICEF/WHO/World Bank Joint Child Malnutrition Estimates, 2011 revision (completed July 2012).

Table 4. Prevalence and Estimated Number of Children 0–59 months Affected by Underweight, Stunting, and Wasting in South and Southeast Asia

Country	Data Source & Year	Total Under-5 Pop. (000s)	Weight for Age (underweight)				Height for Age (stunting)				Weight for Height (wasting)			
			% < -2 z-score	No. of children (000s)	% < -3 z-score	No. of children (000s)	% < -2 z-score	No. of children (000s)	% < -3 z-score	No. of children (000s)	% < -2 z-score	No. of children (000s)	% < -3 z-score	No. of children (000s)
SOUTH ASIA (Population estimates from 2011)														
Afghanistan	MICS* 2011	4,907	25	1,227	11	520	52	2,532	34	1,673	14	682	7	353
Bangladesh	DHS* 2011	14,427	36	5251	10	1500	41	5958	15	2207	16	2250	4	577
India	DHS 2006	128,589	43	55,936	17	22,374	48	61,594	24	30,604	20	25,717	7	8,744
Nepal	DHS 2011	3,450	29	993	8	265	40	1,397	16	558	11	376	3	89
Pakistan	NS†† 2011	22,113	31	6,833	11	2,498	43	9,508	21	4,732	15	3,272	6	1,260
Sri Lanka	DHS§ 2007	1,784	22	385	4	67	18	321	4	74	15	267	3	53
Region		**175,270**		**69,340**		**25,169**		**81,440**		**39,722**		**32,564**		**10,563**
SOUTHEAST ASIA (Most population estimates from 2008; Indonesia estimates from 2011)														
Cambodia	DHS 2010	1,611	28	456	7	107	40	642	14	219	11	175	2	40
Indonesia	MOH†2010	21,199	19	3,943	4	932	39	8,310	20	4,176	12	2,607	5	1,145
Laos	MICS¥ 2006	776	32	245	10	76	48	369	21	160	7	56	2	13
Myanmar	MICS 2010	4,629	23	1,046	6	259	35	1,625	13	588	8	366	2	97
Vietnam	MICS 2011	7,316	12	856	2	131	23	1,660	6	439	4	299	1	87
Region		**35,531**		**6,546**		**1,507**		**12,607**		**5,583**		**3,505**		**1,383**

*MICS=Multiple Indicator Cluster Survey; DHS=Demographic and Health Survey
††National Survey § Data from preliminary report; final report not released.
†Based on Ministry of Health and National Institute of Health Research and Development. National Report on Basic Health Research, Riskesdas, 2010. Jakarta, Indonesia, 2012 (and additional analysis). Source: http://www.who.int/nutgrowthdb/database/countries/idn/en/ (accessed on April 26, 2013).
¥ Listed figures are all < -2 z-score (all moderate and severe cases).

3.1 The Difference between Moderate and Severe Acute Malnutrition and Implications for Management

In South Asia, 22 million children are moderately wasted and 10 million are severely wasted, with India, Pakistan, and Bangladesh bearing the greatest burden of wasting (Table 4). The treatment and rehabilitation for moderate and severe acute malnutrition in children differ in important ways, though the weight gain criteria per day are the same. In this region, children who are moderately wasted could be treated with locally available and hygienically prepared fortified rations that meet their nutrition needs; children who are severely wasted but do not have medical complications ideally should be treated with RUTF through an outpatient approach, which can reach more children and can help children recover more quickly; children who are severely wasted with medical complications should be treated in inpatient facilities. The majority of global and regional experiences in the management of wasting focus almost exclusively on the use of RUTF, most recently through Community-Based Management of Acute Malnutrition (CMAM). Global guidance on approaches and strategies to manage wasting are still being developed. The absence of clear guidance on the management of wasting based on severity and the broader lack of experience with how best to manage the various forms of malnutrition using an integrated approach has resulted in confusion, in South Asia in particular, on how to manage wasting.[2] Moreover, the emphasis on the use of RUTF rather than locally available foods without clarifying which approach should be used under which circumstances has created the broad perception that all cases of wasting, moderate or severe, must be managed only with RUTF.

Historically, the main difference between severe and moderate wasting was based on anthropometric criteria. Serious alteration of basic metabolic functions is seen in severe wasting and not in moderate wasting. This alteration results in a much higher risk of death and requires a tailored approach, first ensuring that these basic functions return to normal and then providing a diet rich enough to promote rapid weight gain.

In the past, severe wasting was treated with intensive care in inpatient facilities. Specific diets were designed and shown to be effective for each phase of treatment for severe wasting: A therapeutic milk called F-75 (providing 75 kcal per 100 g) was used to stabilize the patients and restore metabolic functions, and then a therapeutic milk called F-100 (providing 100 kcal per 100 g) was used for rapid weight gain in the second phase. A key finding of the early research on formulating the right mix to treat SAM was that a severely malnourished child whose nutrient stores are depleted cannot return to a healthy weight and good nutritional status using home foods alone; they need a specific profile of added micronutrients to help absorb protein, energy, and fat calories (Golden 2010). For this reason, specialized foods are essential to rehabilitate severely wasted children.

Moderate wasting was treated on an outpatient basis through supplementary rations provided weekly while patients remained at home. The supplementary ration most widely used was made of a blend of

[2] Global guidelines that are endorsed by all humanitarian organizations, U.N. agencies, and other development actors are yet to be published for the management of any form of acute malnutrition. Presently, guidelines on the management of moderate or severe acute malnutrition often rely on those established by international NGOs.

corn and soy flours with oil and sugar called corn-soy blend (CSB), which was designed by the World Food Programme.

3.2 Management of Wasting

Wasting is defined by WFH, MUAC, and edema status. While WFH and MUAC have significant variations in sensitivity and specificity between regions and populations, each of the three indicators has been demonstrated to be independently associated with an increased risk of death, and because of this, any child identified as wasted by any of these three measures needs immediate treatment. Because each indicator carries a different mortality risk, WHO guidelines still recommend measuring both MUAC and WFH and checking for edema. The MUAC measure is very effective at identifying acute malnutrition in children, and those whose MUAC is less than 11.5 cm (the cutoff for severe wasting) are at more risk of immediate death than children who meet the WFH cutoff for SAM. Updated guidance on the identification of SAM cases based on the new WHO growth standards was also released through a joint statement by WHO and UNICEF in 2009 (WHO and UNICEF 2009).There is emerging evidence of discrepancies between MUAC and WFH indicating that these measures are not equivalent and neatly overlapped in the same population. In fact the prevalence of severe wasting measured by WFH can be almost double that of the prevalence of severe wasting measured by MUAC. More evidence on this discrepancy in the two measures is needed because this has implications for the number of children who need to be treated for SAM using ready-to use therapeutic foods.

3.3 How and Why the CMAM Approach Was Endorsed

These initial efforts to treat severely wasted children through inpatient care in facility-based settings achieved high recovery rates but largely have failed to lower the mortality rates associated with wasting, partly because they achieved very poor coverage, reaching relatively few of the children in need (Briend and Collins 2010). This is because in many countries there are few inpatient facilities close enough for families in need to access. In addition, a family member, usually the mother, must accompany the child to inpatient care and stay with the child during treatment, which can take several weeks. Many families feel this is a burden, as they cannot adequately care and provide for other family members and children. As such, access to services and the opportunity cost of remaining in inpatient care during treatment are challenges and disincentives for families. To overcome these obstacles, a new community-based management approach for treating SAM on an outpatient basis using a nutrient-dense, lipid-based RUTF has been used over the past 10 years and has dramatically increased coverage rates (Collins 2001).

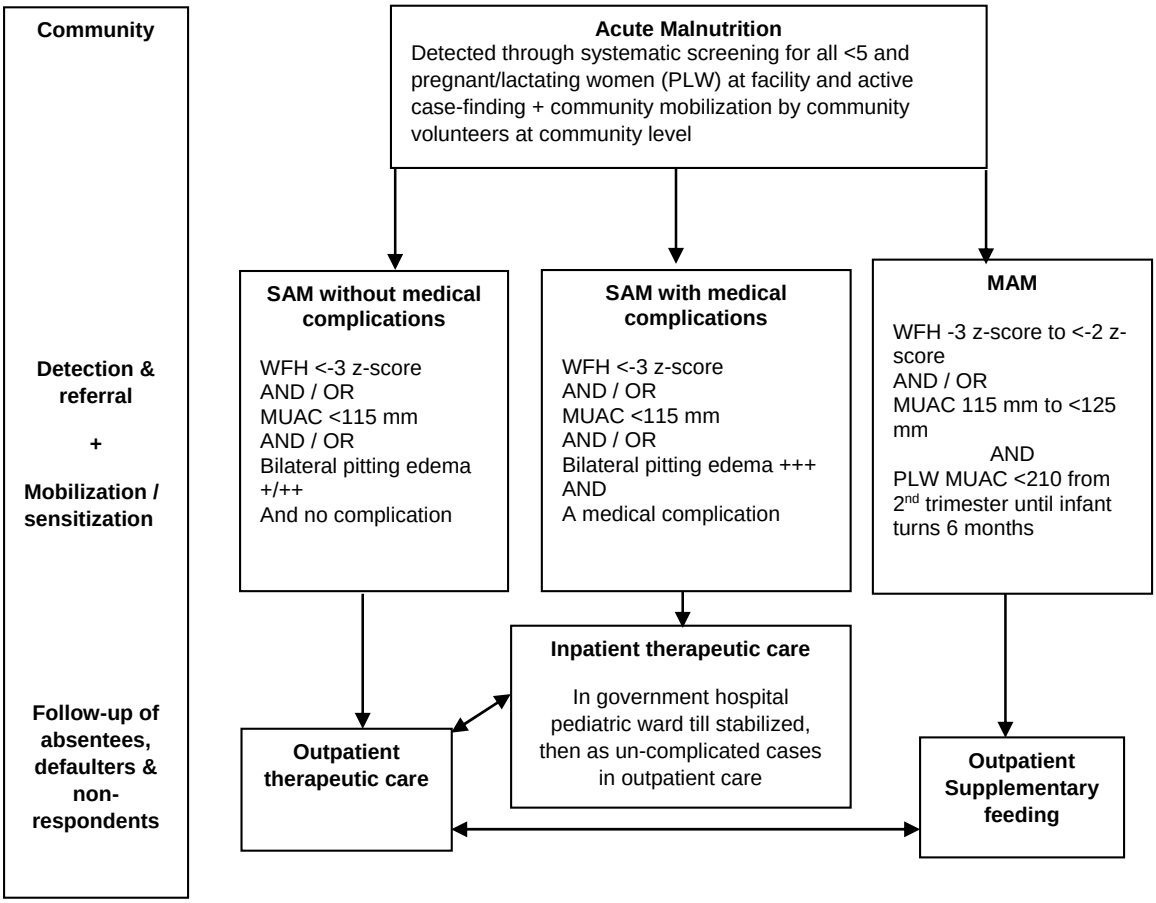
This new model of community-based care was endorsed by the United Nations in 2005 under the name Community-Based Management of Acute Malnutrition (CMAM) and has been adopted by over 25 national governments and all major relief agencies. This approach also was endorsed in 2007 through the joint statement on the community-based management of severe acute malnutrition (WHO, WFP, UN/SCN, 2007). With this introduction of safe, new products to treat most cases of severe malnutrition at home, there has been a massive expansion of services, allowing children to be treated in large numbers near their homes. In 2009, it was estimated that over 1 million children were admitted for treatment of SAM using the CMAM approach; the majority of these children were in Africa.

3.4 Current Standards and Criteria for CMAM

The core components of CMAM programs are universal and encompass all aspects of inpatient and outpatient treatment, strong community-based sensitization and involvement in screening and referral of

children, and activities around prevention and nutrition education. CMAM refers to the management of acute malnutrition through: 1) inpatient care for children with SAM with medical complications and all infants under 6 months old with SAM, 2) outpatient care for children with SAM without medical complications, 3) community outreach, and 4) services or programs for children with MAM that may be provided depending on the context (WHO et al. 2007, WHO and UNICEF 2009). The CMAM framework (Figure 3) includes the management of SAM through outpatient and inpatient care, the management of MAM through prevention and treatment, and community outreach that supports both.

Figure 3. CMAM Framework



The guiding principles behind the creation of the CMAM approach lie in the association between effectiveness and efficacy. While the original inpatient approach had high levels of efficacy—often with more than 85 percent of patients cured—its effectiveness was very low. This is because most severely wasted children would never be treated as they could not stay in hospital with their caregivers for weeks or, in the absence of a community sensitization program, their caregivers did not know a treatment facility existed.

CMAM provided an alternative approach, maintaining high levels of efficacy and increasing effectiveness. High levels of efficacy would be maintained by dividing severely wasted children between those with medical complications or no appetite and those without any complications and with a good appetite. The former would still be treated in the inpatient system, while the latter would be treated at

home with weekly provision of RUTF rations under a system similar to the one used for moderate wasting (Ciliberto et al. 2005).

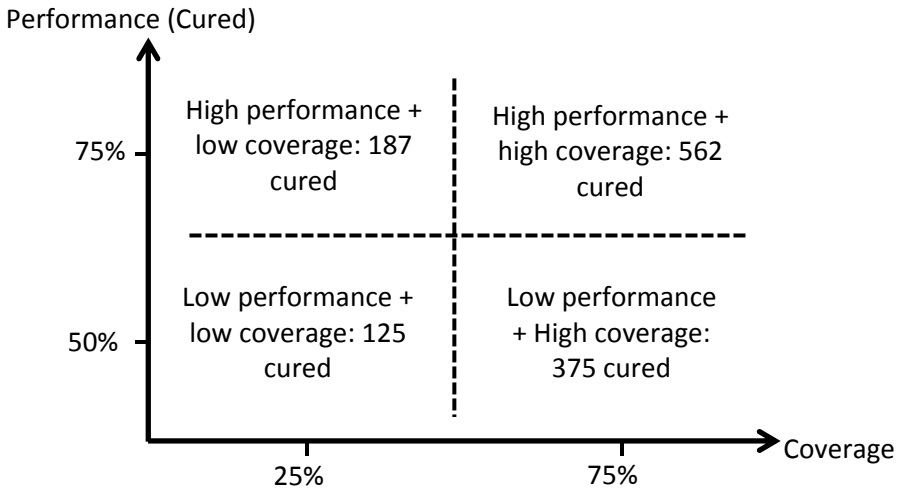
Effectiveness would be increased through higher attendance. The outpatient system makes it easier for families to bring their children for treatment because the opportunity cost of attending weekly distributions near their homes is much lower than spending weeks in a hospital ward.

However, community members have to be sensitized so that they know what malnutrition is, what its risks are, how and where to treat it, how and where to be referred to treatment centers, or how to use RUTF along with medicines. This community mobilization, which is at the core of the CMAM approach, allows coverage to reach high levels.

3.5 The Question of Coverage

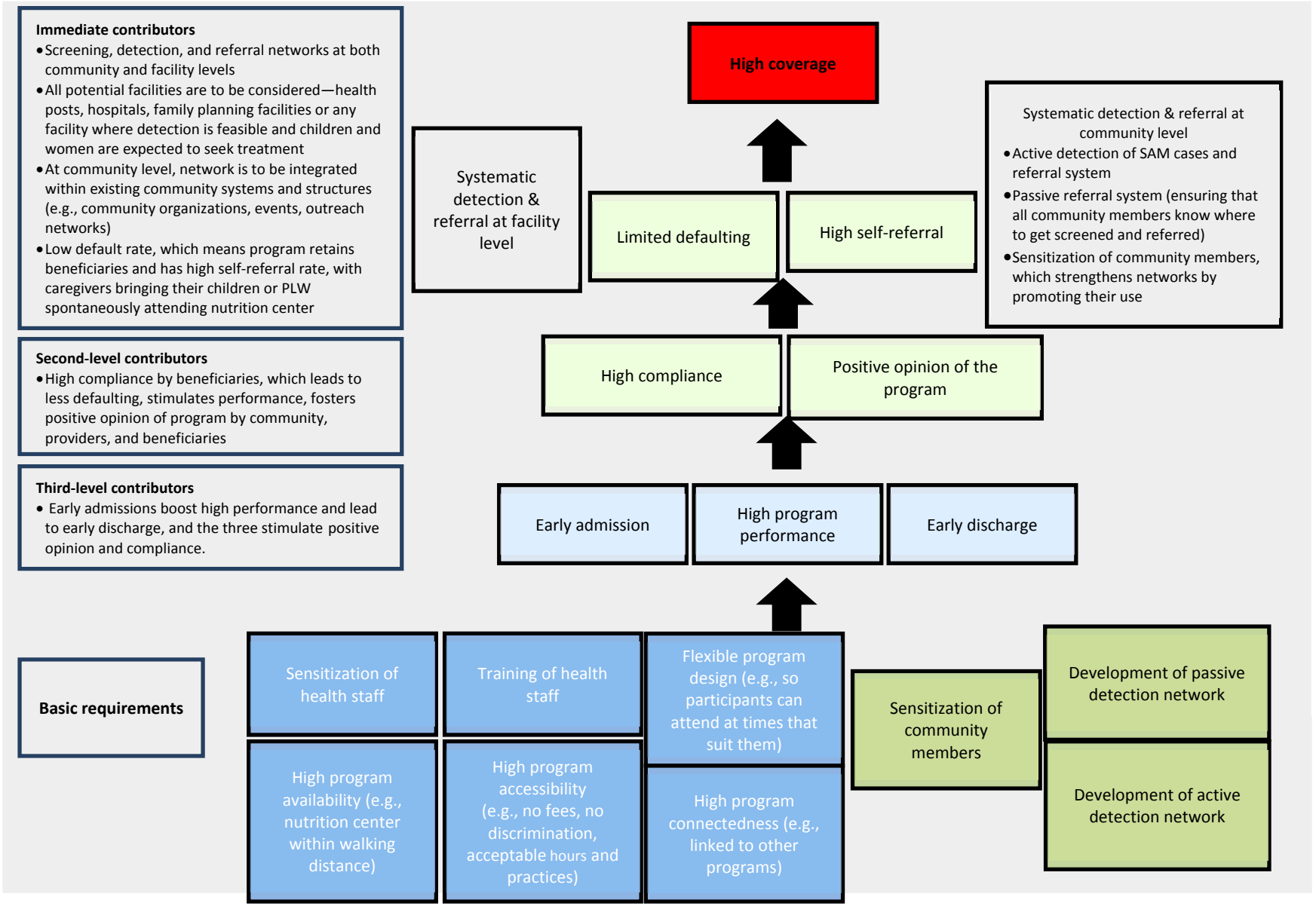
Figure 4 shows how coverage and performance (efficacy, as represented by recovery rates) relate to effectiveness. At similar rates of recovery, the impact of increased coverage is very significant. Although high recovery rates are essential in the CMAM approach, high coverage is the pillar it is founded on.

Figure 4. Comparison between Coverage and Performance in the CMAM Approach for an Area with 1,000 Severely Wasted Children



Coverage is a complex indicator; reaching high coverage as a program outcome requires implementation of all components of the CMAM approach (facility and community components). Figure 5 summarizes the most critical interventions around coverage.

Figure 5. CMAM Coverage Framework



3.6 Food Supplements and Therapies to Manage and Treat Moderate and Severe Wasting

3.6.1 Food Supplements and Therapies to Manage and Treat Severe Wasting

In the CMAM approach, treatment of severe wasting uses the same products that proved efficient when only inpatient care was available. RUTF products developed for CMAM are based on the formula for therapeutic milk F-100, which was the first such product that was successful in treating severely malnourished children (Golden 2010). F-100's use was limited to health facilities because it was used only in intensive care and because households might use the liquid therapeutic milk for other purposes. However, in most developing countries, there are few hospitals or facilities—especially in rural areas—with the capacity to treat severe wasting. As noted, this resulted in high default rates, many refusals to visit the treatment facility, and poor coverage because in many settings it was difficult for mothers to leave their families to take their severely malnourished children to the facilities for inpatient treatment that would last 2 to 4 weeks.

Progress in understanding the pathophysiology of SAM and the development of a lipid-based paste with a formula similar to that of F-100 laid the foundation for the CMAM approach. The first paste was a fortified peanut spread— now marketed as Plumpy'Nut—that was developed jointly by the French Institute of Research for Development and the manufacturer Nutriset in 1996. The paste allowed children with SAM who do not present medical complications and who maintained a reasonable appetite to be treated at home, with limited risk that the product would be misused. The paste and other similar products were termed RUTF, which the 2007 joint statement on community-based management of severe acute malnutrition (WHO et al. 2007) defined as: *high-energy, fortified, ready-to-eat foods suitable for the treatment of children with severe acute malnutrition. These foods should be soft or crushable and should be easy for young children to eat without any preparation. At least half of the proteins contained in the foods should come from milk products.*

The commercially marketed RUTF most commonly used are Plumpy'Nut and BP-100 biscuits. Both are high-energy, high-protein products and contain minerals and vitamins appropriate for rehabilitating severely malnourished children. They are more energy-dense than F-100 but have a similar nutrient-to-energy ratio. Plumpy'Nut can be eaten straight from its foil package or used to enrich home meals. It has a 24-month shelf life, is resistant to bacterial contamination, and has a low osmolarity. BP100 is a 300-kcal biscuit that can be eaten dry or crumbled in hot water to make a porridge. Both products have been shown to be efficacious in clinical trials (Ashworth 2006). In Sierra Leone, faster rates of weight gain were found with BP100 and F-100 at alternate meals than with F-100 alone (11.6 vs. 9.3 g/kg/day, $p = .05$) (Navarro-Colorado and Laquière 2005), and in Senegal, Plumpy'Nut supported faster growth rates than F-100 (15.6 vs. 10.1 g/kg/day, $p < .001$) (Diop et al. 2003).

In addition to milk-based formulas for inpatient treatment and the ready-to-use products, some programs also used modified family foods to treat SAM. In India in particular there are a wide range of experiments using combinations of indigenous local foods (Working Group for Children Under Six 2009). However, there is little evidence of the clinical efficacy of family foods for the treatment of SAM. In 2008, a study by Ferguson and Briend assessed the nutrient densities of local foods in Bangladesh, Ghana, and Latin America and concluded that even optimal combinations of community-based home-prepared rehabilitation diets for severely malnourished children are unlikely to achieve the nutrient density levels of formulas used in a clinical setting (i.e., F-100) without the supplementation of specific nutrients

(Ferguson and Briend 2008). The key nutrients that needed to be supplemented were identified to be vitamin E, riboflavin, thiamine, niacin, zinc, calcium, and copper. Arguments for the use of home-made versions of therapeutic foods for children included promotion of local agricultural practices through the use of locally available foods; promotion of local livelihoods in the context of general poverty and food insecurity, which could raise vulnerable households' economic status; and promotion of greater community participation and control. However, the difficulty of matching the nutrients in F-100 is a major constraint in using home foods to treat severe wasting, as most households with severely wasted children are highly food insecure and cannot afford the high-quality combination of nutrients required to treat severe wasting.

3.6.1.1 Efficacy

There are two types of efficacy studies on the treatment of SAM. One set focused on generating evidence on the efficacy of RUTF for home-based use relative to F-100 in facility-based settings. A second set compared the use of RUTF to foods prepared in the home. To establish the efficacy of RUTF relative to F-100, a systematic review analyzed studies that evaluated the efficacy of the WHO guidelines for management of SAM (Bhutta 2008). Data from 23,511 children on community-based management of SAM showed that the case fatality, recovery, and default rates were comparable to data from facility-based trials. Another systematic review of the efficacy and safety of RUTF noted that the use of RUTF for home management of uncomplicated SAM is safe and efficacious, but it also noted that most of the evidence emerged from studies conducted in emergency settings in Africa and that there is a need to generate more robust evidence in non-emergency settings (Tarun 2010). A Cochrane systematic review (Schoonees et al. 2013) assessed the effects of home-based RUTF on recovery, mortality, relapse, and weight gain. This review included four randomized and quasi-randomized trials; however, in general the authors felt data quality in all four trials was low. The authors were able to pool the data from only two studies; in a key comparison between RUTF and flour porridge, they found that severely wasted children who received RUTF were 32 percent more likely to recover (weight for height >-2 z-score) and 79 percent more likely to gain weight, though they could not show a reduction in risk of mortality or relapse. This latter finding is perhaps not surprising as both the mortality and relapse of severe wasting could be attributed to many other risk factors in the home. However, the sample sizes in the four studies and the pooled analysis were small and limit firm conclusions.

3.6.1.2 Effectiveness

In a review of the effectiveness of rehabilitating severely wasted children in community settings, where effectiveness was defined as mortality of < 5 percent or weight gain of > 5g/kg/day (Ashworth 2006), five of these trials utilized RUTF (in Senegal, Malawi, Sierra Leone, and Niger). One key determinant of effective community-based rehabilitation was shown to be the promotion of frequent feeds of energy- and protein-dense foods and the provision of micronutrients. Other shared features among successful programs included:

- Demonstrated awareness among the population of the basic principles of treatment of severe malnutrition
- Efforts to address wider social, economic, and health issues that face poor families (e.g., promotion of community participation and action as well as integration of SAM treatment with poverty-alleviation activities)
- Advocacy for provision of a high-energy, high-protein intake through frequent meals (at least five daily) and specific food mixtures that families could afford or through provision of RUTF

- Motivated and carefully trained staff

For the home-based programs providing RUTF that did not meet the criteria for mortality and rate of weight gain, Ashworth (2006) suggested a few possible reasons for ineffectiveness, such as sharing of RUTF among family members, inadequate frequency of feeding and too few meals, recurrent infections as a result of poor hygiene and sanitation, meals with inadequate nutrient density, persistent micronutrient and/or electrolyte deficiencies, replacement of home foods with RUTF (substitution rather than addition), and lack of involvement of other family members (e.g., fathers and mothers-in-law).

The literature on effectiveness of products for SAM in South and Southeast Asia clearly points to the need for further evidence on the design, production, and use of locally made therapeutic foods. In India, a number of locally produced "nutrimixes" are in use without having been fully evaluated through trials, and there is a growing demand for further research to be conducted on the efficacy and cost-effectiveness of both imported and locally produced therapeutic foods (Dubey and Malobika 2011; Working Group for Children Under Six 2009). The 2009 Indian National Consensus Workshop on Management of SAM Children through Medical Nutrition Therapy identified the following urgent research needs (Sachdev et al. 2010):

- Comparison of RUTF with locally formulated products for home-based treatment
- Physiological recovery and longer benefits of the above treatments
- Effect of introduction of RUTF on breastfeeding
- Operationalization and economic analysis in different settings: For example, the workshop statement suggests that nutrition therapy could be operationalized by the Health Ministry through the Integrated Management of Newborn and Childhood Illnesses, which has a component for the management of SAM. Outcome measures would be recorded after some time of implementation and include follow-up of rehabilitated children.

Despite concerns over the use of RUTF in India, the most recent consensus statement from the Indian Academy of Pediatrics (IAP) acknowledges the need for the judicious use of RUTF to manage severe wasting on an outpatient basis (IAP 2013).

3.6.1.3 Imported Versus Locally Produced Commodities for the Management of SAM

While there is general consensus and agreement on the composition of supplements and therapies needed to treat SAM, as noted by the global joint statement on management of SAM, there is much less agreement on the use of RUTF itself. This is further substantiated by the fact that the evidence in support of its use is not consistent across studies and the experience of using RUTF to treat SAM is perceived to be context-specific. The lack of robust randomized control trials that firmly establish the effectiveness and efficacy of this type of product further undermines the use of RUTF as a standard therapy globally. In addition, half of the cost of implementing a CMAM program is from the RUTF itself. Moreover, there is a restrictive patent in place with few global producers producing RUTF, and even with the ability to import RUTF, supply chain logistics remain a significant challenge in many contexts. Together, these constraints have led several countries in South Asia, particularly those with the highest burden of wasting, to seek local alternatives to treat SAM. But, even where countries have rejected importing RUTF, production of local RUTF is also a challenge. One issue is obtaining adequate quantities of quality ingredients required to produce RUTF. Another challenge is the time it takes from product testing to full-scale production to meet national need; it can take 3 to 5 years to bring this type of product to market.

In addition to the challenges surrounding the use of RUTF, there is limited understanding of the appropriate use of RUTF-type products. This has led many, particularly in South Asia, to consider RUTF as a product that replaces local foods, when in reality RUTF is a specific therapy intended for treating SAM cases. In part, this misconception is a result of lack of clarity on how to manage the two main forms of acute malnutrition, moderate and severe. As noted earlier, the majority of the cases of acute malnutrition involve moderate wasting and can be prevented and treated using locally prepared fortified foods, while severe wasting requires specialized treatment and therapies. This important distinction is not well understood, in part because the nutrition community has not clearly communicated—particularly to policymakers—which approaches are suited for different forms of malnutrition.

Another aspect that has contributed to the confusion is the fact that most global dialogue on treatment of malnutrition has focused on the management and treatment of severe wasting, and to date there is no global detailed guidance on the management of moderate and severe wasting. This gap in guidance has reinforced the perception that RUTF is appropriate to treat all grades of wasting, when in fact moderate wasting could potentially be managed through locally available fortified foods. Advancing global guidance on the management and treatment of moderate wasting could also go a long way in preventing and reducing the prevalence of severe wasting. To further reinforce the message that RUTF is a therapy to be used under certain supervised conditions, countries at the November 2011 CMAM conference in Addis Ababa recommended, among other things, that RUTF be registered as an essential supply/commodity in countries' essential-drug lists. This would allow easier integration of RUTF into national supply chains, ease the clearing of supplies at customs, and facilitate the integration of RUTF into central medical stores and government-led distribution and logistics systems.

While much of the focus of SAM treatment has centered on the use of RUTF—which is only one small part of a broader CMAM program—there has been much less focus on the challenges and minimum requirements of implementing an effective CMAM program. CMAM should be integrated within a broader health system, which is discussed later in this report. Effective implementation of CMAM to treat both MAM and SAM cases requires a strong community-based infrastructure in which the community is involved and aware of the problem of MAM and SAM, regular screening and referral of children, strong collaboration and coordination between outpatient and inpatient services, and regular follow-up of children who have participated in the program and been discharged. As such, the treatment and management of SAM and MAM require a strong continuum of care that is embedded within a broader health infrastructure, and within this system, RUTF is but one of the therapies needed, particularly targeted to SAM cases.

3.6.1.4 Use of Imported RUTF

Opposition to the use of imported products has been raised, mainly in India and Bangladesh. In India, stakeholders have disagreed about the role of product-based treatment in the management of SAM, and the guidelines for treatment of SAM, formulated by a large group of experts, warned that international RUTF may not be suitable, acceptable, cost-effective, and sustainable and instead recommend the use of home-based food (Gupta et al. 2006). In Bangladesh, the CMAM national guidelines (September 2011) stipulate that locally produced therapeutic products made from local food ingredients are preferred for community-based management of SAM. However, imported RUTF has been used for pilot programs, such as the Community Case Management of SAM program in southern Bangladesh (see Box 1).

All of the South and South East Asia countries reviewed use imported RUTF for CMAM programs except for Bangladesh (which, as noted, has used imported RUTF only in pilot programs), India, and

Vietnam. Among the countries that had data on performance indicators available at the time of this writing, most achieved the Sphere standard recovery rate of at least 75 percent (see Table 5). However, the average weight gain in Pakistan was considerably lower than the expected average of >5g/kg/day. (The results for Bangladesh in the table are for Community Case Management pilot study that used imported RUTF and has since concluded.)

Table 5. Performance Indicators of Outpatient Therapeutic Programs Providing Imported RUTF for the Treatment of SAM

Country	Cured	Default	Non-Cured	Death	LOS*	AWG*
Sphere standard**	**> 75%**	**< 15%**	**-**	**< 10%**	**≤ 60 d**	**> 5g/kg/d**
Afghanistan	82%	17.4%	-	0.5%	-	-
Bangladesh (pilot) (Bhola district)	91.9%	7.5%	0.6%	0.1%	37.4	6.7
Nepal (average of 5 districts)	86.1%	9.0%	1.2	0.7%	49	4.8
Pakistan (average of 6 districts)	91.5%	7.5%	0.8%	0.2%	70	2.0

* LOS: length of stay; AWG: average weight gain

** The Sphere Project, Humanitarian Charter and Minimum Standards in Humanitarian Response. 2011 Edition.

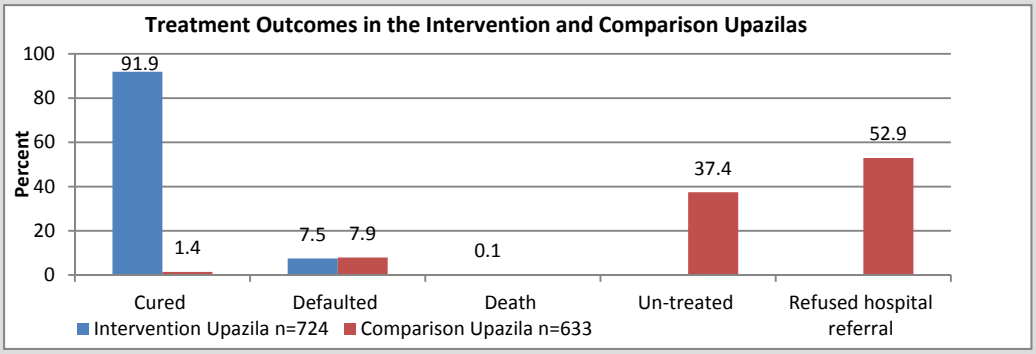
Box 1. Community Case Management of Severe Acute Malnutrition in Southern Bangladesh

A prospective cohort study was undertaken between June 2009 and June 2010 to examine the effectiveness and feasibility of adding the diagnosis and treatment of SAM to the Community Case Management (CCM) package delivered by community health workers (CHWs) affiliated with health facilities in Barisal Division in southern Bangladesh. The study included an intervention Upazila (Burhanuddin) and a comparison non-intervention Upazila (Lalmohan). In the intervention Upazila, children who were screened and identified as having SAM with medical complications received an initial phase of treatment in the health clinic with locally prepared F-75 formula. Once a child was discharged, treatment continued with imported RUTF (Plumpy'Nut) at home. In the comparison Upazila, children who were screened and identified as having SAM were referred to the Upazila Health Complex (UHC) for treatment. In the intervention Upazila, 724 SAM cases were identified and treated, while in the comparison Upazila 633 SAM cases were identified and referred to the UHC for facility-based treatment.

The CCM program used a decentralized network of CHWs for early identification and referral of children with SAM. All children over 6 months whom a CHW identified as having SAM were eligible for the intervention. Each CHW covered around 200 households and conducted one growth monitoring promotion (GMP) session per month. The GMP session covered a high percentage of children under 2 years in each community, and the addition of a MUAC and edema check ensured early identification of any child with SAM. This contributed to increased awareness of SAM and its symptoms among mothers, community health practitioners, and other community stakeholders.

The intervention Upazila treated 724 severely malnourished children, including 13 (1.8 percent) with nutritional edema. All children who were treated at home and monitored by the CHW received RUTF as a weekly ration in proportion to the child's weight, providing 175–200 kcal kg^{-1}/day^{-1} and 4-5 g protein kg^{-1}/day^{-1}. No child had an adverse reaction or symptoms suggestive of allergies to the RUTF. The CCM pilot study achieved extremely good results (92 percent recovery, 0.1 percent mortality, 7.5 percent default rate, average weight gain of 6.7g/kg/day) through a decentralized approach that enabled the early identification and treatment of children with SAM.

In contrast, of the 633 children referred to inpatient care in the comparison Upazila, 52.9 percent (335) never made it to the UHC or went home before completing treatment. Reasons that caretakers refused to take their children to the UHC for inpatient care included lack of permission and family support, distance to the facilities, opportunity cost of being at the facility, and lack of money to pay for transportation or the medicines required for treatment. In addition, study participants noted that the conditions at the UHC—including lack of hygiene and sanitation, poor quality of care and services, and lack of respect for patients and their families—were a disincentive for seeking treatment. Of the children referred to UHC for inpatient care, 37.4 percent were not admitted for inpatient treatment (i.e., they did not receive inpatient care) and were seen as outpatients only. Of the 62 children with SAM who were admitted to inpatient treatment, only 1.4 percent recovered.



This study demonstrated that the community-based management of SAM at the village level by CHWs can achieve high recovery rates and high coverage and be cost-effective compared to inpatient treatment of SAM. The cost per child treated and recovered in the implementation Upazila was $165 and $180, respectively, while in the comparison Upazila the cost for inpatient care was $1,344 per child treated and $9,149 per child recovered. The authors noted that there is a need to develop and test a locally produced RUTF to further improve cost-effectiveness.

Source: Sadler, K. et al. 2011.

3.6.1.5 Local Production of RUTF

Due to the importance of ensuring a regular supply of RUTF and in some cases, to the opposition to the use of imported products, several countries are exploring locally produced options for RUTF, either as a replacement or complement to global supplies. Potential benefits are expected to include reduced prices and transportation costs, shorter delivery times, and the contribution to local economies (in Malawi, 70 percent of the ingredients are purchased locally). Linking nutrition and agriculture through local production of RUTF using local crops grown by smallholder farmers could be a valuable way to improve food security in selected vulnerable populations (Briend and Collins 2010). However, there still are a number of constraints to producing RUTF at the country level, making local production fairly limited in relation to demand. These constraints include:

- A restrictive patent on Plumpy'Nut held by Nutriset, which means that the majority of the producers must be part of the Nutriset franchise or be supported by Valid Nutrition, a not-for-profit company with an agreement with Nutriset to operate in certain countries. Countries need a license to use the Nutriset formula. Some independent producers have attempted to produce a similar product, but the technical requirements to achieve the quality standards demanded by UNICEF have made it hard for these companies to succeed without experienced technical support.
- The sourcing and cost of ingredients (particularly sourcing of quality peanuts and the cost of milk powder)
- The quality control required to ensure that an absolutely safe product is supplied to such a vulnerable group.

3.6.1.6 Challenges

There are two main sets of challenges related to the use of RUTF to treat SAM cases: supply chain issues and implementation.

Supply Chain	Implementation
• Ensuring a sufficient and regular supply of RUTF at health facilities is one of the key challenges at country level (ENN 2011), including: o Logistical challenges in delivering RUTF as well as core medical treatments to care for children (such as antibiotics and deworming) o Breaks in supply chain can impair coverage and program attendance. o Reliance on limited sources of RUTF, affecting supply chain in some countries • Local production often requires import of ingredients and packaging material, which are subject to import duties, often increasing costs too high to justify local purchase (Komrska 2012). • RUTF is a heavy and bulky product, with one carton—one course of treatment for one child—weighing about 15kg. The cost of RUTF increases by 100 percent if shipped by air and by 10 percent if	• In Cambodia, inadequate training of caregivers on correct use of BP100 and no follow-up at home by community outreach workers to make sure that the information given was understood contributed to poor weight gains. • In Nepal, the remoteness and inaccessibility of the CMAM pilot districts were a challenge for ensuring timely supply of essential nutrition products and effective logistics. In addition, air and road services are extremely irregular during the winter season. • In Pakistan, delays in the provision of RUTF from UNICEF to the implementing partners (IPs) affected service delivery and the quality of program implementation. • In Indonesia, the lack of appropriate feeding practices was found to result in poor consumption of RUTF. It was also found that where staff had not delivered key messages adequately, mothers

Supply Chain	Implementation
shipped by sea. • Initially there was only one main global supplier (Nutriset in France), so there have been occasional supply shortages. While there has been some diversification of global production in the past years, with seven UNICEF-approved RUTF suppliers in six countries (Norway, United States, India, Kenya, Dominican Republic, South Africa), their prices are not yet as competitive as Nutriset's (UNICEF 2011).	considered RUTF to be of secondary importance to family foods. • In Myanmar, the high cost of the RUTF product (over 50% of the ACF program's total costs) and the need to import were key challenges.

3.6.2 Food Supplements and Therapies to Manage and Treat Moderate Wasting

Treatment of MAM is generally conducted through targeted supplementary feeding programs (TSFP). Target groups for TSFP include children 6–59 months of age, pregnant and lactating women, malnourished individuals on antiretroviral therapy and/or direct observed treatment short-course (DOTS) treatment (for people living with HIV and tuberculosis). TSFPs allow children recovering from SAM to continue their rehabilitation once discharged from outpatient therapeutic programs (OTPs) and can also be a vehicle for identifying cases of SAM.

Children with MAM have nutritional requirements that differ from non-malnourished and severely malnourished children. Their requirements for energy and essential nutrients exceed that of non-malnourished children but are lower than the intake required in outpatient treatment of SAM. Diets for treating moderately malnourished children should have an energy density (when they are ready to be consumed) of no less than **0.8 kcal/g** and should support rates of weight gain of at least **5g/kg/day** (Golden 2009). The recommended composition for supplementary food products is **20–43g protein** per 1,000 kcal and **25–65g** of fat per 1,000 kcal (WHO 2012).

Moderate malnutrition traditionally has been and continues to be treated at home by provision of supplementary rations children should consume in addition to the traditional family meals. Diets based largely on plant sources with few animal-source and fortified foods generally do not meet these requirements. In addition, poverty and food insecurity restrict access to nutritious diets with high protein quality, adequate micronutrient content and bioavailability, macro minerals and essential fatty acids, low anti-nutrient content, and high nutrient density (de Pee and Bloem 2009). Options for supplementary food include:

- *Ready-to-use supplementary foods (RUSF)*, such as biscuits and pastes, that are similar to the therapeutic foods used for SAM but with a different formula
- *Complementary food supplements* such as micronutrient powders (MNP) or powdered complementary foods containing micronutrients, protein, amino acids, and/or enzymes, or lipid-

based nutrient supplements (LNS),[3] which typically contain milk powder, high-quality vegetable oil, peanut paste, sugar, and micronutrients

- *Fortified blended food (FBF),* such as CSB, that is meant to be mixed with oil and sugar. For feeding young or malnourished children, FBF with improved formulas exist (e.g., CSB++, which has added milk powder).

The WHO technical note on supplementary foods (2012) provides a table (Annex 1) detailing the ideal formula for supplementary food products but also recognizes the need for further research on the composition, acceptability, and use of supplementary foods for the management of MAM to further validate the efficacy and effectiveness of the recommended formula (WHO 2012):

Results of ongoing and future research trials using the proposed composition of supplementary foods will be drawn on to build the evidence base for the World Health Organization (WHO) evidence-informed guidelines on the benefits and harms of the use of supplementary foods in the management of children with moderate acute malnutrition. Pending further research, supplementary foods used in the management of moderate acute malnutrition should conform to the above principles and the proposed nutrient composition …"

The dietary management of MAM ideally should be based on the optimal use of locally available nutrient-dense foods to improve the nutritional status of children and prevent them from becoming severely acutely malnourished or failing to thrive (Ashworth and Ferguson 2009). Intake of nutrients that are not inadequately supplied by the habitual diet can be increased through a number of approaches, including dietary diversification and fortification of certain staple foods with vitamins and minerals. Supplementary foods with varying nutrient compositions have been used to treat children with MAM, but their efficacy and effectiveness have been suboptimal (WHO 2012).

Evidence for the effectiveness of different commodities comes mainly from research conducted in African countries. A clinical trial conducted in Malawi showed that locally produced fortified blended flour (Supercereal Plus /CSB++) was not inferior to a ready-to-use product in rates of recovery for children treated for MAM (LaGrone et al. 2011). Other research cited by WFP as showing strong evidence for the use of new products include:

- In Malawi, children receiving milk/peanut or soy/peanut based fortified spreads (RUSF) showed significantly higher recovery rates (80 percent) after only 8 weeks of treatment, compared to fortified corn/soy blended flour (72 percent) (Matilsky 2009).
- In Niger, children receiving LNS showed higher weight gain, higher recovery rates (79 percent vs. 64 percent), a shorter length of stay, and lower transfer rates to inpatient care compared to CSB (Nackers 2010).
- In WFP operations in Ethiopia, children receiving RUSF showed higher recovery rates (73 percent), compared to CSB (67 percent).

[3]"Lipid-based nutrient supplements" (LNS) refer generically to a range of fortified lipid-based products, including RUTF and highly concentrated supplements such as Nutributter®. LNS formulations and doses can be tailored to suit the nutrient needs of specific groups (e.g., children under 2 years of age) and particular programmatic contexts (e.g., preventive or therapeutic programs).

As most of the studies have been conducted in emergency settings in Africa, a common concern among policymakers is that the results may not be applicable in a different context. To gather local evidence on the use of locally available products for management of MAM, a number of countries in Asia have initiated or are initiating research comparing the effectiveness of different approaches. Several studies have been conducted using different approaches to rehabilitate children with moderate malnutrition using local food recipes, complemented with nutrition education or other interventions focusing on infant and young child feeding (IYCF), but none achieved the target weight gain rate of **5 g/kg/day** used as a standard for supplementary feeding products (Golden 2009).

However, a Cochrane Systematic Review by Lazzerini and Pani (2013) pooled data from eight randomized trials, seven studies from Africa and one from Asia (Bangladesh), and found that MAM could be effectively treated by using either fortified CSB flours (CSB ++) or LNS. The authors found that the use of any specialized foods improved the recovery rate by 29 percent, decreased defaulting by 70 percent, and improved WFH, compared to standard care. The authors noted that the most recent formulation of CSB++ appeared to perform as well as LNS and, given the cost of LNS, the cost-effectiveness of newly formulated blended foods could be a good alternative to treating MAM at scale.

Of the 11 countries reviewed, two were using a locally produced RUSF (Pakistan, Vietnam), three used imported products (Afghanistan, Cambodia, Sri Lanka), four were producing local FBF used in SFPs for MAM (Bangladesh, Indonesia, Laos, Myanmar), and one was not providing supplementary food (Nepal). In Bangladesh, the supplementary food is used only for children with MAM living in food-insecure areas; food-secure families are encouraged to treat children with family foods (Institute of Public Health Nutrition 2011). Of the countries reviewed, only Pakistan had data on the performance of MAM treatment, which showed good results for all indicators except for the average weight gain that was below the expected rate (95.3 percent cured, 4.2 percent defaulted, 0.5 percent non-cured, no deaths, 71.5 length of stay, 1.75 g/kg/day weight gain). In Myanmar, pilot research on management of MAM was conducted in Rakhine State in 2009 by Action Contre la Faim (ACF) France (Salpéteur 2013), comparing three different supplementary rations provided to children with MAM: a local food ration consisting of rice, beans, sugar, and oil fortified with vitamin A and D; Supplementary Plumpy (RUSF); and Plumpy'Doz (LNS). While the results of the study are yet to be published and should not be considered final, findings seem to show that the local food ration and Supplementary Plumpy'Doz had almost equivalent outcomes on treatment of MAM.[4]

[4] The use of Plumpy'Doz did not show any positive outcome on treatment of MAM in this study.

Table 6. Commodities Used for MAM Treatment in Nine Countries

Country	Commodity for MAM	Local Production (LP) / International Procurement (IP)	Ration size	Nutritional value per ration	Efficacy trial conducted
South Asia					
Afghanistan	Plumpy'Sup (Development planned for new almond/ soybean-based RUSF product)	IP	92g	500 kcal, 12.5g protein	No
Bangladesh	Targeted SFP: Wheat-soy blend (WSB+), oil, sugar (Development planned for new chickpea-based RUSF products)	LP	235g	980 kcal, 40g protein, 40g fat	No (Planned)
Pakistan	Acha-Mum	LP	One sachet per day	520 kcal	No
Sri Lanka	CMAM (14 districts): Supercereal Plus (CSB++)	IP	200 g	752 kcal, 16.3% protein, 19% fat	No
Southeast Asia					
Burma/ Myanmar	ACF: Fortified mixture of 125 g rice, 125 g yellow beans, 50g sugar, and 43 g oil	LP			Yes (submitted for publication)
Cambodia	CSB++	IP	200g	820 kcal, 32g protein, 18g fat,	No
Indonesia	SFP program	LP	810g	1,500 kcal, 53g protein (14% of energy)	No
Laos	CSB++ / rice-soy blend+ and oil	LP	200g	1,000 kcal, 32g protein, 32g fat	No
Vietnam	Hebi-Mam (RUSF)	LP	92 g/one sachet per day	450 kcal	Yes (ongoing)

3.6.2.1 Challenges

Some of the challenges of using supplementary foods to treat moderate malnutrition mentioned include:

- FBF not being sweet enough for local taste
- In Pakistan, the use of RUSF was not well monitored, and there was some lack of compliance to the prescribed intake. Failure to meet weight gain targets in some districts indicate the need for improved monitoring to ensure that the RUSF is appropriately administered and utilized.
- Sharing of products with siblings and other family members
- In Pakistan, the logistics/supply chain was not always reliable, with interruptions affecting the quality of program implementation.
- In Sri Lanka, insufficient production led reduced ration sizes.
- Insufficient storage capacity in clinics and poor packaging in Sri Lanka

3.7 Connectedness of the CMAM Approach

The management and prevention of malnutrition among young children requires a multidimensional approach, including access to preventive and curative health services (Bhutta et al. 2008). In principle, CMAM should also include Essential Nutrition Actions, nutrition counseling for families, and other activities that identify and prevent the underlying causes of malnutrition, including nutrition insecurity (WHO 2012, Deconinck et al. 2008). Interventions integrated into CMAM can also be linked to the provision of conditional or non-conditional cash transfers and support to improve food security through agricultural activities, e.g. crop diversification.

CMAM services can be integrated into all or some routine health services, or throughout the health system as part of the health service delivery strategy or essential health care package mandated by a country's ministry of health (MOH) (ENN et al. 2008). Integrating CMAM into public health services requires significant buy-in from the community, training programs for community staff/volunteers, and systems of locally appropriate incentives for these community workers. The process of integration is facilitated if links to existing public health and nutrition activities, such as GMP programs, are established in the initial setup phase. In addition, to increase coverage of treatment of SAM, it is necessary for other existing child health-focused interventions, such as outpatient consultation services and Integrated Management of Childhood Illness (IMCI) activities, to incorporate the assessment and treatment of acute malnutrition. In theory, such activities would become routine if incorporated into the Basic Package of Health Services (BPHS) at a policy level.

In a review of community-based rehabilitation programs for treatment of severe malnutrition, Ashworth found that one feature of successful programs was that they went beyond mere rehabilitation and addressed wider social, economic, and health issues that poor households often face. Interventions included promoting community participation and action, and integrating rehabilitation with poverty-alleviation activities (Ashworth 2006). Linking CMAM with programs across sectors may provide additional opportunities for the identification of children with SAM, for continued rehabilitation of children following discharge from CMAM programs, and for using resources more efficiently (ENN 2011). According to Hailey and Tewoldeberha, the priority for CMAM programming is its integration into government health systems as part of the community-based fight to reduce mortality. This integration may help significantly scale up access to treatment, but it must be done while attaining a reasonable quality of care through health system strengthening. As noted in UNICEF's 2011 Global SAM Treatment Update, integration of management of wasting into the health system is increasingly gaining momentum as some MOHs adopt this as a part of their essential health package (UNICEF 2011a).

Integration of CMAM into the health system in any country encompasses adaptation, creation, and implementation of a wide range of tools and activities from the national government level to the field level. At field level, it includes incorporating components of OTP care, inpatient care, and community mobilization and outreach activities into health care services, from primary to tertiary care. Effective integration into health care services requires functioning systems and associated support at different levels (Gatchell et al. 2006):

- *National policy level*—Demonstrated commitment through a health policy and strategy that address treatment of severe malnutrition
- *Regional or district level*—Functional regional or district health system and appropriate capacity for service provision
- *Community level*—Strong community participation and active screening

An effective referral system is critical to the CMAM approach, both between inpatient and outpatient care and between these units and the communities they cover. Because children suffering from acute malnutrition are highly vulnerable to infections, an efficient community outreach network for early detection of MAM and SAM, referral of children with SAM, and follow-up of the treatment at home is an effective way to limit the number of cases with complications. The referral of cases between SAM and MAM treatment units is often recognized as a challenge in CMAM programs, especially if the units are supported by different agencies. The absence of a referral center or the lack of good communication between the units within CMAM can lead to children being lost to follow-up.

Once referred to treatment units, a child diagnosed with SAM needs an evaluation of his/her medical condition by a clinically skilled health care provider, who will decide whether to refer the child to inpatient or outpatient care. A core component of CMAM is that any child with SAM who develops a complication needs immediate referral and access to inpatient care due to increased risk of death (Deconinck et al. 2008). Therefore, a proper referral system between outpatient and inpatient is essential. In addition to detection and referral of children with SAM, community outreach promotes people's understanding of acute malnutrition and its management, and enhances the coverage of CMAM services.

The 2007 joint statement on CMAM (WHO et al. 2007) that promotes integration with programs that address child health and survival notes: "*Integrating the management of severe acute malnutrition with other health activities, such as: preventive nutrition initiatives, including promotion of breastfeeding and appropriate complementary feeding, and provision of relevant information, education and communication (IEC) materials, and with activities related to the Integrated Management of Childhood Illness at first level health facilities and at the referral level, and initiating such activities where they do not exist.*"

Further, in a statement endorsed by global and national nutrition stakeholders during the CMAM conference held in Addis Ababa in November 2011,[5] participants noted that:

- Management of SAM and MAM are integral parts of CMAM.
- CMAM is one of the basic health services to which a child should have access, delivered by the same means by which other services are delivered.
- CMAM should be embedded as part of a broader set of nutrition activities (IYCF, stunting reduction, micronutrient supplementation, etc.)
- In turn, integrated nutrition services that include CMAM are integrated within a multisectoral approach to tackle the determinants of undernutrition.

For community initiatives to be integrated across sectors they must be realigned from disease-specific interventions to evidence-based integrated packages with a focus on maternal and child health and nutrition (ENN et al. 2008). Recent efforts to do so among countries in South and Southeast Asia include the development of multisectoral nutrition action plans and committing to scaling up both nutrition-

[5] This is not an official definition but may provide a useful basis to define exactly what is meant by "integration" in the context of CMAM.

specific and nutrition-sensitive programs through, for example, the Scaling Up Nutrition (SUN) Movement.

Despite the growing recognition that CMAM services should be provided as a part of a broader set of preventive and curative health services, ideally through the national health system, in most countries, CMAM has been implemented only partially. In these cases, the focus is most often on the management of severe wasting, with few—if any—services to manage moderate wasting. In addition, in most countries, CMAM is implemented as a stand-alone program and not integrated within the broader health services. Of the studies reviewed in this review, none provide any insights or conclusions on how CMAM should be integrated in health systems, although several studies highlighted the effectiveness of community-based approaches in comparison to facility-based treatment. In Pakistan and Bangladesh, the use of CHWs for follow-up of children in OTP contributed to high recovery rates. In Nepal, implementation of CMAM through an integrated program with other child health and development strategies, delivered through government structures, was found to be the most feasible operational model due to its relatively low costs, strong ownership of the government, human resource generation at the local level, and community outreach potential. A few studies in this review mentioned the following interventions in combination with CMAM: growth monitoring, health and nutrition education, IYCF, micronutrient supplementation, supplementary food, psychosocial stimulation, counseling on the importance of breastfeeding, use of safe water and hygienic practices, and preparation of nutritious, low-cost diets using locally available food items. A few lessons learned from incorporating these types of components include:

- Community mobilization that includes follow-up of treated children increases adherence to treatment and promotes linear growth.
- Use of a decentralized network of community workers for early identification and referral has proven successful in enhancing coverage of treatment facilities.
- Providing food supplements encourages greater attendance at follow-up appointments.
- Intensive nutrition education in combination with food supplements or MNP results in higher weight gain and recovery rates than nutrition education alone.

3.8 CMAM Successes in Other Regions of the World

Most initial CMAM experiences and operational research occurred in sub-Saharan Africa; therefore, most of the available literature on best practices applies to this context (Briend and Collins 2010). For example, the 2011 CMAM conference in Ethiopia included case studies from nine countries at various stages of CMAM scale-up—eight were from African countries and one was from Asia (Pakistan).

Experiences on CMAM in sub-Saharan Africa have been documented, and evidence has been built on the approach's efficacy. Use of RUTF through community-based programs has resulted in high rates of recovery in many countries, as documented for Malawi (Trehan et al. 2013) recently or earlier in countries such as Ethiopia, North Sudan, and South Sudan (Collins 2004). In Uganda, Chad, Senegal, and Burkina Faso, evidence suggests that RUTF consistently leads to high recovery rates for uncomplicated SAM cases (Gera 2010). While no robust evidence exists on direct associations between community mobilization and sensitization on coverage of CMAM programs, a large number of operational coverage surveys conducted in a wide range of contexts and programmatic settings show consistently higher coverage in programs with extended and sustained community sensitization and detection and referral networks. Both evidence and experiences with CMAM in African settings suggest that the approach

requires RUTF-type product for efficacy and a comprehensive community mobilization approach for effectiveness.

While several countries in Asia are increasingly scaling up efforts to tackle acute malnutrition, most of the CMAM programs are still implemented as pilot projects. Demand is high for further evidence on effective approaches in the context of Asia. Political commitment to embedding CMAM in a national strategy to tackle undernutrition is largely dependent on an evidence base, and the lack of evidence in the Asian context may have contributed to the slow pace at which CMAM has been incorporated into national policies, plans, and programs in these countries.

This has been particularly true for the community-based management of MAM, where the lack of research and agreement on interventions has led to the implementation of CMAM without a clearly defined strategy for treating MAM. Another major challenge faced by most countries is the lack of sustainable funding for scaled-up programming.

However, willingness and recognition of the importance of addressing malnutrition are not lacking in South Asia. Countries engaged in the SUN Movement have committed to increasing coverage of proven interventions that improve nutrition during the 1,000-day period between a mother's pregnancy and her child's second birthday, including the treatment of severe malnutrition (SUN 2012. Of the 34 countries participating in the SUN Movement globally, five are in South and Southeast Asia: Bangladesh, Indonesia, Laos, Nepal, and Sri Lanka.

3.9 Current Policy and Program Environment for the Management of Acute Malnutrition in South and Southeast Asia

3.9.1 Policy Environment

In both South and Southeast Asia, the policy environment around the management of acute malnutrition within the broader nutrition policy framework is variable (Table 7). Except for Afghanistan, which has clearly articulated its goals for the management of acute malnutrition within its basic package of health services, several other countries in South Asia have a limited policy framework for nutrition. Bangladesh and Pakistan have guidelines on the management of acute malnutrition but do not have a broader national framework for nutrition. India, which has both the highest prevalence and greatest numbers of children affected by acute malnutrition, lacks a broad national framework for nutrition and specific guidelines on acute malnutrition are absent. In contrast, Sri Lanka and Nepal have national nutrition policies, but they do not clarify policy objectives for the management of acute malnutrition.

In Southeast Asia, Vietnam is the furthest ahead in some regards in that IMAM guidelines are being integrated into its broader National Nutrition Strategy. Similarly, Cambodia has developed national CMAM guidelines that are a part of broader strategies for addressing malnutrition. Indonesia has a clear focus on reducing chronic malnutrition but has not articulated policy objectives on the management of acute malnutrition. Laos and Myanmar do not as yet have recent policies on the management of acute malnutrition that are publicly available.

It is interesting to note that the countries with the highest burden of acute malnutrition—India, Bangladesh, Pakistan, and Indonesia—are the very countries that have important gaps in their national policy frameworks for nutrition.

3.9.2 Country Program Experiences

As noted, relative to other regions, South and Southeast Asia have fewer clinical trials on the efficacy and effectiveness of specialized foods for the management of acute malnutrition, and in general there is a lot of opposition in certain countries regarding the use of specialized foods to treat acute malnutrition. However, several countries in these regions have experience with national or sub-national programs for the management of acute malnutrition (Table 8). Afghanistan and Nepal have CMAM programs that are integrated within the broader health system in the districts they serve. Afghanistan, Bangladesh, Pakistan, and Nepal have experience with working with community-based workers for the screening, referral, and management of acute malnutrition cases, though the scale of this experience varies by country. For example, in Bangladesh, using CHWs proved to be a very successful approach in a pilot program. In contrast, in Southeast Asia, only Vietnam is working toward scaling up acute malnutrition management and treatment through the national health system, followed to some extent by Cambodia. Indonesia has had limited success in its previous CMAM pilot, and many aspects of the program would need to change for it to be successful.

The countries that have been more successful at implementing CMAM for the most part have also had low prevalence of acute malnutrition. Tables 9–16 provide more details on the program experience of eight countries. As reflected by those tables, the notable exceptions that do not have current program activities for managing acute malnutrition are India and Bangladesh. As noted, India has 26 million acutely malnourished children, while Bangladesh is home to 2.2 million. The fact that India does not have any programming on acute malnutrition is a significant concern given the number of children affected.

Countries in South Asia have had different experiences with the management of acute malnutrition, and the extent to which these activities are integrated within the broader health system is highly variable as well. For example, the CCM pilot that was completed in Bangladesh was very successful in embedding CMAM activities within a broader set of preventive nutrition activities and in using CHWs to screen, refer, and follow up with children. Part of the success of this pilot project and others like it stems from making CMAM activities an integral part of a broader health system. As such, where CMAM activities are undertaken within a continuum of care that provides both preventive and curative nutrition services, the impact on preventing, managing, and treating all forms of malnutrition appear to be greater.

Countries across South and Southeast Asia have also had varied experience in the management of MAM. In South Asia, where the burden of MAM is the greatest, Pakistan appears to have made strides in developing a local RUSF that can be used to manage and treat MAM. Sri Lanka also is investing in FBF that will be distributed through its national health system to reduce the prevalence of MAM. In Southeast Asia, Vietnam, Cambodia and Myanmar have had success to varying degrees in managing and treating MAM. In Vietnam, a locally produced RUSF is used. Effective approaches to treating MAM in South Asia could go a long way in also reducing the prevalence of SAM as treating children with MAM in the early stages of acute malnutrition can stave off the slide into SAM. These experiences carry important lessons that could be applied to other countries in these regions.

Table 7. National Policies for the Management of Acute Malnutrition

Country Policy Document	Policy Objectives
South Asia	
Afghanistan National Public Nutrition Policy and Strategy 2010–2013 (under Ministry of Public Health)	• Establish and strengthen systematic screening of children in health facilities (both outpatients, inpatients) and establish a system of referral with the nearest OTP or therapeutic feeding unit. • Strengthen the capacity of CHWs to screen children at household and basic health post levels, using MUAC. They should refer children with MUAC <11.5 cm to the nearest Basic Health Centre for a complete diagnosis and referral to the appropriate treatment facility. The screening of SAM by CHWs can be linked with other health-related community mobilization activities and groups, such as community-based GMP and Family Health Action Groups. • Establish a follow-up system whereby cured children are referred to the CHW and Family Health Action Groups for support in preventing relapse. Absentees should be followed up by CHWs and referred back to the health facility for therapeutic food and care. Reasons for defaulting should be identified.
Bangladesh National CMAM Guidelines 2011	• Provides guidelines on the detection, screening, and treatment of SAM and MAM, and aligns with international guidelines. However, while nutrition treatment is mentioned in the guidelines, there is no specific guidance on the type of supplementary foods to be used.
India National Nutrition Policy 1993 (under Ministry of Human Resource Development	• The last nutrition policy dates from 1993 and is too outdated to consider as a guiding document on nutrition overall and on the management of acute malnutrition specifically.
Nepal National Nutrition Policy and Strategy 2004 (under Ministry of Health and Population)	• Does not include specific objectives or strategies on the treatment and prevention of acute malnutrition.
Pakistan Integrated Nutrition Strategy (PINS) 2011	• Pakistan does not have a national nutrition policy, but PINS, a multisectoral strategy developed in 2011, envisions the integration of CMAM and other nutrition programs into the health care system, with health workers responsible for service delivery through both hospitals and community outreach. Lady health workers (LHWs), who assisted with CMAM community outreach, receive incentives from the government instead of working voluntarily, which is expected to increase their motivation to perform well. However, greater use of government-supported LHWs will require that their numbers increase to avoid overburdening. The actual implementation of the envisioned integrated strategy will require stronger partnerships between the supporting agencies (WFP, WHO, UNICEF and implementing partners) and the government, with the government taking an increasing role in accountability, coordination, financing, and monitoring.

Country Policy Document	Policy Objectives
Sri Lanka (under Ministry of Healthcare and Nutrition)	• National Nutrition Policy does not include a specific section on acute malnutrition.
Southeast Asia	
Cambodia National Guidelines for the Management of Acute Malnutrition 2012 (under Ministry of Planning)	Policy objectives include: • Scale-up of inpatient management of SAM in hospital • Scale-up of outpatient management of SAM without medical complications at health center • Management of MAM with targeted supplementary feeding • Case finding/screening, monitoring, and follow-up at community level • Development of CMAM
Indonesia National Action Plan for Food and Nutrition 2006–2010 (National Development Planning Board)	• Policy discusses malnutrition and includes targets for reducing malnutrition, excess nutrition, and micronutrient deficiencies • Does not include specific policy objectives on the treatment and prevention of acute malnutrition
Laos National Nutrition Policy 2008 (under MOH)	• Defines and discusses malnutrition but does not include specific objectives on the treatment and prevention of acute malnutrition
Myanmar National Plan of Action for Food and Nutrition 1994 (under National Health Committee)	The 1994 nutrition policy, which has not been updated, identifies the following objectives: • Reducing the rate of severe malnutrition from 11% to 5% among children under 3 years • Reducing the rate of moderate and severe malnutrition from 37% to 19.5% among children under 3 years • Reducing the rate of stunting from 29% to 15% among children under 5 years • Reducing the rate of low birth weight from 24% to 10% • Reducing iron deficiency disorders • Eliminating iodine deficiency disorders • Eliminating vitamin A deficiency and its consequences • Enabling all women to exclusively breastfeed their newborns in first 4 to 6 months and to continue breastfeeding with complementary food well into the child's second year • Increasing the coverage of monthly GMP activities for all children under 3 from 32% to 100% • Expanding skills, knowledge, and supporting services to increase household food security from 32% to 90%.

Country Policy Document	Policy Objectives
Vietnam National Nutrition Strategy 2011–2020 (under MOH)	The IMAM program has been included in the 2011–2020 National Nutrition Strategy and the 5-year National Action Plan for Nutrition (UNICEF 2011b). Based on the experience from 6 months of implementation in Kon Tum Province, IMAM guidelines have been formulated and submitted to the Minister of Health for approval. Efforts are also ongoing to make evidence and costing data available for including IMAM services and products in the National Health Insurance Scheme/Law, set to be approved by National Assembly in 2014. After the pilot period, the program is expected to be scaled up at national level and its services and products for detection, treatment, and follow-up of acute malnutrition are expected to be included in the National Social Health Insurance and other health financing mechanisms. The National Nutrition Strategy includes the following objectives: • The prevalence of chronic energy deficiency in reproductive-age women will be reduced to 15% by 2015 and less than 12% by 2020. • The rate of low birth weight (less than 2,500g) will be reduced to less than 10% prevalence by 2015 and less than 8% by 2020. • The rate of stunting in children under 5 years old will be reduced to 26% by 2015 and to 23% by 2020. • The prevalence of underweight among children under 5 years old will be reduced to 15% by 2015 and to 12.5% by 2020. • By 2020, the average height of children under 5 will increase by 1.5 – 2cm in both boys and girls, and height in adolescents of each sex will increase by 1–1.5 cm compared with the averages from 2010. • The prevalence of overweight in children under 5 will be less than 5% in rural areas and less than 10% among urban populations by 2015 and will be maintained at the same rate by 2020. • By 2030, Vietnam aims to reduce child malnutrition to less than the level of public health significance (stunting rate of less than 20% and underweight rate of less than 10%).

Table 8. Planned and Ongoing Programs for Management of Acute Malnutrition in 11 Countries

Country	Program	Geographic Target Area	Existing CMAM National Guidelines?	Existing Evaluations/ Assessments of Approach?
South Asia				
Afghanistan	CMAM	15 provinces (119 districts)	Yes	None found
Bangladesh (planned)	CMAM as part of National Nutrition Services 2011–2016	National	Yes	N/A
India (planned)	CMAM pilot	Madhya Pradesh (two districts) and Orissa states	No	N/A
Nepal	CMAM	Bardiya, Achham, Kanchanpur, Mugu, Jajarkot (pilot districts); expanding to six new districts	Yes	Yes (UNICEF, 2011)
Pakistan	CMAM	Punjab, Sindh, KPK, FATA and Baluchistan provinces (42 districts)	Yes	Yes (UNICEF, 2011)
Sri Lanka	Nutrition Rehabilitation Program	National (14 districts planned for MAM treatment in 2013)	Yes	Yes (Medical Research Institute survey, health management information system)
Southeast Asia				
Cambodia	CMAM pilot	2 provinces	Yes	Yes, on initial implementation (Valid, 2011)
Indonesia	CMAM pilot	Nusa Tenggara Timur (NTT) province, Sikka District (5 sub-districts)	Yes	Mid-term evaluation planned
Laos	CMAM pilot	Attapeu, Saravane, and Savannakhet provinces (13 districts)	Yes	Planned for February 2013
Myanmar	CMAM	Rakhine State	Yes	Yes (ACF, 2009)
Vietnam	IMAM	Kon Tum Province	Yes	Yes (UNICEF, submitted for publication)

Table 9. Country Experience in Afghanistan

Prevalence of MAM: 7%	**No. of Children under 5 affected by MAM: 329,000**
Prevalence of SAM: 7%	**No. of Children under 5 affected by SAM: 353,000**
Program type: Integrated CMAM program that provides screening and treatment for SAM and MAM	
Scale of Program: Sub-national, pre-2009 (pilot start year not stated; SFP added in 2009), piloted in nine provinces	
Geographic target area: 15 provinces (119 districts)	
Management of SAM	
Product: Imported RUTF	
Programmatic approach: CMAM is integrated into routine health services delivered under the Basic Package of Health Services (BPHS) (Afghanistan Ministry of Public Health 2011). The prevention and treatment of acute malnutrition will be fully integrated with maternal and child nutrition and health activities such as micronutrient supplementation and promotion of optimal IYCF with nutrition education messages and use of micronutrient-enriched local foods. The seven elements of the BPHS are: • Maternal and newborn care • Child health and immunization • Public nutrition (prevention and management of malnutrition) • Communicable disease treatment and control • Mental health • Disability and physical rehabilitation services • Regular supply of essential drugs	
Evaluations: • Identified a missing link between the different components of CMAM (community mobilization, SFP, OTP/ TFU) (ACF and European Union 2012) primarily because there was no parallel monitoring system that would verify and control the links between different units • Need to strengthen the referral of patients between SFP and OTP • Need to improve follow-up of discharged patients to avoid relapses	
Management of MAM	
Product type: Plumpy'Sup	

Table 10. Country Experience in Nepal

Prevalence of MAM: 8%	**No. of Children under 5 Affected by MAM: 287,000**
Prevalence of SAM: 3%	**No. of Children under 5 Affected by SAM: 89,000**
Program type: CMAM	
Scale of Program: 5 districts plus 6 new districts planned 2008 5 districts in 2008 pilot, IMAMI in 6 additional districts since 2012	
Geographic target area: Bardiya, Achham, Kanchanpur, Mugu, Jajarkot (pilot districts); expanding to six new districts	
Management of SAM	
Product: Plumpy'Nut, EeZeePaste, and Imunut	
Programmatic approach: Three models for integrating CMAM into routine health services provided by the Ministry of Health and Population (MOHP) were tested during the pilot phase. The evaluation determined that direct technical support to the government through an integrated program with other child health and development strategies is the most feasible operational mode due to its relatively low costs, strong ownership by the government, human resource generation at the local level, and community outreach potential. This model included the following components: • Hiring CMAM monitors for the first year to support district public health officers (D/PHOs) • OTPs and stabilization centers (SCs) are managed in the government health facilities • Government is overall responsible for planning, implementation, review, and monitoring • Screening, referrals, and follow-ups done by female community health volunteers (FCHVs) • Funds goes to District Health Office (DHO) for all operations • RUTF, which alone has an average cost of US$38.60 per child.	
Implementation challenges: • The remoteness and inaccessibility of the CMAM pilot districts created difficulties for ensuring timely initiation of CMAM activities, provision of essential nutrition supplies, and effective logistics. Furthermore, air and road services are extremely irregular, particularly during the winter season. • To prevent stocks from running out, more effective logistics have been promoted based on seasonal constraints and varying transportation costs, and health workers were asked to ensure a regular supply by ordering RUTF 3 months in advance. The advance orders and delivery through the national health logistics system were highlighted as good practices in Nepal by the 2011 evaluation, as was the practice of providing FCHVs with the funds needed to transport RUTF within the districts.	
Evaluations: Integration of CMAM into the national health system was noted as weak due to the lack of qualified staff and high turnover of professional health staff, managers, and health care providers from the district to the grass roots levels (UNICEF 2012a). Service provision was found to be dependent on technical assistance from UNICEF through NGOs, which provided CMAM monitors and nutritionists as well as funds for transporting the required RUTF. The implementation of CMAM in the pilot districts relies on external funding for the majority of costs and is totally reliant on UNICEF for procurement of RUTF, which is not sustainable (UNICEF 2012a). Furthermore, not enough emphasis was placed on addressing capacity for management of MAM through counseling and home visits. FCHVs experienced constraints such as overburdening by numerous programs, access and transport problems, and inadequate incentives. To address this weakness and strengthen the capacity of MOHP staff, the CMAM evaluation made these recommendations: • Develop the needed national human resource capacity for ongoing management and scaling up of CMAM and development of Integrated Management of Acute Malnutrition, including Infants (under 6 months) (IMAMI) efficiently through joint planning among stakeholders (the MOHP plans to expand the CMAM program as IMAMI in six additional districts). • Strengthen central MOHP leadership for nutrition services and central and district supply management. • Strengthen the role of FCHVs in community outreach through the provision of transport, capacity strengthening initiatives, and incentives. • Include refresher training, training to improve counseling, and advanced training for management of	

acute malnutrition. • Scale up CMAM in the current pilot districts and in new priority districts using direct technical assistance and support to the government through joint assessment and planning that identifies multisectoral nutrition stakeholders, integrates CMAM scale-up with other child survival and development programs, covers sensitization to CMAM, and identifies the most vulnerable groups and their characteristics. • Ensure the Government of Nepal's commitment to increasing its share of funding and donors' commitment to providing funding and technical support to scale up IMAMI to six new districts and continue the existing CMAM program in five districts. Program funds to anticipate higher costs in Hill and Mountain areas, and reduce costs by involving multisectoral nutrition community members in screening and self-referrals. • Support local production of RUTF for longer-term sustainability and cost-efficiency, particularly during scale-up phase. Support improvement of Sarbttompitho supplementary food based on understanding of current complementary feeding practices and its promotion based on a carefully designed social marketing strategy. • Provide support to the national health system to integrate CMAM with other child survival and development programs.
Management of MAM
No supplementation—counseling only

Table 11. Country Experience in Pakistan

Prevalence of MAM: 9%	**No. of Children under 5 Affected by MAM: 2,012,000**
Prevalence of SAM: 6%	**No. of Children under 5 Affected by SAM: 1,260,000**
Program type: CMAM pilot	
Scale of Program: Sub-national, 2008, 42 northern, central, and southern districts of Khyber Pakhtunkhwa (KP)	
Geographic target area: Punjab, Sindh, KPK, FATA, and Baluchistan provinces (42 districts)	
Management of SAM	
Product used: Plumpy'Nut	
Programmatic approach: LHWs assisted with CMAM by sensitizing families, facilitating screening, and encouraging parents to send their children to the SFP/OTP. The Pakistan Integrated Nutrition Strategy (PINS), a multisectoral strategy developed in 2011, envisions the integration of CMAM and other nutrition programs into the health care system, with health workers responsible for service delivery through both hospitals and community outreach. LHWs receive incentives from the government instead of working voluntarily, which is expected to increase their motivation to perform well (see table 7).	
Effectiveness and acceptability: Acceptance of RUTF is reportedly high, including recognition by fathers that RUTF was more effective in treating malnutrition than traditional food and medicine and mothers' perception of the products as medicine (UNICEF 2012b). The average cost of treatment for a child in OTP with the imported product was US$145, with costs rising significantly higher per beneficiary for cases with severe medical complications.	
Implementation challenges: Supply chain challenges delayed the provision of RUTF to the IPs, making service delivery less efficient and affecting the quality of program implementation. It was recommended to pre-position supplies and keep contingency stocks to ensure availability. Another recommendation was to strengthen national capacity to develop and produce a local RUTF and support a few national food-processing companies to produce it in the quantities required.	
Evaluations: • Linkages between the OTP and SCs were not fully established, making it difficult to trace children who are discharged from SCs. • The referral of cases to SCs from OTPs was only 1% of total OTP admissions in KP, signifying a very low follow-up rate. • Reasons for the low level of successful referrals from OTP to SC include: the distance between the OTP and SC was 10-20 km; in many districts SCs were not available and were being established during the evaluation; and some children with complications were not identified and referred due to absence of medical doctors in the health facilities. • Although health centers and hospitals housed the CMAM activities, CMAM was not well integrated into the facilities' activities. It was believed that establishing CMAM sites in government-run facilities would ensure sustainability of CMAM after the emergency phase ended. Instead, CMAM was implemented largely as a parallel system with IPs responsible for staffing, monitoring, and capacity development. • The program lacked a strong foundation for carrying out CMAM activities over the long term, and the short-term emergency-funded arrangement was not likely to yield substantial reductions in rates of acute malnutrition unless a multisectoral long-term strategy was developed and implemented (UNICEF 2012b). • It was estimated that only about half of the population had access to national health facilities, while the rest had no access to health facilities or opted to use private clinics or traditional homeopathic treatments. Given the poor health and nutrition situation and the limited resources and technical capacity found during the evaluation, expanding CMAM in 24 districts would be difficult. Suggested alternative funding options included pooled funding to promote efficient use of external funds as the government assumes more of the financial responsibility and to enable the program to serve more children. Development partners have indicated interest in supporting transformation of the emergency CMAM program into a regular government-run program.	

Management of MAM

Product type: Acha Mum (locally produced RUSF)

The production capacity for Acha Mum currently exceeds 1,100 metric tons (MT) per month with four local suppliers (annual consumption is approximately 7,000 MT). The CMAM program in Pakistan no longer uses imported RUSF (Shaikh 2013). Performance indicators for MAM management using RUSF showed a 95% cure rate among registered children, but none of the program districts achieved the average weight gain recommendation.[6] The default rate was 4.2%, and there were no deaths. According to WFP analysis, several unique conditions in Pakistan make local production competitive, including (Boston Consulting Group, BCG and WFP 2011):

1. Comparably priced raw materials: Local availability in Pakistan allows producers to match Nutriset's raw material costs, while most producers in other countries incur higher raw material costs due to shipping and tax disadvantages.
2. High demand in country: Sustained local demand in Pakistan has kept factories running.
3. Existing manufacturing infrastructure: Less investment required to ramp up RUSF production allows for lower prices.
4. Exchange rate advantage: The deflation of Pakistan's currency vs. the U.S. dollar lowers the effective price of products when compared to the Euro-based Nutriset products.

Data collected from interviews, monitoring reports, and visits to CMAM sites indicated the following issues in usage and supply of ready-to-use products:

- Home use of RUSF and RUTF was not well monitored, and there was evidence that efficient use was hampered by lack of compliance to the prescribed intake. The findings indicated that more monitoring is required to address the program's longer-than-recommended lengths of stay and failure to meet weight gain targets in some districts and to ensure that RUSF and RUTF are appropriately administered.
- Interviewees said that the take-home RUSF/RUTF intended for a malnourished child was also being used in some cases by siblings and other family members and that the products were sold at times in the community markets. Stronger community awareness may be needed to discourage these practices.
- As it was with management of SAM, the logistics/supply chain was not always reliable. Interruptions in supply of supplementary and therapeutic foods affected the quality of program implementation. There is a need to pre-position supplies and keep contingency stock to ensure availability.
- Although IYCF counseling is provided to caregivers, there is a danger that commercially prepared ready-to-use products will be perceived as better or healthier than locally prepared foods. IYCF, use of local foods, and prevention must be continuously reinforced.
- "Made in Pakistan" products (such as Wawa Mum, a ready-to-use supplementary food, which WFP uses for other programs) would be beneficial for community and health worker acceptance of CMAM, as from a cultural point of view, they tend to have more difficulty accepting foreign-made products.

[6] UNICEF. *Evaluation of Community Management of Acute Malnutrition (CMAM). Pakistan Country Case Study.* July 2012.

Table 12. Country Experience in Sri Lanka

Prevalence of MAM: 12%	**No. of Children under 5 Affected by MAM: 214,000**
Prevalence of SAM: 3%	**No. of Children under 5 Affected by SAM: 89,000**
Program type: National program	
Scale of Program: Sub-national	
Geographic target area: 14 districts planned for MAM treatment in 2013	
Management of SAM	
No national activities on the management of SAM	
Management of MAM	
Product type: Triposha (locally produced CSB++), FBF (Supercereal Plus)	
A large proportion of the national health budget (6%) is allocated to the production of Triposha, a locally manufactured local CSB++ that is fortified with minerals and vitamins and provided through the national maternal and child health program. The target groups include all pregnant and lactating women up to 6 months after delivery and infants, preschool children, and hospitalized children with growth faltering (De Silva et al. 2009). While the food supplementation program has nationwide coverage and reaches about 72% of the planned beneficiaries, production of Triposha has been largely insufficient to meet the program's needs. Approximately 15,000 MT are produced per year, but about 40,000 MT per year is needed (Faure 2011). As a result, the Triposha rations were reduced to about half the size required to adequately treat acute malnutrition. Other problems included insufficient storage capacity in clinics and at the factory, and poor packaging. Recent efforts by the Ministry of Health and WFP include complementing the Triposha ration with FBF (Supercereal Plus) to provide 200g of supplementary food for the treatment of MAM in children 6–59 months in the Northern Province (WFP 2012).	

Table 13. Country Experience in Cambodia

Prevalence of MAM: 9%	**No. of Children under 5 Affected by MAM: 135,000**
Prevalence of SAM: 2%	**No. of Children under 5 Affected by SAM: 40,000**
Program type: CMAM pilot, 2011	
Scale of Program: 2 provinces	
Geographic target area: N/A	
Management of SAM	
Product used: BP100 biscuits	
Programmatic approach: The CMAM pilot provided BP100 biscuits for outpatient treatment of children with SAM (Bourdier 2009).	
Effectiveness and acceptability: An acceptability study in 2009 found that Plumpy'Nut was not well accepted by children in Cambodia. As a result, the CMAM pilot used BP100.	
Implementation challenges: N/A	
Evaluations: • Although BP100 was found to be highly accepted, other foods were being given before BP100, resulting in slow weight gains. This was the result of inadequate training of the caregivers on the correct use of RUTF and no follow-up at home by community outreach workers to ensure that the information given was understood (Walsh, 2011). It was also found that the appetite test was not being done routinely on each visit. • With poor weight gains observed in most centers, it was recommended that health staff carry out weekly appetite tests and assess whether the child was eating the BP100, whether the caregiver was giving it correctly and always offering breast milk or water, and whether the child was being given other foods before finishing her/his daily ration of RUTF. • While the evaluation of initial implementation in 2011 did not find problems with RUTF availability, it was noted that BP100 was not being procured or supplied through the government system and was not included in the national essential drug list.	
Management of MAM	
Product type: CSB++	
Following an acceptability study on different options for children with acute malnutrition, the government has not been in favor of using peanut-based products; hence Cambodia has opted to use an improved CSB (Supercereal Plus/CSB++) for the treatment of MAM. The product has had mixed acceptability, and CSB++ has been described as being too bland and not sweet enough (Horton 2013). In addition, as snacking is very popular in Cambodia, having to cook the product separately has met with resistance; mothers reportedly preferred something that does not require preparation. As part of promoting positive IYCF practices, mothers participating in the CMAM program are encouraged to cook nutritious food for the child.	

Table 14. Country Experience in Indonesia

Prevalence of MAM: 7%	**No. of Children under 5 Affected by MAM: 1,462,000**
Prevalence of SAM: 5%	**No. of Children under 5 Affected by SAM: 1,145,000**
Program type: CMAM pilot, 2012	
Scale of Program: 3 provinces	
Geographic target area: Provinces of Aceh, NTT (CHANSyS project areas in Belu and Sikka), and NTB (Lombok Tengah)	
Management of SAM	
Product used: EeZeePaste	
Programmatic approach: Provided at OTP in new CMAM model	
Effectiveness and acceptability: N/A	
Implementation challenges: N/A	
Evaluations: • Previous CMAM programs observed poor weight gains and a general opinion among program staff that there was low acceptance of RUTF among Indonesian children (UNICEF and Valid International 2012).However, further investigation revealed that the problem did not lie in the acceptance of RUTF. The appetite tests done at every visit showed that the children, including those losing weight, actually had a good appetite for RUTF and that the caregivers' feeding practices (the lack of active feeding) resulted in poor consumption. • The delivery of key messages by staff had, in some cases, been less than optimum; as a result, mothers treated RUTF as a supplementary food that was secondary to family foods. • In one OTP, where the nutritionist conducted home follow-up during the week to ensure feeding was occurring as advised, all of the children admitted achieved weight gains of around 10g/kg/ day, double the minimum standards weight gain in OTP.	
Management of MAM	
No activities on MAM	

Table 15. Country Experience in Myanmar

Percent prevalence of MAM: 6	**No. of children under 5 affected by MAM: 269,000**
Percent prevalence of SAM: 2	**No. of children under 5 affected by SAM: 97,000**
Program type: CMAM program, 2009 (ACF treated children with SAM and MAM)	
Scale of Program: Rakhine state, western Myanmar	
Geographic target area: Rakhine state, western Myanmar	
Management of SAM	
Product used: Plumpy'Nut	
Programmatic approach: CMAM program (Cosgrove et al. 2012)	
Effectiveness and acceptability: N/A	
Implementation challenges: Complications in importing the products contributed to insufficient stock to cover the case load of SAM-affected children.	
Evaluations: • Beyond the relevance of RUTF itself for treatment of SAM, a combination of 14 key factors contributed to the effectiveness of the approach. Chief among these were adequate program management, presence of trained staff, provision of education to the caregiver on the causes of malnutrition and child care practices, and the implementation of a preventive strategy.	
Management of MAM	
Product type: Reduced Plumpy'Nut ration	
• An alternative treatment protocol was introduced for children who had improved from SAM to MAM. In this second phase of treatment, RUTF intake was reduced from two or three sachets per child per day to only one, hence reducing the kilocalories a child consumed from RUTF. ACF staff advised caregivers to make up the child's energy requirements with family foods. • Despite the reduced ration, the program's performance was found to be maintained, exceeding the international minimum Sphere Standards.[7] Other positive results included decreased sharing in the household.	

[7] Research submitted for publication. Cécile Salpéteur, ACF France. January 2013. Personal communication

Table 16. Country Experience in Vietnam

Prevalence of MAM: 3	**No. of Children under 5 Affected by MAM: 212,000**
Prevalence of SAM: 1	**No. of children under 5 Affected by SAM: 87,000**
Program type: CMAM Pilot	
Scale of Program: 1 province	
Geographic target area: Kom Tun province	
Management of SAM	
Product used: Hebi, a locally produced RUTF	
Programmatic approach: IMAM program in 1 province	
Effectiveness and acceptability: While findings from the acceptability and randomized controlled effectiveness trial are yet to be published,[8] according to UNICEF, the performance indicators are in line with international standards (Sphere) (Bourdier 2009, Walsh 2011, and Horton 2013). The research team also observed an increase in the children's height—even for children over 2 years of age—suggesting a catch-up growth effect. RUTF in paste form was found to be slightly more acceptable by children with SAM than RUTF in the form of a bar. The UNICEF Supply Division conducted a General Manufacturing Practices inspection in September 2012 to ensure compliance with international and national quality assurance and food safety standards. A detailed inspection report was prepared, including observations and recommendations related to quality management, premises, equipment, documentation, production, quality control, and contracts to meet the certification requirements for international suppliers. The Supply Division and the Vietnamese National Institute of Nutrition are discussing the report's findings. The current RUTF production capacity in Vietnam is estimated to be 140 MT annually, covering around 10,000 children. However, the capacity has potential to increase as the program scales up to new provinces and the market for RUTF increases.	
Implementation challenges: N/A	
Evaluations: N/A	
Management of MAM	
Product type: Hebi-Mam	
The National Institute of Nutrition developed the RUSF called Hebi-Mam with support from UNICEF and the Institute for Research and Development (IRD) on a not-for-profit basis. Hebi-Mam is proposed to be included into the National Social Health Insurance scheme currently covering children under 6 years of age, and efforts are underway to certify the product as a regional supply for Southeast Asia (UNICEF 2011c). Hebi-Mam follows the new technical specifications on supplementary foods for the management of MAM in infants and children 6–59 months of age from WHO (2012). This RUSF, designed to taste like the traditional green bean cake *Banh dau Xanh,* is a homogeneous mixture of fortified lipid-rich and water-soluble foods, including green beans, soybeans, sesame, and rice. The acceptability trial for the product was conducted with preschool children from Bac Giang Province in September 2012 (Mathisen 2012). The valuable feedback from these children on flavor, smell, consistency, and daily amount to be consumed was used to improve the product. The final version of the product is undergoing an effectiveness trial in Bac Giang Province, and the screening of children to be enrolled in the study started in December 2012. Behavior change communication covering food diversity and safety, care practices, health, and handwashing with soap will also be tested to demonstrate added effectiveness. The aim of this study design is to generate evidence to advocate for more integrated approaches to prevent and treat malnutrition. At the time of this writing, data collection was still going on.	

[8] Findings from the acceptability trial were submitted for publication in a peer-review journal in 2012 and an article for the effectiveness trial was prepared for submission to a peer-review journal in early 2013.

4. Discussion and Conclusions

Acute malnutrition in South Asia affects nearly 32 million children under age 5—the highest of any region in the world—with 22 million moderately acutely malnourished and 10 million severely acutely malnourished. India, Bangladesh, and Pakistan have the highest burden of acute malnutrition. Although the prevalence of acute malnutrition has fallen in the past 20 years, the increasing population over this same time has resulted in the same number of children suffering from acute malnutrition. In preparing this report, it became clear that there is a paucity of research on the efficacy and effectiveness of treatment approaches to manage severe and moderate wasting in South and Southeast Asia. Most studies have been undertaken in Africa. Of the malnutrition studies undertaken in South and Southeast Asia, most have focused on underweight, and few focused specifically on acute malnutrition. Only one pilot study from Bangladesh was found on CMAM. However, several countries have experience with CMAM programming, and some have experience with managing both moderate and severe wasting. The lessons from these experiences are important to guide the integration of the management and treatment of acute malnutrition within broader health systems in other countries in the region.

Although research on the efficacy and effectiveness of specialized foods to manage and treat acute malnutrition has been undertaken in sub-Saharan Africa and not South Asia, recent systematic reviews establish a few key facts that apply to the region. The use of specialized food, in the form of locally fortified CSB flours and LNS, has proven effective for the treatment of MAM. Similarly, the use of RUTF has proven effective for the treatment of SAM. Key considerations on the types of foods that should be used to treat acute malnutrition center not only on nutrient composition but also on whether the food is ready for consumption and carries minimal risk of infection. Particularly in the case of severely wasted children, infections can substantially heighten and precipitate the risk of mortality. For this reason, foods that are ready-to-use and pre-packaged carry significant benefits in treating severely wasted children. In South Asia, lack of hygiene and sanitation within households, especially regarding food preparation, is a significant risk factor in the prevalence of acute malnutrition generally and particularly for SAM. Lastly, severely wasted children cannot digest home foods easily as their physiological ability to absorb nutrients and digest food is severely impaired. Rehabilitating these children requires a specific formulation that is both nutrient-dense and micronutrient-rich, another reason why specialized foods are ideally suited to these children. The impetus to create RUTF stemmed from the fact that few severely wasted children were taken to facilities for inpatient treatment; to more effectively treat severely wasted children and reduce child mortality overall, a specialized food that could be provided safely in the home was needed. The development of specialized therapeutic foods combined with the need to increase program coverage led to the endorsement of the CMAM approach.

However, while CMAM was conceptualized as treating both MAM and SAM cases and as a component of the broader health system that in many respects depended on the broader health infrastructure to function effectively, the predominant focus of CMAM programs in the decade since the approach's inception has been on treating severely wasted children with RUTF. Moreover, these programs are often implemented as individual approaches rather than embedded within a broader set of preventive and curative services for reducing undernutrition. The singular focus on using RUTF for severe wasting has led many to criticize this approach and has created a lot of confusion, especially among policymakers, about what type of treatment approaches should be used and when. While severely wasted children benefit greatly from RUTF, the majority of children with acute malnutrition are moderately wasted and can benefit from locally prepared fortified RUSF. This is a critical difference. This means that of South

Asia's 32 million wasted children, 22 million could be treated with locally prepared fortified foods, while the 10 million children who are severely wasted would be treated with RUTF. As such, a broader approach to managing acute malnutrition is needed, particularly in South Asia.

The findings presented in this review highlight the limited evidence base particularly in South and Southeast Asia while reiterating the tremendous need for nutrition services in South Asia. Although more research on effective treatment approaches is needed, the sheer number of children affected by wasting warrants immediate efforts to scale up services to manage acute malnutrition. Ideally, the management of acute malnutrition should be embedded within a broader platform of preventive nutrition services and accompanying research studies could be planned to understand which approaches and treatment options would have the greatest impact on reducing acute malnutrition.

A strategy for the countries most affected by MAM and SAM would be to use the CMAM approach to screen and treat moderately wasted children with locally prepared fortified foods and treat severely wasted children with RUTF. In this regard, further research is needed to compare the different measures used to assess wasting as there is emerging evidence that the prevalence of wasting measured by MUAC is much lower than the prevalence of wasting measured by WFH. If MUAC is found to be a more accurate measure of severely wasted children who require treatment with RUTF, and the number of severely wasted children identified using this measure are fewer relative to the number of cases identified by WFH, overall this would mean fewer severely wasted children who would need RUTF and there may be more moderately wasted children who could be rehabilitated with specialized supplementary foods, further reducing the cost of an overall CMAM program.

In conclusion, this review identifies a few key ingredients that are needed to scale up the management of acute malnutrition:

Leadership and Coordination

- Political leadership is critical at the country level. Sensitization and advocacy can be used to increase government commitment to scale up CMAM.
- Broad coordination structures and mechanisms dedicated to the scale up of CMAM that are concretely integrated with other sectors and coordination structures are essential to tailor the CMAM approach to the local country context. Coordination also ensures that available resources are focused on a common objective. It is essential to integrate CMAM scale-up within a broader nutrition strategy and use a health systems strengthening approach to integrate CMAM.

Design of the CMAM Approach

- Community aspects are essential and should never be disregarded when designing a contextualized CMAM program. The community component can take various forms but should always take advantage of existing structures and use as few resources as possible. Community mobilization that requires ongoing screening of all households in all communities and is conducted solely by existing community workers is unrealistic and usually unsuccessful. Community mobilization based on an initial sensitization and active case-finding that later switches to a passive referral approach (where caregivers bring their children to community workers instead of community workers actively tracking children) is more likely to be effective and sustainable.

- The CMAM approach encompasses both MAM and SAM. However, a strong emphasis is placed on SAM while MAM often is not considered for scale-up. Because management of MAM at the household and community levels (versus the individual level) is likely to help prevent SAM, MAM scale-up should be given much more attention. Where resources are limited, program designers should carefully consider how to treat acute malnutrition in tandem with efforts to prevent acute malnutrition from occurring or worsening and aim to develop programs that reduce mortality immediately while also reducing acute malnutrition over the longer term.
- While food products for management of both MAM and SAM have attracted the most attention, several studies and projects have shown that these products represent only one component of any program's success or failure. Studies should be conducted and experiences should be documented that consider more carefully how the determinants of acute malnutrition influence the choice of products used to treat SAM and MAM. In some instances, it may appear that strong community support and a rigorous preventive component may be highly effective without use of RUTF or RUSF. Such efforts should be done only within the bounds of ethical standards and carefully documented to avoid endangering malnourished children. The use of local food rations for treatment of MAM shows great potential and should be investigated further. While RUTF and RUSF may still be required in some instances, experience seems to suggest that enhanced family rations may be a more acceptable and sustainable approach to the management of acute malnutrition. The use of local food rations also opens the door to enhanced inter-sectoral coordination (e.g., family planning, agriculture). The right products and approaches should be identified through a detailed multisectoral analysis of the causes and consequences of acute malnutrition to ensure adequacy of the recommendations. Analysis of the use of local food rations remains weak in most countries.

Program Design and Documentation

- This literature review highlighted the urgent need for practitioners to adopt a standardized approach to monitoring and evaluation (M&E) of their programs. Performance measures of CMAM pilot projects were often missing and, when available, they were difficult to analyze due to the absence of a detailed explanation of the program design and of the settings the program is implemented in. Global-level guidance on how to design a simple and proper CMAM M&E system is lacking and should be addressed.
- Knowledge sharing of experiences and information is critical within and among countries and can help identify lessons and new approaches for expanding CMAM within a broader health system.

5. Recommended Approach for Bangladesh to Manage Acute Malnutrition

Bangladesh has made tremendous strides on various health indicators, particularly in promotion of the use of family planning services, use of oral rehydration salts, immunizations, and vitamin A capsule distribution. But chronic and acute malnutrition and certain micronutrient deficiencies remain a significant problem for women and children. Today in Bangladesh an estimated 7 million children suffer from chronic and acute malnutrition. Chronic malnutrition or stunting affects 41 percent of children under the age of 5—nearly 6 million children. Acute malnutrition (wasting) affects 2.2 million children. Among the 2.2 million wasted children, 1.6 million are moderately acutely malnourished (moderately wasted) and 600,000 are severely acutely malnourished (severely wasted). The planned rollout of the National Nutrition Services (NNS) is an opportune time to integrate the management and treatment of moderate acute malnutrition (MAM) and severe acute malnutrition (SAM) in both urban and rural health service delivery systems.

The NNS is working with other line directorates in the Ministry of Health and Family Welfare (MOHFW) to make preventive nutrition services available at the community level, and screening, referral, and treatment of acute malnutrition can be integrated at this point of service. Mid-upper arm circumference (MUAC) and weight-for-height (WFH) screening to identify moderately and severely wasted children can be integrated within monthly growth promotion activities. Moreover, the updated government growth cards have WFH included. Bangladesh already has experience using this type of community-based management of acute malnutrition (CMAM) embedded within preventive nutrition services in Bhola district in Barisal Division (Sadler et al 2011). Experiences from other countries also show that the management of acute malnutrition is most successful when embedded within a broader health service delivery system, because the screening, identification, referral, and treatment of acute malnutrition cases rely heavily on community participation and a functioning community-based health system.

Key stakeholders in Bangladesh who have experience with the management of acute malnutrition note that in their experience in Bangladesh the majority of children affected by SAM have uncomplicated cases that should ideally be treated through outpatient therapy using ready-to-use therapeutic foods (RUTFs), which is one component of the CMAM approach. Only a tiny proportion of children in Bangladesh have complicated SAM that requires facility-based treatment. Under these circumstances, it would be ideal for the Government of Bangladesh (GOB) to embed and implement CMAM within the broader preventive nutrition services planned for the community level across the country.

Although the majority of SAM cases in Bangladesh require outpatient therapy and only a small proportion would benefit from facility-based care, the GOB is nonetheless stepping up its efforts to expand access to facility-based treatment of SAM, and the GOB is in the process of procuring F-75 and F-100 to treat complicated SAM cases in facility-based settings. While facility-based treatment of SAM is one of the four components of CMAM, to significantly reduce the national burden of acute malnutrition rapidly in the next few years, it will also be essential to expand the other three components of CMAM to effectively manage acute malnutrition using both RUTF to treat uncomplicated SAM and ready-to-use supplementary foods (RUSFs) to treat MAM.

The 1.6 million children in Bangladesh who are moderately wasted can be treated using locally prepared fortified foods; several stakeholders in the country already have experience doing this. While there are concerns regarding the use of specialized foods such as RUTF for treating severe wasting, a main focus of

these concerns is the displacement of locally available foods. An approach to managing acute malnutrition for the GOB would be to focus on preventing and treating MAM with locally available fortified foods (such as a fortified-blended food [FBF] or RUSF), while also making facility-based treatment and specialized foods such as RUTF available to treat SAM cases in facilities and at the community level. There are significantly more cases of MAM in Bangladesh than SAM—yet none of the either moderately or severely acutely malnourished children receive any treatment services because of the concerns related to RUTF displacing locally available foods, which is only needed for a small proportion of severely wasted children. In fact, the concerns related to specialized therapeutic foods (such as RUTF) to treat severe wasting have become such a central focus that there is little room for dialogue on managing and treating the vast number of children who are moderately wasted.

By integrating the management of acute malnutrition using a CMAM approach into the government's urban and rural community-based health service delivery system, focusing on treating uncomplicated SAM with RUTF and MAM with locally prepared fortified foods and treating a proportion of children with severe wasting with medical complications at upgraded Upazila health complexes, the majority of acute malnutrition cases could be treated. Over time, screening, identifying, and treating moderately wasted children early would significantly reduce the number of SAM cases that present. But even with this focus on moderate wasting, a small number of uncomplicated SAM cases will remain; these children would need to be treated with specialized therapeutic foods. There is interest within the government to use a locally produced RUTF that meets international standards. But while development of such a product is under way, it can take 3–5 years to bring it to market. The government will need to consider procuring RUTF for an interim period until a locally produced product is available on the market to treat and manage uncomplicated SAM cases at the community level.

The World Health Organization (WHO) recently provided guidelines on the minimum formulation of specialized foods for the treatment of MAM (**Annex 1**) (WHO 2012). And, the recent systematic review of specialized foods to treat MAM clearly finds that these foods are effective (Lazzerini and Pani 2013). This type of formulation can be produced in Bangladesh and rapidly made available to children in need. This approach would rely on using local ingredients to produce high-quality supplements. Currently, the GOB has several safety net programs managed by various ministries. The NNS and these ministries could discuss how these programs could be reoriented in part to meet the needs of moderately wasted children and women among highly vulnerable populations (such as the bottom two wealth quintiles), and whether these food and safety net distribution systems could be used at the community level to rapidly scale up the distribution of locally formulated specialized foods to treat MAM. In terms of preparing the foods, the NNS can collaborate with stakeholders, such as the World Food Programme (WFP), who have extensive experience in the formulation and design of these specialized foods. In addition, Bangladesh is extremely well placed to work with the private sector to produce these foods commercially for distribution through a health or safety net program.

Because of factors such as Bangladesh's experience with private sector partners for the sale and distribution of oral rehydration salts, family planning methods, and multiple micronutrient supplements for children, the country in many respects has an ideal enabling environment to manage acute malnutrition. Importantly, the vast majority of children under 5 who are moderately wasted can be treated with locally prepared fortified foods following the WHO guidelines. Establishing a public-private partnership for the purpose of developing government-approved RUSFs (such as a fortified wheat-soy blend) in which foods are prepackaged and distributed has several advantages. First and foremost is food safety, as children often become moderately acutely malnourished due to repeated infections; ready-to-

use foods are also easy to prepare and do not require refrigeration. Ready-to-use foods would therefore reduce the risk of and exposure to infection and further support recovery from acute malnutrition. The GOB can work in close collaboration with local partners, such as GAIN, UNICEF, and WFP, to design and make available safe and nutritionally adequate supplementary foods. Given the prevalence of wasting in Bangladesh, implementing this approach could be very effective in rapidly reducing the overall prevalence of acute malnutrition.

Box 2. A Way Forward

There are a few essential prerequisites that must be met in order to establish a service delivery mechanism for the prevention and treatment of MAM and SAM using a CMAM approach in urban and rural settings in the current Bangladeshi context. Prevention and treatment of MAM and SAM can begin where the following conditions are met.

1) Preventive nutrition services exist at the community level in select regions or districts (both urban and rural).
   a. Preventive nutrition services are essential prerequisites to establishing MAM and SAM treatment service delivery. This is because treating MAM and SAM cases without also providing preventive care over time will not lead to a sustainable reduction in all forms of malnutrition. In addition, preventive nutrition services that have strong community mobilization activities are essential to establish and effectively implement the monthly screening and referral that is needed in identifying, triaging, and treating MAM and SAM cases. Preventive nutrition services are also essential to ensure that there is adequate follow-up of children who are treated for MAM and SAM, to prevent relapse and sustain recovery.
2) Community mobilization activities, such as growth monitoring and promotion (GMP) are well established at the community level and occur on a regular monthly basis.
   a. Well-established community mobilization activities at the community level, where there are regular GMP activities, are critical to enable monthly screening, identification, treatment, and referral of MAM and SAM cases.
   b. An established community-level follow-up and referral system (where children can be tracked and followed once they receive care) would be another consideration.
3) The GOB establishes an interim procurement system to procure RUTFs to treat uncomplicated cases of SAM using a CMAM approach. The interim procurement would be only a stopgap solution while awaiting the at-scale national production and distribution of a locally produced RUTF.
4) Upazila health facilities are well functioning and can be upgraded to include SAM inpatient treatment services.
   a. Once cases of children with complicated SAM are identified, these children need to be seen at an upgraded Upazila or urban health facility to receive the appropriate treatment, on either an inpatient basis or outpatient basis, depending on the condition of the child.

5) National and Upazila-level coordination to reorient safety net programs to provide mothers and children with MAM with food vouchers that would allow families to obtain safe ready-to-use fortified supplementary foods that follow the WHO guidelines for supplementary foods composition for MAM.
   a. To treat MAM, families need access to locally produced fortified food supplements. These could be made available through Union Parishad food safety net programs or by reorienting unspent monies earmarked for safety net programs that are already available at the union in rural settings or municipality levels in urban settings from the Ministry of Local Government and Rural Development (MOLGRD), but, critically, this depends on national and Upazila/local-level coordination.
6) A public-private partnership between government, nongovernmental organizations, and the private sector to develop and distribute nutritionally adequate ready-to-use therapeutic and supplementary foods.
   a. The government can track the efforts of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) to bring a local RUTF to market in Bangladesh.
   b. In the initial stages and on a small scale, the MOHFW can work with partners such as WFP to distribute RUSFs to families with pregnant mothers and children who are moderately acutely malnourished.
   c. But, over time, sustaining this approach would depend on central-level coordination between the MOHFW and the Ministry of Industry, among others, who are involved in regulating and overseeing food fortification by the private sector and partnerships with the private sector to develop a supplement that is nutritionally adequate, safe, and ready to use for treating MAM.

In the current Bangladeshi context, where there are few preventive nutrition services being provided at scale and few facilities that have been upgraded to provide treatment for SAM cases, carefully selecting the regions of the country where services exist to begin providing MAM and SAM services will be an important first step. Given this programming context, it will be important to use a phased approach. In a first phase, MAM and SAM services could be integrated using a CMAM approach in areas of the country where other preventive services exist and function well. In a second phase, as the government expands the implementation of preventive services, an integrated approach that includes both prevention and treatment services could be implemented from the beginning as a comprehensive package of services.

Adding MAM and SAM treatment services in a context where nutrition services in general are fragmented will undoubtedly be challenging, but using a strategic and phased approach could ease the expansion of these services. Importantly, strengthening coordination and dialogue at the national level to make RUTFs, RUSFs, food supplements, and/or food vouchers, for example, available to families in need at the Upazila level will be essential. This would likely involve discussions and coordination between the MOHFW and other ministries, including the MOLGRD, the Ministry of Women and Child Affairs, the Ministry of Industry, the Ministry of Disaster Management, the Ministry of Agriculture, and the Ministry of Livestock and Fisheries.

If a region or several districts are identified for the initial implementation of this approach, given the high burden of MAM and uncomplicated SAM cases, one option would be to use the monthly screening efforts to identify both uncomplicated SAM cases, and provide these children with an RUTF, and MAM cases, and provide families with a food voucher to obtain locally produced fortified ready to use foods to treat MAM. If this initial phase in a few districts is effective, this approach could then be scaled up nationally.

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Annex 1. WHO's Proposed Nutrient Composition of Supplementary Foods for Use in the Management of Moderate Acute Malnutrition in Children[a,b]

Nutrient per 1,000 kcal	Unit	Minimum	Maximum
Protein[c]	g	20	43
Fat	g	25	65
Minerals			
Sodium (Na)	mg	—	500
Potassium (K)	mg	1,500	2,200
Magnesium (Mg)	mg	280	420
Phosphorus (P)[d]	mg	850	1,400
Zinc (Zn)	mg	20	35
Calcium (Ca)	mg	1,000	1,400
Copper (Cu)	mg	1	3.5
Iron (Fe)[e]	mg	18	30
Iodine (I)	µg	150	350
Selenium (Se)[f]	µg	35	90
Manganese (Mn)	mg	1	2[g]
Vitamins (water soluble)			
Thiamine (vitamin B1)	mg	> 1	—
Riboflavin (vitamin B2)	mg	> 4	—
Pyridoxine (vitamin B6)	mg	> 2	—
Cobalamine (vitamin B12)	µg	> 5	—
Folate (dietary folate equivalent)	µg	> 400[h]	—
Niacin (vitamin B3)	mg	> 25	—
Ascorbate (vitamin C)	mg	> 150	—
Pantothenic acid	mg	> 5	—
Biotin	µg	> 20	—
Vitamins (fat soluble)			
Retinol (vitamin A)	µg	2,000	3,000
Cholecalciferol (vitamin D)	µg	20	60
dl-α tocopherol acetate (vitamin E)	mg	> 30	—
Phytomenadione (vitamin K)	µg	> 50	—
Fatty acids			
ω-6 fatty acid	% energy	> 4.5	< 10
ω-3 fatty acid	% energy	> 0.5	< 3
Trans-fatty acids	% total fat		3
Ratios of nutrients (based on weight)			
Ca/P ratio		1.0	1.5
Zn/Cu ratio		5	20
Zn/Fe ratio		0.8	3.5
Vitamin C/Fe		3	16

a The suggested concentrations are calculated as an example when supplementary foods provide 70 percent of energy. This does not constitute a recommendation that supplementary foods should provide 70% of the energy intake of moderately malnourished children. The formulation is such that it would be safe and effective if the quantity taken by moderately malnourished children represented 100 percent of the energy needs and that it would also provide benefit, although of a lesser

order of magnitude, if taken in lower quantities. There is no evidence to determine maximum levels for some nutrients. In countries with established maximum levels for these nutrients in healthy children, it would appear convenient to use those amounts to inform product formulation.

b The energy density of supplementary foods when they are ready to be consumed should be not less than 0.8 kcal/g.

c Protein digestibility-corrected amino acid score > 70 percent. Corresponds to cereal/legume mixtures, milk, and animal proteins.

d Excluding most phosphorus from phytate because that is not bioavailable; assumes 30 percent of phosphorus from plant sources to be available for absorption.

e Assumes 5 percent iron bioavailability.

f Ensure homogeneity in food because of the low toxicity limit for selenium.

g This proposed value applies to added manganese and not intrinsic manganese occurring naturally in foods.

h Equivalent to 240 µg (0.24 mg) folic acid.

Technical note: Supplementary foods for the management of moderate acute malnutrition in infants and children 6–59 months.
Source: WHO 2012.

Annex 2. List of Key Contact Persons

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