CMAM Surge Approach

Value for Money framework

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Acknowledgments

This framework was primarily developed by Davidé de Beni who was contracted by Concern as a consultant for this purpose, with input from Kate Golden, Senior Nutrition Adviser at Concern, and Chloe Puett and Lani Treynouth of ACF. It builds on previous work by Concern, UNICEF and others related to CMAM cost-effectiveness analysis. If you have any thoughts or comments, please get in touch with kate.golden@concern.net.

Abbreviations

CHW	Community Health Worker
CMAM	Community-based Management of Acute Malnutrition
DHIS	District Health Information System
DHMT	District Health Management Team
HF	Health Facility
HMT	Health Management Team
HSS	Health System Strengthening
HW	Health Worker
IMAM	Integrated Management of Acute Malnutrition
MAM	Moderate Acute Malnutrition
MOH	Ministry of Health
NGO	Nongovernmental Organisation
RHMT	Regional Health Management Team
SAM	Severe Acute Malnutrition
VfM	Value for Money

1 Introduction and background

The Community-based Management of Acute Malnutrition (CMAM) Surge approach was developed by Concern Worldwide to make health systems more resilient to the shocks and stresses that such regular surges in the demand for treatment services of acute malnutrition present in vulnerable contexts. The model draws heavily from Concern's experience supporting CMAM and health services in a range of contexts over the past fifteen years. To date, Concern has piloted the CMAM Surge Approach in Marsabit County in Northeast Kenya (2012-2014) and has introduced elements of the approach in a number of other country programmes, including in the Karamoja District of Uganda (2014). The Marsabit County CMAM Surge programme was externally evaluated in November 2014 with positive results. An internal review of Concern's Uganda CMAM Surge programme also recommended continuation and scale up.

To date, the evaluative work on the CMAM Surge Model has focussed on whether it has been able to respond to increases in caseloads. It has not, however, been able to assess whether this represents Value for Money as compared to the traditional emergency response. The evaluation of the CMAM Surge Pilot in Kenya (Hailey, 2015) recommended "a value for money approach based on examining the impact of sustained HSS and the surge model on reducing costs over time should be adopted as a regular monitoring indicator for organisations such as Concern. Demonstration of the cost savings of the approach adopted by Concern and others to run linked HSS, Surge Model and emergency response programmes in parallel for a sustained period of time would be a powerful argument for sustained investment in the system so that it is capable to respond to emergencies in an effective and efficient way".

With this framework, Concern Worldwide hopes to put in place a more formal mechanism for promoting and sharing learning, including rigorously monitoring and evaluating the CMAM surge approach in different contexts, under different parameters and conducting a more formal cost effectiveness analysis to understand if and how a surge approach could be better value for money than the traditional emergency response.

1.1 Overall objectives

The overall objectives of this document are to: i**) define a Value for Money framework to assess the cost-efficiency-effectiveness of the CMAM Surge approach to manage cases of acute malnutrition from within the health system as an alternative to routine service delivery and traditional emergency actions; and ii) propose a protocol and analytical tools for conducting the cost effectiveness analysis defined in the Value for Money framework in a future iteration of CMAM programming.**

With these objectives in mind, this document **first** defines the **Value for Money (VfM) framework** for cost efficiency-effectiveness analysis of the CMAM Surge approach (section 4).

Second, using the CMAM Surge VfM framework and building on the underlying hypothesis that the CMAM Surge model is a more cost efficient-effective alternative to routine CMAM services or the traditional emergency response, an **ex-ante (prospective) economic appraisal** is conducted by comparing the three options of delivering CMAM in a theoretical context of a surge in caseloads. The economic appraisal is built using data from a recent

study conducted by UNICEF on the cost of high impact nutrition interventions delivered as part of routine heath service delivery in Kenya[1], and by applying some key assumptions and projections when historical data are missing or not adequately structured. The three feasible options considered in this analysis are:

Option 1: **Routine CMAM service delivery (i.e. no Surge approach)**
Option 2: **CMAM Surge approach**
Option 3: **Traditional emergency response**

This ex-ante economic appraisal serves as a practical 'pilot' of the CEA framework and helps to set up the context and the expected outputs and outcomes of the different options based on the current available evidence of effectiveness from other early response actions compared to traditional emergency response (in absence of a specific cost effectiveness analysis based on actuals/historical data of the CMAM Surge approach).

Third, in order to actually apply the VfM framework defined in this document during the next implementation and evaluation phase of Surge, a **research plan for the cost effectiveness** analysis is proposed in which one study arm comprising one or more health facilities where the CMAM Surge Approach is applied can be compared to a second study arm comprising one or more health facilities where the traditional emergency approach or where routine CMAM service delivery takes place. During this phase, data will be collected and structured in line with the framework defined in this document, carrying across key assumptions, where appropriate, from the ex-ante analysis to allow for a comparative **ex-post VfM analysis** of the CMAM Surge approach.

The focus of this analysis is the **treatment of Severe Acute Malnutrition (SAM)** delivered at health facility level but can also be extended to the management of Moderate Acute Malnutrition if this is also part of routine health services.

1.2 Why is this framework needed?

In countries that are vulnerable to emergencies or frequent shocks resulting in increases in need and demand for health services, lack of or weak planning and response capacity often results in late, inflexible, inappropriate and one-size fits all responses. In the past, the health system has responded to these challenges by mobilising external resources, delivered e.g. by NGOs or UN agencies, often leading to a disjointed approach that is inefficient and has the potential to have serious short and long term impacts on the quality, coverage and effectiveness of the services offered. An overdependence on external resources and an incoherent response to surges in demand tends to undermine local capacity, accountability and may also damage ongoing HSS efforts.

This problem is not unique to the nutrition sector and economists and humanitarian actors across multiple sectors have been trying to demonstrate value for money of appropriate, early response to build the economic argument for 'resilience' programming.

The CMAM surge model was developed to improve early and adequate response, to strengthen the capacity of government health systems to effectively manage increased caseloads of severe acute malnutrition (SAM) and moderate acute malnutrition (MAM), during predictable emergencies without undermining ongoing health and nutrition systems

[1] Costing of Kenya's High Impact Nutrition Interventions', UNICEF Kenya, 2015.

strengthening efforts. The evaluation of the CMAM Surge Pilot in Kenya (Hailey, 2015) found that the approach has strengthened the health system to manage increased caseloads of acute malnutrition and demonstrated potential to positively impact coverage by ensuring those who did seek treatment had a positive experience so they were likely to return again. However, evidence that the Surge approach was good value for money compared to other approaches was very due weak because there was no system in place to collect essential related to costs and efficiency.

This document aims to address this gap for future iterations of the CMAM Surge Approach by defining a VfM framework and proposing a practical protocol that will allow stakeholders to compare the costs and results of a scaled up Surge approach to a traditional emergency response and/or to a routine CMAM service delivery from an economy, efficiency and effectiveness point of view.

2 Outlining the Value for Money framework for the CMAM Surge approach

2.1 General principles of Value for Money

The model proposed for this framework is based on DFID's approach on VfM known as the 3Es: **economy**, **efficiency**, **effectiveness**. According to this model, VfM is high when there is an optimum balance between all three elements: costs are relatively low (economy), productivity is high (efficiency) and successful outcomes have been achieved (effectiveness)[2].

Analysis of **Economy** focuses on **input costs** and **what drives them**. Using CMAM as an example, a measure of economy would look at staff costs for Severely Acute Malnutrition (SAM) treatment, unit cost of Ready to Use Therapeutic Food (RUTF), etc. Cost driver analysis is a combination of looking at the proportions/ percentages of budget lines (admin, intl. staff, etc.) and the unit input costs.

Efficiency assesses "how much you get out in relation to what you put in". It measures the efficiency in delivering the expected **outputs**. Outputs need to be clearly identified, quantified and comparable. Output unit costs are most commonly collected in the form **of cost per beneficiary**. Using the same nutrition example, a metric of efficiency would be the cost of SAM treatment per child.

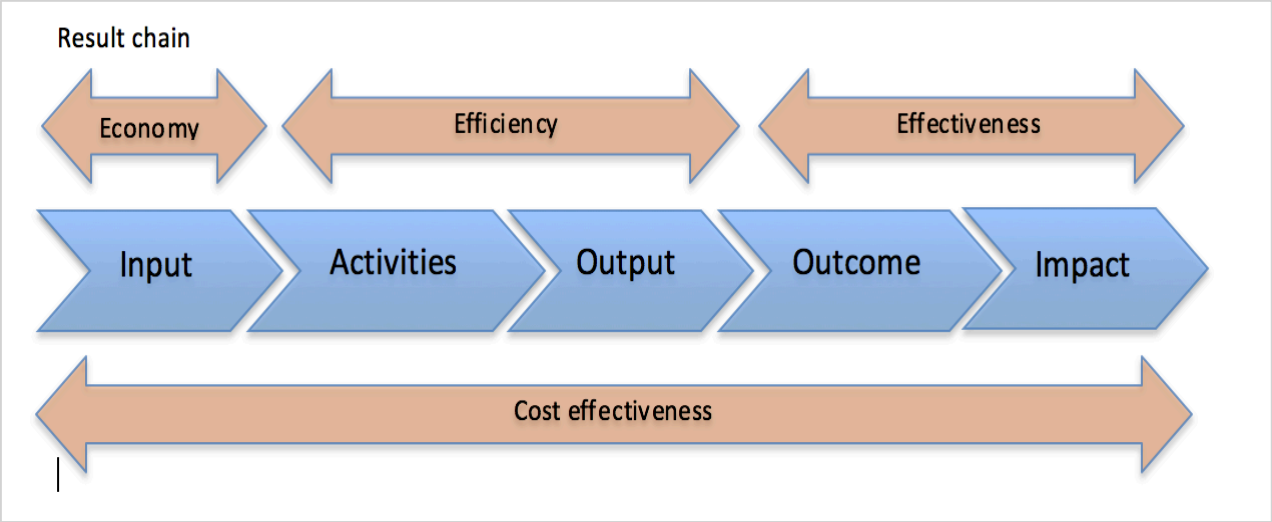
Effectiveness, the most important element of VfM, refers to the optimal use of resources to achieve intended **outcomes**. In the case of nutrition related projects, a measure of effectiveness would be the cost per child recovered from SAM or cost per lives saved . This measure facilitates undertaking cost-effectiveness and cost benefits analyses, as well as comparisons between the effectiveness of different humanitarian aid instruments or responses in achieving the same outcome. **Cost-effectiveness analysis** measures the cost of achieving intended programme outcomes and impacts, and can compare the costs of alternative ways of producing the same or similar benefits.

A well-defined project logical framework identifies results, expected benefits and, where possible, allows a comparison between costs and results/benefits. **Figure 1** below illustrates

[2] UK Audit Agencies, Value for Money in Public Sector Corporate Services, Audit Commission et al., National Audit Office, 2007

the links between each element of a project/programme result chain (input, process/activity, output, outcome, impact) with the three VfM measures (economy, efficiency, effectiveness).

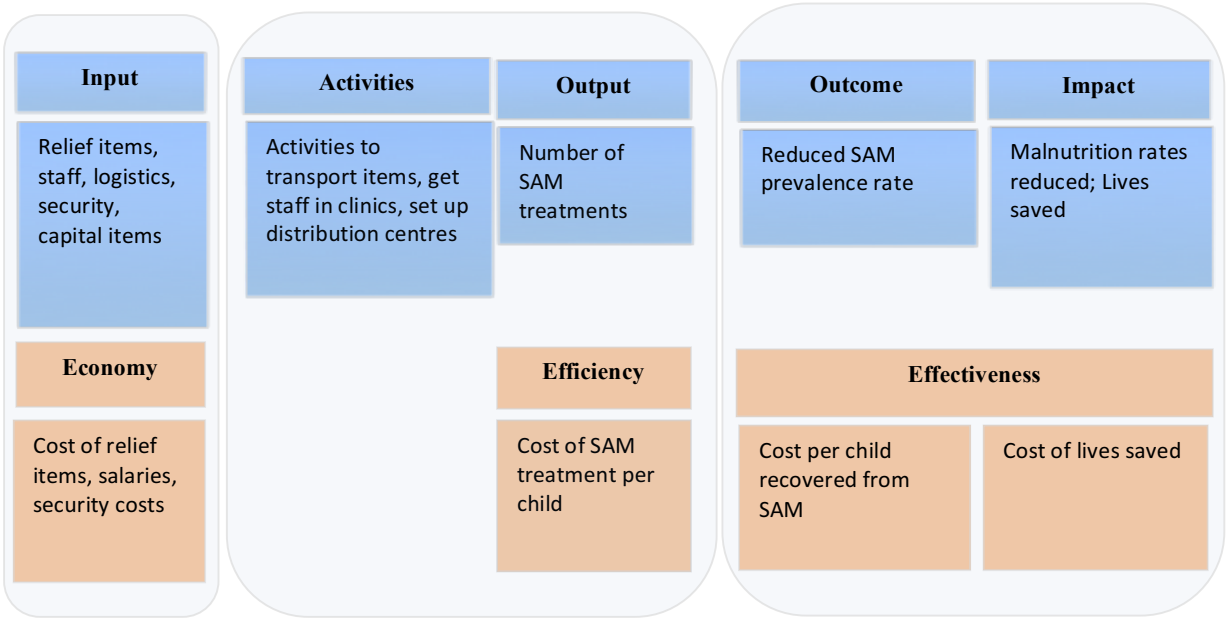
Figure 1: Value for Money measures and results chain



Source: 'Humanitarian Value for Money Toolkit', DFID, June 2014.

The example contained in **Figure 2** below is based on a typical nutrition project and shows the connections between the results chain and VfM metrics for a routine CMAM programme:

Figure 2: Example of results chain for routine CMAM programme and VfM metrics



Source: adapted from 'Humanitarian Value for Money Toolkit', DFID, June 2014 – page 13.

2.2 Anticipated results and theory of change for the CMAM Surge approach

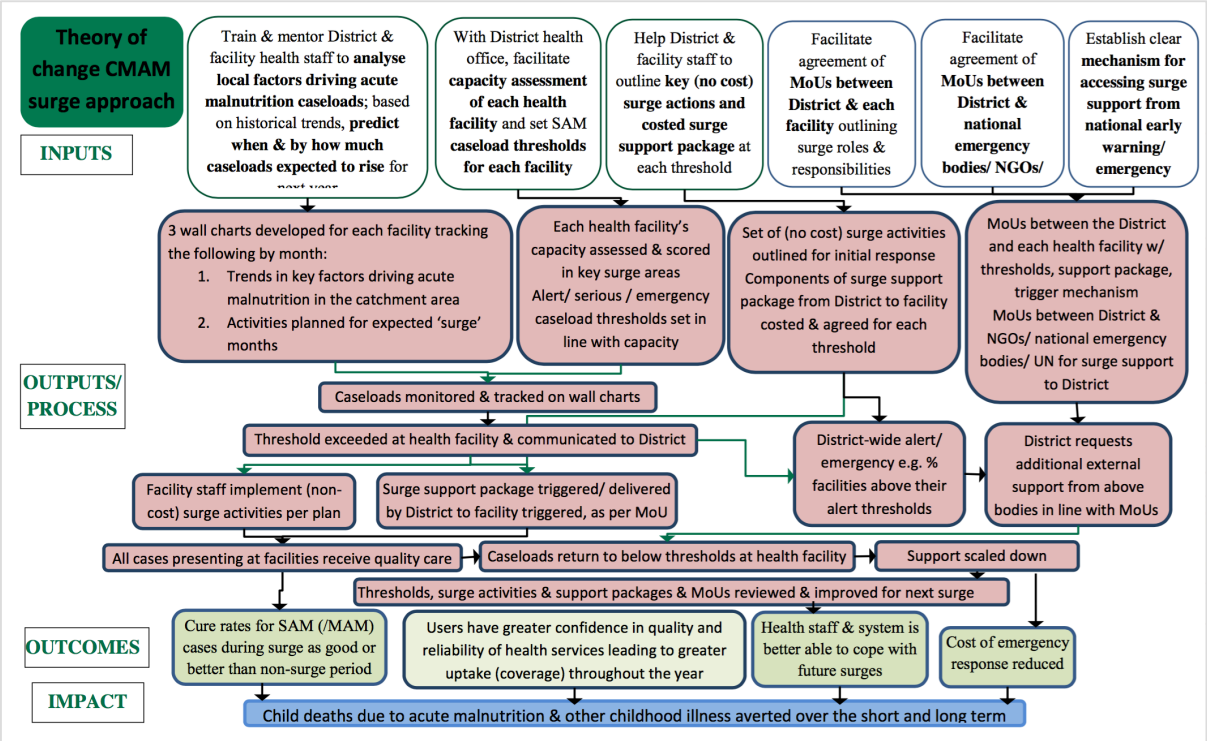
The CMAM Surge approach is designed to meet surges in service demand by first leveraging the existing capacity within a health facility team and then, if needed, by mobilising an agreed package of external support that is tailored to the specific needs of each health facility

and delivered only while those needs are unmet. It builds on the premise underpinning much of the current focus on resilience programming i.e. that **an appropriate, early response is generally more cost-effective than a more traditional, large-scale response launched once an emergency is underway**[3]. (Concern Worldwide , 2015).

Value for money of the CMAM Surge approach will be measured through tracking performance against a range of VfM indicators that span the length of the results chain (from inputs to outcomes). The CMAM Surge approach's ultimate aim (impact) is to avert child deaths due to acute malnutrition and other childhood illness (**Figure 3**), by achieving 4 main outcomes:

1. Cure rate for the treatment of SAM during as good or better than non-surge period;
2. Cost of emergency response reduced;
3. Health staff and system is better able to cope with future surge;
4. Users have a greater confidence in quality and reliability of services leading to greater uptake (coverage) throughout the year.

Figure 3: Theory of Change of CMAM Surge approach



Source: Concern's CMAM Surge Approach: An Overview (July, 2015)

Keeping in mind these main expected results this framework will attempt to answer to the following questions in relation to the CMAM Surge approach:

- What are the main cost drivers (inputs/economy)?
- What are the costs of inputs (inputs/economy)?
- What are the total costs for the implementation over a one-year period (inputs/economy)?

[3] Defining Disaster Risk Reduction: What does it mean for DFID? DFID, November 2011, Crown copyright.

- What is the **cost of SAM treatment per child** for the CMAM Surge approach in comparison to a traditional emergency response (outputs/efficiency)?
- What is the **cost per case of SAM cured** for the CMAM Surge approach in comparison to a traditional emergency response (outcomes/effectiveness)?
- Do health facilities have the capacity and resources to treat all cases arriving at the centre during surge/peak months? (**timeliness,** outcomes/effectiveness)?
- What is the level of **users' satisfaction** in quality and reliability of the services provided through the CMAM Surge approach (outcomes/effectiveness)?

Table 1 below contains a set of VfM indicators for the measurement of economy, efficiency and effectiveness of the CMAM Surge approach.

Table 1: Value for Money indicators

VfM criteria	Metric		Commentary
Economy	Unit cost of main inputs (purchase of drugs and medical supplies, etc.)		Looks at price and quality of purchase items items
	Unit cost of transport of inputs from country of origin to final location		Particularly relevant when comparing transport/storage costs of prepositioning inputs versus airlifting inputs later in the response when roads conditions have deteriorated (traditional emergency response)
	% of indirect costs and other administrative costs		Including government and partner agencies' District/ head office support costs, expenses associated with routine running of the wider health system; writing and implementing donor proposals, currency conversions cost, etc.
Efficiency	Cost per case of **SAM treated**		Average unit cost per child **treated** for SAM per year. # children treated obtained from patient registers
Effectiveness	Cost per case of **SAM cured**		Average unit cost per child **cured** for SAM per year. # children cured obtained from patient registers
	Timeliness of the CMAM Surge approach	**Speed** of initial response: when thresholds are crossed are facilities requesting and receiving support in a timely manner?	% of occasions where agreed threshold was exceeded that were reported to DHMT within 2 weeks and/ or % of occasions where pre-agreed support was delivered to a health facility within two weeks of a threshold being passed
		……	…….
	Satisfaction levels of end user		X% of beneficiaries surveyed indicated were satisfied with speed and quality of response

2.3 Economy: value for money at the input level

A first set of indicators of VfM for the measurement of economy refer to input costs required for the implementation of CMAM. A list of inputs and activities costs is contained in **Table 2**

below. Inputs and activities that are specific to CMAM Surge planning and response are compared and distinguished from those undertaken as part of routine CMAM service delivery and a traditional emergency response. Those costs specific to the CMAM Surge Approach are sourced from the analysis of the Eight Steps to implementing the Surge Approach as outlined in the CMAM Surge Implementation Guide and provided as an Annex. The list of input costs and activities is not exhaustive and will have to be refined at the outset of any actual CEA undertaken in a specific context.

Costs in **Table 2** are divided into '**direct costs'** and '**programme costs**'. Direct costs are costs for inputs per beneficiaries incurred at heath facility level at the point of delivering CMAM, such as medical drugs and supplies, medical personnel costs. Programme costs refer to costs that operate across a number of different service delivery points at a level other than the delivery point of CMAM, like training, coordination, monitoring and evaluation, etc. Programme costs can be shared with other interventions, and activities and will have to be allocated pro rata to CMAM in consultation with the programme implementers.

Input costs considered in this framework are financial costs of goods and services required to deliver each of the interventions from a supply-side prospective, and do not reflect the full economic and social cost of how resources could be used differently, such as opportunity costs of time of beneficiaries seeking and accessing the health facilities (lost wages, etc.).

Table 2: Inputs and activities costs for the Treatment of SAM included under each option

Cost category	Input/activity	Routine CMAM service delivery	CMAM Surge approach	Traditional emergency response
Direct costs				
Drugs and medical supplies	RUTF, Amoxicillin, Albendazole, Vitamin A, ..	✓	✓	✓
	Drugs and supplies' transport costs	✓	✓	✓
	Expand storage space, pre-position buffer stock		✓	✓
	Additional transport costs (emergency response)			✓
Medical personnel	Nutritionists, Nurses, Clinical Officers, etc. (MoH/County's staff)	✓	✓	✓
	Community health workers	✓	✓	✓
	Provide overtime compensation to current MoH/County's staff		✓	✓
	Second/transfer MoH's staff from Sub-county, provide incentives		✓	
	Recruit and train staff on temporary basis		✓	✓
	Make temporary staff accommodation (partitions, tents, etc.)		✓	
	Recruit international staff (including benefits)			✓
Programme costs				
Programme-Specific Human Resources	Senior managers, nutrition officers, etc. (MoH/County's staff)	✓	✓	✓
	Support staff (administrative staff, logistic, drivers, etc.)	✓	✓	✓
	Provide overtime compensation to current MoH/County's staff		✓	✓
	Recruit international staff (e.g. project officers/ managers including benefits)			✓
Training	Standard CMAM training (health workers, CHWs, ICCM)	✓	✓	✓
	Supplies management (CMAM)	✓	✓	✓
	Training of trainers (CMAM)	✓	✓	✓
	Additional refresher and on the job training		✓	✓

Equipment	Anthropometric equipment (Measuring boards, MUAC tapes, etc.)	✓	✓	✓
	Other equipment (basins, buckets, soap, etc) - OTP	✓	✓	✓
	Additional stationery, phone credit, etc.		✓	✓
	Additional anthropometric equipment		✓	✓
	Additional other Equipment (basins, buckets, soap, etc) - OTP		✓	✓
	Additional Stationery		✓	✓
	Additional working space for staff seconded		✓	✓
	Additional outreach sites/set up mobile clinics to improve access		✓	✓
Other programme costs (M&E, Supervision, Communication, Media & Outreach, Advocacy, General Programme Management)	Surveys (SLEAC, SMART, SQUEAC)	✓	✓	✓
	Routine surveillance costs	✓	✓	✓
	County nutrition technical forums	✓	✓	✓
	Coordination meetings, supervision and monitoring costs	✓	✓	✓
	Communication - media - social outreach activities	✓	✓	✓
	Advocacy activities	✓	✓	✓
	Joint supportive supervision visits	✓	✓	✓
	General programme management	✓	✓	✓
	Increased communication between HF and SCHMT (point above)		✓	✓
	Conduct more frequent coordination meetings		✓	✓
	Increase joint supervision visits & on-the-job training by SCHTM staff		✓	✓
	General programme management (traditional emergency response)			✓

The actual input and activity costs will be collected prospectively during the implementation phase of the research and compared between the three delivery options under analysis (routine CMAM service delivery, CMAM Surge approach, traditional emergency response) and against international benchmarks. Potential sources to help determine those costs are provided in Section 4.

2.4 Efficiency: value for money at the output level

Programme efficiency is measured by calculating and comparing **unit costs per case of SAM treated** for the CMAM Surge approach with routine service delivery and traditional emergency response. External benchmarking is also possible against similar programmes delivered in other countries, although consideration will need to be made for different contexts and delivery models (see **Table 12**).

The unit cost of the SAM treatment, intended as an average unit cost per child treated, is determined by the cost of drugs and supplies, plus the cost of direct medical personnel delivering the intervention and a portion of programme related costs.

The **unit cost per case of SAM treated** is obtained as:

$$= Cost\ per\ average\ case\ for\ drugs\ and\ supplies + \frac{Medical\ personnel\ costs + Programme\ costs}{\#\ children\ treated}$$

Where:

The cost per average case for drugs and supplies (including a percentage to account for transportation and distribution) is calculated using the so called ingredient approach, which can be conceptualized as follows: a percentage of beneficiaries needing a service will receive X doses of drugs/supplies to be taken Y

times per day for Z days. This is translated into a cost per average case by this equation:

Percentage receiving x Number of units x Times per day x Days per case x Unit cost of drugs/supplies + % Transportation and distribution

Units and doses used in this framework for the treatment of SAM are determined based on the assumptions explained in **Annex 2**, using information from a recent study conducted by UNICEF on the cost of high impact nutrition interventions delivered through the health system in Kenya[4]. These assumptions will have to verified and possibly amended during the implementation phase of the research based on local context.

Medical personnel costs - including salaries for nutritionists, nurses, community health workers, and other medical personnel - are calculated and apportioned in terms of full-time equivalents (FTEs) of personnel required for the treatment of SAM.

Programme costs are those necessary to support the implementation of CMAM and are not directly related to the number of people receiving care. Programme costs include training, supervision, monitoring and evaluation, equipment, advocacy and communication, and media and outreach.

The **# of children treated for SAM** during the period of analysis is obtained from the patient registers at health facility level.

2.5 Effectiveness: value for money at the outcome level

This dimension of VfM is associated with the cost of achieving the programme outcomes stated in the theory of change (**Figure 3**):

1. Cure rate for the treatment of SAM during as good or better than non-surge period;
2. Cost of emergency response reduced;
3. Health staff and system is better able to cope with future surge;
4. Users have a greater confidence in quality and reliability of services leading to greater uptake (coverage) throughout the year.

The measure of effectiveness for outcomes 1 and 2 of the theory of change above is combined in one metric: that is the **unit cost per case of SAM cured.** Similar to the analysis of the cost per child treated discussed in the efficiency section above, this unit cost is calculated as:

$$= \textit{Cost per average case for drugs and supplies} + \frac{\textit{Medical personnel costs} + \textit{Programme costs}}{\textbf{\# children cured}}$$

Where the **# of children cured for SAM** during the period under analysis is obtained from the patient registers at health facility level.

Another important set of metrics are those **qualitative indicators** that are meant to measure effectiveness of outcomes 3 and 4 of the CMAM Surge approach. These outcomes refer to

[4] Costing of Kenya's High Impact Nutrition Interventions', UNICEF Kenya, 2015.

the capacity of the health system and its staff to better cope with future surges of new admissions, and the users having a greater confidence in the quality and reliability of the services provided under the CMAM Surge model. In this respect, a first group of metrics looks at **timeliness of the CMAM Surge approach (Table 1)**. For example, the analysis could look at the **speed of the initial response** i.e. how quickly the pre-agreed support (including secondment of staff) is delivered once a facility crosses a caseload threshold . Finally, to measure the **level of satisfaction of the end users**, exits surveys should be conducted to assess the level of satisfaction of the beneficiaries with the speed and the quality of the response. These metrics around timeliness are not yet fully developed, but Concern together with other stakeholders plan to more fully develop them in 2016/17 for routine monitoring and evaluation of the Surge Approach as well as VfM analysis.

During the research phase, this set of indicators will be used to measure the effectiveness of the CMAM Surge Approach as implemented in one study arm (e.g. a set of health facilities) versus a second study arm (a second set of health facilities in the same or neighbouring district with comparable context) where routine CMAM services or a more traditional emergency response is adopted.

3 Ex-ante economic appraisal

The ex ante economic appraisal is built using data from a recent study conducted by UNICEF on the cost of high impact nutrition interventions delivered through the health system in Kenya[5], and by applying some key assumptions and projections based on a review of available evidence when historical data are missing or not adequately structured. The options considered in this economic appraisal are:

Option 1: **Routine CMAM service delivery (no Surge approach)**
Option 2: **CMAM Surge approach**
Option 3: **Traditional emergency response**

The CMAM Surge approach is generally implemented at health centres or health posts and hospitals where inpatient treatment for acute malnutrition is provided. Ideally, it is implemented across a district, but it may be implemented in a subset of facilities within a district or region. The VfM framework discussed in this document is applicable to most contexts; however, this ex ante economic appraisal is modelled on the CMAM Surge Approach as implemented in Marsabit County, Kenya, over a one-year period. Future economic appraisals of the approach will ideally collect actual data prospectively, if any of the Marsabit assumptions are used, they will need to be reviewed and refined based on each context. Furthermore, while this analysis focuses on management of SAM, if services for MAM are also a standard part of health services they can be included in the research framework.

3.1 Option 1: Routine CMAM service delivery (no Surge approach)

The first option assumes that health facilities are delivering CMAM as part of routine health services but do not have the flexibility or resources to expand their capacity to provide adequately for the increased demand for SAM treatment. It would likely mean a significant number of children requiring the treatment would be turned away due to inadequate supplies or discouraged to come due to long waiting times or poor service. This would have negative consequences in terms of child malnutrition and loss of life. Unfortunately, the real impact on

[5] Costing of Kenya's High Impact Nutrition Interventions', UNICEF Kenya, 2015.

mortality and malnutrition would be difficult to assess as children turned away or who don't seek treatment would not be recorded in the HF's patient registers.

3.2 Option 2: CMAM Surge approach

As described in **Appendix 1** of this document, the CMAM surge approach aims to make a health system better able to cope with the surges in demand for CMAM services and in this way to make the health system more resilient over time. In the past, the health system has responded to these surges by trying to continue with the basic service (Option 1) or by mobilising external resources, often leading to a disjointed approach that is inefficient (Option 3).

Evidence for potential cost savings and benefits using the CMAM Surge approach

The assumption underlying this model is that the Surge approach would generate **cost savings** by more effectively leveraging existing capacity from within the health system, thereby reducing the need for expensive external aid to respond.

In addition to costing less, the Surge approach would also allow for an **early response, meaning cases can be treated as they begin to increase**. While the importance of rapid response (i.e. within weeks or days) is obvious for rapid onset disasters, such as earthquakes, but the importance of early response in the context of slow onset disasters, such as droughts or conflicts, is less appreciated. More often, donors only decide to fund and act when a slow-onset crisis is peaking and a rapid action is necessary to save lives. In both types of crisis, however the sooner action is taken, the more lives can be saved.

So far, several studies have highlighted the weaknesses and the cost implications of traditional emergency response in the context of slow onset food crises (D Hillier, 2012) (Levine, 2011). However, only few attempted to compare the costs of an early and effective response with a late and ineffective response. Some estimates suggest that an early response can save between 30% and 500% (Bailey, 2012). A CHASE-commissioned multi-country analysis of the economics of early response and resilience showed that a resilience approach can be the most cost effective of the three scenarios analysed. The scenarios were: resilience, early response and late humanitarian response. The findings indicated that there is the potential for very large cost savings in all case study countries as a result of moving to early response and resilience. In Kenya, these savings were as high as $21 billion over 20 years, simply as a result of responding early. Benefit to cost ratios of investing in resilience ranged between $2.3 and $13.2 of benefit for every $1 spent (based on a very conservative assumption on returns to investment in resilience – these ratios are likely to be significantly higher). So choosing the right time to intervene as well as the right type of response (such as building resilience in disaster prone areas, intervening early in slow onset disasters) is where significant and real VfM gains can be obtained over the long term (Venton, 2012).

In nutrition, the same logic can be applied, meaning an early and well-planned response to health system 'emergencies' i.e. when caseloads peak can result in greater cost efficiency. The cost savings and gains can be grouped into two main categories: improved outputs and outcomes; and operational cost savings.

Evidence for potential improved outputs and outcomes using the CMAM Surge Approach

One of the main objectives of the CMAM surge model is to improve **early and adequate response** to increased caseloads of severe acute malnutrition In the short-term and within a discrete period of time, this should in the health system being able to treat a **higher number**

of SAM cases over the course of a year because it is able to 'capture' and treat the increasing number of cases arriving at the health facility as they arrive (and turn no child away).

Ensuring that the quality care can be provided even during peaks also promotes early detection and treatment of children because they will continue to be brought to health facilities earlier, before their malnutrition has become more severe and complications have set in requiring more intensive and more expensive treatment (i.e. inpatient). This ultimately leads to **higher recovery rates** and greater **client satisfaction, which in turn should contribute to increased coverage**.

Evidence for potential operational cost savings using the CMAM Surge Approach

Operational costs include procurement, transport, logistics and pre-positioning of supplies, and the ability to plan and operationalise long-term interventions. Early procurement and pre-positioning of supplies (i.e. RUTF) based on a sound analysis of when caseloads are likely to surge is a key strategy of the CMAM Surge Approach. The cost of nutrition supplies is generally lower if procured and positioned in advance of the surge period, due to lower logistics and transport costs, as caseloads peaks often coincide with periods of poor road access (due to rains) (last minute air freight of RUTF can increase the landed cost up to 100%[6]). There is **strong evidence** that the unit cost of supplies can be reduced by 1/2 to 1/3 of the original cost if procured early. Evidence from Ethiopia's Productive Safety Nets Programme (PSNP) shows that the estimated cost of delivering food aid was $487 per metric ton (MT) of food aid (2010/11), as compared with WFP figures for late humanitarian aid of $845 per MT.14 (this estimate also includes internal transport, storage and handling costs)[7]. Other estimates suggest that the cost of food aid provided early in Ethiopia could be even lower; for example, the World Bank's, "Project Appraisal Document for a Productive Safety Net APL III Project" cites a cost of $422 per MT (2009 data), a 50% decrease. (The World Bank, 2009). Stock prepositioning will also ensure that the right items are procured and arrive in good time and meet nutritional requirements.

The CMAM Surge approach has the potential to deliver other significant operational cost savings on various level, as compared with the traditional emergency response model. High staff costs are often associated with hiring international humanitarian staff for short term contracts at the peak of an emergency. These include expensive benefits and high recruitment costs. In contrast, seconding or recruiting national staff within country/counties, extending working hours, engaging volunteers, and similar 'local solutions' reduces costs promotes strengthening health systems and maintaining institutional knowledge.

The CMAM Surge approach also reduces the general management and administrative costs often associated with traditional emergency response including, agencies' head office recovering and support costs, expenses associated with writing and implementing proposals, currency conversions, etc.

3.3 Option 3: Traditional emergency response

While the he traditional emergency response model has enormous potential to save lives and is still required for very large emergencies, it has in many cases arrived late, often with an inflexible one-size-fits-all approach and unsustainable, stop-start funding. This can have

[6] Komrska, J. (n.d.). *Increasing Access to Ready-to-Use Therapeutic Foods (RUTF.* UNICEF.
[7] DFID. (2012). Ethiopia's productive Safety Net Programme 2010-2014: A value for money assessment.

negative impacts on the existing health system. The traditional emergency response model can also be inefficient in its exit strategy, waiting for nutrition surveys to demonstrate that the levels of acute malnutrition have returned to below crisis levels, at which point the programme may be abruptly closed and the external actor leaves until the next time (Hailey, 2015). The cost implications of a late rather than an early response as outlined in the previous section are clear.[8]

Table 3 below shows a summary of evidence for potential cost savings and benefits of the CMAM surge approach in comparison to a traditional emergency response. In order to sustain the hypothesis that the CMAM Surge Approach is more cost efficient than the traditional model, further research / investigation will be required to strengthen the evidence is currently considered medium/weak.

Table 3: Evidence for potential cost savings and benefits of the CMAM Surge approach against a traditional emergency response

VfM criteria	Metric	Potential cost savings and benefits of CMAM Surge approach as compared to routine CMAM services and traditional emergency response
Economy (inputs)	Unit cost of main inputs (purchase of drugs and medical supplies, etc.); Procurement and logistics costs; Administrative costs.	**Strong evidence**: - Lower staff costs - Lower procurement prices - Savings from pre-positioning of stock / transport and logistics Medium evidence: - Lower general management and administrative costs
Efficiency (outputs)	Cost per case of **SAM treated**	**Strong evidence**: - Lower costs of treatment - Higher number of children treated (new admissions)
Effectiveness (outcomes)	Cost per case of **SAM cured**	Medium evidence: - Improved recovery rates (# children cured) - Higher number of children cured - Lower cost per SAM cured
	Timeliness of the CMAM Surge approach	Medium evidence: - Timeliness of the response
	Satisfaction levels of end user	Weak evidence - Customer satisfaction

3.4 What are the costs and benefits of each option?

This section contains an attempt to quantify the costs and the benefits of implementing CMAM for each of the feasible options considered in this framework.

The incremental costs over a one-year timeframe of implementing CMAM are calculated in a hypothetical scenario of surge in caseloads of SAM in Marsabit county, Kenya. The costing of the treatment of SAM is performed adopting a mixed approach dependent on data availability. Where adequately organised historical data is lacking, costs per average case for drugs and supplies and other SAM related programme activities, such as training, monitoring visits, etc, are obtained using the so called 'ingredients approach' from a recent costing exercise undertaken in Kenya by UNICEF and the World Bank (UNICEF Kenya, 2015). Other CMAM Surge costs and assumptions have been estimated by the author, based on the

[8] Venton, Courtenay Cabot, et al. "The Economics of Early Response and Disaster Resilience: Lessons from Kenya and Ethiopia". London: DFID (2012).

available evidence discussed above. During the research phase these costs will have to be reviewed based on actual expenditures using the classification proposed in this framework (**section 2**).

The total cost for each option is calculated by the product of the cost per average case for drugs and supplies and the **estimated number of cases treated** during the year, plus the cost of medical personnel delivering the intervention and the portion of programme costs allocated to the treatment of SAM (an explanation of cost category is contained in **section 2.3** "Economy: Value for Money at the Input Level").

The **estimated number of cases treated** during the year are projected for each scenario based on the number of children in need of SAM treatment and, within this subset, the number of children seeking treatment. The **number of children in need of treatment** is calculated using the methodology and formula recommended by the CMAM forum (Myatt, http://www.cmamforum.org, 2012). **Table 4** below shows the total population, proportion of children 6-59 months, SAM prevalence, and incidence factor determining the potential number of children in need of treatment estimated in this economic appraisal exercise. In practice, the **number of children seeking SAM treatment services** at health facilities is always less than the potential number of children in need due to a number of limiting factors including: lack of knowledge of malnutrition; lack of knowledge of the programme; high opportunity costs; distance to site; previous rejection (Puett, Hauenstein Swan, & Guerrero, 2013). In this analysis for Marsaabit it is assumend that the percentage of children seeking treatment is 60% of the total number of children in need. This is based on an expected level of coverage of around 50% (an average coverage figure according to Puett, et al above) but assuming that a slightly higher percent of SAM would have potentially sought care but not been fully enrolled due to insufficient supplies, staff or dissatisfaction with the service. In this model, it is assumed that an increase in number of children in need of treatment takes place in quarter 2 of the year, reaching its peak in quarter 3, based on analysis of caseloads in Marsabit in 2012-2014.

Table 4: Estimated number of children in need and seeking treatment of SAM (Marsabit, Kenya)

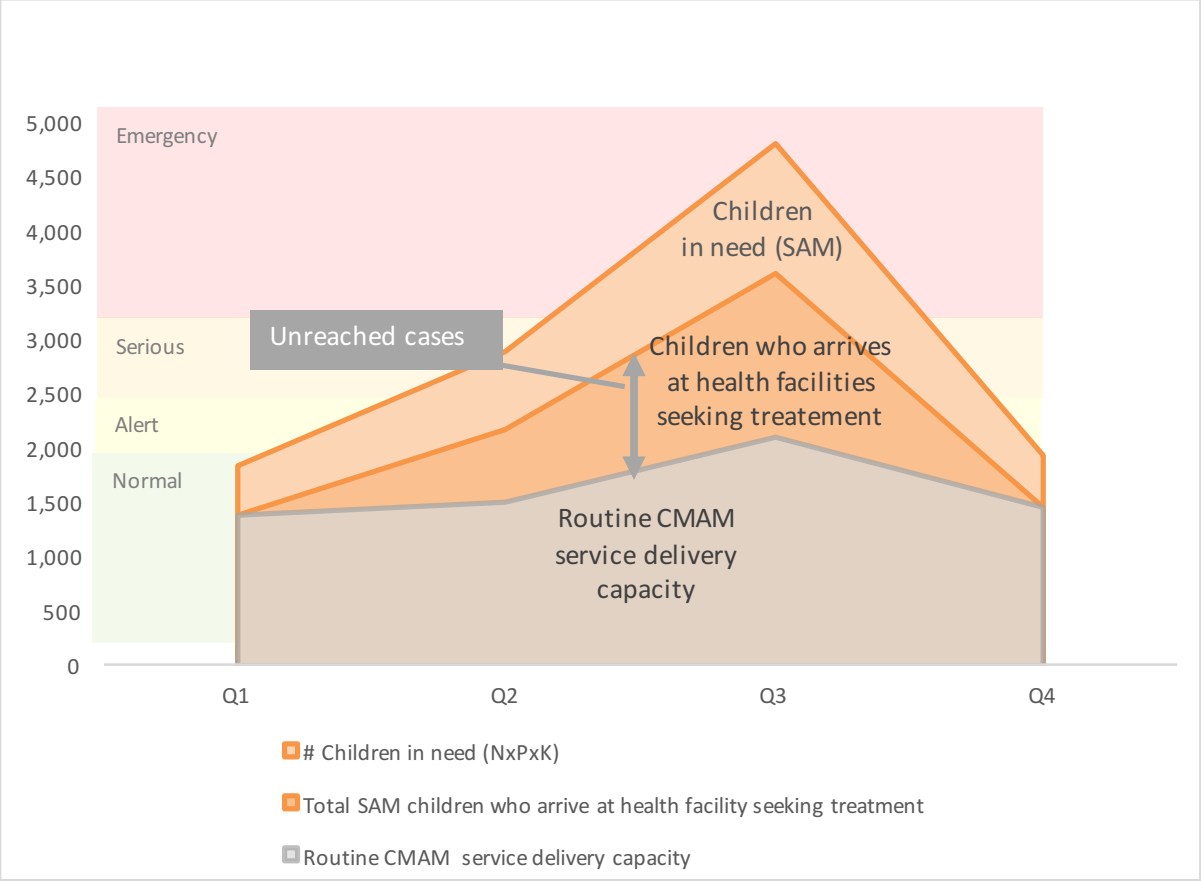
Quarter	Q1	Q2	Q3	Q4
Total population*	343,636	343,636	343,636	343,636
Proportion children 6-59 months*	20.00%	20.00%	20.00%	20.00%
# Children 6-59 months (N)	68,727	68,727	68,727	68,727
SAM prevalence (P)	**1.90%**	**3.00%**	**5.00%**	**2.00%**
Incidence factor over 3 months (K=1+3/7.5)	1.40	1.40	1.40	1.40
# Children in need (NxPxK)	**1,828**	**2,887**	**4,811**	**1,924**
# Children seeking treatment at HFs (60%)	**1,097**	**1,732**	**2,887**	**1,155**

Sources: *Population data from 'Marsabit County Nutrition Action Plan July 2015-June 2018'

Figure 4 illustrates the increase in number of children in need of SAM treatment in relation the number of children expected to arrive at health facilities seeking treatment. This graph also shows the limited ability of the routine CMAM service delivery to treat all children who arrive during a surge (due to staff's shortages, lack of stock of RUTF, etc.), which is indicated as the 'normal' level of health capacity. CMAM Surge thresholds to indicate an alert, serious and emergency level of caseloads is also outlined on the left. With no external

support, it is hypothesised that there will always be a gap of unreached cases depicted in Figure 4.

Figure 4: Children in need and seeking SAM treatment in routine CMAM service delivery



3.4.1 Expected costs for the management of SAM for each option

Table 5 indicates the estimated annual costs in relation to the number of beneficiaries treated for the three options under consideration. The projected cost of implementing the routine CMAM service delivery assuming no room for expanding capacity to meet the surge in demand for SAM treatment is US$ 508,690. Scaling up by adopting the CMAM Surge model would cost US$ 695,241, while under the same assumptions of population in need a traditional emergency response over a year would cost US$ 937,049.

Cost differences between the options stem from different assumptions made in terms of estimated number of SAM children treated, and differences in the cost structure associated with different modalities of implementation. The CMAM Surge approach costs significantly less than the traditional emergency response, despite the highest number of children treated due to early response to surges in demand. It also accounts for the highest estimated expenditures for drugs and medical supplies, which are directly related to the number of children treated. However, the highest cost for drugs and supplies is discounted by savings due to pre-position of stock and lower procurement prices and transport/logistics costs. Furthermore, as discussed in the analysis of available evidence, compared to the traditional emergency response, the CMAM Surge approach allows for staff cost savings (both medical personnel and programme specific human resources) and less programme costs in terms of general management and administrative fees.

Table 5: Estimated annual costs for the management of SAM for each option

Cost category	Routine CMAM service delivery[2]	CMAM Surge approach[3]	Traditional emergency response[4]
	US$	US$	US$
Drugs and medical supplies[1]	356,702	449,445	554,421
Medical personnel	15,755	41,103	63,755
Programme-Specific Human Resources	-	25,348	72,000
Training	63,775	82,247	93,775
Equipment	20,440	40,880	40,880
Other programme costs	52,018	56,218	112,218
Total	**508,690**	**695,241**	**937,049**

Source: Author's calculations

[1] Include freight from country of origin to destination

[2] Cost assumptions explained in Appendix 2 based on the ingredients approach from a recent costing exercise undertaken in Kenya by UNICEF and the World Bank (UNICEF Kenya, 2015)

[3] Extra costs, in addition to higher expenses for RUTF, include: staff seconded; additional refresher and on the job training; additional anthropometric and other equipment and stationery; Additional joint supportive supervision visits

[4] Extra costs include: additional transport costs; higher staff and general programme management costs

3.4.2 Expected benefits of each option

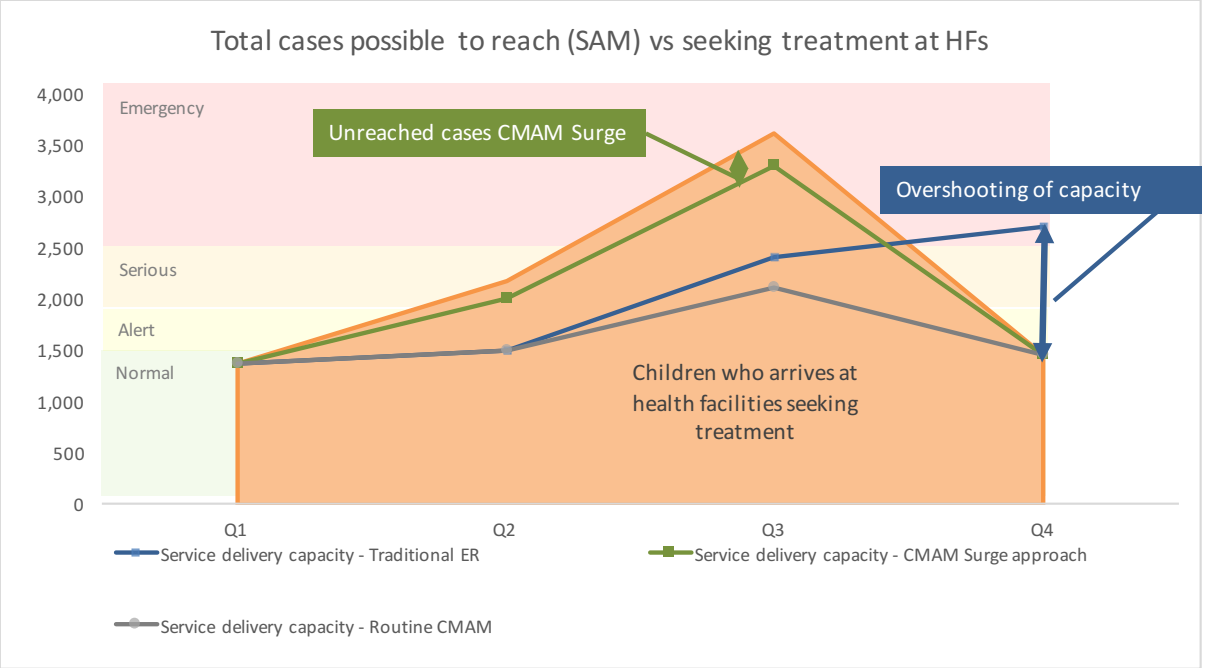
The benefits of the options are assessed in terms of number of children treated as a measure of efficiency, and number of children cured for effectiveness. These results have been estimated by the author based on the main assumptions and evidences discussed in the previous section, that the CMAM Surge approach allows to intervene and adapt capacity of the HFs faster than the traditional emergency response approach and therefore **treat a higher number of cases of SAM**, achieve **higher recovery rates,** and **it is able reach out and treat a much higher of children seeking access to the services**.

Figures 5 shows the assumptions underlining each of the service delivery options as caseloads increase. First, as in Figure 4, there is a portion of children who are in need but don't reach the health facility for whatever reason: this is the same for all three approaches. The bottom line represents the routine CMAM service delivery option and assumes that in the context of a surge in SAM prevalence (Q2) the health system is not able to increase its responsive capacity, and, therefore, the number of children treated and cured does not meet the level of those seeking treatment and arriving at the health facility. In contrast, the CMAM Surge approach option allows for this extra capacity to be put in place as the number of children seeking treatment increases, resulting in a significantly higher portion of those children seeking treatment actually being treated.

Finally, the traditional emergency response option will also react to the increased demand, but this will take place significantly later when the number of children seeking treatment is already decreasing. This event, has been referred to as '**overshooting of capacity'** (Hailey & Tewoldeberha , Suggested New Design Framework for CMAM Programming, 2010). Itis due to the start-stop nature of traditional emergency response and the lag time between the declaration of an emergency and resource mobilization. Whilst partners are mobilising funding, staff, supplies and other resources, part of the crises – and the caseload - has already passed. Unfortunately, many of those cases missed during the early stages may have died due to poor treatment. Similarly, once a survey or assessment has shown the SAM rates have

moved below emergency thresholds or the assessment indicates improvements it takes some time for an organisation to stop their input of resources or to hand over, meaning the resources are now surplus to requirements. This poorly timed and inefficient use of resources under the traditional emergency response is central to the argument for surge for CMAM Surge, particularly the economic argument.

Figure 5: Estimated potential SAM cases reached for each option compared to children seeking treatment



Based on these assumptions**, Table 6** details the estimated benefits of each option in terms of number of number of children treated and cured, in relation to those seeking access, during a hypothetical one-year period when it is assumed a peak in SAM prevalence (and consequent increase in number of children in need of treatment).

Table 6: Estimated annual benefits of each option

Option	Indicator	Q1	Q2	Q3	Q4	Total
All	# Children in need	1,828	2,887	4,811	1,924	**11,450**
	# Children seeking treatment at HFs	1,097	1,732	2,887	1,155	**6,870**
Routine CMAM service delivery	% Children seeking treatment at HFs who were treated	100%	70%	60%	100%	76%
	# Children treated	1,097	1,212	1,732	1,155	5,196
	# Children cured	910	1,006	1,437	958	4,312
CMAM Surge approach	% Children seeking treatment at HFs who were treated	100%	93%	93%	100%	95%
	# Children treated	1,097	1,611	2,684	1,155	6,547
	# Children cured	1,042	1,530	2,550	1,097	6,219
Traditional emergency response	% Children seeking treatment at HFs who were treated	100%	70%	67%	100%	78%
	# Children treated	1,097	1,212	1,920	1,155	5,384
	# Children cured	998	1,103	1,747	1,051	4,899

Source: Author's calculations

3.4.3 Balance of costs and benefits (cost-efficiency-effectiveness analysis)

Table 7 shows the estimated costs and benefits for each of the options analysed in this hypothetical scenario of surge in caseloads of SAM in Marsabit county, Kenya. Based on the assumptions discussed earlier, the CMAM Surge approach results in the highest number of children treated and cured during the one-year time frame considered (6,547; 6,219) and this approach is able to reach out the highest number of those children seeking treatment (95%). In contrast, due to the assumed late intervention, the traditional emergency response would only be able to reach 5,384 children and cure 4,899 during the same period.

By all measures, **Table 7** suggests that CMAM Surge option is the most efficient and effective in delivering treatment of SAM as it would ensure the lowest cost per child treated (US$ 106.20) in relation to the highest number of children reached out of those seeking assistance; and the lowest cost per child cured (US$ 111.79). The traditional emergency response, in addition to be most expensive in absolute term, would reach out a considerable lower number of beneficiaries, resulting in almost double cost per child treated (US$ 174.05) and more than double cost per SAM case cured (US$ 191,26).

Table 7: Estimated costs and benefits of each option

	Routine CMAM service delivery (no Surge)	**CMAM Surge approach**	**Traditional emergency response**
Cost			
Total annual cost (US$)	508,690	695,241	937,049
			Expected annual benefits
# Children seeking treatment at HFs	6,870	6,870	6,870
% Children seeking treatment at HFs who were treated	76%	95%	78%
# Children treated	5,196	6,547	5,384
# Children cured (annual)	4,312	6,219	4,899
			Cost effectiveness (US$)
Annual cost per child treated	97.90	106.20	174.05
Annual cost per child cured	117.96	111.79	191.26

The analyses conducted in this ex-ante economic appraisal highlights significant potential advantages of delivering SAM through the CMAM Surge approach in terms of better Value of Money ensured by this approach in comparison to other more traditional emergency responses. It should be noted that the real magnitude of the costs and benefits estimated in this appraisal should be reconsidered and tested during the implementation of the research phase described below.

3.4.4 Sensitivity analysis

The estimated costs and benefits presented in this analysis are highly dependent on some basic assumptions established for each of the options considered, such as % children treated and cured for each service delivery option and unit costs per average case treated (drugs and supplies only). A sensitivity analysis is presented below to assess the impact variation of a set

of key parameters on the worst and base case scenario of variability **(Table 8)**. The worst case should be interpreted as the case that makes CMAM least cost-effective.

Table 8: Input parameters for sensitivity analysis

Parameters	Base case	Worst case	Best case	Source of base case (and range)
% SAM children seeking treatment	60%	45%	75%	+/- 25% from base case
Routine CMAM service delivery				
% Children treated:	76%	57%	90%	Worst case: - 25% from base case
% Children cured:	83%	62%	90%	Best case: 90%
CMAM Surge approach				
% Children treated:	95%	71%	100%	Worst case: - 25% from base case
% Children cured:	95%	71%	100%	Best case: 100%
Traditional emergency response				
% Children treated:	78%	59%	95%	Worst case: - 25% from base case
% Children cured:	91%	68%	95%	Best case: 95%
Unit cost per average case of treatment (RUTF and other drugs only)[1]	$69	$110	$37	Base: 56 days treatment (UNICEF Kenya 2015) Best: 90 days treatment Worst: 30 days treatment

[1] Unit costs from (UNICEF Kenya, 2015)

Table 9 shows how changes in this set of parameters may have significant impacts on the cost effectiveness of the implementation of CMAM for the three arms of service delivery. However, under the hypothetical worst/best cases for all variables, the model indicates that the CMAM Surge approach is still the most cost-effective service delivery option.

Table 9: Sensitivity analysis for changing assumptions

	Base case	Worst case	Best case
Routine CMAM service delivery			
Annual cost per child treated	**97.90**	161.53	56.89
Annual cost per child cured	**117.96**	260.53	63.21
CMAM Surge approach			
Annual cost per child treated	**106.20**	176.97	65.83
Annual cost per child cured	**111.79**	249.25	65.83
Traditional emergency response			
Annual cost per child treated	**174.05**	290.53	102.56
Annual cost per child cured	**191.26**	427.26	107.96

4 Research plan for ex post cost effectiveness

4.1 Methodology

In absence of historical data adequately organized, the economic appraisal discussed in the previous section is built on very strong assumptions based on a hypothetical scenario of surge in caseloads of SAM in Marsabit county, Kenya. In order to generate more robust cost-effectiveness data for the CMAM Surge Approach, the same methodology should be applied during its next implementation cycle e.g. in Kenya, Uganda or Niger. Planning from the outset of the programme cycle would allow data to be collected and structured in line with the framework defined in section 3 of this document and for a comparative ex-post VfM analysis of the CMAM Surge approach to be conducted. This is critical for making the case for the CMAM Surge Approach as well as for early, flexible response in the face of potential crisis.

As for the ex-ante analysis, there are two potential comparisons for ex-post VfM analysis. The first is a comparison with routine CMAM services (i.e. no Surge Approach) and the second is with the traditional emergency response. A comparison with routine CMAM services is likely to be more straightforward, as it may be more feasible to have two study 'arms' – the first arm a group of health facilities in a given district where only routine CMAM services are being delivered and the second arm a group of health facilities in the same district or a neighbouring but comparable district where the CMAM Surge Approach is implemented. A comparison against the traditional emergency response will likely rely on a more theoretical scenario based on more assumptions combined with historical data, as it would be difficult to find or create a situation where a traditional emergency response was only be applied in a subset of health facilities. If the emergency was extreme, all health facilities should be targeted; if the emergency was not extreme, it would be difficult to ensure that the traditional emergency response took place as planned.

In both comparison scenarios, the two arms should located in the same or a very context and data on the costs and benefits of implementing the CMAM Surge versus the alternative should ideally be collected over the course one or more years.

A key assumption / requirement for this analysis to be valid is that a caseload surge of some significance occurs during the study period. This is similar to studies in other humanitarian settings, where an emergency must occur for the counter factual to be tested.

4.2 Data collection strategy

Once health facilities to be included in the research have been selected for each comparison group, it is important to initiate the data collection during the routing monitoring of the programmes and make sure that VfM questions referring to the metrics discussed in this document are always included. At the end of the implementation phase, data can be analysed using actual costs and results rather than projections, for each of the dimensions of VfM.

Input costs considered in this framework are financial costs of goods and services required to deliver each of the interventions from a supply-side prospective, using the classification of costs defined in this framework. However, beneficiary and community costs may be included to reflect the full economic and social cost of the actions. **Table 10** below contains

a list of possible data sources to assess input costs required for the treatment of SAM for each comparison group. The main source of information will be the finance systems and procurement database of implementing organisation and partners using the classification of costs proposed in this framework. Additional costs, which details are not included in the accounting systems of the implementing organisations, can be obtained from additional sources and other programme documentation or interviews with key informants. These costs may include salaries for staff participating to the programme implementation to be sourced from organisation's payroll, budgets or interviews with counties or district nutrition team. Indirect costs may have to be allocated to the treatment of SAM using activity-based costs analysis techniques, such timesheets determining the amount allocated by each staff to nutrition interventions.

Table 10: Source of data for input costs (economy)

Cost category	Input/activity	Source of data
Drugs and medical supplies	RUTF, Amoxicillin, Albendazole, Vitamin A, ..	Database of procuring agency (UNICEF, MoH, etc.)
	Drugs and supplies' transport costs	Same as above
	Expand storage space, pre-position buffer stock	Interview with County/District nutrition team; Implementing partner's finance system
	Additional transport costs (emergency response)	Implementing partner's finance system
Medical personnel	Nutritionists, Nurses, Clinical Officers, etc. (MoH/County's staff)	MoH/District/County's payroll or budget
	Community health workers	Implementing partner's finance system
	Provide overtime compensation to current MoH/County's staff	
	Second/transfer MoH's staff from Sub-county, provide incentives	
	Recruit and train staff on temporary basis	
	Make temporary staff accommodation (partitions, tents, etc.)	
	Recruit international staff (including benefits)	
Programme-Specific Human Resources	Senior managers, nutrition officers, etc. (MoH/County's staff)	MoH/District/County's payroll or budget
	Support staff (administrative staff, logistic, drivers, etc.)	Implementing partner's finance system
	Provide overtime compensation to current MoH/County's staff	
	Recruit international staff (project officers including benefits)	
Training	Standard CMAM training (health workers, CHWs, ICCM)	Implementing partner's finance system
	Supplies management (CMAM)	
	Training of trainers (CMAM)	
	Additional refresher and on the job training	
Equipment	Anthropometric equipment (Measuring boards, MUAC tapes, etc.)	Interview with County/District nutrition team MoH/District/County's
	Other equipment (basins, buckets, soap, etc) - OTP	
	Additional stationery, phone credit, etc.	
	Additional anthropometric equipment	

	Additional other Equipment (basins, buckets, soap, etc) - OTP	payroll or budget Implementing partner's finance system
	Additional Stationery	
	Additional working space for staff seconded	
	Additional outreach sites/set up mobile clinics to improve access	
Other programme costs (M&E, Supervision, Communication, Media & Outreach, Advocacy, General Programme Management)	Surveys (SLEAC, SMART, SQUEAC)	Interview with County/District nutrition team MoH/District/County's payroll or budget Implementing partner's finance system
	Routine surveillance costs	
	County nutrition technical forums	
	Coordination meetings, supervision and monitoring costs	
	Communication - media - social outreach activities	
	Advocacy activities	
	Joint supportive supervision visits	
	General programme management	
	Increased communication between HF and SCHMT (point above)	
	Conduct more frequent coordination meetings	
	Increase joint supervision visits & on-the-job training by SCHTM staff	
	General programme management (traditional emergency response)	

Table 11 contained data sources for quantitative and qualitative data collection for outputs and outcomes indicators. Number of SAM children treated and cured in each of the health facilities included in the research will be obtained from the respective patient registers. Focus group discussions and interviews with implementing staffs and beneficiaries will provide information on the timeliness of the implementation and the experiences of the programme beneficiaries.

Table 11: Source of data for outputs and outcomes indicators (efficiency/effectiveness)

VfM criteria	Metric		Source of data
Efficiency	Cost per case of **SAM treated**		- # children treated obtained from health facility patient registers
Effectiveness	Cost per case of **SAM cured**		- # children cured obtained from health facility patient registers
	Timeliness of the implementation	**Speed** of initial response	- Focus group discussion with staff - Interviews with staff of implementing organizations and relevant partners - Focus group discussions with intervention beneficiaries
	Satisfaction levels of end user		

4.3 Data entry and analysis

Data entry and processing for both quantitative and qualitative information will be undertaken using a customised Microsoft Excel tool.

Total costs for the treatment of SAM and Value for Money metrics of cost efficiency and effectiveness (cost per case of SAM treated and cost per case of SAM cured) will be calculated for each comparison group using the methodology described in section 4 of this

document, and presented as the ex-ante economic appraisal conducted in section 5. The unit costs for the treatment of SAM, in addition to a comparison within the three implementation modalities (CMAM Surge, Traditional emergency response or routine CMAM service delivery), can also be compared to some of the **international benchmarks** obtained from others costing and cost effectiveness analysis (**Table 12**).

Table 12: International benchmarks unit costs for the treatment of severe acute malnutrition (SAM) - Outpatient

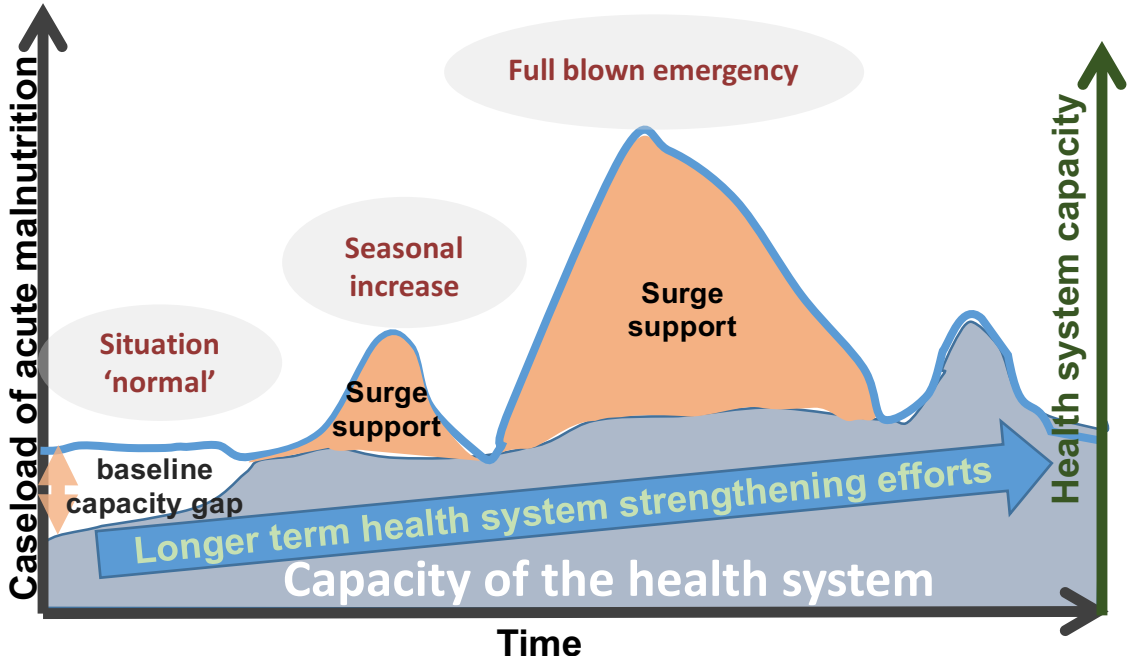
Unit cost per average case (US$)	Notes	Source
US$ 200	Using a community- based management approach	The World Bank (2010)
US$ 140-212	Cost-effectiveness of community-based management of acute malnutrition in Malawi (Dowa)	Wilford R., Golden K. and Walker D.G. (2011)
US$ 146-150	Based on ingredient approach (Sub Saharan Africa)	Lancet (2013)
US$ 109.86 (ASAL) US$ 75.73 (Non-ASAL)	Based on ingredient approach (Kenya)	UNICEF Kenya (2015)

A **sensitivity analysis** may be performed on the cost-effectiveness indicators to determine if and how they are sensitive to variation in certain uncertain quantitative and qualitative parameters. This also include building **best and worst case analysis** that involve replacing, in turn, each cost and outcome variable with its best and worst case to see how the cost-effectiveness ratios changes.

Annex 1: The CMAM Surge approach

The objective of the CMAM surge approach is to improve the resilience of health systems so they are better able to deliver services for the treatment of acute malnutrition over time - particularly during periods of high demand when the potential to save lives is greatest - without undermining the capacity and accountability of government health actors.

Figure 6: Seasonal surges in case loads



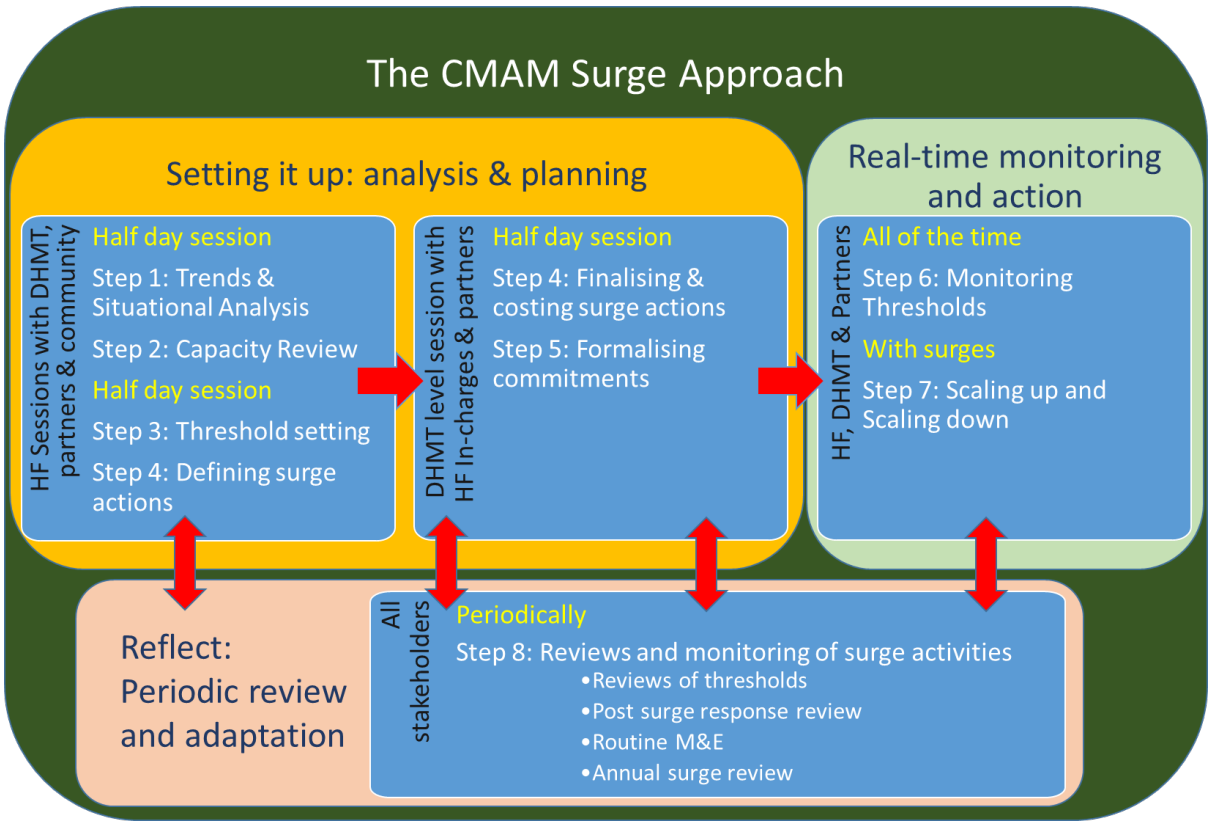
*Adapted from P. Hailey and D. Tewoldeberha, ENN, 2010, issue 39

It is composed of a number of steps conducted at the health facility and district or county management levels to determine the capacity and ability to respond to changing levels of acute malnutrition; the analysis allows the setting of context specific thresholds that when passed trigger pre-agreed activities and capacity support; the triggering process is based on real time analysis of health data action is triggered when the situation deteriorates and deactivated as the situation normalises

The approach is designed to first leverage existing capacity within a health facility and then, if needed, to mobilise additional, pre-agreed external support tailored to the needs and capacities of that health facility. It builds on the premise underpinning much of current resilience programming i.e. that an appropriate, early response is more cost-effective than a traditional, large-scale response launched once an emergency is underway (DFID, Defining Disaster Risk Reduction: What does it mean for DFID?, 2011).

The CMAM Surge approach is made up of 7 steps that can be divided into 2 main stages – the **set-up stage** followed by **real-time monitoring and action stage**, with regular periods of reflection and adaptation (**Figure 7**).

Figure 7: Overview of the CMAM surge approach focusing on the Health Facilities



The set up stage is made up of 5 steps, outlined below:

Step 1. Trends and situational analysis: each facility analyses the key factors generally affect demand for SAM services among the catchment population through examination of past trends in clinic and contextual data to understand the relationship between these factors and the trends in workload for the HF, and to identify key factors that should be monitored to better plan for future response.
***Cost implications*:** meeting costs (rooms, material, refreshments); personnel time (Facilitator from the DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Step 2. Capacity review: a basic capacity assessment in key areas required for CMAM services is also undertaken for each facility to reflect on the capacity of the HF to manage CMAM services and highlight strengths and weaknesses. Also, to understand what they can do to prepare themselves during normal times for increases in demand for services and to provide the HWs with a basis upon which to define thresholds.
***Cost implications*:** meeting costs (rooms, material, refreshments); personnel time (Facilitator from the DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Step 3. Threshold setting: based on the capacity assessment and previous experience, a set of caseload thresholds are agreed for each HF for the number of new admissions of SAM to indicate four phases, normal, alert, serious and emergency. The crossing of thresholds into a

higher phase will trigger action to ensure the HF can manage their workload. On the contrary, when crossing a threshold into a lower phase, surge actions will be phased down so the HF returns to their normal way of functioning. At **emergency** level, the HF staff is overstretched to the point where even greater additional support is required from the DHMT and partners in order to a) ensure that services for SAM are functioning effectively and at full capacity and b) the population is able to access appropriate services in a timely manner. Significant resource inputs from partners are likely (i.e. additional human resource, supply chain support, infrastructure and equipment).
Cost implications: meeting costs (rooms, material, refreshments); personnel time (Facilitator from the DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Step 4. Defining and costing of surge actions: The District Health team leads each health facility through a process to agree and prioritise actions to be carried out during a normal situation and alert, serious and emergency phases to ensure that HFs have the capacity to manage SAM services for their catchment population at all times. These surge actions include modifications to normal facility procedure that would allow teams to do more with less. Examples include using auxiliary staff to do basic assessment tasks such as RUTF appetite test; rerouting patient flow; reducing the amount of information recorded for each child seen, or postponing staff leave.
Surge actions for each phase are costed per HF in order for these costs to be budgeted in annual planning processes for the various HMTs, any national level disaster or drought management team and partners.
Cost implications: personnel time (DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Step 5 formalising commitments: This step is meant to ensure that all key actors have the same understanding about the surge package, who does what, when and specific responsibilities. It is also to ensure that there is confirmed commitment to this support and that it is both budgeted and funded. Without this formalising step, it can translate into delays in action when a higher phase is activated, especially if little is documented and staff turnover is common.
Cost implications: personnel time (DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Stage 2 – Real-time monitoring and action is comprising of 2 further steps:

Step 6. Monitoring thresholds: This step involves regular monitoring of SAM admissions and SAM caseload against set thresholds at both the HF and DHMT levels. This provides the mechanism to activate or trigger the surge package when a threshold is exceeded or return to a lower phase or normal operating procedures when numbers decrease or the HF capacity is sufficient.

Cost implications: Communication costs; meeting costs (rooms, material, refreshments); personnel time (Facilitator from the DHMT, HF staff or HF in-charges, hospital/inpatient focal point, CHWs, key community representatives, partners working in the area).

Step 7. Scaling up and scaling down surge actions: Once a threshold is exceeded the health facility implements agreed surge actions / modifications to normal protocol and informs the district health management team. The respective support package should be promptly delivered. As caseloads reduce, any surge support package is gradually scaled down in line with the thresholds. Ultimately, caseloads and external support are expected to return to 'normal' pre-surge levels.

Cost implications: standard service delivery costs.

Step 8: Reviews and monitoring of surge actions.

Annex 2: Assumptions used for costing the Treatment of Severe Acute Malnutrition (routine CMAM service delivery)

The management of children with Severe Acute Malnutrition (SAM) includes *inpatient care* for cases with medical complications, and *outpatient care* for cases without medical complications. The analysis of unit costs for the management of SAM is conducted dividing the intervention between inpatient and outpatient treatment.

Description: SAM is manifest through severe thinness and wasting. Sometimes patients also present with bi-lateral oedema also known as nutritional oedema. Children who are diagnosed with SAM and have no medical complications are admitted in Outpatient Therapeutic Programs (OTP) and are managed with RUTF. Those present with complications are first admitted in for inpatient care in a hospital or a stabilization centre where they are managed with F75, then F100 and are then discharged into OTP. In OTP, these children are then managed with RUTF until they attain the recommended weight for height. Other drugs like antibiotics, vitamin A supplementation and deworming may be included in management of SAM.

Population in need: All children 6-59 months with a Z-Score less than -3 (<-3 Z-Score), a MUAC less than 11.5cm or bi-lateral pitting oedema. The prevalence was corrected by an incidence factor (taken as 2) as recommended by the CMAM forum (Mar).

Delivery channels: Inpatient care for children who have SAM with complications are managed in inpatient health facilities. This is mostly in county referral and sub-county hospitals. SAM without complications is managed in all levels of health facilities in outpatient care. It is also managed in the integrated health outreaches when health workers take services to the community.

Drugs and supplies:
Children 6-59 months with medical complications (SAM Inpatient)

Stabilization
A child admitted in the inpatient care is first managed with F75 until they are fully stabilized. This normally takes 2-3 days. F75 is prescribed at 100kcal per kg body weight per day. A patient with 7kgs who stays in phase 1 for 3 days utilizes 6 sachets of F75 (F-75 therapeutic milk, sachet, 102.5g for 500ml).

Transition
Children who are stable take slightly increased calories and nutrients. They are managed with F100 at 130kcal per kg body weight per day. Quantity of milk remains the same as that of F75, but the calorie intake increases with F100. A child weighing 7kgs and stays in transition for 3 days utilizes a total of 6 sachets of F100 (F-100 therapeutic milk, sachet, 114g for 500ml water).

Catch up growth
Patients move from Transition phase into phase 2 when they have a good appetite, have no major medical complications and oedema is resolved. In this phase, patients receive F100 at 200kcal/kg/day or the equivalent in the form of RUTF. A child weighing 7kgs utilizes 11.5 sachets of F100 for 4 days. Recovered patients are then transferred to OTP to continue therapeutic treatment.

Medications provided in inpatient care include:
- Gentamycin; 21.9 (Gentamycin, injection, 40 mg/ml in 2ml vial)
- Amoxicillin; 7*3 total 21 tablets
- Vitamin A-2 dosages, one on admission, another on discharge
- Deworming; one dose in phase 2
- Folic Acid, 1(5mg)
- Iron; A total of 3.2 tablets (Ferrous sulphate tablets, 200mg) dissolved in F100 for 4 days in phase 2

Children 6-59 months without complications (SAM Outpatient)

Children without complications and those discharged from inpatient care are managed with RUTF. Prescription is dependent on weight of the child. A child weighing 7-8.4kgs consumes 3 sachets of RUTF daily. Taking into account an average length of stay to be 56 days, this child will consume a total of 168 sachets to recovery. Children who previously were not in the inpatient are prescribed amoxicillin for seven days (total of 21 tablets). They also take one dosage of Albendazole and vitamin A that is appropriate for their age.

Personnel time required:

SAM Inpatient
Children with SAM and medical complication need an average of 10 days hospitalisation before being referred to outpatient care. For this reason, personnel time for inpatient treatment is much higher in hospital than outpatient. During the hospitalisation period, a nutritionist or a student nutritionist spend approximately 7 minutes preparing feeds and distributing to 1 patient as well as counselling them on a daily basis. They visit patients 4 times a day for 10 days. A nurse spends an almost equal time administering drugs, preparing night feeds and administering the feeds. They visit patients approximately 5 times a day for 10 days. A paediatrician and a general physician visit a patient once a day for 10 days. They each spend approximately 5 minutes per patient per day and a total of 50 minutes each for the entire inpatient period. A clinician visits a patient on average twice a day, spending an average of 5 minutes on each visit that totals to 100 minutes in 10 days. A lab technologist normally carries out tests like stool test, urine test, HB test and RBS test. This is conducted once and it takes approximately 95 minutes. Radiotherapist carry out an x-ray on children and this takes approximately 15 minutes.

SAM Outpatient
Once a child is referred to outpatient care, during the 56 days period of program, a nutritionist or student nutritionist sees one patient for an average of 8 times and spends approximately 15 minutes for each session. This totals to 120 minutes per patient. A general physician/ clinical officer sees the patient once in order to diagnose and prescribe medicine for 5 minutes. A lab technologist normally carries out tests like stool test, urine test, HB test and RBS test. This is conducted once and it takes approximately 95 minutes. Radiotherapist carry out an x-ray on children and this takes approximately 15 minutes.

Programme Costs for management of SAM are mainly those shared with treatment of MAM, including Integrated Management of Acute Malnutrition (IMAM) trainings for CHMT and SCHMT; training of trainers; training of health workers and CHWs; and IMAM supplies management training for CHMT. It also includes costs for equipment, consumable and stationery used in supplementary feeding programs, such as: anthropometric equipment like measuring boards, scales, MUAC tapes, record books, OTP cards, etc.

Other programme costs are allocations of shared programme activities such as personnel not directly implementing the intervention, supervision, monitoring and evaluation, communication, advocacy and general programme management.

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