Field Exchange

Emergency Nutrition Network

60th edition

Special issue on the continuum of care for acute malnutrition

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A POSHAN Prahari (sentinel) evaluates the weight of a child during a POSHAN day, Rajasthan, India

Government of Rajasthan

Editorial

Dear readers,

We are delighted to mark our 60th edition of *Field Exchange* with an issue dedicated to the continuum of care for children with acute malnutrition. The process of developing this edition has given us valuable insights into many dimensions of continuum of care, ranging from programme design to institutional politics and policies. We truly appreciate the open, candid contributions and time given by so many to this initiative. We believe that this reflects the continued commitment of the nutrition community to share and learn from each other and that this issue is relevant and topical. As with all special issues of *Field Exchange*, we have written an extended editorial to reflect our learning in pulling together this special issue. Below is a short summary of the content that we feature.

As ever, we have rich mix of contributions, reflecting different contexts and aspects of continuity of care. These range from the use of expanded protocols in highly vulnerable and insecure areas in Northeast Nigeria, South Sudan and Somalia, integrating moderate acute malnutrition (MAM) treatment within 'preventive' blanket supplementary feeding programmes in Cameroon, to UNHCR experiences of facilitating continuity of care in East Africa. Experiences of Positive Deviance (PD) Hearth programming implemented by World Vision in several countries and a supplementary feeding programme (SFP) that integrates severe acute malnutrition (SAM) cases in Zambia add an interesting dimension to continuity in the context of broader child nutrition and longer-term community programmes.

One of the factors that prompted this special edition was the emergence of research exploring simplified/expanded/combined approaches to treat acute malnutrition. Headline findings, implementation experiences and research plans constitute much of the research section, including the COMPAS trial led by the International Rescue Committee in Kenya and South Sudan, the MANGO study by Action Against Hunger, and a considerable research portfolio by ALIMA in the Sahel region. Regional perspectives on simplified approaches in West and Central Africa are shared in an article by UNICEF regional team. Given this is such a dynamic area, No Wasted Lives has launched a Community of Practice on the State of Acute Malnutrition platform to share information about research and implementation of simplified approaches. It is coordinated with a newly launched thematic area on en-net to support the initiative. One challenge we faced in developing this edition was that much emerging research is pending peer review publication, limiting the results we could share. As research is published we will rapidly summarise and share findings through FEX online (www.ennonline.net/fex) with links posted on Facebook and Twitter and the 'newsroom' section of our website (www.ennonline.net/newsroom).

Several articles from India provide valuable and additional dimensions to continuity of care. The UNICEF South Asia team raises important questions regarding wasting profile, patterns and associated mortality in India, and discuss the enormous poten-

tial for acute malnutrition treatment in the country, leveraging and integrated within existing platforms and services as part of an approach to continuity of care that starts pre-pregnancy. Two articles, also from India, examine and share experiences around information continuity between service providers and users, reflecting how fundamental communication and engagement with caregivers is to enabling continuity of care for their children.

Another important dimension of continuum of care is how wasting treatment and stunting prevention programmes are linked. An article by World Food Programme (WFP) describes how a programme designed to prevent stunting reduced incidence and caseload of wasting (results published soon). Research by ALIMA in Burkina Faso, also due for publication soon, found a high prevalence of stunted children among wasted children admitted under mid-upper arm circumference (MUAC) criteria. While it is no surprise that MUAC selects wasted children, the question remains whether treatment as currently offered is adequate for these particularly high-risk children who are both wasted and stunted.

Over the years we have featured many experiences and much research on SAM treatment, with far less content on moderate acute malnutrition (MAM). This edition has sought to redress this balance. An insightful article by a Médecins Sans Frontières (MSF) practitioner describes experiences and concerns regarding high-risk MAM children who are neglected in guidance and programming. A four-country evaluation by WFP assesses the relationship between treatment and prevention in emergency and post-emergency contexts, while a WFP-led systematic review on treatment of MAM using nutrition counselling or food products highlights the significant gap in comparable evidence. Longstanding reports of disconnects between SAM and MAM treatment services prompted ENN to conduct a basic mapping of UN-supported services in East and West Africa using existing data; a summary of findings is included in this edition.

Anthropometric indicators are useful but have their limitations in identifying children at nutritional risk and in measuring recovery. Several articles explore additional avenues to help address this. Body composition of acutely malnourished hospitalised children through recovery has been examined as part of the Childhood Acute Illness & Nutrition (CHAIN) Network cohort study in Malawi and Uganda (results published soon). Utilisation of a combination of risk predictors to inform care pathways and intensity of treatment is being explored by researchers in

Sierra Leone, while MUAC threshold combined with other predictors of risk is explored in an analysis prompted by questions on en-net. The Bill and Melinda Gates Foundation's Knowledge Integration (KI) initiative will shortly publish a series of papers on analysis of longitudinal wasting and stunting patterns in the first two years of life that will provide valuable insights into patterns around wasting and stunting from birth and including mortality risk.

Much of our content fits within the SAM and MAM programming paradigm. We recognise that thinking is evolving around malnutrition and risk, and official categorisation based on MAM and SAM divisions may well change; programmers are already making changes through use of combined protocols, for example. Our extended editorial examines this area in more detail.

The experiences and research that we share in this edition are largely from Africa, yet South Asia has the highest prevalence and number of children affected by wasting in the world. Characteristics of wasting in Asia, programme approaches and challenges faced in scale-up of prevention and treatment are not the same in this region. Recognising this, we are delighted to announce that ENN is planning to produce a special edition of *Field Exchange* on wasting in South Asia in mid-2020, in partnership with the UNICEF Regional Office and in collaboration with No Wasted Lives. More details and calls for content will follow soon.

ENN's raison d'être is to support collective lesson learning; we learn from positive and negative experiences and at times it takes institutional courage to share the latter. In this spirit, our extended editorial uses the rich body of curated material to challenge whether the system (particularly institutional arrangements and related programming modalities) as currently configured are fit for purpose to deliver on a continuity of care for acutely malnourished children. We hope that our frank appraisal of what we think is lacking in the current system and what may help move us towards putting it right is received in the spirit in which it is intended: to challenge the status quo to catalyse necessary change and to improve how we care for malnourished children.

Jeremy Shoham and Marie McGrath,
Field Exchange Editors

We welcome feedback on this edition and our editorial reflections; letters to the editor will be published online and in *Field Exchange 61*. Send to chloe@ennonline.net

Diane Baik

Editorial perspective on the continuum of care for children with acute malnutrition

By Jeremy Shoham and Marie McGrath, *Field Exchange* **Co-Editors**

Rationale for FEX special edition

We are delighted to mark our 60th edition of *Field Exchange* with an issue dedicated to the continuum of care (CoC) for children with acute malnutrition (see Box 1). The global burden of acute malnutrition and numbers *not* accessing treatment justify our attention. An average of 50 million children under five years old are wasted worldwide, of whom 17 million are severely wasted and 33 million moderately wasted. In 2018 an estimated 10 million children with wasting, including 4.5 million with severe wasting, received treatment (WHO *et al,* 2019). This means that nearly three quarters of severely wasted children and 83% of moderately wasted children did not.

Several factors prompted us to embark on this special issue. Until now, the management of acute malnutrition has largely been through distinct programmes for complicated and uncomplicated severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) treatment. Separate institutional responsibilities of lead United Nations (UN) agencies for different degrees of malnutrition were identified in an ENN 2011 report as significantly contributing to observed disconnected programming (Shoham and Dolan, 2013). Efforts to re-align UN agency mandates and ways of working for a more effective care continuum for acute malnutrition appeared to gain momentum in 2018; we wanted to inform these. Furthermore, over the years, moderate acute malnutrition (MAM) treatment had not kept pace with severe acute malnutrition (SAM) treatment scale-up and we wanted to examine why. Significant developments, in the form of simplified/expanded/combined approaches to manage acute malnutrition, were emerging through research and programming. One key reason for this was to enable more joined-up programming. Overall, it looked like a good time to take stock. Nine months later, we reflect here on what we have learned.

Framing this special edition

Prevention, treatment and care

What constitutes prevention is poorly and inconsistently defined and what works is not well evidenced. There are different interpretations of what constitutes prevention and treatment of acute malnutri-

tion, with overlap between how both are understood (e.g. MAM treatment can be a SAM prevention strategy). This lack of clarity appears to lend itself to arbitrary categorisation; e.g. provision of ready-to-use therapeutic food (RUTF) is considered as treatment, while enrolment in a blanket supplementary feeding programme (BSFP) and or social protection are considered as more preventive in nature. Some interventions apply a 'preventive' lens to management; for example, emerging approaches to manage at-risk infants under six months old are adopting a more public-health approach, considering community-based interventions as secondary *preventive* strategies embedded in existing health systems, frameworks and capacities.[2] Given multiple evidence gaps on what works for prevention, a soon to be published research prioritisation on wasting prevention should help inform direction.[3] Different interpretations of what constitutes prevention and treatment can breed confusion. We have not attempted to resolve this definitional impasse here.

Anthropometry and risk

The controversy over which anthropometric indicators are best to determine risk of mortality and functional impairment has raged long and hard among nutritionists. It is increasingly appreciated that anthropometry as an indicator of nutrition risk is flawed. Anthropometric indicators are a proxy for what is going on inside the body that leads to illness and death; e.g. impairment of major organs, compromised immune systems, that may have multiple causes not limited to undernutrition; e.g. in utero growth deprivation, social factors. Furthermore, anthropometric categorisation has limitations: wasting (identified using WHZ) and stunting (using height-for-age (HAZ)) have been considered as distinct conditions in programming and in global narrative, with wasting considered a humanitarian problem and stunting the focus of the development sector. The work of the ENN-coordinated Wasting-Stunting Technical Interest Group (WaSt TIG) has challenged

this paradigm.[4] There is increasing evidence that wasting and stunting are inter-linked and confer added risk of one to the other and that stunting is in part a biological response to previous episodes of being wasted (Schoenbuchner *et al*, 2019). Children who are both wasted and stunted (WaSt) at the same time have a risk of death which is similar to that of children who are severely wasted (McDonald *et al*, 2013; Myatt *et al*, 2017). Recent analysis by the WaSt TIG has found weight-for-age (WAZ) and MUAC better identify WaSt children (Myatt *et al*, 2017). Interestingly, WAZ and MUAC have also been identified by the ENN-coordinated Management of At Risk Mothers and Infants (MAMI) Special Interest Group (SIG) as the anthropometric indicators that best identify mortality risk in infants under six months old and select for low birth weight infants who have higher associated mortality than normal weight infants that persists to 12 months of age (Mwangome *et al*, 2019).

These developments have potentially significant consequences for caseloads and require management options that are not limited to nutrition interventions. The first ever analysis of concurrence based on 84 country datasets found pooled prevalence of concurrence (based on WHZ and HAZ) was 3.0% (giving an estimated burden of 6 million children); prevalence was significantly higher in fragile and conflict affected states (3.6% v 2.24%) (Khara *et al*, 2016). Since MUAC selects for stunted children, the prevalence among wasted children in current community management of acute malnutrition programme (CMAM) programmes is likely to be even greater; for example in the OPTIMA study in Burkina Faso, prevalence of concurrent stunting was 42% amongst children treated under a MUAC only strategy[5] (Phelan 2019). This means that, in practice, it is likely we are already selecting for these children in treatment programmes, but the optimal treatment regime for WaSt children is still to be determined. This is being increasingly considered by programmers (Phelan, 2019) and is the

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1. The terms 'wasting' and 'acute malnutrition' are in common use and in general refer to the same manifestation of under nutrition. However, both terms have shortcomings; e.g. 'acute malnutrition' implies a recent or more urgent condition, while 'wasting' does not include oedematous malnutrition. We use both terms interchangeably in the edition.
2. www.ennonline.net/ourwork/research/mami
3. https://www.ennonline.net/ourwork/researchandreviews/wastingprevention
4. https://www.ennonline.net/ourwork/reviews/wastingstunting
5. Prevalence of concurrent wasting and stunting was 56% for those with MUAC <115 mm at admission; 46% for those with MUAC 115-119 mm; and 37% for those with MUAC 120-124 mm.

Box 1 Continuum of care (CoC) for acute malnutrition – a definition

CoC for acute malnutrition means that any child receives appropriate, timely care to enable full recovery wherever they present along the spectrum of acute malnutrition.[1] Based on current guidance and practice categorisation, this encompasses children with Mid-Upper Arm Circumference (MUAC) <125mm or weight-for-height z-score (WHZ) <-2 who may be classified as moderately or severely malnourished, and both complicated and uncomplicated cases.

We recognise that risk identified may be a consequence of multiple factors and require interventions beyond nutrition. Different forms

of treatment and support across sectors may be necessary, depending on the level of risk, circumstances and recovery phase. Attention to continuity of care is especially critical when there is service delivery through more than one programme/access point, requiring coherent and effective transition between services.

Complete CoC for acute malnutrition can only be secured by alignment with prevention programmes such as growth monitoring promotion (GMP), blanket supplementary feeding programmes (BSFP) and social protection, etc., as well as integration of services within health service systems.

A child at a TSFP site for his follow-up visit, Pakistan

subject of a new research project in ENN. While WAZ identifies high risk infants and children it has some practical constraints since it relies on age assessment that introduces imprecision. Referral of children where their age is accurately known (e.g. through growth monitoring, at vaccination) may be most feasible and existing programmes that already use WAZ, such as in India (de Wagt *et al*, 2019) are arguably already ahead of the curve. In future, we may well see technological advances that enable much more sophisticated and specific assessment of individual nutrition risk and earlier identification of decline to inform case management. These may not involve or rely so heavily on anthropometry.

Back now to 2019, where the current operational world is underpinned by agency mandates and normative guidelines still largely delineated between wasting and stunting along humanitarian and development divides, between prevention and treatment, dependent on anthropometric indicators and focused primarily on children over six months of age. We share and examine experiences and research configured on this currently defined 'reality'. However, it is important that the emerging strong, consensus-based and evidence-driven direction of travel around new ways of assessing and managing at risk children are factored into future programme experience capture, research agendas, and ultimately new ways of working.

Scope of content
A CoC for acute malnutrition requires comprehensive and aligned policies, guidance, financing and programming to ensure adequate, appropriate and accessible services, with capacity to surge to meet demand or challenges in crisis. This has informed our selection of programme experience and research studies for this special edition. There are eight field articles, 19 research pieces and one evaluation. A fuller description of the material in this special issue can be found in our opening editorial. We have also conducted interviews with senior staff in the four main UN agencies – UNICEF, UNHCR, World Food Programme (WFP) and World Health Organisation (WHO) – responsible for treatment of acute malnutrition, and the No Wasted Lives Coalition (NWL), to better understand roles and responsibilities, challenges faced and agency visions going forward. An interview with the Global Nutrition Cluster (GNC) provided insights around coordination in crises. In addition, we mapped UN supported SAM and MAM services in East and West Africa to provide the first multi-country snapshot of how CoC for acute malnutrition is playing out in programming.

Setting the scene
Evolution of treatment arrangements
Current programming arrangements and systems reflect a considerable story of evolution over 20 years or so; understanding where we are now is informed by reflecting on how we got here. The development of the Community Therapeutic (CTC)[6] model and subsequent Community based management of acute malnutrition (CMAM) approach in the late nineties was a major innovation in the humanitarian sector. Complicated[7] cases of acute malnutrition (both moderate[8] and severe) would still require admission for stabilisation, while uncomplicated SAM and MAM would be treated in outpatient care. In practice, delivery was modelled around programmes and arrangements typical for emergency contexts. UNICEF, where technical nutrition knowhow resided, took charge of outpatient care for uncomplicated SAM, including Ready to Use Therapeutic Food (RUTF) supply, while the World Food Programme (WFP) – whose established forte was food assistance – took charge of targeted Supplementary Feeding Programmes (TSFPs), and therefore 'MAM'. WHO, as lead UN health normative agency, was assumed to have continued responsibility for children with complicated acute malnutrition; since WHO guidance only existed for SAM treatment, this centred on complicated SAM. Reflecting in large measure prioritisation of children most at risk of death, CMAM quickly focused on SAM treatment, as demonstrated in the 2007 joint UN statement on community-based management of SAM (WHO *et al*, 2007). A huge drive since, largely led by UNICEF, to roll out community-based SAM treatment integrated within existing health systems has led to further evolution of the model of treatment for outpatient SAM management. This has not been matched by equivalent attention to scale-up of MAM treatment and prevention.

An important factor contributing to this SAM/MAM disparity has been lack of clear direction on MAM management; WHO global guidelines on SAM exist, have informed national guidelines that are relatively constant, and so enabled integration of SAM treatment into health systems in a fairly consistent manner. In contrast, the lack of WHO global guidelines on MAM has meant lack of equivalent models for scale up including but not limited to health system integration which has a created a vacuum filled by varied national and agency policy guidance and practice and biased towards humanitarian settings.

Are MAM children at risk?
Given the above, we examined evidence on risks associated with MAM and implications of not providing care. Published evidence shows that all degrees of anthropometric deficit (WAZ, HAZ and WHZ) are associated with substantially increased risk of under-five mortality, especially from infectious diseases (Olofin *et al*, 2013). Mortality risk increases along a continuum; an exponential rise only occurs in the very severely wasted/stunted/underweight child (WHZ/HAZ/WAZ <-4). Published pooled analysis identifies sick moderately wasted children at height-

ened risk of death (Black *et al*, 2008). Recent randomised nutrition trials in Niger (Isanaka *et al*, 2015), Burkina Faso (Cichon *et al*, 2006) and the TREAT-FOOD trial (Fabiansen *et al*, 2017) demonstrate a range of significant morbidity in moderately malnourished children. Published work by van der Kam *et al* in Nigeria found one third of post-infection MAM children developed SAM during the six-month follow-up period. Concerns regarding higher-risk MAM children are reflected in research (Phelan, 2019) and programming articles (de Polnay (2019; Hanson, 2019) in this issue of *Field Exchange*. Research is underway in Sierra Leone to examine outcomes among high risk MAM children admitted for treatment compared to a control group (routine care) (Lelijveld *et al*, 2019 [1]).

Evidence around so called 'spontaneous recovery' is limited as most MAM studies lack controls (Lelijveld *et al*, 2019 [2]). Definitions of 'recovery' also have shortcomings; i.e. determined by anthropometric gain, which is a marker, but not the ultimate outcome, of treatment. Bearing this in mind, several studies find that a considerable proportion of MAM children without intervention fail to recover or decline to SAM, in both food-secure and insecure environments. James *et al* (2016) found 54.2% of MAM children (defined as MUAC >110mm) in a stable and food-secure situation with no intervention recovered within seven months of follow-up; one third of children remained MAM and 9.3% had at least one episode of SAM. Amahu *et al* found that, without treatment, the vast majority of MAM children (79%) from food-insecure households and 40% of children from food-secure households remained moderately malnourished or declined to SAM by two months of follow-up. Household food security, duration of exclusive breastfeeding, dietary diversity, low maternal MUAC and unplanned pregnancy were all associated with low child MAM recovery. No data are presented in these studies on whether 'recovered' MAM children developed other deficits; e.g. became more stunted or anaemic. One study included in a systematic review of MAM interventions summarised in this edition of *Field Exchange* found that, while 71% of children receiving nutrition counselling 'recovered', these children became more stunted. Recovery in terms of wasting in the absence of treatment but decline in other indicators of undernutrition has also been documented in infants under six months of age (Munirul *et al*, 2018). More insights may emerge in soon-to-be-published analysis by The Bill and Melinda Gates Foundation's Knowledge Integration (KI) initiative, using aggregated data from more than 190 studies that includes regional and age-specific patterns in child wasting, including spontaneous recovery (*Field Exchange* 60.)

[6] Community based therapeutic Care (CTC). A Field Manual. First edition, 2006. www.validinternational.org/bahwere-et-al-community-based-therapeutic-care-ctc-a-field-manual/

[7] Medical complications in infants and children include severe bilateral pitting oedema, marasmic kwashiorkor, anorexia, intractable vomiting, convulsions, lethargy or not alert, unconsciousness, lower respiratory tract infection (LRTI), high fever, dehydration, persistent diarrhoea, severe anaemia, hypoglycaemia, hypothermia, eye signs of vitamin A deficiency, and skin lesions. Source: Training Guide for Community based Management of Acute Malnutrition (CMAM), 2018. www.fantaproject.org/focus-areas/nutrition-emergencies-mam/cmam-training

[8] Children with MAM and medical complications are admitted to supplementary feeding services or programmes (such as SFPs in the emergency context) and receive supplementary food rations, but are referred for medical treatment and return to supplementary feeding when medical complications are resolved. Source: Training Guide for Community based Management of Acute Malnutrition (CMAM), 2018. www.fantaproject.org/focus-areas/nutrition-emergencies-mam/cmam-training

The published and operational evidence indicates that children on the moderate end of the anthropometric spectrum (currently categorised as MAM) are at heightened risk of death and adverse outcomes relative to their nourished peers. There is a spectrum of risk that is influenced by context-specific factors for a variable and undefined proportion of these children, as is the case for children on the more severe end of the spectrum; co-morbidity is a common and critical contributor to risk across contexts but is not the only one. Food security affects but does not guarantee protection from adverse outcomes.

UN mandates and ways of working to deliver acute malnutrition care

Institutional (UN agency) arrangements around SAM and MAM treatment are a key determinant of realising a CoC. To improve our understanding of UN commitments, roles and responsibilities, we reviewed 20 available relevant UNICEF, WHO, UNHCR and WFP memoranda of understanding (MoUs), letters of understanding (LoUs), policy, strategy and guidance documents (1997-2017).

Global MoUs and strategies that refer to ways of UN agencies working together on acute malnutrition care reflect longstanding ways of working. Most formalised arrangements were last updated around 2011/12 and, with a few exceptions, have not been updated (see Box 1). Broader agency nutrition policies and strategies have seen more recent development and further updates are in progress (see Box 2).

Our review reflects a clear division of labour in terms of responsibility for SAM treatment (UNICEF) and MAM treatment, mainly in the form of TSFPs. While UNICEF Core Commitments for Children in Humanitarian Action (CCCs) (UNICEF, 2010) commit to acute malnutrition and collaboration with WFP regarding MAM treatment, in practice this has translated into full delegation of MAM treatment responsibility to WFP and a primary focus by UNICEF on SAM. This is reflected in both working arrangements and reaffirmed in recent UNICEF and WFP policies. WFP's declared mandate and programme approach on MAM in 2012 was based on longstanding experience in delivering SFPs in humanitarian contexts. Consequently, UN supported approaches to MAM treatment became generally equated with TSFPs.

Among all these arrangements and policies, there is a notable gap in understanding which agency is responsible for case management of complicated acute malnutrition. Working arrangements between WHO and other agencies are not formalised in global MoUs; in some situations, country-level agreements have been developed to govern working arrangements. A lead operational role for WHO in complicated case management for SAM cases is, in principle, understood and referred to in general terms in various documents, such as "supporting integration of SAM treatment into health systems" and "assisting governments to adopt SAM treatment protocols". However, this is not clearly defined and, in many instances, not realised. While UNICEF has prioritised and invested in SAM treatment and scale-up, this centres on uncomplicated case management. Both UNICEF and WHO describe their role in complicated SAM management as 'gap filling'; UNICEF steps in where WHO lacks operational capacity, with WHO stepping up to this role when and where it can (e.g. Yemen, Central Africa Republic, Ethiopia and South Sudan), but recognising a lack of country-level capacity in this regard. Given the division of institutional responsibility along SAM/MAM lines, it is also not clear where complicated MAM cases fall within the various UN remits.

More broadly, the operational role of WHO in case management of acute malnutrition remains unclear in practical terms and needs clarification. Support to scale-up of essential nutrition actions, including malnutrition treatment, is highlighted in WHO's current nutrition strategy, but operational implications are not articulated; WHO's remit around normative guidance development and uptake is more clearly articulated and understood. However, many stakeholders argue the need for WHO to demonstrate stronger technical leadership. Through this special issue we have found considerable variation in treatment protocols for SAM. This is an example of an area where WHO must assume a more active oversight of normative guidance uptake at country level, i.e. adaptations, their rationale, the consequences for interpreting and comparing programme performance, and the implications for child outcomes.

All UN agencies assert a commitment to prevention of acute malnutrition or prevention of malnutrition and/or its treatment. What constitutes prevention is, however, poorly defined in UN policies. For example, UNICEF speaks of SAM treatment and prevention of malnutrition, but do not specify if treatment of MAM is considered as part of its preventive strategy. WFP seeks to prevent "all forms of malnutrition" and to treat MAM.

It is unclear how UN agency mandates and policies have and continue to be determined. Working arrangements are negotiated between UN agencies, sometimes behind closed UN doors. There is no overall operational framework for how the three (and sometimes four) UN agencies work together to provide a CoC for treatment of acute malnutrition; hence there are gaps, overlaps and lack of granularity on how to deliver programmes together and a lack of accountability on supporting such a provision of care. Securing a new way of working is critically important to provide a CoC for acutely malnourished children and warrants independent facilitation and brokerage of inter-UN arrangements informed by competencies, capacities and country presence.

Mapping of SAM and MAM services in East and West Africa

Data on SAM/MAM programme convergence is not centrally collated or available. To bring greater visibility, ENN undertook a basic mapping exercise on

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Box 2 — Inter-UN ways of working

UNICEF and WFP: A 2011 updated guidance on mutual areas of responsibility states clearly that WFP is responsible for the treatment and prevention of MAM and that UNICEF is responsible for the treatment of SAM. The guidance describes the complementarity of both agencies, collaboration, some task-sharing where one agency is unable to deliver a component, and joint programming in locations where both are present and active. While WFP is responsible for coordinating delivery of SFPs (except in situations where UNICEF is better placed to do so) and for supplies, it is recommended that joint guidelines are developed to include responsibilities where one agency is absent and SFPs are necessary. UNICEF is responsible for therapeutic programme supplies and to support staff training on 'severe undernutrition'. WFP should provide food for the 'recovery phase' of Theraeutic feeding Programmes (TFPs), and food for TFPs more generally if UNICEF is unable to do so. A new UNICEF and WFP MoU has been under discussion by the two agencies since 2013 (Shoham and Dolan, 2013), but has not yet been released.

WHO and UNICEF: There is currently no written or formalised arrangement between WHO and UNICEF for the treatment of acute malnutrition. WHO's role is described in a UNICEF 2015 document on the 'management of SAM' (see Box 2). Here it describes collaboration with WHO 'to support integration of SAM management into health systems and to assist governments in adopting SAM treatment protocols'. However, there is no specificity on ways of working. A global MoU between UNICEF and WHO has been an ambition since 2013 (Shoham and Dolan, 2013), reaffirmed in Global Nutrition and Health Cluster discussions in 2016 based on a working letter of understanding (LoU) from Pakistan. However, this has not been produced. Key informant interviews with UNICEF and WHO staff) suggest that, in principle, WHO governs the area of inpatient care of complicated SAM.

UNHCR: UNHCR has mandated overall responsibility for treatment and prevention of wasting among refugees and internally displaced populations (IDPs) affecting >5,000. MoUs and LoUs outline arrangements with UNICEF, WFP and WHO to deliver assistance to those under UNHCR protection.

The 2011 MoU between **UNHCR** and **WFP** states that WFP will meet all food needs of refugees and IDPs in order to restore and or maintain sound nutrition status, but that UNHCR is responsible for determining nutrition status of refugees and for implementing selective feeding programmes as necessary. WFP is responsible for mobilising a range of food commodities for targeted and blanket supplementary feeding to address MAM, stunting and micronutrient deficiencies. When WFP is unable to provide these items, UNHCR in consultation with WFP will explore other possibilities for their provision until WFP is able to resume provision. WFP is also responsible ex ante for informing UNHCR of any pipeline issues.

The **UNHCR/UNICEF LoU (2015)** formalises bilateral cooperation between both agencies, with the annexed joint action plan articulating division of labour. The LoU outlines collaboration between both agencies to identify and treat SAM, explicitly referring to linking with other programmes to ensure the CoC for acute malnutrition, coordination to ensure screening and referral systems across the CoC of nutrition services that are provided, and support to integration of SAM treatment into health services. This document also recognises WHO as the global lead agency in health that sets norms, standards and guidelines that are used by UNICEF and UNHCR. UNICEF collaborates technically and programmatically with WHO on a wide range of health, HIV and nutrition issues, including SAM.

The existing MoU between UNHCR and WHO only mentions nutrition in respect to both agencies coordinating health and nutrition policies and WHO extending support with health and nutrition assessments. There is no mention of complicated acute malnutrition management. An update to the WHO/UNHCR MoU is in progress, but according to key informants this barely mentions nutrition.

UN-supported SAM and MAM treatment in selected countries in East and West Africa, using data sourced from UN regional and country offices. A summary with key recommendations is included in this issue (Brown R *et al*, 2019). UNICEF provided SAM data and WFP provided MAM data, which we used to examine the extent to which SAM and MAM treatment programmes supported by the UN agencies (essentially stabilisation centres (SCs), OTPs and TSFPs) are aligned. An online survey of country stakeholders provided further insights into programming. The mapping exercise had limitations; we did not investigate other MAM programmes that may exist at country level or approach governments directly for data; the online survey is not representative; we had limited time to contextualise findings and for busy regional and country teams to source and compile data. Bearing these in mind, we have important observations.

First and foremost, we found significant gaps in availability, consistency and comparability of UN-sourced data to help understand the extent to which a CoC for children with acute malnutrition is being achieved. Available data (national/sub-national/district) varied between regions and countries, between SAM and MAM, and between/within agencies. Different and problematic methods are used to calculate geographical coverage and treatment coverage. We could not determine service crossover at facility level, the degree to which services located in the same geographical region were linked operationally, and successful referral rates between services. Complicated case management particularly lacked visibility. A clearer picture of programme coherence was presented when one country level authority/agency had oversight and collated data or mapped service provision; e.g. Kenya (led by government), South Sudan and Somalia (Nutrition Cluster) and UNHCR programmes (East Africa). However, in general, no one UN agency has mandated responsibility for data continuity and monitoring of treatment for acute malnutrition.

Overall, we found SAM treatment without MAM treatment (TSFPs) is common. This reflects differences in UN strategies for the implementation of these two services. TSFP implementation is prioritised for areas/populations of highest vulnerability according to several criteria, including global acute malnutrition (GAM) rate of greater than 10%, and may be seasonal. Treatment for SAM aims for long-term 100% coverage integrated within existing health services. In this operational reality, geographical mismatch and lower MAM coverage are understandable. However, we could not determine the extent to which TSFPs are not present in settings where they should be and the degree to which commonly reported resource shortfalls were the determining factor. This approach implies that there is no UN ambition for 100% MAM coverage; both policy and practice reflect that UN supported MAM treatment is only warranted in certain circumstances, while SAM treatment should always be available. Given that children who are moderately malnourished are at increased risk of death, we challenge this position.

These observations support the need for an urgent strengthening of the evidence base and broadening of the scope in care options for MAM children across humanitarian and development contexts. Arguably, TSFPs are the best-evidenced MAM intervention and may be another reason why they are the 'go-to' option in many contexts. A 2007 retrospective analysis of emergency TSFPs by ENN and Save the Children has been cited as evidence of poor SFP effectiveness (for

Box 3 Relevant UN agency policies

WFP: The 2012 WFP nutrition policy identifies prevention of acute malnutrition as a major focus area for WFP and states that WFP is the lead UN agency responsible for addressing MAM. It states that WFP is responsible for the treatment and prevention of MAM, and UNICEF for the treatment of SAM. The policy stipulates that WFP will deliver MAM programmes (TSFPs) in areas with global acute malnutrition (GAM) > 10% or 5-9% where there are exacerbating factors and that, in these areas, all eligible children and pregnant and lactating women should have access to MAM treatment, especially through CMAM programmes.

WFP's 2017 Nutrition Policy expands its remit to cover prevention of all forms of malnutrition, including both undernutrition and overweight/obesity, while reaffirming WFP's support to treatment of MAM, which it considers a critical part of the CoC. While working arrangements between UNICEF and WFP are configured around WFP delivering TSFPs for MAM treatment (see Box 1), this policy reflects a much wider programming remit around treatment and prevention and longer-term, in-country commitment by WFP beyond acute emergency contexts. WFP nutrition policy will be operationalised in country strategic plans or interim country strategic plans in support of national nutrition targets and/or emergency nutrition needs and aligned with national priorities and goals. Programmes, including MAM treatment, will depend on the context. WFP will seek to co-locate or integrate programme activities with other interventions to enhance nutrition-sensitivity and use existing platforms, such as social protection schemes, to maximise reach and support scale. WFP asserts a role in building demand for MAM services and will work with governments and partners, including UNICEF, UNHCR and its own cooperating partners, to treat MAM where needed and maintain the CoC.

UNICEF: UNICEF commits to ensuring that children and women with acute malnutrition access appropriate management services (Commitment 4, UNICEF CCC to children in humanitarian action, (UNICEF 2010)); benchmarks include both therapeutic and supplementary feeding targets. Programme action specifies collaboration with WFP for appropriate MAM treatment and support to existing capacity for management of SAM for children at community and facility levels. A subsequent UNICEF document from 2015, 'Management of SAM in children, working towards results at scale', reflects the focus of UNICEF on SAM. Reference is made to WHO (see Box 1). No specific mention is made of responsibilities regarding complicated SAM. The UNICEF 2014-2017 Strategic Plan states that UNICEF will

continue to support delivery of community-based prevention and management of malnutrition. Emphasis is placed on the scale-up and integration of management of SAM. UNICEF's CCC and strategic plan are currently under revision.

WHO: WHO's first nutrition strategy, Ambition and Action in Nutrition 2016-2025, priorities include improving the availability of nutrition actions in health systems and scale-up of nutrition actions as part of efforts to achieve Universal Health Coverage (UHC) 2030 targets. WHO's delivery model for nutrition is framed around leadership, guidance and monitoring at global, regional and country levels. Within WHO, nutrition is a specific programme area within the non-communicable disease category. WHO commits to supporting scale-up of effective nutrition actions that include management of malnutrition and involves advocacy and guidance to organisational teams, strengthening linkages between programmes, ensuring nutrition actions are integrated within WHO essential care practices guides (such as Integrated Management of Childhood Illness (IMCI)), health workforce training, and improving the availability of therapeutic nutrition products (including RUTF) by inclusion in the essential medicines list (EML) and prequalification of manufacturers. WHO will provide direct technical assistance and convene partnerships for the collection, analysis and reporting of data. The strategy recognises the need for WHO to strengthen its nutrition capacities across the organisation at all levels.

The WHO 13th General programme of work (2019-2023) states that the WHO Secretariat will work with national authorities and partners to ensure that essential life-saving health services, including nutrition, are delivered, but no specific reference is made to malnutrition treatment. Within health emergencies, only breastfeeding support is specified. More programme specificity is reflected in a WHO article published in Field Exchange (Prinzo et al, 2017). This states that WHO's role in supporting integration of nutrition within UHC involves systematic identification, referral and treatment of acutely malnourished cases and urgently attending to SAM children with severe complications. Nutrition interventions to prevent and treat acute malnutrition are part of the WHO essential health package in emergencies. WHO helps ensure that key nutrition interventions are conducted in health facilities, including inpatient management of SAM, and that referral is made to other nutrition interventions (e.g. outpatient SAM, SFPs for MAM). It also states that WHO should monitor and evaluate inpatient management of SAM in health facilities, integrated within existing systems.

example, GNC, 2017[9]), which mispresents the findings. Examining data from 82 programmes implemented by 16 agencies in Africa and Asia, the analysis found that, out of 365,179 children treated, 260,034 recovered (69%); 67,366 defaulted (17.9%); 1,763 died (0.46%); and 47,016 (12.5%) were classified as non-responders to treatment. Most of the recovery-rate variation was due to defaulting. Nearly three quarters (73.8%) of programmes had a recovery rate equal to or above 75%, the standard set by SPHERE. Among the conclusions of the study was that TSFPs can be expected to reduce the incidence of SAM; it also noted that, where high defaulting is expected, alternative options may be more appropriate.

As a priority, we need to improve transparency on the degree to which a continuum of care is being provided to children with acute malnutrition, to learn from contexts where this is being achieved and identify where we need to act where there is no such

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9 Opening lines, p1: "A review of targeted supplementary feeding programmes in emergencies found that there was very limited data on the effectiveness of these programmes".

10 David Milliband, President and CEO of IRC, Keynote speech at World Innovation Summit for Health, Doha, November 2018. www.rescue.org/press-release/speech-rt-hon-david-milliband-president-and-ceo-international-rescue-committee-world

provision. The findings of this mapping are further evidence on why we need to change our current ways of working. Most immediately and for as long as treatment is implemented through MAM and SAM specific programming, our findings point to an urgent need for a more in-depth, comprehensive and contextualised global review of MAM and SAM treatment services - their alignment and availability at national and sub-national level, how this is captured, or could be, in national, regional and global tracking mechanisms/platforms, and how (looking ahead) systems need to develop to capture evolution or revolution in care. Critically, we need to determine which UN agency is responsible for such oversight and which UN agency or agencies should support government capacity and, as necessary, delivery of contextualised support to all acutely malnourished children.

A Project Peanut Butter nurse explains the study to a mother with her MAM child at one of the Hi-MAM study clinics in Pujehun, Sierra Leone, 2018

An evolving programme landscape for treatment of acute malnutrition

Simplified/expanded/combined approaches for acute malnutrition care

Simplified/expanded/combined (hereon referred to as simplified) approaches to acute malnutrition treatment are not a new development but are getting more attention and traction, fuelled by the culmination of several important research studies in 2019 and high-profile advocacy[10]. Their development has been driven by challenges with current institutional arrangements to deliver a CoC, the need to simplify protocols to improve SAM scale-up within health systems, to fill a gap in treatment available to MAM children and ambitions to drive down costs. There is no single simplified/expanded/combined protocol or approach but rather a burgeoning mixture of research protocols and programme approaches.

MSF has adopted context-specific simplified approaches for many years in response to challenging conditions of access and need in humanitarian crisis (Hanson, 2019) and, since 2014, these approaches have been sanctioned by the GNC for exceptional circumstances (GNC, 2017) when either UNICEF or WFP cannot deliver SAM/MAM services (Aburmishan *et al*, 2019; Ntambi *et al*, 2019). An overview by UNICEF West and Central Africa Regional Office (WCARO) reflects a range of options being researched or programmed in the Sahel region (Woodhead *et al*, 2019) that include family MUAC (using caregivers to screen for acute malnutrition), reducing dosage of RUTF as SAM children move through the MAM phase of recovery, MUAC-only admission and MUAC-based (COMPAS) or MUAC- and weight-based (ALIMA) RUTF prescription. For some, MUAC-only programming is recommended where WHZ is not feasible; for others it is considered as the default option for all programming. The latter is (again) raising concerns regarding the implications of excluding children with low WHZ (Mohmand, 2019). Simplification to facilitate integration of SAM treatment into Integrated Community Case Management (iCCM) (Charle-Cuellar, 2019) or delivery of treatment by low-literacy workers (Kozuki N *et al*, 2019 [1]) is also under active research.

Some simplifications are relatively well evidenced and are consistent with WHO guidance on SAM treatment (e.g. family MUAC to improve community screening coverage); others are at a much earlier stage (of evidencing) and involve guidance departure (e.g. reduced RUTF dosage through the course of SAM treatment). We identified different visions and ambitions for these approaches amongst pro-

ponents, such as reducing RUTF costs, streamlining services, increasing treatment coverage for SAM children, and providing care for MAM children. Some consider combining SAM and MAM treatment as a short-term option in select contexts; others consider this the way forward for all settings.

Research will be published through 2019; headline findings are included in this special issue, where possible. Most research involves small-scale pilots, with more planned through 2019 and 2020. Preliminary findings from pending trials look promising but are mixed: the COMPAS trial found evidence of non-inferiority with MUAC-only admission and reducing dosage of RUTF through treatment, but default is considerable. However, preliminary findings of the MANGO trial by ACF[11] and ALIMA OPTIMA[12] trial have found less favourable outcomes among the sickest, youngest or poorest children.[13] Barriers to uptake of simplified approaches amongst country stakeholders in a four-country review (Kozuki *et al*, 2019 [2]) included concern about costs and caseloads, impact on SAM case management in health facilities, and confusion exacerbated by a lack of WHO guidance.

There is currently no formal responsibility for coordination of this growing research portfolio or oversight of the emerging evidence base and the implications for policy and programming; different agencies and, to a degree, donors (by funding), are setting the agendas. Scale and sustainability, including implications for health-system capacity and supply chains, have not been examined. A recent joint UN communique regarding simplified approaches, emerging from a WHO-hosted inter-UN meeting to take stock of emerging evidence, identified a lead role for WHO in evidence review and guidance development in this area (WHO *et al*, 2019). Such WHO engagement must translate into active technical leadership at regional and country level. Without this there is a substantial risk of inconsistency, unmanaged policy uptake and rollout of approaches that have not been thoroughly appraised.

UN agency perspectives on CoC

ENN conducted a series of interviews with WFP, UNICEF, WHO, UNHCR and the GNC to explore their vision and experiences of provision of a CoC for acute malnutrition. All agencies asserted that provision of a CoC must include activities directed towards the prevention of wasting, and that wasting cannot be separated from other forms of undernutrition, including stunting and micronutrient deficiencies. All also articulated a 'child-centred' narrative around growth and weight faltering, rather than just wasting or stunting. Integration of treatment and pre-

vention services for acute malnutrition into health systems in conjunction with health-systems strengthening is also a critical part of the UN agency vision and discourse around CoC. Each agency described how this more holistic approach translates into 'tangible' programme activities. For example, WFP now introduces blanket supplementary feeding programmes (BSFPs) in emergency and country programmes alongside, and in some cases instead, of TSFPs (Ngwenyi *et al*, 2019). UNICEF invests substantial resources into health-system strengthening (HSS) and the integration of wasting treatment into these systems, while actively supporting infant and young child feeding (IYCF). WHO, for its part, is invested in an HSS approach for the treatment of complicated SAM. UNHCR approaches treatment of wasting from a 'health care perspective', working across sectors including health, water, sanitation and hygiene (WASH) and protection, and always endeavouring to integrate treatment within national health systems.

While presenting a comprehensive – and, indeed, a unified UN vision for a CoC approach to undernutrition – in practice we have found that achieving such continuity for the acute malnutrition treatment element of the continuum is hampered by multiple factors. These include the division of institutional responsibilities across the continuum of acute malnutrition (as currently defined using SAM and MAM); different agency-specific programme approaches, including targeting; lack of information continuity for referrals between services; major gaps in guidance and programming for care for children with moderate risk; resource constraints for scale-up of treatment; capacity challenge of health systems to integrate all acutely malnourished children; and significant RUTF/ready-to-use supplementary food (RUSF) supply shortfalls. We examine these factors in turn.

Institutional challenges around CoC for MAM and SAM children

One critical juncture in CoC for acute malnutrition is between community-based SAM and MAM services. Institutional separation of responsibilities between UNICEF and WFP (see policy section above) create challenges, arising from ways of working as well as agency-specific constraints.

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11 Presented at the Innovations in the Treatment of Acute Malnutrition: From Evidence to Action Meeting hosted by Action Against Hunger on behalf of the No Wasted Lives Coalition. London. 3 June 2019.

12 ibid

13 Personal comms and presented at the Innovations in the Treatment of Acute Malnutrition: From Evidence to Action. Meeting hosted by Action Against Hunger on behalf of the No Wasted Lives Coalition. London. 3 June 2019.

One major difficulty is co-location. Data compiled in the SAM/MAM mapping exercise (see above) and reflected in field articles and research suggest that co-location of OTPs and TSFPs is not common. This is understandable given that, in most cases, WFP and UNICEF use different targeting criteria to programme MAM and SAM respectively. WFP programme TSPs where GAM >10% or 5-9% with exacerbating factors (mainly food security related); UNICEF aims for 100% SAM treatment coverage where rates of GAM are high and health services are present. SAM services are available throughout the year, while TSFPs may only be delivered for part of the year during vulnerable periods. Also, while WFP/UNCEF MoU commit to working together where both are present/active; this is different to committing to always being present together (see policy section). UNICEF typically has longstanding presence in countries enabling a health-system integration approach, while WFP may not, so that MAM treatment in the form of TSFPs requires new and often parallel systems or may be absent where WFP is not present and/or no treatment is provided for in national policy. WFP and UNICEF may also have different implementing partners working in different catchment areas of the same district. Securing one partner for delivery of both SAM and MAM services is practiced – most commonly in refugee settings – but can be administratively complex. Pipeline breaks and supply challenges for RUTF (UNICEF) and ready-to-use supplementary food (RUSF) (WFP) are also a critical constraint affecting both agencies in different ways and at different times (see below).

A second critical juncture for CoC for acute malnutrition is between community-based management for uncomplicated cases and inpatient services for complicated cases. Complicated SAM data are captured and integrated within UNICEF-compiled country SAM data for global presentation (Nutridash) but are not distinguished in reports. WHO could not provide us with global-level geographic or admissions data for children with complicated acute malnutrition; while data may exist, it would require country-by-country investigation and compilation and is not harmonised. Similarly, there are no compiled data on the numbers of complicated cases referred between community and inpatient services or on direct admissions of complicated cases. Interpreting any available data in terms of coverage is complex, given the lack of (and challenges to generate) estimates of the burden of complicated acute malnutrition.

Apart from TSFPs, many other types of support may be offered to families of moderately malnourished children, such as nutrition counselling or household targeted support; e.g. social protection and livelihood support (Brown R *et al*, 2019). These services may be supported or provided by UN and/or civil society organisations and government and will be context specific. Very little information is available on the nature and caseload coverage of such support and the degree to which they are meeting the needs of these children. This partly reflects a lack of clarity regarding whose responsibility it is to ensure and track this provision, as well as the multiple agencies who may be involved in implementing this provision across humanitarian and development settings. Data may be available or collatable at country level but is not currently presented at global level.

At an institutional level, UNICEF and WFP have made considerable headway in several countries to strengthen continuity of care by working closely together. A good example comes from South Sudan

where, overseen by the Nutrition Cluster, UNICEF and WFP have aligned targeting, achieving good coverage and a high level of geographical convergence (Aburmishan *et al* (2019). The Nutrition Cluster, which is charged with effecting improved coordination among actors involved in emergency response programming, has strengthened CoC for acute malnutrition in other countries, too. In Somalia, for example, the Nutrition Cluster has encouraged single partners to implement the range of treatment programmes for acute malnutrition or co-location among different implementing partners (Ntambi *et al*, 2019). Continuity is also facilitated by the cluster collating and sharing mapping data and initiating expanded protocols for combined SAM and MAM treatment in Somalia and South Sudan, delivered in both instances by UNICEF.

Attempts to address many of the constraints around TSFP delivery are reflected in recent innovations, where WFP has developed new strategies and programme modalities with government to improve reach and scale of MAM treatment, integrating MAM case management within BSFP in Cameroon (Ngwenyi *et al*, 2019) with a similar approach under pilot in northeast Nigeria. In Cameroon the BSFP is also used as a platform to access and refer to and from other services, including SAM treatment, and thus support continuity of care; this is also a good example of UNICEF and WFP coordinating and co-planning together. In India political commitment and flagship programming is looking to support an integrated approach to prevent and treat wasting, with ambitions for continuity of care from pre-pregnancy through to a child's second birthday, leveraging existing nutrition and health platforms and services (de Wagt *et al*, 2019).

Continuity of acute malnutrition treatment is also a strong feature of refugee programmes overseen by UNHCR. UNHCR has clear overall responsibility and duty of care for those under its protection, coordinates with and between WHO, UNICEF and WFP for service provision, and aims to secure one implementing partner across all treatment services wherever possible. However, UNHCR may have to contend with numerous institutional and resource challenges to enable a CoC (Mohmand, 2019). Significant shortfalls in providing a CoC for acute malnutrition characterised the early response to the Rohingya crisis in Bangladesh in 2017.[14]

Continuity of care appears most successful where there is coordination by one body/agency over data management and service provision (whether government or UN) and buy-in to this authority, where WFP/UNICEF undertake joint assessments and planning, and where one implementing partner provides SAM and MAM treatment services.

Confusion and ambiguity around the care of moderately malnourished children

Children classified as 'MAM' are a heterogenous group; they include those who transition through a moderate phase while recovering from SAM, those who present with MAM as a primary condition, those with complications, and those with concurrent anthropometric or other nutritional deficits (e.g. concurrent stunting, anaemia).

We have found substantial variation in how children recovering from SAM are managed in programmes. According to WHO 2013 guidelines, SAM children should be treated until full recovery (WHZ ≥-2 or MUAC ≥125mm, no oedema, depending on entry

criteria). Furthermore, while not specified in WHO guidance, 'good practice' among some programmers is understood to be that, where available, recovered SAM children should be referred to TSFP, with a further eight weeks of supplementary feeding provision (a protection ration). What we have found from the SAM/MAM mapping exercise (Brown *et al*, 2019) and from articles in this edition (Kozuki *et al*, 2019 [3]; Guesdon and Roberfroid, 2019) is that an unknown proportion of children are discharged from OTPs once they reach the anthropometrically-defined moderate phase of recovery (WHZ ≥-3 or MUAC ≥110). Sometimes existence of a TSFP may prompt this adaptation; other times such adaptations are made by agencies to align with national guidelines. While MAM treatment in an OTP is implicit in WHO's interpretation of its guidance (personal comms), the guideline itself does not specify this. A WHO manual to support implementation of the 2013 guidelines should have more operational specificity but remains in the final stages of a very long development period. There is lack of evidence on the implications of completing SAM treatment through a TSFP in terms of continuity, intensity and quality of care.

Children who present with MAM as a primary condition at OTPs may or may not be treated or cared for, depending on the availability of TSFPs, OTPs with simplified protocols, nutrition counselling, BSFP that include MAM treatment, expanded general ration, livelihood programming, social protection, etc. Such provision may be reactive rather than proactive, determined by what happens to be available rather than by design. For example, ACF describes how lack of available MAM treatment (RUSF supplies/health-service capacity) led to community health workers expanding their remit from SAM to MAM, promoting breastfeeding, dietary diversification and two-week follow-up for MAM cases (Charle-Cuellar *et al* (2019).

As outlined earlier, variation and lack of clarity regarding MAM case management at least partly reflects a longstanding gap in comprehensive guidance on MAM. WHO guidance for MAM is limited to a technical note on supplementary foods for the management of MAM in children (2012) and essential nutrition actions (2013) and there is no WHO guidance on complicated MAM management. WHO recognise that guidance is not adequate for preventing and managing the global MAM burden; development of guidance is hampered by a weak evidence base.[15] As it stands, TSFPs are actually the most evidenced approach we have (see above).

The MAM guideline vacuum has prompted agency-led 'stop gap' guidance development. For example, variation in and lack of clarity on approaches to treat MAM in emergencies prompted the WFP-led MAM Taskforce to produce the MAM decision tool for emergencies (GNC, 2017) This remains the main 'go-to' guidance for many programmers. National guidelines on MAM exist in most countries surveyed in the SAM/MAM mapping but their basis, in the absence of WHO global guidance, is not clear. In countries like Nigeria there is no national guidance on MAM, which has hampered service provision in the recent emergency response (Hanson K, 2019). This gap has also created discord; a WHO MAM-related recom-

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[14] Experiences presented at the Global Nutrition Cluster meeting, 2017. Presentation (Bangladesh Continuum of Care) available at: http://nutritioncluster.net/what-we-do/events/ and will feature in an online Field Exchange article later in 2019.

[15] WHO Paris MAM research 'ideation' meeting, 10-12 October 2017

Therapeutic Feeding Centre in Gwange, Borno State, Nigeria, 2016

mendation (that providing supplementary foods to moderately wasted infants and children presenting to primary health-care facilities is not recommended) included in an update on the integrated management of childhood illness (IMCI) guidance to prevent overweight and obesity generated a subsequent open letter of concerned researchers and programmers; a rapidly convened meeting and joint UN clarification followed.[16] This helped catalyse a 2017 research consultation by WHO to formulate a research plan on MAM to address the evidence gap on individual characteristics of MAM children, the efficacy of interventions, and the package of care needed for full recovery. However, the multi-country randomised control trial proposal that was subsequently developed remains unfunded (personal comms).

These gaps in knowledge are critical as the nutrition sector grapples with the tension between scale-up of SAM services (currently still only at around 27%[17]), care of more moderately malnourished children (and other lower risk categories of undernutrition), and prevention programming in the face of limited resources. Experience and existing evidence suggest the consequences of failure to comprehensively address those at more moderate risk, particularly in hostile environments (infectious disease, food insecurity) include excess morbidity and mortality, risk of deterioration into SAM or development of complications (serious illness), and more anthropometric deficit (concurrently wasted and stunted, underweight), as well as unknown developmental and functional outcomes. A 2010 WHO, UNICEF, WFP and UNHCR consultation on the programmatic aspects of MAM identified many gaps that remain outstanding some nine years later (WHO *et al*, 2010). We think there are good mortality and economic risk arguments to give concerted attention to evidencing and delivering care packages constituting a range of options by context for those children at the moderate end of the spectrum. This should complement rather than compete with the ongoing effort to scale up accessible quality treatment to those children most at risk (identified as SAM).

Health-system capacity and health-system strengthening

The degree to which national health systems can accommodate acute malnutrition treatment is a key factor in determining continuity of care. UNICEF has made enormous strides in supporting HSS and integrating SAM treatment into health systems over the past 12-15 years, with an estimated 4.4 million SAM children (2017 data) being treated[18] and ambitions to reach 6 million children by 2021. However, coverage of SAM treatment remains stubbornly low. With

regard to children categorised as MAM, other than global estimates of burden and numbers treated, there are no equivalent global projections and ambitions for its management in whatever form that might take. Approaches to simplifying protocols for treatment of SAM for health facility and community worker delivery are with a view to facilitating the scale-up of SAM and, for many, moderate cases too. However, while streamlining and easing case management for frontline staff (Marron *et al*, 2019), caseload will increase, particularly if direct admissions of moderate cases take place. Some fear that accommodating a broader spectrum of children at risk will compromise the care of the most severe (and most at risk), spreading capacity even more thinly than is currently the case. In such circumstance, a critical consideration will be the ability of governments to resource treatment to accommodate a 'moderate' caseload two to four times greater than the current SAM caseload. As reflected in the UNICEF WCARO review of initiatives in West and Central Africa engagement with government and context-specific research and adaptation is essential to examine consequences for service quality and scale (Woodhead S *et al*, 2019). Prioritising 'moderate' children who need health facility-level management; i.e. higher risk cases, makes practical as well as clinical sense; how to identify these children is, as we have outlined earlier, an area of increased research and programming innovation. Determining the implications of current proposed approaches in terms of cost, capacity and sustainability for health systems in different contexts, particularly those seeking to accommodate a wider spectrum of at risk children within health services, is critical. It is essential that WHO engage in this at country and regional level, as well as global authority.

Continuity of RUTF and RUSF supplies

In compiling this edition we have identified significant shortfalls in RUTF and RUSF supply that are compromising care. Half of surveyed stakeholders in our SAM/MAM mapping in East and West Africa reported problems with the RUTF/RUSF supply chain (Brown *et al*, 2019). RUSF pipeline integrity has threatened research studies (Pilar Charle-Cuellar *et al* (2019); IRC work in South Sudan). UNHCR contingency planning for shortfalls has been necessary to meet needs in East Africa but is unsustainable.

One international non-governmental organisation (INGO) that conducted a review of RUTF supplies found eight out of 12 of its country programmes experienced shortfalls in 2018, and seven expected shortfalls in 2019 (key informant interview). Factors

contributing to this included limited availability of supplies, weak supply-chain management at multiple levels, poor communication between suppliers and facilities, lack of access due to insecurity, and inadequate reporting. Mitigation actions included purchase of stocks, redistributing supplies between facilities and borrowing and using alternative products. Preparation for anticipated stockouts included securing buffer stocks where possible (although donors are often not keen to fund this), transport support, and advocacy. A rapid assessment among another five INGOs active in CMAM programming in multiple countries found all experienced significant RUTF shortages in 2018. Stockout tracking by another INGO reported that, in one West African country, serious supply shortages were experienced in one-fifth (21%, ranging from 7 to 41%) of 22 Ministry of Health (MoH) facilities in 2018 (due to underestimated needs by UNICEF, delayed delivery and lack of a transport budget). Most agencies do not routinely gather data on stockouts; it has become 'the norm'. Facilities and INGOs are rarely alerted to impending stockouts.

UNICEF, as the lead RUTF supplier, has been working hard on supply-chain strengthening as part of HSS. UNICEF Supply Division (Copenhagen) report working on better systems for supply planning for RUTF at country and regional levels. Some regional initiatives are underway, e.g. a UNICEF West Africa tracking tool has been developed to help forecast gaps in supply and demand. This may evolve into a web-based tool modelled on that used to track vaccines.[19] In other countries, such as Burkina Faso, the addition of RUTF to country EML has enabled better supply-chain management by facilitating local RUTF production and access to development funding.[20] While RUTF is not included on the WHO's EML (WHO, 2019), 17 out of 38 countries tracked by UNICEF now include RUTF on national EML.

Problems with RUSF supply have also been reported by many agencies to ENN as even more widespread and unpredictable. RUTF and RUSF pipeline interruption is a significant, longstanding and complex problem involving many factors. Supply depends on government systems, international and domestic funding, health-system capacity and logistics. Challenges are increased in fragile, insecure settings. A critical gap is the lack of data on the extent and nature of RUTF and RUSF pipeline problems. We need to know the scale of this problem so that we can collectively determine how to solve it. We do not know how this is impacting quality of programming and child outcomes, such as increased default rates and slower recovery due to reduced supply. Success of new, simplified approaches will still depend on product supply. If we are struggling to deliver supplies to facilities, how will we manage to deliver at community health-worker level? As a critical first step we need transparency regarding supply-chain issues for both RUTF and RUSF in order to address this significant impediment to CoC for children.

Information continuity

Availability and continuity of information at multiple levels is instrumental to continuity of care (Dasgupta

15   WHO Paris MAM research 'ideation' meeting,10-12 October 2017

16   https://www.en-net.org/question/3251.aspx

17   https://www.acutemalnutrition.org/en/countries

18   https://acutemalnutrition.org/fr/countries

19   ViVa (visibility for vaccines) www.vivaplatform.org/en/Footer/About-ViVa

20   Lessons on integration of SAM treatment into health structures and services in Mali and Burkina Faso; to feature in Field Exchange 61.

R *et al*, 2018). At a global level, this gives visibility to need and service provision; at national and sub-national level it helps plan for delivery. Throughout our reflections we have highlighted many challenges around continuity and availability of harmonised data. Institutional divisions of labour and lack of clarity in areas of responsibility are reflected in siloed or absence of data. UNICEF's Nutridash platform compiles country-level data on treatment (e.g. burden, coverage, numbers treated) for SAM only.[21] WFP's global dashboard on acute malnutrition is specific to WFP response and reports on numbers assisted by country.[22] WHO's Global database on the Implementation of Nutrition Action (GINA) provides a repository of policies, actions and mechanisms related to nutrition, but does not collate data on acute malnutrition treatment.[23] While the NWL's goal and 2020 outcomes are for wasting, treatment coverage and target-tracking the allied State of Acute Malnutrition platform is based on SAM indicators and SAM data (Nutridash) only.[24] No one agency has responsibility for continuity of information around acute malnutrition treatment and prevention, which limits collective and individual agency accountability.

Conclusions

We recognise the rapidly emerging new thinking around undernutrition and risk. How we describe, identify and categorise acute malnutrition and how we intervene may well change in the relatively near future. Our conclusions are prefaced on the understanding that with new emerging research, evolving programming and a developing 'new' narrative, it is feasible that programming will evolve away from assessment and care purely determined on whether a child is categorised as SAM or MAM. While research, programming and high level agency discourse is indicating such a direction of travel, wholescale change will require a significant rethink and reconfiguration of guidance and approaches at multiple levels; if it happens, it will take time. We continue to consider MAM and SAM children in this edition as this reflects how programming and guidance is currently organised and to highlight learning from the MAM and SAM experience over the past 40 years. It is our hope that any new risk profiling and programming approach that does emerge in the years to come, will learn from these lessons.

It is clear from the work contained in this special issue that there is considerable appetite for and some progress to improve CoC for children. However, this is not enough to address the overall poor CoC for acutely malnourished children reflected in the evidence amassed in this edition of *Field Exchange*. A key area needing change is current UN institutional arrangements around acute malnutrition care which translate into lack of programme coherence. As it stands, there appears to be no overall oversight and institutional responsibility for ensuring the care of all malnourished children in all contexts, and consequently, no comprehensive strategy to address this, no data system to track this and hence no accountability when provision is inadequate. Furthermore, there is no overall operational framework for how the UN agencies work together to provide a continuum of care for treatment of acute malnutrition. There are gaps, overlaps, and lack of granularity on how UN agencies deliver programmes together. Protracted UN efforts to progress at an institutional or operational level to address problems are not transparent and have not yet shown tangible progress. An updated UN joint statement on continuum of care has been postponed pending greater evidence on the effectiveness of

new simplified approaches. Our view is that conflicted technical positions and institutional territoriality has, and will continue to, underpin the prevailing stalemate or may be reconfigured in new self-determined arrangements. We consider the UN system alone is unable to fix these 'institutional disconnects' from within but requires external oversight and help to do so.

Shortfalls in CoC is most stark for children at the moderate end of the spectrum of risk (primary MAM cases), but also extends to children who are recovering from SAM and are discharged early which may compromise care continuity and outcomes, and most likely to complicated cases too. While global narrative commits to increase treatment coverage to all acutely malnourished children – as reflected NWL 2020 targets, for example - in practice, there is no UN ambition for full coverage of all children at moderate risk, unlike for SAM children. This disparity raises questions of equity - is there an 'avoidable difference' in how we have approached the care of children, where attention to and therefore access to treatment is based on how a child is categorised (SAM v MAM)?[25] While provision of care for complicated case management appears more consistent for SAM cases than for MAM, for all these children there is a lack of clear agency operational responsibility for this highly vulnerable cohort of children and therefore poor visibility with respect to coverage and quality of service provision.

In practical terms, this means that an unknown proportion and number of acutely malnourished children – especially those categorised as 'moderate' - receive limited or no support. We therefore don't know what concerted action to support these children is needed, where, the costs of intervening and the price (financial and human capital) of not doing so. We know that some of these children will recover, others will remain 'moderate' and become stunted, others will progress to severe status. There are limited data on outcomes for these untreated moderate cases, but even very conservative estimates (10% progressing to SAM) would suggest that this untreated cohort could add at least 45% to the SAM caseload.[26] This is in a global context where, despite best efforts, we are still unable to reach and treat more than 27% of SAM children for a variety of complex reasons; e.g. cost, resources, pipeline breaks, weak health systems, conflict and access, etc.

The absence of global normative guidance (one of the areas where institutional responsibility is clear) that addresses complicated and uncomplicated MAM has significantly hampered CoC for acutely malnourished children. This has fuelled ad hoc national strategies, narrow programme options and poorly developed institutional architecture to support governments to deal with this vulnerable cohort of undernourished children across humanitarian and development settings. The need for WHO to 'step up' here to remedy this situation could not be clearer. Reflecting on what we have observed, we feel compelled to recommend three urgent courses of simultaneous action:

First, one UN agency should be designated with overall responsibility for provision of CoC for acute malnutrition in all settings. This does not preclude operational and normative roles for other UN agencies, but does confer a unique authority, responsibility and accountability for the presiding UN agency. Competencies, capacity and resource should be defined for such a position. For example, this agency should have long-term presence in countries with

burdens of acute malnutrition and work largely through the health system to facilitate integration as appropriate, as well as provide access points for preventive services, such as social protection and livelihoods support. This 'umbrella' UN agency must provide coherent and comprehensive data on CoC provision. This position should not be self-determined by UN agencies but involve some form of independent oversight or appraisal with transparent criteria and process. Similarly, inter-UN initiatives to address wasting, such as the Global Action Plan on Wasting currently being developed, should be subject to external multi-stakeholder and expert peer review. We should look to lessons from other sectors and how they do business. At the same time, urgent clarification is needed around UN agency operational and normative mandates and ways of working together to deliver acute malnutrition services.

Second, there is a need for a dedicated body of coordinated research into approaches to manage at risk infants and children, that includes those currently categorised as 'MAM', in both humanitarian and development settings across Asia and Africa. It should investigate different risk profiles of children and take account of national resources, health systems and household level interventions, such as livelihood and social protection programming. Research must include cost effectiveness studies and consider scalability and sustainability. This should culminate in normative guidance for the treatment and care of at-risk children that can be contextualised by governments and agencies and that includes cost and cost-effectiveness. In the meantime, interim rapid guidance is needed. Existing research plans, such as WHOs multi-country research plan on MAM, should be considered along with emerging research prioritisations, such as on prevention of wasting, and newer approaches to identify and manage at risk infants and children. More broadly, urgent WHO technical leadership and activism is needed on research, rapid/interim and longer-term guidance development (including simplified approaches and RUTF formulations), as well as guidance rollout and uptake at global, regional and country levels. How to quickly address WHOs recognised shortfalls in nutrition capacity to deliver on this, and alternative arrangements if necessary, needs urgent examination and action.

Third, an urgent review of the extent and nature of RUTF and RUSF supply issues is needed so that these can be collectively addressed.

As we go to print, there is considerable will and action being taken to reform wasting treatment at the highest levels. It is essential that we learn from our past mistakes with MAM and SAM programming – especially in relation to institutional architecture – in determining how continuity of care can be facilitated, supported and accounted for in the best interests of the child.

[21] www.unicefnutridash.org
[22] WFP dashboard (internal)
[23] https://extranet.who.int/nutrition/gina/en
[24] https://acutemalnutrition.org/en/website-guide-data
[25] Equity is the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, geographically or by other means of stratification. https://www.who.int/topics/health_equity/en/
[26] This 'back of the envelope' calculation is based on the following understanding. At least 10% of untreated cases of MAM progress to SAM and a further 5% progress to being both wasted and stunted. See section on 'Are MAM children at risk' above.

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Nutrition screening in Yamani refugee camp, Markazi, Djibouti, 2017

UNHCR/Naser Mohmand

Conducting a Hearth session in a remote village in Bangladesh, 2011

World Vision's Positive Deviance/Hearth programme: multi-country experiences

By Diane Baik

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Location: *Global*

What we know: Positive Deviance/ Hearth (PDH) is a community-based behaviour change programme that aims to rehabilitate malnourished children (identified as underweight) in the context of their own homes, using local resources and knowledge.

What this article adds: PDH is implemented by World Vision in 30 countries throughout Asia and Africa. The primary target is underweight children under five years of age. Acutely malnourished children (identified using mid-upper arm circumference (MUAC)) are referred to available health services as per national protocol, but where such services do not exist, they have been admitted to PDH programmes. A multi-country programme evaluation in 2010 informed several years of programme quality improvement. Analysis in 2016 of programme data from 56,000 children in seven countries found good recovery rates for underweight children, but some limitations (such as loss to follow-up). Acutely malnourished children are screened but on-going monitoring data is not systemically gathered and is an important area for improvement. Data and experience from Burundi indicate slower but good recovery in both MUAC and underweight status in children admitted with moderate acute malnutrition. Plans include mobile data collection, ongoing research in an urban setting in Cambodia, and securing funds to research acute malnutrition management within PD Hearth.

Background

Positive Deviance/Hearth (PDH) is a community-based behaviour change programme that aims to rehabilitate malnourished (identified as underweight) children in the context of their own homes. Despite limited resources, some parents find ways to raise well-nourished children. Identifying and understanding what these 'positive deviant families' are doing differently in their feeding, hygiene, caring and/or health-seeking practices from the parents of malnourished children in the same community is the

foundation for this approach. Studies show that PDH can lead to positive behaviour change among caregivers and improvements in nutritional status of children (Bullen, 2011). World Vision (WV) began implementing PDH in 1999 in Guatemala and Honduras and later expanded the approach to eight countries in Latin America, Asia and Africa. In 2010, WV adopted PDH as a core programme. In 2014, in addition to admitting underweight children, WV began screening for children using MUAC in response to many countries expressing con-

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cern over the lack of services to manage moderate acute malnutrition (MAM) in the community. To date, over 40 countries have implemented PDH and the approach is currently being implemented by WV in 30 countries throughout Asia and Africa in rural, urban, fragile and transition contexts. WV's PDH curriculum has so far been adopted into the national health and nutrition strategy in Uganda, Sierra Leone, Senegal and Burundi.

WV uses the PDH approach to target underweight children (with mild, moderate and severe underweight) between 6 and 36 months of age.[1] Depending on the context, acutely malnourished children (identified using MUAC) are accommodated in programmes and/or linked to available services. The programme indirectly benefits the households of underweight children by empowering primary caregivers with knowledge and positive practices who help prevent malnutrition and promote the growth and development of all children in the household and improve their own nutrition and wellbeing; for example, feeding and food choices, early childhood care practices, water, sanitation and hygiene (WASH) and health-seeking behaviours.

WV agency guidance stipulates conditions under which PDH programmes should be considered; i.e., families can meet regularly, there is food security, complementary health services are available, and there are active community networks. Adaptations may be needed for urban settings; e.g., targeting mobile food vendors to include low-cost, micronutrient-rich ingredients and the use of mobile phones to conduct follow-up visits. PDH programmes are challenging to implement and are generally not recommended where there is household food insecurity, landless/mobile/scattered communities, in conflict or acute emergency settings.

How PDH works

A situation analysis is first conducted in the local community, including wealth ranking, identification of underweight through growth

Washing vegetables before cooking the Hearth meal, 2011

Diane Baik

monitoring, focus group discussions, seasonal calendars, market surveys, transect walks and community mapping to identify the major challenges contributing to malnutrition in the community. Following this, a positive deviance inquiry (PDI) is conducted to identify the local solutions and practices to address the major challenges in the homes of the PD households that inform six key hearth messages. Hearth menus are developed using PD foods and other nutrient-rich foods that are locally available and affordable. Table 1 shows the nutrient content of a PD meal compared to the nutrient content of ready-to-use supplementary food (RUSF) and ready-to-use therapeutic food (RUTF).

Hearth sessions are then conducted by two volunteers daily over 10-12 days, with 6-10 caregivers per group. Caregivers bring set ingredients and meals are prepared according to PD menus and fed to the beneficiary children. PD practices

are discussed at the same time. Following this period, volunteers visit Hearth caregivers in their homes two or three days per week over two weeks to assess progress, overcome barriers, and re-emphasise PD practices. Children who do not recover are re-enrolled or referred to the health facility if there is an underlying illness. Regular growth-monitoring is conducted in the community to track children's progress and identify new cases of malnutrition.

Depending on the context, PDH links with programmes from other sectors, including livelihoods (kitchen gardens and small livestock revolving projects); WASH; childhood development (ECD); and economic development (savings groups). For example, PDH participant caregivers are trained to build kitchen gardens, provided with seeds for PD foods, and/or given training and seedlings for biofortified, iron-rich beans or orange fleshed sweet potatoes. The PDH participant caregivers may also be included in savings groups, trained in business start-up and linked to subsidy programmes or vocational training programmes supported by the government (e.g., for fertilizer, loans or training). The team also works closely with local health centres to provide deworming, immunisation and vitamin A supplementation two weeks prior to a child starting Hearth.

While Hearth sessions are not costly to implement, the project requires funds for the early stages of implementation, including trainings and human resource development, which typically accounts for around 90% of project costs (this does not include opportunity costs for participating caregivers). A greater economy of scale is seen where the total cost per child per year decreases as more children are included in the

Table 1 — Comparison of Hearth menu nutrient content with RUSF and RUTF

Food type	Quantity (g)	Calories (kcal)	Protein (g)	Vit A (mcg RAE)	Vit C (mg)	Iron (mg)	Zinc (mg)	Cost (USD)
Hearth menu nutrient requirements for 7-36 months	250-300	600-800	25-27	300	15-25	8-10	3-5	n/a
RNI for 7-12 months	N/A	608-844	11	400	30	18.6*	8.4**	n/a
RNI for 13-36 months	N/A	900-1400	13	400	30	11.6*	8.3**	n/a
Hearth meal in a Bangladesh village	291	645	25	400	53	20	4	0.17
Hearth meal in a Burundi village	287	607	28	318	23	8.7	7.8	0.18
Hearth meal in a DRC village	237	627	25	763	37	11	7.5	0.20
RUSF	100 (per sachet)	510-560	11-16	1150	60	10-14	14	n/a
RUTF	92 (per sachet)	500	10	840	49	11	13	0.40-0.84

*Bioavailability at 5%; ** Low bioavailability.
RNI: reference nutrient intake; RUSF: ready-to-use supplementary food; RUTF: ready-to-use therapeutic food.

[1] Some projects expand this range to include children aged 6-59 months; i.e. all children under 5 years old, and include mildly underweight children as well.

project. WV's experience so far shows that the average yearly cost per child decreased from USD17 per child when 750 undernourished children were targeted to USD8 per child when the number of beneficiaries was doubled to approximately 1,400. Some projects, particularly those that integrate food security, may have a higher cost of up to USD100 per child per year.

Quality improvement of PDH in World Vision

In 2010, WV conducted a PDH programme evaluation in eight countries in Asia, Africa and Latin America. It found that countries with stronger implementation of technical components had greater reductions in the prevalence of underweight.[2] Major challenges to this included high number of cascade trainings, which diluted critical technical details; delayed implementation post-training, which compromised programme quality; lack of standardised training curriculum for trainers; missed essential elements in programme implementation; lack of standardised supervision tools; and poor systems for data monitoring and analysis. In addition, there were several criticisms by donors at the time, including the labour-intensive nature of PDH; the need for a high level of technical input; the need to focus on a small scale to ensure effectiveness; difficulties in implementation for staff and volunteers; lack of success of PDH in food-insecure areas; the targeting of only a small population of malnourished households; and low graduation rates.

Informed by these findings, WV acted to improve PDH programme quality across the organisation over several years by standardising training content and implementation, developing new tools such as the menu design tool, improving monitoring and evaluation, and emphasising quality, simplification and strong leadership and management. Hearth sessions continued to be targeted to malnourished (underweight) children aged 6-36 months, but contextualised key Hearth messages were shared more broadly with caregivers of all children up to 59 months of age in the community through existing mother support groups (MSGs), growth monitoring and promotion (GMP), village savings and loans associations, and health committee meetings.

Project monitoring data from seven countries was analysed in 2016. Across these projects 56,000 children under five years old were admitted

Actively feeding Hearth meal to participant children during Hearth session, 2011

into PDH with underweight (mild, moderate or severe). By three months, 54% were fully rehabilitated.[3] Bangladesh had the highest number of admissions, with over 49,800 underweight children enrolled.[4] At three-month follow-up, the proportion of moderate and severe underweight had decreased from 81% to 46%. By six months it had decreased to 37%. An important limitation in interpreting this data is loss to follow-up, which was considerable at 36% at three months and 62% at six months. Another challenge in interpretation is that these data include children who are now older than 59 months (and therefore no longer part of the programme) and defaulters. Reasons for defaulting and 'aged out' children are now being tracked but this was not the case at the time this data was collected.

In most areas, a child anthropometry census to assess the weight-for-age z-scores (WAZ) of all children aged 6 to 36 months (or up to 59 months in some contexts) is conducted quarterly or through existing governmental services/systems such as growth monitoring and promotion (GMP). The review of the data compares the prevalence of underweight in the PDH community area at the end of one year to that at baseline. A tool called the "Implementation Quality Assurance" (IQA) tool can be used to assess the readiness of the target area to implement PDH, design the programme or project to ensure all essential elements are incorporated and to monitor implementation to determine if the essential elements of the PDH approach are

being implemented according to the standards. The IQA tool is used on an ongoing basis every year and, in some contexts, once every six months. WV has observed considerable decline in prevalence of underweight over a two-year period in communities where PDH has been implemented, even when only some behaviours have changed. For example, in Rwanda, data from health centres in one community (Kigogo), where PDH was implemented, show decreased prevalence of underweight from 50% in 2009 to 6% in 2011. In contexts where data shows limited improvement, the IQA tool can be used to provide qualitative assessment of the programme to help the implementing team to easily identify areas to address.

Management of acutely malnourished children

Since 2014, WV has also screened and admitted children to PDH using MUAC. Cases are admitted in order of priority, as shown in Table 2. Where no community-based programme to manage MAM is available, moderately malnourished children are admitted to PDH with close monitoring by PDH volunteers, community health workers (CHWs) or health centre staff. Children with a 'red' MUAC (<11.5cm), indicating severe acute malnutrition (SAM), are referred directly to the health clinic or hospital for management. On discharge, these cases may be admitted to PDH. Uncomplicated SAM cases may also be admitted to PDH where community-based treatment services are unavailable, also under close supervision.

Table 2 Priorities for admission into PDH

Priority	Acute malnutrition (MUAC)	Underweight (Weight-for-age)	Age
1	Moderate (Yellow)[5]	Severe*	6-59 months
2	Normal (Green)	Severe	6-36 months
3	Normal (Green)	Severe	37-59 months
4	Normal (Green)	Moderate	6-36 months
5	Normal (Green)	Moderate	37-59 months
6	Normal (Green)	Mild	6-36 months
7	Normal (Green)	Mild	37-59 months

Note: From our observations, moderate wasting is always associated with severe underweight.

[2] The evaluation compared different countries implementing PDH without a control group using programme monitoring data. A research project is currently underway to compare PDH with a control group, the results of which will be available soon.

[3] WAZ ≥-2.0 if admitted with moderate or severe underweight or gained ≥900g if admitted with mild underweight. Analysis of the recovery trajectory of the remaining 46% of children was not undertaken as most of them repeated Hearth and their monitoring data was accounted for in the next fiscal year.

[4] Includes data from 53 Area Development Programs (ADPs) and the Nobokoli special project.

[5] Close counselling and monitoring is provided to MAM children by volunteers, CHWs or health centre staff after they complete Hearth sessions.

Children who are admitted under MUAC criteria are monitored for progress using weight gain. The weight-gain guidelines are ≥ 200g at 12 days; ≥ 400g at 30 days; and ≥ 900g at 3 months for all ages. Discharge and graduation is declared after three months of enrolment. If the child was admitted with moderate or severe underweight, the child is discharged if they are healthy or have mild underweight (WAZ ≥ -1.0), regardless of weight gain. If the child is still moderately or severely underweight, the child repeats the Hearth cycle up to a maximum of three times. If the child was admitted with mild underweight, the child graduates if nutritional status improves to 'healthy' or if the child gains ≥ 900g. If children do not gain adequate weight after two rounds of Hearth, they are referred to the health centre for investigation of underlying medical complications that may be contributing to malnutrition.

Overall weight gain is monitored through household visits to positively reinforce the improvements caregivers see in their children as a result of their positive behaviour changes. The weight of each admitted child is monitored on days 1, 12, 30; 3 months; 6 months and 1 year. Community health meetings are also conducted every one to three months to enable the community to monitor the growth of PDH participant children, share health and nutrition messages and conduct graduation ceremonies.

Plans

In mid-2019 WV will launch a PDH Facilitators' eWorkshop on its online learning centre (eLearning Academy) to support improved learning outcomes. It is hoped that this will lower training costs by shortening face-to-face training sessions. In addition, the mobile data collection application is currently being used in several countries in Asia and Africa and the PDH online monitoring database (quantitative data) and online quality assurance tool (qualitative) will be rolled out soon to enable real-time access and analysis of data by programme staff and enable better WV oversight and identification of areas for programme improvement.

The acceleration of urbanisation and food insecurity in many country contexts requires PDH to adapt. WV is therefore currently conducting an operational research project in Cambodia (2017-2020), in partnership with Emory University and the National Institute of Public Health in Cambodia, to compare a control group with a PDH and a PDH-lite (mobile health) group with integrated food security programming in a peri-urban context. The aim is to compare the effectiveness of the two programmes in a context with up to three months of food insecurity. The PDH-lite group is using mobile phones to enable interactive conversations between PDH volunteers and Hearth participant caregivers to replace 50% of Hearth session days and 80% of face-to-face household follow-up visits. The study period is two years; final results will be available in 2020.

PDH shows promise for addressing uncomplicated MAM and even SAM children 6-59 months of age, but this component needs strengthening. Data is not systematically gathered on SAM and MAM cases managed within PDH programmes. Further research is required on this sub-group of children and funding is being sought in this regard.

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Box 1   Burundi PD Hearth case study

In 2018, WV Burundi, a fragile context, admitted 1,727 underweight children (WAZ<-1.0) 6-59 months of age into PDH (see Table 1). Of these admissions, 35.1% did not have MUAC measured on admission; 46.1% (n=797) had MUAC ≥12.5cm; 17.9% (n=309) met MAM criteria (yellow MUAC); and 0.8% (n=14) met SAM criteria (red MUAC) (Table 5). Following 12 consecutive days of Hearth intervention, 53.7% (n=166) of MAM children and 35.7% (n=5) of SAM children were rehabilitated to a MUAC of ≥12.5cm (Table 5).

The overall graduation rate at three months for all PDH-admitted children in their first round of Hearth was 64% (n=956), with a default rate of 2.7% (n=46) (Table 6). Of the MAM and SAM children admitted on day one of Hearth, 53.1% (n=164) of MAM and 50% (n=7) of SAM children graduated in three months. WV Burundi's monitoring data shows that MAM and SAM children recover in terms of MUAC and weight gain through the rehabilitation process. Programme observations suggest that recovery of MAM children takes longer (an additional one to two Hearth sessions) than for children who are only underweight.

Table 3   World Vision Burundi's PDH data for 2018

Underweight Status	Day 1 # Children	Day 1 % Children	Day 12 # Children	Day 12 % Children	Day 30 # Children	Day 30 % Children	3 Months # Children	3 Months % Children
Healthy	0	0.0%	109	6.4%	250	14.8%	279	18.6%
Mild	510	29.5%	583	34.3%	671	39.6%	713	47.5%
Moderate	726	42.0%	649	38.2%	516	30.5%	367	24.5%
Severe	491	28.4%	360	21.2%	256	15.1%	141	9.4%
TOTAL	1,727		1,701		1,693		1,500	
% of admitted children weighed			98.5%		98.0%		86.9%	

Table 4   Number of underweight children WV Burundi admitted into PDH with MAM and SAM in 2018

MUAC	MUAC Day 1 # of Children	MUAC Day 1 % of Children	MUAC Day 12 # of Children	MUAC Day 12 % of Children
MUAC ≥12.5cm, but WAZ<-1.0	797	46.1%	1447	83.8%
MAM (MUAC ≥11.5cm, <12.5cm)	309	17.9%	143	8.3%
SAM (MUAC <11.5cm)	14	0.8%	9	0.5%
MUAC not recorded	607	35.1%	102	5.9%
Children >59 months of age	0		7	0.4%
Defaulted	0		19	1.1%
TOTAL	1,727		1,727	

Table 5   Caseload at 3 months follow-up (WV Burundi, 2018)

Caseload at 3 months	# of children	% of Children
Remained in programme for declaration of graduation/no graduation	1,500	86.8%
Over 59 months of age (no longer eligible)	20	1.2%
Less than 3 months in programme	163	9.4%
Default rate (loss to follow-up)	46	2.7%
TOTAL	1,729	

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Field Article

By John Ntambi, Pramila Ghimire, Ciara Hogan,
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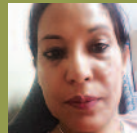
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Mothers wait with their children at Mahaas Health Facility, Somalia, 2019
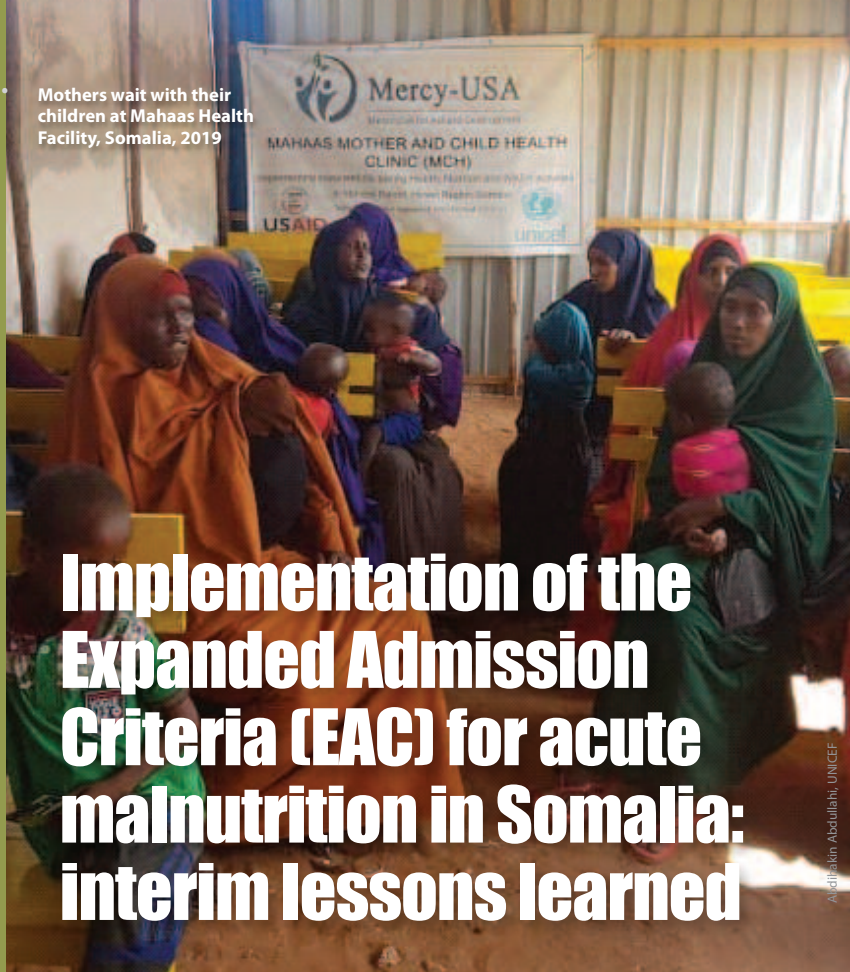
Implementation of the Expanded Admission Criteria (EAC) for acute malnutrition in Somalia: interim lessons learned

Location: *Somalia*

What we know: Somalia is characterised by persistently high wasting prevalence and insecurity that often constrains access to treatment.

What this article adds: In drought-affected, insecure districts of Somalia, gap analysis by the Nutrition Cluster in 2017 showed seven drought-affected areas had treatment services for severe acute malnutrition (SAM), but none for moderate acute malnutrition (MAM). As an exceptional measure, UNICEF implemented an expanded admission criteria (EAC), combining SAM and MAM treatment (using a ready-to-use therapeutic food (RUTF) product for all), implemented in seven districts by 11 partners. Operational challenges included low local partner capacity (reflected in inconsistent delivery of the protocol and limited monitoring data), challenges in RUTF supply delivery, and poor population access to primary healthcare. Coverage of global acute malnutrition caseload increased to 53%. Performance met Sphere standards for six partners with adequate data. Key ongoing actions include capacity strengthening of partners, increased quality assurance and monitoring, and cost analysis for this fragile, operationally challenging context.

Context

The nutrition situation in Somalia is characterised by a persistently high prevalence of wasting, with global acute malnutrition (GAM) >10% and pockets of GAM above the World Health Organization (WHO) emergency threshold (>15%). Over the past 12 years, GAM prevalence has never been below 10% (Figure 1).

Key drivers of wasting in Somalia include: food insecurity; high morbidity (partly due to limited access to basic social services such as healthcare and adequate water, sanitation and hygiene (WASH)); conflict; climatic shocks;

Figure 1 — GAM and SAM trends in Somalia 2007-2018

Source: www.fsnau.org

of TSFPs in districts where UNICEF has operational presence. EAC practice is consistent with the lifesaving agenda of the Humanitarian Response Plan (HRP) and is outlined in the Global Nutrition Cluster (GNC) interim operational guidance on MAM[2] and interim operational guidance for community-based management of acute malnutrition (CMAM) programming in exceptional circumstances.[3] Guided by these documents, country-level consensus was developed and joint UNICEF and WFP guidance formulated to aid the operationalisation of the EAC into OTPs in Somalia by non-governmental organisation (NGO) partners.

EAC implementation process

The Somali Cluster Rationalization Plan III, currently under development by the Ministry of Health (MoH), will advise that OTPs and TSFPs operate 'under the same roof', using the same implementing partner. This approach, and that of the EAC, intends that SAM and MAM cases are treated in the same facility, ensuring access to treatment services for acute malnutrition while drawing on the same resources, to minimise overheads and operational costs, simplify organisational structures and enable a better flow of patients from one service to the other. Under this protocol (described in Table 1), both SAM and MAM children receive all minimum elements of the basic nutrition services package, including immunisation, deworming, vitamin A supplementation and infant and young child feeding (IYCF) counselling. MAM children receive a weekly ration of one sachet of RUTF/day until discharge at MUAC ≥12.5cm, while uncomplicated SAM care and treatment continues to follow existing Somali national integrated management of acute malnutrition (IMAM) guidelines. Given the absence of stabilisation centres in these hardest-to-reach areas, children with SAM with complications are referred to stabilisation centres in accessible districts.

Exit strategy

The implementation of the EAC is a temporary strategy to save lives in specified areas as agreed by the Nutrition Cluster, WFP, UNICEF and the MoH. When the security situation improves and the specified locations become accessible for programme implementation and monitoring, EAC implementation will cease and the management of MAM will be transferred to WFP. Additionally, EAC may only continue for as long as implementing partners have access to the specified areas and the risk of loss of UNICEF resources can be mitigated.

and underlying factors such as weak governance, marginalisation and inequality. Humanitarian access to deliver services to communities living in hard-to-reach areas, often controlled by non-state actors, is constrained. At the peak of the 2017 drought response, cluster mapping reported districts with partial or total absence of lifesaving nutrition services, largely due to security constraints in areas partially controlled by non-state actors. Seven districts in the central south regions of Somalia had operational outpatient therapeutic programmes (OTPs) for the management of severe acute malnutrition (SAM), but no targeted supplementary feeding programmes (TSFPs) for the management of moderate acute malnutrition (MAM). This is in part explained by a policy that requires operational

TSFPs to be accessible either to World Food Programme (WFP) staff or to WFP-assigned third-party monitors (TPMs) to conduct monthly programme monitoring and supervision. Expanded admission criteria (EAC) districts are not accessible to UNICEF staff in the same way; however, as a provider of last resort, UNICEF can contract TPMs to visit implementing sites quarterly to assess service quality and provide a degree of programme oversight. This system mitigates staff risk while enabling UNICEF to deliver on the humanitarian imperative.

Rationale for adopting the EAC

In late 2017 UNICEF and WFP agreed to apply a practice outlined in a 2011 memorandum of understanding (MoU)[1] to treat MAM with ready-to-use therapeutic food (RUTF) in the absence

Table 1 — Threshol Protocol for the management of SAM and MAM under the EAC

Programme type	SAM	Expanded Admission Criteria for MAM (EAC)
Admission criteria (children aged 6 to 59 months)	MUAC <11.5 cm or bipedal edema or medical complications	MUAC ≥11.5 and <12.5 cm
Therapy/food given	RUTF (as per IMAM guidelines)	RUTF (1 sachet per day)
IYCF	Individual and group counselling	Individual and group counselling
Medical Interventions	Vitamin A and amoxicillin at admission Albendazole (week 2) Measles vaccination (week 4)	Vitamin A, albendazole and Measles vaccination at admission
Follow up	Weekly	Weekly
Cured discharge criteria	MUAC ≥12.5cm without oedema on two consecutive weekly visits	MUAC ≥12.5cm on two consecutive weekly visits

Figure 2 — EAC timeline for rollout

October-December 2017	January-March 2018	April-June 2018	July 2018	February 2019
• WFP, UNICEF and Cluster Technical mapping and gap analysis • WFP/UNICEF Senior Management engagement and Agreement	• Fundraising • Technical consultations with UNICEF Regional Office on project design • Procurement of supplies	• Development of EAC guidance note and tools for implementing partners (IPs) • Contracting of IPs	• Inception workshop with IPs • EAC Implementation roll out	• Review and learning meeting with IPs

1   MOU WFP-UNICEF: Areas of Technical Cooperation – March 2011. http://nutritioncluster.net/resources/mou-wfp-unicef-march-2011/ last accessed 30 November 2018

2   Global Nutrition Cluster (2017) Moderate acute malnutrition: a decision-tool for emergencies. Global Nutrition cluster MAM Task Force, updated March 2017.

3   Interim operational guidance for CMAM programming in exceptional circumstances; http://nutritioncluster.net/interim-operational-guidance-cmam-programming-exceptional-circumstances/

Abdihakin Abdullahi, UNICEF

Ridwan Muse Hussein has his MUAC measured by health staff in Mahaas, Somalia, 2019

UNICEF's experience

Somalia is a particularly complex and difficult context in which to operationalise the EAC. Districts selected for the EAC were chosen due to their elevated levels of malnutrition, limited accessibility and security risks relative to other parts of the country. It follows that the global capacity of implementing partners is limited and the ability to attract highly skilled staff to these areas is greatly reduced. TPMs, like partners, often lack the technical expertise to oversee and assess the quality of services of this innovative approach.

Overall, implementing partners appear to face challenges of adherence to the EAC protocol, as evidenced by varying treatment outcomes across partners such as length of stay and amount of RUTF required to cure one case of MAM. Thus, resources are required to build partner capacity, hold training workshops and ensure adherence to the treatment protocol.

Despite challenges, children who were previously inaccessible are now able to receive life-saving treatment. Furthermore, the EAC has the potential to provide a platform for the expansion of a package of integrated services in some districts. However, there are questions which could not be answered in the February 2019 review workshop that will remain a focus for future review meetings. Such questions include the level of human resources changes or adaptations required to implement EAC, the actual cost per MAM case treated, and the supply-chain management capacity of partners to prevent leakage of RUTF in these hard-to-access areas.

Partner's experience

A key barrier to EAC implementation was maintenance of the RUTF supply pipeline, which was often disrupted by precarious road transport. As a result, some partners reported a mismatch between the estimated caseloads in their catchment areas and allocated supplies. Other partners discussed challenges in meeting the overall primary healthcare needs of the local community, such as the fact that services for routine vitamin A supplementation, malaria treatment, and treatment for diarrhoea and deworming were not currently available. Follow-up of cases also posed problems due to population movement in some districts in search of pasture and water for livestock. Finally, community health workers were described by some partners as lacking key skills to complement service delivery, while the increased caseload reported by some partners increases the burden on health facility staff.

Key achievements identified by partners included the ability to reach children who previously had no access to lifesaving services, the positive response of the community to the service, and consistent MAM cases in excess of SAM cases,

EAC timeline for rollout

The timeline of activities in the adoption of the EAC approach are outlined in figure 2.

The process began organically with a gap analysis during the last quarter of 2017 which mapped the distribution of existing services across the country. Following learnings from this analysis, WFP and UNICEF came together to reach agreement on adopting the EAC approach in districts without MAM treatment but in the presence of OTPs. MoH, UNICEF and WFP agreed the following district selection criteria: malnutrition rate above emergency threshold; WFP unable to support programme implementation due to their internal policy on access. Fundraising was sought in the first quarter of 2018 and the UNICEF Regional Office was consulted on the technical design of the project. Guidance was developed in the second quarter of 2018 with input from WFP, the Nutrition Cluster and MoH. Following a positive donor response, 10 implementing partners from across the seven EAC districts were subsequently selected to deliver the EAC, based on their existing presence and technical capacity to offer MAM and SAM services. Caseload estimations were derived from the food security and nutrition assessment unit (FSNAU)[4] seasonal prevalence estimates.

In July 2018, all 10 partners were brought together in an inception workshop where the technical approach was outlined by UNICEF

and programme expectations agreed. Programme documents were then signed and, from August onwards, on receipt of supplies, partners began programme rollout. Another district, where accessibility had deteriorated due to security concerns, was identified by WFP for the EAC in December 2018. An international NGO was contracted to take up the caseload in this district; implementation began from March 2019. Eleven partners are therefore now implementing EAC across eight districts in the central south regions of Somalia, including Hiran, Bay, Galgaduug, Lower Juba and Bakool regions.

Implementation experiences

Although it is still too early to fully understand the operational implications of the EAC approach and factors affecting its effectiveness and sustainability, an initial review and learning workshop took place in early February 2019 to analyse emerging data and discuss strengths and challenges of the approach so far. Nine partners participated in the workshop, including eight local and one international NGO, with participation and support from UNICEF, WFP, the Nutrition Cluster and MoH. This was the first time the partners came together to share their experiences of implementation and the first opportunity UNICEF had to understand the practical realities of rollout on the ground. The following sections outline learnings from the different perspectives, informed by the February workshop.

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4   Food Security and Nutrition Assessment Unit of the United Nations Food and Agriculture Organization: www.fsnau.org/

Figure 3 — Total MAM and SAM cases treated, August 2018-January 2019

Figure 4 — Discharge outcomes of the EAC programme, August 2018-January 2019

Discussion and next steps

There is growing global interest in the continuum of care and the development of a combined/simplified protocol for MAM and SAM treatment, with research ongoing in several countries in Africa. Modalities employed in this approach vary from context to context. In our experience, there is no 'one-size-fits-all' solution or model. Somalia is embarking on a learning process and we hope, in time, to increase our understanding of the viability and effectiveness of the EAC approach in this emergency setting.

Interim lessons show that the capacity of partners needs to be strengthened in order to deliver the EAC consistent with the protocol. To do this, regular performance-review meetings and information sharing must take place. Quarterly reviews and regular analysis and interpretation of data will enable timely identification of challenges and continual improvement of the quality of care for patients, as well as the drawing of hypotheses on the effectiveness of the approach. Increased support to TPMs through closer oversight of implementation and quality control through site visits is also warranted. Operating in a fragile context like Somalia bears a higher cost than in more stable settings. This effect is compounded in hardest-to-reach areas and may have an impact on the longevity of this approach. Protection issues should also be considered; mothers come long distances to seek services that may expose them to risks in areas that have limited service provision of any kind. In the future, we hope to undertake an analysis of costs, comparing the EAC model versus 'business as usual' to help inform the development of an appropriate model adapted to the Somalia context.

The key next steps include:

- UNICEF to provide further support to implementing partners to improve capacity through quarterly performance-review meetings.
- UNICEF to build capacity of TPMs to monitor and report EAC activities.
- Partners and UNICEF to continue implementation and participate in monthly reporting for quality assurance and analysis.
- UNICEF to further build the capacity of partners in key areas, including preparation of activity reports, caseload estimation, RUTF supply planning and compliance with the protocol.
- UNICEF to advocate in the Health Cluster for the incorporation of certain primary healthcare elements, such as immunisation and the treatment of diarrhea, into the approach.
- UNICEF, WFP, MoH and partners to develop a single EAC protocol adapted to the Somali context to be triggered during emergencies or periods of limited accessibility

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which is thought to reflect good community awareness of service availability and uptake.

Data analysis and outcomes

During the workshop, data from the initiation of implementation (ranging from August to October 2018) to January 2019 was extracted from various sources, including OTP registers and monthly OTP reports (with data disaggregated for OTP and MAM admissions); RUTF stock cards; individual OTP follow-up cards; and copies of quarterly reports submitted to UNICEF.

Key data were summarised in Excel tables in small working groups, guided by UNICEF and WFP staff, including details of SAM and MAM admissions and outcomes, RUTF use and estimated length of stay.

Following the workshop, data from all partners were compiled and analysed. Results revealed significant differences in completeness of data, with only two of the nine partners having comprehensive data across all domains, reflecting the significant constraints of the context. Taking into account these limitations, key findings from the data analysis include:

- As of January 2019, almost 11,000 children were treated for acute malnutrition from a projected caseload of 20,615 children (53% coverage) over six months. Of these, 30% (2,398) were SAM cases (70% coverage) and 70% (8,559) were MAM cases (50% coverage) who previously had no access to services.
- Discharge information for six partners revealed that outcomes consistently met SPHERE standards for MAM programmes of deaths <3%, defaulters <15% and cured cases >75% (Figure 4).
- Data from four partners showed that one carton of RUTF was required to treat 2.9 (range 1.0- 5.37) children with MAM and 0.97 (range 0.22 - 2.0) children with SAM. For SAM, the average is in line with the national guideline, whereas for MAM this is almost double the projected 1.67 children served per carton. Performance data appeared not to be affected by considerable variation in RUTF quantities used by partners, but this requires closer monitoring and examination.
- Data from three partners revealed an average length of stay for children discharged as cured of 7.6 weeks for MAM (minimum 4 weeks, maximum 9 weeks) and 7.3 weeks for SAM (minimum 5 weeks, maximum 13 weeks).

Research

ComPAS trial in South Sudan and Kenya:
Headline findings and experiences

By Bethany Marron, Pamela Onyo, Eunice N Musyoki, Susan Were Adongo and Jeanette Bailey

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Location: *South Sudan and Kenya*

What we know: Acute malnutrition is a continuum condition, yet severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) are treated separately, which creates logistical, human resource and cost inefficiencies.

What this article adds: The Combined Protocol for Acute Malnutrition Study (ComPAS) aims to test a simplified, combined approach to treat uncomplicated SAM and MAM with one protocol through the community-based management of acute malnutrition (CMAM) delivery model. Stage 1 research generated a simplified dosage protocol based on mid-upper arm circumference (MUAC) only. Stage 2 (cluster-randomised non-inferiority trial) tested the effectiveness of the combined protocol compared to national protocols in Kenya and South Sudan; results are pending publication. Operational insights from trial implementation include significant supply chain challenges (particularly in procuring ready-to-use supplementary food); benefits for health facility staff in efficiently delivering treatment; and appreciation by caregivers. While MUAC-only programming remains a concern, one third of weight-for-height indices were inaccurately calculated by facility staff. Operational pilots of the combined, simplified protocol are planned in Chad and Mali to investigate outstanding questions about programme cost and coverage, supply chain and considerations for implementing at scale.

Overview

Acute malnutrition is a continuum condition, yet severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) are treated separately with different protocols, at times from independent geographical locations, and using different therapeutic products managed by separate United Nations agencies. Although children with MAM are three times more likely to die than well-nourished children, many nutrition programmes manage to provide treatment for the most severe form of malnutrition only (Black *et al*, 2008). The current division of malnutrition and its treatment has, in practice, created logistical, human resource and cost inefficiencies that threaten the continuity of care. Children require transition between protocols and treatment products. The scarcity of resources limits the availability of treatment for moderately malnourished children who are at risk of death and deterioration but may be deprioritised.

The Combined Protocol for Acute Malnutrition Study (ComPAS) aims to test a simplified, combined approach to treat uncomplicated SAM and MAM with one protocol through the community-based management of acute malnutrition (CMAM) delivery model. The aim is to improve global coverage, quality, continuity of care and cost-effectiveness of treatment. A previous article, summarised below, and pending peer-reviewed publication of ComPAS trial results, hypothesise that a single ther-

apeutic food product, provided at doses tested to optimise growth and using mid-upper arm circumference (MUAC) as the sole entry criterion, is a non-inferior, cost-effective approach compared to current national protocols to recover children with acute malnutrition.

Evidence that a simplified, integrated SAM/MAM protocol is comparable to the current approach to treat acute malnutrition could empower health systems to treat more children earlier in their episode of malnutrition, improve the continuity of care between SAM and MAM by eliminating the need for separate products and resources, simplify current procedures for health workers and caregivers, and demonstrate a programme model which can be more easily and efficiently scaled in access-constrained settings.

This article shares a summary of Stage 1 results, an overview of the Stage 2 ComPAS field trial in Kenya and South Sudan, and operational insights from implementing the field study.

Stage 1 ComPAS

Stage 1 of ComPAS, published in *Field Exchange* in 2016 (Bailey, Chase *et al*, 2016), retrospectively analysed treatment data from 8,233 acutely malnourished children between the ages of 6 and 59 months across five countries in order to observe their response to treatment and make recommendations for an optimised dose of ready-to-use therapeutic food (RUTF) correlated

with MUAC category. The study found that growth trends in MUAC and weight change mirrored each other and slowed as children progressed toward recovery, indicating MUAC status is an appropriate proxy for growth. Stage one assessed energy requirements to recovery from acute malnutrition and found that 1,000 kcal/day covers energy needs for children with a MUAC <12.5cm. An expert committee developed a simplified MUAC-based dosing chart to treat all children age 6-59 months with MUAC <12.5cm and/or oedema (+/++). The resulting combined protocol admits and treats children with MUAC <11.5cm and/or oedema using two sachets of RUTF/day (1,000 kcal) and children with MUAC 11.5cm- <12.5cm using one sachet of RUTF/day (500 kcal).

Stage 2 ComPAS

Stage 2 of ComPAS tested the effectiveness of the combined protocol compared to the current national treatment protocol (standard protocol) for SAM and MAM in Kenya and South Sudan. It also evaluated cost-effectiveness. The study was a cluster-randomised non-inferiority trial conducted in 12 health facilities in Nairobi County, Kenya and 12 health facilities in Aweil East, South Sudan. Children age 6-59 months presenting at any of the 24 health facility clusters with a MUAC <12.5cm and/or oedema (+/++) and no medical complications were eligible for enrolment. Randomisation of health facilities was stratified by country. Children admitted to combined-protocol health facilities received RUTF according to their MUAC and/or oedema status; children admitted to standard-protocol health facilities received RUTF in the outpatient therapeutic programme (OTP) to treat SAM or ready-to-use supplementary food (RUSF) in the supplementary feeding programme (SFP) to treat MAM. From May 8 2017 to August 31 2018, a total of 2,071 children were treated in

12 combined-protocol clinics and 2,039 in 12 standard protocol clinics.

Children were treated until cured or otherwise discharged from the treatment programme according to the criteria in Table 2.

The primary outcome for analysis was recovery (cured). Secondary outcomes included non-response (16 total weeks in any treatment without achieving recovery), default, referral out of the treatment programme, and death. Length of stay, average daily weight gain (g/kg/day), and average daily MUAC gain (mm/day) for children who achieved recovery were also compared. A full description of the methods for this trial was published in BMC Trials on 24 April 2018 (Bailey, Lelijveld *et al*, 2018). The detailed final analysis is currently under review for peer-reviewed publication.

Experiences from ComPAS implementation

In addition to the pending field trial results, the study offers valuable insight on implementing CMAM in Kenya and South Sudan. International Rescue Committee (IRC) and Action Against Hunger (AAH) applied the 'gold standard' for treatment (RUTF and RUSF) in all standard protocol health facilities; equipped all health facilities with additional staff, supervision and training; and ensured uninterrupted supply of RUTF and/or RUSF during the implementation period. However, the study faced several operational challenges. High defaulting and frequent missed visits persisted across both study arms. The rainy season in South Sudan, a national nurse's strike and two national elections in Kenya disrupted access to health facilities and increased opportunity costs for caregivers. In Nairobi in particular, urban employment often took priority over attending follow-up visits. These and additional contextual factors will be discussed in the final peer-reviewed publication.

This article focuses on observations specific to implementing the new simplified, combined protocol which are most operationally relevant to strengthening the continuum of acute malnutrition treatment. The combined protocol was implemented by health workers with support from the Ministry of Health (MoH) and IRC in
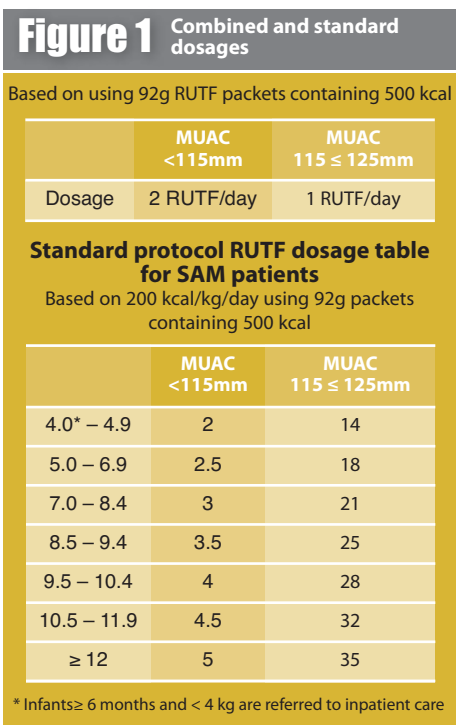
six health facilities in Nairobi County, and in six health facilities in Aweil East with support from AAH for the study period. During the implementation, IRC and AAH programme and research teams gained key insight on how the combined protocol was operationalised from set-up to close-out. This included challenges and/or barriers to uptake and adherence by health workers and caregivers, and general impressions and preferences by all stakeholders of the protocol at the health facilities during implementation. Key lessons learned were as follows.

Supply chain

From the outset of the trial, study operations in Kenya and South Sudan were directly impacted by supply chain obstacles inherent in the current system of separate SAM and MAM treatment programmes. Global shortages of RUSF in late 2016 through early 2017 delayed the start of the trial by several months. Despite utilising a global tender process, IRC was unable to source a buffer stock of RUSF to support standard-protocol research sites from any supplier or partner. Of the organisations approached for help, few had supply

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Figure 1 — Combined and standard dosages

Based on using 92g RUTF packets containing 500 kcal

	MUAC <115mm	MUAC 115 ≤ 125mm
Dosage	2 RUTF/day	1 RUTF/day

Standard protocol RUTF dosage table for SAM patients
Based on 200 kcal/kg/day using 92g packets containing 500 kcal

	MUAC <115mm	MUAC 115 ≤ 125mm
4.0* – 4.9	2	14
5.0 – 6.9	2.5	18
7.0 – 8.4	3	21
8.5 – 9.4	3.5	25
9.5 – 10.4	4	28
10.5 – 11.9	4.5	32
≥ 12	5	35

* Infants ≥ 6 months and < 4 kg are referred to inpatient care

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Table 1 — Combined (Intervention) and standard (Control) treatment protocols

Combined Protocol (Intervention)	Standard Protocol (Control)
MUAC < 115mm and/or oedema (+/++): • Weekly treatment • Routine medical treatment as recommended for OTP patients • 2 sachets RUTF (1,000 kcal) / day	SAM (MUAC <115mm and/or WHZ <-3 and/or oedema +/++): • Weekly treatment • Routine medical treatment as recommended for OTP patients • RUTF 200kcal / kg/ day (according to chart)
Transition: 2 consecutive weekly measurements ≥115mm AND no oedema	Transition: 2 consecutive weekly measurements ≥115mm and/or WHZ >-3 and no oedema
MUAC 115 ≤ 125mm: • Biweekly treatment • 1 sachet RUTF (500 kcal) / day	MAM (MUAC 115<125mm and/or WHZ <−2 to >−3): • Biweekly treatment • RUSF 500kcal/ day (1 sachet)

Table 2 — Combined (Intervention) and standard (Control) discharge criteria

	Combined Protocol (intervention)	Standard Protocol (control)	
		OTP	SFP
Cured	MUAC ≥125mm for 2 consecutive measurements and no oedema	MUAC >115mm AND/OR WHZ >-3 z-score AND no oedema for two consecutive visits	Child maintains WHZ >-2 z-score AND/OR MUAC ≥125mm for a period of two consecutive weighs/measurements
Non-response	Has not achieved discharge criteria within 16 weeks		
Default	Absent for 3 consecutive visits		
Referred	Any child who develops medical complications and/or is not responding to treatment will be referred for a medical evaluation and/or to the stabilisation centre		
Death	Child died while receiving treatment		

Caregiver interview, Nairobi, Kenya, 2018

Natasha Lelijveld

or they had very limited stock which could not be diverted, even as a stopgap. While severe drought in the Horn of Africa undoubtedly exacerbated normal supply and demand for RUSF in the region, it is also worth noting that IRC procured RUTF during the same time period without issue (due to easier access of RUTF via UNICEF and better global availability). The randomised control trial (RCT) protocol to run both standard and combined treatment protocols notwithstanding, treatment for acute malnutrition using the combined protocol could have begun several months earlier.

AAH operations in South Sudan also faced delays due to procurement procedures. Unlike IRC, AAH was able to partner with World Food Programme (WFP) in-country to obtain an initial buffer stock of RUSF. However, by the study mid-term, depleting stock necessitated AAH to engage in a complicated pre-approval and tax-exemption process to procure additional RUSF, as well as RUTF. The administrative task of procuring RUTF and RUSF magnified the increased burden that operating separate SAM and MAM treatment programmes and protocols impose on procurement and supply-chain operations.

RUTF and RUSF were never procured at the same time in Kenya or South Sudan, which meant that other programme logistics like transporting supply from a central warehouse in Juba or pre-positioning RUTF or RUSF could not always be streamlined. Rather, duplicate time and costs were incurred to ensure standard-protocol sites received the two products necessary to provide treatment. While it should be noted that IRC and AAH had heavy involvement in procuring, positioning and managing RUTF and RUSF during the study, it is reasonable to believe that ministries of health and/or national partners contracted to manage the supply chain

of RUTF and RUSF would face similar challenges to source and transport multiple treatment products, versus focusing effort on RUTF.

During implementation at the combined-protocol sites in Kenya and South Sudan, other logistical benefits of programming RUTF as the single treatment product were quickly realised by IRC, AAH and MoH health worker staff. Storage and tracking of supply were easier to manage, both because RUTF did not require separate counting from RUSF and because non-health staff could be relied on to support storage, tracking and movement of supply without any supervision to differentiate products. Staff who had pre-study CMAM experience programming with corn-soya blend to treat MAM were especially convinced by the ease of transporting and storing shelf-stable cartons of RUTF to treat MAM.

Implications for health staff time and capacity

The combined protocol was well received by MoH health workers in Kenya and NGO staff in Aweil East in the 12 clinics where it was implemented. The protocol streamlines the infra-structure required to administer treatment by simplifying anthropometric measurement requirements, condensing patient tracking and paperwork, eliminating referral between SAM and MAM treatment programmes, and setting a fixed 2:1 RUTF dosing chart. Health workers found the combined-protocol procedures easier to understand and implement with limited staff assistance and/or lower personal or support staff experience. While the preferred staff structure for CMAM programmes typically includes a nurse or clinician, a nutritionist and community health workers (CHWs), the reality in Kenya, South Sudan and many programmes around the world is that CMAM is run without this team. More often, a few staff receive limited

official or on-the-job training and are expected to implement CMAM in addition to their regular responsibilities (if they are not nutritionists).

Although weight and height were taken and recorded for inclusion in the study database, the combined protocol is a MUAC-only programme. As such, health workers acknowledged the time-saving potential of eliminating weight-for-height z-score (WHZ) as an admission and discharge criteria. While MUAC-only programming remains an issue of concern in the global community due to its inability to identify the same population of malnourished children as WHZ, the implication of using WHZ as an indicator is an interesting finding from this study. Preliminary analysis using statistical software to recalculate WHZ scores indicates that more than a third of all reported WHZ scores were calculated incorrectly by health worker staff at admission. Administration of the standard protocol has implications for training, availability and accuracy of anthropometric equipment and job aids such as salter scales, height boards and WHZ charts, and staff availability to take weight and height in a hectic, under-staffed health facility environment. The simplified, combined protocol may eliminate these issues without compromising treatment outcomes.

Due to the short-term nature of the ComPAS RCT, health worker staff at combined-protocol sites had also to adhere to MoH requirements on documenting SAM and MAM treatment. However, health clinic staff acknowledged that the simplification and unification of treatment protocols would reduce current time and effort spent on filling out separate patient cards and registers for SAM and MAM children, particularly as they improve or deteriorate between criteria. Also, staff agreed that treatment by a single protocol and product would alleviate the cumbersome process of aggregating individual SAM and MAM patient data for entry into the national DHIS monitoring system.

The simplicity of the combined protocol also empowered CHWs who are relied on to provide significant assistance during CMAM programming in Kenya and South Sudan and, in some instances, improved their communication with caregivers during follow-up visits and community MUAC screening campaigns. The elimination of complex anthropometry and introduction of a 2:1 RUTF dosage chart based on MUAC meant that CHWs could easily and effectively support health facility staff during treatment at the health facility as well as accurately communicate the entire protocol directly to caregivers when visiting their homes. Based on a child's MUAC, CHWs knew if a child was eligible for treatment, the treatment product and quantity of sachets he or she would receive, and the frequency of follow-up visits. Also, as a MUAC-only programme, CHWs were able to assess for acute malnutrition in the community in the exact same way the facility-based staff would assess, diagnose and treat which reduced confusion for caregivers.

Health worker and caregiver experiences

Health workers in the combined-protocol sites reported feeling confident in their ability to diagnose, provide and explain the simpler combined-protocol treatment and felt high satisfaction with the protocol's principle of providing treatment for all acutely malnourished children through to recovery. Particularly among health workers with prior CMAM experience, the vision of combining and simplifying treatment seemed to align with a pre-existing willingness to modify the standard protocol to maximise resources. During pre-study scoping activities, it was observed that few health facilities were able to fully implement the standard protocol due to limited or no supply of RUTF and/or RUSF and lack of anthropometric equipment or trained staff. Given this, several health workers were already applying various methods to triage cases, such as applying their own MUAC cut-offs for admission and discharge, reducing and/or mixing treatment dosage, and holding vulnerable children in OTP SAM treatment instead of discharging to an SFP MAM programme. Particularly where there was limited or no MAM treatment available, health workers retained children in OTP SAM treatment past standard protocol graduation criteria. In addition to their expressed preference for the combined protocol, health workers' instinct in Kenya and South Sudan to adapt the standard protocol even before the ComPAS RCT began suggests that effort to officially simplify and combine treatment would be accepted in similar resource-constrained contexts.

Overall, caregivers had good awareness of the combined-protocol nutrition programme and satisfaction with the combined-protocol treatment. Coverage surveys implemented in Nairobi and Aweil East indicated comparable coverage across the study arms. However, it is difficult to differentiate whether their satisfaction indicates preference for the new protocol or their general appreciation of consistent availability of treatment due to the programmatic support provided by IRC and AAH. Similar to the standard protocol, the combined protocol stipulates that children admitted with a MUAC <11.5cm attend weekly follow-up visits to allow closer monitoring of progress, but can graduate to bi-weekly follow-up once their MUAC reaches ≥ 11.5mm. Notably, caregivers in Kenya and South Sudan preferred less frequent follow-up visits and valued the biweekly transition in alignment with the standard protocol.

Conclusions

A simplified, combined approach to treat SAM and MAM has great potential to ensure that resources are optimised, more children are reached with treatment, continuity of care between SAM and MAM treatment is improved, and health systems are able to treat MAM children before they deteriorate into SAM. While operationalisation at the health-facility level would require a shift from current protocol, benefits like those observed in Kenya and South Sudan may be immediately realised:

- A combined, simplified protocol eliminates the need for multiple treatment products, easing procurement, logistics and stock management procedures.
- A combined treatment programme reduces the administrative burden of implementing and documenting two programmes, both from the individual patient perspective and from aggregating health data for reporting.
- A MUAC-based treatment protocol requires less time and equipment to implement and may enable more health workers to be trained to assist the administration of treatment.
- Health workers prefer a simplified, combined protocol because it is easier to implement and enables them to treat children through recovery.

Ultimately, we envision one programme which can admit any child with a MUAC <125mm and treat through recovery using a lower simplified dosage. This would include direct admissions of MAM cases into the simplified, combined programme. While our hypothesis is that a simplified combined approach will achieve time and cost efficiencies in the larger CMAM system which lead to greater availability of treatment it is important to note that this was not tested in the ComPAS trial. Given this and the high level of oversight and support provided by IRC and AAH for this RCT, future research should assess programme performance and health worker and caregiver preferences over time and under routine MoH management. Furthermore, in order for health systems to consider adopting this approach, it will also be important to rigorously evaluate the ComPAS hypothesis that a combined, simplified approach achieves time and cost efficiencies in the larger CMAM system that lead to greater availability of treatment and ensure that care of the most vulnerable SAM cases is not compromised. IRC and partners (UNICEF and WFP, funded by ECHO) will conduct operational pilots of the combined, simplified protocol in Chad and Mali with the aim of addressing remaining questions about programme cost and coverage, supply chain, and ways to integrate with other nutrition activities when implementing at scale.

Published results of the Stage 2 ComPAS trial will shared on **www.ennonline.net/fex** as soon as available.

For more information please contact Bethany Marron at **bethany.marron@rescue.org**

Appetite test at health facility, Nairobi, Kenya, 2018

Natasha Lelijveld

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Using MUAC to predict and avoid negative outcomes in CMAM programmes: Work inspired by en-net

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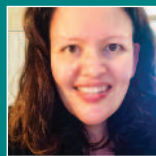
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Location: *South Sudan and Kenya*

What we know: Acute malnutrition is a continuum condition, yet severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) are treated separately, which creates logistical, human resource and cost inefficiencies.

What this article adds: The Combined Protocol for Acute Malnutrition Study (ComPAS) aims to test a simplified, combined approach to treat uncomplicated SAM and MAM with one protocol through the community-based management of acute malnutrition (CMAM) delivery model. Stage 1 research generated a simplified dosage protocol based on mid-upper arm circumference (MUAC) only. Stage 2 (cluster-randomised non-inferiority trial) tested the effectiveness of the combined protocol compared to national protocols in Kenya and South Sudan; results are pending publication. Operational insights from trial implementation include significant supply chain challenges (particularly in procuring ready-to-use supplementary food); benefits for health facility staff in efficiently delivering treatment; and appreciation by caregivers. While MUAC-only programming remains a concern, one third of weight-for-height indices were inaccurately calculated by facility staff. Operational pilots of the combined, simplified protocol are planned in Chad and Mali to investigate outstanding questions about programme cost and coverage, supply chain and considerations for implementing at scale.

Background

The work reported here is a response to a discussion on en-net discussion forums about monitoring and interpreting mid-upper arm circumference (MUAC) at admission in community-based management of acute malnutrition (CMAM) programmes.[1]

There was some discussion regarding how MUAC at admission is interpreted in SQUEAC coverage assessments using a distributions approach. CMAM and SQUEAC experts on the forum suggested a number of thresholds that might be used to predict good coverage (e.g., > 75% of admissions with MUAC ≥ 110 mm), define late admission (e.g., admission MUAC < 105 mm), or identify cases of severe acute malnutrition (SAM) with very high risk of mortality for automatic referral to inpatient care or triage (e.g., admission MUAC < 100 mm).

The discussion turned to establishing a threshold for an additional band on MUAC tapes that could be used to select children most likely to require more intensive monitoring or more intensive treatment (e.g., children being directed for more intensive clinical examination at admission and follow-up at subsequent visits, weekly rather than fortnightly outpatient therapeutic feeding programme (OTP) attendance, or inpatient care). This article attempts to addresses this particular issue.

Methods

We collected OTP data from eight CMAM programmes (see Table 1). Data from children with MUAC ≥ 115 mm at admission were discarded. Children who died during treatment or were discharged as not responding to treatment or who were transferred to inpatient care during the treatment episode were classified as having a negative outcome. Defaulters were excluded from the analysis presented here because their outcomes were uncertain.

Data from the eight programmes were pooled. The performance of MUAC at admission for predicting negative treatment outcomes (i.e., death, non-response or transfer to inpatient care) was examined by calculating the sensitivity and specificity of MUAC below systematically varied thresholds for predicting negative treatment outcomes. The thresholds used ranged between the minimum and maximum observed MUAC at admission in steps of 1 mm. The sensitivity and specificity estimated at each threshold were plotted as a receiver operating characteristic (ROC) curve and the area under the ROC curve (AUC) estimated using the trapezoidal rule. An ROC curve charts the performance of a diagnostic or predictive test. The ROC curve and its associated AUC estimate summarise the performance of a diagnostic or predictive test (see Figure 1). The AUC corresponds to the probability that, given two randomly chosen people, one with a negative outcome and one without a negative outcome, the test will rank the person with a negative outcome with a higher suspi-

cion of having a negative outcome than the one without a negative outcome. For example, an AUC of 0.70 means that, of two randomly chosen people, there is a 70% chance that the person with a negative outcome will be ranked with higher suspicion of having a negative outcome than the person without a negative outcome.

The optimal MUAC threshold for predicting negative treatment outcomes was identified using the maximum observed value of Youden's Index. Youden's Index is a function of both sensitivity and specificity:

$$Youden's\ Index= Sensitivity\%+Specificity\%-100\%$$

Youden's Index is a commonly used measure of diagnostic effectiveness. The maximum value of Youden's Index occurs at the threshold that optimises a test's ability to differentiate between cases (e.g., negative outcomes) and non-cases (e.g., positive outcomes). This occurs at the point on the ROC curve with the maximum vertical distance from the diagonal (chance) line to a point on the ROC curve (see Figure 1). Youden's Index may range between zero (the test is useless) and 100% (the test is perfect).

All data analysis was performed using purpose-written R language (version 3.5.2) scripts managed using the R Analytic Flow scientific workflow system (version 3.1.8).

Results

The ROC curve for predicting negative outcomes using MUAC at admission based on all 5,842 admissions with MUAC < 115 mm who did not default is shown in Figure 2. The area under the curve is AUC = 0.72. This is considerably better than chance. The maximum observed value of Youden's Index was = 34.23% at MUAC < 109 mm with a sensitivity of 50.00% and a specificity of 84.23%. The MUAC thresholds for the maximum value of Youden's Index for the separate programmes were similar to each other.

Discussion

In this application, *sensitivity* is the proportion of negative outcomes that are correctly predicted as negative outcomes and *specificity* is the proportion of positive outcomes that are correctly predicted as positive outcomes. Use of a very high MUAC threshold would predict all negative outcomes (i.e., have 100% sensitivity) but would also make very many false predictions (i.e., have a low specificity). Good tests have both high sensitivity and high specificity. This is not always possible to achieve and a trade-off between sensitivity and specificity has to be made. For relatively uncommon outcomes (e.g., treatment failure in OTP) the trade-off will usually be for moderate sensitivity and high specificity. This avoids workload being inappropriately dominated by large numbers of false positive predictions. It is usually a safe compromise if other tests are also used (see Table 2) and routine monitoring of response to treatment is practised. In our analysis we found that MUAC alone predicted negative treatment outcomes with moderate sensitivity and good specificity.

Youden's Index ≥ 50% is usually required for a stand-alone diagnostic test. This was not achieved in our analysis. This is acceptable, however, if we expect the test to be used with other tests (see Table 2).

MUAC used alongside other predictors that are currently used in therapeutic feeding programmes (i.e. clinical signs and history, the ready-to-use therapeutic food (RUTF) appetite test, and other triage criteria present in a programme's 'action protocol') could be useful when deciding care pathways at admission (see Table 2). For example, children with MUAC < 110 mm at admission and either ill at admission or with a history of illness in the previous seven days could receive a thorough clinical examination and more intensive counselling at admission (see Table 2). It may also be safe for children

Figure 1 Some features of a ROC curve
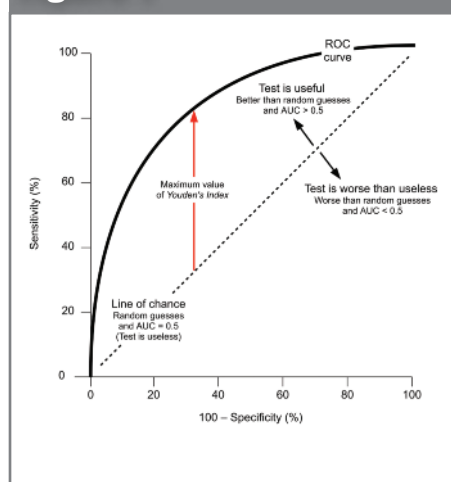
Figure 2 ROC curve for predicting negative outcomes using MUAC at admission, using data from all 5,842 admissions who did not default from eight programmes
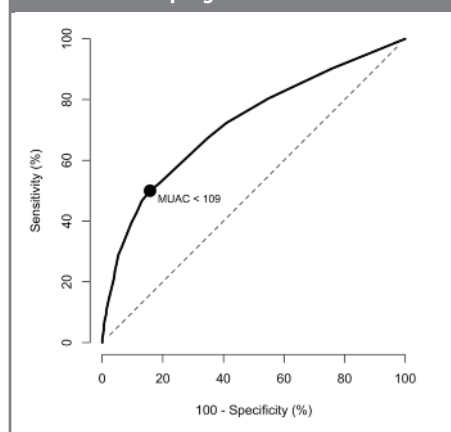
The point of the maximum observed value of Youden's Index is marked (see text). The maximum observed value of Youden's Index was 34.23% using MUAC < 109 mm with a sensitivity of 50.00% and a specificity of 84.23%. The area under the ROC curve (AUC) was 0.72. The dashed line is the line of chance.

Table 1 Characteristics of the eight cohorts of patients

Location	Agency	Start date	End date	Admission criteria*	Discharge criteria**	N***
Bangladesh	Terres des hommes (Tdh)	11/06/13	20/08/14	MUAC < 115 weight-for-height z-score (WHZ) < -3	MUAC >= 115 & WHZ > -2	288
Kenya	International Rescue Committee (IRC)	01/01/18	31/12/18	MUAC < 115 WHZ < -3	Same criterion as used for admission (i.e. MUAC ≥ 115 or WHZ ≥ -3 for two consecutive weeks). Discharge to supplementary feeding programme (SFP).	784
Kenya					An expanded criteria (i.e. MUAC > 125 or WHZ > -2 for two consecutive weeks) if SFP	395
Mali	Action Against Hunger (ACF)	15/02/15	28/02/16	MUAC < 115 WHZ < -3	MUAC ≥ 125 or WHZ ≥ -1.5 for two consecutive weeks).	409
Malawi	Ministry of Health (MoH)	01/03/11	29/03/12	MUAC < 115	MUAC ≥ 125 for two consecutive weeks	195
Niger	ALIMA	04/04/13	05/05/14	MUAC < 125	MUAC ≥ 125 for two consecutive weeks	780
South Sudan	IRC	01/01/18	31/12/18	MUAC < 115 WHZ < -3	Same criterion as used for admission (i.e. MUAC ≥ 115 or WHZ ≥ -3 for two consecutive weeks). Discharge to SFP. An expanded criteria (i.e. MUAC > 125 or WHZ > -2 for two consecutive weeks) if SFP	2,344
Uganda	MoH	01/01/16	31/10/17	MUAC < 115 WHZ < -3	115 ≤ MUAC ≤ 125 or -3 ≤ WHZ <-2 (discharge to SFP) MUAC > 125 & WHZ > -2 (discharge to home)	647
						5,842

* All admission criteria included bilateral pitting oedema and age between 6 and 59 months. MUAC is measured in mm. WHZ is measured in z-scores.
** All discharge criteria included loss of oedema/absence of oedema.
*** The number of cases with MUAC < 115 mm at admission (excluding defaulters).

with MUAC ≥ 110 mm without current illness and without a history of recent illness to attend OTP every two weeks, rather than every week. Programmes using fortnightly follow-up might use weekly follow-up for children with MUAC < 110 mm with current illness or a history of recent illness for the first few weeks of treatment. Programmes using community health workers to deliver CMAM services could refer children with MUAC < 110 mm or illness or a history of recent illness to health centres for further assessment. Priority could also be given to more rigorous follow-up of absentees and defaulters with MUAC < 110 mm or illness at their most recent visit. Adaptations such as these should be tested by further operational research before being adopted as a routine practice in OTP programmes in order to avoid unintended consequences (such as unmanageable increases in staff workload or increasing costs to beneficiary households of accessing care).

Adaptations such as the ones outlined above may help to reduce negative outcomes, but their effect will be limited. The probability of a negative outcome decreases as MUAC at admission increases. Negative outcomes may, therefore, be reduced by early case-finding and prompt treatment-seeking behaviours using strategies such as regular and frequent at-home MUAC screening by mothers or other family members. Better compliance with the OTP treatment protocol by the beneficiary also decreases the probability of a negative outcome. Negative outcomes may be reduced by (e.g.) reducing intra-household sharing of RUTF, reducing sale of RUTF and increasing attendance rates. Programmes can also have compliance deficits such as RUTF stock-outs and partial delivery of services. These also increase the probability of negative outcomes. Maintaining protocol compliance and continuity of care by programmes may also reduce negative outcomes.

Research and pilot programmes have demonstrated the feasibility of delivering different intensities of treatment for children with MAM and SAM within a single therapeutic feeding programme. The analysis reported here used data from one such programme, but data on admissions with MUAC ≥ 115 mm were discarded. We did this in order to provide an analysis that addresses the current most common therapeutic feeding programme model (i.e., OTP admitting using MUAC < 115 mm). The finding of the analysis presented here can, however, be applied without modification to integrated MAM/SAM treatment programmes. These types of programme already have 'treatment transition criteria' in which (e.g.) a MAM case becoming a SAM case triggers a switch to more intensive treatment and a SAM case becoming a MAM case triggers a switch to less intensive treatment.

Limitations

There are a number of limitations to this analysis. Nothing is known about what happened to defaulters. Some may have been cured but defaulted prior to a 'proof-of-cure' visit. Others may have stopped attending because of a lack of response to treatment. Others may have died and their resulting non-attendance recorded as defaulting. This means that fewer deaths and non-responders may have been recorded than actually occurred. Transfers to inpatient care may also under-represent negative outcomes, as some patients referred to inpatient care may have refused the referral and continued treatment in OTP. Discharge criteria varied. For programmes using a discharge criteria of MUAC ≥ 125 mm, there will likely be a difference in lengths of stay (treatment durations) and an increased potential for absenteeism, default or non-cure compared to programmes using (e.g.) a discharge criteria of MUAC ≥ 115 mm. Our exclusion of defaulters will have reduced effects caused by this issue. The finding that the MUAC thresholds for the maximum value of Youden's Index for the separate programmes were similar to each other despite the use of different discharge criteria suggests that this was not a major issue.

Conclusion

MUAC at admission when used with other predictors could improve the effectiveness and cost-effectiveness of OTP programmes by helping to reduce the number of negative treatment outcomes. If MUAC at admission can be used to direct patients to less intensive treatment options, focusing attention and resources on those at highest risk, then programme costs could be lowered and cost-effectiveness further improved. Improved outcomes and reduction in crowding at programme delivery sites may also lead to improved programme coverage.

A post on an en-net discussion forum was the starting point for the work described here. En-net was useful in recruiting collaborating researchers and obtaining data. It may be useful for ENN to systematically monitor en-net and to identify, encourage and sponsor similar pieces of operational research, with results published in *Field Exchange*.

Table 2 Example OTP admission checklist/triage rules/action protocol*

Examination	Determination	Action
MUAC	≥ 110 mm	Admit to OTP
	< 110 mm	Review by clinical officer (CO)/nurse-in-charge
Oedema	Grade +	Admit to OTP
	Grade ++	Review by CO/nurse-in-charge
	Grade +++	Refer to stabilisation centre
Appetite for RUTF	Good	Admit to OTP
	Eats only with encouragement	Review by CO/nurse-in-charge
	Refuses to eat or has difficulty eating RUTF	Refer to stabilisation centre
Temperature	Between 35.5° C and 37.5° C	Admit to OTP
	Between 37.5° C and 39 ° C	Review by CO/nurse-in-charge
	≥ 39° C	Refer to stabilisation centre
	< 35.5° C	
Respiratory	Normal breathing/no cough	Admit to OTP
	Cough	Review by CO/nurse-in-charge
	> 50 breaths/minute (age < 12 months)	Refer to stabilisation centre
	> 40 breaths/minute (age between 1 and 5 years)	
	Chest in drawing /nasal flaring	
Hydration	Normal urine/mouth not dry	Admit to OTP
	Diarrhoea/vomiting	Review by CO/nurse-in-charge
	Poor urine output	Refer to stabilisation centre
	Sunken eyes with history of diarrhoea/vomiting	
Anaemia	Hb > 9 g/dl	Admit to OTP
	No palmar pallor	
	Hb between 7 g/dl and 9 g/dl	Review by CO/nurse-in-charge
	Some palmar pallor	
	Hb < 7 g/dl	Refer to stabilisation centre
	Severe palmar pallor	
Alertness	Alert	Admit to OTP
	Sleepy/quiet/apathetic	Review by CO/nurse-in-charge
	Very weak/lethargic/ unconscious	Refer to stabilisation centre
	Fitting/convulsions	
	Very pale, severe palmar pallor	
Infection	No skin infections	Admit to OTP
	Discharge from ears	Review by CO/nurse-in charge
	Superficial skin infections/sores	
	Severe skin infection/extensive sores	Refer to stabilisation centre

* This table is presented for illustration purposes only. Always use local examination rules/triage rules/action protocols, which are usually presented in national CMAM protocols and guidelines.

Continuity of information in nutrition interventions in India:
Experiences from Jharkhand

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This work draws on part of the author's doctoral thesis.

Location: *Jharkhand State, India*

What we know: Informational continuity – the availability and utilisation of information that connects healthcare providers and beneficiaries and facilitates consistent care across time and levels – is important to achieve continuity of care for acute malnutrition.

What this article adds: A case study in Jharkhand State, India, explored the continuum of information-sharing between care providers and beneficiaries across different levels of care in India between community (home) and facility-based care. Interviews with mothers/caregivers and nurses at malnutrition treatment centres identified many shortcomings in the nature and timing of information shared between frontline health workers (FHW), facility staff, mothers/caregivers and communities. These impact on prevention (e.g., missed danger signs), treatment (e.g., late or declined referral for severe cases) and rehabilitation (e.g., no community-level support post facility discharge). Actions to improve information continuity around case management of acute malnutrition are identified, including: clear FHW guidance on referral communication, training of facility staff on contextual messaging and post-discharge communication between facility and community services for individual children.

Context

The term 'continuum of care' (CoC) describes a system that guides beneficiaries through health services over time and prevents them from falling out of the care pathway through regular follow-up. CoC covers delivery of a range of healthcare services across different levels that are timely, consistent and appropriate.[1] One of the key drivers of CoC is informational continuity – the availability and utilisation of information that connects healthcare providers and beneficiaries and facilitates consistent care across time and levels. Good information flow also connects different healthcare providers to each other to aid coordination of care and to facilitate early identification, the development of an appropriate care plan, and the provision of consistent care to ensure that a beneficiary does not slip out of the continuum.

Information continuity centres on information-sharing and good communication between healthcare providers and beneficiaries. This goes beyond mere information transfer to the incorporation of processes for the co-creation of appropriate care plans. One of the primary requirements for information continuity is the provision of clear messages that can be correctly understood and acted on by beneficiaries. Community knowledge, belief and practices in childcare and feeding influence mother/caregivers' interpretation of messages, and practicing care advice is influenced by socioeconomic and cultural position of mothers/caregivers (Ramji,

2009). This interpretation in turn governs their practices of care and feeding, which determine actual prevention, treatment and rehabilitation of malnourished children.

This article examines the interplay between information continuity and treatment outcome (high default rate, low cure rate and secondary failure to respond). Drawing on findings from a case study in Jharkhand State, India, it considers the continuum of information-sharing between care providers and beneficiaries across different levels of care in India from home (community-based care) to facility-based care and back to home.

Treatment of acute malnutrition in India

The primary acute malnutrition intervention in India focuses on addressing severe acute malnutrition (SAM) through facility-based management at nutrition rehabilitation centres (NRCs), also known as malnutrition treatment centres (MTCs). This nutrition intervention model has two major care points – facility and community level. At the facility level (NRC/MTC) SAM cases with medical complications are treated with therapeutic food and medical care, modelled on the African experience of SAM management. As malnutrition interventions in India do not have a strong community-based component, community-level or family-centred care is crucial. A fractured continuum in care services (between facility and community-level care points) has been identified as one of the

reasons why SAM management in India exhibits poor treatment outcomes (Dasgupta & Chaand, 2018). Furthermore, India has a high prevalence of stunting and in many states stunting and wasting co-exist in children under five years of age. This has prompted recommendations for an extended treatment regimen to achieve target weight gains (Dasgupta *et al*, 2014).

Nutrition in the state of Jharkhand

According to the National Family Health Survey-4 (NFHS-4), 2015-16, Jharkhand is in the top five states with the highest prevalence of malnutrition in children under five years old in India. Almost half of children (45.3%) are stunted (higher than the national average of 38.4%) and 29% are wasted. Almost half (47.8%) are underweight.

Jharkhand, as in most states in India, has a three-tier healthcare system comprising of primary health centres (PHC), community health centres (CHC) and district hospitals. The main model for the management of malnutrition is the provision of care for children aged between 3 and 6 years through Anganwadi centres, under Integrated Child Development Services (ICDS). There is no state provision of care and support for children below three years of age. Village health and nutrition days are organised monthly and include screening for severely malnourished children and referral to an MTC for further

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[1] See research snapshot in this issue of *Field Exchange*, ' Programmatic approaches for nutritional care in India: Perspectives on continuum of care', which summarises a research paper by the same author.

care. Community-based care in Jharkhand, as in the rest of India, is largely delivered by frontline health workers (FHWs), including Anganwadi workers (AWWs), accredited social health activists (ASHAs) and auxiliary nurse midwives (ANMs). These workers are responsible for health promotion, prevention, referral of complicated SAM cases and community-based rehabilitation of discharged children through additional supplementary nutrition and follow-up.

Research method

This research study adopted a case study method. Six MTCs in Jharkhand were used as case settings. In-depth interviews were carried out across the MTCs with 15 mothers/caregivers accompanying children to the facility for inpatient care and 10 nurses. In addition 20 FHWs (AWWs and ASHAs) were interviewed in the community using semi-structured interview guides. Data was transcribed, coded and analysed. Programme documents, reports (published and unpublished) were also used to extract necessary data.

Results

Prevention

The study indicates that continuity of information between FHWs and beneficiaries is inadequate to support and capacitate mothers/caregivers in preventing malnutrition among children under five years old. Findings indicate that the sharing of information between FHWs and mothers/caregivers is inadequate to capacitate them to identify danger signs, take precautionary measures and/or seek appropriate healthcare for the treatment of their malnourished children. Results also indicate that caregivers do not receive support from the FHWs to provide appropriate care and feeding to children with uncomplicated MAM/SAM or children discharged from MTCs.

The study identified many examples of misinterpretation or misunderstanding of information provided by FHWs to mothers and how this can compromise care. For example, explanation of exclusive breastfeeding revolves around not feeding food or honey to infants; mothers therefore consider that exclusive breastfeeding allows giving water to their infants. There may be ambiguity in information provided; e.g., "feeding at frequent intervals" does not define how long an interval is. FHWs advise mothers to wash hands before feeding 'food' (khana) to children. Culturally, khana is understood to mean a meal. It was found that, while mothers washed hands before feeding each meal, they did not practice the same before feeding other items between meals. Such a difference in understanding of terms by FHWs and mothers/caregivers governs the actual behaviours that result around age-appropriate feeding and needs-based care of children.

Sickness and malnutrition are fundamentally interrelated. Appropriate and timely treatment of sickness among children is critical to preventing malnutrition among children (Dasgupta *et al*, 2012). The analysis found that capacity-building of mothers and caregivers to identify danger signs among their children was weak. There was inadequate transfer of knowledge to the community concerning appropriate care providers and care facilities for the provision of different health services for children. Hence, caregivers either do not utilise available services or present to the wrong service level when their child is unwell and are turned away unattended.

Treatment

Sharing the right information at the right time is key to early identification and treatment of malnourished children. One of the primary functions of CoC is to ensure timely care. Lack of ac-

curate and adequate communication to the family about the need for referral is an important driver of delay in accessing and utilising timely, appropriate care.

This study found that FHWs do not routinely inform mothers about the dangers of growth faltering, growth stagnation or dropping off growth curves. Mothers are informed about the growth status of their children only if a child falls into the red band in the growth-monitoring chart or MUAC tape or if the child has visible signs of undernutrition.

Once FHWs identify an 'at-risk' child, they inform the mother/caregiver that their child is getting 'kamzor' (weak) and mothers are counselled to 'feed well' and 'provide good care' to children.[2] None of the mothers interviewed could explain what this means in practice. The FHWs do not follow or find reason for consistent decline in a child's weight; mothers/caregivers are only informed when there is severe growth faltering warranting treatment referral. On identifying a SAM child, mothers are informed that their child has become 'bahut kamzor' (too weak) and is in need of medical care. However, the cause of weakness, possible consequences of delay in seeking medical care, and the value of nutrition rehabilitation is not explained.

FHWs usually counsel mothers for referral. If a mother is unable to convince her husband or family of this need, the FHWs try counselling the family to attend the MTC/NRC. However, the community is not informed on SAM as a condition that requires medical attention. Rather, it is often communicated to the family as a local

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[2] The words kamzor ('weak') and kamzori ('weakness') are used in the community by community members as well as healthcare providers to denote a child with malnutrition.

A mother and child in Jharkhand, India, 2008

WFP/James Giambrone

disease called 'kamzori' or 'puni/puniya'. The community has its own cultural understanding of the cause and treatment of this disease and so prefers to seek treatment from traditional healers and faith healers. Thus, due to poor knowledge of malnutrition and its management, families refuse referrals, only accepting them if traditional/faith healers fail to provide any relief to the ailing child.

Before referring mothers/caregivers to NRC/MTC, FHWs do not adequately prepare them regarding admission, probable duration of stay, treatment and treatment output at the facility. Mothers/caregivers are not informed that their child is being referred for malnutrition assessment and may be admitted for treatment. Since mothers/caregivers come unprepared for a stay of 14 to 21 days, they must go home to make necessary arrangements and return after a few days. This leads to delay in initiation of care at the facility or declined admission.

If admission is denied at the health facility, health professionals do not then inform parents of SAM children of the reasons for this. Such experiences create mistrust among parents regarding the credibility of FHWs, such that the community refuses to act on referrals made by FHWs in future. There is also no information exchange between FHWs and care providers at the MTC/NRC regarding children who are denied admission to inpatient care; nor are FHWs equipped to provide appropriate care for such children in the community.

FHWs commonly inform parents that malnutrition is a disease that can be treated at the NRC/MTC. This understanding of malnutrition as a disease and therapeutic food as a medicine creates confusion among mothers/caregivers. Before mothers/caregivers bring their children to the NRC/MTC they are informed by FHWs that children will be treated with 'good medicine'. They perceive therapeutic feed as food and not medicine; hence they often become confused and feel deceived that their child is not receiving medical treatment. They also do understand why some children are subjected to various tests and receive pills and syrups, whereas others do not receive tests or medicines. Mothers report that, when they do ask about the differences in treatment at the health facility, nurses and doctors do not address their queries, leading mothers to feel discriminated, alienated and confused.

Mothers/ caregivers appear to be more satisfied with treatment if doctors screen children before admission, if their children undergo tests and if they are prescribed medicines. Nurses at NRC/MTC play a significant role in motivating mothers to stay at the facility until treatment is completed. Mothers/caregivers were found to be more satisfied at facilities where nurses provided regular health updates of children, gave reasonable answers to their queries, dispelled their doubts and counselled on care and feeding practices (orally and through support in care and feeding).

Rehabilitation

The findings show that, during their prolonged stay, mothers/caregivers are not adequately prepared for care of their child post-discharge. The FHWs and doctors/nurse counsel mothers/caregivers on 'treatment' aspects; however none of them are made aware of their child's 'rehabilitation' needs. During inpatient facility treatment, mothers/caregivers are counselled on appropriate care and feeding. These counselling sessions are, however, challenged by lack of dedicated personnel and separate time for counselling, lack of individual counselling sessions, lack of context-specific advice, and lack of appropriate information education communication material to facilitate learning and retention by mothers/caregivers.

Neither the mothers/caregivers nor the FHWs understand the difference between discharge from facility and discharge from the nutrition programme. Facility discharge is concluded without counselling mothers/caregivers fully on the reason for discharge from inpatient care and the significance of follow-up visits and care and feeding practices post-discharge. Neither are they informed of the need to contact FHWs for assistance for home-based care. Hence, although mothers/caregivers are entitled to reach out to the FHWs for care support, they do not do so. In their understanding, children discharged from the facility are completely cured and therefore they often do not attend follow-up visits and return to routine child care and feeding.

On discharge, the case history of each NRC/MTC beneficiary is not shared with the appropriate FHWs; nor are they assisted in developing an appropriate care plan for the ongoing community-based care of the discharged child. FHWs are unaware of their role in the rehabilitation of SAM children in terms of frequent growth-monitoring, supply of supplemental nutrition, follow-up, support in child care and actions in case of growth faltering. FHWs have very little and sometimes zero involvement in the rehabilitation of discharged cases. Children discharged from inpatient care are managed by mothers/caregivers amidst their usual responsibilities and lack support to mitigate and overcome childcare challenges.

Conclusion and recommendations

This small study identified many opportunities to improve on information continuity around case management of acute malnutrition that should improve outcomes. Successful communication is critical to promote prevention and early identification, effective treatment and rehabilitation of SAM children.

Providers at different levels of care must be capacitated to provide appropriate information and support to help mothers/caregivers to improve health behaviours and overcome barriers to positive health practices. Carefully drafted messages should consider the specific health needs and sociocultural context of the community and individual beneficiaries. The existing health structure provides space for community-level counselling both in groups, particularly on village health and nutrition days and on a one-to-one basis through home visits. In both cases counselling should focus on assessing feeding and care practices, identification of challenges, information to overcome challenges, provision of feasible care advice, and information on identification of danger signs. Once a referral is needed, both at community and facility levels, counselling must then include information about where the child is being referred and why and what the referral will entail in order to manage expectations and give every chance for the family to access and utilise the appropriate available service. Furthermore, both community and facility-level practitioners must be capacitated to communicate with each other to facilitate effective referral from community to facility and back to community again to ensure continuity of care for each child.

Recommended actions include:

- The provision of clear guidelines to FHWs on the management of malnutrition in children under five years old, including clear referral guidelines with important messages to convey to caregivers at the point of referral.
- Training for healthcare providers at facility and community levels on the social, economic and cultural context of the community, the provision of care appropriate to this context and the drafting of context-specific health messages.
- Appointment of trained nutrition counsellors at MTCs (or training of existing nursing staff) to provide nutrition and health counselling for caregivers during admission and discharge, including appropriate child care and feeding.
- Sharing of information on all cases discharged from MTCs with primary health facilities and FHWs to enable effective monitoring and follow-up in the community.
- Improved coordination between the National Health Mission and ICDS in the early identification of at-risk children, secondary prevention, referral and community-based management of malnourished children.

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Substandard discharge rules in current severe acute malnutrition management protocols: An overlooked source of ineffectiveness for programmes?

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Location: *State of Rajasthan, India*

What we know: In practice national, programme and research protocols for severe acute malnutrition (SAM) treatment vary from World Health Organization (WHO) recommendations on admission and discharge criteria.

What this article adds: The impact of various community-based management of acute malnutrition (CMAM) discharge criteria was simulated in a single cohort of 7,398 uncomplicated SAM children treated in a pilot eight-week stay programme in 2016. Nine discharge rules were simulated. The cure rate for each was compared to discharge when WHO recommendations are stringently applied, and the proportion of children still acutely malnourished (according to standard case definition) among those 'cured' was determined. Cure rates over eight weeks of treatment ranged from less than 50% to more than 90%. A varying and substantial proportion of children discharged as cured were still classified as having moderate acute malnutrition (MAM) or SAM. Discharging a child as cured using weight-for-height z-score (WHZ) or mid-upper arm circumference (MUAC) regardless of admission criteria greatly impacts on cure rate. Discharge using MUAC alone for both MUAC and WHZ admissions also increases apparent cure rate at the expense of discharging more MAM and SAM children as cured. As a theoretical simulation, external validity is limited. However, these findings raise significant concerns regarding variable discharge criteria. This may increase the risk of relapse and poor health outcomes and needs urgent review. An upgrade of protocols to ensure at least consistency between discharge and admission criteria is urgently required.

Background

Severe acute malnutrition (SAM) in children aged 6-59 months is defined in anthropometric terms as weight-for-height z score ≤–3 Z-score (WHZ), or mid-upper-arm circumference (MUAC) <115 mm, or presence of bilateral oedema. Since 2013 the World Health Organization (WHO) has recommended that children with SAM should only be discharged from treatment when their WHZ or weight-for-length z-score (WLZ) is ≥ –2 or mid-upper arm circumference is ≥125 mm (MUAC ≥125mm) and they have had no oedema for at least two weeks. The anthropometric indicator used to identify SAM should determine nutritional recovery. For example, a child admitted using MUAC is discharged based on MUAC. WHO does not specify what criteria should be applied for discharging children who meet both MUAC and WHZ/WLZ on admission; i.e.; whether either can be applied or both should be met. The most stringent interpretation is that a child meeting both criteria on admission should meet both criteria for discharge (see Box 1).

Currently implemented national CMAM protocols, as well as several simplifications being researched/implemented[1] (such as those incorporating MUAC/oedema-only programming), deviate from stringent WHO recommendations for discharge in various ways. The most common deviations are a lower number of visits to ascertain discharge cut-off reached; the use of the target weight rule (calculating a target weight for discharge based on height on admission, rather than current height and recalculated WHZ/WLZ); and inconsistent use of the same indicator at admission and discharge. Such deviations are likely to influence the proportion of SAM children considered as cured within a given period (nutritional recovery). Strictly speaking, this means a proportion of children are still moderately or severely malnourished at

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[1] A range of simplified/combined/expanded protocols is being researched or implemented in programmes in various contexts. (See editorial for overview and articles in this edition of *Field Exchange* for examples of research and programming.) There are no current WHO recommendations on simplified approaches.

Box 1 | **Stringent application of WHO recommendations for discharge from community-based management of acute malnutrition (CMAM) programmes**

Child admitted with WHZ <-3 only (A1): Reach WHZ ≥-2 and no oedema for two consecutive visits*

Child admitted with MUAC <115mm only (A2): Reach MUAC≥125mm and no oedema for two consecutive visits

Child admitted with WHZ <-3 and MUAC <115mm (A3): Reach MUAC ≥125mm and WHZ ≥-2 and no oedema for two consecutive visits

It could be argued that observing reach of discharge criteria for at least two weeks implies that the criteria should be observed at three consecutive weekly visits. To our knowledge, however, no national protocol follows this recommendation.

discharge. A recent review of relapse from SAM management suggests that relapse risk is a larger issue than previously thought and is significantly affected by the anthropometric status reached at discharge (Stobaugh, 2018). Heterogeneity in protocols is also a matter of concern for those interested in investigating the effectiveness of real-life CMAM programmes across the world and influencing contextual factors.

This article investigates the potential impact of the variability in the discharge criteria of various CMAM protocols on apparent cured rates and on the proportion of children discharged as cured while still acutely malnourished.

Methods

The impact of various discharge criteria was simulated in a single cohort of SAM children. A standard cohort was used rather than comparing the results of multiple programmes applying different discharge strategies to avoid confounding factors, such as severity of nutritional status, type of SAM diagnosis at admission, adherence to treatment protocols, and quality of implementation of protocols by health staff.

The cohort consisted of 7,398 uncomplicated SAM children who had been screened for SAM in the community (using MUAC only) and who were referred for admission to treatment (using MUAC and/or WHZ) in a CMAM pilot programme implemented in 2016 by the State of Rajasthan with the technical support of Action Contre la Faim (ACF) India. All beneficiaries received standard outpatient care for eight weeks, independent of their intermediary nutrition status (i.e., no discharge criteria were applied before week eight). Anthropometric measurements were taken weekly up to week eight for all children, with very little loss to follow-up. In some centres, treatment continued after eight weeks, but the decision was made to report on reach to discharge at eight weeks across the board, as until that point there was very little loss to follow up.

Nine discharge rules were applied to the dataset, informed by existing national protocols and recently piloted simplified or combined protocols that use MUAC only/MUAC thresholds[2] for admission of acutely malnourished children (Table 1). The number of children considered as cured under each of these discharge rules was simulated. This cure rate was compared to the cure rate if WHO recommended discharge criteria were stringently applied. Finally, under each discharge rule, the proportions of children who are still MAM, SAM or non-acutely malnourished according to widely accepted case definitions (UNHCR/WFP, 2011) were assessed. For example, a child admitted with WHZ <-3 and discharged using MUAC only may still have a WHZ <-3 or <-2. Similarly, a child admitted with MUAC<115mm and discharged using WHZ only may still have a MUAC<125mm. A child admitted with WHZ<-3 may be discharged as cured based on reaching WHZ<-2 while still having a MUAC<125mm or even

MUAC<115mm. These 'cured' cases would all be still classified as severely or moderately acutely

Table 1	Discharge rules applied to the same SAM cohort dataset[3]			
Simulated discharge rule no.	Targeted populations of SAM children	Discharge criteria	Interpretation	Existing protocols (known to ACF) and simulated protocols incorporating these discharge criteria
1	A1: MUAC <115 mm A2: WHZ <-3 A3: MUAC <115 mm AND WHZ <-3	A1: MUAC ≥125 mm, for 2 visits A2: WHZ ≥-2, for 2 visits A3: MUAC ≥125 mm AND WHZ ≥-2, for 2 visits	Corresponds to the stringent WHO recommendations for discharge	Protocols implemented in some ACF-supported programmes or pilots in Asia, such as Indonesia and India (in the absence of national protocols)
2	As rule 1	A1, A2, A3: As rule 1, for 1 visit	Only required to meet discharge criteria at one visit	Simulated protocol
3	As rule 1	A1 and A2: as rule 1 A3: MUAC ≥125 mm, for 2 visits	Only MUAC discharge criterion is required for SAM children with both anthropometric diagnosis at admission, over 2 visits	National protocols in Burkina Faso and Afghanistan
4	As rule 1	A1, A2, A3: As rule 3, for 1 visit	Only MUAC discharge criterion is required for SAM children with both anthropometric diagnosis at admission, over 1 visit	Simulated protocol
5	As rule 1	A1, A2, A3: MUAC ≥125 mm OR WHZ-2 for all, 1 visit	MUAC or WHZ are recommended for discharge for all No recommendation to use the same indicator for admission and discharge	National protocols in Chad, Central Africa Republic (CAR), Cameroon, Mali, Democratic Republic of Congo (DRC) and others
6	As rule 1	A1, A2, A3: MUAC ≥125 mm OR target weight, 1 visit	MUAC or reach of target weight (for discharge rule 6) are recommended for discharge for all No recommendation to use the same indicator for admission and discharge	National protocols in Chad, CAR, Cameroon, Mali, DRC and others
7	As rule 1	A1, A2, A3: MUAC ≥115mm and a minimum duration of treatment (6 weeks), 1 visit	MUAC ≥115mm and a minimum duration of treatment for all admissions	National protocol in Nepal
8	A1: MUAC <115 mm A2: WHZ <-3 & MUAC <125mm A3: MUAC <115 mm AND WHZ <-3	A1, A2, A3: MUAC ≥125 mm, 2 visits	MUAC threshold applied for admission using WHZ and only MUAC criterion used for discharge, over 2 visits.	Simplified protocol using MUAC threshold programming applied to WHZ admissions
9	As rule 8	A1, A2, A3: MUAC ≥ 125mm, 1 visit	MUAC threshold applied for admission using WHZ and only MUAC criterion used for discharge, over 1 visit	Simplified protocol using MUAC threshold programming applied to WHZ admissions

malnourished as per standard and internationally acknowledged SAM or MAM case definitions.

Observations were excluded that had missing anthropometry or implausible z-scores at admission (WHZ<-6 or WHZ >5), implausible height growth (negative, or >7 cm), or MUAC gain (>3cm) during the two-month treatment period. All analyses were performed using STATA 13 software (StataCorp, USA).

Results

Among the 7,398 uncomplicated SAM children in the cohort, 29.4% of children met admission

MUAC criteria only (A1); 28.6% met WHZ only (A2); and 42% met both criteria (A3). There were no oedematous cases in this cohort. Forty-two observations were excluded from analysis because of missing anthropometry at admission; 384 were excluded because of implausible z-scores at admission; and 523 were excluded for implausible height or MUAC gains during treat-

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[2] Several simplified protocols allow admission using MUAC only or may admit using MUAC and/or WHZ criteria, but all WHZ-identified children must fall under a MUAC threshold (e.g., <125 mm).

[3] Actual protocols cited in the table are available on request.

Table 2 — Apparent cured rates and proportion (%) of children still MAM or SAM among those cured with each discharge rule

Discharge rules		Proportion (%) of admitted children discharged as cured under discharge rules	Proportion (%) of discharged cured children still classified as MAM or SAM according to standard case definition
Simulation in a cohort of 6,449 SAM children, admitted according to WHO recommendations (A1: MUAC <115 mm A2: WHZ <-3 A3: MUAC <115 mm AND WHZ <-3). For discharge details see Table 1	Rule 1	35.0	24.0
	Rule 2	51.6	25.2
	Rule 3	41.3	35.5
	Rule 4	60.1	41.5
	Rule 5	86.1	91.6
	Rule 6	88.9	93.3
	Rule 7	92.9	77.9
Simulation in a cohort of 6,351* SAM children with MUAC <125mm, admitted according to simplified protocols examined (A1: MUAC <115mm A2: WHZ <-3 & MUAC <125mm A3: MUAC <115mm AND WHZ<-3). For discharge details see Table 1	Rule 8	43.1	35.5
	Rule 9	64.6	41.7

*Ninety-eight children had WHZ<-3 but MUAC ≥125mm, hence did not meet the inclusion criteria for the protocol and were excluded from the analysis.

ment period, leaving 6,449 SAM children for analysis. Ninety-eight children had WHZ<-3 but MUAC ≥125mm, hence did not meet the inclusion criteria for the simplified protocol simulation; these were excluded from the simplified protocol analysis (n=6,351).

The simulations find huge variations in the apparent cured rates over eight weeks of treatment depending on the discharge rules applied, ranging from less than 50% up to more than 90% cured rates. A varying and substantial proportion of children discharged as cured per the various protocols were, in fact, still MAM or SAM according to standard case definitions (Table 2). Figures 1 and 2 show the observed increase in apparent cured rates when discharge rules become less stringent, and the related increase in the number of children discharged as cured while still MAM or SAM.

Nearly one quarter (24%) of children discharged as cured according to WHO discharge criteria were still MAM or SAM when compared to the standard case definition. This is because, even when the WHO criteria are stringently applied, a child admitted and

discharged under MUAC criteria may still have a WHZ <-2 and is therefore considered malnourished. Similarly, a child admitted and discharged meeting full WHZ criteria may still have a MUAC <125mm.

Most importantly, these simulations reveal the very large impact of the recommendation for discharge used in most African national protocols, which consider a child as cured according to WHZ or MUAC, regardless of the admission criteria used. We translated this in our simulations as considering the children as cured whenever one of these criteria is first reached (for discharge rules 5 and 6). Under such rules, a very high proportion of children admitted with MUAC<115mm are discharged as cured according to reach of WHZ≥-2 or target weight, while their MUAC is still below

125 or even 115 mm. Similarly, a very high proportion of children admitted with WHZ<-3 are discharged as cured according to reach of MUAC≥=125mm while their WHZ is still below -2 or -3. This is clearly reflected in Rule 5 simulation, a protocol which leads to an impressive apparent cured rate of 86.1% observed after eight weeks of treatment (versus 35% when stringent WHO discharge criteria are applied). However, more than 90% of these children identified as cured still meet MAM or SAM case definitions (Table 2 and Figure 1). Among these children, 60.5% are still MAM and 31.1% are still SAM.

Although the impact is not as large, an increase in the percentage of MAM and SAM children among those discharged as cured is observed when the only deviation was using MUAC ≥125mm alone for SAM children admitted meeting both WHZ and MUAC criteria (A3, discharge rule 3). When this discharge cut-off is reached only once (as with discharge rule 4), a 60% cure rate after eight weeks of treatment is observed, with 41.5% still acutely malnourished among those discharged as cured (35% MAM and 6.5% SAM). When compared with the results obtained with stringent WHO discharge criteria, reaching MUAC cut-off for one visit only induces a fivefold increase in the proportion of children erroneously discharged as cured while still SAM, which translates into a ninefold increase in the corresponding number of children affected.

Results for simplified protocols (discharge rules 8-9), are shown in Figure 2 and Table 2. Cure rates are higher with these rules than with stringent WHO discharge criteria due to the increased number of children who are classified as cured while still MAM or SAM, since the number of children cured and no longer acutely malnourished according to standard definition (i.e., with both MUAC ≥125 mm and WHZ ≥-2) is actually similar between discharge rule 1 and 8, as well as between discharge rules 2 and 9. Using MUAC ≥125mm at one visit for dis-

charge of all children (rule 9), a 64.6% cure rate is observed, with 30% MAM and 11.7% SAM among those cured. When compared with stringent WHO discharge criteria, this discharge rule induces a ninefold increase in the proportion of children erroneously discharged as cured while still SAM, which translates into a seventeenfold increase in the corresponding number of children affected.

Study limitations

Since the figures reported come from theoretical simulations of the application of simple discharge rules, performed on a single dataset, one should be cautious with their external validity. First, the cohort dataset used comes from a unique programme in Rajasthan, India, with many contextual specificities. This was an uncomplicated SAM management programme that was ideally staffed and supervised, with much effort made through home visits to improve the adherence of the families to treatment. Secondly, it can be argued that the a posteriori application of simple discharge rules to an observed anthropometric growth pattern oversimplifies not only the existing protocols, but also what is at stake in the health staff decision to discharge a child as cured, and thus should not be expected to translate into the same decisions in real-life programmes. Another limitation in the analysis is that the discharge criteria could only be applied until week eight, while most programmes implemented in real life have a maximum duration of treatment of 12 to 16 weeks. On that point, however, it should be noted that, while a longer duration of treatment would raise the numbers of discharged cured, it is unlikely to change the proportions of children who are still MAM or SAM among those classified as cured. Furthermore, discharge rules are often more nuanced than implied here and may suggest several options for use in different contexts, such as health centres or mobile clinics, be complemented by trainings or guidance to bring clarity to gap areas, or indeed integrate more deviations from the WHO stringent recommendations, such as minimal length of stay, a varying z-score cut-off to determine target weight, or use of simplified unisex tables to calculate z-scores.

There is also limited evidence to ascertain whether it is safe to discharge children from SAM treatment programmes according to different indicators. In 2013 WHO had identified as a research priority the need to evaluate the validity of MUAC values versus WHZ as discharge criteria and to determine appropriate cut-off values in relation to response to treatment, relapse and mortality (WHO, 2013). There is also a knowledge gap on relapse (Stobaugh, 2018). For now, WHO recommendations must be considered as the standard against which other simplified protocols should be evaluated among similar populations, based on similar judgment criteria.

Discussion

These results demonstrate long-overlooked impacts of discharge rules incorporated into national

A POSHAN Prahari (sentinel) assesses the appetite test of a child enrolled in the POSHAN program during a home visit, Rajasthan

Government of Rajasthan

protocols that deviate from the WHO 2013 recommendations. A varying and substantial proportion of children currently admitted as SAM and discharged as cured from CMAM programmes are still moderately or severely malnourished, according to standard case definitions. This affects apparent cured rates, with the greater the protocol 'deviation' generally increasing the proportion of MAM and SAM children classified as cured. Lowest bidder rules mean that protocols that use discharge criteria that most depart from WHO recommendations may paradoxically appear to be most effective in terms of cure rate and length of stay.

These findings may provide one plausible explanation for the perception that CMAM pro-grammes are more effective in Africa than in Asia, whereby recent Asian programmes and pilots have tended to abide more strictly to WHO recommendations, in the absence of national protocols.

Findings are in line with the striking difference that can be observed between the very high cure rates reported by routine CMAM programmes that use protocols reflected in rules 5 (MUAC ≥125 mm or WHZ-2 for all, 1 visit) or rule 6 (MUAC ≥125 mm or target weight, 1 visit) that frequently report cure rates >90% (against a cure rate benchmark >75%), and the much lower cure rates reported in studies using more stringent criteria. For instance, a recently published multi-centre trial in India reported

cure rates of 43-57% by 16 weeks of treatment, where cured status was defined as reaching WHZ ≥-2 and absence of oedema of feet in children admitted with WHZ<-3 (Bhandari, 2016). The authors of this article reported that the use of height at enrolment to determine discharge increased the proportion of children who reached the cut-off for recovery, which they assumed could partly explain the apparently better results observed in Africa, where using admission height is common. These results are also consistent with what we have observed in 'real-life' ACF programmes and following national protocols incorporating discharge rules 6 and 7: secondary analysis by ACF of the actual nutritional status of children at discharge found proportions of global acute malnutrition above 40% among the children discharged as cured, most of which could be explained by the use of different discharge criteria (MUAC or WHZ) compared to admission criteria.

Although simplified protocols under research may provide an answer to a range of practical issues, these results show that the related discharge rules could lead to a large augmentation in the number of children discharged as cured while still MAM (with WHZ<-2) and, most concerning, still SAM (with WHZ<-3).

These observations reflect the need for urgent action to upgrade and standardise protocols on discharge criteria: most urgent is correction of inconsistent use of discharge criteria for different admission criteria; i.e. admissions under MUAC should be discharged using MUAC and children admitted under WHZ MUAC should be discharged according to WHZ.

Conclusions

Results presented here indicate that an overlooked, variable and often dramatic proportion of malnourished children are considered cured by CMAM programmes, mostly due to discharge rules set by national protocols that depart from 2013 WHO recommendations. In the absence of evidence to the contrary, this may increase the risk of relapse and poor health outcomes in the mid to long term and precludes us from achieving a valuable assessment of the effectiveness of real-life SAM management programmes around the world and influencing factors. In the short term, an upgrade of protocols to ensure at least consistency between discharge and admission criteria is urgently required to avoid the erroneous discharge of a very large number of children who are still acutely malnourished.

Considering these findings, we call for a global effort by stakeholders involved in the development of technical guidance, support of national guidance development and implementation of SAM management programmes to standardise protocols, investigate the rationale for deviations from WHO guidance in national protocols, and rigorously evaluate the effectiveness of current WHO recommendations in a range of contexts, according to defined health outcomes.

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Figure 1 Impact of varying discharge rules from CMAM programmes (simulation, n=6,449)

7. MUAC≥115mm and a minimum duration of treatment for all A, 1 visit
6. MUAC≥125 mm OR Target Weight for all A, 1 visit
5. MUAC≥125 mm OR WHZ≥-2 for all A, 1 visit
4. MUAC≥125 mm for A3, 1 visit
3. MUAC≥125 for A3, 2 visits
2. MUAC≥125 mm AND WHZ≥-2 for A3, 1 visit
1. MUAC≥125 mm AND WHZ≥-2 for A3, 2 visits

■ admitted children cured but still MAM (%)
■ admitted children cured but still SAM (%)
□ admitted children cured and not acutely malnourished anymore

Figure 2 Impact of discharge rules such as those adopted by simplified protocols (simulation, n=6,351)
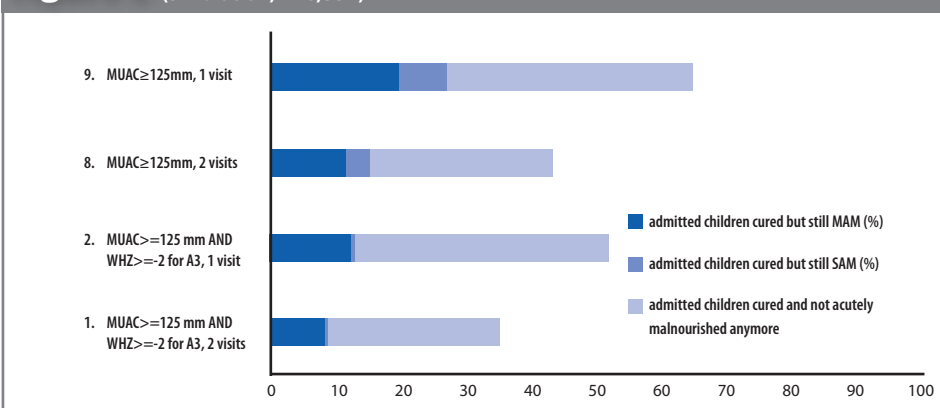
9. MUAC≥125mm, 1 visit
8. MUAC≥125mm, 2 visits
2. MUAC>=125 mm AND WHZ>=-2 for A3, 1 visit
1. MUAC>=125 mm AND WHZ>=-2 for A3, 2 visits

■ admitted children cured but still MAM (%)
■ admitted children cured but still SAM (%)
□ admitted children cured and not acutely malnourished anymore

Regional perspectives on simplified approaches for the management of children with acute malnutrition: West and Central Africa

By Sophie Woodhead, Dolores Rio and Noel Zagre
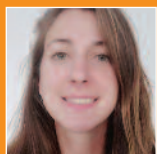
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The findings, interpretations and conclusions in this article are those of the authors. They do not necessarily represent the views of UNICEF, its executive directors, or the countries that they represent and should not be attributed to them.

A community healthcare worker checks a child's MUAC in Kananga, Kasai-Occidental province, Democratic Republic of Congo (DRC), 2018

Location: *West and Central Africa[1]*

What we know: In 2018 almost two million children with severe acute malnutrition (SAM) were treated across West and Central Africa, an estimated 30% of the children in need.

What this article adds: A range of context-specific, simplified approaches (adaptations to treatment) are being piloted in the region by non-governmental organisations to improve treatment coverage and reduce treatment costs. UNICEF is supporting these innovations in collaboration with national governments, United Nations agencies and development partners. Simplifications may include but are not limited to: family mid-upper arm circumference (MUAC); use of a single product; reduced product dosage; reduced follow-up visits; MUAC-only programming and/or case management by community health workers. Published evidence is forthcoming and more research is planned, including in Burkina Faso, Chad, Democratic Republic of Congo, Mali, Mauritania, Niger and Senegal. Outstanding operational questions for simplified approaches were identified in a regional/country consultation. A regional meeting in late 2019 will consolidate knowledge and evidence emerging from the region.

Context

Rates of child wasting remain persistently high in West and Central Africa. It is estimated that, at any point in time during 2018, on average 7.9 million children suffered from the condition across the region (UNICEF, WHO & World Bank, 2019). Based on results of SMART surveys, the prevalence of wasting is considered 'serious' in Chad, Mali, Mauritania and Niger (i.e., prevalence >10%). It is important to note that these national figures tend to hide disparities at sub-national levels, where the critical emergency threshold of 15% is often exceeded. The estimated number of children suffering from severe wasting is excessively high in certain sub-regions (Figure 1).

Since the international endorsement of the outpatient care of acute malnutrition (WHO, WFP & UNICEF, 2007) and its subsequent recognition as a high-impact intervention by The Lancet (Bhutta *et al*, 2008), countries across the region have been scaling up community-based management of acute malnutrition (CMAM). To date, all countries in the region have national CMAM protocols, based on international normative guidance, adapted according to country policies and regulations. All of these protocols include the management of complicated and uncomplicated severe acute malnutrition (SAM) and many include the management of moderate acute malnutrition (MAM). In Burkina Faso, Mali, Mauritania, Niger and Senegal, SAM treatment services are now available in over 80% of health facilities. In 2018 almost two million children with SAM were treated across the region[2], reaching an estimated 30% of the need and contributing to a significant proportion of global admissions (figures being finalised).

After more than 10 years of implementation and scale-up in this region, many important operational lessons are emerging on how these CMAM protocols respond to the needs, at scale and within national health systems. A

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1. For UNICEF, the West and Central Africa Region includes the following countries; Benin, Burkina Faso, Cameroon, Cabo Verde, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo
2. UNICEF Regional Integrated Management of Acute Malnutrition (IMAM) dashboard.

Figure 1 Estimated number of children with severe wasting in 2019 across West and Central Africa

NA
SAM Prevalence <= 1%
SAM Prevalence 1% - <= 2%
SAM Prevalence > 2%

emergency responses are:

- Engaging family members to screen and refer their children (Family MUAC);
- Use of a single ready-to-use therapeutic food (RUTF) product for treatment;
- Admission, treatment and discharge based on mid-upper arm circumference (MUAC) >125mm and/or presence of oedema;
- Treatment dosage of RUTF reduced over the course of recovery;
- Reduced number of follow-up visits during treatment; and
- Management of wasting and other forms of acute malnutrition by community health workers.

To date, these simplifications have been piloted by NGO partners with the support of UNICEF in several countries across the region. The pilots have taken different approaches and formulations, depending on the context and organisation. Published evidence on these simplifications is building but remains limited.

UNICEF is taking a country-by-country approach to ensure that a package of simplifications is adapted to the context of each country. Some of these simplifications are already approved by normative guidance on the basis of evidence of their safety and effectiveness, such as the Family MUAC approach, where practitioners are encouraged to involve community members in the screening of children. Across the West and Central Africa region over 1.5 million mothers and community members have now been trained on the use of MUAC. UNICEF and partners are looking to expand opportunities to integrate MUAC training into existing health; water, sanitation and hygiene (WASH); and education intervention packages. Other simplifications remain in the pilot stage and need a much stronger basis of evidence before they can be scaled up at national level.

Planned activities across the West and Central Africa region during 2019

A variety of country-level pilot projects and meetings are planned in the region in 2019 to support the advancement of evidence on the modification of acute malnutrition treatment to improve coverage and access. These include the following:

In *Burkina Faso* the Ministry of Health (MoH) Directorate of Nutrition, with the support of UNICEF, convened partners and sub-national health staff to standardise simplified approaches for implementation in exceptional circumstances after the implementation of various simplified approaches by NGO partners – notably OptimMA-Burkina Faso – by ALIMA.

In *Central African Republic* UNICEF and World Food Programme (WFP) are exploring options to implement a series of simplified approaches to treat acute malnutrition to reach more children in a timely manner and will collect outcome data to add to the evidence base.

series of bottleneck analyses (BNAs) conducted across the region in 2018 have helped to document key issues with regard to service delivery and uptake, particularly with regard to outpatient SAM management. Human resources are a persistent bottleneck. Besides issues relating to limited availability and quantity of health staff, which affect the system more broadly, there are issues with regard to the training of health staff. In most countries, CMAM modules do not feature in pre-service training, which inhibits the effective implementation of CMAM protocols and appropriate case management at facility level. There is also anecdotal evidence of health staff finding current protocols complex and difficult to deliver. Other major problems have been identified concerning community outreach. While many efforts have been made to integrate screening for acute malnutrition into community health platforms and other health interventions (e.g., seasonal chemoprophylaxis of malaria), active outreach and screening remains limited and is often dependent on the support of non-governmental organisation (NGO) partners. Finally, issues have been identified around access and utilisation, including long distances to treatment facilities and limited awareness of the service and its mechanisms, meaning that initial utilisation of services remains low. There are also barriers to retaining children as a result of high opportunity costs, long waiting times, stock-outs and geographic access.

Regional exercises have also taken place in recent years to review challenges for sustainable scale-up of services within health systems. These exercises have reinforced the presence of access issues identified at country level and have also identified ongoing challenges around policy and financing. From a policy perspective, it has been recognised that SAM treatment is not prioritised as a key child-survival intervention, resulting in SAM services being omitted from key child-survival packages and action plans. In addition, service inputs remain highly dependent on external financing mechanisms (for the most part

humanitarian funding streams) which are short term and unpredictable in nature. Furthermore, the cost per SAM child treated in outpatient care across the region remains high, ranging between USD85-219 (UNICEF; Isanaka *et al*, 2015), with a substantial proportion of this cost associated with treatment products. As a result, integration of this intervention into national health systems has been challenging.

As well as working on overall structural issues (such as financing mechanisms) in recent years, UNICEF has supported many partner organisations to pilot modified and simplified approaches to address issues of access, coverage and cost. The results are promising and UNICEF continues to support pilots and the collection of evidence regarding modifications to programme design, together with other members of the No Wasted Lives coalition.[3] The overall objectives of these modifications are to improve coverage, cost-effectiveness, quality and continuum of treatment for children suffering from acute malnutrition. The main driver of simplification is to ensure greater coverage of services for children at high risk. Crucially, UNICEF is committed to supporting the integration of these services, where proven to be safe and effective, into national health systems to ensure that service delivery models are as acceptable and feasible as possible for health systems, while ensuring high-quality nutrition outcomes.

Definition of simplified approaches

Simplified approaches are adaptations to existing national and global protocols and programmes designed to improve coverage and reduce the costs of caring for children with uncomplicated wasting, while maintaining quality of care. There is no single or prescriptive set of simplifications, but rather a series of different approaches that might be adapted and adopted according to the opportunities and challenges in each context. Some of the key simplifications that have been explored in the context of research projects or

In *Chad* the MoH, in collaboration with UNICEF, WFP and IRC, will pilot a combination of simplified approaches in one province as a response to issues faced in the integration of the current treatment model into the health system.

In the *Democratic Republic of Congo* ALIMA will implement a randomised controlled trial (RCT), OptiMA-DRC, to test a package of simplified approaches to build the evidence base. UNICEF is coordinating with ALIMA and PRONANUT on this pilot.

In *Mali* IRC is currently conducting an operational pilot combining community MUAC with a single-product approach based on MUAC <125mm. ALIMA will also be implementing an operational pilot in the urban context of Bamako, entitled OptiMA-Mali. Action Against Hunger also plans to conduct a package of simplified approaches in other regions of the country. These pilots are supported by a national-level steering committee under the guidance of the MoH Division of Nutrition with support from UNICEF.

In *Mauritania* a national-level workshop led by the MoH with support from UNICEF was held with Nutrition Cluster members to discuss opportunities and challenges for simplified approaches with the objective of defining a simplified package based on the existing barriers to service delivery, to be tested in 2020.

In *Niger* ALIMA plan to implement OptiMA-Niger, an RCT to test a package of simplified approaches to support the building of generalisable evidence specific to dosage optimisation. Prior to this, given the high burden of SAM, ALIMA will run the package of simplified approaches in two health facilities to gain a better understanding of caseload and dosage to inform the RCT. UNICEF is supporting in the supply chain and national coordination.

In the final quarter of 2019 UNICEF Regional Office for West and Central Africa, in collaboration with partners, intends to hold a regional meeting to consolidate the knowledge and evidence coming from this vast array of studies in the region.

To support the acceleration of evidence to action, a series of outstanding questions has been identified across the region. These questions were identified through a consultation process with members of a regional technical group and country teams. Efforts are being made to ensure that consideration is given to these questions during the design of any new operational pilots.

Next steps and recommendations

UNICEF remains committed to transparent, evidence-based leadership for the prevention and treatment of acute malnutrition. The risks and opportunities of adopting different simplifications explored in different pilots can only be adequately and responsibly assessed when the evidence and experiences are openly and publicly available. In instances when the implementation of simplified approaches requires changes to existing normative guidance, UNICEF will support the World Health Organization in reviewing this evidence using existing guideline review procedures. In instances where the implementation of simplified approaches does not require changes to existing normative guidance, UNICEF will work with inter-agency platforms and initiatives, including the Global Technical Assistance Mechanism for nutrition (G-TAM), No Wasted Lives/Council of Research and Technical Advice on Acute Malnutrition (CORTASAM), and Inter-agency Harmonization Working Group/Food Aid Quality Review to review and adopt programmatic and operational changes that can safely care for more children with wasting.

UNICEF will continue to work with national governments and their ministries of health to ensure that efforts to simplify treatment are well coordinated in order to build the evidence base effectively. Establishing national-level piloting committees may be an effective way to support the collaborative design and supervision of approaches, capture learning and support the standardisation of operational tools. In addition, clear research questions should be identified to justify the intervention, even in the context of operational pilots, to provide clarity on the objectives of the modifications and to ensure robust data-collection systems. Nutritional outcomes of children should be followed closely in any modification to treatment protocols and, where possible, individualised datasets should be recorded and analysed during piloting phases.

Furthermore, it is important to capture the voice of health staff and families to ensure that modifications are acceptable and indeed serve to facilitate both access and utilisation of services. Finally, it is important to document costs and cost-effectiveness of pilot approaches so that these pilots can effectively influence national and global policy.

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UNICEF Regional IMAM Dashboard

Table 1 — Outstanding operational questions for simplified approaches

Theme	Questions
Financing and costs	What are the implications on cost of harmonising to one supply chain and procuring only one product for acute malnutrition?
	What are the implications on cost per child treated and how are these distributed within an operational programme (RUTF and supply chain, delivery, length of treatment, etc)?
	How do costs change over time?
Policy and decision-making	Which contexts should be prioritised for the implementation of the simplified approaches?
	How should the caseload be estimated using the simplified approaches?
	How does the caseload of SAM change over time with the simplified approaches?
Health system infrastructure	How will supply chains be impacted by a harmonised product and how will this impact on the health system?
	Do health staff prefer the simplified approaches? What is the level of appropriation of the new protocol by health staff?
	What are the positive and negative impacts of this approach on the health system at all levels, from a vertical and transversal perspective?
	Does simplification facilitate better integration into community health platforms?
Nutritional outcomes	What is the optimum dosage for children who are both wasted and stunted?
	What is the optimum dosage for SAM children, particularly older and larger ones?
	What should be the accepted recovery rates for MUAC <115mm?
	Can ready-to-use supplementary food (RUSF) be used as the single product for the simplified protocols?
Coverage and programme quality	How do the simplified approaches affect ease of access from the perspective of the family/caregiver?
	Do the simplified approaches lead to early detection and admission?
	How do simplified approaches impact on defaulting?
	How do simplified approaches impact on length of stay?

Testing an adapted severe acute malnutrition treatment protocol in Somalia

Summary of research[1]

By Naoko Kozuki, Jama Mohamud Ahmed, Mukhtar Sirat and Muna Abdirizak Jama

Muna Abdirizak Jama is the Health Manager for IRC Somalia. She is a medical doctor by training and oversees health, nutrition and community development programmes.

Naoko Kozuki is the Health Research Adviser for the International Rescue Committee (IRC), overseeing its health research portfolio. Her research focuses on maternal, neonatal and child health and nutrition, and community health systems.

Jama Mohamud Ahmed is the Nutrition Research Officer for IRC Somalia, responsible for coordinating, supporting and supervising research programmes.

Mukhtar Sirat is the Nutrition Manager for IRC Somalia. His role is to plan, coordinate and implement nutrition programmes, focusing on both curative and preventive interventions.

Location: *Somalia*

What we know: Some severe acute malnutrition (SAM) treatment approaches have potential inefficiencies, such as poor continuity of care from SAM to MAM phases of treatment, higher than necessary dosage of Ready-to-Use Therapeutic Food (RUTF), and management of dual supply chains for RUTF and Ready-to-Use Supplementary Foods.

What this article adds: The International Rescue Committee (IRC) conducted a prospective cohort study to test an adapted protocol for the treatment of SAM in Mogadishu, Somalia using a reduced RUTF dosage (two sachets per day, weekly for SAM phase; one sachet per day, every two weeks, in MAM phase). There was no control group. In total 727 SAM children without complications were enrolled. Median number of weeks to recovery was 14; recovery rate was 98% (1% defaulted and 1% were referred); non-response and death rates were 0%. Good treatment adherence in the study was likely helped by close proximity of services to beneficiaries. Further research is needed on how to enable beneficiaries to see through treatment to full recovery and the potential impact of direct admission of MAM cases.

Context

The International Rescue Committee (IRC) conducted a prospective cohort study to test an adapted protocol for treating severe acute malnutrition (SAM) as outpatients in the outpatient therapeutic programme (OTP) of Karaan Clinic, Mogadishu, Benadir district, Somalia, with the aim of improving continuity of care for severe acute malnutrition (SAM) children. The adapted protocol treated SAM children until full recovery with a simplified dosage protocol. Treatment was based on the provision of ready-to-use therapeutic food (RUTF) for children in both severe and moderate malnutrition 'zones', with children in the severe zone receiving weekly treatment at two RUTF sachets per day and, once in the moderate zone, two-weekly treatment at one RUTF sachet per day, based on MUAC or WHZ benchmarks (both mid-upper arm circumference (MUAC) and weight-for-height z-score (WHZ) were used as admission criteria). There was no control group.

Headline findings and some implementation experiences are shared in this article; full results will be submitted for peer review publication in 2019.

Method

Between January and March 2018 the study enrolled SAM children aged 6-59 months presenting to Karaan Clinic OTP with no medical complications and with MUAC 90 - <115mm or WHZ <-3. Children were treated weekly at the same clinic, with a total of 14 RUTF sachets (two per day) sent home with the caregiver, until the children had achieved two consecutive visits with MUAC ≥115mm (for MUAC enrollees) or WHZ ≥-3 (for WHZ enrollees, based on height taken monthly). On reaching that anthropometric benchmark, children were treated once every two weeks, with a total of 14 RUTF sachets (one per day) sent home with the caregiver. Children were considered recovered when after two consecutive visits, they achieved MUAC ≥125mm (for MUAC enrollees) or WHZ ≥-2 (for WHZ enrollees). The children were retained at the OTP throughout the course of their treatment. Qualitative data were collected from clinic staff and caregivers.

Results

The study enrolled 727 SAM children without complications. A total of 700 (96%) had eligible results, of whom 640 (analytic sample) were treated with strict adherence to protocol. In the analytic sample, the median age of enrolment was eight months (range 6-42 months), with 41% male and 59% female. The caregivers reported a median time of 21 minutes to reach the facility, with 72% walking there. Anthropometry at enrolment is described in Table 1; treatment outcomes are described in Table 2. Median number of weeks to recovery was 14 weeks (IQR: 12-16, range 7-27 weeks). Full data will be published elsewhere.

Discussion

This study did not include a control group; thus definitive comparisons could not be made against a standard CMAM programme. However, we have made several observations, as follows:

Continuity of care

The Somalia Integrated Management of Acute Malnutrition (IMAM) national protocol recommends treatment of uncomplicated cases of SAM until full recovery (MUAC ≥12.5cm or WHZ ≥ -2). In practice, if a Targeted Supplementary Feeding Programme (TSFP) exists, some programmes discharge recovering SAM children from the OTP at MUAC ≥ 11.5cm / WHZ ≥ -3 and refer to the TSFP for treatment completion. This was the situation in the IRC programme area. Qualitative data collected from clinic staff and caregivers revealed poor continuity of care between the OTPs and TSFPs under this practice;

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[1] Full results from this study will be published in a future peer-reviewed publication and shared in *Field Exchange*.

it appears that few caregivers completed the referral to a TSFP. At the time of the study, while both OTPs and TSFPs were present in Benadir district, OTPs and TSFPs were not co-located and were supported by different implementing partners. Pre-pilot data on referral completion rates between OTP and TSFP were not available.

Clinic staff believed that the rate of recovery from SAM to full recovery is significantly improved in the test protocol compared to previous practice. This does not necessarily mean that co-location of SAM and MAM treatment is sufficient in itself to ensure continuity of care in every location; programmatic experience from other contexts has found poor treatment completion despite co-location of SAM and MAM services. In this study, physical proximity of the beneficiaries to the clinic is likely to have contributed to high treatment adherence to full recovery. For areas with less straightforward access, further insights into infrastructure and behaviours are needed to determine how best caregivers can be supported to continue treatment for their children through to full recovery.

We consider that MAM cases in recovery from SAM are more at risk than children who present with MAM. In line with Somalia national guidelines and WHO 2013 SAM guidance, the study protocol facilitates treatment to full recovery and improves continuity of care for SAM cases.

Caseload considerations

The IRC's vision for a combined treatment protocol is for SAM and MAM to be treated in the same location, including direct admissions of MAM cases.[2] However this study only enrolled SAM cases. In the research design phase, staff of the clinic, nutrition staff of IRC Somalia and the Principal Investigator concluded that, without sufficient additional financial and human resources needed to absorb both SAM and MAM cases, the clinic would be unfairly over-burdened if direct MAM admissions were included. This risked compromising the potential success of the combined protocol for logistical reasons rather than the efficacy and effectiveness of the protocol itself. Thus, the study was restricted to enrolling SAM cases only. This decision was justified a few months after the end of the study when TSFP programmes were opened in OTP locations in Benadir district, including Karaan Clinic where this study was held. No additional human or financial resources were provided to Karaan Clinic to absorb the influx, which led to unreasonably long hours for staff, reduced functionality of the OTP programme and insufficient physical space to absorb the extra MAM children. This experience highlights that any ambitions to expand current OTP-only or TSFP-only programmes to include broader categories of children must take account of the inevitable initial growing pains and long-term implications for sustainability by providing sufficient resources.

Conclusion

This study shows that SAM children without complications can be successfully treated under a simplified dosage protocol that supports a continuum of treatment; the protocol was consistent with national guidelines to treat children to full recovery. We believe that the simplified protocol tested has the potential to ease logistical constraints (e.g. using lesser amounts of one product, simplify dosage calculation for clinic staff) of delivering services, particularly during emergencies or in severely access-limited locations. Further exploration is needed on the right dosage, timeline and behaviour communication with caregivers to optimise recovery rates and length of time to recovery, as well as further examination of human resource and cost implications, particularly for including direct admissions of MAM cases into programmes that currently only treat SAM cases.

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Table 1 Anthropometry at enrolment

	MUAC	WHZ
Median	112 mm	-2.5
Mean	110.5 mm	-2.5
IQR	110, 113 mm	-3.2, -1.8
Range	90, 119 mm	-7.1, 0.4

IQR: inter-quartile range

Table 2 Treatment outcomes and weeks to outcome

Outcome	n (%)	Median (IQR) weeks to outcome
Cured	629 (98%)	14 (12, 16)
Defaulted	7 (1%)	19 (7, 20)
Non-response	0	N/A
Referred	4 (1%)	7 (4, 10.5)
Death	0	N/A

Default: Three consecutive missed visit. Non-response: non-recovery after 28 weeks (derived from 12 weeks allowed in OTP programmes, 16 weeks in TSFP programmes).

2 www.ennonline.net/fex/53/thecompasstudy

Clinic and IRC staff practice informed consent processes, Somalia

Factors affecting decision-making on use of combined/simplified acute malnutrition protocols in Niger, north-east Nigeria, Somalia and South Sudan

Summary of research[1]

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Location: *Niger, north-east Nigeria, Somalia and South Sudan*

What we know: Current guidance and approaches to acute malnutrition management treat severe acute malnutrition and moderate acute malnutrition separately. Combined/simplified approaches are being piloted in several countries.

What this article adds: A policy study was undertaken by the International Rescue Committee to analyse factors affecting decision-making on use of combined/simplified acute malnutrition protocols in Niger, north-east Nigeria, Somalia and South Sudan. Fifty respondents were interviewed from Ministries of Health, United Nations agencies and non-governmental organisations. Simplified protocols are currently implemented in exceptional circumstances in all four contexts. Respondents appreciated the rationale and benefits of combined protocols, but there is reluctance by national governments to depart from global guidelines without stronger evidence and World Health Organization-endorsed global guidance. There is confusion around terminology and concerns regarding implications of mid-upper arm circumference-only programming and ready-to-use therapeutic food supply-chain resourcing and management. Discussions are largely confined to humanitarian circles, largely driven by UNICEF, ECHO and the Nutrition Cluster. Findings highlight opportunities and an urgent need for global research and collaboration around combined protocols to generate scientific evidence and examine implications for health systems.

Introduction

Current guidance and approaches to acute malnutrition management treat severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) separately, despite malnutrition being a spectrum disorder. Recently, the International Rescue Committee (IRC), alongside other global actors, began advocating for simplified, combined protocols to manage both conditions. This policy study sought to analyse factors affecting decision-making surrounding acute malnutrition policies in food-insecure contexts. Niger, north-east Nigeria, Somalia and South Sudan were selected as locations for case studies, each of which are at various stages of discussion on combined/simplified protocols.

Methods

Data collection, carried out between March and August 2018, included semi-structured, in-depth interviews with 50 respondents (N=11-15 per country) from the Ministries of Health, multi-national institutions such as UNICEF and the World Food Programme (WFP), non-governmental organisations (NGOs), and other stakeholders. Eleven global and regional stakeholders were also interviewed to shed light on dynamics impacting national-level policy discussions. Documents such as national policies and guidelines, memos, strategic plans and academic and research reports were also analysed.

Results

Full results will be made available in a future peer-reviewed publication and are summarised here. In all four countries, combined/simplified protocols for management of acute malnutrition have featured in recent policy discussions. National malnutrition protocols in all countries are based on global-level community-based management of acute malnutrition (CMAM)/integrated management of acute malnutrition (IMAM) protocols. The protocols were revised in 2016 in Niger and in 2017 in South Sudan and were undergoing revision in Nigeria and Somalia (as of October 2018).

Terminology around protocols: Only a few respondents were able to clearly define or distinguish between the terms "combined protocol", "simplified protocol" and "expanded criteria." Regional and global-level respondents said this confusion stemmed from a lack of coherence at higher policy-making levels.

Implications of adapted protocols: The implications of adopting a combined/simplified protocol varied significantly by country. For national authorities, the gold standard remained World Health Organization (WHO) guidelines, without which it was said to be dif¬ficult or impossible to advance discussions. There was generally much more knowledge and appreciation of combined/simplified protocols among external actors than among government authorities. In Niger, national policy-makers rejected a push by partners to introduce mid-upper arm circumference (MUAC)-only diagnosis and remained suspicious of what they saw as an inferior protocol from a clinical perspective. In Somalia and South Sudan, processes for triggering combined/simplified protocols were more systematic. In all countries, current use of combined/simplified protocols was viewed as "exceptional".

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[1]   Full results from this study will be published in a future peer-reviewed publication and summarised in *Field Exchange*.

Acceptability of combined/simplified protocols: Specific aspects of combined/simplified protocols were deemed more or less acceptable. There was strong agreement in all countries on providing MAM and SAM treatment at the same location, and specific steps had been taken toward making this an effective rule in Somalia and South Sudan. In Niger and Nigeria, MAM treatment is rarely provided due to funding limitations, leading to concerns about caseload and shifting resources from SAM treatment should a combined protocol be adopted. In all countries, there was poor acceptability of using MUAC as the sole screening measure, due especially to the 'tall and thin' morphology of people in Niger, Somalia and South Sudan. There were also strong reservations about the appropriateness of ready-to-use therapeutic foods (RUTF) as the single product because of the shift of significant supply burden from WFP to UNICEF.

Respondents nonetheless appeared to be open to combined/simplified protocols and expressed the view that even sceptical government authorities could be convinced of their appropriateness if presented with scientific evidence. The lack of scientific evidence cited by respondents had to do with clinical effectiveness, operational implications and cost. Pilot projects can move discussions forward, but are not always aligned with national priorities.

Barriers/facilitators to adoption: The main barriers to adopting combined/simplified protocols had to do with the lack of scientific research and validated global guidance, lack of clarity on the conditions under which they are meant to be used, and unclear operational and funding implications. Facilitators to country-level adoption included widespread recognition that current protocols are inefficient, openness to exploring

Table 1	Barriers and facilitators to adoption of combined/simplified protocols	
Barriers	**Facilitators**
• Lack of research evidence to support specific components of combined/simplified protocols • Expectation of significant operational and financial implications of taking on the MAM burden in Niger and Nigeria • Absence of a unified message on combined/simplified protocols from global and regional partners • Occasional lack of trust created by partners operating or conducting research without the permission/involvement of country authorities	• Recognition that current protocols are inefficient and leave out key beneficiaries • Openness to adapting, amending or modifying country protocols in all four study countries • Eagerness to learn more about research evidence on combined/simplified protocols • Wide awareness of ongoing research

ways to improve these protocols, and awareness of ongoing research studies (Table 1).

Drivers of change: The initiative to discuss novel protocols comes from partners: UNICEF and ECHO are the main 'transfer agents', alongside Nutrition Clusters. Respondents noted that WHO guidelines motivate changes and updates to national policies.

Complexities of international networks: Respondents reported a good relationship between UNICEF and WFP, but feared the combined protocol could damage this by disturbing their established mandates and suggested discussions are needed at the highest level of these organisations. They also felt there was a lack of coherence in international networks, such as between actors based in the US vs. those based in the UK, and unclear role of coalitions, such as No Wasted Lives. Discussions were confined to humanitarian circles.

Discussion

This research stresses the contextual complexities that contribute to national-level decisions on the adoption of protocol adaptations in food-insecure, emergency contexts. Stakeholders in each country are balancing practical considerations surrounding acute malnutrition treatment, including logistical access, funding and malnutrition burden, against remaining gaps in evidence. There appeared greater resistance to combined/simplified protocols in more stable governments dealing with more localised and/or recent crises (such as Niger and north-east Nigeria) than in less stable contexts with higher physical and food insecurity (Somalia, South Sudan). The challenges described in this study highlight opportunities and urgent need for discussion and collaboration between implementers, funders and researchers around increasing efficiency and effectiveness of current malnutrition treatment protocols and taking into account broader health systems.

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Child being screened for acute malnutrition in Ganyiel, South Sudan

P. Biro / IRC

OptiMA study in Burkina Faso: Emerging findings and additional insights

By Kevin PQ Phelan

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Location: *Burkina Faso*

What we know: Different protocols, products and coordination mechanisms are typically used for the care of severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) that limit continuity of care for a continuum condition.

What this article adds: TALIMA's **Opti**mizing treatment for acute **MA**lnutrition (OptiMA) is a simplified approach to current case management of acute malnutrition based on existing and emerging evidence. It centres on family MUAC (home screening by mothers/caregivers), single admission criteria (MUAC < 125mm and/or oedema), single treatment product (ready-to-use therapeutic food (RUTF)) and rationalisation of RUTF doses according to the degree of wasting. A pilot study (2016-2018) tested this new protocol against a control (standard care) in 54 health centres in one district of Burkina Faso; 5,000 children were enrolled. Prevalence of concurrent stunting was high (42%) and associated with the degree of wasting. Full results will be published shortly. Further research is planned in Democratic Republic of Congo, Niger and Mali. More randomised control trials are needed to test the effectiveness of RUTF dose reductions, the 'safety' of excluding children with MUAC > 125mm but WHZ <-2, and gender-specific MUAC thresholds. Observational studies are also needed in multiple contexts using high-quality programme data.

Background

Current standard practice for community management of acute malnutrition (CMAM) is guided by the 2008 United Nations (UN) Joint Statement and subsequent generic protocols that, in theory, integrate severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) care. However, limitations to the current approach have been evident for years: SAM and MAM care use different protocols and different products, and different UN agencies support country-level efforts for the same continuum condition. Often treatment is only available for SAM children, resulting in lives lost and costly hospitalisation that could be averted if nutritional support was available earlier in the wasting process. Gains in numbers of children treated for both conditions have stalled since 2015.

Participants at a UN agency workshop in Dakar 2017 (ACF *et al*, 2017) identified several barriers to reaching more children, including high costs and caseloads, weak governance, limited human resources capacity, parallel information systems with poor quality data, and complicated supply chains resulting in stockouts. In addition, SAM and MAM programmes are chronically underfunded. A 2016 World Bank report estimated it would take an additional USD900 million per year globally to mitigate wasting at the scale required (Shekar *et al*, 2017). The key costs in CMAM are health workers' time and ready-to-use therapeutic foods (RUTF) for SAM, and ready-to-use supplementary food (RUSF) for MAM. Thus, programmes that make efficient use of health workers' time and apply intelligent targeting of one product (RUTF) in a single protocol may overcome many of the identified barriers.

Because of these challenges inherent in the current MAM/SAM approach, many organisations have been looking at alternative, simplified protocols. ALIMA's Optimizing treatment for acute MAlnutrition (OptiMA) is one such strategy, proposing three main changes to current protocols:

1. Earlier detection by training mothers and caregivers how to use mid-upper arm circumference (MUAC) bands to screen children regularly for malnutrition in the home (i.e., family MUAC.)

2. Simplification and easier management by using only one anthropometric measure (MUAC <125 mm (and/or oedema)) for admissions and one product (RUTF) for treatment.

3. More intelligent use of the costliest input (RUTF) by gradually reducing the dosage based on a child's MUAC status and weight to increase the number of children with access to treatment at no extra or similar cost.

Justification

There is a growing body of evidence for each of these three elements. ALIMA was the first organisation to show that mothers can screen for malnutrition after being trained to use MUAC bracelets on their own children (Blackwell *et al*, 2015), and that this can increase early detection and reduce hospitalisations at a lower overall cost when brought to scale (Alé *et al*, 2016). There have been promising results from programmes that only use MUAC criteria for admissions, management, and discharge (such as Binns *et al*, 2016). Furthermore, in different contexts, it has been shown that MUAC gain parallels weight gain; both are very rapid in the first weeks of SAM treatment, before reaching a plateau (Goossens *et al*, 2015). This trend is similar in MAM children (Fabiansen *et al*, 2015). A reduced RUTF-dosing regimen in Myanmar achieved results exceeding the Sphere standards (Philip *et al*, 2015).

Under OptiMA, the diagnosis of acute malnutrition is refined to targeting treatment to children with a MUAC < 125 mm or oedema. The simplicity of the MUAC measure allows families to screen children and check for oedema at home and identify malnourished children on a regular basis (Alé *et al*, 2016). The diagnosis is quickly confirmed by clinicians at the health centre. MUAC progression is also used to monitor recovery and determine discharge, thus eliminating the discrepancies that occur when both MUAC and WHZ are used to diagnose acute malnutrition. One of the characteristics of MUAC is that it selects stunted children, and recent research shows how concurrently wasted and stunted children are at a very high risk of death (Myatt *et al*, 2018); therefore devising strategies that broaden inclusion criteria to encompass these children is important for reducing malnutrition-related mortality. Arguably, a single protocol may be the most practical way to reach these children. Second, RUTF dosage is rationalised and calibrated to the child's degree of wasting. The WHZ tables and dosing tables are replaced by a single table that determines the child's RUTF ration based on MUAC category and weight. Larger rations, on a per kilo basis, are given to the most severely malnourished and the ration is reduced as the child progresses to recovery. Third, supply chain is simplified to

a single RUTF and data management from two programmes are merged into one. This streamlined programme should result in better coverage, a high proportion of children detected before MUAC <115 mm, lower RUTF consumption per child, and fewer acute malnutrition-related hospitalisations.

Furthermore, data from recent randomised nutrition trials in Niger (Isanaka *et al*, 2015) and Burkina Faso (Cichon *et al*, 2016) demonstrate significant morbidity in children with MUAC ≥115mm. In Niger there was no difference in the prevalence of clinical complications among children with MUAC <115 mm and those with MUAC ≥115 and WHZ <-3. In the TreatFOOD trial in children with MAM (MUAC 115-124 mm or -3 < WHZ <-2), 70% of children had a clinical condition identified on admission to the supplementary feeding study. This suggests that a large proportion of children with MUAC 115-124 mm and often classified as moderately malnourished may benefit from the more thorough medical evaluation provided in current SAM programmes.

One published study demonstrates the promise of a MUAC-based simplified protocol. Maust *et al* (2015) in Sierra Leone achieved >80% recovery in children managed with a MUAC-based, reduced dose RUTF-regimen integrated protocol, compared to 79% recovery in standard treatment. The ComPAS study is a randomised control trial (RCT) comparing a similar protocol to current standard practice (Bailey *et al*, 2018) (summarised in this issue of *Field Exchange* and due for peer review publication in 2019).

OptiMA is one of several recent trials seeking to simplify and streamline nutrition protocols and directly address research gaps. In Minding the Undernutrition Evidence Gap, experts identified "the need for further simplifying protocols"

and treatment of MAM as two priorities (ECF, 2018). The Humanitarian Health Evidence Review by the London School of Hygiene and Tropical Medicine concluded that early detection of SAM should be prioritised (Blanchet *et al*, 2015). The Research Agenda for Acute Malnutrition launched by the Council of Research and Technical Advice (CORTASAM) and convened by the No Wasted Lives Initiative identified "the appropriate entry and discharge criteria for treatment of acute malnutrition" and "investigating the safety, effectiveness and cost-effectiveness of reduced dosage ready-to-use therapeutic food dosages" as key research priorities (No Wasted Lives, 2018).

OptiMA-Burkina Faso
In 2016 ALIMA and its Burkinabe partners Keoogo and SOS Médecins, in partnership with the Ministry of Health (MoH), designed the protocol for OptiMA-Burkina Faso as a pilot trial against external control (i.e., national Burkinabe and international Sphere standards). Figure 1 shows the differences between the current Burkina Faso protocol and OptiMA. Figure 2 shows the reduced-dosage table, which addresses the current dosing paradox in which children receive more RUTF at the end of treatment, even after their weight has plateaued.

The study was conducted in all 54 health centres in Burkina Faso's Yako district, in the north region, from January 2017 to March 2018 and was implemented by MoH clinical staff. Research staff supervised and monitored data collection, from which an individual database was created. A separate study was conducted to determine rates of relapse at three months post-recovery.

Nearly 5,000 children were admitted under OptiMA and will be included for analysis. A small number of children presented with MUAC >=125 mm and a WHZ <-3; they were treated

under the current Burkina Faso SAM protocol. As anticipated in a MUAC-based strategy, prevalence of concurrent stunting was high overall at 42% of children treated under OptiMA, with a positive correlation between levels of stunting and wasting: i.e., 56% for those with MUAC <115 mm at admission; 46% for those with MUAC 115-119 mm; and 37% for those with MUAC 120-124 mm.

Discussion and next steps
Full results of the OptiMA-Burkina Faso pilot will be available in the next few months in a peer-reviewed publication and will be summarised in Field Exchange. ALIMA also hopes to share programme lessons in a future issue of *Field Exchange*. Regardless of the positive results from Maust *et al* (2015) and similar forthcoming results from OptiMA- Burkina Faso, it is important to clearly understand the questions that must still be addressed. We need RCTs to determine whether modest RUTF dose reductions (i.e., 150 kcal/kg/d) are non-inferior to current dosage regimens (175-200 kcal/kg/d) for children who present with MUAC < 115 mm or oedema. Second, we need RCTs to learn whether it is 'safe' to exclude children with MUAC > 125 mm but WHZ <-2 (children who are currently CMAM eligible but would not be eligible in a MUAC < 125 mm threshold programme). Third, MUAC consistently selects more girls than boys, although there is no reason to believe that girls in sub-Saharan Africa are more affected by acute malnutrition than boys; thus, RCTs are also needed to investigate gender-specific MUAC thresholds to see if gender balance in MUAC-based programming can be improved. Most importantly, given the highly context-dependent aspects of nutrition programming, more observational studies are needed in more places. This means investing in high-quality programme data collection that allows for creation of individualised, monitored databases for thousands of children in multiple countries in east, central and west Africa and in places with high HIV prevalence or significant burden of kwashiorkor.

ALIMA and its national partners have two RCTs and two operational pilots already in the works. The OptiMA-DRC trial, an individual RCT that will begin in 2019, will determine how well this strategy works in a region with a high prevalence of oedematous malnutrition. OptiMA-Niger, first as a small-scale operational pilot and then as an individually randomised control trial, will provide crucial evidence on simplified programming in an area of very high incidence of both wasting and stunting. And OptiMA-Bamako in Mali will test the approach in an urban setting.

With the results from OptiMA-Burkina Faso and these upcoming OptiMA trials, ALIMA hopes to help fill in several research gaps in the coming years and contribute to improved management of acute malnutrition, so that more children have access to life-saving treatment.

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Figure 1
Differences between OptiMA-Burkina Faso and the current Burkina Faso protocols for management of acute malnutrition.

	National protocol		OptiMA		
	SAM	MAM	Acute Malnutrition		
Admission	MUAC < 115 mm or WHZ <-3 or oedema	115 < MUAC <125mm Or -3 <WHZ< -2	MUAC < 115mm or oeema	115 <MUAC < 120mm	120 <MUAC < 125mm
Treatment product	RUTF 150-200 Kcal/kg/d	Super cereal plus, 200 g/d or RUSF, one 92g sachet /d	RUTF 175 Kcal/Kg/d	RUTF 125 Kcal/Kg/d	RUTF 75 Kcal/Kg/d
Calculation of dosage	According to weight	Fixed amount, regardless of weight or MUAC status	According to MUAC status and weight		
Discharge criteria	MUAC ≥125mm for two consecutives visits, Or WHZ ≥-2 for two consecutives visits		- MUAC>125mm for two consecutive weeks - No oedema for minimum two weeks - Minimum four weeks in programme - Good clinical health		
	- No oedema minimum two weeks - Minimum four weeks in programme - Good clinical health	-After recovery from SAM: discharge after three months without losing weight.			

Figure 2 — OptiMA-Burkina Faso RUTF dosage table compared to the current Burkina Faso national protocol dosage

Burkina Faso standard protocol 2016 oedema, MUAC < 115 or WHZ<-3z 150-200 kcal/kg/j			OptiMA-Burkina Faso MUAC < 115 mm oedema ~175 kcal/kg/j			MUAC 115-119 mm ~125 kcal/kg/j		MUAC 120-124 ~75 kcal/kg/j	
Weight	sach/w	(kcal/kg/j)	Weight	sach/w	(kcal/kg/j)	sach/w	(kcal/kg/j)	sach/w	(kcal/kg/j)
3.0-3.4	8	(190-168)	3.0-3.4	8	(190-168)	8	(190-168)	7	(166-147)
3.5 -4.9	10	(204 - 145)	3.5-3.9	10	(204-183)	8	(163-142)	7	(142-125)
			4.0-4.4	10	(179-162)	8	(143-130)	7	(122-114)
			4.5-4.9	12	(206-189)	8	(127-117)	7	(111-102)
5.0-6.9	15	(214-155)	5.0-5.4	13	(186-172)	9	(129-119)	7	(100-92)
			5.5-5.9	14	(182-170)	10	(130-121)	7	(91-85)
			6.0-6.4	15	(179-167)	11	(131-123)	7	(83-78)
			6.5-6.9	17	(187-176)	12	(132-124)	7	(77-72)
7.0-9.9	20	(204-144)	7.0-7.4	18	(184-174)	13	(133-125)	8	(81-77)
			7.5-7.9	19	(181-172)	14	(133-127)	8	(76-72)
			8.0-8.4	20	(179-170)	15	(134-128)	9	(80-76)
			8.5-8.9	22	(185-175)	15	(126-120)	9	(76-72)
			9.0-9.4	23	(183-175)	16	(127-122)	10	(79-76)
			9.5-9.9	24	(180-173)	17	(128-123)	11	(83-79)
10.0-14.9	30	(214-144)	10.0-10.4	25	(179-172)	18	(129-124)	11	(79-76)
			10.5-10.9	26	(177-170)	19	(129-125)	12	(82-79)
			11.0-11.4	27	(175-169)	20	(130-125)	12	(78-75)
			11.5-11.9	29	(180-174)	21	(130-126)	13	(81-78)
			12.0-12.4	30	(179-173)	22	(131-127)	13	(77-75)
			12.5-12.9	31	(177-172)	22	(126-122)	14	(80-78)
			13.0-13.4	33	(181-176)	23	(126-123)	14	(77-75)
			13.5-13.9	34	(180-175)	24	(127-123)	15	(79-77)
			14.0-14.4	35	(179-174)	25	(128-124)	15	(77-74)
			14.5-14.9	36	(177-173)	26	(128-125)	16	(79-77)
15.0-19.9	35	(167-126)	15.0-19.9	36	(171-129)	27	(129-97)	16	(76-57)

Nutritional recovery

RUTF dosage reduction

*increased dose compared to standard protocol

Nutritional recovery

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Treatment of moderate acute malnutrition using food products or counselling:
A systematic review

Mothers feeding their children supplementary food in a MAM treatment programme in Sierra Leone

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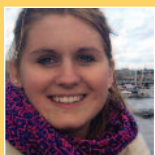
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Nancy Aburto has over 15 years of experience working in the field of nutrition globally and is currently Chief of the Nutrition Specific Unit in the Nutrition Division of World Food Programme headquarters. She has a PhD in Nutrition and Health Sciences from Emory University and a Master's Degree from University of Georgia.

Location: *Global*

What we know: There is a lack of international guidance on the most appropriate treatment for moderate acute malnutrition (MAM).

What this article adds: A 2018 systematic review synthesised current evidence on outcomes of MAM children treated with food interventions compared to no treatment or management with nutrition counselling. Since only one eligible study was identified, inclusion criteria were widened and 11 studies finally included. Seven studies found food products to be superior in terms of anthropometric outcomes compared to counselling and/or micronutrient powder supplementation; two studies found no significant benefit of a food product intervention compared to control; and two studies were inconclusive. Outcomes are likely influenced by type of supplementary food provided, dosage and length of treatment, as well as quality, content and adherence to counselling programmes. More research is needed in this area, especially studies that measure food insecurity and functional outcomes beyond anthropometric gains.

Introduction

There is currently a lack of international guidance on the most appropriate treatment for moderate acute malnutrition (MAM) and there are discrepancies in national treatment strategies. Some national guidelines for MAM treatment recommend the provision of supplementary food products, whereas others recommend that caregivers of MAM children should be provided with nutrition counselling alone. There is some debate about the necessity of supplementary foods for MAM and whether they result in better outcomes than no treatment or management with nutrition counselling. With the rise of non-communicable diseases in low-income settings and lack of understanding of the exact causes, confidence is needed in the effectiveness of MAM interventions to optimise immediate survival as well as long-term health (Shrimpton and Rokx, 2012). Moreover, food product interventions can be costly and unsustainable; therefore, concrete evidence is needed to establish their impact on child health outcomes compared to alternative methods.

Child eating ready-to-use therapeutic food in a treatment programme in Sierra Leone

Leone ©Alyssa Los, Project Peanut Butter

This review aims to identify and synthesise the current evidence on outcomes of MAM children treated with food interventions compared to no treatment or management with nutrition counselling. Through identifying the current state of knowledge and highlighting evidence gaps, we hope to inform future research and international guidelines for the treatment of MAM.

Methods

We conducted a systematic literature review in October 2018, identifying studies that compared the treatment of MAM children (aged 6-59 months) with food products versus management with counselling or no intervention, using a predefined Population, Interventions, Control and Outcome (PICO) framework (Table 1). We searched Pubmed, Cochrane and ScienceDirect databases, as well as resources catalogued on the following websites: ENN, Valid International, Evidence Aid and State of Acute Malnutrition.

Results

We screened a total of 673 abstracts and identified one study that met the PICO framework. Due to this very limited number of eligible studies, we widened the inclusion criteria and identified two studies that provided micronutrient supplement powders to the control group, and eight studies that did not enrol children based on current, common definitions of MAM; however MAM children were part of the sample. For example, enrolment based on low weight-for-age or mid-upper arm circumference (MUAC) <12.9cm.

Seven of the 11 studies found food products to be superior with regard to anthropometric outcomes compared to counselling and/or micronutrient powder supplementation; two of the studies found no significant benefit of a food product intervention compared to control; and two of the studies were inconclusive. A summary of the results is presented in Table 2.

Discussion

The majority of studies in this review found

that food products resulted in greater anthropometric gains than counselling or micronutrient interventions. This was especially true if the supplementary food provided was of suitable quality and provided to the child for an adequate duration.

Lack of adherence to counselling programmes may be one of the limitations influencing their effectiveness among control groups in these studies. The "per protocol" analysis by Nikièma et al (2014) suggests that, if adhered to, the counselling programme may be as effective as the food intervention. One other study also stated high defaulting in the counselling group (Hossain and Ahmed, 2014); however no other studies presented per protocol analyses. Finding ways to improve adherence to counselling interventions needs to be explored. The standardisation of quality and content of nutrition counselling interventions also requires consideration.

It is important to note that the study by Nikièma et al (2014) was conducted in a "relatively food secure" context, which may be an important consideration for effective counselling interventions. One other study states that it was conducted in a relatively food-secure setting, taking

place in an urban area of Iran (Javan et al, 2017). They found food supplementation with counselling to be superior to multivitamins and counselling; although there was some spontaneous recovery (WHZ>-2) (32%) in the counselling group, this was much lower than in the food supplementation group (80%). Three studies mention that their study populations are likely to be food insecure. Roy et al (2005) suggest that, although food supplementation had the best weight gain, an "intensive counselling" group still had better weight gain than the "standard counselling" group, despite low food security, whereas Christian et al (2015) conclude that counselling alone is not sufficient in areas of food insecurity.

Not all studies in this review found food supplements to be superior to nutrition counselling. The type of supplementary food provided, as well as the dosage and length of treatment, may influence their effectiveness. Studies specifically highlighted the micronutrient content and protein quality of supplements as likely significant factors. The majority of studies provided supplements for at least three months; however, one study provided one sachet of ready-to-use therapeutic food (RUTF) for 14 days and was found to be ineffective at preventing SAM in MAM children recovering from illness (van der Kam, 2017).

The results of this review suggest that food supplementation is superior for anthropometric improvements compared to counselling and/or micronutrients when the type of supplementary food provided, dosage and length of treatment are adequate. The quality, content and adherence to counselling programmes also requires consideration. These results can be used to guide policymakers when improving recommendations for MAM treatment. Researchers should also take note as there is currently a paucity of studies on this topic, especially those using standard definitions of MAM and recovery, as well as a lack of studies including measures of food security and important functional outcomes beyond anthropometric proxies.

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Table 1 — PICO framework for search strategy

Population	Intervention	Comparison	Outcome
Children with MAM* (6-59 months) *defined as mid-upper arm circumference (MUAC) ≥11.5cm to <12.5 cm and/or weight-for-height z-score (WHZ) ≥-3 to <-2, or weight-for-height (WFH) ≥70 to <80%, and absence of bilateral oedema	Ready-to-use supplementary foods (RUSF) Lipid-based nutrient supplements (LNS) Fortified blended foods such as Supercereal Plus Ready-to-use therapeutic foods (RUTF) Other macronutrient food supplements	Nutrition counselling alone No intervention	Recovery Weight gain MUAC improvement Non-recovery/Non-response Default Deterioration into SAM Relapse Death Length of stay Tolerance and acceptability Morbidities

Table 2 Summary of review results

Author, Year, Study design	Location and sample size	Target age and admission criteria	Study groups	Food product better than control?
Nikièma *et al*, 2014, Cluster RCT	Burkina Faso N=1,974	6-24 months, WHZ <-2 & ≥ -3	RUSF vs Super Cereal Plus vs counselling	Yes – better anthropometric recovery due to lower default
Micronutrients provided to control groups				
Hossain *et al*, 2012, 2014, 2016 (conference abstracts) Cluster RCT	Bangladesh N=227	6-24 months, WHZ<-2 & ≥ -3	Cereal-supplement vs cereal-supplement & psychosocial stimulation vs health education	Maybe – Not possible to distinguish between benefits of supplement vs psychosocial stimulation
Javan *et al*, 2017, RCT	Iran N=70	9-24 months, WHZ <-2 & ≥ -3 & referred for treatment	Blended flour, multivitamins & counselling vs multivitamins supplement & counselling only	Yes – better recovery, weight gain and WHZ gain
Target participants not based on current MAM definitions				
van der Kam *et al*, 2016, RCT	Nigeria N=2,213 (25% of sample had MAM at enrolment)	6-59 months, Diagnosed with malaria, diarrhoea, or LRTI MAM= WHZ <-2 & ≥ -3, & MUAC>11.5cm	RUTF (14 days) vs MNP vs no intervention	No – incidence of SAM was same for RUTF group compared to MNP group and to control group
Roy *et al*. 2005, Cluster RCT	Bangladesh N=282	6-24 months, Weight-for-age 61% - 75% of median (NCHS)	Supplementary food & intensive education vs intensive education vs counselling	Yes – better immediate and sustained recovery
Fauveau *et al*, 1992, RCT	Bangladesh N=134	6-12 months, MUAC >11.0 & <12.9cm, & living in bamboo structure	Supplementary food vs counselling	Maybe – Food group have larger weight gain in first 3 months but not for the whole 6 months
Target participants not based on current MAM definitions and micronutrients provided to control groups				
Hossain *et al*, 2011, RCT	Bangladesh N=507 (81% of sample had WHZ<-2 at baseline)	6-24 months, WAZ<-3 (NCHS) & recovered from diarrhoea at the hospital	Cereal-supplement vs cereal-supplement & psychosocial stimulation vs health education	Yes – better WHZ and HAZ gain.
Heikens *et al*, 1989, RCT	Jamaica N= 82	3-36 months, WAZ <80% of median (NCHS)	Supplementary food & multivitamins vs multivitamins only	Yes – better WAZ after 3 months but no difference after 6 months. Better HAZ after 6 months.
Preventative trials: majority adequately nourished children in sample				
Schlossman *et al*, 2017, Pilot cluster RCT	Guinea Bissau N=681	6-59 months, WHZ<2 or WAZ<1 or HAZ<2	RUSF 15% protein vs RUSF 30% protein vs no intervention	No – controls improved an equal extent to food group
Christian *et al*, 2015, Cluster RCT	Bangladesh N=5,421	6 months, All infants aged 6 months in the catchment area	RUSF-rice vs RUSF-chickpea vs RUSF-soy vs WSB++ vs counselling	Yes – for soy-based RUSF No benefit of WSB++ over counselling
Grellety *et al*, 2012, Prospective cohort	Niger N=2238 (18% of sample WHZ<-2)	6-23 months, All children 60-80cm length	RUSF vs no intervention	Yes – better MUAC and WHZ gain and lower mortality rate

*RCT= randomised controlled trial. MNP= micronutrient powder. LRTI = lower respiratory tract infection. WSB++ = fortified wheat-soy blended flour. Z-scores are generated using WHO 2006 reference, unless otherwise stated.

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Research

MAM and SAM cases reduced through a stunting prevention programme in Malawi and the associated costs averted

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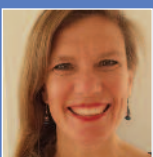
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A programme beneficiary in her green homestead garden

Vanessa Jones/WFP

Location: *Malawi*

What we know: Stunting and wasting are related manifestations of undernutrition; little is known about the effect that stunting prevention programmes have on the burden of wasting.

What this article adds: From January 2014 to March 2018, the Government of Malawi (GoM), with technical and logistical support from the World Food Programme (WFP) and financial support from the Children's Investment Fund Foundation (CIFF), implemented a comprehensive stunting prevention programme in Ntchisi district, Malawi. External evaluation at baseline and endline in both implementation districts saw a significant fall in severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) incidence compared to controls. Over the course of the programme, reduced caseloads of 2,582 MAM beneficiaries and 470 SAM beneficiaries were estimated, averting USD301,070 of costs otherwise associated with their treatment. Programme monitoring identified improvements in dietary diversity, minimum acceptable diet, infant and young child feeding and hygiene practices. Impact on stunting prevention will be available soon in a peer-review publication.

Introduction

Over the past 15 years, the global nutrition community has successfully established an investment case for interventions to prevent undernutrition. The World Bank estimates that cumulative effects of undernutrition create total gross domestic product (GDP) losses of approximately 11% in Asia and Africa (Global Nutrition Report, 2016). As a result, programmes to prevent undernutrition are often considered to be among the most cost-effective interventions in global health (Horton and Hoddinott, 2015). However, less attention has been paid to the more immediate benefits of reduced demand on health services that can result from prevention programming.

Interventions that aim to reduce child undernutrition often focus on a single form of undernutrition, such as child wasting or stunting (Khara & Dolan, 2014); yet there is evidence that most of the risk factors for a child becoming wasted or stunted are the same (Martorell & Young, 2012) and that these two manifestations of undernutrition are linked, whereby a wasted child is more likely to become stunted and vice versa (Richard *et al*, 2012). Practitioners are therefore calling for greater integration of nutrition interventions and better monitoring to evaluate crossover impacts (Khara & Dolan, 2014). Little is known about the effect that stunting prevention programmes can have on wasting prevalence.

In Malawi, the national prevalence of stunting is considerable at 37%. Prevalence of wasting is 3% (DHS, 2015-2016). The Government of Malawi (GoM), with technical and logistical support from the World Food Programme (WFP) and financial support from the Children's Investment Fund Foundation (CIFF), implemented a stunting prevention programme in Ntchisi district, Malawi from January 2014 to March 2018. While stunting reduction was the primary objective of the programme (due for peer-review publication), it was hypothesised that the programme impact pathway could also reduce wasting. Wasting (weight-for-height z-score (WHZ)) and underweight (weight-for-age z-score (WAZ)) were therefore also monitored by the external evaluation team, John Hopkins University (JHU). The additional findings regarding wasting are shared in this article.

Design of the stunting prevention programme

The programme aimed to address chronic undernutrition over four years through a multi-dimensional design, targeting all children under two years of age and their caregivers and communities during the window of opportunity in the first 1,000 days of life (from conception to two years of age). Key components of the programme included:

i) Provision of a small quantity of lipid-based nutrient supplement (SQ-LNS) to all children aged 6-23 months living in the programme district.
ii) Provision of fortified blended flour (as well as sugar and oil) to pregnant and lactating women (PLW) suffering from moderate acute malnutrition (MAM) during the first months post-partum.
iii) A social and behaviour change communication (SBCC) campaign targeting front-line workers (in the areas of health; water, sanitation and hygiene (WASH) and agriculture) and community leaders, households and caregivers to improve maternal diets, infant and young child feeding (IYCF) practices, and hygiene.
iv) Support to government programmes such as the provision of iron and folic acid (IFA) supplements to pregnant women, deworming and vitamin A supplementation.
v) Support to government for scaling up WASH promotion services in the district.

The programme also sought linkages with nutrition value chains and local agricultural production through homestead gardening (seed starter pack distributions) and small livestock rearing aimed at improving dietary diversity and the consumption of animal-source foods (ASF).

The programme elements were chosen after extensive research and discussions among programme partners and stakeholders, including the GoM, nutrition experts from local non-government organisations (NGOs) and United Nations (UN) agencies, and WFP staff at head-quarter, regional and country levels. The approach was also informed by the Malawi Nutrition Education and Communication Strategy (NECS), which was part of the national Scaling Up Nutrition (SUN) Movement in Malawi. Box 1 summarises the main differences between WFP-supported stunting prevention programmes and acute malnutrition prevention programmes.

WFP systematically identified existing nutritional problems and evaluated potential options for addressing these problems to determine the most effective programme design for this context. A panel of international nutrition experts provided input and guidance on the strengths and limitations of each specialised nutritious food (SNF) considered for inclusion. In consultation with the GoM, WFP chose an SQ-LNS, based on the conclusion that this product would fill the nutrient gap without interfering with breast-milk consumption. SQ-LNS was also considered to have a lower risk of being shared than other products, high likelihood of acceptance by the community, and a high benefit-to-cost ratio compared to other product options. As per normal WFP programme operations, Super Cereal together with oil and sugar was distributed to PLW with acute malnutrition.[1]

Given the importance of proper maternal nutrition, the programme was designed to complement ongoing government health initiatives for PLW by boosting demand for government IFA supplementation through community-based sensitisation to encourage mothers towards timely attendance at antenatal clinics (ANCs). Intended government coverage of IFA tablet distributions in the district was 100%. According to monitoring survey data, 81% of women received IFA tablets during their previous antenatal clinic (ANC) visit and, on average during the 4.5 years of programme duration, 54% consumed their IFA tablets within the last 24 hours. A separate report presents why adherence to the IFA tablets remained low, concluding that one of the main factors was the nausea effect women experienced on taking them (Museka-Saidi, 2018).

Formative research findings also highlighted the importance of including SBCC to optimise nutrition and health-related outcomes. Nutrition-sensitive components were introduced in the second year in response to the challenge in accessing diverse diets in Ntchisi district, including small-livestock promotion and homestead gardens. Other nutrition-sensitive actions included WASH activities, such as advocating with the government to drill community boreholes and encouraging households to build pit latrines, handwashing stations and dishwashing racks.

Evaluation methods

JHU conducted a comprehensive evaluation of the programme,[2] assessing various anthropometric indicators of undernutrition through cross-sectional surveys and assessing body composition and child-development indicators with

Figure 1 | MAM prevalence at baseline and endline in Ntchisi and Dowa and difference-in-differences

MAM prevalence reduced in Ntchisi by 2.2 percentage points

—— Nitchisi   —— Dowa   - - - Expected
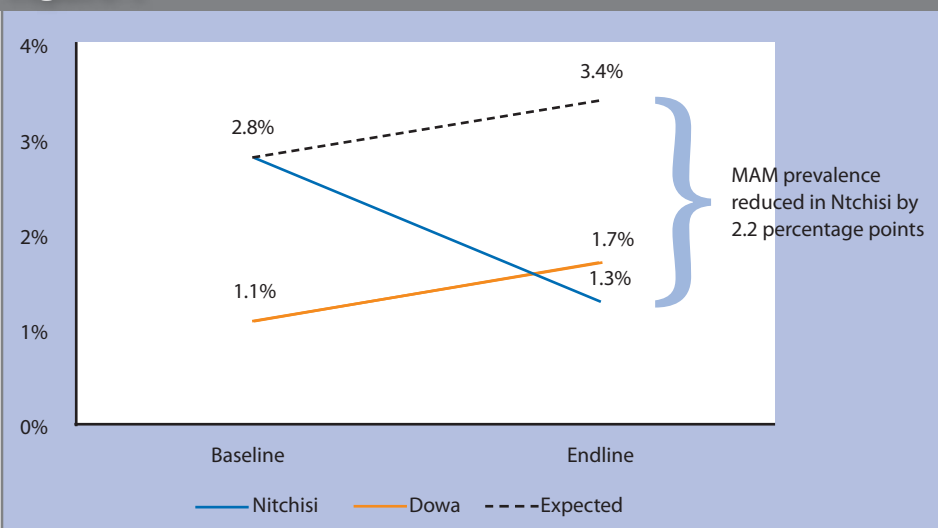
[1]   WFP Specialized Nutritious Foods (SNF) factsheet (April 2018): https://docs.wfp.org/api/documents/WFP-0000100654/download/

Figure 2 SAM prevalence at baseline and endline in Ntchisi and Dowa and difference-in-differences

SAM prevalance reduced in Ntchisi by 0.4 percentage points

— Nitchisi   — Dowa   - - - - Expected
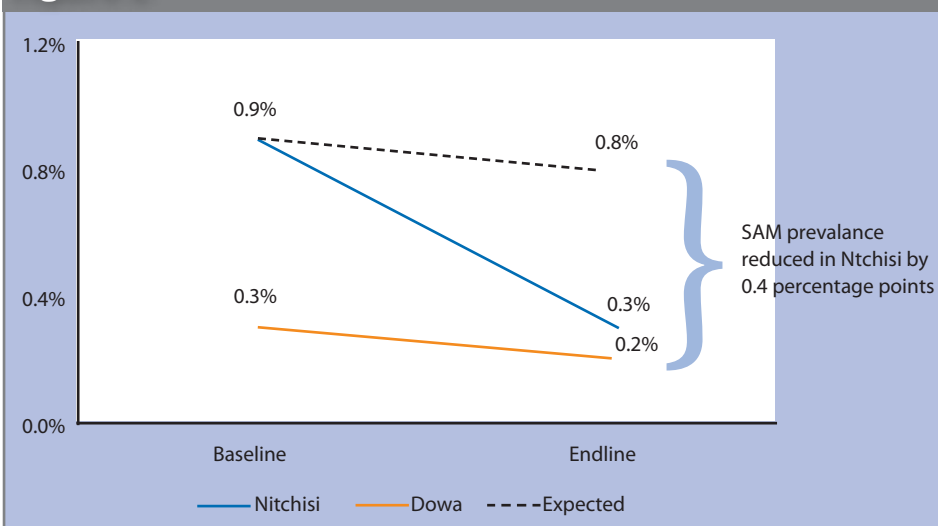
longitudinal follow-up in a sub-sample. A cost-effectiveness analysis of the programme was also conducted.[3] As it was hypothesised that the programme could reduce wasting (defined by weight-for-height z-score (WHZ)) and underweight (defined by weight-for-age z-score (WAZ)) as well as stunting, measures of acute malnutrition were also monitored.

Data were collected from Ntchisi, the intervention district, and Dowa, a comparison district, over the same period. Using cross-sectional data from both locations, JHU employed a difference-in-differences (DID) methodology for estimating the effect of the stunting prevention programme on MAM and SAM prevalence and propensity-score matching to help correct for differences between populations in the two districts.

Results

Incidence of SAM and MAM

Figures 1 and 2 illustrate the results from the DID analysis. The baseline survey (January 2014 to March 2014) included 2,404 participants (1,166 children and 1,238 PLW). The endline survey (January 2017 to April 2017) included 2,453 participants (1,333 children and 1,120 PLW). The same villages were sampled in both districts in both surveys (n=108 in Dowa; n=108 in Ntchisi).

In the absence of the stunting prevention programme, Ntchisi district would be expected to see a similar rise in MAM prevalence as that seen in Dowa; however, MAM prevalence was lower at endline in Ntchisi (Figure 1). Both districts saw a reduction in SAM between baseline and endline, but this reduction was greater in Ntchisi (Figure 2). The resulting DID analysis indicates that the stunting prevention programme in Ntchisi resulted in a reduced MAM prevalence of 2.2 percentage points and a reduced SAM prevalence of 0.4 percentage points. These results are statistically significant (p < 0.05).

Estimating reduced incidence of acute malnutrition

Using MAM and SAM prevalence data, it was possible to estimate the number of children who did not suffer from acute malnutrition in Ntchisi who would otherwise have done so in the absence of the stunting prevention programme. The methodology used was developed by the CMAM Forum[4] to estimate the incidence of acute malnutrition based on prevalence. This methodology is consistent with other guidance on estimating incidence of acute malnutrition (e.g., see Kakietek *et al.*, 2018) . Incidence = (N)(P)(K), where:

N = Population
P = Prevalence of acute malnutrition
K = A multiplier to estimate the rate of new cases within a given time period

The following numbers are estimated for Ntchisi district:

N = 15,182 (population of children aged 6-23 months, as estimated by WFP monitoring data for March 2015)
P = 2.2% for MAM and 0.4% for SAM (based on DID results above)
K = 2.6 (a standard multiplier within a 12-month period based on CMAM Forum methodology for estimating incidence)

Calculating (N)(P)(K), it was found that, in 2015:

- 868 children did not suffer from MAM as a result of the stunting prevention programme;
- 158 children did not suffer from SAM as a result of the stunting prevention programme.

Assuming the consistency of figures across the entire length of the stunting prevention programme (January 2014 to March 2018), it can be estimated that 3,689 fewer children suffered from MAM and 672 fewer children suffered from SAM.

Caseloads and costs averted

The results above relate to the reduced incidence of acute malnutrition. In order to calculate the reduced caseloads (the number of MAM and SAM cases handled by MoH, WFP and partners through treatment programming), the incidence was multiplied by an assumed coverage level of 70%, estimated based on historical monitoring data for treatment programming. Over the full course of the programme (January 2014 to March 2018), this yields a reduced caseload of 2,582 MAM beneficiaries and 470 SAM beneficiaries.

A community cooking demonstration showing diverse and healthy locally available foods

Mica Jenkins/WFP

It can be assumed that reduced caseloads decrease the financial cost of SAM and MAM treatment programmes. In Malawi's Operational Plan for Community Management of Acute Malnutrition (GoM, 2016), the government cites standard per-child costs for the treatment of both MAM (USD80.00 per child) and SAM (USD200.00 per child). Multiplying these costs by the reduced caseloads, it is possible to estimate that, as a result of the stunting prevention programme, in 2015 alone, USD 48,640 was not spent on MAM treatment programmes and USD22,200 was not spent on SAM treatment programmes (total USD70,840). Across the entire implementation period (January 2014 to March 2018), it can be estimated that a total of USD301,070 was not spent on MAM and SAM treatment programmes that otherwise would have been.

Additional findings based on programme monitoring

WFP's corporate beneficiary tracking and registration system (SCOPE) was used as part of a detailed monitoring and evaluation system to track implementation in near real-time to enable programme adaptation as needed. This programme was the first time SCOPE had been used for an in-kind intervention; previously the system had only been used for cash interventions.

Moving forward, SCOPE was adopted as the corporate solution for beneficiary registration and tracking for all WFP programmes.

WFP-led trimesterly programme monitoring revealed an average monthly attendance rate for caregivers at SNF distributions across the programme period of 82%. This figure exceeded WFP's Strategic Results Framework target of 70%. Tracking identified high scores for minimum acceptable diet (MAD) (which rose by 11%) and minimum dietary diversity (MDD) (which rose by 14%) across the programme period (both statistically significant (p<0.05). Data showed that intra-household sharing of SQ-LNS was low, with almost 90% of the monthly redeemed SNF being consumed by target children. While SQ-LNS contributed to improved child nutrition, when SQ-LNS was removed from the calculation, MAD and MDD both improved over time, based on the increased diversity of foods available in the household (p<0.05). This finding suggests the additional positive effect of the SBCC and nutrition-sensitive components of the programme (homestead gardening and rearing of small livestock).

Indicators related to WASH also improved over the course of the programme. Data from regular programme-monitoring surveys show that the percentage of households with children enrolled in the programme that owned hand-washing stations increased significantly (p<0.05) and the percentage of children who had diarrhoea in the district decreased. These data are all based on regular programme-monitoring surveys.

These results show it is possible to achieve improvements in IYCF and WASH practices and maintain high attendance rates at SNF distributions by including appropriate, context-specific programme components.

Conclusion

While the reduction of stunting was the primary aim of the programme in Malawi's Ntchisi district, this article highlights secondary outcomes, such as the potential of a stunting prevention programme to reduce the number of children suffering from acute malnutrition. This can allow for financial resources to be reallocated as a result of reduced demand for MAM and SAM treatment programming. Furthermore, the additional impact of stunting prevention programmes on acute malnutrition can lead to positive outcomes related to maternal and child health and nutrition, and assist in overcoming the inter-generational cycle of malnutrition.

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An enumerator conducting a monitoring survey with a programme beneficiary

Alessandro Dinucci/WFP

Comparison of treatment of severe acute malnutrition with ready-to-use therapeutic food and ready-to-use supplementary food:
Research plans in Pakistan

A child successfully recovering from acute malnutrition, Pakistan

Khawas Zubair/ WFP Pakistan

By Sumra Kureishy, Meghan Callaghan-Gillespie, Gul Nawaz Khan, Atif Habib, Mica Jenkins, Khawaja Masuood Ahmed, Baseer Achakzai, Saskia de Pee, Mark Manary, Cecilia Garzon and Sajid Soofi

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Location: *Pakistan*

What we know: Locally produced ready-to-use therapeutic food (RUTF) is not available in Pakistan; locally produced ready-to-use supplementary food (RUSF) is available.

What this article adds: Problems with RUTF supply chain has prompted the Government of Pakistan to commission an individual randomised, double-blind, controlled trial to compare the effectiveness of locally produced RUSF to standard RUTF to treat severe acute malnutrition (SAM) children aged 6-59 months in a community-based management of acute malnutrition programme in Umerkot district, Sindh Province. The RUSF formulation has been revised and meets RUTF specification. A sample of 850 SAM children aged 6-59 months per study arm will be selected from 10 basic health units. The treatment protocol is in line with Pakistan national guidelines. The primary outcome of interest will be recovery from SAM (mid-upper arm circumference (MUAC) ≥ 11.5cm, clinically well, and no bilateral pitting oedema for two consecutive weekly visits). Secondary outcomes are neurocognitive performance, changes in MUAC, weight and length, time to recovery from SAM, time to recovery from moderate acute malnutrition defined as MUAC ≥12.5 cm, relapse and any adverse events. Cost-effectiveness of the approach will be studied. Results will be available by second half of 2021.

Background

In Pakistan it has been estimated that approximately 15% of children under five years old are wasted, which is almost twice that of the global prevalence of 7.5% (Government of Pakistan, 2011). The Pakistan community-based management of acute malnutrition (CMAM) programme was initiated during the autumn of 2008 as an emergency response to those displaced by massive flooding in Khyber Pakhtunkhwa (KP). The programme was expanded to food-insecure and conflict-affected districts and, by 2010, approximately one third of the country was implementing the CMAM programme.

Programming is governed by Pakistan CMAM guidelines (Government of Pakistan, 2010), developed by a CMAM Technical Working Group under the nutrition wing of the Ministry of Health. CMAM is currently implemented by the Government and local non-governmental organisations in limited areas of Balochistan, Sindh, KP and Punjab, with coverage generally reported as 30-40% (Valid International, 2015; Government of Sindh, 2005). Coverage remains a challenge due to low capacity among healthcare providers and implementing partners, limited government funding allocated to CMAM, poor stakeholder coordination and supply shortages.

Supply chain challenges

Supplies of ready-to-use therapeutic food (RUTF) for SAM treatment are imported into Pakistan. Difficulties in

Box 1 — Profile of reformulated RUSF for SAM treatment trial

Acha Mum is a lipid-based nutrient supplement which consists of chickpeas, vegetable oils, sugar, skimmed milk powder, vitamins and minerals to meet the specifications of RUSF and LNS-MQ. Canola oil has been substituted for soybean to meet polyunsaturated fatty acids (PUFA) specifications (omega-6 (2.6-6.10g per 100g) and omega-3 (0.30-1.80g per 100g) to optimise essential fatty acids content and ratio, especially important for SAM treatment.

The skimmed milk powder content of Acha Mum is 20%, contributing to half of the total protein content. This is twice the level specified in WFP RUSF specifications and comparable to the formulation of RUTF. A detailed comparison between RUTF specifications and the revised formulation is given in Table 1.

predicting programme caseloads and delays in distribution of RUTF from the port, as well as additional costs due to taxes and duties, often lead to pipeline breaks. Given this, the Government and UNICEF initiated local production of RUTF, but this is still in progress.

To ensure a steady supply of cost-effective ready-to-use supplementary foods (RUSF) for treatment of MAM, the Government and World Food Programme (WFP) initiated local production

Table 1 — Nutrient composition of Acha Mum compared to the UNICEF specifications for RUTF

Nutrient	Acha Mum per 100g	UNICEF RUTF specification per 100g
Energy, kcal	520	520-550
Protein, g	13	12.8-16.2
Fat, g	32.2	25.8-36.3
Omega-6 polyunsaturated fatty acids, % TE	7.8	3-10
Omega-3 polyunsaturated fatty acids, % TE	1.6	0.3-2.5
Sodium, mg	270	< 290
Potassium, mg	852.8	1,100-1,400
Calcium, mg	773.9	300-600
Phosphorus, mg	747.1	300-600
Magnesium, mg	167.7	80-140
Iron, mg	15	10-14
Zinc, mg	13.0	11-14
Copper, mg	0.54	1.4-1.8
Copper, mg	0.54	1.4-1.8
Selenium, µg	19.9	20-40
Iodine, µg	117	70-140
Vitamin A, mg RE	1.15	0.8-1.1
Thiamin, mg	1.12	≥0.5
Riboflavin, mg	2.3	≥1.6
Niacin, mg	13.2	≥5
Pantothenic acid, mg	6.23	≥3
Vitamin B6, mg	1.5	≥0.6
Biotin, µg	21.6	≥60
Folic acid, µg DFE	256	≥200
Vitamin B12, µg	3	≥1.6
Vitamin C, mg	121.9	≥50
Vitamin D, µg	23.7	15-20
Vitamin E, mg	22	≥20
Vitamin K1, µg	61.3	15-30

using chickpeas as one of the main ingredients in 2010. Since then, WFP has provided technical assistance to improve RUSF production to align with new global product specifications (ISO 22000 standards) for ready-to-use lipid-based products for the treatment of MAM (RUSF) and prevention of acute malnutrition (lipid-based nutrient supplement medium quantity (LNS-MQ)) (WFP, 2016). Locally produced RUSF (Acha Mum) has been available in-country for a decade. RUTF production is being developed by the same manufacturer; however, the process is taking longer and local RUTF is not yet available.

Implementing partners have reported ad hoc use of RUSF to government-led forums to treat SAM due to non-availability and shortage of RUTF supplies. Given this, the Government requested WFP to conduct research into the efficacy of RUSF as a stop-gap or replacement for SAM treatment when RUTF is unavailable.

Proposed research

WFP, in collaboration with Aga Khan University (AKU) and Washington University in St. Louis (WUSTL), will conduct an individual, randomised, double-blind controlled clinical non-inferiority trial to compare the effectiveness of a revised formulation of Acha Mum (see Box 1) to the standard RUTF to treat uncomplicated SAM in children aged 6-59 months through the CMAM programme in Umerkot district, Sindh Province. The CMAM programme is implemented by the Pakistan Ministry of Health (MoH). Technical support and capacity-building is provided by the UN agencies responsible for their respective components (WFP – MAM, UNICEF –SAM without complications, World Health Organization (WHO) – SAM with complications).

According to national CMAM guidelines, admission is based on MUAC criteria only and when targeted supplementary feeding (TSFP) is available, children are discharged from SAM treatment when MUAC ≥ 11.5cm (Government of Pakistan, 2010). Given this, the primary outcome of the study is recovery from SAM, defined as MUAC ≥ 11.5cm (for two consecutive weekly visits), clinically well, and no bilateral pitting oedema (for two consecutive weekly visits). The secondary outcomes are neurocognitive performance (eye-tracking measures and problem-solving) after the first four weeks of treatment; changes in MUAC, weight and length; time to recovery from SAM; time to recovery from MAM defined as MUAC ≥12.5 cm; relapse into MAM; relapse into SAM; and any adverse events. Each study arm will enrol 850 SAM children. A subset of 200 children aged 8-24 months will be selected from each study arm for the neurocognitive assessment, measuring eye-tracking and problem-solving. The assessment will be conducted at the time of diagnosis and after some weeks of therapeutic feeding.

Children with SAM (MUAC <11.5 cm and/or with bilateral pitting oedema [+, ++]) with appetite and without medical complications will receive either Acha Mum or RUTF through trained healthcare workers at the basic health units. RUTF will be procured internationally,

while Acha Mum will be procured locally in Pakistan. The daily ration of RUTF and RUSF given to children in this study will be based on weight (190 kcal/kg/day).

After reaching a MUAC ≥ 11.5 cm, children will be transferred to the targeted supplementary feeding programme (TSFP), where they will be followed up every two weeks, receive Acha Mum (100g/d, as per national guidelines), and infant and young child feeding counselling (Government of Pakistan 2010). Discharge criteria from the TSFP will be: child MUAC ≥ 12.5 cm; child has not lost weight for two consecutive visits; and child has had a minimum of eight weeks of combined feeding (including the time during SAM treatment). As per the national guidelines, SAM children who have not recovered/met the exit criteria of MUAC ≥ 11.5 cm within four months are identified as "non-recovery". Children who have had weight loss for three consecutive weeks or have not gained weight for five consecutive weeks are transferred to inpatient care (implemented by WHO). Children who have not recovered from SAM (MUAC ≥ 11.5) after three months will receive a failed treatment outcome and will be referred for further medical attention.

WFP will be responsible for procurement, labelling and distribution of RUTF and Acha Mum during the study. WFP will distribute the RUTF and Acha Mum to the AKU field office in Umerkot district, from where it will be distributed to the clinics on a weekly basis.

A cost-effectiveness assessment for each food will also be conducted, based on actual prices at the time of the study and historic prices for RUTF and Acha Mum. Costs unrelated to therapeutic food or its effectiveness (such as mother's opportunity costs, cost of transport to the clinic and programme implementation costs) will be considered fixed and not quantified.

The study will be registered as a randomised trial in clinicaltrials.gov. Study enrolment is expected to begin in 2019. Results are expected in second half of 2021.

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Research

Implementation of a field study of body composition among infants and young children in sub-Saharan Africa

By Ezekiel Mupere, John Mukisa, Lynnth Turyagyenda, Peace Aber, Luke S Uebelhoer, Celine Bourdon, Robert Bandsma, Emmanuel Chimwezi, Jonathan C Wells, Wieger Voskuijl, Judd L Walson, James A Berkley and Christina Lancioni

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An important question regarding continuum of acute malnutrition treatment concerns the differences and similarities between severely and moderately malnourished children that contribute to poor outcomes. Assessment of body composition is an evolving area to help improve risk identification and inform targeted care (Eds).

A young Ugandan CHAIN participant undergoing BIA measurements

Location: *Malawi and Uganda*

What we know: There are several techniques available for direct measurement of body composition; the gold standard is isotope dilution technique. Bio-electrical impedance analysis (BIA) is affected by hydration status and has not been validated in low- and middle-income countries (LMIC).

What this article adds: As part of the Childhood Acute Illness & Nutrition (CHAIN) Network cohort study across nine sites in Asia and Africa, body composition of severe acute malnutrition (SAM), moderate acute malnutrition (MAM) and normally nourished hospitalised children were assessed in two sites (Malawi and Uganda) at hospital discharge and 90 days post-discharge. Isotope dilution was used to establish and validate prediction models of body composition for measures of anthropometry, BIA and skinfold thickness. The study found BIA and skinfold thickness could be practically implemented in a multi-site study of infants and children in LMIC. However, results could not be validated due to difficulties in application of the isotope dilution protocol in young and undernourished children. Revision, adaptation and field testing of this gold standard is necessary to resolve this. Results regarding body composition by nutrition status will be available in forthcoming peer review publication.

Use of body composition to assess recovery from disease and undernutrition

Body composition reflects nutritional intakes, losses and needs over time. Unlike conventional anthropometry, techniques to measure body composition can quantify tissue losses by analysing two distinct body compartments: fat mass (FM) and fat-free mass (FFM). During periods of undernutrition, loss of FFM and FM varies with increasing duration of undernutrition. Loss of FFM has been associated with decreased survival, worse clinical outcomes, and poor quality of life in some diseases, including an increased rate of infections, complications, hospitalisations, length of hospital stay and recovery period (Pichard *et al.*, 2004; Pirlich *et al.*, 2006; Cetano *et al.*, 2016; Thibault, Genton and Pichard, 2012). In addition, data suggest that body composition in children remains salient in monitoring growth and development, progression of disease, and

response to treatments as shown in studies of children recovering from critical illness and Sickle Cell disease (Eke *et al.*, 2015; Zamberlan *et al.*, 2019). Despite these observations, there are little published data from low- and middle-income countries (LMIC) regarding whether the outcomes of mortality and growth recovery in undernourished children can be ascribed to changes in FM and FFM.

Conventional anthropometry includes measurements of weight, length/height and mid upper-arm-circumference (MUAC) to generate age- and sex-specific z-scores used to monitor growth throughout childhood. Conventional anthropometry has been widely adopted to identify undernourished children, classify the severity of undernutrition, and monitor recovery and growth trajectory among children undergoing nutritional rehabilitation. Despite its simplicity and effectiveness in identifying children most at risk of poor outcomes, conventional anthropometry cannot assess differences in body composition among undernourished children; specifically, their FM and FFM.

In clinical practice, nutritional recovery of young children is typically gauged by short-term weight gain. However, an increase in weight does not necessarily reflect an increase in FFM as weight gain following severe illness has been shown to be secondary to gains in FM rather than FFM. Despite accounting for height and weight, Body Mass Index (BMI) also does not accurately reflect FFM, as individuals with similar BMI can have significant variations in FFM. There is mounting evidence that quantification of body composition can be used to gauge illness severity and predict outcomes of childhood illnesses. For instance, children treated for malignancies have significantly lower body cell mass and higher FM compared to healthy, age-matched children (Murphy *et al.*, 2010). A study of critically ill children supports the hypothesis that measurements of body composition, including Phase Angle (an indicator of cellular membrane integrity and correlate of FFM), can predict outcomes from severe illness (Zamberlan *et al.*, 2019). We predict that quantitative assessment of body composition among young children in LMIC can be used to identify those

children most at risk of poor outcomes following an acute illness and to gauge recovery during rehabilitation for severe malnutrition.

Techniques for measurement of body composition in low- and middle- income countries

Conventional anthropometry is relatively quick and can be executed by health care workers with minimal training. However, this method only provides an indirect estimate of body composition that depends on the biological inter-relationships among tissues and their expected distribution among normal individuals (Roche, 1996). As a result, such indirect methods have larger predictive errors that are dependent on the disease type that is being examined. For example, Papathakis *et al.* (2005) compared body composition as measured by isotope dilution, bioimpedance spectroscopy and anthropometry in asymptomatic HIV-infected and -uninfected breastfeeding mothers. Using isotope dilution as the reference standard, BMI and MUAC were useful predictors of FM in both groups but did not accurately estimate FFM in HIV-infected mothers (Papathakis *et al.*, 2005). Notably, Bila *et al.* (2016) also reported that isotope dilution was superior to conventional anthropometry in the assessment of body composition in overweight and obese European children.

Several techniques are available for direct measurement of body composition, with isotope dilution using deuterium oxide remaining the gold standard (Roche, 1996). This technique is based on determining total body water (TBW), including both extracellular and intracellular water. During the isotope dilution procedure, a known volume of the inert radionucleotide deuterium oxide (99.9 atom % 2H2O) is ingested. The 2H2O mixes with body water but is largely excluded from body lipid stores, and hence allows the differentiation of FFM (which includes the non-lipid components of adipose tissue) and FM. An equilibrated distribution is reached after 3-5 hours in healthy children, though potentially longer in malnourished children with oedema. Saliva or urine (depending on the analysis technique) is then collected to measure the amount of deuterium in body water above

that naturally present (known as the enrichment of body water), which can be used to directly calculate TBW and derive FFM and FM.

BIA permits indirect extrapolation of FFM and FM by analysing a low electric current as it travels easily through the body's conductive water but is impeded by fat. Differences in electrical conductivities between positive and negative electrodes positioned on distal ends of a subject's limbs are measured by a BIA machine that reports out resistance, reactance, impedance, and phase angle. These measurements represent an index of the TBW that depends on the overall electrical conducting properties of a body with varying tissue composition. Standardised equations are then applied to calculate predicted FFM and FM for an individual. However, these equations vary by age, maturation state, ethnicity and illness; hence, for accurate results this approach requires the derivation of an appropriate equation for the study population. The phase angle measured by BIA is considered an estimate of cellular membrane integrity and lean tissue mass (Lukaski, 1987). BIA has been extensively used in studies of body composition in healthy subjects due to its ease of application, capacity to rapidly process outputs, and relative low cost. However, BIA measurements depend on hydration status (Lukaski, 1996) and importantly, the equations used to calculate FFM and FM are derived from children in high income settings and have not been well validated in young children in African settings (Wells, 2014). Measurement of various skinfold thicknesses (e.g. triceps, subscapular and other regions) is another widely adopted, non-invasive approach to estimate body composition used in both low- and high- income settings. However, this technique is very operator-dependent, and is difficult to perform in young children; thus, results may not be reproducible. In addition to these limitations, the triceps skinfold varies considerably by sex and can reflect differences in the underlying triceps muscle rather than an actual change in body fatness.

In this article, we describe challenges in the practical implementation of a multi-site study in LMIC comparing the techniques of conventional anthropometry, skinfold thickness, BIA, and isotope dilution to measure body composition. Our population of interest is infants ages 2-23 months who have severe, moderate, or normal nutritional status, and are recovering from hospitalisation.

Integration of direct and indirect measures of body composition in a multi-site paediatric field study

The Childhood Acute Illness & Nutrition (CHAIN) Network is a cohort study currently being carried out across nine sites in Africa and South Asia, with the purpose of understanding determinates of morbidity and mortality among infants and young children aged 2-23 months following hospitalisation for an acute illness[1]. Using MUAC, children are classified at hospital

Table 1	Inter-evaluator variations between the Ugandan and Malawian teams as evaluated by Technical Error of Measurements (TEM) and relative TEM						
		Uganda			**Malawi**		
Category	Item	TEM	Relative TEM	Classification of Relative TEM**	TEM	Relative TEM	Classification of Relative TEM**
Anthropometry	Weight	0.104	0.786508	Acceptable	0.83	6.424149	Acceptable
	Length	0.307	0.356935	Acceptable	0.31	0.360885	Acceptable
	Head circumference	0.204	0.412955	Acceptable	2.189	4.502633	Acceptable
	MUAC	0.39	2.582781	Acceptable	0.2207	1.46742	Acceptable
Skinfold Thickness	Triceps	1.45	18.35443	Unacceptable	0.83	1.029777	Unacceptable
	Subscapular	5.64	69.8452	Unacceptable	0.206	3.942584	Acceptable
BIA	Reactance	2.43	3.823761	Acceptable	5.036	10.29777	Acceptable
	Resistance	23.01	3.209563	Acceptable	16.8	2.51497	Acceptable

**TEM classification based on the cut-off values by Perini *et al.* (2005).

[1] CHAIN Network http://chainnetwork.org/

Table 2	Variation in estimation of fat mass and fat-free mass as estimated by BIA and isotope dilution					
Nutrition Status	Estimation type	No.	Fat mass (FM) mean (SD)	*p-value	Fat-free mass (FFM) mean (SD)	*p-value
SAM	BIA	47	1.58 (0.80)	<0.0001	4.70 (1.00)	<0.0001
	Isotope dilution	47	- 0.86 (3.10)		7.10 (3.39)	
MAM	BIA	32	1.97 (0.52)	<0.0001	4.71 (0.83)	<0.0001
	Isotope dilution	32	- 1.05 (3.50)		7.77 (3.50)	

*paired t-test

Figure 1 Fat mass values as calculated by isotope dilution procedure performed at hospital discharge among Ugandan children

Isotope dilution procedure was performed on 121 children of varied nutritional status (SAM, MAM, NAM) at time of hospital discharge. Shown are fat mass values of each child grouped by nutritional category.

admission as severely acutely malnourished (SAM, including children with nutritional oedema), moderately acutely malnourished (MAM), or normally nourished (NAM). Children are enrolled within 24 hours of their hospitalisation, closely monitored throughout their hospital stay, and then followed-up 45-, 90- and 180-days after discharge. An age-matched reference population of community children is also recruited at each site. The CHAIN Network aims to determine modifiable risk factors for highly vulnerable children. In this network, two sites (Mulago Hospital in Kampala, Uganda and Queen Elizabeth Hospital in Blantyre, Malawi) aimed to: 1) establish whether FFM, FM and phase angle as measured by BIA at hospital discharge are predictors of re-admission or post-discharge mortality; 2) describe the post-discharge changes in FFM, FM and phase angle as measured by BIA 90 days following hospital discharge; and 3) use isotope dilution to establish and validate prediction models of body composition for measures of anthropometric, BIA and skinfold thickness in hospitalised children of different nutrition backgrounds at discharge, day 90 post-discharge and in community children.

Indirect measures of body composition: Challenges and solutions for protocol harmonisation and minimisation of operator-dependent measurements

Skinfold thickness and BIA are operator-dependent measurements and prone to errors due to insufficient training and variation in technique, as well as minor differences in instrument calibration, use, and maintenance. The CHAIN study therefore tackled operator bias by: 1) standardising all equipment (BIA was assessed using Quadscan 4000 (Bodystat), skinfold thickness was performed using a Harpenden Skin Fold Caliper, weight was obtained using SECA 334 and 335 electronic scales, length was measured with the SECA 416 infantometer and MUAC was recorded using UNICEF tape); 2) developing Standardised Operating Procedures (SOPs), which were followed by all stakeholders to guide measurement recording and equipment maintenance; 3) standardising instrument calibration across the two sites at the start of and throughout the study; and 4) organising in-person joint trainings to ensure SOP harmonisation. Even

though researchers and nutritionists in both the Ugandan and Malawian teams had previous experience with measuring conventional anthropometry, skinfold thickness and BIA, we found that in-person SOP training was essential to harmonise procedures and obtain precise and accurate measurements. Table 1 presents the post-training quality assessment of anthropometry, BIA, and skinfold thickness measurements performed by the Ugandan and Malawian CHAIN teams. The Technical Error of Measurements (TEM) summarises inter-evaluator performance of the study team personnel as compared to gold standard measurements obtained from a nutritionist with five years of field experience in assessing anthropometry in children (Lynnth Turyagyenda). 'Relative TEM' expresses TEM as a percentage of the average value of that variable and these were classified as "acceptable" or "unacceptable" based on established criteria (Perini *et al.*, 2005). In this study, we considered the variables weight, length, head circumference, MUAC, subscapular skinfold thickness, reactance, and resistance, and computed their TEM.

The TEM of team members were generally small (less than 10) except for the BIA measurement of resistance. This suggests that the differences between measurements done by CHAIN Network personnel and the gold standard were very small. Relative TEMs were classified as acceptable for both the Ugandan and Malawian teams, except those for skinfold thickness. Additional training was subsequently organised to ensure harmonisation of measures for BIA resistance and skinfold thickness. This resulted in improved quality of measurements for the entire study (data not shown).

Operationalisation of isotope dilution protocol for direct measurement of body composition: Challenges and solutions for protocol implementation

As isotope dilution is a more complex and demanding procedure, it was conducted only by the CHAIN Ugandan team since one of their lead researchers (John Mukisa) had direct experience with performing this procedure in children. For this, the International Atomic Energy Agency (IAEA) protocol was followed
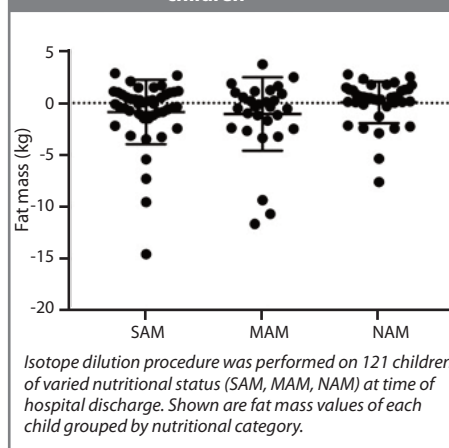
(IAEA, 2010) and an experienced consultant facilitated the design, training, implementation, analysis and data interpretation (Ndagire *et al.*, 2018). From the early isotope dilution experiments, we calculated FM (Figure 1) and found that, despite overhead technical guidance, several challenges arose when implementing the protocol among young children (detailed in Table 3). For example, after analysing the first set of samples, it became apparent that results were compromised by: 1) small amounts of oral intake during the three-hour procedure (e.g. breastfeeding to calm an infant); 2) missed collection of outputs (e.g. urine soaked up by diaper); 3) small variations in overall procedure time; or 4) imprecise dosing due to the child not consuming the full volume of isotope mixture.

Despite efforts to implement current recommendations for isotope dilution, much of the generated data yielded problematic results: 1) many FM values were negative among children in all nutritional categories; 2) calculated FM did not reflect expected differences between nutritional groups (as was observed when FM was calculated by BIA (Table 2)); 3) isotope dilution was particularly problematic among children with SAM, where the highest variance in values was observed. We also compared the estimated values for FM and FFM at hospital discharge among children with SAM and MAM, as measured by BIA and isotope dilution in the same child (Table 2). Here we noted statistically significant differences in the estimated FM and FFM in both groups of children depending on the applied method, with BIA providing more plausible values. Analysis of body composition of SAM, MAM and normal-weight children, including longitudinal data, will be shared in an upcoming peer-reviewed publication and summarised in a future *Field Exchange* article.

Many, but not all children, with non-plausible/negative FM as estimated by isotope dilution were observed to have minor protocol deviations. Although the data improved with corrective procedures (detailed in Table 3), it became apparent

that the current international protocol for conducting isotope dilution was inadequate to accurately measure body composition in young, undernourished infants in LMIC. A main challenge was to deliver the correct dose of isotope (3 gm in 10 ml as per recommendation) to infants and young children; if a small amount remained unconsumed, calculated TBW was over-estimated. A 1% error in dose (in this case 0.03 gm) produces a 1% error in TBW, and this positive error bias results in variable but systematic over-estimation of TBW and, thus, inaccurate FM and FFM. Technical measurement biases and/or errors were apparent in children of all nutritional backgrounds. Concordantly, we also noted that the isotope-equilibration time appeared to differ among children with varying nutritional status: the greater the level of malnutrition, the longer the isotope needed to equilibrate. Thus, these differences in equilibration dynamics between groups may significantly impact measurement error and variability. Proposed solutions to these and other issues encountered are detailed in Table 3.

Conclusions

Assessment of body composition can provide an in-depth understanding of weight changes in terms of FFM and FM that could allow for earlier and objective management of undernutrition. In this field study, we found that measuring body composition using conventional anthropometry and BIA analysis could be practically implemented in a multi-site study of infants and children in LMIC. However, due to difficulties in implementing current IAEA protocols in infants in our setting, we were unable to validate these indirect measurements against the reference standard of isotope dilution. Our experience has highlighted several issues and solutions that could prompt the revision and adaption of current IAEA protocols. Application of isotope dilution to measure body composition in our young and undernourished target population would require further field testing before a wider implementation.

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Table 3 — Challenges in performance of BIA, skinfold thickness, and IAEA isotope dilution procedures in paediatric population

Isotope dilution process

No	Challenge	Solution
1	Fasting for 3 hours was difficult for many participants and caretakers thus, endpoint sampling was often taken early.	Clear explanation of procedure and support of caretakers before and during the procedure.
2	Feeding during the process some caretakers fed participants during the 3-hour fast.	Ensure that all children are properly fed prior to procedure.
3	Accounting for urine passed during the process was a challenge as participants usually wore unstandardised diapers.	Use of a standard diaper for all participants this diaper is weighed before and after the process using a sensitive scale to quantify urine passed.
4	Collecting sufficient saliva was challenging some participants failed to produce saliva while others provided insufficient amounts.	Ensure all children are properly fed and hydrated prior to procedure, as this yields more saliva.
5	The fourier-transform infrared spectroscopy (FTIR) machine requires warming prior to use long wait times (>12-24 hours) were often needed before machine would function.	Switch on machine a day before the procedure to ensure proper function and reduce delays. Increase coordination with clinical team to coordinate timing of participant testing at desired time point.
6	Lack of a validated equation to determine FFM, FM, and TBW for this study population.	Conduct additional research to adapt existing equations for estimating body composition in young, undernourished children.
7	Insufficient information available regarding optimal equilibration time for undernourished children.	Prioritize research studies to determine equilibration time for isotope dilution in undernourished children.

BIA measurements

No	Challenge	Solution
1	Performing measurements on kicking, fighting and screaming participants.	Support efforts to start or delay procedure to when participants are calm or sleeping.
2	Frequent wear and tear of the code wires for the Bodystat Quadscan 4000 Touch machine.	Repeated staff training on use and handling of the wires keeping two pairs of back-up code wires in storage.

Skinfold thickness

No	Challenge	Solution
1	Consistency in depth/thickness of the pinch across several measurers.	Repeated staff training and restrict the number of measurers performing the technique to maintain consistency.

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Bottleneck analysis for the integrated management of acute malnutrition services in Somalia

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Location: *Somalia*

What we know: Actions to improve effective coverage of acute malnutrition services need to consider context specific barriers to programme performance and scale.

What this article adds: A participatory bottleneck analysis was performed to identify the root causes of sub-optimal performance in the Somalia integrated management of acute malnutrition (IMAM) programme. It was jointly led by UNICEF, WFP and the Somalia Nutrition Cluster in collaboration with health authorities of the Federal Government of Somalia (FGS), Puntland and Somaliland. Identified barriers to integrated SAM/MAM continuum of service included lack of a common definition and standards for integration; absence of a harmonised supply-chain system, difficulties to recruit and track deployment of human resources for nutrition; limited geographical coverage of IMAM services; and insufficient community involvement. The geopolitical context and a complex humanitarian landscape contributed to challenges. Acting on recommendations, progress since includes greater integration of nutrition services within health services, and development of a human resource capacity development strategy. Less progress has been made on integrating nutrition supplies into logistics information management systems. Ongoing strategy, policy and advocacy processes in Somalia should benefit from the report recommendations.

Background

Reducing acute malnutrition (wasting) is integral to reducing child mortality and the achievement of sustainable development goals. However, despite substantial investment in scaling up the integrated management of acute malnutrition (IMAM), wasting remains persistently high in Somalia. Thus, achieving the global target of reducing wasting prevalence to 5% or below by 2030 will require a comprehensive strategy addressing the multi-dimensional causes of malnutrition. A bottleneck analysis (BNA) for IMAM in Somalia was undertaken, consistent with UNICEF's guidance for scale-up and based on the Tanahashi model of assessing effective coverage of public health services delivery (Tanahashi, 1978). The BNA assessed the determinants of effective coverage of IMAM services, including supplies, human resources, geographic coverage, initial and continuous utilisation, and quality, with the objective of identifying the root causes of sub-optimal performance in the IMAM programme.

Programme context

The Somali guidelines for IMAM draw from the community-based management of acute malnutrition (CMAM) model developed by Valid International and endorsed by the World Health Organization and UNICEF. The IMAM guidelines are designed to contribute to the overall strategy of reducing childhood morbidity and mortality in Somalia. The IMAM programme is led by the Ministry of Health (MoH) with support from partners including the Nutrition Cluster, United Nations agencies (UNICEF and the World Food Programme (WFP)), and local and international non-governmental organisations (NGOs). The programme is comprised of four pillars:

Figure 1 — Bottleneck analysis (BNA) process

June 2016	Hiring of a consultant with support from UNICEF headquarters (HQ) and Regional Office
August 2016	Organisation of inception workshops and training of stakeholders on BNA methodology and determinants of IMAM coverage.
Sept-Dec 2016	Data collection by regional task force teams Data analysis by the consultant
Apr-Oct 2016	Dissemination of findings Causal analysis Validation workshops Work plan development to address identified bottlenecks

1. Active case-finding: through community volunteers who regularly screen and monitor all young children so that cases of malnutrition can be identified early and treated immediately.

2. Screening and triage: children with moderate acute malnutrition (MAM) and uncomplicated severe acute malnutrition (SAM) are treated at home, while those with existing serious medical conditions are referred to stabilisation centres (SCs) located in district hospitals. Children from SCs are discharged back to the community for follow-up in community-based facilities.

3. Community-based facilities: provide care and treatment to children and their caregivers close to their own communities through a network of outpatient therapeutic programme (OTP) and targeted supplementary feeding programme (TSFP) facilities based on established criteria.[1] The former provide care and treatment for uncomplicated SAM, while the later provide treatment for MAM. Children discharged from the OTP are sent to the TSFP for consolidation of their nutrition status to avoid relapse. When no TSFP is available, carers are advised to bring the child back to the OTP if their status deteriorates.

4. Building community capacity and resilience: The IMAM programme works with communities through trained community health workers (CHWs) to identify and prevent acute malnutrition. This helps to enhance participation in and ownership of the programme.

Methods

The BNA was a consultative and participatory process consistent with the objective of promoting and building the capacity of the government and partners in the scale-up of the treatment of acute malnutrition. The process was jointly led by UNICEF, WFP and the Somalia Nutrition Cluster in collaboration with health authorities of the Federal Government of Somalia (FGS), Puntland and Somaliland. The BNA process consisted of four distinct stages (Figure 1) carried out over 16 months (June 2016 to October 2017).

Definition of standards

Supply determinants were defined as the inputs required to deliver IMAM services, subdivided into: i) commodities (using tracer commodities of ready-to-use supplementary food (RUSF) and ready-to-use therapeutic food (RUTF)[2]); ii) human resources (facility-based health workers); and iii) geographic access and community outreach (trained community-based volunteers). On the demand side, determinants were subdivided into: a) utilisation; b) continued utilisation; and c) effective coverage (quality) (Tables 1, 2 and 3). While Sphere standards are calculated using the denominator of the actual numbers of children enrolled into the programme, BNA indicators are calculated based on the estimated burden. This is based on the principle of equity; i.e., that all children in need (the entire burden) should receive treatment.

Causality analysis

On completion of the initial analysis, three separate five-day validation workshops were conducted in Somaliland, Puntland and Mogadishu. During the validation workshops a review of bottlenecks was conducted through a systematic analysis of determinants of effective coverage.

The causality analysis phase was followed by the development of action plans to address the identified root causes of the bottlenecks. Thus, the major outcome of the causality analysis workshops was the development of zonal specific action plans with realistic targets and indicators to measure progress.

Key findings and actions

For geopolitical purposes, the analysis is based on the three administrative entities of Somaliland, Puntland and FGS. Figures 2, 3 and 4 report data as defined in Tables 1, 2 and 3. Percentage figures relate to indicators calculated as per Tables 1 and 2; colour coding relates to the thresholds described in Table 3.

Somaliland

On the demand side, effective coverage was identified as poor for MAM because, despite a good initial uptake (83.7%), coverage fell to 59.8% – 23.9 percentage points above the acceptable <3% point threshold (Figure 1). For SAM, effective coverage was fair, falling within a 3 to 8 percentage points drop from initial utilisation. Overall, on the demand side, the IMAM programme in Somaliland has a good reach and retention of children with MAM, with 83.7% of the total MAM burden admitted and 81.3% of them completed treatment. The SAM programme had a poor reach, with only 18.7% of the total burden enrolled for treatment. Continuous utilisation (programme retention) was a major bottleneck for SAM, evidenced by only 18.1% of the estimated burden completed treatment.

During the reference period, 62% of OTPs and 35% of TSFPs did not experience stock-outs of RUTF and RUSF respectively. However, as per BNA thresholds, the indicator for RUSF was poor compared to the desired >80% of facilities that should not have stock-outs. The same indicator for RUTF was fair at 62% of sites that did not experience stock-outs compared to the desired threshold of >80%.

The shortage of service providers trained on IMAM guidelines is another common bottleneck and was rated as poor, with only 15% and 36%

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[1] OTP admission criteria: Bilateral oedema + OR ++ and/or mid-upper arm circumference (MUAC) < 115mm and/or weight-for-height z-score (WHZ) <-3 and pass appetite test and no medical complications. OTP discharge criteria: WHZ > -2 ; MUAC > 125 mm and no oedema for two consecutive visits (= cured); absent for three consecutive visits (=defaulted). TSFP admission criteria: No bilateral oedema; MUAC ≥ 115mm - <125mm; WHZ ≥ -3 - < -2. TSFP discharge criteria: WHZ -2; and MUAC > 125 mm for two consecutive visits (=cured); absent for three consecutive visits (=defaulted).

[2] Therapeutic milk was not included in the analysis; the consensus was to focus on RUTF and RUSF only as tracer commodities.

Table 1 — Indicators and data sources for supply determinants

Determinant	Indicator	Data sources
Commodity	% of health facilities that did not have stock-outs of RUTF for 2 or more weeks in the last 12 months or RUSF for 4 or more weeks (1 July 2015 to 30 June 2016)	Implementing partner sock reports supply distribution reports monitoring and supervision reports
Human resources	% of health and nutrition workers who have been trained on IMAM in the last 12 months (1 July 2015 to 30 June 2016)	Information from health facilities and IMAM sites
Geographical access	% of health sites offering SAM management services (OTP) and MAM management services (TSFP) in the last 12 months (1 July 2015 to 30 June 2016)	Information from health facilities, IMAM sites and IMAM database
Community outreach	% of CHWs trained on screening for acute malnutrition in the last 12 months (1 July 2015 to 30 June 2016)	Information from health facilities and IMAM sites

Table 2	Performance indicator thresholds (set in consultation with MoH and partners)						
Categories	Commodities (RUTF/RUSF)	Human resources (clinicians)	Geographical access (OPD)	Outreach (CHWs)	Initial utilisation	Continuous utilisation	Quality/effective coverage
Good	≥80%	≥60%	≥60%	≥80%	≥50%	<2% drop from initial utilisation	<3% drop from initial utilisation
Fair	50-79%	49-59%	49-59%	60-79%	40-49%	2-5% drop from initial utilisation	3-8% drop from initial utilisation
Poor	50%	<40%	<40%	<60%	<40%	>5% drop from initial utilisation	>8% drop from initial utilisation

Table 3	Indicators and data sources for demand determinants	
Determinant	Indicator	Data sources
Initial utilisation	% of children 6-59 months admitted to SAM/MAM management services (out of the estimated burden) in the last 12 months (1 July 2015 to 30 June 2016)	OTP/SC/TSFP databases
Continuous utilisation	% of children 6-59 months who did not default from SAM/MAM management services (out of the estimated burden) in the last 12 months (1 July 2015 to 30 June 2016)	
Quality/ effective coverage	% of children 6-59 months cured from SAM/MAM management services (out of the estimated burden) in the last 12 months (1 July 2015 to 30 June 2016)	

of service providers trained on MAM and SAM management respectively against the required national standard of >80%.

Geographic coverage was found to be good and above the national standard of >70% for both MAM and SAM services. This level of geographic coverage – 71% for MAM and 79% for SAM in Somaliland – could be attributed to the effective integration of the two programmes and the relatively better security situation enabling humanitarian access to the area. However, the initial utilisation (18.7%) reflects poor access of the population to SAM treatment services.

Regarding outreach activities, only 44% of volunteers are trained on IMAM. However, although outreach coverage is sub-optimal compared to the cut-off (70%), it is a good indication of integration of both programmes, since the same proportion of volunteers were trained to screen for both MAM and SAM.

Key actions
Overall, stakeholders agreed to develop work plans to increase the proportion of services providers and CHWs trained on IMAM. To achieve this, the root causes to be addressed include the weak supply-chain system for commodities, inadequate integration of MAM and SAM training, high turnover of health workers, inadequate supportive supervision of volunteers, and the disproportionate distribution of health workers between urban and rural hard-to-reach areas.

Puntland
Coverage for both MAM and SAM treatment was rated fair, since they fell within a 3 to 8 percentage points drop from initial utilisation (Figure 2). Initial utilisation and continuous utilisation for MAM were both rated good at 87.9% and 86.9% respectively. For SAM, initial utilisation was fair at 41.1%, while continuous utilisation (programme retention) was fair, rated 38.4%.

On the supply side, stock-out of commodities was found to be a common bottleneck in both programme components. Only 12% and 49% of TSFPs and OTPs respectively did not experience stock-outs of IMAM commodities. The availability of health workers trained on IMAM was rated poor for MAM (17.5%), but fair for SAM (57.7%). The outreach indicator for both MAM and SAM was rated good at 87.5%, which is reflective of a good level of training of CHWs. While geographic coverage for SAM was fair at 67%, the same indicator for MAM was poor at 46%. The low uptake relative to geographic coverage may reflect inadequate case-finding and follow-up by CHWs and inadequate communication between facility-based health workers and CHWs.Key actions: The task force for Puntland developed an action plan to address the root causes, which include the improvement of the capacity of service providers in supply-chain management cycle, planning, quantification, monitoring and reporting. Specifically, there is a need for harmonised supply-chain management tools for nutrition to be integrated in the logistics management information system (LMIS) under development with support from the Global Fund. A database to track and monitor the training of service providers and their equitable deployment to urban and rural settings was identified as a priority. To improve geographic coverage, the task force developed a plan to integrate both MAM and SAM in functional maternal child health facilities as an immediate priority.

Federal Government of Somalia
On the demand side, effective coverage for FGS was poor for MAM, with a more than 8 percentage point drop from initial utilisation (Figure 3). The same indicator for SAM was rated fair, with a 6.7 percentage point drop from initial utilisation. Initial and continuous utilisation for MAM were over and above the standard thresholds at 91.6% and 90.3% respectively. For SAM, initial utilisation (programme enrolment) was fair at 48.3%, while continuous utilisation (programme retention) was 46%.

On the supply side, stock-out of commodities was fair for both SAM and MAM, with nearly 67% of TSFPs and 56% of OTPs that did not experience stock-outs of RUSF and RUTF respectively. The availability of health workers trained on IMAM and geographic coverage of services constituted a major bottleneck for MAM at 19.9% and 43.3% respectively. For SAM, the availability of trained health workers and geographic coverage were rated good at 84.7% and 74.9% respectively.

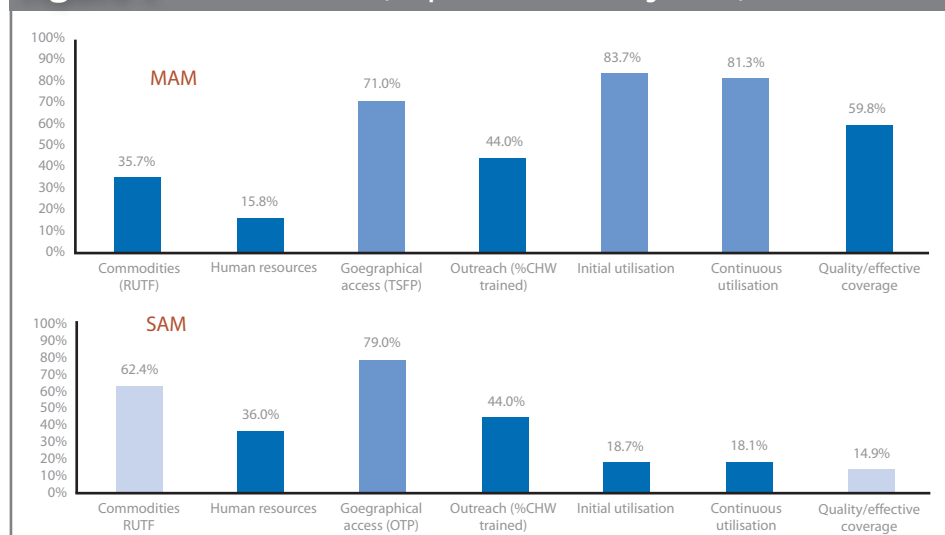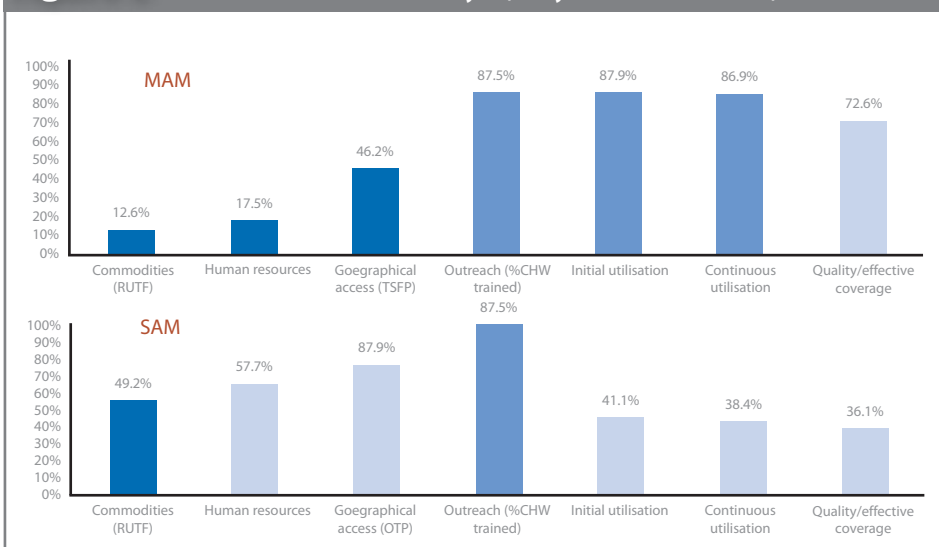| Figure 1	Somaliland IMAM BNA (1 September 2015 to 31 August 2016)

Figure 2 Puntland IMAM bottleneck analysis (1 July 2015 to 30 June 2016)

Although outreach coverage for SAM was above the national threshold at 80.3%, the enrolment of children with SAM into the programme (initial utilisation) remained fair at 48.3% compared to the recommended ≥50% of the total SAM burden. By comparison, while MAM outreach was rated fair at 79.6%, the enrolment (initial utilisation) of MAM children into the programme was good (91.6%).

Key actions: Priority actions to address identified bottlenecks included strengthening the supply-chain management system to prevent commodity pipeline breaks in hard-to-reach areas. This includes increasing the capacity of service providers on planning, quantification, storage capacity and buffer-stocking. Other actions include reviewing the current coverage of SAM and MAM treatment in terms of geographic access, developing service plans for all the accessible areas, integration of SAM and MAM treatment in health services, and strengthening integration of training on both SAM and MAM.

Lessons learnt
Strategic lessons learnt
Despite the challenging geopolitical landscape, Somalia succeeded in working collaboratively to complete this BNA. All parties involved agreed to integrate specific activities into their respective work plans to address the identified root causes.

While the treatment of acute malnutrition is premised on integration along the continuum of care of MAM and SAM, the BNA findings showed sub-optimal coverage and integration of the two programme components. This is exemplified by the differing uptake of SAM and MAM services; if the two programs were well integrated, they would achieve similar outcomes. Key root causes include but are not limited to: i) lack of a common definition and standards for integration; ii) absence of a harmonised supply-chain system for IMAM commodities; iii) lack of a centralised system to recruit and track the deployment of human resources for nutrition; iv) limited geographical coverage of

IMAM services; and v) insufficient community involvement in IMAM. The BNA therefore recommends the development of a comprehensive nutrition strategy[3] to address the identified root causes.

Geopolitical context
To overcome the challenges related to the geopolitical sensitivities, the BNA was conducted and presented in three separate zones: Somaliland, Puntland and FGS. While this approach worked in the short term, it created many logistical and resource challenges. First, organising separate workshops for the inception and training, dissemination and causality analysis increased time and costs. Second, the BNA failed to reach a common consensus on the data collection reference period. While Puntland and FGS agreed on the reference period 1 July 2015 to 30 June 2016, Somaliland opted for 1 September 2015 to 31 August 2016. Third, data collection and analysis for the regions disputed between Puntland and Somaliland (Sool and Sanaag regions) was a major bottleneck, because data from districts falling within these areas was reported by both Somaliland and Puntland.

Humanitarian situation
Overall, IMAM service delivery in Somalia is challenged by several factors, including the complex humanitarian landscape; conflict dynamics; geopolitical sensitivities; capacity; access to communities in hard-to-reach areas; demographic shifts; and displacement and the trend towards urbanisation. The conflict and insecurity is more accentuated in Central South region, which compromises humanitarian access and consequently impacts negatively on the quality and coverage of service delivery, as observed in this BNA. Because of the relatively better humanitarian access in Somaliland and Puntland, the BNA results showed a relatively better integration and geographic access in the two regions compared to the Central South Region.

National nutrition cluster IMAM database
The availability of an integrated SAM and MAM cluster database saved time and money in collecting the necessary data for the analysis. The strong coordination mechanism established by the Nutrition Cluster enabled collaboration of partners to collect and submit missing data on demand, which was not available in the cluster database. The creation of regional task-force teams to vet and validate data before submission to the consultant for analysis enhanced local ownership of the process and results.

Multi-disciplinary involvement
The determinants of effective coverage for IMAM cut across a wide range of disciplines and key players, including the health management information system (HMIS), infant and young child feeding (IYCF), donors, LMIS, C4D, community volunteers and representatives of programme beneficiaries. This BNA did not fully benefit from that wide range of expertise across the relevant disciplines because some of them could not commit to attending the different zonal workshops. Future BNA should endeavour to involve the

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3   As of writing, the strategy is in early stages of development, the process having slowed due to prioritisation of the pre-famine response in Somalia.

Figure 3 Central South Regions FGS IMAM bottleneck analysis (1 July 2015 to 30 June 2016)
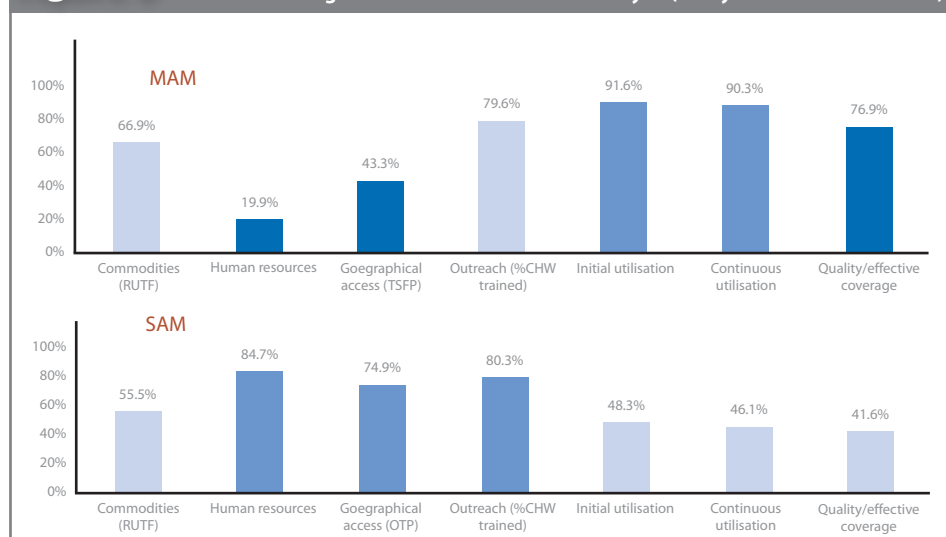
corresponding multi-disciplinary team, encompassing a diversity technical skills along the spectrum of the determinants of effective coverage; enabling environment, supply and demand.

Identification of the root causes of bottlenecks

The BNA recommends the use of the 'fish bone' method of analysis and the corresponding minimum five '5xWHY' to drill down on root causes of bottlenecks.[4] However, for Somalia, this method did not prove very effective in guiding participants to think 'out of the box'. Similar challenges related to the 5xWHY technique were reported in Malawi BNA (2014). Because of the critical nature of this step, to get the most out of the participants the 'brainstorming' method was used instead. Using 'sticky' cards, participants were grouped per bottleneck and, based on their work experience, requested individually to note one root cause per card for up to five different causes pertaining to a specific bottleneck. Participants were able to clarify their thoughts and ideas and provide better inputs when encouraged to write and express themselves in Somali. During the plenary sessions the cards were pinned on the wall and thereafter clustered into common themes translated in English with the help of a skilled facilitator.

Recommendations

IMAM scale-up strategy and costed operational plan of action

This BNA is part of the broader Somalia strategy to scale up IMAM, which includes the ONA[5] online information management system dashboard, rationalisation plan III, human resource capacity development (HRCD) strategy and geotagging. The IMAM scale-up strategy and a corresponding costed roll-out plan should define the specific actions required to address the bottlenecks related to frequent stock-out of commodities (a supply-chain analysis and plan was initiated), inadequate supply of skilled service providers, low geographic access to services, and sub-optimal demand and utilisation of services.

Short-term targets

While the scale-up strategy and the costed operational plan are under development, MoH and partners can take actions on the identified bottlenecks to achieve quick results; notably,

strengthening and integrating the required data into existing institutional systems, including the HMIS and LMIS database. In addition, the development of the human resources dashboard to enable the deployment and tracking of an equitable distribution of skilled staff is critical. The ongoing roll-out of DHIS2 across Somalia provides an opportunity to achieve this objective.

The human resource situation in nutrition

The current nutrition workforce is largely employed by the humanitarian actors, whose ability to attract and hire qualified staff largely depends on availability of donor funding. While this problem can be solved in the short-term through regular refresher training, the high turnover of NGO staff due to fluctuating funding will frustrate those efforts. A long-term human resource capacity-development strategy is therefore required, including the integration of IMAM in pre-service training curricular and a system to recruit, retain and track the equitable deployment of skilled staff in rural and urban settings. To ensure sustainable, in-service training and capacity-building, the BNA recommends the creation of IMAM centres of excellence, in collaboration with academic institutions.

The concept of TSFP and OTP integration

Ideally, MAM and SAM treatment should occur along a continuum of care, thus enabling the seamless transition of patients across the different components of the programme. However, there is no standard guidance on what the scope of integration entails. Because of this observed lack of integration, minimum standards for integrated service delivery were developed and recommended (see Figure 4).

Conclusions

In the time since this analysis was carried out, progress on recommendations has been slightly slower than originally anticipated due to the pre-famine response of 2017-2018, which took precedence over some other planned activities. Nevertheless, even during this phase, substantial progress has been made on the integration of MAM and SAM treatment, with a majority of nutrition sites delivering both MAM and SAM treatment using one partner by 2019 (although,

in some cases, this was done in adjacent facilities). Integration of nutrition services with health services has also progressed substantially, allowing for greater efficiencies. For example, in the joint WFP/UNICEF project in the south, supported by KfW (German Development Fund), all TSFP and OTPs are integrated and delivered by the implementing partner. In the north, about 75% of IMAM facilities are integrated.

Additionally, a long-term human resource development strategy has been finalised (although dependence on NGO actors remains as high as ever, due to limited budgets apportioned to the Federal MoH to support a strategy roll-out). The concept of a centre of excellence (CoE) for training remains of great interest to FGS, under the championship of the Scaling up Nutrition (SUN) Focal Point based in the Office of the Prime Minister. A costed business plan for the CoE is in final draft stages; although again reliable sustainable resources will be a challenge to implementation. Training remains largely in the hands of UN agencies for both funding and execution, albeit under the strong leadership of the FMoH.

Progress on integrating the nutrition data into the HMIS2 has picked up pace recently, under the leadership of the FGS. Nutrition stakeholders have held detailed review workshops of the current nutrition data for eventual inclusion into DHIS2 system, aligning its work with the work of the health sector, which is undertaking a similar revision exercise. Full integration of ONA into DHIS2 is expected by the fourth quarter of 2019 at the latest.

Less progress has been made on integrating nutrition supply into LMIS although, here again, nutrition can benefit from the work of the health sector in terms of aligning with its budgets and timelines.

Overall, this exercise has proved that it is feasible to conduct BNA for both MAM and SAM in humanitarian situations. Partners are encouraged to integrate key recommendations of this report into their respective workplans. The following ongoing strategy, policy and advocacy processes should also benefit from the recommendations of this report: i) a multi-sector recovery and resilience framework (RRF) that includes funding streams; ii) a national development plan (NDP); iii) a common results framework (CRF) for scaling up nutrition (SUN); iv) a joint health and nutrition supply-chain strategy; v) IMAM guidelines; and vi) Somali nutrition strategy development.

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[4] This is a BNA tool used in the analysis of the root causes on public health problems: www.cms.gov/medicare/provider-enrollment-and-certification/qapi/downloads/fishbonerevised.pdf

[5] ONA is a brand name for the online cluster reporting system

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Figure 4 — Minimum requirements for MAM and SAM integration

Enabling environment	Supply	Demand	Quality
National IMAM guidelines aligned to WHO (2013) recommendations are in use National IYCF counseling tools adapted to Somalia are in use	Same IP for TSFP & OTP operating under the same roof OR Different IPs but OTP and TSFP located ≤3km apart (GPS required) IP staff trained on both MAM and SAM in the last 1 year Community workers trained on both MAM &SAM screening and referral in the last 1 year Zero stock out of RUTF & RUSF	Community workers screening for both MAM and SAM (Mothers' MUAC) Standardised community referral forms are in use Minutes of quarterly gatherings of IPs with community workers are available	IP submitting program reports to the national online ONA platform IP represented at quarterly subcluster review meetings to conduct joint situation analysis

Management of severe acute malnutrition by community health workers: Early results of Action Against Hunger research

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Community Health Worker in Kita performing the appetite test with children under five, Kita District, Mali, 2016

Location: *Mali, Niger and Mauritania*

What we know: Integrated community case management (iCCM) is a strategy that capacitates community health workers (CHWs) to treat illness in children. Integrating severe acute malnutrition (SAM) treatment should strengthen continuum of care between health and nutrition.

What this article adds: Action Against Hunger is examining a treatment model that utilises CHWs to provide SAM services to children age 6-59 months in the community. Research is recently completed, ongoing and planned in Mali (2014-2016), Niger and Mauritania (2017 to 2019) and Senegal (planned). Phase 1 results from Mali showed cure rates of 94.2% in three intervention health facilities (using 19 CHWs), compared to 88.6% in four control health facilities. Defaulter rates were twice as high in the control group and coverage was twice as high in the intervention group. Quality of care was good, most children were clinically assessed appropriately and the intervention was cost-effective, particularly for beneficiary households. Phase 2 research in Mali compared two different levels of training and supervision of CHWs to standard care (control) to assess inputs needed for scale-up. Preliminary results from phase 2 indicate raised standards of care using the CHW model. Full results, and the Niger and Mauritania studies, are forthcoming in 2019. Implementation challenges included poor treatment availability for moderate acute malnutrition and negative impact of emergencies on both facility and CHW capacities.

Background

Integrated community case management (iCCM) is a strategy that aims to improve access to essential health services by training, supporting and supplying community health workers (CHWs) to diagnose and treat multiple illnesses in children under five years old. iCCM has been described as "a missed opportunity" for the integration and increased coverage of community-based interventions to prevent and treat uncomplicated severe acute malnutrition (SAM) (Friedman and Wolfheim, 2014).

Action Against Hunger is currently implementing a treatment model that integrates the management of SAM into iCCM to increase coverage and treatment quality (also known as the 'C-project'). The model utilises CHWs to provide SAM services in the community, including behaviour change communication, screening and treatment of SAM without medical complications. The approach aims to ensure a continuum of care for each child age 6-59 months with SAM through the management of multiple illnesses (malaria, diarrhoea and pneumonia), alongside acute malnutrition management, between multiple levels (community and hospital/facility). The approach also aims to strengthen existing health systems and build the capacity of Ministry of Health (MoH) personnel on data collection, monitoring and evaluation, and supply chain management, to ensure programme sustainability.

A recent review of current evidence on the effectiveness of CHWs treating SAM included 18 studies, covering pro-

grammes in nine countries where CHWs were reported to have played an active role in the provision of SAM treatment (López-Ejeda *et al*, 2018). Results showed that CHWs have the potential to improve early detection and treatment of SAM, thereby reducing risk of medical complications. However, results were achieved by small projects supported by non-governmental organisations, with little evidence on the implementation of these approaches at scale. Outstanding research questions identified in this and another review (Friedman and Wolfheim, 2014) include:

- What works, for whom, under what circumstances and how?
- How can nutrition best be incorporated into existing governing policies? And how can health systems best be strengthened to support programming?
- How can SAM treatment protocols be simplified to apply to low-literacy CHWs?
- How should MAM cases be managed (since there are no standard protocols for MAM treatment)?
- What is the minimum level of training and supervision required by CHWs to provide SAM treatment and still meet the Sphere quality standards?
- How much work/how many tasks can one CHW absorb and what is feasible for a CHW to do in addition to other iCCM tasks?
- How can the supply of ready-to-use therapeutic food be ensured?
- What remuneration/motivation is needed by CHWs to deliver services and how can this be sustained?

To address these questions, Action against Hunger has developed a research strategy on iCCM and nutrition. The three axes of the strategy are: generation of evidence on the approach; dissemination of results and communication; and advocacy on the basis of findings at national, regional and international levels. This will be achieved through a series of pilot studies, validation of the intervention model and support for scale-up. This article shares research completed, underway and planned, including first and second phase studies in Mali, pilot studies in Mauritania and Niger, and plans for research in Senegal. Experiences are also shared from implementation.

Methods

Pilot studies in Mali, Niger and Mauritania

From 2014 to 2016 ACF implemented an observational, prospective cohort study in partnership with the Ministry of Health (MoH) in Mali, the Institute National de Recherche et Santé Publique (INRSP) and the Innocent Foundation, to explore whether CHWs could successfully treat SAM in Kita, Kayes region, Mali. The study (phase 1) aimed to discover whether SAM treatment delivered through CHWs was as effective (cured, defaulter and death ratios) as SAM treatment delivered at Centre de Santé Communautaire (CSCOM, Community Health Facilities) and whether the model can increase coverage.

Two similar studies were undertaken from 2017 to 2019 in Mayahi district, Niger, in collab-

oration with the MoH and Centre National de Recherche Medical (CERMES), with funding from the USAID Office for Disaster Assistance (OFDA) and in Guidimakha region, Mauritania, funded by the same donor in partnership with the MoH, Institute National de Recherche et Santé Publique and l'Université de Nouakchott Al Asriya.

Details of control and intervention groups for each study are provided in Table 1. For all three studies, children aged 6-59 months were admitted according to national protocols in each country using mid-upper arm circumference (MUAC) < 115cm, or weight-for-height z-score (WHZ) <3, or bilateral oedema and consent given by parents. Children in all three studies were followed up once per week over six to eight weeks until full recovery, reaching discharge criteria of MUAC >125mm or WFZ >1.5 and no oedema during two consecutives visits. In all three sites children identified as having SAM with medical complications before the study, or treatment failure during the study, were referred to the nearest stabilisation centre.

Coverage assessments using SQUEAC methodology were carried out at the start of each study and have been carried out at the end of the studies in Mali and Niger (yet to be undertaken in Mauritania). Quality of care was analysed in Mali through direct observation by trained enumerators using checklists, rediagnosing the cases admitted for treatment, and reviewing admissions cards and registers. Quality of care was defined as the capacity of the CHWs to evaluate, classify and treat cases of uncomplicated SAM, provide nutrition counselling to caretakers of children receiving treatment for SAM, malaria, pneumonia or diarrhoea, and to correctly refer cases of complicated SAM. Cost-effectiveness analysis was undertaken in Mali and will be undertaken in Niger and Mauritania in May/June 2019.

Mali validation model

According to Mali's national policy, the training package for CHWs in the iCCM programme is 18 days, including one day of training in the management of malnutrition. According to the same protocol, CHWs should be supervised monthly by the nurse responsible for each health facility and every three months by the district focal point. To assess how much more training and supervision is needed to scale up implementation successfully, a second study phase was carried out in Mali with the same partners from 2017 to January 2019. A prospective non-randomised implementation study was undertaken to compare outcomes (cured, defaulter and death ratios) for the three different models of training and supervision for CHWs. The study was carried

out in the Kayes region in three districts (Kita, Kayes and Bafoulabe) through 135 health facilities with 169 CHWs. In the control group in Bafoulabe, nurses managed health facilities and CHWs managed SAM with no external support, compared to the intervention groups where support was provided to nurses and CHWs by Action Against Hunger to a moderate level (Kayes) or intensively (Kita). All three groups implemented the community management of acute malnutrition (CMAM) Mali national protocol (with the same admission criteria, discharge criteria and follow-up as phase 1). CHWs used the admission criteria of MUAC and bilateral pitting oedema only.

A cross-sectional study was also carried out over one month to evaluate the use of time and workload of 144 CHWs in each of the three models. A self-administered questionnaire was used to collect information related to curative, preventive and other actions of CHWs. Semi-structured interviews with key actors at district-level and focus group discussions in the community were undertaken to complement the study. A cost-effectiveness analysis of the three models was also undertaken using the same methodology as that in phase 1.

Results to date

Results are available so far from the Mali studies only. During the first phase in Mali, 699 children were admitted to the intervention group and 235 children to the control group. The intervention group reported cure rates of 94.2% compared to 88.6% in the control group (risk ratio 1.07 [95% CI 1.01; 1.13]). Defaulter rates were twice as high in the control group compared to the intervention group (10.8% vs 4.5%; RR 0.42 [95% CI 0.25; 0.71]). Coverage assessment carried out in December 2015 using SQUEAC methodology revealed coverage rates of 86.7% in the intervention group compared to 41.6% in the control (p< 0.0001) (Álvarez Morán *et al*, 2018a).

Results of the quality of care assessment revealed that most children (97.6%) were correctly assessed for the presence of major clinical signs (cough, diarrhoea, fever and vomiting). MUAC circumference was correctly assessed in 96.8% of children and oedema was correctly assessed in 78.4%. The composite indicator, which includes all essential tasks to provide high-quality treatment, was achieved in 79.5% of cases (Álvarez Morán *et al*, 2018b).

The cost-effectiveness analysis found that delivery of treatment by CHWs is a cost-effective intervention. A major benefit of this strategy is the lower cost incurred by the beneficiary household when treatment is available in the community. This study found that weekly costs to beneficiary households for CHW-delivered care were three

Table 1	Overview of control and intervention groups in pilot studies in Mali, Niger and Mauritania

Study	Control group	Intervention group
Mali 2014-2016	4 health facilities	19 CHWs at 3 health facilities
Niger 2017-2019	5 health facilities	10 CHWs at 6 health facilities
Mauritania 2017-2019	6 health facilities	12 CHWs across 14 health facilities

times lower than facility-delivered services (USD0.60 and USD1.70 respectively). Moreover, each visit to the CHW took half the time required for a facility visit (Rogers *et al*, 2018).

In the second phase of the Mali study, more than 1,400 children with SAM were enrolled across the three study arms. Preliminary results show raised standards of care; however, full analyses of effectiveness and coverage are ongoing and will be published in 2019.

Results of the cost-effectiveness analysis and workload of CHWs study will be available in 2020. Results from the Niger and Mauritania studies, including effectiveness, coverage and cost-effectiveness, are also forthcoming.

Implementation experiences

Management of moderate acute malnutrition

In some contexts, due to the inability of the health system to absorb MAM cases, CHW services have been extended to provide a level of care to children with MAM in addition to those with SAM. In Mali, MAM management is under the responsibility of the Nutrition Directorate of the MoH and should be treated using ready-to-use supplementary food (RUSF). However, there are national-level difficulties with RUSF supply, and areas in the north of the country are prioritised so that stock is not available in most of the study areas. As a result, CHWs are required to promote breastfeeding and dietary diversification and request caregivers to return with MAM children in two weeks for follow-up.

In Mauritania, MAM management is under the responsibility of the Ministry of Social, Childhood and Family Affairs (MASEF), distinct from the Health and Nutrition Directorate of the MoH, which is responsible for SAM treatment. MASEF runs nutrition activities that focus on behavioural change communication, but it is unclear to what extent RUSF is available for MAM children. During the study, only a few health facilities had regular supplies of RUSF, resulting in insufficient coverage of MAM treatment. In these cases, CHWs promoted breastfeeding and best practices in complementary feeding to caregivers of MAM children.

Emergency contexts

Another complicating factor in implementing our approach is the emergency context where we carried out our interventions. Humanitarian crises are present in some areas of each of the countries studied, which are marked by severe restrictions on movement due to insecurity. The impact on the health system is dramatic in terms of infrastructure (hospitals, health centres and supply chains), as well as the availability of human resources and community volunteers, who are the bedrock of this approach.

There is increasing evidence on the use of family MUAC, whereby caregivers are trained to used MUAC to detect and refer SAM cases to local health facilities for treatment. Evidence suggests that this approach can enable effective and timely detection of children, to the same level of quality as community volunteers, leading to fewer hospitalisations and greater coverage

(Blackwell *et al*, 2015). This may provide an opportunity to overcome the short supply of community workers who can engage in screening in emergency contexts.

Discussion

Evidence from the first phase of the Mali study demonstrates increased programme effectiveness and coverage for SAM treatment. On this basis, the Mali MoH has since adapted two policies to support programme scale-up: i) integration of SAM treatment into the primary health package (2015. Guide de la mise en œuvre des Soins Essentiels dans la Communauté. (SEC)); and ii) integration of SAM treatment with CHWs into the CMAM protocol (2017. Protocole de Prise en Charge Intégrée de la Malnutrition Aiguë au Mali).

Pilot studies carried out in other countries have also demonstrated effective SAM treatment by CHWs, all attaining above-Sphere Standards of a 75% cure rate. In Angola, 23,865 children were treated in a CMAM programme using CHWs with cured rates of 93.8% (Morgan *et al*, 2015). A prospective cohort study in Bangladesh examining the effectiveness of adding the diagnosis and treatment of SAM to the community case management package delivered by CHWs demonstrated 91.9% cured rates among 724 children (Sadler, 2011). A study in South Sudan of the impact of integrating SAM management into iCCM using CHWs demonstrated 89% cure rates among 3,564 children (Keane, 2013). Ethiopia, the only country implementing this intervention at national level, has demonstrated dramatic increases in the numbers of SAM cases treated annually between 2002 and 2012 (18,000 to 230,000; more than twelvefold), as well as considerable increases in geographic coverage and cure rates among 703,878 children of 82.1% (UNICEF, 2012).

Once published, results from the Niger and Mauritania pilot studies will add to this evidence base and will show how the intervention can be adapted to suit specific contexts with different policies and different profiles of CHWs. For example, in Niger, CHWs are part of the health pyramid, have formal health education and receive regular government salaries; whereas in Mauritania they are volunteers with a lower level of education. Several publications have already shown the importance of regular supervision to contribute to the quality of care and motivation of CHWs. The second phase of the Mali research will help identify the most efficient model for providing this to enable scale-up and identify other research gaps.

More research is needed on options to improve coverage of this programme, such as the improvement of referral systems at community level and the use of family MUAC (known also as MUAC for mothers or mother-MUAC), through which mothers and caregivers are trained to detect early signs of malnutrition in the home. There is evidence that suggests that family MUAC enables effective and timely detection of children, leading to fewer hospitalisations and greater service coverage (Alé *et al*, 2016), but this needs further exploration.

Another important area of research is coverage of MAM in the context of erratic supply of

RUSF in different countries. There is emerging evidence on the integration of SAM and MAM into the same protocol; for example, a study by Morgan *et al* (2015) in Angola that showed that a combined protocol achieved 93.8% recovery. In addition, a randomised control trial at health-facility level in post-conflict Sierra Leone demonstrated 71% coverage and 83% recovery for a combined protocol, compared to 55% and 79% in standard care (Maust *et al*, 2015). SAM children receiving integrated management recovered faster, resulting in lower spend on RUTF (USD36 vs. USD68 per case treated), while the cost for MAM was the same for both standard and integrated care (USD12). Authors recommend this model as an alternative in humanitarian crises where there are time and logistics constraints and because delivery is simplified using MUAC-only criteria. A similar study ('ComPAS') is currently being implemented in South Sudan and Kenya, with results forthcoming (Bailey *et al*, 2018). More research is needed in this area, including the potential for CHWs to expand their remit into MAM as well as SAM treatment and prevention. Irrespective of CHW capacity and time for case management, ensuring availability of RUTF supply for an expanded caseload will be a key determining factor of successful service delivery.

The work of Action against Hunger in the west Africa region continues to focus on tackling systematic peaks of malnutrition, reducing structural vulnerability to undernutrition, and advocating for community and government ownership and commitment. Work continues to generate more evidence related to these issues to contribute to the global evidence base in the fight against malnutrition.

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Defining and treating "high-risk" moderate acute malnutrition using expanded admission criteria (Hi-MAM Study):
A cluster-randomised controlled trial protocol

Lead mothers after their training on how to implemented the "Mother Support Group" programme for caregivers of MAM children in the Hi-MAM study, 2018

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Location: *Sierra Leone*

What we know: There is a lack of a global guidance on moderate acute malnutrition (MAM) treatment and a weak evidence base to inform its development.

What this article adds: A cluster-randomised controlled trial is underway in Sierra Leone on a select subset of uncomplicated MAM children aged 6-59 months considered at high risk of deterioration to severe acute malnutrition (criteria: MAM and MUAC<11.9 cm, or mother not being the main caregiver, or not breastfed, or weight-for-age z score <-3.5). Intervention clinics will integrate treatment of high-risk MAM children into the outpatient therapeutic programme and refer 'lower risk' MAM children to nutrition counselling via mother support groups (MSGs). The intervention will be compared to control clinics where all MAM children will receive the current recommended treatment of nutrition counselling through MSGs. Target sample is 880 children enrolled from 22 clinics (clusters). Study recruitment began in November 2018 and is continuing in 2019. Follow-up will end in early 2020 and study results are planned for mid-2020.

Background

Around 8% of children under five years old are acutely malnourished worldwide (Development Initiatives, 2018). Children with severe acute malnutrition (SAM) experience an increased number of infectious diseases, delayed cognitive development and decreased adult stature and productivity (Bhutta *et al*, 2017). Since 2007 the United Nations agencies have recommended home-based therapy with ready-to-use therapeutic food (RUTF) for the treatment of uncomplicated SAM; however, there is currently no consensus on how best to treat moderate acute malnutrition (MAM).

In 2017 the World Health Organization (WHO) recognised the current lack of global guidelines for the treatment of MAM and called for more evidence in this area to inform policy (WHO, 2017). Children currently defined as MAM (MUAC 11.5 cm – 12.5 cm) are at higher risk of mortality, morbidity and developing SAM; hence finding an effective method of supporting

Table 1
Proportion of children recovered when they have none, one or multiple "risk factors"

No. of risk factors present (mother not caretaker, not breastfeeding, MUAC 11.5-11.8 cm, WAZ -3.5 or less)	Recovery rate No. (%)
0	433/547 (79)
1	218/360 (61)
2	71/138 (51)
3	22/46 (48)

this group is important for meeting Sustainable Development Goal II (James *et al*, 2016). The current convention of treating SAM and MAM with separate interventions based on anthropometric criteria contributes to low treatment coverage; many MAM children receive sporadic food supplementation with a variety of nutrient content or nothing at all. Given sub-optimal recovery rates for supplementary feeding programmes (SFPs) for MAM (Chang *et al*, 2012), recent studies have explored treating MAM children alongside SAM cases in outpatient therapeutic programmes (OTPs). Studies in Niger, Malawi and Sierra Leone have shown improved recovery, reduced treatment duration and improved programme coverage using an integrated RUTF-based protocol (James *et al*, 2016; Maust *et al*, 2015). A further simplified protocol that treats all children with MUAC<12.5 cm using RUTF has recently been trialed in the ComPAS study (Bailey *et al*, 2018) (see summary in this issue of *Field Exchange*). Using expanded admission criteria and a single product has also been endorsed by some agencies for use in exceptional circumstances during humanitarian emergencies and protracted crises.

However, therapeutic food treatments are not without considerable cost and some worry that they pose a risk to longer-term health, particularly in light of the growing "double burden of malnutrition" (Ekelund *et al*, 2007). Therapeutic food interventions should be targeted to those at highest risk of mortality, morbidity and negative functional implications in order to maximise cost-effectiveness and have a net positive impact on long-term health and wellbeing. To help build this evidence base, a study is underway in Sierra Leone on a selected subset of MAM children considered at high risk of deterioration to SAM

based on previous programme data and clinical trials. The study aims to assess the provision of a therapeutic feeding intervention (RUTF) to "high-risk" MAM children, and support those who have a lower risk with an education and behaviour-change intervention.

Defining "high-risk" MAM cases
In order to identify high-risk children within the MAM group (MUAC 11.5 cm -12.5 cm), we analysed recent programme data for 1,099 MAM children being treated in SFPs in Sierra Leone, operated by an NGO (Project Peanut Butter). We compared means and proportions of potential, practical, risk factors between children who recovered and those who did not (died or discharged as non-response), including age at admission, sex, relation of the main caretaker, multiple vs single births, father living at home, breastfeeding status, presence of fever or diarrhoea, and anthropometry. We identified MUAC<11.9 cm, mother not being the main caregiver and not breastfeeding as simple, practical indicators positively associated with treatment failure. A study in Ethiopia also found that children with MUAC of 11.5 cm to 11.9 cm demonstrated a high likelihood of deteriorating or not recovering, when left untreated (James *et al*, 2016).

Given the recent evidence on the mortality risk of being both stunted and wasted (WaSt), we added weight-for-age z-score (WAZ) $\leq$-3.5 to the identification criteria for "high risk" (Khara *et al*, 2017). We selected this cut-off as only 53% of those with WAZ<-3.5 recovered in the SFP, compared to 65% for WAZ <-3 and 73% for WAZ>-3. Case burden to the programme was also considered. Table 1 shows the proportion of non-response when MAM children have one or multiple of these risk factors using data from current SFPs; when three of these risk factors are present, less than half of children were successfully cured. This analysis is not ideal for truly identifying children who can recover through counselling vs those who require RUTF; however, it is a logical starting point. The control group of this study, where all MAM children will be treated through counselling, will enable better identification of "high-risk" indicators, including further exploration of the inclusion and cut-off value of WAZ.

Methodology
Trial Design: This is a cluster-randomised controlled trial of 22 community clinics providing malnu-

trition support in Pujehun District, Sierra Leone. Intervention clinics will integrate treatment of "high-risk" MAM children into the OTP service, and refer "lower risk" MAM children to nutrition counselling via mother support groups (MSGs). This model will be compared to control clinics where all MAM children will receive the current recommended treatment of nutrition counselling, also delivered via MSGs. Admission to both trial arms is based on MUAC >11.4cm and <12.5cm.

Hypothesis and outcomes: We hypothesise that the intervention group will have improved recovery rates, based on MUAC, at 6 and 12 weeks post-enrolment. The intervention group will also have better sustained recovery based on MUAC at 24 weeks post-enrolment, as well as WHZ and WAZ scores closer to the global mean based on WHO growth standards, without unhealthy ratios of abdominal to peripheral subcutaneous fat levels. They will also have better cognitive development and lower morbidity rates at 24 weeks post-enrolment than the control group. Fat levels and distribution will be assessed through skinfold thickness z-scores. Cognitive development will be assessed using eye-tracking technology. Eye-tracking performance in young infants has been found to correlate with IQ and executive function at four years of age, as well as socio-emotional development at two years of age. The technology has also been validated for use in African settings, including Malawi and Sierra Leone (Forssman *et al*, 2017).

Study setting: The project will take place in Pujehun districts of Sierra Leone, Africa. The national population in 2016 was 7.3 million and approximately 43% of the population is under 15 years of age (UNDESA, 2017). Five per cent of children under five years are severely wasted and 4% are moderately wasted (SLDHS, 2013). This district was selected due to the low coverage of malnutrition support available (Valid International, 2013). The research will take place in community clinics where MAM treatment services were not available prior to the implementation of the study.

Participants: The participants will be age 6-59 months with uncomplicated MAM (based on MUAC >11.4 cm and <12.5 cm). All eligible children will be included. Children will be excluded from the study if they are currently involved in another research trial or feeding programme; have a medical complication such as oedema, severe nausea/vomiting, severe dehydration, or severe pneumonia (as defined by integrated man-

Table 2
Control and intervention protocols for the "Hi-MAM" trial

	Intervention facilities MUAC >11.4 cm and <12.5 cm		Control facilities MUAC >11.4 cm and <12.5 cm
	Low risk	High risk	
Admission criteria	MUAC 11.9 to 12.4 with no risk factors (i.e., WAZ>-3.5 and mother is caretaker and breastfeeding up to 2 years)	MUAC >11.4 to <11.9 or WAZ<-3.5 or mother is not the caretaker or not breastfeeding at <2 years	MUAC >11.4 cm to <12.5
Intervention	Nutrition education via MSGs	RUTF, amoxicillin, and nutrition education via MSGs	Nutrition education via MSGs
Dosage	N/A	1 sachet RUTF per day (525 calories)	N/A
Treatment frequency	Fortnightly	Fortnightly	Fortnightly
Discharge criteria	After participation in MSG for 6 weeks	MUAC ≥12.5	After participation in MSG for 6 weeks
Follow-up for data collection	6, 12 and 24 weeks post-enrolment	6, 12 and 24 weeks post-enrolment	6, 12 and 24 weeks post-enrolment

agement of childhood illness (IMCI) guidelines); or have a diagnosed or visible sign of developmental delay. Children defined as MAM based on MUAC (>11.4 cm and <12.5cm) but SAM based on weight-for-height z-score (<-3) will be treated for SAM and are not included in this study.

Interventions: Clinics will be randomly assigned to provide children diagnosed as MAM with either the control treatment or intervention treatment. Control treatment is MSG counselling, delivered by a respected mother in the local community. MSGs are an established programme in Sierra Leone and the current national recommended treatment for MAM children. MSGs increased recovery from MAM and SAM by 5% in Sierra Leone in previous work by this team (unpublished). The intervention treatment also incorporates mother support counselling, and for those children with high-risk characteristics (mother not caretaker, not breastfeeding and/or WAZ≤-3.5), it will include provision of one packet (525 calories) of RUTF daily and a course of amoxicillin. This provision will continue until the child has reached a MUAC > 12.4 cm or 12 weeks have elapsed. All children will be assessed for study outcomes at 6, 12 and 24 weeks after

enrolment. Further details of the control and intervention protocol are in Table 2.

Sample size: Total sample size will be 880 children enrolled from 22 clinics (clusters). A total of 20 clusters, containing 40 children each, is adequate for detecting, at 80% power and 5% significance level, an increase in recovery rates in the high-risk group from 53% in the controls to 73% in the intervention group. This estimation was based on recovery rates for MAM children in Ethiopia who received no support (James *et al*, 2016) and MAM recovery rates from programmatic data in Sierra Leone when MAM children are supported with supplementary feeding. An intra-cluster correlation coefficient (ICC) of 0.05 was assumed; a conservative estimate based on the results of a cluster randomised study testing an integrated SAM protocol in Sierra Leone (Maust, 2015). We have included two extra clusters (clinics) in case of any issues with specific sites.

Additional considerations: Adherence to nutrition counselling interventions has been an issue highlighted by previous studies and has to be considered if scaling up counselling interventions for MAM in the future (Nikièma *et al*, 2014). We

have experienced challenges in implementing a protocol which provides food intervention only to some participants; however, we strive to ensure that the nutrition education implemented via MSGs is of high quality. In addition, the regular monitoring of MAM children not receiving a food intervention should allow us to "catch" any deterioration to SAM within a few days.

Conclusion: If the intervention protocol, which expands SAM admission criteria to include "high-risk MAM" children as well, is found to be superior to the current recommended nutrition education, this could become a clear and standardised protocol for better supporting MAM children in non-emergency settings. The additional focus on outcomes beyond anthropometric recovery, such as body composition and cognitive function, will provide evidence on whether the intervention supports children towards healthy adulthood, rather than purely weight or height gain.

Study timeline: Study recruitment began in November 2018 and will continue until late 2019. Follow-up will end in early 2020 and study results are planned for mid-2020.

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Longitudinal patterns of wasting and stunting – new analysis by the Knowledge Integration (KI) initiative **Upcoming research**

The Bill and Melinda Gates Foundation's Knowledge Integration (KI) initiative has aggregated data from more than 190 studies on child growth and development. A team of scientists at University of California, Berkeley, in conjunction with the KI initiative, has completed an analysis of longitudinal patterns in wasting and stunting in the first two years of children's lives using KI-collected cohorts and trials. A series of manu-

scripts detailing the pooled analysis of wasting and stunting from cohort and trial data is forthcoming later in 2019, including an analysis of wasting incidence, recovery, and seasonality using data from 19 monthly-measured cohorts and an analysis of the causes and consequences of wasting using data from 38 cohorts and trials. Using data from repeatedly-measured children from a geographically diverse set of cohorts, they compare and contrast regional and age-

specific patterns in child wasting onset, spontaneous recovery, and associations between wasting incidence and a large set of child, parental, and household characteristics. They also estimate associations between different types and timings of growth faltering and later child mortality and measures of serious growth faltering.

For more information, contact: Andrew Mertens, amertens@berkeley.edu

A mother washes her son's hands before malnutrition screening in Kaédi, Mauritania

WFP/Agron Dragaj

SAM and MAM programming in East and West Africa: An insight into continuum of service provision for acute malnutrition treatment

By Rebecca Brown, Kate Sadler, Tanya Khara, Marie McGrath and Jeremy Shoham

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The findings, interpretations and conclusions in this article are those of the authors. They do not necessarily represent the views of the contributing individuals and organisations.

Location: *East and West Africa*

What we know: Combined data on location and links between SAM and MAM treatment services is not globally available.

What this article adds: Between January and June 2019, ENN undertook a basic mapping of United Nations (UN) -supported severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) treatment in selected countries in East and West Africa. ENN collated and analysed available UN data on SAM and MAM admissions at national and sub-national levels and on geographical/treatment coverage. An online survey contextualised the data provided. Conclusions on service alignment were limited by significant gaps in availability and consistency of data within the timeframe available and at the level of data collection. While good examples exist, in general there are gaps in how outpatient therapeutic programmes (OTPs) and targeted supplementary feeding programmes (TSFPs) are operationally aligned. At sub-national level a degree of geographical convergence of SAM and MAM services was observed but could not be mapped at facility level. Referral tracking between services, successful referral and complicated case service availability/linkage to other services could not be determined. Variable discharge criteria and supply pipeline breaks for supplies were commonly reported. Lower MAM geographical coverage compared to SAM likely reflects different targeting strategies and coverage ambitions for these services, variable integration within national systems, consideration of TSFPs only, and possible resource shortfalls. No single UN agency is responsible for data management and oversight of continuum of care for acute malnutrition. Findings warrant more in-depth reviews of service availability and alignment in multiple contexts, product supply chain, referral systems and practices, and protocol adaptations.

Background

As part of ENN's initiative to collate and appraise experience and evidence around the delivery of programmes in relation to continuum of care for acute malnutrition treatment[1], we undertook a basic mapping exercise and review of current practice in severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) treatment in selected countries in East and West Africa between January and June 2019. The exercise aimed to determine the extent to which services for the treatment of children with MAM and SAM are aligned with each other in these regions, which were selected due to their high burden of acute malnutrition and widespread treatment services. For this exercise, we examined SAM treatment as those services supported by UNICEF and WHO, and MAM treatment in the form of targeted supplementary feeding programmes (TSFPs) delivered by World Food Programme (WFP)[2]. The mapping was carried out against the backdrop of policy and guidance whereby SAM services are in general being scaled up with UNICEF support as a systematic service in health systems, albeit in an incremental way; whereas MAM treatment implementation is led by WFP guided by contextual factors (global acute malnutrition (GAM) prevalence, food insecurity, etc.) as reflected in the Global Nutrition Cluster (GNC) MAM decision tool[3].

Based on data availability, the mapping specifically aimed to collect and compare SAM and MAM treatment admissions data at national and sub-national level in selected countries in the region and identify geographical crossover of services and the extent to which protocols are aligned. This initiative was necessary as data on

SAM and MAM treatment is not currently collated globally. The scope of work was determined by available funding and timeframe and considered a first step to bringing some visibility to reports of unaligned services from programmers.

For the purpose of the mapping, ENN defined continuum of acute malnutrition care as the extent to which treatment programmes for children with MAM and those with SAM, both complicated and uncomplicated, are aligned on a number of levels, including how successful referrals between services are operating. We recognise this is just one part of a broader continuum of care for malnourished children that encompasses prevention.

The mapping was undertaken with input from UNICEF and WFP East Africa and West Africa regional offices, who in turn engaged with country offices as necessary to secure available data and with UNHCR East Horn and Great Lakes (EHAGL) regional office. The GNC was also engaged and country cluster representatives contacted as potential additional sources of data. No data was provided by regional WHO offices.

This article summarises key findings and recommendations.

Methodology

The mapping began with initial discussions with

1   Collated in a special edition of *Field Exchange* (issue 60); www.ennonline.net/fex
2   As outlined in 2011, UNICEF is responsible for SAM treatment and WFP is responsible for MAM treatment; hence UNICEF and WFP-sourced data on services supported or delivered was sought.
3   GNC, 2017. Moderate Acute Malnutrition. A Decision Tool for Emergencies. GNC MAM Task Force. March 2017.

representatives from UNICEF, WFP, WHO, GNC and UNHCR headquarters and regional offices to define parameters and data sources mapping. It was agreed that countries of focus for the review would be those classified in the same regional zones by both UNICEF and WFP, as follows:

West Africa: Burkina Faso, Cameroon, Central African Republic, Chad, Mali, Mauritania, Niger, Nigeria and Senegal.
East Africa: Burundi, Ethiopia, Kenya, Rwanda, Somalia, South Sudan and Uganda.

Existing programme data was collected from regional nutrition data managers at WFP (MAM data) and UNICEF (SAM data) separately and collated by ENN. Exceptions were South Sudan, where MAM and SAM treatment data for 2017 and 2018 was provided in combined form by the National Nutrition Cluster, and Kenya, where combined data on referral between MAM and SAM services was provided by government. Data on SAM and MAM admissions at national and sub-national levels and on geographical/treatment coverage where available in the selected countries was collected. In addition, UNHCR EHAGL regional office shared its own mapping of alignment of available services for SAM and MAM for refugee populations in the selected countries. Data was also sought on treatment admissions and referrals, but was not available in time from the CMAM Report (individual agency/country permissions needed), Action Against Hunger (data not collated) and World Vision International (insufficient detail).

An online survey (in English and French), proposed by the East Africa regional team, was also targeted to representatives from government, UN and non-governmental organisations (NGOs) in all selected countries. The survey (completed by 116 respondents in East Africa[4] and 46 in West Africa[5]) collected broader information on the country approach to treatment of acute malnutrition (both SAM and MAM), the structure of the services, protocols (including products used), admission and discharge criteria, level of integration, mechanisms and monitoring for referrals, reported barriers to ensuring continuum of care for acute malnutrition, examples of good models of continuum of care, and ideas on how continuum of care for acute malnutrition could be improved.

Limitations

The data collected was secondary and from multiple sources, with consequently varying definitions, and was incomplete, particularly in relation to coverage. Data collection and the online survey were limited to selected countries in two regions of Africa, to a limited range of government, UN and NGO respondents (particularly for West Africa) and to humanitarian contexts, and therefore must be interpreted with caution. The online survey represents personal opinions and representation across countries is not comparable. The review would have benefited from a context analysis covering national strategies, national nutrition profile and sub-national-specific analysis, including prevalence of GAM, but this was not feasible within the timeframes. Specific limitations regarding data available and/or the degree of analysis possible within the scope of work are further reflected in the results and conclusions.

Results

Coverage and geographical alignment

Comparable data on geographical coverage (proportion of health facilities offering the service) was available only for countries in West Africa[6] (see Box 1 for limitations). This data illustrates the more widespread coverage of SAM services compared to MAM in 2017 and 2018, reflecting the common strategy of SAM service scale-up at national levels in the health system (see Figures 1, 2 and 3). Notable exceptions are Chad and Mauritania, where there were similar levels of geographical

[4] Burundi (n=14), Ethiopia (n=14), Kenya (n=20), Rwanda (n=6), Somalia (n=31), South Sudan (n=27) and Uganda (n=4); across government (n=6); NGOs (n=79); and United Nations (n=31).
[5] Burkina Faso (n=6), Cameroon (n=3), Central African Republic (n=2), Chad (n=3), Mali (n=4), Mauritania (n=1), Niger (n=7), Nigeria (n=17), and Senegal (n=4); across government (n=4); NGOs (n=15); United Nations (n=26); and a research centre (n=1).
[6] Comparable estimates of geographical coverage (proportion of health facilities/health catchment areas where the service is provided) for MAM was available for a limited number of countries in West Africa only (Burkina Faso, Chad, Mali, Mauritania, Niger).

Figure 1 Geographical coverage of SAM and MAM treatment in selected countries in West Africa in 2017

Legend: SAM Geographical Coverage 2017 / MAM Geographical Coverage 2017
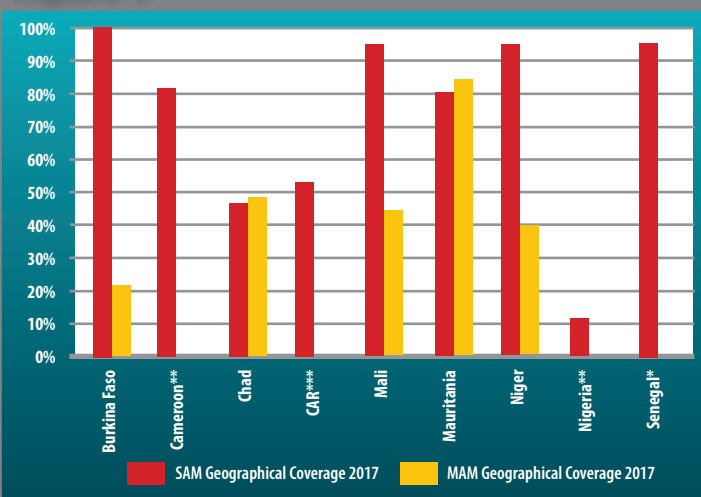
Figure 2 Geographical coverage of SAM and MAM treatment in selected countries in West Africa in 2018

Legend: SAM Geographical Coverage 2018 / MAM Geographical Coverage 2018
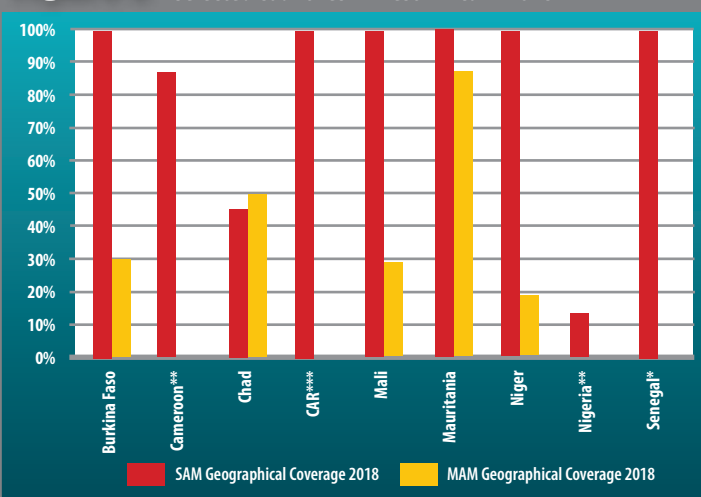
*Very limited TSFP has been operating in Senegal for two years due to absence of resources.
**A BSFP that includes MAM children is being implemented in Cameroon (data provided) and in Northeast Nigeria (data not shown here).
***No data on geographical coverage of MAM treatment provided by Central Africa Republic (CAR).

Figure 3 Geographical coverage of SAM treatment in selected countries in East Africa, 2017 and 2018

Legend: SAM Geographical coverage 2017 / SAM Geographical coverage 2018
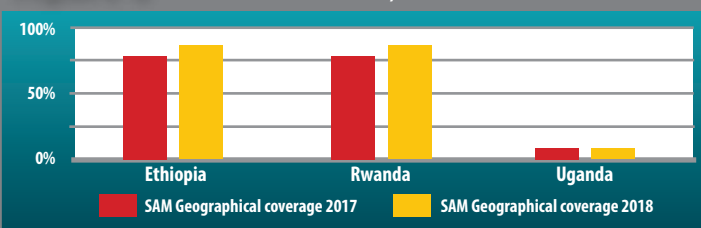
* Comparable data for geographical coverage of MAM treatment in East Africa for 2017 and 2018 was only provided for Ethiopia.

Box 1 Variations in definitions of coverage

The mapping highlighted limitations in the comparability of coverage data for MAM and SAM programming and ongoing difficulties with relying on estimates of treatment coverage. Both SAM treatment coverage and MAM treatment coverage figures for West Africa obtained are calculated as the number of children treated as a proportion of the estimated overall burden. Burden is calculated from estimates of prevalence, population and incidence. There are well publicised issues with such estimates and the errors involved in their calculation may have a different magnitude of implications when applied to SAM or to MAM, limiting the utility of comparisons. SAM geographical coverage is calculated as the number of health facilities treating SAM out of the total number of health facilities in a country. In some cases, MAM coverage is calculated in the same way; however, in many cases this data was not provided.

Figure 4 SAM and MAM admissions data from selected countries in East Africa, 2017 and 2018

SAM Admissions 2017 • MAM Admissions 2017 • SAM Admissions 2018 • MAM Admissions 2018

Figure 5 SAM and MAM admissions data from selected countries in West Africa, 2017 and 2018

SAM Admissions 2017 • MAM Admissions 2017 • SAM Admissions 2018 • MAM Admissions 2018
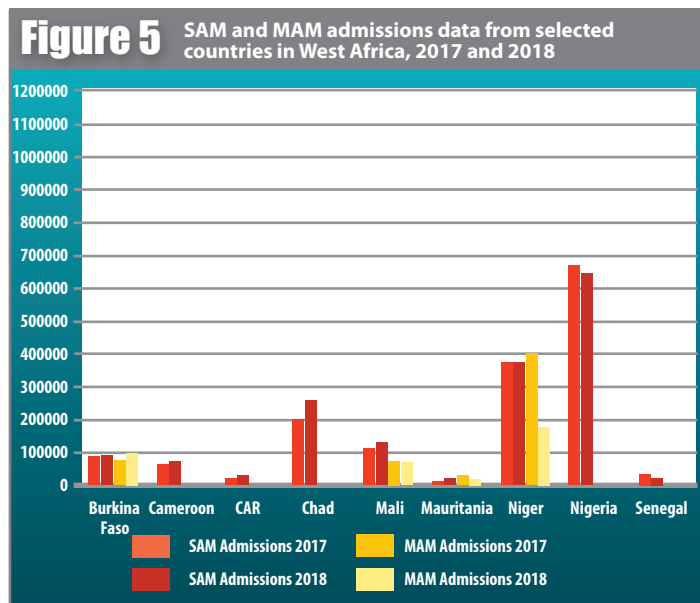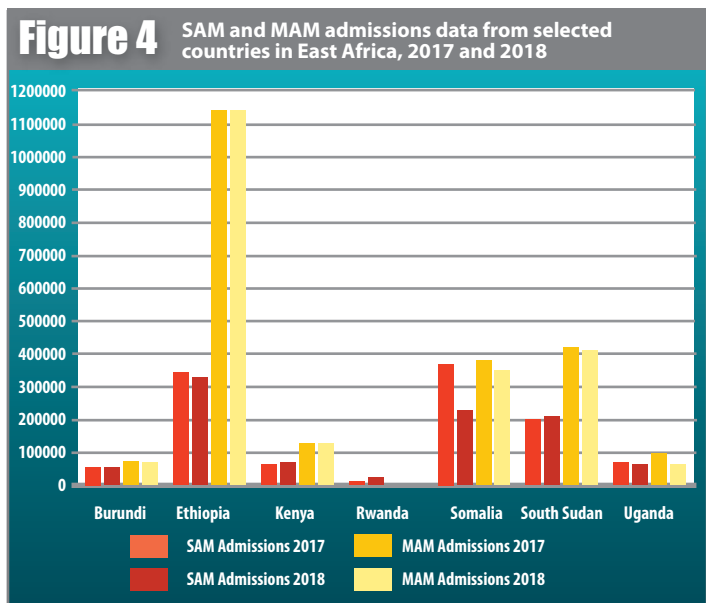
coverage for both services; i.e. proportion of facilities offering the service. Although it cannot be assumed that there is 100% overlap in the facilities offering both services throughout the year (MAM treatment in Mauritania only operates for five months per year), the higher the geographical coverage reported for both services, the greater is the degree of likely overlap.

Availability of data on treatment coverage (proportion of affected children who are accessing the services) was limited to rough estimations (projected burden compared to actual admissions), rather than on assessment and was made available for SAM in all countries and for five countries for MAM (see Figures 4 and 5). It has therefore not been possible to make any robust comparisons between what is being achieved for MAM and SAM, beyond the need for improvement in practical methods to routinely calculate and report on treatment coverage, a critical indicator of programme impact for both SAM and MAM treatment.

At a sub-national level, the degree to which both services are in place and admitting children can be discerned to some extent from the data collected on admissions by district for the selected countries[8]. Although we cannot assume that the service reaches the whole district, that it is available for the whole year, or that beneficiaries have equal and opportune access to all services, 2018 sub-national data on admissions indicates that in Kenya, South Sudan, Ethiopia and Niger both SAM treatment and MAM treatment services were present in all the districts providing data. Burundi, Uganda, Burkina Faso, Chad, Mali and Mauritania all have significant proportions of districts/regions where SAM treatment was implemented without MAM treat-

ment. In Rwanda, Nigeria and Cameroon, data indicated there was no MAM treatment in the form of targeted SFP in any districts in 2018[9]. In both Nigeria and Cameroon[10] an 'expanded' prevention programme (i.e. expanded to manage MAM cases) is being implemented as an alternative strategy for reaching children with MAM. Whether this was the case in other contexts was

not captured and is a limitation of the mapping. In Rwanda WFP reported MAM programming only in camp settings. Only in Mali did the sub-national data for 2018 suggest that MAM treatment was being implemented without SAM treatment, and then only in two districts. Together these findings indicate there is a range of different combinations of SAM and MAM treatment on

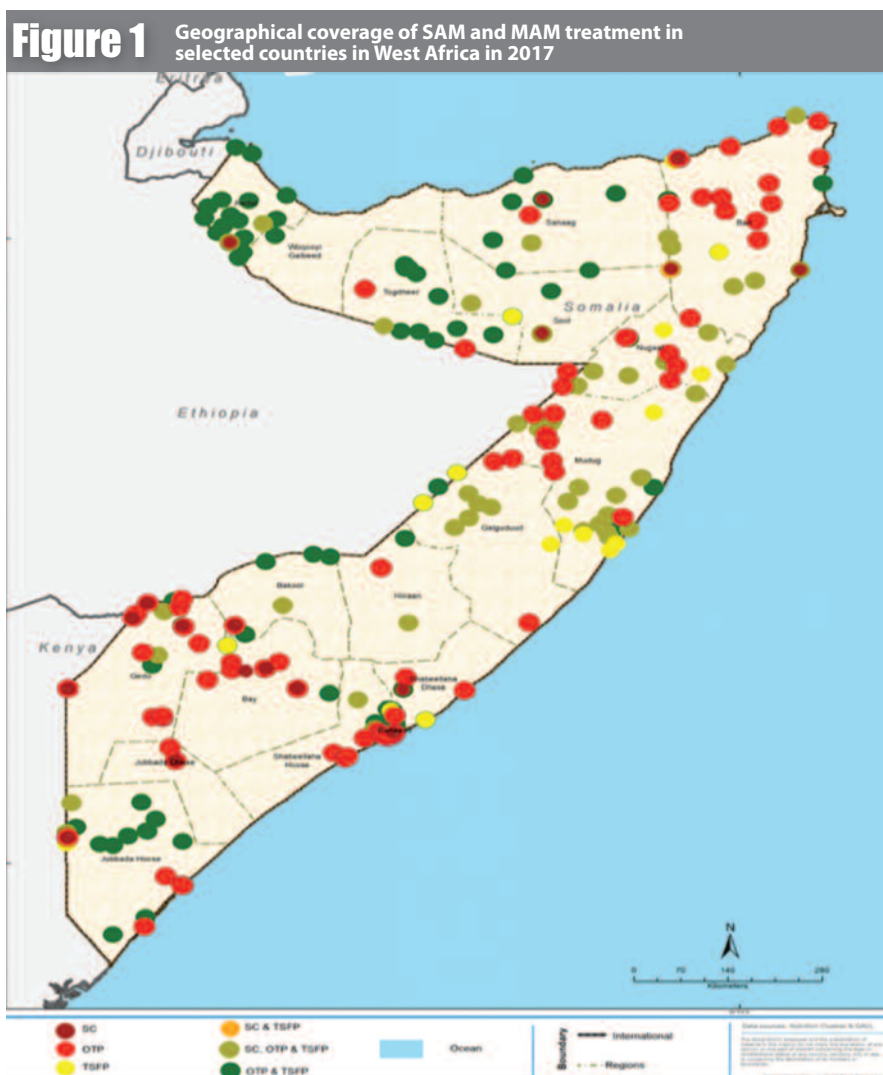**Figure 1** Geographical coverage of SAM and MAM treatment in selected countries in West Africa in 2017

SC • OTP • TSFP • SC & TSFP • SC, OTP & TSFP • OTP & TSFP • Ocean • International • Regions

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8   Detailed data is available in the full regional reports; see contact at end of article.

9   Comparable data for Senegal and Somalia was not available.

10 Eveline Ngwenyi, Mica Jenkins, Nicolas Joannic and Cécile Patricia (2019). Addressing acute malnutrition in Cameroon during an emergency: Results and benefits of an integrated prevention programme. *Field Exchange* issue 60, June 2019. www.ennonline.net/fex/60/acutemalnutritioncameroon

the ground, but that it is common for SAM treatment to be implemented without MAM treatment in the form of TSFPs. Further mapping is required to comprehensively understand how continuum of care is being provided in the absence of TSFPs in those cases (e.g. counselling, social protection, blanket feeding approaches).

Alignment of the services where they do coincide

The majority of survey respondents in both West and East Africa reported that SAM and MAM services in their country or region are provided in combination. This suggests there is an ambition that SAM and MAM treatment should be parts of a whole in terms of national and/or agency protocols and criteria, monitoring and reporting, and successful movements of children between them where they are provided in the same place. The level of integration in the health system reported by survey respondents was also in general positive for both MAM and SAM. This mapping exercise was not able to back these findings up with quantitative data.

Protocols

The survey indicated that there is a wide range of standard and non-standard discharge criteria in place for SAM treatment, which may have implications for continuum of care. A number of respondents in West Africa, and particularly in East Africa, noted that SAM discharge criteria were adapted; i.e. lowered (e.g. from MUAC >=125 to MUAC>115), so that children were discharged sooner from OTPs when MAM treatment (SFPs) was present. In East Africa the majority of respondents in Burundi, Ethiopia, Rwanda and Uganda reported that children with SAM are discharged once cured (no acute malnutrition); while one third of respondents in Kenya, 40% in Somalia and half in South Sudan reported discharging SAM children to TSFP one they reach MAM criteria. However, a larger number of respondents indicated that the presence or absence of MAM treatment did not lead to SAM discharge protocol change. Whether such practice is detrimental to continuum of care requires further investigation.

Referral between SC and OTP components

Most respondents in both East (73%) and West Africa (80%) reported that outpatient services can successfully refer complicated cases of SAM to an inpatient facility. More (over 90% in both regions) reported that referral was successful the other way; from a facility after stabilisation to an outpatient programme. Geographical distance between the outpatient and inpatient facilities was the major barrier identified to achieving successful referral. Most respondents reported that, at local level, monitoring systems are in place to assess whether referrals are being made successfully; however, it is not possible to conclude from the data on the quality and completeness of these systems to sufficiently ensure individual children are not lost between these components of therapeutic care.

Referral between MAM and SAM services

Data relating to referral between SAM and MAM services is generally not collected/collated in standard SAM and MAM national reporting formats, although it may be available at lower level. It was not possible, given the timeframe, to examine records kept at district/facility level or by individual agencies at country level to report on different mechanisms in place; thus we cannot discern the degree of convergence in referrals between services. Data on numbers of referrals made from SAM treatment to MAM treatment and vice versa are available for Kenya; however, the utility of this information is limited for exploring continuum of care as it does not tell us whether referrals were successful, i.e. whether children actually arrived.

The survey responses suggest in general that there are challenges with referral between MAM and SAM services in most countries. Respondents in both East and West Africa reported that many SAM treatment centres could not successfully refer children to MAM treatment centres consistently, even when the service is in place. Respondents were in general more positive about the availability of SAM services for those children identified with SAM in SFPs and requiring referral.

Respondents in both regions described considerable variation in management of acutely malnourished infants under six months old. In terms of access, 17% of respondents in West Africa and 25% in East Africa reported that the service did not admit acutely malnourished infants for treatment. Among those who reported infants being admitted, 50% and 40% of respondents in West and East Africa respectively reported the use of non-standardised admission criteria coupled with variable discharge criteria.

Expressed challenges to continuum of care

The six main barriers to continuum of care for children with acute malnutrition reported in East Africa are, in order of priority: lack of financial resources, insecurity/issues with access, limited geographic coverage of services imple-

mented at health-facility level, product pipeline issues, lack of capacity at health centres, and limited infrastructure (see Table 1). The type of barrier experienced obviously differs by country: Somalia and South Sudan rated access and security issues as the primary barrier; for Kenya pipeline issues and access/security issues were a major barrier; and for Burundi, Rwanda and Uganda main barriers were limited geographical coverage and lack of capacity, while limited financial resources was a major barrier common to all. Cross-cutting all these factors was a reported lack of coordination among agencies and between levels of the health system operating the different services, which leads to children being lost to follow-up. High caseloads paired with low human resources are also reflected as barriers to the extent to which treatment programmes for children with MAM and SAM are aligned and successfully making referrals between the two services. Similar barriers were reported in West Africa (see also Table 1).

Availability and alignment of data

Collection of data for this exercise highlighted that, in most instances, no single agency at country or regional level (or at global level) has overall responsibility for data continuity and monitoring of treatment for acute malnutrition. Although several survey respondents suggested a key role for government health information systems and country clusters in the collection and collation of relevant SAM and MAM service data, this exercise did not succeed in accessing these sources, perhaps due to timeframe constraints and the level at which data was being sought. Given the need for national systems for sustainable reporting on services for nutrition, the question remains how progress in achieving a continuum of care can be tracked at regional or global level. A clearer picture of service coherence can be presented in those exceptions when one agency at national level has oversight of the range of services available for acute malnutrition in different areas (but not necessarily responsibility for the delivery of all of them), as was the case in Kenya (led by government), South Sudan (Nutrition Cluster) and UNHCR programmes (East Africa).

Table 1	Main reported barriers to continuum of care for children with acute malnutrition in East and West Africa (descending order)
East Africa (n=100)	**West Africa (n=42)**
1. Lack of financial resources	1. Lack of financial resources
2. Limited geographical coverage of services implemented at health-facility level	2. Lack of capacity of health centres
3. *Pipeline issues*	3. Limited geographical coverage of services implemented at health-facility level
4. *Insecurity/access issues*	4. Pipeline issues
5. Lack of capacity of health centres	5. Limited infrastructure
6. Limited infrastructure	6. Deprioritisation of treatment of MAM
7. *High defaulting rates*	7. Insecurity/access issues
8. *Differences in geographical targeting between MAM and SAM*	8. Differences in geographical targeting between MAM and SAM
9. Deprioritisation of the treatment of MAM	9. High defaulting rates
10. Lack of implementing agencies	10. Lack of implementing agencies

Italics: Same number of respondents reported this barrier

This exercise identified a lack of alignment in the data being collected for SAM and MAM by individual agencies, through national ministry of health systems, and in some instances within agencies in a number of areas. As noted above, treatment and geographical coverage data available to us was limited in its robustness, comparability and completeness in many cases, particularly for East Africa. Differences in methods of calculating geographical coverage and treatment coverage for SAM and MAM further limited comparability.

Several specific data gaps when collecting data at this level were also highlighted. We have not been able to present data on the crossover between MAM and SAM treatment at facility level. Although this has been possible to some extent at district level using admissions figures, it is important to note that yearly admissions figures may not represent the service, particularly for MAM treatment, being available throughout the district or even for the full year.

At this level of data collection it was also not possible to comprehensively determine the extent to which SAM and MAM treatment services are linked where they are being implemented in the same geographical area; e.g. existence of systems for referral between them, distances between them and the degree to which protocols are aligned. The extent to which this information exists at national level and the extent to which it is harmonised within or across agencies requires further investigation. Equally, data on the extent to which referrals are being made successfully for complicated cases between in-patient and outpatient care was not possible to discern at this level as data on complicated SAM is mainly integrated within collated SAM figures at national level. Although some data on numbers of complicated admissions is available, with no denominator of complicated cases it is not possible to draw helpful conclusions. Finally, data on level of service or any systems in place for identifying and referring complicated MAM for appropriate treatment was not available.

Discussion

Considerable data is currently collected and collated on SAM and MAM treatment and involves huge effort and investment by government, agencies and individuals at regional, national and sub-national levels. While fully appreciating this commitment, and the short timeframe that was available for this exercise, the data obtained points to gaps in the nature, availability and consistency of data at regional and global level for understanding the extent to which a continuum of care for children with acute malnutrition is being achieved. Further information may be available at national and sub-national level and further investigation is therefore required in order to be able to draw conclusions on continuum of care. Clarity on what constitutes continuity of care across different contexts, including where there is no intention to implement a TSFP and which UN agency is responsible for liaising with government on such oversight,

provision or support, is also needed. Based on this, further investigation of the level and extent of gaps in information and potential ways to fill them will be needed in order to provide a more secure basis for discussions on the extent to which the international community and governments can better ensure a continuity of care for acute malnutrition and track progress.

Although there are crossovers in implementation areas (and, to a limited extent, in protocols), the data available and experiences shared indicate that even where they are both being implemented, SAM and MAM services are often not practically aligned in a way that is conducive to a continuum of care; i.e. to ensure that children can move through the different components appropriately and successfully. Important aspects of this include the limitations identified in the tracking of referrals, the need for clarity on how admission and discharge criteria for the services coherently fit together, and gaps in support for at-risk infants under six months of age. Critically, supply breaks for ready-to-use therapeutic foods (RUTF) and ready-to-use supplementary foods (RUSF) were reported in both regions as compromising continuity of care for children.

Despite its limitations, this mapping exercise provides important clues to and highlights significant gaps in our collective capacity to deliver a continuum of care to children who are acutely malnourished. Both the data and reported experiences indicate that SAM treatment without MAM treatment (in the form of TSFPs) is commonplace. This pattern reflects differences in global strategies for the implementation of these two services; TSFPs are configured for delivery in emergency contexts that prioritises areas/populations of highest vulnerability according to several criteria, including GAM rate of greater than 10%[11], and may be seasonal. SAM treatment scale-up and 100% coverage targets are potentially realisable through an established system (health service) with widespread reach and governed by global WHO SAM guidance. The substantially larger MAM caseload, limited evidence on feasible implementation within the health system, absence of normative guidance for MAM treatment and prevention, and no UN ambition for 100% coverage are all factors contributing to the lack of equivalent MAM programme scalability.

It is important to emphasise that, while this exercise focused on mapping availability of TSFPs as a treatment option for MAM (reflecting WFP's operational experience and primary approach), TSFPs are not the only intervention options for MAM. Approaches to care for MAM children reported in the regions included nutrition counselling, referral to health centres, referral to 'preventive' services, and management in blanket supplementary feeding programmes (BSFPs). These interventions were not mapped in this exercise. It is also not possible to determine from this mapping the extent to which TSFPs are not present in settings where they should be according to criteria set out in the MAM decision tree or due to resource shortfalls.

Conclusions and recommendations

As a priority, we need to improve transparency on the degree to which a continuum of care is being provided to children with acute malnutrition to learn from contexts where it is being achieved, and identify where and how we need to act where it is not. We recommend the following actions:

- A more in-depth and comprehensive global review of MAM and SAM treatment services at national and sub-national level. This should include different models and care options (e.g. prevention programmes that are being implemented with a treatment aim); a mix of settings, including Asia and non-emergencies; cluster-activated countries; and context-specific analysis (e.g. GAM prevalence, emergencies/non-emergencies, donor vs no donor support). A review would benefit from scrutinising methods for estimating coverage for SAM and MAM services and more in-depth investigation of data and services for complicated acute malnutrition.

- A detailed global review of bottlenecks to predictable and sustained supply of RUTF and RUSF to further identify the extent and the patterns of pipeline breaks and major bottlenecks to resolution, given how fundamental supply-chain security is to continuum of care.

- A review of implementation protocols for admission, discharge and referral between SAM and MAM treatment programmes (including early discharge of recovering SAM children to TSFPs) to examine outcomes and clarify best practice. Examples of referral mechanisms that are functioning and being reported at local levels could be used to identify good scalable models, help more clearly determine how to measure successful referral, and inform guidance on child movement through levels of service to sustained recovery.

- The potential to include MAM data in national and international databases that capture SAM data (e.g. UNICEF global Nutridash platform) should be explored, building on learning from contexts where this has been achieved.

We hope that the findings of this mapping inform wider conversations and initiatives that are drawing on emerging evidence to examine what needs to change – including ways of working between UN agencies, governments and partners, and options available for care – to ensure that children suffering from malnutrition receive the most appropriate care across the continuum of their experience, including but not limited to acute malnutrition.

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[11] Moderate acute malnutrition: a decision tool for emergencies. MAM Task Force. Global Nutrition Cluster. Updated March 2017.

Modelling an alternative nutrition protocol generalisable to outpatient (MANGO) study

Upcoming research

Action Against Hunger conducts operational research with academic partners to contribute to building the scientific and operational evidence emerging from field programmes. Its research strategy focuses on testing innovative approaches designed to improve the effectiveness of its humanitarian responses and longer-term programmes, particularly in the treatment of acute malnutrition in children under five years old. The Modelling an Alternative Nutrition Protocol Generalizable to Outpatient (MANGO) study emerged in 2014 from a successful field innovation in Myanmar that used lower doses of ready-to-use therapeutic food (RTUF) in the management of uncomplicated severe acute malnutrition (SAM) (James *et al*, 2015). This led to the development of the hypothesis that RUTF dosage could be reduced in the management of severe acute malnutrition (SAM) without harm.

The MANGO trial aims to test the efficacy and cost-efficacy of a reduced RUTF dosage for treatment of children aged 6 to 59 months with uncomplicated SAM (defined by weight-for-height z-score <-3 and/or mid-upper arm circumference <115mm) in 10 health centres of Fada N'Gourma district, eastern Burkina Faso. Children recruited between October 2016 and July 2018 were randomly allocated to one of two groups. For the first two weeks children in both groups were given the same amount of RUTF. From week three children in group one received the same standard RUTF dose and children in group two received a reduced dose until their discharge from the programme. All children were given the same basic medical treatment, in line with SAM treatment protocols. Main outcomes measured were weight gain velocity and programme outcomes (children recovered, dead, defaulted, referred and non-respondents). Secondary outcomes measured included body composition, vitamin A and iron status, food intake and dietary diversity.

Findings will be available in 2019 through peer review publication and subsequent summary in *Field Exchange*. Additional results based on secondary outcomes will be available in 2019 and 2020.

The trial is registered on IRSCTN: **https://doi.org/10.1186/ISRCTN50039021** More information can be found on the AAH website and MANGO blog: **https://mangoactioncontrelafaim.wordpress.com/**

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Research *Snapshots*

Programmatic approaches for nutritional care in India: Perspectives on continuum of care

Research snapshot[1]

Continuum of care (CoC) from pregnancy to early life is central to planning and designing public health interventions to address undernutrition through strategic, systematic and consistent nutrition-specific and nutrition-sensitive interventions. However, while practitioners and planners believe in CoC, it is understood differently by different disciplines. The core element of CoC is the emphasis on individual care experiences received over time and maintained through a care plan through which patients receive seamless care across transitions to different settings. These are linked to preventative and curative services that strengthen patients' positive health behaviour, self-care, needs identification and timely care-seeking. CoC involves health providers, the health system and the community, and demands integration, coordination and collaboration across different levels and multiple services.

Three prime drivers of CoC are: informational continuity (availability and use of information across providers and services); relational continuity (sustained contact between client and a consistent provider across time); and management continuity (so that no services are missed, duplicated or delayed). These drivers operate through the core elements of people, an enabling environment (shaped by political commitment and a strong health system), and time (care received over time at all stages of life, based on the life-cycle approach). Care should extend from home to hospital and back again with appropriate referral and case management, with the community health caregiver as the critical link across the different care settings.

In India CoC in the management of undernutrition is currently weak. Nutrition care pivots around clinical management of complicated severe acute malnutrition (SAM) through nutrition rehabilitation centres (NRCs); whereas undernutrition in India is a much broader problem, with SAM and severe chronic malnutrition (SCM) commonly co-existing in the same children. The existing public health service offers ample scope for the prevention, treatment and rehabilitation of undernourished children through integrated child development services (ICDS), sub-centres (SC), primary health centres (PHC) and NRCs. Current guidelines specify that complicated SAM cases are to be treated as inpatients in NRCs and uncomplicated SAM and moderate acute malnutrition (MAM) cases are to be managed in the community; however, there is no mention of which entity is responsible for the latter. ICDSs are an obvious choice, but are limited in their scope and poorly equipped to manage cases of discharged SAM, uncomplicated SAM, MAM and SCM. Furthermore, SAM management through NRCs has poor care outcomes, with low cure rates, high default rates, high numbers of non-responders and high secondary failure. This confirms weak CoC connecting nutrition care within and across different levels from community to facility and back to community. Implementation of integrated nutrition care will need to incorporate CoC elements at each level to make the big leap in addressing ongoing challenges.

[1] Dasgupta R and Chaand I. (2018) *Programmatic Approaches for Nutritional Care in India: Addressing the Continuum of Care Perspectives.* Indian paediatrics, volume 55, August 15 2018.

Field Articles

Scaling-up of care for children with acute malnutrition during emergency nutrition response in South Sudan between 2014 and 2018

By Dina Aburmishan, Vilma Tyler, Lucas Alamprese, Priscilla Bayo Nicholas, Marie Darline Raphael, Joseph Senesie, Allison Oman Lawi, Kibrom Tesfaselassie, Ismail Kassim, Kiross Abebe, Gilbert Dachi, Qutab Alam, Hermann Ouedraogo, Diane Holland, Patrick Codjia and Biram Ndiaye.

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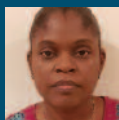
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Gilbert Dachi is a nutrition specialist for UNICEF South Sudan.

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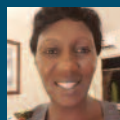
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Location: *South Sudan*

What we know: A division of labour exists between UNICEF and the World Food Programme (WFP) on severe and moderate acute malnutrition treatment respectively. In practice, programmes may be delivered via separate advocacy, caseload planning and partner selection.

What this article adds: In 2014, UNICEF and WFP initiated a unified approach to scale up treatment of children with acute malnutrition in South Sudan to optimise programme delivery and align partners to deliver on the Nutrition Cluster response plan. A joint strategy and an annually updated plan specifies UNICEF and WFP commitments, operating principles, detailed actions and indicators to track deliverables. Collaboration has led to increased coverage and quality of the response. Achievements include a 2.6-fold increase in beneficiary children reached; greater geographic coverage (increased number of sites); and alignment between OTP and targeted supplementary feeding programme (TSFP) services. A simplified 'expanded criteria' approach was introduced for exceptional situations to address treatment continuum gaps. Success factors included a spirit of collaboration between the agencies at management and technical levels; structured and predictable engagement between UNICEF and WFP; collaboration in support of the leadership by the Nutrition Cluster; joint donor engagement; joint shared data management and needs analysis; flexibility in traditional institutional arrangements; and embedding joint actions in agency country plans.

Background

With a national prevalence of 23% global acute malnutrition (GAM) among children aged under five years old in South Sudan, the Nutrition Cluster was first activated in the country in 2010. Between 2010 and 2013 the Nutrition Cluster led and coordinated a limited nutrition response, given the relatively lower needs, restricted resources allocated to nutrition and few implementing partners. Nutrition actors implemented programmes for the management of acute malnutrition, prevention of acute malnutrition, and nutrition surveillance in a few counties in seven former states of South Sudan (Northern Bahr el Ghazel, Warrap, Upper Nile, Unity, Jonglei, Western Bahr el Ghazel, Lakes and Eastern Equatoria). During this time UNICEF and the World Food Programme (WFP) worked largely in parallel, with separate advocacy activities, caseload estimation and partner selection.

In December 2013 a civil war broke out across South Sudan, causing mass displacement, suspension of basic services and deterioration of already-high levels of food insecurity and malnutrition, prompting a large-scale humanitarian response. By August 2014 the integrated food security phase classification (IPC) estimated that 3.9 million people were severely food insecure, with 2.6 million people in the acute phase (Phase 3) and 1.3 million in emergency phase (Phase 4). The same IPC estimated a doubled burden of severe acute malnutrition (SAM)

Gabriela Vivacqua/WFP

Young boy being measured in a health centre in former Aweil Centre county, South Sudan

Table 1 — Set of joint operating principles and commitments from UNICEF and WFP

UNICEF and WFP commit to:	UNICEF and WFP will ensure that:
• Agree in partnership to scale up an integrated and comprehensive package of interventions for both the treatment and prevention of acute malnutrition; • Advocate for respective resources for scale-up and to prevent further deterioration; • Maintain a healthy supply chain for nutrition commodities and equipment; • Increase human resources for technical expertise to support quality scale-up and supervision; • Support the Nutrition Cluster, with UNICEF providing the cluster coordinator and WFP providing a cluster co-coordinator; • Streamline respective agencies' administrative procedures for partner contracting and request for supplies; • Provide strategic input and technical support to ensure programme quality; • Provide expertise in nutritional situation analysis, surveillance and assessment.	• All the responses are coordinated under the leadership of the Nutrition Cluster; • Action is based on joint planning between the two agencies; • An agreed deployment consisting of a variety of modalities will be used to maximise the response; • UNICEF and WFP will initiate an 'expanded criteria' approach to treat SAM and MAM when services/supplies for only one are available; • An agreed sensitive approach to programming is used to err on the side of inclusion, ensuring that all needs will be met; • Emergency response actions (whenever possible) include long-term sustainable solutions.

each of the agencies accountable for their agreed actions, on the understanding that targets would not be reached without joint aligned actions

The expanded criteria approach

The ongoing conflict greatly complicated access to certain geographical areas and reduced partner presence on the ground. There was a need to develop a system for the treatment of acute malnutrition when service delivery was compromised. Provision for a simplified approach using expanded criteria was made when treatment for either SAM or MAM was exceptionally unavailable (see Box 2). The expanded criteria approach used in South Sudan has at its base co-location, single product, single partner, rapid delivery, life-saving principle, capacity for inclusion of pregnant and lactating women (PLW) and use of MUAC/WHZ as independent admission criteria. (Box 2)

Coordination

Human resource capacity was increased at all levels to support the scale-up and oversee the response. A dedicated nutritionist was recruited to facilitate, coordinate and oversee progress of the action plan and the overall response between the two agencies. At country-office level, the two agencies' nutrition teams initially met weekly, then biweekly and eventually monthly, to review admissions statistics and actions taken in order to inform decision-making, discuss implementation challenges and decide the way forward. The coordinated nutrition response was integrated into the representatives' regular agenda during bilateral meetings and resourcing and advocacy statements were harmonised to ensure adequate funding was achieved for each agency. This set the tone for a unified partnership from country-office to field-office levels.

At field-office level, as adequate funds were received, UNICEF and WFP increased technical experts. This reinforced the collaboration as nutritionists began consulting regularly on partnership alignment, joint supervision missions and caseload calculations. The Nutrition Cluster structure in South Sudan was such that, while UNICEF is the Nutrition Cluster lead agency and supports a Nutrition Cluster Coordinator and Nutrition Information Specialist, there is also a Co-cluster Coordinator position supported by Action Against Hunger. To ensure additional support, a Deputy Nutrition Cluster Coordinator is supported by WFP. This additional appointment was critical in supporting the Nutrition Cluster in responding to the stretched workload emergency needs.

Reporting

Progress reports, jointly produced and published quarterly and annually, allowed UNICEF and WFP to assess progress made and communicate

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from 2013 to 2014, from just over 100,000 to 235,000 children. The burden of moderate acute malnutrition (MAM) had a 447% increase, from 123,383 to 675,400 children. Faced with this increased burden, wider geographical spread and a continued hazardous environment, it was clear that UNICEF and WFP needed to come together to rapidly scale up the existing response.

The approach
Setting the foundation

In June 2014 the two levels of representations of UNICEF and WFP, technical[1] and management[2], and the Nutrition Cluster met to kick-start the conceptualisation of the joint UNICEF-WFP emergency nutrition response. Working according to their respective global mandates (WFP as the lead for MAM and UNICEF as the lead for SAM), the agencies marshalled their collective resources and leveraged their comparative advantages to develop a detailed response strategy.

A vital set of overarching commitments and operating principles were agreed that set the tone of the partnership (Box 1). Key foundations for an effective partnership between the agencies were defined as:

1. A joint action plan, regularly revised;
2. Mutually agreed principles and commitments;

3. Close coordination at country and field level;
4. Quarterly and annual progress reports and reviews;
5. Dedicated staff member facilitating and coordinating the partnership; and
6. Scheduled joint UNICEF and WFP management meetings for partnership updates.

The resulting *Joint Nutrition Response Scale Up* Plan included specific actions that each agency needed to take, jointly and separately, to reach their respective targets by the end of 2014, with the overall aim of reaching the nearly 330,000 pregnant and breastfeeding women and one million acutely malnourished children in need of life-saving treatment. The plan was subsequently presented to members of the Nutrition Cluster in July 2014, including non-governmental organisations and the donor community, who readily endorsed it.

A joint nutrition scale-up action plan was also developed, laying out urgent and immediate actions for each agency to contribute to a scaled-up emergency nutrition response and the broader Nutrition Cluster scale-up plan.[3] The details of each action were described, as well as timelines, responsibilities, humanitarian scenarios with corresponding implications, risk, and mitigation measures. The plan provided a means to hold

1 Regional Advisors for Nutrition, Senior Advisors for Nutrition in Emergencies from HQs, Chiefs of Nutrition from country offices.
2 Senior Advisors Nutrition from HQ, Regional Directors and related advisors and county representatives.
3 Experience of the Nutrition Cluster regarding partnership and accountability in South Sudan are detailed in Isaack Biseko Manyama (2017). Partnership and accountability in the South Sudan Nutrition Cluster (2015-2017). *Field Exchange 56*, December 2017. p29. www.ennonline.net/fex/56/southsudannutritioncluster

Box 1 'Expanded criteria' approach for acute malnutrition treatment in South Sudan

The expanded criteria approach was developed as an exceptional interim measure to be used when the appropriate product was not available to treat the relevant condition. This could be due to lack of concurrent geographic coverage of programmes to treat children with SAM with ready-to-use therapeutic food (RUTF) and to treat children with MAM with ready-to-use supplementary food (RUSF) or when a respective pipeline break occurred. This is intended as an interim measure until appropriate services to treat children with SAM and MAM with the relevant product is in place.

Possible scenarios for use of the expanded criteria approach were: stock-outs of supplies at site level, breaks in the supply chain, and other logistics/delivery issues or interruptions. The expanded criteria approach could be activated for a distribution period as short as one day to more than one week, depending on the severity of the situation, the number of beneficiaries and how quickly stocks could be replenished at the distribution site. In these circumstances, the agency present could use available commodities (RUTF/RUSF) for treatment of SAM or MAM (without complications) in order to enable treatment and reduce associated mortality. The Nutrition Cluster was responsible for activating the expanded criteria approach after a consultative

meeting with UNICEF, WFP and implementing partners working in the affected location. Under the expanded criteria approach, children with SAM received 14 sachets of RUSF per week (2/day) and children with MAM received seven sachets of RUTF per week (1/day).

UNICEF and WFP had agreed in principle that this approach could be deployed with the condition that use of RUTF/RUSF would not impact availability of the product to treat children with the corresponding acute malnutrition diagnosis.

Since 2015, when the expanded criteria approach was operationalised, it has been used in two circumstances. First, during routine programming when only one product was available (due to product pipeline break, looting/depletion of supplies, or when the nutrition site was immediately inaccessible). The second circumstance was during the rapid response mechanism (RRM) missions when only one agency was present and only one product was used. In 2018, for example, 3,031 children were reached through the expanded criteria in this way, including 180 SAM/MAM children using RUSF and 2,851 SAM/MAM children with RUTF. Data on the use of the expanded criteria approach was not captured in the routine programme prior to 2018.

Table 2 Examples of UNICEF and WFP joint activities and indicators

Activities	Indicators
CMAM services in 70% of existing functional health activities	Percentage of functional health facilities that have integrated the community-based management of acute malnutrition (CMAM)
Harmonise field-level agreement (FLA) and programme cooperation agreement (PCA) processes through joint engagement of partners	Number of partnerships established through same cycle of FLA/PCA
Utilise gap analysis of CMAM services to develop PCAs and FLAs	Percentage of facilities with the same partner implementing OTP and TSFP
Align nutrition partner presence at the county level	Number of counties covered entirely by one partner
Continue joint supportive monitoring visits to nutrition partners at the site level	Number of supportive visits conducted by December 2018
Continue joint supportive monitoring visits involving the department of nutrition at the national and state levels	Number of supportive visits involving the Government conducted by December 2018
Integrate infant and young child feeding in emergencies (IYCF-E) into blanket supplementary feeding programme (BSFP) implementation	Number of BSFP sites providing IYCF-E messages

Source: UNICEF and WFP Collaboration Framework, South Sudan, July 2017 to December 2018[4]

externally on the impact and achievements of the strategic partnership. Annual review meetings were held with UNICEF, WFP and the Nutrition Cluster to discuss progress against indicators, impact in terms of targets reached and continued challenges. Subsequently, annual action plans were developed to enable continued collaboration. The initial commitments and operational principles continue to be honoured with each incoming nutrition team and representative, and the stage is set for continued planning, joint funding and advocacy efforts.

In 2015 UNICEF and WFP conducted a review and consultation with key stakeholders on the achievement of targets, implementation of activities and the added value of the partnership between the two UN agencies, as outlined in the joint nutrition scale-up action plan. Feedback

on the challenges and way forward from the consultations and the analysis of the nutrition emergency, at the time shaped the plan for the next 12 months, which was renamed the Joint Nutrition Response Plan. This new plan reflected the focus on maintaining the scale-up gains made through the continued humanitarian response, while improving quality and building systems around delivery of nutrition services.

The Joint Nutrition Response Scale Up Plan continues to be updated annually, with each plan since 2014 building on the previous year's achievements and responding to existing challenges and gaps. Each plan includes specific actions and indicators to enable the measuring of progress and to hold each agency to account. Box 3 provides examples of joint agency actions and corresponding indicators.

Achievements

Due to increased investment, collaboration and commitment by both agencies over the past five years, there have been several significant achievements. Data show that, between 2014 and 2017, the number of beneficiary children reached increased each year, even with a rising burden of acute malnutrition (Figure 1 and 2)[5]. This needs to be viewed in the context of the severe conflict, internal displacement, restricted access to certain areas, a nascent health-delivery system and a functioning but severely resource-constrained Nutrition Department of the Ministry of Health (MoH). Coordination, led by the Nutrition Cluster, executed through UNICEF and WFP, and supported by different international and national partners, supported the scope and scale of the response. UNICEF and WFP scaled up coverage from less than 100 operational nutrition sites combined in 2013 to over 900 nutrition sites, covering 76 out of 79 counties, in 2019 (Figure 3), indicating both pre-existing gaps and expanded needs.

Information on how UN agency/Cluster targets are determined is shown in Box 4. This is a yearly exercise that allows for discussion, analysis and forecasting of the expected caseload needs. It uses the programme data from the previous year, as well as the caseload determination calculation, the projected resources and partner capacity for implementation, to derive a target caseload for the year. It is agreed by the agencies and the Cluster and then used for implementation planning.

The spirit of effective collaboration and partnership has successfully fed down from senior management of UNICEF and WFP country offices to field level. Feedback from the teams demonstrates a strong level of collaboration down to field level, particularly in terms of partner alignment, to ensure a continuum of care, joint supervision and monitoring, bilateral and joint meetings with partners, and enhanced sub-cluster coordination systems. Rapid response mechanism (RRM) missions continued to be the best way of reaching women and children in areas made inaccessible by insecurity and limited access. UNICEF, WFP and cluster partners scaled up the use of RRM missions, ranging from annual missions of 37 to 66 over the last five years. Nutrition interventions for the RRMs have also been harmonised, with dedicated staff from both agencies overseeing the full nutrition-in-emergency package of preventative and treatment interventions.

Co-location of service delivery allowing for a continuum of care is one of the success stories of nutrition treatment in South Sudan. At the start of the conflict in 2014, OTP and TSFP services were co-located in approximately 45% of all sites. This was primarily due to historical

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4   This action plan was developed for one year and a half to align the scale-up calendar (July-June) with the routine programme cycle (Jan-Dec).

5   The reduction in admissions observed in 2018 reflects the beginning of an improved trend in the GAM rate as confirmed by the FSNMS round 22, which showed a GAM of 13.3%.

Figure 1 Number of children with severe acute malnutrition age 6 to 59 months targeted and reached in South Sudan, 2014-2018
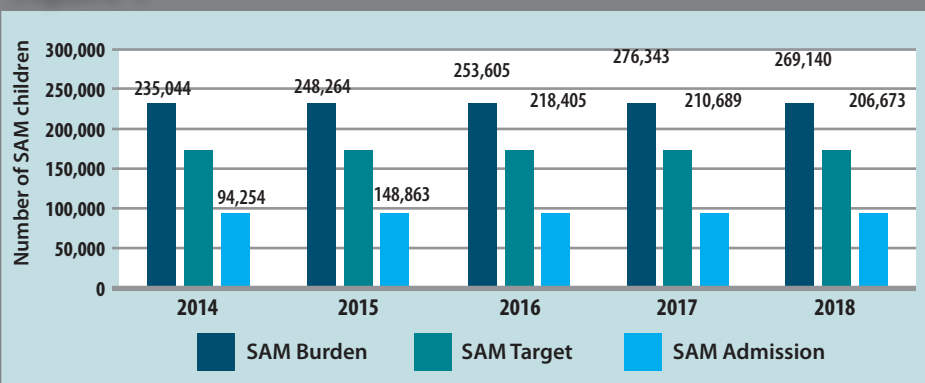

Figure 2 Number of children with moderate acute malnutrition age 6 to 59 months targeted and reached in South Sudan, 2014-2018
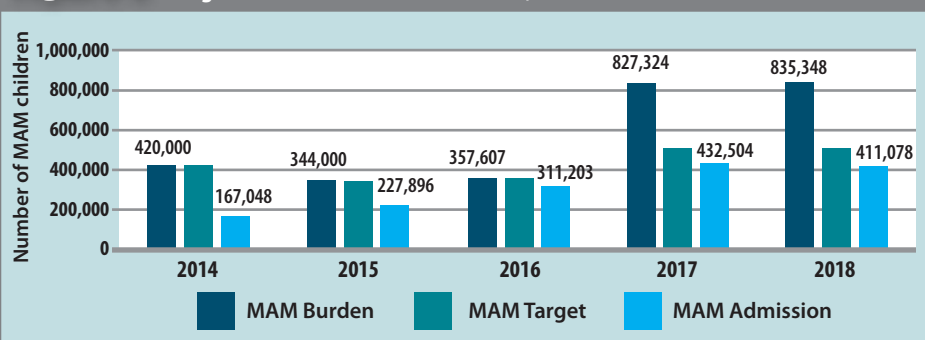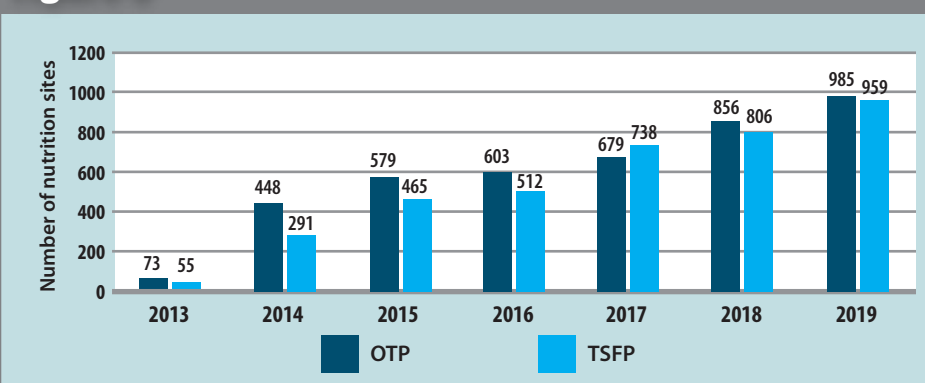

Figure 3 Number of operational nutrition sites in South Sudan, 2014-2019

and leveraging different funding modalities, such as the Common Humanitarian Fund (CHF) and organisation-specific funding.

In order to better understand the needs and gaps in the country and help develop a targeted response, in 2014 UNICEF and WFP advocated for the inclusion of nutrition indicators in the Food and Nutrition Security Monitoring System (FSNMS) (conducted biannually to assess food security outcomes) and piloted the Integrated Food Security Phase classification for Acute Malnutrition (IPC-AMN). South Sudan subsequently became one of the few countries to include acute malnutrition within the IPC analysis and projection maps. Furthermore, active participation of nutrition stakeholders was enabled through the Cluster in order to contribute to IPC analysis. UNICEF and WFP continued to improve quality and expand the scope of nutrition data collected within FSNMS beyond anthropometry of children aged 6-59 months, increasing the scope to anthropometry of children aged 0-59 months to capture indicators on stunting and wasting and include information on maternal and women's nutritional status and infant and young child feeding indicators. Further improvement on data quality was done through harmonisation of training through training of trainers, use of mobile phone technology to include controls in measurement, and real-time daily data availability for quality check and feedback to field teams.

In 2015 the Nutrition Cluster launched a new, site-based nutrition information system (NIS) in order to move away from the county/partner-based Excel reporting. The average reporting rate of sites providing treatment of SAM/MAM improved gradually from a pre-crisis rate of below 50% to 98% between 2013 and 2018. The NIS now contains six years of nutrition data and performance indicators and plans are underway to integrate it into the reformed national health information system. These efforts have enabled a much clearer picture of the current and projected nutrition situation in the country. Beside their use in planning and prioritisation of interventions, the assessments contribute to inform the IPC. Three annual IPC exercises were conducted in January, May and September 2018.

Another key success has been the strengthening of the policy environment and capacity of the Department of Nutrition under the MoH.

discordance in partner presence, previous preference of alignment of partners based on agency activities versus sector activities, and limited capacity of partners to implement the full community-based management of acute malnutrition (CMAM) protocol. Over the course of five years, through continued dialogue with partners and with leadership and encouragement from the MoH, Nutrition Cluster and donors, UNICEF and WFP are now implementing joint services in over 91% of nutrition sites.

Co-location enables a more effective flow of beneficiaries between services. (For example, children transferred from OTP to TSFP services to continue treatment once recovered from SAM.) Co-location of services was made possible through cooperation between UNICEF and WFP (with the Nutrition Cluster), specifically when choosing cooperating partners through field-level agreement

(FLA) and programme cooperation agreement processes. Working together on this has helped overcome issues such as different timeframes for contract renewal; cooperating partner preferences (i.e. a cooperating partner may be preferred by one organisation but not the other);

Box 2 Determining UN agency annual targets for SAM and MAM

The total burden, or people in need (PIN) can be derived from the humanitarian need overview (HNO)/humanitarian response plan (HRP) and is calculated using the total number of individuals with acute malnutrition found using the following caseload determination calculation.

Burden = Population 6-59m x [Prevalence + (Prevalence x 1.6)]

Or

Simplified to: Burden = Population 6-59m x Prevalence x 2.6

Based on the projected availability of resources and achievement of the previous year, UNICEF and WFP provide support to a percentage of the burden or PIN. This acts as the target for UNICEF, WFP and the Nutrition Cluster and varies from year to year.

A young child having their MUAC measured at a health centre in former Aweil Centre county, South Sudan

WFP and UNICEF contributed to this through the provision of technical staff, development of revised CMAM guidelines and protocol, development of a new maternal infant and young child nutrition strategy and guidelines, and support for cascading capacity-strengthening trainings to state MoH and implementing nutrition partners. UNICEF and WFP also jointly funded and supported the launch of the Scaling Up Nutrition (SUN) Movement in South Sudan.

A strong example of the effectiveness of the partnership was seen in January 2017, when famine was declared by the IPC in Leer county in Southern Unity. The same year, the Greater Equatoria region, previously considered the 'green belt', saw a rising rate of acute malnutrition. Due to the strong collaboration and partnership between UNICEF and WFP and established joint systems for information gathering, commodity delivery and engagement with partners, it was possible to quickly adapt to the growing needs and expand operations in both Unity and Greater Equatoria.

Lessons learnt

Enabling factors

Given the dramatic increase in the estimated number of children affected by acute malnutrition as a result of the civil war, it was clear that, in order to reach their targets, the two leading agencies in nutrition needed to collaborate rather than work in silos. By working together, it was possible to respond to critical levels of acute malnutrition even in the highly complex, insecure environment of South Sudan. In addition, the collaboration created a favourable resourcing environment. This was achieved by donors supporting harmonised planned activities and separate proposals to support the treatment

of acute malnutrition in both programmes. UNICEF, WFP and the Nutrition Cluster all received adequate funding to fulfil their individual and joint commitments in the scale-up plan.

The approach was also helped by the country teams that set the tone for collaboration, with very strong support from both the regional and global teams of both agencies. The regional offices have continued to jointly support each successive joint plan. Through high-level engagement, the joint action plan and strategy provided the notion and practical framework for close collaboration. Joint working is now a given for all existing staff members and there is a clear expectation that the collaboration must be maintained.

Challenges

Despite the achievements, certain challenges persist. Understanding coverage gaps remains an area of confusion. With continued population movement and the limited functional government health system, many nutrition sites still exist outside the health structure, limiting full integration and compromising continuum of care and health referral pathways. And, while partner alignment has greatly improved, due to the fractured environment prior to the joint partnership and pre-existing partner selection, the improvement has taken almost five years; whereas, in 2018, over 90% of nutrition sites could provide OTP and TSFP services by one partner.

Funding continues to be focused on emergency, life-saving interventions with one-year financing. Over this period, four humanitarian response plans have been developed; each including sections and financing specific to the nutrition sector. This funding horizon provides a challenge to achieving sustainable impact, as partners require committed financing to provide longer-term support to enable sustainable change and build community resilience.

Poor infrastructure has also been a challenge for transport of commodities in South Sudan. This requires dry-season prepositioning of essential nutrition supplies for continuity of service delivery. On many occasions, prepositioning is delayed due to lack of timely advance funding to take advantage of the dry-season window.

Discussion and conclusion

The partnership between UNICEF and WFP in South Sudan has allowed for a more complete and integrated response, with each agency providing its comparative advantages: WFP bringing expertise in food security, access, deep field logistics expertise and Cluster experience; and UNICEF contributing health, education, water, sanitation and hygiene expertise.

This successful partnership was impelled by the overwhelming population needs that neither UN agency could meet alone. It required multiple programmatic commitments, including an investment in planned actions and interventions; a dedicated coordinator managing the partnership and holding each agency to account; an acceptance among the nutrition and donor community of

partnership; a harmonised approach to geographic coverage; a joint shared-data management and needs analysis; continued leadership by the Nutrition Cluster; and embedding of the partnership targets and activities in the UNICEF and WFP respective country strategies and plans. Furthermore, the senior management commitment to this initiative, as well as the concerted and joint support from the regional and headquarter levels of both agencies, contributed to the success and continued partnership of the project.

Although the initial stages of the partnership experienced 'growing pains', many lessons were learned that were subsequently reflected in the following years' joint nutrition response plans that allowed both agencies to 'course correct' as needed. While both the Nutrition Cluster and the MoH supported the partnership, the strength and success of the collaboration rested on several factors, including rapport-building, desire to move towards a common goal and the recognition and utilisation of each agency's comparative advantage. Ultimately, strong coordination was critical: where the cluster system is activated, the Nutrition Cluster is best placed to provide the oversight and leadership for this type of coordination effort. In the absence of a cluster system, the sector system should be active and the government – in this case the MoH through the Department of Nutrition – should ideally take the lead.

This experience raises questions regarding the modus operandi for UN agencies. In South Sudan, alignment had its challenges, given existing institutional approaches and policies. This was an area on which UNICEF and WFP worked hard to reach consensus when selecting a cooperating partner, establishing targets and caseloads, and adding a TSFP or OTP to their programming remit. Alignment had its challenges, given existing institutional approaches and policies, and required goodwill on all sides, as well as a willingness to shift programming norms.

Five years into the emergency in South Sudan and three changes of leadership later, WFP and UNICEF continue to coordinate closely; this year producing their sixth Joint UNICEF/WFP Collaboration Framework. The institutionalisation of this joint initiative has enabled the project to be independent from the leadership changes, both at the technical and management level. This is the result of much hard work by staff in both agencies, motivated by the goal of combating malnutrition in South Sudan.

This case study has been drafted to provide insight into how two UN agencies can work together towards a common objective in an extremely challenging context with a high burden of acute malnutrition. While contexts will be different, the lessons learned here, particularly at the strategic level, can be applied to other contexts, agencies and sectors experiencing similar challenges in the management of overlapping priorities and objectives.

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Enhancing the effectiveness of a community-based management of acute malnutrition programme in Zambia

Operator of the Nutrition. A talk for mothers/guardians on different health topics, Rainbow Pamodzi Nutrition Programme, Ndola, Zambia, 2015

by Stefania Moramarco with technical input from Giulia Amerio, Elisabetta Garuti, Gloria Gozza, Ersilia Buonomo and Leonardo Palombi

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The findings, interpretations and conclusions in this article are part of the PhD thesis of the main author.[1]

Location: *Zambia*

What we know: Acute malnutrition is typically managed through separate programmes for severe acute malnutrition (SAM) and moderate acute malnutrition (MAM). Children who are underweight are not routinely managed in treatment programmes.

What this article adds: The Rainbow Project is a supplementary feeding programme across 11 sites in Zambia, delivered by community-based organisations and community volunteers. In addition to MAM children, children with SAM were admitted to SFPs due to shortcomings in delivering local outpatient therapeutic programmes, as well as underweight children. Published evaluation researches (2012-2017) informed developments to improve programmes' effectiveness, involving continuous monitoring, building capacity, better referral systems for HIV cases and improved nutrient provision. Retrospective analysis of outcomes post-programme changes showed statistically significant improvements in recovery, death and defaulter rates, reduced length of stay and average weight gain, and increased diagnosis of HIV children. Individual nutrition counselling significantly improved dietary diversity, meal frequency and drinking water treatment. Significant predictors of mortality were found for HIV infection, oedematous SAM and severe underweight. The Rainbow Project shows the potential benefits of providing a continuum of care that prevents and treats multiple forms of malnutrition in situations where community-based management of acute malnutrition is not fully covered or scaled up, with the need to integrate health and nutrition activities for both child malnutrition prevention and treatment in food-insecure areas with high burdens of malnutrition and HIV infection.

Community-based management of acute malnutrition in the Zambian context

The reduction of child malnutrition remains a national public health priority in Zambia. Strides in Zambia's economic growth in recent years (reclassified as a middle-income country by the World Bank in 2012) have not translated into significant poverty reduction. Prevalence of malnutrition remains high, with 40% of Zambian children stunted, 15% un- derweight and 6% wasted (CSO, MoH, ICF International, 2014). This situation is exacerbated by high rates of HIV/AIDS, with an estimated 85,000 HIV-infected children in 2015 (UNIADS, 2018). The Zambian Government remains commit-ted to the scale-up of high-impact serv-

ices, with a special focus on maternal and child health in the *Seventh National Development Plan 2017-2021*. The April 2018 National Food and Nutrition Summit, *Investing in Food and Nutrition for Accelerated National Development – Walk the Talk for Nutrition*, demonstrated the increased interest of the Zambian Government in translating food and nutrition security priorities into tangible, measurable, multi-sector actions by government and non-government actors.

Although community-based management of acute malnutrition (CMAM) is the gold standard for the treatment of acute malnutrition in children in Zambia, its main components are not yet fully implemented or integrated into the health system at scale and services are at times disrupted. Support and innovation from non-governmental organisations (NGOs) is needed to fill gaps. One example of this is the Rainbow Project, which supports an integrated, community-based approach for the management of malnutrition that combines the treatment and prevention of moderate acute malnutrition (MAM), severe acute malnutrition (SAM) and underweight through supplementary feeding programmes (SFPs).

The Rainbow Project model
Evolution
The Rainbow Project, under the Association Pope John the 23rd[2], has operated in Ndola and Kitwe Districts since 1998, providing a large-scale model of care for orphans and vulnerable children. It started as a network for already active organisations to develop, empower and coordinate better care for vulnerable children. Since 2001, Rainbow has been mandated by the district health authority to develop and operate SFPs to manage malnutrition in children aged 6 to 59 months. There are now 11 Rainbow SFPs in Ndola district; nine in urban areas and two in rural areas. The SFPs are run by small, local NGOs and community-based organisations (CBOs) and coordinated and supported by the Rainbow Project office, which also works in close collaboration with local health facilities, the district children's hospital, the Ndola District Health Management Teams (DHMTs) and other health authorities.

Starting in 2008, the Rainbow Project established and ran six OTPs in Ndola District for the management of SAM, in collaboration with the DHMT. These were each run by a doctor from the Rainbow Project and a DHMT nurse. In 2011, after several orientations and intensive training, all OTPs were handed over to the district authorities. Currently, seven OTPs are in operation, run by local staff under the supervision of the DHMT nutritionist. While the OTPs are well used, they are severely challenged by the erratic supply of ready-to-use therapeutic food (RUTF) and challenges associated with integration into routine services at the local clinics where they are co-located. Given this, for ethical and humanitarian reasons, it was decided to routinely enroll SAM cases as well as MAM cases into Rainbow SFPs. In addition, Rainbow SFPs enroll children who are under-

weight on the basis that improving nutritional status and optimising growth can reduce and prevent episodes of wasting. This more holistic approach enables the inclusion and management of children most in danger and/or in need of early detection and assistance.

Programme overview
All children referred from local clinics and hospital are triaged for admission into the SFPs. First priority admissions are SAM cases (mid-upper arm circumference (MUAC) ≤ 11.5 cm and/or bilateral pitting oedema) and MAM cases (MUAC > 11.5 cm and ≤ 12.5 cm). Second priority cases are underweight children (weight-for-age <-2 SD)[3]. All children identified in community outreach are screened for malnutrition and referred to the nearest health facility for medical assessment. Those eligible for community programmes are referred back to the SFPs with a request for enrollment signed by the health staff.

Weekly activities at each SFP include anthropometric assessment and monitoring; cooking demonstrations; group health talk sessions; individual nutrition counselling; on-site meal provision and distribution of take-home high-energy protein supplement (HEPS) and local food. Until 2014, 2kg of HEPS were given to each beneficiary child per month (roughly 75g per day), whether MAM or SAM, under the assumption that SAM children were also given RUTF from local OTPs. However, when RUTF supplies at local OTPs were interrupted (a common occurrence), extra HEPS (1kg per week, roughly equating to 150g per day) was given to these children until RUTF supplies resumed. This protocol was changed after 2014, following a programme evaluation, as described below. Local food (maize flour, oil, sugar, groundnuts) is also given to each recipient family to contribute to its food security and help prevent malnutrition among other children in the household.

Home visits are used to identify specific needs and challenges at household level and to follow up on children's health conditions. Children found with medical complications during weekly programming or home visits are immediately referred to local clinics for health assessment and treatment. Leaders of each local organisation running the SFPs meet regularly at the Rainbow office to discuss progress and challenges and receive training and information. Where this can be provided by DHMT personnel, this is encouraged to strengthen collaboration and integration of services.

Community engagement in the programme (community sensitisation, participation, involvement and outreach) is prioritised to facilitate early case detection of malnourished children, increase coverage of services and positively impact on health outcomes. Community volunteers are a core part of the programme and have allowed SFPs to become a central point of reference for whole communities over the years.

Monitoring and evaluation
Monitoring and evaluation activities are well integrated into the programme. Basic data are

routinely collected from each SFP (e.g. total number of admissions, disaggregated by malnutrition type, and exits disaggregated by outcome) and compared to international standards to evaluate programme performance.

Evidence-based programme evolution
External evaluation (2012-2013)
In 2012 and 2013, the SFPs were externally evaluated by Zambian professionals. Areas of weakness identified included poor written planning, lack of documentation of the activities, lack of supervision and poor individual nutrition counselling (Moramarco *et al*, 2014). Adaptations were made to the programme in response, including the development of a printed register to standardise documentation across the SFPs, enhanced centre supervision, and improve quality of nutrition counselling. Specifically, findings showed that nutrition counselling could not be conducted effectively by community volunteers alone at that stage. In response, in 2015, a local nutritionist was employed by the programme to better target counselling quality and effectiveness (Moramarco *et al*, 2014).

PhD research
Three years of PhD research (2015-2017) were carried out to evaluate the effectiveness of Rainbow SFPs in the management of child malnutrition in the Zambian context. Main findings are presented below.

Assessment of programme performance (2012-2014)
A first retrospective study (Moramarco *et al*, 2016) was conducted of 858 malnourished children (with either MAM or SAM or underweight) admitted to the SFPs between 2012 and 2014 to assess the programme's performance and identify programme strengths and areas for improvement. When compared to international standards (Sphere (2011); UNHCR/WFP (2011)), the programme was deemed to be effective in the management of MAM (86.1% recovery rate compared to >75% acceptability and 2.8% death rate compared to <3% SFP acceptability) (Table 1). However, mortality rates exceeded international standards when the overall sample of MAM, SAM and underweight children was analysed together (5.6%), and specifically in the SAM sample (12.4%). Main predictors of mortality were found to be HIV infection, SAM and very low weight-for-age (WAZ <-3 SD) at admission (HR: 3.1; HR: 3.8; and HR: 3.1 respectively). Time needed by the children to recover exceeded international guidelines by around seven weeks of treatment. However, results suggested that, to achieve higher cure rates, the period of nutritional assistance should be prolonged even further to 24 weeks, at which point 80% of children recovered from malnutrition. The average rate of weight gain

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[2] The Pope John 23rd Association is part of the Associazione Comunità Papa Giovanni XXIII that was founded in Italy by Father Oreste Benzi in 1968. https://www.apg23.org/

[3] The SFPs can accommodate from 20 to 40 children on average. The priority system is to be used when an excess of new cases is referred; however, in practice, no child has been denied enrollment to date.

Table 1 — The Rainbow Project outcomes in 2012-14 and 2015-17, compared to international standards

Indicators	Total Rainbow 2012-14 (n=858)	Total Rainbow 2015-17 (n=900)	Total P value	MAM Rainbow 2012-14 (n=323)	MAM Rainbow 2015-17 (n=242)	MAM P value	SAM Rainbow 2012-14 (n=241)	SAM Rainbow 2015-17 (n=346)	SAM P value	International Standards (Sphere Project-UNHCR/WFP 2011) Acceptable	International Standards Alarming
Recovered, no. (%)	709 (82.6)	771 (85.7)	0.08	278 (86.1)	219 (90.5)	0.1	177 (73.5)	284 (82.1)	*0.01*	>75% *	<50%
Defaulters, no. (%)	101 (11.8)	101 (11.2)	0.72	36 (11.1)	17 (7)	0.09	34 (14.1)	41 (11.8)	0.42	<15% *	>30%
Deaths, no. (%)	48 (5.6)	28 (3.1)	*0.01*	9 (2.8)	6 (2.5)	0.8	30 (12.4)	21 (6.1)	*0.006*	< 3% for SFPs * <10% for TFPs *	>10%
Mean length of stay, weeks (SD)	19.3 ±11.5	16.6 ± 9.6	*<0.001*	19.3 ± 11.9	13.1 ± 7.4	*<0.001*	22 ±11.8	15.9 ± 9.6	*<0.001*	< 12 weeks for SFPs < 3-4 weeks for TFPs (IC until full recovery) < 60 days for TFPs (IC and OTP combined)	
Average weight gain, g/kg/day (SD)	1.7 ±1.2	2 ± 1.5	*<0.001*	1.7 ±1	1.9 ±1.2	*0.03*	2 ±1.3	2.4 ± 1.7	*0.007*	≥ 3g/kg/day for SFPs ≥ 8g/kg/day for TFPs (IC until full recovery) ≥ 4g/kg/day for TFPs (IC and OTP combined)	

IC = inpatient care; MAM = moderate acute malnutrition; OTPs = outpatient therapeutic programmes; SAM = severe acute malnutrition; SFPs = supplementary feeding programmes; TFPs =Therapeutic feeding programmes. Table first published in Moramarco *et al*, 2018. * These remain the same in the updated SPHERE standards (2018).

was low (Table 1), which suggested the need to improve the quality of the food supplement distributed weekly (which could then reduce mean length of stay). Based on these results, the following changes were made:

- The weekly ration of HEPS for all beneficiaries was doubled to 150g/day/child and the recipe improved through the addition of oil and sugar during porridge preparation, using the take-home ration of local foods.
- The same food ration was given to children with SAM, irrespective whether RUTF was provided via OTPs, always emphasising that RUTF (when available) should have been the best-practice food choice for SAM children.
- Community volunteers' knowledge on how to promote HIV voluntary counselling and testing was strengthened. Sensitisation on HIV treatment and prevention was integrated into group discussions and health talks (with advice to attend local health clinics for testing and treatment) and individual nutrition counselling further promoted.

Evaluation of impact of programme developments (2015-2017)

A second retrospective analysis was performed of 900 malnourished children admitted to the Rainbow SFPs between 2015 and 2017 to evaluate the impact of programme changes. Results, published in an article by Moramarco *et al* (2018), show that international standards were now met in the main performance indicators (recovery, death and defaulter rates), all of which had improved since the 2012-2014 evaluation, with a statistically significant change in recovery rate found for SAM. The reduction in mortality rates was significant in the overall sample (5.6% to 3.1%) and for SAM cases (12.4% to 6.1%), with all mortality rates brought within acceptable international standards. The mean length of stay remained above international standards, although standards for MAM were only exceeded by one week. A longer period of recovery was needed by SAM children (+4 weeks) and marasmic children were likely to stay longer (OR 2.3, CI:1.6-3.4), while children with oedema recovered earlier (OR 0.4, CI:03.-0.6) (Moramarco, 2018). Significant reductions in mean length of stay were found both for the overall group and the SAM and MAM groups. The relapse rate, defined as a child having previously been admitted to an SFP due to a previous malnutrition event (MAM, SAM or underweight), was 14.3%.

A statistically significant increase in average weight gain (p < 0.001) was found, likely due to increased quality and quantity of HEPS rations.

However, despite these gains, this measure was still found to be below international targets (2g/kg/day versus 3g/kg/day for SFPs). The suspected reason for this is the sharing of food within households, which is a common cultural practice, especially in contexts of food insecurity. Results showed that Rainbow SFPs were effective in the nutritional rehabilitation of underweight children (85.9% recovered; 13.8% defaulters; 0.3% deaths); however international guidelines do not provide specific targets for underweight children in SFP programmes with which to compare performance.

Univariate and multivariate analyses showed that HIV infection remained a major predictor of mortality (HR 5.5; CI: 1.9-15.9), as well as oedematous SAM (HR 3.5; CI: 1.2-9.5) and severe underweight status on admission (WAZ <-3) (HR 4.6; CI: 1.3-16.1). The latter confirms the need to consider the prevention and management of underweight an essential part of the management of childhood malnutrition.

The reinforcement of training for operators/ community volunteers in HIV knowledge and the deep integration of HIV counselling into the nutrition programme was shown to be effective. Figure 1 shows a 30% increase in the diag-

Figure 1 — HIV status at discharge: Comparison between Rainbow 2012-14 and 2015-17

Legend:
- HIV positive
- HIV negative
- HIV exposed (diagnosis not confirmed)
- HIV unknown (status and exposure)

Rainbow 2012-14: 7.3, 2.2, 67.6, 22.9
Rainbow 2015-17: 4.1, 9.7, 78.2, 8

Figure 2 — Changes in food groups consumption in Rainbow Project from baseline (admission) to follow-up (discharge)

Cereals: 100 / 100; Tubers/Roots: 2.7 / 2.7; Beans/Pulses: 29.7 / 91.9; Fish: 2.6 / 48.6; Meat/Poultry: 13.5 / 29.7; Eggs: 24.3 / 32.4; Milk/Dairy: 0 / 5.4; Vegetables: 62.2 / 97.3; Fruits: 5.4 / 56.8; Sugar: 83.8 / 94.6; Oil/Fats: 100 / 100; Nuts/Seeds: 48.6 / 43.2

nosis of HIV children (p<0.001) and a sharp reduction in the percentage of children whose HIV status was unknown at time of discharge (22.9% in 2012-2014 to 8% in 2015-2017).

Impact of nutrition counselling (2015-2016)

The impact of individual nutritional counselling was assessed in a study of 37 children enrolled in Rainbow SFPs from 2015 to 2016. Results, published in Moramarco *et al* 2017, show that children's diets were very poor on admission, with a lack of dietary diversity, emergency and macronutrient deficits and inappropriate feeding practices. Significant improvements were noted at discharge following individual nutritional counselling performed by a local nutritionist, based on culturally appropriate messages. Statistically significant increases (p<0.0001) were found in dietary diversity (from five to seven food groups) and mean number of meals per day (from three to five). A comparative analysis of dietary composition showed a significant increase in intake of energy and all macronutrients, although 32.4% of children were still receiving less than 75% of daily recommended energy according to international guidelines (FAO, 1997). Figure 2 shows an increase in the number of children consuming animal-source foods (fish, eggs, meat/poultry) by 35% (p=0.004) and vitamin-rich foods (+ 35% for vegetables and +50% for fruit; p<0.001). This can be assumed to be a direct result of nutrition counselling and education, since Rainbow SFPs did not include these food types in food supplements. As an essential part of the nutrition counselling, important emphasis was also given to drinking-water treatment. Significant improvements (p<0.001) in treating drinking water (boiling) were noted from baseline to follow-up (18.9% vs 72.9%).

Lessons learned

By listening and adapting to the specific needs of the local community, Rainbow has developed an innovative model of action, "implementing what is at local level and adding what is lacking". In the context of CMAM, Rainbow SFPs' present an innovative approach that provides a continuum of care for malnourished children, integrating treatment and prevention activities, offered by well trained and closely supervised community volunteers. In this model, community volunteers have been found to be capable of identifying and managing cases of uncomplicated acute malnutrition and providing accurate data.

Rainbow SFPs have been effective in contributing to the reduction of mortality among malnourished Zambian children aged under five years old, whether MAM, SAM or underweight. Recognising that the OTP is the first choice for uncomplicated SAM treatment, accommodating SAM children in the SFP has helped to compensate for shortfalls in OTP services. A package of nutrition-sensitive and nutrition-specific activities in the SFP has allowed mothers to acquire basic nutrition skills and child health knowledge. Home visits have played a paramount role in keeping malnourished children and vulnerable households "on the radar".

Consistent monitoring and evaluation has allowed early identification of critical areas to address and has provided a solid evidence base to inform decision-making. The programme has quickly adapted and evolved over the years to improve outcomes by tailoring technical assistance, support and training to respond to identified gaps.

Improved integration between HIV and malnutrition programming among different stakeholders at local level has facilitated the early detection of HIV-infected children at most need of health support. The integration of individual nutrition counselling was shown to be an effective form of behavior change communication that resulted in improvements in child diets, supporting rehabilitation from malnutrition.

Discovering that very low weight-for-age was one of the main predictors of mortality has supported the hypothesis for including underweight children in SFP; where and when no other specific nutrition programme is available. Rainbow SFPs have been effective in the nutritional rehabilitation of underweight children, although there is no specific international guidance on treatment protocols or targets for underweight against which to measure this success. Research and guidance are needed to identify specific thresholds for underweight, as well as innovative indicators for growth-monitoring programmes, to aid early detection of child malnutrition in contexts such as these with chronic food insecurity and high prevalence of HIV/AIDS.

Conclusions and recommendations

Child malnutrition is a public health priority in most sub-Saharan African countries that needs to be addressed through collaborative efforts between local authorities, communities, NGOs, CBOs, international agencies and investors through interventions focused both on treatment and prevention. CMAM is effective, but scale-up of all components to reach full coverage has yet to be achieved in low- and middle-income settings. In development contexts, resources are usually limited, including insufficient skills and low-motivated staff, and national health systems often do not have sufficient capacity to integrate MAM management as a routine health service. Too often, SAM/MAM services are linked only when the same body supports both activities, which remains the exception.

The example of the Rainbow Project shows the benefits of providing a continuum of care that prevents and treats multiple forms of malnutrition in the context of one programme, in full cooperation with the existing health system. The results presented here show that, when CMAM is not fully covered or scaled up in all its components, there is great potential for operational nutrition programmes to identify coping strategies so as not to neglect any form of child malnutrition, especially the most severe cases. From our experience, small but essential changes, such as including nutrition counselling, improving food provided and continuous train-

ing, can have high impact on programme performance. The Rainbow Project also demonstrates the need to integrate health and nutrition activities for both prevention and treatment in food-insecure areas with high burdens of malnutrition and HIV infection.

More quality evidence is needed on the effectiveness of SFPs in different contexts to develop best practices for the delivery of integrated preventive and curative interventions, effectively and affordably at scale. While considerable attention is usually focused on curative measures, there is still poor evidence on effective activities to prevent malnutrition.

Further research is also needed to identify other indicators to be included in the evaluation of the effectiveness of CMAM, especially when referring to underweight, and to develop a standard protocol for preventive and treatment programmes delivered in non-emergency contexts. Furthermore, specific additional indicators, such as growth velocity assessment (Buonomo 2019; forthcoming) and routine evaluation of motor milestones development (Buonomo *et al*, 2015), should be considered to provide a more holistic approach in the management of child malnutrition.

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Continuum of care for children with wasting in India: Opportunities for an integrated approach

Soumi Das

An Anganwadi Worker plots a child's progress on the growth chart, India

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The findings, interpretations and conclusions in this article are those of the authors. They do not necessarily represent the views of UNICEF, its executive directors, or the countries that they represent and should not be attributed to them.

Location: *India*

What we know: An estimated 26 million children aged under five years are wasted in South Asia; four out of five of these children live in India. Progress on wasting targets is slow.

What this article adds: In India, prevalence of wasting is highest at birth and in the first six months of life. Severe wasting is predominantly managed in inpatient facilities. There is renewed political commitment to deliver a community-based programme to prevent and treat wasting, reflected in POSHAN Abhiyaan, the Government's new flagship programme to reduce all forms of undernutrition. This seeks to support an integrated approach to a continuum of care by leveraging existing platforms including (but not limited to) inpatient treatment services for severe acute malnutrition (F-SAM); India's Supplementary Nutrition Programme (SNP), delivered by the Anganwadi Services under the umbrella of the Integrated Child Development Services (ICDS) scheme; the Mothers' Absolute Affection (MAA) programme; and the recently introduced Home-based Care for Young Child programme. The Government programme has huge potential but many of the existing interventions do not reach all children and lack the required impact. Implementation bottlenecks need to be systematically addressed so that high-impact nutrition interventions are delivered with coverage, Continuity, Intensity and Quality (C2IQ).

Introduction

An estimated 26 million children aged under five years are wasted in South Asia; over half of the global burden of wasting (UNICEF, WHO and World Bank Group, 2018). India is home to four out of five of these children and lies at the epicentre of this global public health problem, with 22 million children wasted and over eight million severely wasted at any one time (UNICEF, WHO and World Bank Group, 2018). In 2015 India committed to reducing the proportion of children suffering from wasting to less than 5%, a nutrition target of Sustainable Development Goal (SDG) 2. However, the prevalence of wasting (21.0%) and severe wasting (7.5%) remain very high in the country (NFHS 4 2015-2016) and have not fallen in the past decade, despite a 10 percentage point decline in stunting during the same period. This lack of progress towards the wasting target, and the persistently high numbers of children with wasting, is of immense concern.

The globally recognised model of community-based management of acute malnutrition (CMAM) does not exist at scale in India and severe wasting is predominantly managed in inpatient facilities. However, platforms to deliver a community-based programme to prevent and treat wasting exist and there is new commitment to utilise this infrastructure to deliver a community-based model of care for children with severe wasting. Together with the political commitment to POSHAN Abhiyaan (the Government's new flagship programme to reduce all forms of undernutrition), the opportunities to resource and implement services at scale to prevent

and treat severe wasting have never been more promising.

This article describes the characteristics of wasting in children in India and the opportunities and challenges to harness the country's community-based public health infrastructure to contextualise a response along a continuum of care.

Characteristics of wasting in India

The prevalence of wasting in India is highest at birth (37%) and declines with age, a pattern seen in other South Asian countries such as Bangladesh (Figure 1).[1] Over 30% of infants aged less than six months are wasted in India, underlining the imperative to address growth failure in early life. In comparison, data from selected countries in West and Central Africa show that the prevalence of wasting in these countries is relatively low at birth and increases in infancy, reaching a peak at around 12 months of age.

These contrasting patterns suggest that poor maternal nutrition and health may play a larger role in the aetiology of wasting in early life in India (and Bangladesh) than it does in other

settings. Almost one quarter (23%) of women of reproductive age in India are thin (body mass index (BMI) <18.5 kg/m2), 11% have a low stature (height <145 cm) and 53% are anaemic (NFHS 4, 2015-2016). Maternal thinness, low stature and anaemia predict low birth weight (LBW) and wasting in India (Bhilwar *et al*, 2016; Harding *et al*, 2018). These findings indicate that a comprehensive response to wasting in India must include a strong focus on the prevention and management of growth faltering in infants under six months, including interventions to improve the nutritional status of women before and during pregnancy.

Another significant finding is the relationship between wasting and mortality in India and South Asia, which appears to be affected by different factors than in other regions of the world. Figure 2 shows that the prevalence of wasting and severe wasting is higher in India and South Asia than in other regions, yet underfive mortality rates are comparatively lower. These comparisons need careful interpretation and more research is needed to understand the relationship between mortality and wasting in India.
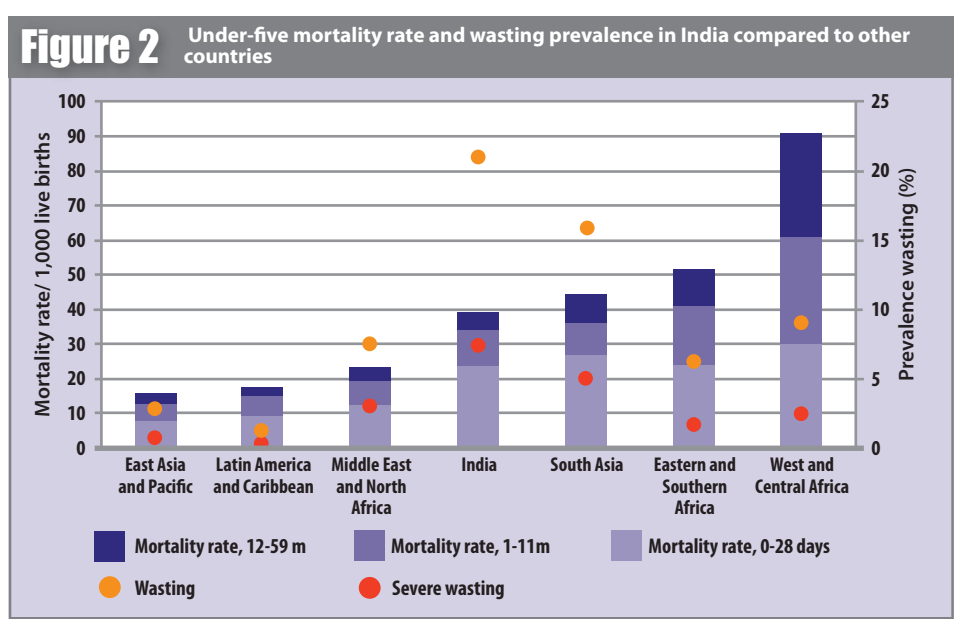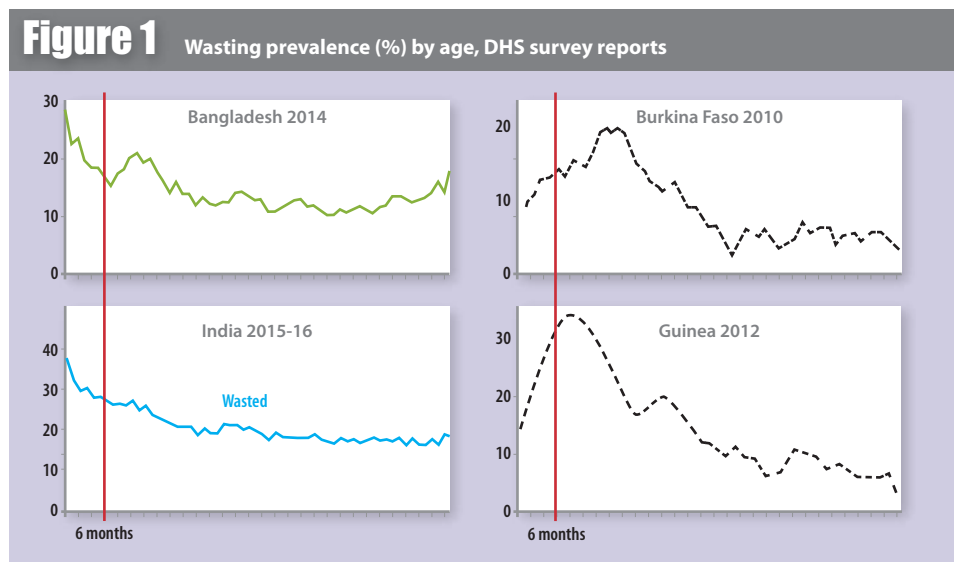
Opportunities and challenges to an integrated approach to address wasting across a continuum of care

There is an array of existing government schemes and programmes to counter malnutrition and its underlying causes in India. However, it is evident from the continuing high prevalence of wasting that these schemes and programmes are not designed to address the burden adequately, or are not functioning optimally.

Currently the main approach to treat severe wasting in India is facility-based treatment, known as F-SAM. The guidelines for F-SAM, which provides inpatient treatment of SAM with medical complications, were released in 2011. A network of 1,151 nutrition rehabilitation centres (NRCs) has since been established across the country and these manage approximately 180,000 cases annually, which represents a small fraction of the annual caseload. This existing inpatient infrastructure is neither sufficient nor intended to manage all children with severe wasting. Approximately 85-90% of children with severe wasting do not have medical complications and can safely be managed at community level. Indeed, the national guidelines on F-SAM recognise the need for the community-based management of severe wasting without medical complications. However, community-based management has been challenging to operationalise in the absence of national guidelines, which are currently in the process of being developed by the Government, although their content remains unclear.

The launch of POSHAN Abhiyaan by the Government in 2018 signals its strong commitment to accelerate efforts to improve the nutritional status of children and women and is an opportunity to transform the care of children with wasting in India. POSHAN Abhiyaan is designed to provide a continuum of care to address malnutrition from pre-pregnancy to a child's second birthday through a comprehensive package of convergent interventions across multiple government schemes and programmes. Its integrated package of health and nutrition interventions includes community-based management of SAM as one of a range of nutrition-sensitive and nutrition-specific interventions. States, districts and blocks are expected to develop 'Convergent Action Plans' that outline the priorities and roles of each government department to address malnutrition holistically, and these plans should include indicators on the number of children who are screened and diagnosed and who receive inpatient and outpatient (community-based) care for wasting.

India has well designed community-based public health systems and delivery platforms at

Figure 1 Wasting prevalence (%) by age, DHS survey reports

Bangladesh 2014

India 2015-16

Wasted

6 months

Burkina Faso 2010

Guinea 2012

6 months

Figure 2 Under-five mortality rate and wasting prevalence in India compared to other countries

- Mortality rate, 12-59 m
- Mortality rate, 1-11m
- Mortality rate, 0-28 days
- Wasting
- Severe wasting

East Asia and Pacific | Latin America and Caribbean | Middle East and North Africa | India | South Asia | Eastern and Southern Africa | West and Central Africa

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1 Wasting is defined as weight-for-height/length z-score (WHZ <-2SD. Severe wasting is defined as WHZ<-3 SD, as per WHO standards for infants under six months. Recent evidence suggests there are indicators that more effectively identify infants under six months who are at risk of adverse outcomes than WHZ.

facility and community level that can be leveraged by POSHAN Abhiyaan to support a comprehensive response to severe wasting. This should include four components: (i) the prevention of wasting and severe wasting, including relapse after successful treatment; (ii) early case detection of wasting through active screening; (iii) facility-based management of severe wasting with medical complications; and (iv) community-based management of severe wasting without medical complications (Figure 3). Each component will now be considered in turn to examine the opportunities and challenges to integrate these services into schemes, programmes, services and delivery platforms that currently exist or are planned under POSHAN Abhiyaan.

Prevention of wasting

Many nutrition-specific interventions to prevent wasting and other forms of malnutrition are delivered at community-level in India through Anganwadi Services under the umbrella of the Integrated Child Development Services (ICDS) scheme. Anganwadi centres, a nationwide network of rural community centres, provide health and nutrition services and pre-school education to a population of up to 1,000. Each Anganwadi centre is run by an Anganwadi worker (AWW), who delivers the services and ensures linkages with health facilities. There are also two other cadres of community health workers: auxiliary nurse midwives (ANMs), based at health sub-centres, and accredited social health activists (ASHA), who are incentivised community volunteers based in every village. AWWs, ANMs and ASHAs organise monthly village health, sanitation and nutrition days (VHSND) to deliver a range of community-based health services, including health check-ups, immunisations, contraceptives, treatment of diarrhoea and referral services. Nutrition-specific interventions are also delivered during the VHSND or on separate days, including growth monitoring, the promotion and support of infant and young child

feeding (IYCF), micronutrient supplementation and supplementary feeding.

There are a host of schemes, programmes and services that target pregnant and breast-feeding women (PLW) with nutrition interventions. These include a take-home ration from Anganwadi centres; anaemia prevention and control under the Anaemia Mukt Bharat programme; antenatal care services, including dietary counselling through VHSNDs; and schemes such as Pradhan Mantri Surakshit Matrutva Abhiyaan that provide quality antenatal check-ups. Institutional deliveries are promoted through conditional cash-transfer schemes (Janani Suraksha Yojna and Pradhan Mantri Matru Vandana Yojna) and free services for delivery and early neonatal care (Janani Shishu Suraksha Karyakaram), and provide an important opportunity to support mothers in establishing good breastfeeding practices.

The Mothers' Absolute Affection (MAA) programme aims to intensify IYCF efforts. AWWs and ASHAs promote and support recommended IYCF practices in the community, while ANMs provide support at the first referral level (health sub-centres). Under the recently introduced Home-based Care for Young Child programme, ASHAs will visit all households with young children every three months from the age of three to 15 months, which will greatly expand the opportunities to influence IYCF practices.

Community mobilisation occurs through existing community-based platforms, including monthly community-based events and VHSNDs at Anganwadi centres and quarterly community events for all pregnant women and mothers under the MAA programme. These are boosted by POSHAN-Maah, an intensive, one-month community-based campaign held annually in September under POSHAN Abhiyaan, which involved over two million nutrition-related events in 2018. This range of community-based

events could be used as platforms to increase families' understanding of severe wasting and demand for treatment services.

While the schemes, programmes and delivery platforms are nationwide in scale, the Coverage, Continuity, Intensity and Quality (C2IQ) of the high-impact nutrition interventions are insufficient to achieve the impact required. For example, only three in 10 women take iron-folate supplements for at least 100 days during pregnancy. Furthermore, these various schemes and programmes often function in silos and mechanisms for integration and convergence need to be further strengthened.

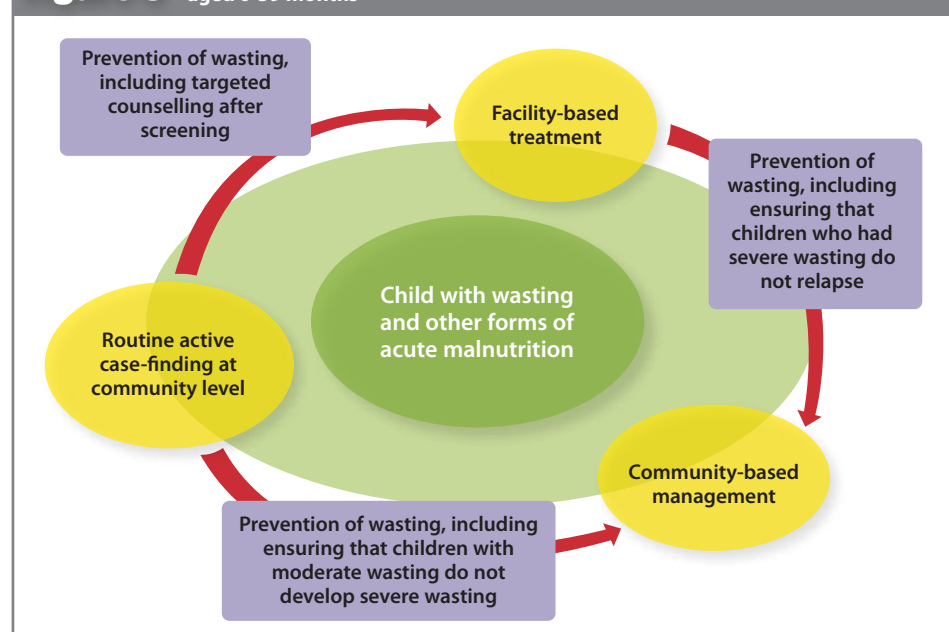## Active case-finding and referral of children with wasting

Active case-finding of children with wasting at the community level is essential to ensure that cases are detected early before wasting becomes severe or children develop medical complications. Children under five years old are currently weighed every month to assess weight-for-age (WFA) as part of growth monitoring and promotion at Anganwadi centres. Under POSHAN Abhiyaan, height measurements will be included in monthly growth monitoring going forward. This will enable all children to be screened for wasting at community-level each month.

Several challenges need to be addressed to ensure that active case-finding for severe wasting using weight-for-height (WFH) is effective at community-level. First, it is essential to increase the coverage of monthly weighing (and height) measurements at Anganwadi centres. The 2015-16 national survey (NFHS 4) revealed that only 43% of children under six years of age were weighed at an Anganwadi centre in the previous 12-month period (NFHS 4, 2015-2016). It is expected that the renewed focus of POSHAN Abhiyaan on growth monitoring will increase coverage of screening. Second, community health workers must be equipped with the anthropometric equipment and skills to accurately take height and weight measurements and determine whether a child has severe wasting. Third, screening for wasting should become part of routine healthcare for children in health centres to maximise the opportunities to identify children suffering from severe wasting. Fourth, referral mechanisms must be activated if a child is found to have severe wasting so that appropriate care is provided; this is particularly important for wasted children with medical complications.

Management of wasting in children aged 6-59 months

India's Supplementary Nutrition Programme (SNP), run by Anganwadi Services, aims to reduce malnutrition across the country. All children currently receive a take-home ration of fortified blended supplementary food (for children age six months to three years) or a hot cooked meal (for children age three to six years), delivered at Anganwadi centres, to increase the energy, protein and micronutrient content of their diets. Severely underweight children are given a double ration of the same supplementary food. There is currently no food supplement specifically formulated for children with moderate

Figure 3 Comprehensive approach for addressing acute malnutrition in children aged 0-59 months

Prevention of wasting, including targeted counselling after screening

Facility-based treatment

Prevention of wasting, including ensuring that children who had severe wasting do not relapse

Child with wasting and other forms of acute malnutrition

Routine active case-finding at community level

Community-based management

Prevention of wasting, including ensuring that children with moderate wasting do not develop severe wasting

or severe wasting; little is known about the effect of the general take-home ration or cooked meal on the condition of these children.

The production and distribution of take-home rations and hot cooked meals is the responsibility of each state and authorities are given flexibility to apply locally appropriate production and delivery models within overarching ICDS norms. Models for the production of rations and meals range from decentralised self-help groups to centralised production facilities (Flanagan *et al*, 2018). The nutrition quality of the supplementary food varies greatly between states and the Government is currently looking at ways to enhance their nutritional content. There are also challenges in distribution that compromise coverage and potential impact of the programme. The national survey in 2015-16 found that only 48% of children under six years old received a food supplement in the previous 12 months (NFHS 4 2015-2016), which demonstrates the urgent need to increase programme coverage.

Under the 2011 F-SAM guidelines, children who are identified with severe wasting and/or bilateral oedema at community or health centre-level are referred to an NRC for confirmation of the diagnosis. Children with severe wasting and medical complications are admitted and treated with therapeutic milks and medical treatment. The Government's forthcoming guidelines for management of severe wasting at the community level will specify how children with severe wasting without medical complications will be managed. It is important that the nutritional commodity that is used to treat severe wasting at community level conforms with World Health Organization (WHO) specifications.

Care of low birth weight and at-risk infants under six months

In light of the high prevalence of LBW and wasting at birth in India, as well as relatively high neonatal mortality rates, it is essential to provide care for infants under six months old at risk of growth failure. It is not possible (or necessary) to admit all at-risk infants into inpatient care, which highlights the need to focus on community-based interventions to optimise breastfeeding practices and relactation where possible. These interventions can build on existing health programmes that target young infants, including those with LBW. As part of the Home-based Newborn Care programme, ASHAs visit every LBW newborn at least five times in the first month of life, and monthly thereafter for two years, to provide breastfeeding counselling and to refer children to higher levels of care if required. Other community-based programmes that target interventions to LBW babies include Kangaroo Mother Care and the MAA programme.

Tracking children across the continuum of care

Children should be carefully tracked across different health and nutrition programmes and services to prevent and treat wasting. The Government has various mechanisms in place, including the mother-child tracking system, the use of unique identification numbers and real-time monitoring by AWW using mobile phones under the ICDS-CAS (Common Application Software). However, these mechanisms need to be standardised across all programmes to ensure a continuum of care across the various service delivery platforms.

Discussion

Under POSHAN Abhiyaan there is huge ambition to ensure that every child has access to quality services to address wasting across the continuum of care. This requires a cost-effective, integrated and sustainable approach that successfully prevents the development of wasting and provides care for those with wasting.

The infrastructure to deliver a comprehensive, community-based programme to prevent and treat wasting already exists in India; a vertical programme to address wasting is therefore unnecessary. There is an extensive network of community-based Anganwadi centres and community-health workers, together with health and nutrition schemes and programmes, into which components of a comprehensive approach can be integrated at scale.

Context-specific solutions to prevent children from developing wasting must be the priority. These solutions should be grounded in an understanding of the specific causes and drivers that lead to wasting. The high prevalence of wasting at birth in India suggests the need to improve the nutritional status of women before and during pregnancy and to ensure mothers have access to skilled support for early and exclusive breastfeeding. From six months of age, counselling on complementary feeding and continued breastfeeding and the prevention and treatment of diseases become important components of preventive approaches. These interventions are already part of existing health and nutrition schemes and programmes, but are not reaching children and women with the desired Coverage, Continuity, Intensity and Quality (C2IQ).

The introduction of monthly height measurements for all children during growth monitoring at Anganwadi centres will increase opportunities for the early detection of wasting. However, it is necessary to ensure that community health workers have the capacity (equipment, skills, time and motivation) to add this responsibility to their roles and increase community demand for services.

The Anganwadi centres currently cater to children with severe underweight and any children identified by health workers as having severe wasting with medical complications are admitted to inpatient care. The forthcoming community-based guidelines on the prevention and management of wasting will guide how treatment reaches children with severe wasting without medical complications at community level. Optimising the quality, production and distribution of rations under the SNP and identification of the nutritional treatment that will be used to manage severe wasting at community level are needed so that treatment puts children back on the path to healthy growth. A strong referral system and tracking of individual children across the different programme components, from the community through to the inpatient facility, are also essential to ensure that children receive the full continuum of care on offer.

It is important to build the evidence base around this comprehensive approach to managing children with acute malnutrition in India and delivering services across the continuum of care. This learning could inform both India and other country contexts with a similar profile of wasting. Key evidence questions include a context-specific understanding of wasting in India; how to scale up screening using WFH at community level effectively; the modalities of managing growth failure in infants under six months old; and the cost-effectiveness of forthcoming guidelines to care for children with severe wasting at community level. In addition, a better understanding is needed of how to address challenging issues such as linkages and referrals between various programmes and schemes to ensure a continuum of prevention and care.

Conclusion

There is unprecedented commitment from the Government of India to address the needs of children with wasting more holistically and at scale. The Government is developing a response that builds on existing infrastructure and systems and is intended to provide sustainable solutions that focus on both prevention and treatment. The programme, once launched, has the potential to reach every child with severe wasting rapidly due to the extensive network of health facilities and community-based platforms that exist in the country.

Despite this huge potential, many of the existing interventions do not reach all children and lack the required impact. Implementation bottlenecks need to be systematically addressed so that high-impact nutrition interventions are delivered with Coverage, Continuity, Intensity and Quality (C2IQ).

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Bioelectrical impedance analysis (BIA) in the management of acute malnutrition

A briefing paper on body composition measurement by bioelectrical impedance analysis (BIA) was published in 2018 by Action Against Hunger (AAH). The aim of the document is to describe the principles of BIA and to propose practical steps in collecting good quality BIA data, based on AAH's operational experience in this area. The paper explains how body composition can provide insights into children's health and shows great potential for improving the diagnosis of acute malnutrition and improving treatment effectiveness. BIA is a way to estimate body composition that is becoming easier to study since new methods have been developed, making the measurement quicker, easier and more reliable for field practitioners to perform in otherwise challenging settings. Because of its potential in providing important information on the true physiological status of malnourished children, body composition measurement should be systematically incorporated into research projects aiming to test the effectiveness of current or new diagnostics or treatment methods. Body composition data is also crucial in informing the long-term health of children, an area that deserves much more attention. Finally, among oedematous children, BIA measurements could provide insights on the distribution and extent of fluid imbalance and help optimise the treatment of this particularly vulnerable malnourished group.

While BIA is relatively simple to measure, it does require cooperation from the patient to remain calm and in a correct position, which is a challenge for young children. Particular attention and effort should be placed in standardising a quality scale for BIA measurement in order to obtain valid results, comparable across studies. Despite its great interest and added value in research settings, BIA remains a method that cannot be applied yet in field routine programmes. More simple, reliable and straightforward interpretation methods are needed in addition to population-specific and validated reference values.

For more information, see www.actioncontrelafaim.org/projet-mango/

SCOPE CODA: World Food Programme innovation to improve data management in malnutrition treatment

The World Food Programme (WFP) has introduced a cloud-based innovation named 'SCOPE CODA' to improve data management in malnutrition treatment programmes. The application gives a digital identity to clients and tracks nutrition and healthcare services, replacing pen-and-paper records, ration cards and reports in healthcare centres with android devices and a personalised smartcard linked to an electronic database. The application builds on WFP's existing client management system, SCOPE, to merge identity management with case management.

Frontline workers use an android device to record routine malnutrition treatment processes during treatment, from registering the client with a unique identity and collecting anthropometric and health data to recording the distribution of nutritional products and other medicines and health commodities. The data collected creates a complete electronic health record of the malnutrition treatment that the client receives across both moderate and severe acute malnutrition treatment (currently to WFP and partner programmes). This record is saved in the android device and then written to a smart card, which is provided to the client to act as their record. All these processes can be done offline; once connectivity is available, the android device syncs to and saves the data to the cloud. Cloud data is analysed and sent to national government health information systems to provide up-to-date, accurate reports to improve programme planning and performance.

Where SAM and MAM programmes are integrated (e.g. South Sudan), the devices and cards are provided to frontline workers. Where SAM and MAM treatment is provided in separate locations (e.g. Uganda), WFP provides the system to the government to use across the programme. Since the android devices are needed to add or read data from the cards, organisations currently need to come via WFP to utilise the system. WFP is looking at building a more open hardware system (i.e. that would require downloading an application and programming a Java Card) to facilitate access.

SCOPE CODA seeks to improve client's care and nutrition results through improving decision-making for frontline workers and utilising the data to generate evidence on best practices. Digitisation also has the potential to improve quality of data, lessen the workload of frontline workers and reduce programme inefficiencies. Finally, since the system works across both severe and moderate acute malnutrition, it provides a unified platform to aid information continuity among multiple stakeholders involved in delivering treatment services.

SCOPE CODA is presently being used in South Sudan, Uganda, Tajikistan and Madagascar. Over the next year WFP will roll it out to countries with a high acute malnutrition burden to expand the digitisation of nutrition services.

For more information, visit https://innovation.wfp.org/project/scope-coda or contact Craig Arnold at craig.arnold@wfp.org

Previous Field Exchange content on continuum of acute malnutrition care

Content previously published in *Field Exchange* is also relevant to this issue's focus on continuity of care for acutely malnourished children. You can search online at www.ennonline.net/fex. Below is a selection of relevant articles from previous editions:

Phase 1 study results of the COMPAS trial and a summary of the study protocol for the economic evaluation:
Jeanette Bailey, Rachel Chase, Marko Kerac, André Briend, Mark Manary, Charles Opondo, Maureen Gallagher and Anna Kim (2016). Combined protocol for SAM/MAM treatment: The ComPAS study. Field Exchange 53, November 2016. p44.
www.ennonline.net/fex/53/thecompasstudy

The "ComPAS" trial combined treatment model for acute malnutrition: study protocol for the economic evaluation. *Field Exchange 58*, September 2018. p10.
www.ennonline.net/fex/58/compastrial

Research on integrating treatment in community health worker in Bangladesh:
Community case management of severe acute malnutrition in southern Bangladesh. Field Exchange 42, January 2012. p11.
www.ennonline.net/fex/42/community

IRC research on low-literacy tools in South Sudan:
Naoko Kozuki, Casie Tesfai, Annie Zhou and Elburg van Boetzelaer (2019). Can low-literate community health workers treat severe acute malnutrition? A study of simplified algorithm and tools in South Sudan. *Field Exchange 59*, January 2019. p30.
www.ennonline.net/fex/59/samtoolssudan

MSF experiences on treatment admission simplification:
Kevin PQ Phelan, Candelaria Lanusse, Saskia van der Kam, Pascale Delchevalerie, Nathalie Avril and Kerstin Hanson (2015). Simplifying the response to childhood malnutrition: MSF's experience with MUAC-based (and oedema) programming. *Field Exchange 50*, August 2015. p108. www.ennonline.net/fex/50/msf-muacprogramming

Research on preventing malnutrition in sick children:
Does nutritional supplementation for two weeks prevent malnutrition in ill children? *Field Exchange 55*, July 2017. p36.
www.ennonline.net/fex/55/doesnutritional-supplementation
Susan Shepherd (2018). TreatFOOD study in Burkina Faso. *Field Exchange 57*, March 2018. p73.
www.ennonline.net/fex/57treatfoodstudyin-burkinafaso

Risk of relapse following moderate acute malnutrition treatment:
Heather Stobaugh and Mark Manary (2018). Relapse after treatment for moderate acute malnutrition: Risk factors and interventions to prevent it. *Field Exchange 57*, March 2018. p64.
www.ennonline.net/fex/57/malnutriskfactor-sandinterventions

WHO's role in acute malnutrition management:
Zita Weise Prinzo, Adelheid Onyango, Dr Ferima-Coulibaly Zerbo, Hana Bekele, Dr Ngoy Nsenga and Adelheid Marschang (2017). Nutrition in health response in emergencies: WHO perspectives and developments. *Field Exchange 56*, December 2017. p89.
www.ennonline.net/fex/56/nutrition-healthresponsewho

Experiences of an adapted (reduced RUTF) protocol by ACF in Myanmar (a precursor to the MANGO study highlighted in Field Exchange 60):
Naomi Cosgrove, Jane Earland, Philip James, Aurélie Rozet, Mathias Grossiord and Cecile Salpeteur (2012). Qualitative review of an alternative treatment of SAM in Myanmar. Field *Exchange 42*, January 2012. p6.
www.ennonline.net/fex/42/qualitative

Review of CMAM innovations by Save the Children:
Anne Marie Kueter, Claudine Prudhon, Emily Keane and Megan Gayford (2018). Report on innovations in CMAM. *Field Exchange 58*, September 2018. p41. www.ennonline.net/fex/58/reportoninnovationsincmam

RUTF supply:
Jan Komrska (2012). Increasing Access to Ready-to-use Therapeutic Foods (RUTF). Field *Exchange 42*, January 2012. p46.
www.ennonline.net/fex/42/access

Local versus offshore costs of RUTF and LNS. *Field Exchange 54*, February 2017. p36.
www.ennonline.net/fex/54/costrutfandlns

RUTF formulations:
Comparison of milk free v milk containing RUTF in SAM treatment in Zambia.
Field Exchange 47, April 2014. p17.
www.ennonline.net/fex/47/comparison

Marta Ortiz Nunez (2010). Impact of local RUTF manufacture on farmers' incomes in Malawi. *Field Exchange 38*, April 2010. p17.
www.ennonline.net/fex/38/impact

Consultation on wasting in Asia to build the evidence base

Field Exchange 59 featured headlines from a consultation on wasting in Asia, organised in support of the No Wasted Lives Coalition mission and priorities. A report on the proceedings is now available online. Participants concluded that there are unique characteristics to wasting in South Asia (high wasting prevalence at birth and in the early months of life, lower associated mortality with wasting, persistent wasting, and lower and slower response to treatment) that need closer examination. Emerging government approaches to community-based management of acute malnutrition and country-level adaptations are looking to build on the relatively strong community platforms for early case detection, community-based management and referral in India. The Indian government is seeking sustainable and scalable solutions that focus on both the prevention and treatment of wasting, including during the first six months of life. As this evolves, there is an opportunity for a strong learning agenda. Finally, research in South Asia can contribute to global and regional efforts in optimising and innovating care and treatment approaches for children with severe wasting. Areas of research include modifications in the quantity, duration and formulation of ready-to-use therapeutic food used in nutrition rehabilitation; the use of home-based foods or home-augmented foods to treat severe wasting; and transitioning from treatment foods to family diets.

Identified ways forward include the need for a new narrative on wasting in South Asia (and globally) that positions prevention as a priority, ensures that children have access to treatment when prevention fails, links wasting with stunting, and frames the functional consequences of wasting on cognition and learning, as well as the mortality risks.

Wasting in South Asia: Consultation on building the evidence base on the policy and programme response. Field Exchange 59, January 2019. p8.
www.ennonline.net/fex/59/wastinginsouthasia

UNICEF (2018). Wasting in South Asia: Consultation on Building the Evidence Base for the Policy and Programme response. UNICEF Regional Office for South Asia: Kathmandu, Nepal.
www.unicef.org/rosa/reports/no-time-waste

No Wasted Lives Coalition launch Community of Practice on simplified approaches to acute malnutrition treatment

The No Wasted Lives Coalition has launched a community of practice (COP) on Simplified Approaches to Treatment Across the Continuum of Acute Malnutrition hosted on the State of Acute Malnutrition website. The aim is to share evidence, knowledge, learnings, and updates about research and implementation of simplified approaches, specifically those focused on uniting treatment of severe and moderate acute malnutrition.

Simplifications explored in this COP refer to a range of modifications to the standard Community-based Management of Acute Malnutrition (CMAM) model. These include:

- A common approach for detection and treatment of both severe (SAM) and moderate (MAM) acute malnutrition, in one programme and at delivery-point.
- The use of just one type of ready-to-use food (RUF) product for treatment.
- These programmes may only include children who transition between SAM and MAM, in recovery or deterioration, or can also include all primary cases of SAM and MAM.

In addition, commonly implemented and researched elements of the simplified approaches, described in the COP include:

- Training mothers and family members to detect acute malnutrition at home and refer for treatment
- Admission and discharge based on MUAC or oedema
- A simplified dosage of RUF, not based on weight
- A reduced dosage of RUF, either for SAM patients or for all acutely malnourished children as they recover.

Broader options to simplify include reduction of visits to health sites during treatment or management of acute malnutrition by community health workers.

The COP includes an introduction to the topic, collates specific and allied evidence to date, frequently asked questions, and implementation examples from research and pilots.

A dedicated thematic area on simplified approaches has been set up on the ENN hosted en-net, and integrated within the COP, to support this effort.

Visit the COP here in English: **https://acutemalnutrition.org/en/Simplified-Approaches** and French: **https://acutemalnutrition.org/fr/Simplified-Approaches**

Visit en-net in English: **www.en-net.org and French: fr.en-net.org**

For further information on the COP, contact: **info@acutemalnutrition.org**

What's new at ENN?

Field Exchange

We are now translating all original Field Exchange articles into French and putting them online on our FEX French landing page-**https://www.ennonline.net/fex/fr** Circulate this link to your French-speaking colleagues and partners where they can find an archive of French material. Articles from this issue will appear there shortly. Ensure your colleague and partners are fully subscribed to Field Exchange here **www.ennonline.net/subscribe/fex**

We will release general issues of Field Exchange in October 2019 and February 2020 and a special issue on wasting in South Asia in June 2020. If you have ideas for articles please email **chloe@ennonline.net**

Nutrition Exchange

ENN and UNICEF Regional Office for South Asia (ROSA) have partnered to produce our first regional issue of Nutrition Exchange (NEX) on maternal nutrition in South Asia. This contains nine articles from seven countries (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka) and has been written by and for government staff and their development partners. Download from **https://www.ennonline.net/nex/southasia** and also access a podcase about a maternal nutrition programme in India **https://www.ennonline.net/mediahub/podcast/karnatakanutritionprogramme**

NEX issue 12 will be published in July in English and French with Arabic and Spanish to follow. Access all copies here **https://www.ennonline.net/nex**

Update on MAMI (management of at-risk mothers and infants under six months of age)

ENN coordinates a special interest group focused on the management of at-risk mothers and infants under six months of age comprising researchers, programmers and policy-makers active in this area. You can watch video footage of ENN presenting about this work and MAMI collaborators sharing research and programming at the MSF Paediatric Study Day in Stockholm in April 2019: **https://youtu.be/BoG2MW0lLsM** (English) and **https://youtu.be/FzQGimGnvKY** (French). Read more about the research and work happening in this area at **https://www.ennonline.net/ourwork/research/mami**

Related to this, ENN is also part of a new research initiative led by the London School of Health & Tropical Medicine in collaboration with Jimma University in Ethiopia and GOAL. Funded by the Eleanor Crook Foundation, a randomised control trial on a community-based intervention for at risk infants the under six months will be carried out in Ethiopia. For more information, contact Marie McGrath, **marie@ennonline.net**

en-net

A new thematic area on simplified approaches for acute malnutrition treatment has been launched on en-net, ENN's online discussion forum. Visit en-net in English: **https://www.en-net.org** and French: **https://fr.en-net.org**

Global Technical Assistance Mechanism for Nutrition (GTAM)

ENN is the knowledge management and monitoring partner for the Global Technical Assistance Mechanism for Nutrition (GTAM) led by UNICEF and World Vision. This mechanism aims to improve the support countries receive who face humanitarian emergencies by mobilising global resources to address unresolved technical issues with advice, consensus-driven guidance and specialist technical expertise.

en-net (**https://www.en-net.org**) is one of the key platforms GTAM will link with. ENN's role is to monitor and document the development and functioning of the GTAM against its objectives (using our existing publications to share this with the wider nutrition community) and to support the development and dissemination of knowledge products in response to the needs identified through the system. For more information, contact Tanya Khara, **Tanya@ennonline.net**

Wasting-stunting study

ENN has started research as part of its long-standing work into wasting and stunting (WaSt). This study, funded by USAID/OFDA and the Global Health Bureau, will be implemented in Nigeria. It aims to bring new evidence produced by the WaSt Technical Interest Group (TIG) on the relationship between wasting and stunting and their combined impact on mortality into existing programme practices. To read more about the study, see this summary **https://www.ennonline.net/attachments/3150/WaSt-Study-Summary_25Apr19.pdf** or email Carmel Dolan **Carmel@ennoline.net**

Multi-sector nutrition programmes

ENN recently published three new case studies from Bangladesh, Ethiopia and Niger on large-scale, sub-national implementation of multi-sector nutrition programmes. This work builds on previously published case studies on the same theme and provides important evidence for policy-makers and practitioners on how these programmes are being operationalised by various government departments and institutions in these three countries. For more details on the case studies see **https://www.ennonline.net/ourwork/knowledgemanagement/sunkm** For related videos and podcasts please see **https://www.ennonline.net/mediahub**

Benoit Fick/MSF

A young girl has her MUAC measured at an MSF outpatient clinic in Northeast Nigeria, May 2018

"There are MAMs, then there are MAMs"

By Kirrily de Polnay

Kirrily de Polnay is a Nutrition Adviser for MSF based in Brussels and is leader of the MSF Nutrtion Working Group. She is a medical doctor by training, with a background in paediatrics. She previously worked in the field with MSF and at the Institute of Tropical Medicine in Antwerp before returning to MSF in a headquarters role in 2016.

Five expectant faces are staring at me, waiting for me to answer the question. "Well," I start, "There are MAMs, and then there are MAMs". Five expectant faces show a variety of frowning, nervous smiles and confused expressions.

I am standing in our inpatient nutrition ward in a hospital in Masisi, Democratic Republic of Congo. The five expectant faces are two doctors, two nurses and a nutrition assistant – we are doing the morning ward round together. Once we have all established, yes, I meant to say that, it wasn't my bad French, I try my best to explain.

The question they asked me is one of a suite of questions I get asked by many of our projects in many different countries and continents: 'How should we treat the children with moderate acute malnutrition (MAM) with medical complications who need hospitalisation – do we treat them as if they were suffering from severe acute malnutrition (SAM)? Do we put them through the whole nutritional treatment protocol, starting with F-75 onwards? Do we refer them to outpatient therapeutic feeding programme (OTP) nutritional care when they exit the hospital?'

At Médecins Sans Frontières (MSF), pratically all of our projects are implemented directly by MSF doctors, nurses, midwives, pharmacists, psychologists, etc., working on the ground, whether with ministry of health staff or in our own projects. We try to equip our staff to deal with the many different contexts and medical conditions with which they will be confronted through medical protocols and guidelines that take into account the latest evidence, combined with our communal clinical experience. We then try to support them through field visits, calls, skypes and emails to make sure that these protocols are achieving the quality of patient care that we all aspire to.

One of the biggest goals of this approach is to provide guidance for clinicians with differing levels of clinical experience and expertise, from the community health officer in Sierra Leone who is now working in our paediatric intensive care unit with only three years of medical education, to the first mission doctor who has ten years of experience in Europe, but has never seen a malnourished child.

We don't always have the luxury of experienced clinicians who can take our protocols, but then use their own knowledge and experience to adapt treatment to each specific patient. This is especially the case for children with MAM with medical complications who need inpatient treatment. Complications may include shock, altered state of consciousness (coma, lethargy, drowsiness), seizures, pneumonia, diarrhoea with severe dehydration or bloody diarrhoea, severe anaemia, severe malaria, other severe infections (e.g., meningitis), severe skin conditions and con-genital malformations leading to feeding difficulties, among others.

The most common approach in MSF has been to treat these children the same as those suffering from SAM, providing the same medical and nutritional treatment.

Indeed, this was the approach that I followed as a field doctor when I started with MSF in 2011. I was very new to seeing malnutrition; my training in south London had actually exposed me to advanced tuberculosis, HIV and even rickets in children, but treating kwashiorkor and other aspects of malnutrition was a huge learning curve. Even then, I had concerns as to whether this was the right thing to do for all of these children, but there were no strong international recommendations that were different to MSF's.

The more time that I have spent caring for malnourished children, both in the field and now from headquarters, still giving clinical input into individual cases as well as working on the aforementioned protocols and guidelines, the more complicated I see the 'MAMs with medical complications'.

One of the main issues here is a chicken-and-egg conundrum. MSF is likely to see two main profiles of MAM with medical complications – and probably everything in between. There are children who come into our health

facilities who are very sick, perhaps even in a coma, who may be having a seizure, who are found to be MAM in triage. After 24 to 48 hours of appropriate treatment and close monitoring, these children are bright as buttons. This Lazarus-like ability of children to recover from illness quickly is why we love paediatrics so much.

Then there is the other profile. These children have the same presenting condition and after the initial 24 to 48 hours of treatment and monitoring are usually slightly better, but are most definitely not bouncing around the ward. These children are slower to repond and may experience some ups and downs in their condition. The general feeling is that this is a vulnerable child – one we need to watch.

We have come to think that the first profile is likely to be a child who has become severely unwell (over a period of time that it is often hard to determine) and then slipped into MAM. This child likely still has the physical resources and homeostatic buffers to br able to bounce back with appropriate treatment. The second profile is likely to be a child who has been MAM for a longer period of time, whose physiology has had to adapt and adapt again to decreasing resources, perhaps also suffering from a number of episodes of illness. There is then one severe episode that pushes them over the edge; homeostasis breaks down and their bodies can no longer cope. Their slower response to treatment, with a bumpier course, is most likely related to their exisiting MAM.

Following this train of thinking, it would seem logical that the first profile of children could be treated as MAM rather than SAM; i.e.; start them on normal food as soon as their condition is stable enough for enteral feeds (whether initially through a naso-gastric tube or straight to oral), with supplementation such as a ready-to-use-supplementary food. Indeed, as I started children with this profile on the full nutritional protocol with F-75 in my early experiences in the field, I worried they were not getting enough calories or protein to help fight their infection. Furthermore, these children were hungry! It is

Children being screened at a targeted food distribution, Maiduguri, August 2016

Hakim Khaldi/MSF

hard enough when you see a SAM child cry for normal food rather than F-75, but at least you know that this is the best treatment we currently have available for their condition, and that giving them normal home food could make them worse through refeeding syndrome.

For the second profile of child, the one who has likely had MAM for a long time, one can feel more confident starting them on the full nutritional protocol as it seems logical that they need a slower approach, with more attention to their metabolic stabilisation.

More often than not, it is extremely difficult to be able to tell if the sickness or the MAM came first when a child first presents. Why? There are many reasons. For example, the history given by the child's caregiver may not be precise enough to help you to work out which profile the child fits. We often see that caretakers may not feel confident talking about a lack of food at home or a difficult situation that has led to the child having less food. We also frequently see these children brought in by their mothers, but with a history of staying with other family members while the mother works or studies elsewhere. This is a stressful time for this mother. She is unlikely to have wanted to leave her child in the first place, but it was the only way to keep her family afloat. She may feel guilty because the child became unwell or did not have access to enough food, or the right kind of food, while

she was away. She is unlikely to be able to give a clear account of her child's health during the time she was not with the child.

As mentioned previously, these two profiles are perhaps the extremes of the spectrum. The added complication to this already-complicated issue occurs when a child presents in between these two extremes: it can be even more difficult to work out the best course of action. So, how can we write a clear protocol that accounts for this complexity and caters to clinicians with differing levels of experience and capacity? Well, we probably haven't come up with the right answer yet. What we have tried to do is to put huge emphasis on assessing next steps of care by the clinical response that we see when we start treatment, close monitoring to pick up on subtle changes in clinical condition, and discussing these cases with our medical team. That team starts with the medics in the field, but extends all the way to me in Brussels through direct emails and calls or via our telemedicine platform.

And what about follow-up? Again, we advise case-by-case and give our teams the autonomy to adapt to their context, but we all know paediatricians are control freaks, so we usually advise them to come back to our outpatient clinic for follow-up, even if our outpatient programmes don't normally admit MAMs (something else we are trying to change at MSF…)

We all grew up in medicine working in teams; they are our support network and often our lifeline. With some of these difficult and complex questions regarding malnourished children, my medical team extends beyond MSF and into the nutrition community. I often send out my distress calls to clinicians I trust and respect, such as Jay Berkley and Indi Trehan. It brings me comfort when I find them thinking along the same lines (although they usually express it more eloquently and with a whole bunch of papers for me to read to back it up!). It is also a comfort to know that there is great research in progress, such as Mark Manary's high-MAM tudy in Sierra Leone. Hopefully, we will soon be able to provide better guidance to our clinicians in the field and deliver the best possible care to these little ones with MAM.

For more information please contact Kirrily de Polnay at *kirrily.de.polnay@brusselsmsf.org*

Fatima attempts to feed her daughter RUTF in an MSF hospital in Pulka town, Northeast Nigeria, May 2018

Igor Barbero/MSF

Field Articles

Simplified approaches to treat acute malnutrition:
Insights and reflections from MSF and lessons from experiences in NE Nigeria

By Kerstin Hanson

Kerstin Hanson has a background in paediatrics and public health. She most recently worked as a nutrition adviser for Médecins Sans Frontières/Doctors Without Borders Operational Centre Paris.

Mothers and children awaiting consultation in a joint OPD/OTP clinic, Borno State, Nigeria, 2016

Background to MSF's use of simplified acute malnutrition programming

Médecins Sans Frontières/Doctors Without Borders (MSF) has been engaged in simplifying and streamlining the treatment of acute malnutrition dating back to before the creation of ready-to-use therapeutic food (RUTF), with the aim of improving both coverage and quality of care and the ultimate goal of decreasing mortality. Working in greatly differing contexts, including in acute and chronic humanitarian emergencies and urban and rural settings, has required MSF to develop interventions that fit challenging operational constraints and objectives.

Current barriers to increased coverage and quality of treatment for acute malnutrition include rigid and unrealistic national community-based management of acute malnutrition (CMAM) protocols and poor integration with primary and secondary healthcare programming and strategies. The classic CMAM approach is resource-intensive, often impractical for caregivers, and lacks the flexibility required to adapt to different needs and limitations, while also largely neglecting the continuum between health and nutrition.

Characteristics of MSF-Operational Centre Paris (OCP) nutrition operations

Numerous unique operational features of MSF-OCP allow and encourage the organisation to simplify and adapt its nutrition interventions to suit the varying contexts in which it operates. As an emergency medical organisation, the priority is to provide life-saving treatment, thereby decreasing mortality; preventive interventions are not excluded but are often secondary. The focus of nutrition programmes is therefore treatment of severe acute malnutrition (SAM), including high-level hospital and medical care for the very ill, with the treatment of moderate acute malnutrition (MAM) implemented only in specific contexts, according to need and feasibility. Also related to its medical roots, the integration of healthcare and nutrition programming is the norm for MSF-OCP. Where MSF supports an outpatient therapeutic programme (OTP), there is generally a medical outpatient department (OPD), and alongside any stabilisation centre (SC) there is most often also a paediatric inpatient department (IPD), providing free access to healthcare for anyone in the target age group. This simultaneously decreases morbidity and mortality among patients without acute malnutrition and treats diseases that commonly lead to deterioration of nutrition status.

Another unique feature of MSF, due to its independent financing and functioning and logistics strength, is its flexibility to intervene rapidly before other nutrition partners are mobilised. MSF teams are, therefore, often among the first international responders in humanitarian emergencies. MSF chooses to work in operationally difficult and insecure contexts with limited access for both teams and beneficiaries; this requires flexible operational strategies that can suit realities on the ground. MSF responds in restricted geographic areas, targeting prioritised populations with focused interventions, often horizontal (integrated) in nature. This contrasts with United Nations (UN) agencies and other partners, who often implement large-scale (although generally vertical) nutrition programmes.

The complexity of horizontal and integrated programmes requires each component to be as simple as possible; taking some of the complexity out of the nutrition programming allows room and resources for primary healthcare programming, for example. There is also need for rapid but phased responses allowing for immediate attention to those most at risk, followed by adaptation of the intervention as the context evolves, including availability of other actors. These features of MSF's way of working encourage the use of simplified and context-specific protocols for acute malnutrition treatment.

Rationale and considerations for simplifying acute malnutrition treatment

MSF has advocated for the simplification of acute malnutrition treatment approaches to enable nutrition programmes to improve access and quality of care, according to varying context-imposed operational needs and constraints. This has involved using mid-upper arm circumference (MUAC) as the sole anthropometric indicator for identifying children requiring nutritional treatment and monitoring progress during treatment; reduced frequency of follow-up in outpatient care; single programming for MAM and SAM; and simplified dosing of specialised nutritious food products (SNFPs). Context-specific adaptations which MSF advocates for also include context-appropriate use of antibiotics; context-appropriate choice of target population (with use, for example, of a sliding MUAC scale); and integration of nutrition screening and treatment with essential life-saving health interventions during blanket emergency strategies in contexts without functioning nutrition programmes (e.g., anthropometric screening and provision of RUTF during measles vaccination campaigns or seasonal malaria chemoprophylaxis).

Sole use of MUAC

Although the debate around the use of MUAC as a sole criterion for entry to programmes is ongoing, in practice MUAC enables rapid de-centralised screening and identification of at-risk children. This has an important advantage for use in understaffed and overburdened health structures and enables decentralised care through community health workers and mothers. Benefits also include improved early detection.

Reduced frequency of follow-up

Standard CMAM programming requires weekly follow-up during outpatient SAM treatment. This is a heavy burden for both mothers and healthcare facilities. When access is limited, it can mean the difference between receiving treatment or not. Decreasing the frequency of visits when children are stable can significantly reduce the burden for caretakers and programmes. This is ideally accomplished through task-shifting of surveillance and monitoring to community health workers or mothers.

Joint SAM and MAM programming

Single programming for SAM and MAM, referred to as "expanded", "extended" or "simplified" programming, offers treatment for both SAM and MAM in a collaborative effort with a common circuit and staff, and with use of a single SNFP. This approach has administrative and logistic advantages and allows for easier adaptation of the target population according to resources and needs as contexts evolve. This approach also enables a continuum of care for each child as they recover from acute malnutrition.

Context-driven adaptations

To truly optimise coverage of needs and quality of services, interventions must be simplified and adjusted according to context-specific needs and barriers. Whether to provide treatment for SAM and MAM jointly may, for example, depend on general MAM treatment strategy, whether faced with an acute emergency, expected caseload, available resources, expected catchment area, presence of contributory co-morbidities, and presence of other actors. In some contexts, for example, rather than including all of SAM and MAM, it may be more feasible and realistic to expand criteria to include only children with MUAC <120mm (MUAC sliding scale). Context should also be considered when deciding whether to use mothers or community healthcare workers for MUAC-based case-finding and follow-up between visits, and whether and how far to space outpatient visits.

Current CMAM protocols include systematic treatment with amoxicillin, in spite of lack of conclusive evidence for the benefits of this practice, growing antibiotic resistance and World Health Organization (WHO) recommendations to limit and rationalise antibiotic use. Providing broad-spectrum antibiotics systematically only when truly required would follow WHO recommendations and further simplify SAM treatment. While systematic treatment may be warranted in certain contexts, local factors such as prevalent co-morbidities, access to healthcare and resistance patterns should be considered when choosing whether to provide blanket antibiotics during treatment of SAM (Trehan, 2013; Isanaka, 2016).

Many of these strategies are now being studied and implemented more widely. While positive results have been demonstrated, care must be taken not to upscale new strategies too hastily and, when implemented, new strategies must be monitored appropriately. MSF experiences demonstrate both advantages and drawbacks that should be considered. One of the most recent and significant experiences in using simplified and context-adapted protocols was during MSF-OCP's interventions in Borno, Nigeria in 2014-2015.

MSF experiences of simplified approaches to acute malnutrition treatment in north-eastern Nigeria

Context

MSF-OCP has maintained a permanent presence in Borno State, Nigeria, since 2014, providing healthcare to populations affected by the ongoing violence and population displacement in the region. Operations have varied over time, with activities in a number of different locations, over different durations, and in constant evolution. MSF has intervened in official and unofficial camps in and on the outskirts of Maiduguri (the state capital), as well as various other areas throughout the state, serving both displaced and host communities. Activities have included water, sanitation and hygiene (WASH) interventions, primary healthcare and nutrition (including OTPs) and secondary healthcare (including an SC for the treatment of SAM with complications), perinatal care, epidemiological surveillance and monitoring, response to outbreaks, and food and non-food item (NFI) distributions. Operations were, however, severely constrained as a result of multiple factors, including escalating violence, security problems and lack of access to populations in need. MSF had a difficult relationship with the Ministry of Health (MoH), including (among other issues) lack of access to land or structures for MSF to run activities. Although the International Committee of the Red Cross had an international presence in Maiduguri, in 2014-2016 there was minimal presence of any other international non-governmental organisations.

By June 2016 the conflict had displaced around 1,404,483 people in Borno State. Maiduguri was hugely overcrowded (with multiple informal camps/settlements and 11 official camps), with inadequate access to food, healthcare, shelter and sanitation. By June 2016 consultations in the two MSF-OCP supported OPDs in Maiduguri had increased to over 1,000/day and remained at that level until October of that year; 20% of children presenting were identified as having SAM. During the same period, OTPs at the same two sites were following 1,000-2,000 cases of malnourished children, and maternity units were assisting 120 simple deliveries and providing 1,200 antenatal clinic (ANC) consultations each week. After being forced by the MoH to leave the previous site, a new 30-bed SC was set up in the Maiduguri district of Gwange in May 2016. Despite expanding to 115 beds by July, the centre continued to have a bed occupancy rate of over 100%. Half of the SC admissions were from the host population, who complained of high food prices and food unavailability.

In mid-June the Nigerian military, along with a local non-governmental organisation, organised the evacuation of 1,192 people requiring urgent medical care from Bama camp to Maiduguri. The camp was located around 70 kilometres south of Maiduguri, inside a former hospital compound with entry and exit controlled by the military. Of 466 children screened using MUAC measurements by MSF-OCP upon arrival in Maiduguri, 66% were wasted and 39% had SAM, raising an immediate alert. A first visit by an MSF-OCP team in June 2016 discovered a catastrophic humanitarian situation: 15,000 internally displaced persons (IDPs) were found living in terrible conditions, completely dependent on aid, with very high rates of SAM (20%) and high mortality due to malnutrition and malaria. A press release alerted the humanitarian community to the dire situation to mobilise action. Due to serious security concerns, MSF-OCP settled on monthly rapid emergency interventions rather than maintaining a permanent presence. A team was moved into Bama by United Nations Humanitarian Air Service helicopter for four days per month to implement a mass treatment package for health and malnutrition, including identification and treatment of SAM and MAM and targeted food distribution to families of all children under five years old, as well as health and WASH interventions. Malnutrition rates rapidly dropped to below emergency thresholds as a result. By October 2016 Bama had become a priority location for the state government and UN agencies, with regular food distributions by World Food Programme and UNICEF, and Nigerian Air Force-supported clinics. Given this scale-up, MSF-OCP decided to redirect its assistance to other more vulnerable areas.

Interventions

Maiduguri

In July 2016 MSF-OCP ran two OTP sites in Bolori and Maimusari and an SC in Gwange, all targeting care to children aged 1-59 months with SAM. In Bolori and Maimusari outpatient treatment was provided side-by-side with general OPD consultations for all-comers, as well as antenatal care (ANC) and maternity services. Admission and discharge criteria for the therapeutic feeding programme included standard indicators: both WFH- and MUAC-based anthropometric cut-offs and bilateral pitting oedema. Admissions to the SC came primarily from the two MSF-supported OTPs or via referrals from MSF activities in IDP camps on the outskirts of Maiduguri and elsewhere. In light of the critical situation, steps were taken to expand coverage, including the addition of an OTP at the site of the SC (increasing the number of OTPs to three), increased bed capacity of the SC, inclusion of treatment of children with MAM up to age 59 months and inclusion of treatment of children with SAM up to age 10 years. A second objective was to improve quality of care, particularly with regard to the critically ill children arriving at the SC, but also regarding the general continuum

MSF health worker screening for acute malnutrition with MUAC during OPD consultation, Borno State, Nigeria, 2016

of care, through reinforced referral systems and improved emergency and critical care.

In order to allow for the large increase in activities in the context of immense operational constraints, a simplified approach was essential. MSF-OCP had initially used MUAC-only programming when activities were established in north-eastern Nigeria in 2014, but had to change to a combination of MUAC and WFH as required by the MoH and UNICEF in order to comply with national protocols. When the situation worsened in 2016, MUAC-only programming was reinstated alongside other methods to simplify, streamline and contextualise the response, including a simplified/MUAC-based dosing using a single product for SAM and MAM. Children were discharged once MUAC reached >125mm for two consecutive visits and after a minimum of four weeks in the programme. Improving patient flow, including the patient circuit and triage, was also a priority; particularly to facilitate flow between the OPD and OTP. There were clear advantages of having both activities side-by-side including more systematic screening and case-finding and a simpler continuum of care.

By adopting these modifications into the strategy, MSF-OCP was able to treat 11,911 cases of global acute malnutrition (GAM), including 2,121 cases of complicated SAM, in the period from July to December 2016 across its three OTPs and one SC.

By early to mid-2017 the situation had changed. Many other actors were involved in nutrition programming in the area, providing OTPs, a blanket supplementary feeding programme providing one ready-to-use supplementary food per day to all children under five, cash programming, and general food distributions. MSF had strengthened the referral system to and from the SC for cases treated at OTPs supported by other actors. The malaria and diarrhoea peaks had passed, but there was still a lack of access to primary and

secondary care for non-SAM cases and secondary care for children with complicated SAM. MSF modified its strategy in response to these changing needs, eventually narrowing back down to the treatment of SAM in children up to age 59 months only. Complicated MAM cases were still managed by MSF, as were all other children under five years old, but now as general paediatric cases in the paediatric hospital.

There has not yet been any formal evaluation regarding use of the described adaptations in Borno, but internal reports show that programme outcomes remained within MSF thresholds and Sphere minimum standards throughout their use in 2016 and 2017.

Bama
The strategy in Bama differed from that in Maiduguri due to a different set of barriers. The objective in both locations was high coverage of care using a multidisciplinary approach. Although quality of services remained a constant goal, there was a particular emphasis in Bama on rapidity and comprehensiveness of services due to security constraints (to do as much as possible in a short time frame with punctual visits and with services that would continue to provide a benefit over time). The strategy included monthly rapid emergency interventions rather than maintaining a permanent presence on the ground. On each visit the team provided many services, including comprehensive MUAC-based nutrition screening of all children aged under 10 years (age estimated based on height), with systematic antibiotics and one-month supply of RUTF for all children with acute malnutrition (dosing based on whether SAM or MAM according to age-specific MUAC cut-offs), and targeted food distribution of millet/oil/beans to families of all children under five years of age. Simultaneous activities included outpatient consultations, seasonal malaria chemoprophylaxis, distribution of mosquito nets and NFIs, water and sanitation activities, and measles and pneumococcal vaccinations.

Challenges, lessons learned and questions raised
MUAC-only protocols
In Maiduguri the use of MUAC-only to identify SAM cases and monitor their progress was implemented principally as a means to simplify and speed up flow through the patient circuit by enabling a broader range of health workers to take anthropometric measurements and thereby ease overcrowded outpatient services. In this context of very high caseload of GAM and limited resources, this was the most feasible way to identify children with SAM at highest risk of death in need of additional support. Using a single anthropometric marker also facilitated expanding care to treatment of children with MAM, then scaling back down to SAM-only management.

OPD teams were satisfied with the approach, describing increased ease and speed of systematic and comprehensive screening of all children presenting for general consultations and improved efficiency during follow-up consultations. Overall, the MUAC-only approach allowed for manage-

ment of a larger caseload and improved allocation of valuable time and space for improving quality of care.

The principal implementation challenge was gaining approval from MoH and national-level UNICEF to depart from national protocols. There was also some disagreement around acceptable admission criteria between MSF and other implementing partners, most of whom used both MUAC and weight-for-height (WFH), particularly as it related to patients referred between non-MSF OTPs and the MSF-run SC. Finally, there were some concerns regarding cut-offs for children aged 5-10 years in light of minimal experience using MUAC-only programming in this age group.

In Bama, anthropometric screening was used to establish eligibility for provision of prompt essential treatment rather than inclusion into a more typical nutrition programme. MUAC was the only feasible option for rapid massive screening during a multidisciplinary intervention. The only concern, as in Maiduguri, was related to lack of experience with MUAC cut-offs for children older than 59 months.

Single circuit/single product programming for SAM and MAM
In light of the high prevalence of SAM with an underlying context of poor sanitation, lack of access to health care, and food insecurity, MSF decided to not only treat but also prevent deterioration into SAM. Preventive strategies included increasing general access to primary care and identification and treatment of MAM. As SAM programming and OPD services already existed but human and physical resources were limited, MAM treatment was integrated into the pre-existing SAM programme. SAM and MAM services used a single patient circuit, and the same staff and product (RUTF). The principal differences in care were RUTF dosage (children with MAM received half the dosage received by children with SAM) and treatment of complicated cases (complicated SAM cases were referred to the SC whilst complicated MAM cases were referred to the MSF IPD for standard paediatric care in accordance with MSF-OCP and national protocols thus shortening length of stay in hospital). Nutritional stabilisation for SAM cases in SCs, involving initial feeding with therapeutic milk followed by gradual reintroduction to solids and increased caloric content, generally takes 5-7 days. In standard paediatric care children are advanced to full feeds as soon as medically stable, with length of hospital stay averaging only 3 days. MAM children with complications were thus able to rapidly return to nutritional rehabilitation after medical treatment and not required to stay as long in the hospital.

Use of an expanded criteria protocol allowed MSF-OCP to adapt to the context by increasing coverage when required and to reduce the programme caseload when the situation evolved. Providing both SAM and MAM treatment through a single programme also enabled continuity of care for children recovering from SAM, allowing them to continue nutritional rehabilitation without transfer or admission to a separate MAM programme.

In Bama, where limited access required a rapid intervention, screening for and treating SAM and MAM in a single process and with a single product allowed for efficient and rapid treatment and prevention of SAM. In addition, supply and distribution of only one product greatly simplified logistics.

The biggest challenge to this expanded criteria strategy was the sheer number of children admitted. A three-fold increase in caseload when the admission cut-off was increased from 115mm to 125mm is largely attributable to the increase in MAM caseload that accounted for 70% of admissions during 2016 (25% were SAM cases under 5 years of age; the remainder were SAM children aged 5-10 years). As part of the general project upscale, an IPD was opened to provide secondary care for children up to age 10. MSF-OCP was thus able to hospitalise complicated MAM cases in this facility, referring them to the therapeutic feeding programme on discharge. It would have been more complicated if children with both complicated SAM and MAM had required hospitalisation in the SC.

Medical case management for children with MAM in the context of the expanded protocol

MAM cases are, by definition, not as advanced in the disease process nor at as high risk of illness and death as SAM cases. Expanding the criteria to include MAM and thereby provide the same intensity of care as for SAM may risk overtreating MAM, over-complicating MAM treatment and wasting resources. This may be most pertinent where it pertains to medical management and follow-up provided for MAM cases. Does MAM require the same intensity of care as SAM in terms of frequency of visits, stabilisation during hospitalisation for complicated cases, and routine antibiotics, for example? Although MSF-OCP and national protocols recommend hospitalisation of complicated MAM cases in a general paediatric IPD, this is not universal. Some protocols do not specify where to hospitalise cases and others recommend hospitalising cases in SCs, alongside SAM cases. Although routine antibiotic administration is not practised in supplementary feeding programmes and WHO recommendations are to reduce general antibiotic use, a combined GAM treatment protocol runs the risk of adding unwarranted antibiotics to the treatment of MAM. Standard MAM treatment protocols generally recommend monthly follow-up visits. Expanding this to weekly visits, the current standard for SAM treatment, may be unwarranted, especially given already limited resources and the additional burden on caregivers and healthcare providers.

Simplified RUTF dosing regimen

Whereas standard SAM dosing is weight-based, with several different dosages possible, in this context MSF-OCP used dosing based on results from phase one of the ComPAS study, which recommended simplified MUAC-based and single-product dosing, treating children with MUAC <115mm with two RUTF sachets per day and children with MUAC ≥115mm with one RUTF sachet per day (Bailey et al, 2016). This regimen greatly improved efficiency by pre-packaging RUTF into bundles with appropriate supplies of RUTF for either SAM or MAM treatment, which could then be easily and rapidly distributed to mothers as they passed through the patient circuit. The same system was used for Maiduguri and Bama, differing only in the duration the bundle was expected to cover (two weeks for Maiduguri and four weeks for Bama).

The simplified dosing was easily implemented and generally well accepted. OTP staff did, however, express concerns regarding MAM dosing and MUAC discharge cut-off, observing that many children plateaued around MUAC 120mm, taking a long time to reach the 125mm discharge cut-off. They felt this put an increased burden on daily caseloads and that children should either be discharged earlier or be given higher doses of RUTF.

Reduced follow-up

As outlined above, major constraints in Maiduguri were the large number of malnourished children, limited physical space in which to conduct activities, and the need to prioritise and allocate limited resources for maximum impact. Beneficiaries lived principally in the surrounding areas, so transport and access to the MSF health centres was not a barrier. SAM children responding positively to treatment were thus asked to attend follow-up sessions every two weeks, with parents being encouraged to return to the health centre sooner should there be cause for concern. This was well accepted by staff and parents and allowed for the treatment of twice as many children with SAM. Principle concerns and questions related to follow-up were again related to care of patients with MAM. While children with MAM recovering from SAM are generally seen weekly, standard follow-up for children with MAM is monthly. Combining treatment of SAM and MAM meant that all children with MAM were followed up every two weeks, thus doubling the frequency of MAM visits and contributing to over-crowded health centres.

In Bama, difficulty of access to the population for MSF teams necessitated decreased frequency of follow-up visits. All patients with acute malnutrition, MAM or SAM, were given a four-week supply of RUTF (dose dependant on MUAC), with the plan that the team would return in four weeks to screen the whole population again and allocate new supplies of RUTF accordingly. Medical follow-up was provided through access to general consultations as for the rest of the population. Although not an ideal situation, this was seen as a "better-than-nothing" solution: better to give therapeutic food, even without possibility of regular follow-up and surveillance, than to give nothing at all because of inability to provide the "full package". Impact evaluation was not feasible due to lack of cohort follow-up, although population-based screening indicated decreased prevalence of acute malnutrition over time through this multidisciplinary intervention.

In other contexts, reduced follow-up may be an important aspect of regular (non-emergency) programming when access to CMAM programming is limited and parents/children are required to travel long distances or make big sacrifices to reach centres for follow-up.

Integration of nutrition programming and access to general healthcare

As noted above, the number of actors providing nutrition programmes in Maiduguri increased dramatically as news of the emergency spread. The number of actors providing primary and secondary healthcare unfortunately changed very little during the same period, despite the high demand. Thus, left untreated, diarrhoeal disease and malaria continued to contribute to the burden of acute malnutrition. As recognised in UNICEF's conceptual framework of the determinants of childhood undernutrition, alongside inadequate nutritional intake disease is an immediate cause of malnutrition. Access to primary healthcare is fundamental to preventing acute malnutrition (and equally as important as provision of adequate nutrition), yet far too often it is neglected in standard vertical nutrition interventions.

Conclusions

The experience of MSF-OCP supports simplifying the treatment of acute malnutrition as a means for improving programme coverage and quality of care. Use of MUAC-based admission and discharge criteria, treatment with a single product, reduced follow-up visits for stable children and more efficient triage and patient flow reduced the workload and burden on staff and caregivers. They also enabled easier integration with primary and secondary healthcare and addressed the needs of a large number of children with malnutrition in an acute humanitarian crisis in an insecure region where access was often problematic. Documented outcomes met international standards and the approach allowed management of many more children than would have been feasible using the conventional approach. Outstanding questions remain, including around the best methods and criteria for identifying children at risk of, and suffering from, acute malnutrition in different age groups; optimal dosages for SNFPs; and whether different treatments are needed according to type and severity of acute malnutrition. It is essential that nutrition protocols retain the flexibility to adapt to varying and evolving contexts, but also to an evolving evidence and knowledge base.

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The USAID experience of advocating to employ the expanded admission criteria in Nigeria

By Erin Boyd

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In northeast Nigeria in 2016 nutrition assessment reports indicated a nutrition crisis, with reports of large numbers of mothers and children arriving severely malnourished to camps. USAID did not have many emergency nutrition partners operating in northeast Nigeria and sought to support partners to rapidly scale up treatment of acute malnutrition in response to a potential famine.

Access to northeast Nigeria was very constrained and there were few partners with capacity to implement community-based management of acute malnutrition (CMAM). There was also no World Food Programme (WFP) presence in Nigeria during this time, which made moderate acute malnutrition (MAM) treatment impossible. Given the circumstances, USAID worked with non-governmental organisations (NGOs), partners and the Nutrition in Emergencies Working Group (NiEWG) to share resources and experiences related to the expanded admission criteria (EAC) and urged the NiEWG and NGOs to consider its application in northeast Nigeria. While the information was well received, decision-making by the emergency nutrition community, including national authorities and United Nations agencies was slow, despite the availability of funds and resources to implement this model.

USAID continues to support the use of the EAC and different modifications to national guidelines to treat acute malnutrition in specific settings. We also support operational research to test which modifications yield the most improved outcomes and are operationally feasible. USAID maintains a willingness and flexibility to modify the treatment model for acute malnutrition in certain contexts in order to reach children as early as possible in humanitarian settings.

Protocol adaptations to deal with programme realities: UNICEF Nigeria perspective

By Sanjay Kumar Das, Reuel Kirathi Mungai and Maureen Gallagher

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Prior to 2016 the presence of international humanitarian organisations supporting Borno state primary health care in the management of acute malnutrition was limited to a handful of partners. Occasioned by the security situation and limited access, all humanitarian coordination was initially undertaken from Abuja, with consultations with the state leadership and the humanitarian coordination organisations. Coordination was decentralized to Borno by the end of 2016.

Robust nutrition situation analysis was undertaken collaboratively between the humanitarian partners and the state with technical support from UNICEF as the cluster lead agency. This led to the declaration of a nutrition emergency on June 2016 by the then Federal Minister of Health. This declaration led to an upsurge of humanitarian partners working in the nutrition sector as well as the formal activation of the Sector to respond to the Level 3 humanitarian crisis. The crisis in the NE Nigeria, with its epi-center affecting Borno state, was reflected in high malnutrition prevalence. At the height of the crisis in 2017 there were an estimated 520,393 malnourished children in the state, the majority of whom were in the host community and in access challenged local government areas.

The Nigerian CMAM guideline recognizes the use of both MUAC and WHZ as admission criteria. With the high burden of acute malnutrition and a fragile health system operating below 40% capacity, the sector agreed with all partners on the use of MUAC only as the admission and discharge criteria for treatment. The Nigerian CMAM guideline also recognizes the absence of MAM services; hence MUAC above 12.5 cm is used as a discharge criterion for those treated for severe acute malnutrition.

Following the establishment of the nutrition surveillance system, the nutrition sector identified pockets of extremely high global acute malnutrition (GAM) rates with access challenges where a typical CMAM service delivery approach through the health system was not feasible. Some partners requested the use of the expanded admission criteria (EAC) in those locations with intermittent access, through the CMAM Technical Working Group (TWG) which was discussed and approved to be executed in specific circumstances. Key concerns from the state and the federal nutrition focal persons were availability of RUTF supplies as the numbers of malnourished children were high, challenges with misuse of RUTF if the EAC was not properly undertaken, criteria for activation and deactivation, as well as reporting tools to be utilized. These concerns were discussed by the CMAM TWG and an operation guidance was adopted from the global tool "Options for exceptional community-based management of acute malnutrition programing in emergencies" to set criteria and boundaries for these temporary adaptations to deal with this exceptional situation.

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Addressing acute malnutrition in Cameroon during an emergency:
Results and benefits of an integrated prevention programme

Education session in Lagdo, Cameroon

By Eveline Ngwenyi, Mica Jenkins, Nicolas Joannic and Cécile Patricia

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Location: *Cameroon*

What we know: Cameroon is host to significant numbers of refugees and displaced populations; this situation heightens chronic food and nutrition insecurity and can overwhelm services.

What this article adds: Low coverage of targeted supplementary feeding programmes (TSFP) to treat moderate acute malnutrition (MAM), rising acute malnutrition rates and capacity limitations catalysed a strategic shift to a prevention-oriented programme in 2016, piloted by WFP and the Government of Cameroon in the Far North and East and Adamaoua regions. The new approach uses the blanket supplementary feeding programme as an operational platform to deliver multiple services, including household food assistance, specialised nutritious food, social and behaviour change communication, and health and water, sanitation and hygiene services. The programme targets all children aged 6 to 24 months to prevent malnutrition and treats uncomplicated MAM cases, complicated MAM cases (where referral services are not available) and recovering severe acute malnutrition cases to prevent relapse among children aged 6 to 59 months. In 2017 the programme was decentralised for better integration, access and coverage. The number of children reached has doubled since 2015; total cost per beneficiary is half that of TSFP; and prevalence of acute malnutrition in target regions has fallen. MAM admissions match estimated caseload and recovery rate is high. Programme success is attributable to well-informed decision-making, strong government leadership and coordination, community engagement, ongoing learning and implementation adjustments, cross-sectoral engagement and communication and adequate sustained external funding.

Country and programme context

Cameroon is prone to climatic shocks in the northern regions, compounded in recent years by conflict in neighbouring countries, including a sociopolitical crisis in Central African Republic (CAR) since 2013, resulting in a large number of refugees arriving in the eastern regions, and the Lake Chad basin crisis, a consequence of Boko Haram activity. The resulting influx of refugees, in addition to internal dis-placements resulting from insecurity across Cameroon, led to significant deterioration of an already chronic food security and nutrition situation in Cameroon in 2014.

At the initial stage of the response to the CAR refugee crisis in early 2014, World Food Programme (WFP) support to the government focused mainly on the provision of moderate acute malnutrition (MAM) treatment services as targeted supplementary feeding programmes (TSFP) provided through the existing health facilities. How-

Figure 1   Expanded prevention programme in Cameroon

- Family Planning
- Household cash/food assistance (including PLW)
- Promotion of appropriate IYCF
- **Platform for prevention of Malnutrition (BSF)**
- Health interventions e.g., deworming, Vit A supplementation, HIV services
- Water, Hygiene & Sanitation
- MUAC screening

Figure 2   Management of acute malnutrition in children aged 6-59 months

COMMUNITY

Monthly nutrition screening of all children 6 - 59 months

CHILDREN
6 - 59 months
with MUAC < 115 mm, WHZ < -3 and/or bilateral oedema

CHILDREN
6 - 23 months
including children with
115 mm ≤ MUAC < 125 mm

CHILDREN
24 - 59 months
with 115 mm ≤ MUAC < 125 mm

Outpatient Therapeutic Programme/ Stabilization Center

RUTF:
170kcal/kg/day
(treatment to recovery)

*WHZ ≥ -1.5 z-score or MUAC ≥ 125 mm and absence of bilateral oedema*

MUAC < 115 mm, WHZ < -3 and/or presence of bilateral oedema

Prevention platform

Super Cereal Plus:

100g/child/day for children 6-23 months
(prevention for 12 months, or treatment to recovery followed by prevention)

200g/child/day for children 24-59 months
(treatment to recovery)

ever, a joint UNHCR/UNICEF/WFP mission in June 2014 concluded that the nutrition response in the eastern regions was not reaching expected outcomes, with coverage and effectiveness of treatment programmes below SPHERE standards and dramatic increases in global acute malnutrition (GAM) prevalence among refugees and host communities, compounded by a lack of resources, capacity and preparedness to manage the provision of treatment services for an unexpectedly high caseload. It was thus concluded that, rather than investing further resources to improve the performance and coverage of the MAM treatment programme, the nutrition response would be reoriented to have a stronger focus on prevention. WFP and partners therefore scaled up coverage of the malnutrition prevention programme, alongside general food assistance (GFA).

In 2015 Cameroon hosted approximately 80,000 refugees in the Far North region and over 234,000 in East and Adamaoua regions, in addition to a growing number of internally displaced people (IDPs) fleeing insecurity. Commercial trade and markets were greatly disrupted and essential services, including schools and hospitals, were made only partially functional, overwhelmed by the influx of refugees and movements of IDPs. Food security sharply deteriorated alongside intensifying violence, especially in the Far North region, where approximately 35% of households were food insecure (WFP, 2015). While a 2015 SMART survey confirmed the stabilisation of the nutrition situation in regions affected by the CAR refugee crisis, the prevalence of GAM and severe acute malnutrition (SAM) continued to deteriorate significantly in the northern regions affected by the conflict in northeast Nigeria, reaching 13.9% GAM and 2.2% SAM, compared to 9% and 2% respectively in the 2014 SMART survey.
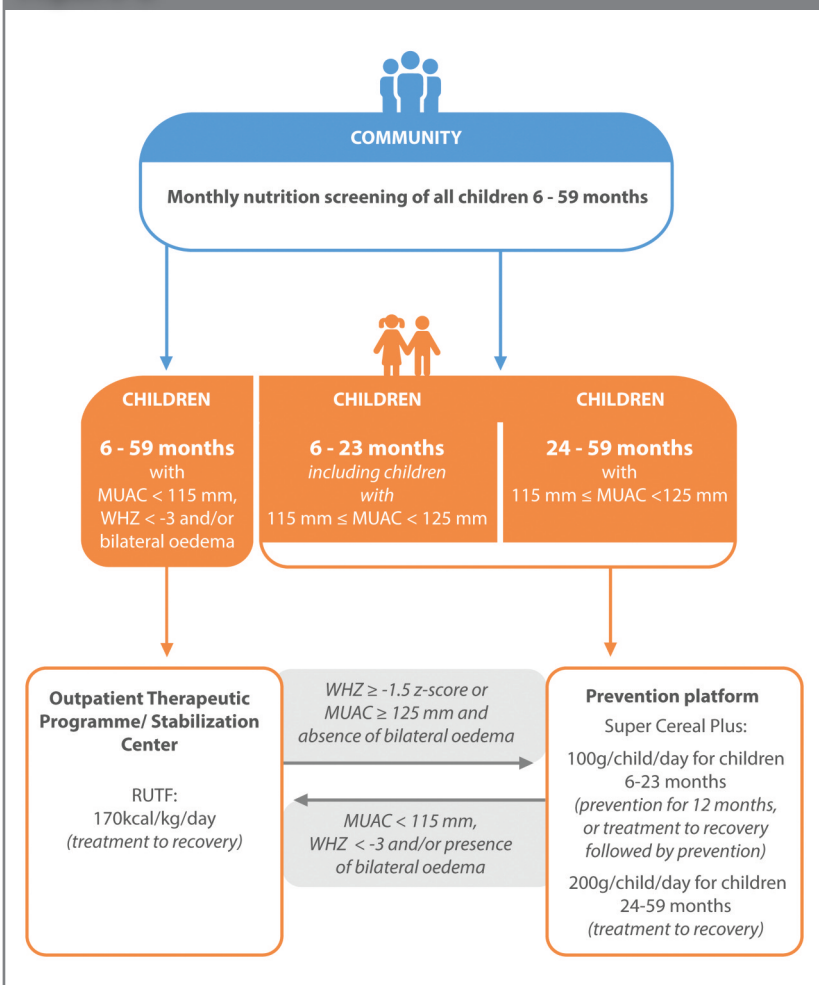
When the WFP emergency operation was launched in the Far North region in early 2015, WFP was supporting MAM treatment only. Despite the efforts and resources invested in this treatment, coverage remained too low (<10%) due to lack of capacity, poor coordination of partners in community-based management of acute malnutrition (CMAM), poor quality of service delivery, and difficulties related to access for scaling up the humanitarian nutrition response in the region. Considering the deteriorating nutrition situation in the Far North, the Ministry of Public Health (MoPH) agreed to strategically shift the emergency nutrition response in early 2016 towards a prevention approach, while gradually suspending the treatment-focused approach for MAM.

Programme overview

WFP and the MoPH designed an innovative nutrition response with a stronger focus on preventive strategies, which included both nutrition-specific and nutrition-sensitive interventions focused on the prevention of malnutrition in children and pregnant and lactating women (PLW), as described in Figure 1.

The new approach, piloted since early 2016 in the Far North, East and Adamaoua regions, built on WFP's presence at the community level, using the existing blanket supplementary feeding programme (BSFP) as an operational platform to deliver multiple services to address both the immediate and underlying causes of malnutrition. The design of the programme ensures that the nutritional status of non-malnourished children is protected, while those who are already malnourished receive the same nutritional supplement provided in regular MAM treatment programmes (therapeutic supplementary feeding programmes (TSFPs)). How this sits within overall management of acute malnutrition is reflected in Figure 2.

The decision to pursue this model was based on the understanding that, in a highly food-insecure area with impaired access to basic health care services, the limited effectiveness and coverage of a treatment-only approach would not have a significant impact on the reduction of acute malnutrition and associated consequences in children and pregnant and lactating women (PLW). A multi-sector approach, with prevention of malnutrition as the central focus, was needed to increase programme coverage in high prevalence areas and achieve a sustainable reduction in malnutrition, without compromising immediate access to MAM treatment services and referrals for SAM treatment. Thus, the programme has a dual goal of reducing both the incidence and prevalence of MAM, through prevention and treatment, as well as providing timely referrals for SAM treatment.

The revised emergency nutrition response aims to deliver a package of nutrition-specific and nutrition-sensitive services focusing on prevention, targeting the most vulnerable and hard-to-reach populations, and improve coordination between nutrition actors and across sectors, ensuring convergence and synergy of activities, especially with SAM treatment programmes. These aims have been facilitated by the implementation of a robust monitoring and evaluation (M&E) plan.

The prevention package involves:

- Distribution of Super Cereal *Plus* to children aged 6-24 months for prevention of MAM and to children aged 6-59 months for treatment of MAM (Figure 2).
- Social and behaviour change communication (SBCC) focused on infant and young child feeding (IYCF) and water, sanitation and hygiene (WASH), including cooking demonstrations of locally available nutritious foods.
- GFA in the most food insecure areas, including Super Cereal mainly intended for PLW.[1]
- Making complementary services at health facility and community level available through the BSFP platform, including childhood disease management, immunisation, deworming, malaria prevention through distributions of treated nets, micronutrient supplementation, IYCF counselling and promotion, and family planning.
- Systematic and exhaustive mid-upper arm circumference (MUAC) and oedema screening and referral.[2]
- Capacity-strengthening of health workers, including community health workers (CHWs), at the national, regional and community levels.

The new approach targets refugees and IDPs and the host resident population, both in and outside camps. Implementation in camp settings is facilitated by a higher concentration of humanitarian actors and regular camp management meetings to aid coordination, synergy and complementarity.

Programme implementation

In 2016 a guideline was drafted by the MoPH[3] and WFP on the implementation of the BSFP, and in 2017 the national CMAM guideline was revised to include BSF. The MoPH and its representatives at the regional level[4] took proactive steps to promote a decentralisation process for management through replication of the model.

Under government leadership, the new approach was supported by a strong situation analysis and robust monitoring system that included comprehensive monthly MUAC and oedema screening and post-distribution monitoring (PDM), allowing for adjustments and programme corrections. To maximise synergies, prevention activities were conducted in close collaboration with national health structures; all areas targeted by the integrated prevention programme have health facilities offering SAM treatment services. In addition, supplementary feeding was integrated with GFA to affected populations; 80% of children aged 6-23 months in households receiving GFA also received a specialised nutritious food (SNF).

Evidence collected during a joint programme review led by the MoPH in October 2016 indicated that the BSFP was an adequate platform to effectively integrate complementary services at scale. Although experimental and piloted in a specific context, this expanded prevention programme offers important lessons for conducting large-scale, multi-sector nutrition programmes with prevention as the central focus in food-insecure or conflict-affected settings.

Results

Gradual programme scale-up through decentralisation to health facility and community levels resulted in better integration of the prevention programme in regular health services and improved access and coverage for beneficiaries. Overall, the number of MAM children reached has more than doubled compared to the treatment programme in 2015. The total cost per beneficiary (Figure 3) was approximately half that of targeted supplementary feeding (TSF) due to the relatively high logistical costs of monthly distributions in multiple remote locations in TSFPs, as well as costs involved in hiring and training specialist staff and purchasing equipment. In addition, the new prevention platform used a cheaper food commodity (Super Cereal Plus at USD800 USD per metric ton, rather than Plumpy-Sup at USD2,800 per metric ton, which greatly reduced cost per beneficiary.

Coverage of health districts also increased from 30% in 2015 to 46% in 2016 across the three regions. By 2016 almost all of the 377 prevention sites had integrated other health and hygiene-related complementary services. In the Far North region alone, the number of nutrition service delivery points increased from 109 in 2015 to 301 in 2016, and the number of beneficiaries of supplementary feeding increased from 24,000 in 2015 (TSF programme admissions) to nearly 100,000 (prevention programme admissions) in 2016 and 2017.

Results of PDM showed that, by the end of 2016, 70% of the eligible population in the targeted area (i.e. 165,000 children aged 6-59 months) had received SNF and 90% of beneficiaries enrolled in the programme participated in an adequate number (two thirds) of distributions. A total of 30,979 MAM cases aged 6-59 months were enrolled in 2016 of a total burden of 31,787 in the target areas and approximately 85% of PLW in targeted areas participated in health and nutrition education sessions. In 2017 the prevention programme delivered complementary services to an average of 155,000 monthly beneficiaries (20% boys and 80% women and girls).

Monthly MUAC screenings were conducted for all eligible children in the intervention areas. The prevalence of acute malnutrition in children (MUAC <125 mm and/or bilateral pitting oedema) was plotted against the number of beneficiaries assisted. A decrease in the proportion of children with MUAC <125 mm was seen across all regions. In the eastern regions, MUAC-based GAM rates decreased from 17% in May 2014 to less than 2% in December 2017 (Figure 4), with

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[1] A decision was made to suspend provision of SNF to PLW based on the results of monthly MUAC screenings and SMART nutrition surveys, which were showing low to very low prevalence of MUAC in PLW.
[2] In the prevention programme only MUAC is used for MAM treatment.
[3] Sous-Direction de l'Alimentation et de la Nutrition (SDAN) (Sub-directorate of Food and Nutrition)
Délégation Regionalé pour la Santé Publique (DRSP) (Regional Delegation for Public Health)
[4] Délégation Regionalé pour la Santé Publique (DRSP) (Regional Delegation for Public Health)

Figure 3 Cost per beneficiary of WFP nutrition response in 2015 and 2016
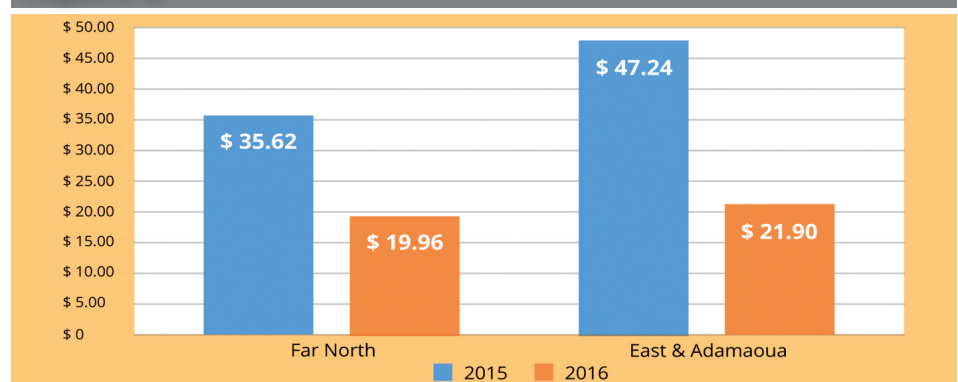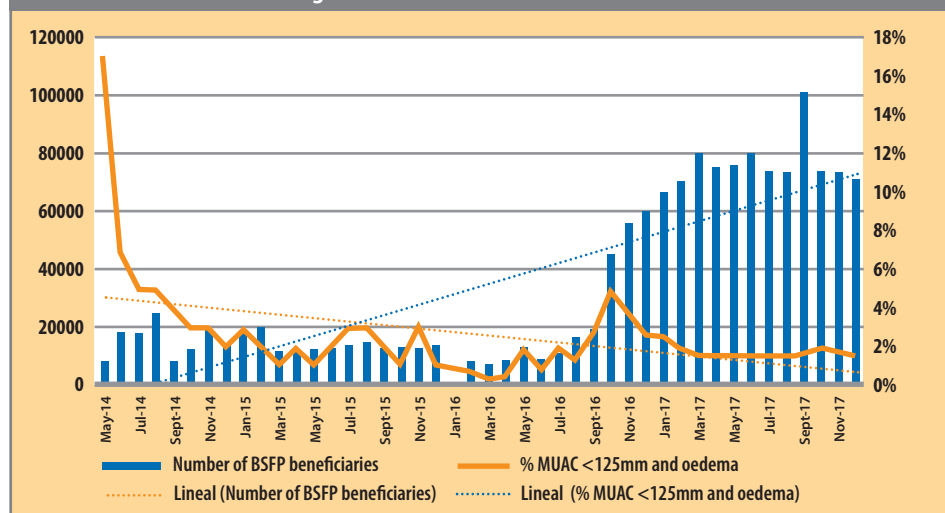
Figure 4	Prevalence of MUAC <125 mm and/or bilateral oedema in eligible beneficiaries and number of BSFP beneficiaries, May 2014 to December 2017, East and Adamaoua regions

WFP leveraged data collected through M&E activities to inform decision-making. PDM was conducted, including a qualitative component measuring ration-sharing and time management of beneficiaries and service providers. Participation and coverage were measured through PDM and a cross-sectional survey. These data were key in gaining consensus among major nutrition actors. On-site joint supervision was conducted on a monthly/quarterly basis by the MoPH (Sub-directorate of Food and Nutrition and the Regional Delegation for Public Health), UNICEF, UNHCR, WFP and cooperating partners, and a joint mid-term review was led by the MoPH. The supervision missions resulted in identification of areas for collaboration between the different agencies for implementation of complementary services. The missions also facilitated the identification of gaps (e.g. in monitoring capacity, adherence to enrolment/discharge criteria and correct distribution of rations), which led to joint problem-solving and follow-up.

Government ownership and coordination

The Government of Cameroon, through the MoPH, was a major actor from design to scale-up of the prevention approach. This programme fits well with the government's commitment to achieving the objectives of the National Nutrition Policy 2018-2030, the National Multisectoral Operational Plan to fight all forms of malnutrition, and the ongoing development of institutional capacity within the health system. This programme also contributes to positioning nutrition higher on the national policy and development agenda in Cameroon by placing key prevention activities into the United Nations Development Assistance Framework (UNDAF 2018-2020).

WFP was able to work strategically to bring partners together under the leadership of national authorities. A joint action plan on the prevention programme was developed by the MoPH and WFP during the start-up phase in 2016 to inform and support nutrition stakeholders on specific activities, timelines, roles and responsibilities.

A communication plan was developed to ensure all stakeholders were informed of the programmatic shift. Nutrition working groups were established at national and regional levels and monthly meetings were held to identify challenges and agree solutions. Continuous technical support was provided by the MoPH and the WFP nutrition team to healthcare workers, CHWs and cooperating partners.

A significant effort was made by WFP and UNICEF to coordinate activities in this context. A joint action plan was developed between the two UN agencies to better integrate interventions and ensure complementarity of activities, and a joint communication strategy was elaborated to improve buy-in from government, donors and other stakeholders. In some geographic areas the same cooperating partners were used to minimise cost and ensure a robust referral system from SAM treatment to the prevention programme and vice versa. Nearly half had the

similar trends being observed in the Far North. These findings were corroborated by results of the SMART survey conducted in October 2016 and September 2017 by the Government of Cameroon and UNICEF. Although the decrease cannot be attributed solely to the prevention programme, it is likely that the programme was a major contributing factor.

Continuum of care

The prevention platform was designed to ensure that children aged 6-59 months with MAM could also receive treatment. MAM children aged 6-23 months receive a monthly ration of 3kg of Super Cereal Plus (the same ration provided to non-malnourished children in this age group) and MAM children aged 24-59 months receive a monthly ration of 6kg of Super Cereal Plus. MAM children also receive systematic medical treatment provided by UNICEF through health facilities. In this way, the programme both protects the nutritional status of healthy children and promotes recovery of children with MAM.

A key recommendation emanating from a 2017 programme review was better monitoring of MAM admissions. This was acted on from 2018 and the resulting data show that, among a total of 35,522 MAM children enrolled in the programme during 2018, 25,253 had recovered by the end of December 2018, with a recovery rate among those discharged of 96.7%. The number of MAM admissions exceeded the estimated number of eligible cases (n=33,440), likely reflecting high demand and good uptake. Sick children with MAM affected by illness were treated using the guidelines on integrated management of childhood diseases at either the prevention site, where complementary health services were being provided, or at the health facilities.

In areas where the platform exists, demand for SAM services has increased, due mainly to the active screening and referral system associated with the platform. On the other hand, admission in stabilisation centres (SCs) for SAM with complications has progressively decreased. In the health district of Lagdo, for instance, monthly

caseload SCs have progressively decreased with implementation of BSFP from 15 cases in 2017 to an average of two cases at the end of December 2018. Access to SCs is very limited, due to an inadequate number of centres, long distances between them and frequent shortfalls in stock. A 2018 SAM programme coverage study revealed moderate coverage (20-50%) in 72% of the targeted districts and low coverage (<20%) in 18% of targeted districts (PCIMAS, 2018). In 2018 a total of 3,907 children aged 6-59 months with MUAC < 115 mm or bilateral pitting oedema were referred from the prevention platform to SAM treatment (data on the proportion that were complicated cases is not available). These include cases identified during quarterly screening in communities. Referrals were only possible where treatment was available, and approximately 75% of referrals made were successful (cases diagnosed as SAM in the community who were then referred and admitted to a health facility), with 100% success rate recorded in some health districts. Monitoring of referrals is carried out by CHWs, who are paid based on performance (funded by WFP and MoPH through the performance-based financing programme), including number of successful referrals. This provides a strong incentive to follow children across the continuum of care from the prevention programme to SAM treatment and back again after full recovery. A total of 1,624 children aged 24-59 months were referred to the prevention programme after full recovery from SAM (i.e. WHZ ≥ -1.5 or MUAC ≥ 125mm and absence of bilateral pitting oedema). Data on referrals of children aged 6-23 months is not available.

Discussion
Thoughtful and informed decision-making

The reorientation of the nutrition response in Cameroon was based on a strong situation analysis and well-articulated rationale. Decisions made were the result of a thoughtful process that involved the main nutrition actors in the country. The aim was to improve the coverage of the programme while also improving cost-effectiveness.

same partner for prevention and SAM treatment; in most of the other areas, SAM services were directly provided by MoPH staff without support of NGO partners. Consultations were held to determine geographic targeting for the prevention programme (supported by WFP) and micronutrient powder (MNP) programme (supported by UNICEF) to avoid duplication and maximise use of available resources. UNICEF also provided systematic medical treatment to children with MAM. Joint training was conducted by WFP, UNICEF and MoPH for service providers (i.e. health workers, CHWs and NGO partners) on BSFP, MNP, CMAM and IYCF.

Working under the leadership of the government facilitated strong national ownership and encouraged programme accountability among all stakeholders. A regional workshop was held in 2017, during which various government ministries (e.g. health, WASH, agriculture) and relevant partners developed an action plan on the coordination of multi-sector activities. Coordination was strengthened and government capacity reinforced to manage nutrition at central and decentralised levels, which was critical to the success of the programme. The commitment shown by the WFP country office senior management was also pivotal in bringing partners together and ensuring constant engagement between key actors throughout the process.

Community engagement

Services have been brought closer to remote, vulnerable communities typically out of reach of the healthcare system through this programme, using WFP's presence in fragile and humanitarian settings. Most prevention sites were organised at community level across the three regions and CHWs were given responsibility for most of the routine tasks involved. The prevention platform facilitated the work of CHWs by enabling them to provide a variety of services at once, rather than at multiple times during the month and year. The prevention sites gather children from multiple villages, allowing CHWs to come together at the sites and divide labour, making their work faster and more efficient. The work of CHWs was supervised by the head of the national health facility to ensure programme sustainability, with a view to WFP and partners handing over direct programme implementation in future.

Referral systems at the community level between the prevention platform and SAM services were established, ensuring that the same CHWs at a particular health zone were assigned to both prevention and SAM treatment activities (i.e. identification of acutely malnourished individuals through screening, follow-up and home visits). Building on the monthly MUAC monitoring system put in place by WFP, a monthly community-based nutritional surveillance system is now in place which permits timely detection of malnutrition and serves as an early warning system. Community-based BSFP sites contribute to increasing coverage, reaching the children previously not reached under the treatment programme.

Ongoing learning and adjusting of implementation arrangements

A programme start-up phase was conducted from April to June 2016 to assess the available options for delivering the prevention package and the level of integration of nutrition services into existing health structures in Far North, East and Adamaoua regions. This enabled WFP and partners to recommend the best option for each of the identified programme sites and led to the revision and adoption of updated programme reporting and monitoring tools with indicators.

A joint M&E plan between the MoPH, WFP and its cooperating partners was developed at national and regional levels highlighting the roles of each party with clear timelines. The information collected through the M&E activities was fundamental to the measuring of programme performance and improving efficiency and effectiveness.

A typical challenge in food assistance is the timely availability of sufficient funds to initiate procurement and avoid pipeline breaks. At the launch of the pilot phase adequate funds were allocated (Humanitarian Response Plan and WFP country programme funds) and sustained since to cover all components of the planned prevention programme, enabling timely procurement of SNFs as well as capacity-strengthening of government health workers, CHWs and partners. Decentralisation to community level and scale-up of prevention activities on time was also facilitated by proper funding allocation.

The WFP supply chain was regularly adjusted to meet programme requirements and three-month distribution plans were updated regularly, facilitating adequate allocation of resources to meet needs and achieve distribution targets. In addition, warehouse management was included as a topic in the training package for cooperating partners, health workers and CHWs to ensure efficiency at health facility and community levels. Prepositioning of SNFs at health district level was essential to prevent delays in programme activities, especially during the rainy season.

Engaging across sectors

At the launch of the programme a communication plan was developed and a strategy for the preventive approach disseminated to stakeholders at all levels. The communication package included information on the objectives of the programme and how the proposed changes would improve programme coverage and quality. Annual and monthly activity plans, aligned with outreach activities in the health areas, such as immunisation, were shared with all stakeholders in target regions to facilitate planning. WFP and its cooperating partners worked to strengthen coordination mechanisms at local level; for example, by supporting MoPH to advocate for the prevention platform to other government ministries and humanitarian actors during coordination meetings. During the meetings brief presentations were given to show the impact of the new service delivery model with a focus on coverage of complementary services.

The adapted programme required scale-up from other agencies to deliver on complementary services, which was complex due to variation in funding sources and fiscal calendars. However, WFP minimised the effect of this complexity by using the availability and presence of other actors in geographic sites as a criterion for targeting (in addition to vulnerability criteria) to guarantee a minimum set of services to be delivered to targeted communities. Variation in the complementary services provided is highly dependent on the number of humanitarian actors present at each site. A minimum package is based on services provided by the MoPH, including immunisation, routine vitamin A supplementation, deworming, prevention and treatment of malaria and other common childhood illnesses, family planning, promotion of appropriate IYCF practices, and other essential family practices.

Conclusions

WFP successfully assisted the Government of Cameroon to reorient the nutrition programme in response to the increased influx of refugees from CAR and the Lake Chad crisis. The programme was not intended to replace treatment, but rather to respond to an immediate and growing emergency, taking into account the limited financial and human resources and preparedness capacity in-country for a treatment-centred approach. The shift towards a multi-sector preventive approach was supported by a robust situation analysis.

The programme is scheduled to continue until 2020, aligned with the timeframe of WFP's Country Strategic Plan for Cameroon. The future transition strategy will require a continued focus on geographic areas with high GAM, based on MUAC screening, and will involve expanding the programme to focus on stunting prevention, with the possibility of using locally produced fortified nutritious foods, distributed in kind or made available and accessible through cash and vouchers.

This example of a programmatic shift towards prevention in Cameroon demonstrates the importance of exploring innovative nutrition solutions, especially when the programmes in place are not achieving expected outcomes. This experience offers important lessons for conducting large-scale multi-sector programmes to prevent and treat malnutrition in humanitarian and fragile settings and areas prone to high food insecurity. The integration of this programmatic approach into national social protection or social safety nets remains critical for medium and long-term sustainability.

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New arrival refugees from DRC at Kigoma reception centre, Uganda, 2018

UNHCR/Naser Mohmand

UNHCR experiences of enabling continuity of acute malnutrition care in the East, Horn of Africa and Great Lakes region

By Naser Mohmand

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nutrition (MPH) and 23 years of experience in different technical and managerial positions in emergency and post-emergency contexts with various international humanitarian organisations across Asia and Africa, as well as in UNHCR headquarters in Geneva.

Location: *East, Horn of Africa and Great Lakes (EHAGL) region*

What we know: Acute malnutrition treatment is a key component of UNHCR's global public health strategy and an essential part of its wider protection mandate.

What this article adds: There are an estimated 5.21 million refugees and asylum seekers in the EHAGL region. Global acute malnutrition (GAM) prevalence remains high; 20% of refugee sites exceed the >15% emergency threshold. UNHCR-led acute malnutrition management involves community-based management of acute malnutrition (CMAM), the protection, promotion and support of infant and young child feeding, and multi-sector activities. This involves close collaboration with existing national health and nutrition programmes in refugee-hosting communities and United Nations (UN) agencies and implementing partners. Through global and country-level agreements, UNICEF provides supplies for severe acute malnutrition (SAM) treatment programmes and World Food Programme supports and provides supplies for targeted and blanket supplementary feeding programmes. In refugee sites, most SAM and moderate acute malnutrition (MAM) treatment services are co-located with one implementing partner. Challenges to achieving continuum of treatment include shortfalls in nutrition product supplies (compensated by UNHCR contingencies), low capacity of host heath systems, lack of national programmes for MAM, and shortfalls in food and non-food assistance. Adequate funding, sustained product supplies and continued technical support through a collaborative, interagency approach are critical to addressing ongoing complex needs in the region.

Context

Displacement is a major shock that often leads to a loss of livelihoods, entitlements, food insecurity, sub-optimal infant and young child feeding (IYCF) and morbidity linked to environmental, hygiene and shelter concerns. As a result, undernutrition in its multiple forms, including wasting, stunting and micronutrient deficiencies, is highly prevalent in refugee populations. Maintaining adequate nutrition and preventing malnutrition is an essential part of UNHCR's wider protection mandate, especially with regard to refugee women and children, who are the majority (81%) of refugee populations. With regard to nutrition and food security,

in accordance with UNHCR's global public health strategy, UNHCR strives to prevent undernutrition and micronutrient deficiencies, treat malnutrition, and provide up-to-date food security and nutrition information to inform effective programming.

The New York Declaration for Refugees and Migrants was adopted in 2016, reaffirming the importance of the international refugee regime. It contains a wide range of commitments by member states to strengthen and enhance mechanisms to protect people on the move. Based on this, the Comprehensive Refugee Response Framework (CRRF)[1] has been launched to forge a stronger, fairer response to large refugee move-

ments and situations of prolonged displacement. Fundamental to both the Global Compact on Refugees (GCR) and CRRF is recognition of the importance of supporting communities that host large numbers of refugees and to promoting inclusion and integration of refugees in national systems. This requires the engagement of development actors from an early stage of response, bringing national and local authorities together with international, private and civil society actors to generate a 'whole-of-society', integrated approach to refugee response. To date, six countries in the region (Djibouti, Ethiopia, Kenya, Somalia, Uganda and Rwanda) have applied the CRRF.

[1] https://intranet.unhcr.org/en/about/new-york-declaration.html

Table 1 Percentage of UNHCR refugee sites meeting targets and thresholds in EHAGL region 2015/2016 compared to 2017/2018

	2015/2016	2017/2018
Global acute malnutrition (GAM) prevalence within UNHCR target (<10%)	50%	62%
GAM prevalence above emergency thresholds (>15%)	30%	20%
Stunting prevalence within UNHCR target (<20%)	30%	35%
Stunting prevalence at critical level (>40%)	33%	16%
Anaemia prevalence within UNHCR target (<20%) Children aged 6-59 months	1%	4%
Anaemia prevalence ≥20-<40% Children aged 6-59 months	21%	41%
Anaemia prevalence at emergency thresholds (≥40%) Children aged 6-59 months	78%	52%
Anaemia prevalence within UNHCR target (<20%) Women aged 15-49 years (non-pregnant)	18%	31.5%
Anaemia prevalence ≥20-<40% Women aged 15-49 years (non-pregnant)	44%	54.8%
Anaemia prevalence at emergency thresholds (≥40%) Women aged 15-49 years (non-pregnant)	38%	13.7%

UNHCR coordinates with relevant government ministries (such as refugee affairs authorities, ministries of health and ministries of education), other United Nations (UN) agencies (such as World Food Programme (WFP), the World Health Organization (WHO), UNICEF, Food and Agriculture Organisation (FAO), Office for the Coordination of Humanitarian Affairs (OCHA) and the United Nations Population Fund (UNFPA)); and international and national non-governmental organisations (NGOs). UNHCR also partners with many other agencies to ensure availability, access, integration and sustainability of quality public health nutrition services for refugees and other persons of concern. Memoranda/letters of understanding (MOU/LOU) govern and inform arrangements with other UN agencies, cooperating partners and governments, as relevant, to deliver services to those under UNHCR's protection.

Refugee operations in the East, Horn of Africa and Great Lakes (EHAGL) region

Ongoing conflict compounded by food insecurity has resulted in major displacement in the EHAGL,

with 5.21 million refugees and asylum seekers in the region, around 81% of whom are women and children. The highest number of refugees in the region originate from South Sudan, from where around 2.3 million people have fled, with continued new influxes into neighbouring countries. There are also large influxes of refugees from Democratic Republic of Congo (DRC), Somalia, Burundi, Central Africa Republic, Sudan, Eretria and Rwanda. In addition, the region is host to around 12.4 million internally displaced persons.

Nutrition and food insecurity remain key concerns in the region as a result of ongoing conflict and insecurity, prolonged drought, and increased food prices; all exacerbated when people are forced to flee their homes either internally or across borders. UNHCR conducts standardised expanded nutrition surveys (SENS)[2] regularly throughout the region. Global acute malnutrition (GAM) levels among refugee populations in the region are typically high; in 2017/18, around 46/74 sites (62%) met the UNHCR GAM standards of <10%, while 15/74 (20%) of sites were above the emergency threshold of ≥15%. However, UNHCR surveys for 10 countries (Burundi, Djibouti, Eretria, Ethiopia, Kenya,

Sudan, South Sudan, Tanzania, Rwanda and Uganda) from 2017/18 demonstrate considerable improvement in key nutrition indicators (including stunting in children and anaemia in children and women of reproductive age) compared to 2015/16 (Table 1). Improvements are due to strengthened nutrition screening (active case-finding among newly arrived refugees); improved nutrition monitoring and assessment; development and roll-out of UNHCR multi-sector IYCF framework for action (2017/18); training and capacity-building of UNHCR and partners on prevention and management of malnutrition; strengthening of preventative interventions; and strengthened partnership and collaboration at regional and country levels between WFP, UNICEF, WHO and FAO, including a regional UNHCR/WFP workplan and a UNHCR and UNICEF regional collaboration framework.

UNHCR's approach to acute malnutrition management

Prevention, detection, referral and treatment of acute malnutrition are key elements of UNHCR's global public health nutrition programme. This involves community-based management of acute malnutrition (CMAM); the protection, promotion and support of IYCF (Box 1); and multi-sector activities (Box 2 and Figure 2). Strong linkages and referral mechanisms exist between each element of CMAM, as well as with other interventions (healthcare, antenatal care, postnatal care and expanded programme of immunisations, with referral to district and regional hospitals where needed).

UNHCR works in close collaboration with existing national health and nutrition programmes in refugee-hosting communities in the region. To treat malnutrition, UNHCR provides services in refugee camps or through national programmes, depending on the context; always using the principles of CMAM and according to relevant national guidelines or WHO guidance where these do not exist.

UNHCR collaborates closely with other UN agencies. Collaboration with WFP is in accordance with a global MOU signed in 2011. In refugee settings, WFP supports general food assistance, targeted supplementary feeding programmes (TSFPs) for the treatment of moderate acute malnutrition (MAM) through the provision of ready-to-use supplementary food (RUSF) or Super Cereal ++, and preventive blanket supplementary feeding programmes (BSFPs) for children aged 6 to 23 months or 6 to 59 months and pregnant and lactating women, depending on local needs and available resources. Partnership with UNICEF is in accordance with a global LoU signed in 2015, a regional collaboration framework (2018/19), and country-level LOUs to deliver services. UNICEF provides therapeutic feeding products (ready-to-use therapeutic food (RUTF) and therapeutic milks (F75 and F100) for the treatment of severe acute malnourished

Nutrition screening among new arrival South Sudanese refugees in Gambella, Ethiopia, 2017

UNHCR/Naser Mohmand

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[2] www.sens.unhcr.org provides standard tools. SENS includes anthropometry as well as information on health, anaemia, IYCF, food security, WASH and mosquito net coverage.

Box 1 Multi-sector IYCF framework for action in refugee populations

UNHCR's 'Multi-sectoral IYCF framework for action in refugee populations', rolled out in the region in December 2018 in priority countries (Uganda, Kenya, Sudan and Ethiopia), provides guidance to managers and technical staff across sectors on what needs to be considered to create an 'infant and young child-friendly' environment

and facilitate optimal IYCF in refugee situations. The framework specifically encourages protection of pregnant and lactating women (PLW), infants and young children through multi-sector integration of IYCF-sensitive activities by taking advantage of all contact points with PLW, infants, young children and caregivers.
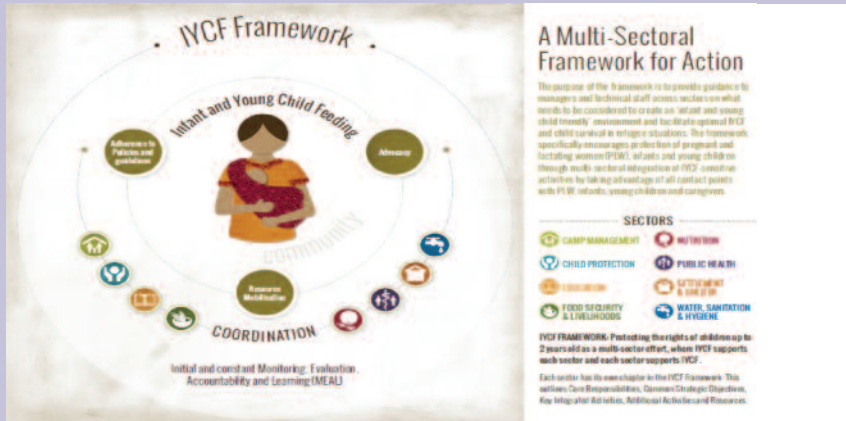
(SAM) in inpatient settings (stabilisation centres (SCs) and outpatient settings (outpatient therapeutic programmes (OTPs). UNHCR supplies required medication (vitamin A, folic acid, deworming and amoxicillin) for systematic treatment of SAM and MAM cases in TSFPs and OTPs.

In partnership with UNICEF, WFP, WHO and the national MoH, UNHCR conducts regular technical training and coaching sessions to build the capacity of health and nutrition personnel in the national health system and among UNHCR partners. Training commonly includes nutrition in emergencies, IYCF in emergencies, the multi-sector IYCF framework for action, and CMAM. Joint supportive supervision (UNHCR/UNICEF/WFP/project partners and MOH) is conducted in several refugee operations in the region (including Uganda, Ethiopia and Kenya).

All UNHCR-supported public health nutrition programmes are planned, assessed, monitored

and evaluated using available quality health and nutrition data, collected and interpreted according to UNHCR guidance.[3] UNHCR's health information system (HIS) is currently available in two versions – one for camps and another one for out-of-camp (urban and rural) settings. The HIS is used to collect standardised health information from partners and to compile mortality data to help design, monitor and evaluate programmes in order to provide evidence-based information for programme monitoring and policy formulation.

Continuum of acute malnutrition care

Service delivery

UNHCR seeks to ensure a continuity of care for children who are acutely malnourished. This includes securing co-location of SC, OTP, TSFP and BSFP services and aligning systems to maximise efficiencies for those delivering services

and the beneficiaries. Table 2 reflects the co-location of services achieved in the refugee settings in the region. UNHCR selects well-reputed international and national partners to implement preventive and curative nutrition interventions through project partnership agreements (PPAs). Partner selection considers sector expertise, programme experience, local knowledge, good relations with communities and track record of efficient and effective implementation. In almost all the refugee operations in this region, the management of SAM and MAM is under the responsibility of the one project partner. However, if more than one partner is involved, UNHCR makes sure that strong linkages and effective referral mechanisms are in place.

In accordance with the CCRF framework, wherever possible, UNHCR integrates nutrition and health programmes in the refugee population within existing health and nutrition programmes in refugee-hosting countries. An example of this is Uganda, where a national integrated health response plan for refugees and host communities has been developed and is being implemented.

Continuity of product supply

Given ongoing emergencies and new influxes of refugees in the region, contingency planning is an essential element of UNHCR operations and regional refugee response plans (RRRPs). As part of contingency planning and to cover supply pipeline breaks and sudden emergencies, UNHCR also sometimes directly procures contingency stocks of nutrition products (RUSF, RUTF) in refugee operations (e.g., in Dollo Ado and Gambella in Ethiopia, Kakuma and Dadaab in Kenya, and Uganda) and holds buffer stocks in some locations. In addition, UNHCR sometimes procures special nutritional products (such as RUSF and micronutrient powders (MNP)) to reduce micronutrients deficiencies and malnutrition in refugee populations (depending on the context and funding availability). The presence of RRRPs, country-level contingency planning and enhanced coordination among partners has prevented major breaks in the supply of RUSF and RUTF to refugee operations.

Information management

UNHCR has recently revised and upgraded its HIS to 'Integrated Refugee Health Information System' (IRHIS) to standardise data collection and analysis for all sector programmes (health, nutrition, HIV, reproductive health, expanded programme of immunisations (EPI)). For nutrition programming, information is now collected on each component, including MUAC screening, growth monitoring, SC, OTP, TSFP and BSFP using weekly tally sheets and monthly reports. Performance indicators include data segregated by sex and age groups, number of children screened, number of SAM and MAM cases identified and referred, new admission SAM and MAM, relapse cases, cured, defaulters, death, transfers, length of stay and weight gain for SAM and MAM cases. In partnership with

Box 2 UNHCR nutrition programme interventions

Preventative interventions:
- Community-based outreach programme through a network of outreach workers and volunteers, including: nutrition screening, detection and referral ('active case-finding'); community sensitisation on prevention of all forms of malnutrition; supporting, promoting and protecting IYCF practices through awareness and mother-to-mother support groups; cooking demonstrations; and follow-up of SAM and MAM cases and PLW at community level.
- Growth monitoring and promotion in some refugee operations (depending on programme structure and resource availability).
- Preventive BSFP for children aged 6 to 23 months or 6 to 59 months and PLW (depending on context and available resources)

- Follow-up of cured cases from OTPs and provision of nutritional support to avoid relapse.
- Provision of nutritional support to HIV and TB cases (depending on context and available resources).
- Small-scale homestead gardening programme at household level (depending on context and available resources).

Curative interventions:
- TSFP for management of MAM cases using take-home dry rations.
- OTP for management of SAM cases without medical complications.
- Inpatient therapeutic feeding programme (SC based in the health facility) for management of SAM cases with medical complications.

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3   UNHCR's global public health strategy/health information system.

Table 2 — UNHCR mapping of SAM and MAM treatment services in refugee operations 2017-2018

Country	Region hosting refugees	UNHCR mapping of available CMAM services for refugees EHAGL region				Follow-up on BSFP for OTP cured?
		SC	OTP	TSFP	BSFP	
Burundi	Muyinga	Y	Y	Y	N	Y
Djibouti	Holl Holl	Y	Y	Y	Y	Y
	Ali Adeh	Y	Y	Y	Y	Y
	Obock (Markazi)	Y	Y	Y	Y	Y
Eritrea	Emkulu	Y	Y	Y	Y	Y
Ethiopia	Dollo Ado/Somali Region of Ethiopia	Y	Y	Y	Y	Y
	Gambella	Y	Y	Y	Y	Y
	Afar	Y	Y	Y	Y	Y
	Assosa/Benishangul Gumaz	Y	Y	Y	Y	Y
	Jijiga/Somali region of Ethiopia	Y	Y	Y	Y	Y
	Shire/Tigray	Y	Y	Y	Y	Y
Kenya	Kakuma/Turkana North-West	Y	Y	Y	Y	Y
	Dadaab/Garissa North-East	Y	Y	Y	Y	Y
Sudan	East Sudan	Y	Y	Y	N/A	N/A
	White Nile	Y	Y	Y	Y	Y
	West Kordofan	Y	Y	Y	Y	Y
	South Kordofan	Y	Y	Y	Y	Y
	East Darfur	Y	Y	Y	Y	Y
South Sudan	Unity State	Y	Y	Y	Y	Y
	Upper Nile	Y	Y	Y	Y	Y
	Central Equatoria	Y	Y	Y	Y	Y
	Western Equatoria	Y	Y	Y	Y	Y
Uganda	South West	Y	Y	Y	Y	Y
	Mid-West	Y	Y	Y	Y	Y
	West Nile	Y	Y	Y	Y	Y
Rwanda	North and West	Y	Y	Y	Y	Y

of nutrition products for SAM and MAM treatment and in preventative BSFP to the nutrition programme in several refugee operations. For example, due to insecurity and limited access to some of the refugee sites in South Sudan, there has been delay in the supply and delivery of nutrition products. In some countries in the region, limited capacity of the national nutrition programme supply chain has resulted in delays in the timely delivery of nutrition products requiring UNHCR intervention (e.g., in Ethiopia, UNHCR intervened to receive therapeutic feeding supplies in Addis Ababa and organised transportation to field locations in Gambella, Dollo Ado and other locations). Similar problems have been experienced in Djibouti, Eretria, Sudan, South Sudan, Rwanda and Uganda. In some instances, this is due to delayed and inadequate requisition for nutrition products from the nutrition programme in the district and sub-district to the national nutrition programme at the capital level. Funding gaps at the global and regional level have also compromised adequate supply and delivery of nutrition products for SAM and MAM treatment and preventive BSFP in the refugee population and host communities during 2019.

Health system and partner capacity

Delivering a continuum of treatment is compromised where the existing health system is inadequate, usually due to limited human resource, capacity, supplies of essential drugs, supervision and monitoring. UNHCR has ongoing challenges related to health system capacity in the region in both the country of origin of refugees (such as South Sudan, Somalia, DRC, Burundi, Sudan, Eritrea and Rwanda) and in countries of asylum (such as Uganda, Ethiopia, Kenya, Tanzania and Djibouti). In some contexts where there is limited or zero presence of international non-governmental organisations, such as Eritrea, it is challenging to find a local partner with good capacity and resources.

Disease outbreaks emphasise the need for integrated or closely aligned health and nutrition services. Refugees are vulnerable to cholera and bloody diarrhoea in acute onset of emergencies. Outbreaks add pressure to ongoing health and nutrition interventions in refugee sites and refugee-hosting communities as caseload of morbidities increases, and complicate acute malnutrition management.

Limited access to national nutrition programmes

Challenges exist for the refugees who do not have access to national programmes where they exist, and for the nationals where services in host communities are absent. In some settings, the host government may not allow access to or integration of refugees into the national system. Regarding nationals, SAM cases from host communities surrounding refugee camps can easily access SC and OTP services within camps. However, there is often limited or zero possibility of further referral and follow-up for SAM cases that are discharged to the host community. In most refugee-hosting communities, there is limited or no treatment programme for MAM

its partners in the region, UNHCR is planning to pilot a project on digitalising individual nutrition records to help track and follow up children through different components in a nutrition programme (screening, referral/admission/discharge in and out from OTP, SC, TSFP and BSFP).

Challenges and constraints

Shortfalls in food and non-food assistance

Household food security is critical to prevent malnutrition and to support sustained recovery of treated cases. A major challenge to refugee operations in the EHAGL region is the increasing numbers of refugees in need and limited resources available to meet food and non-food needs. Due to funding shortfalls in 2018, UNHCR and WFP was unable to provide recommended food assistance (2,100 kcal/p/d) to refugees and adequate non-food assistance in the region, leading to serious cuts in refugee food rations in different counties in the region. The daily food basket was cut by 20-40% in Ethiopia; 50% for the old caseload of refugees in Uganda; 25% in Rwanda; 27% in Tanzania; 10-20% in Djibouti; 30% in South Sudan; and 30% in Kenya. There were also breaks in food distribution in Sudan. However, as a result of joint advocacy in 2019 and donor response, food assistance was restored to 100% in Uganda, Tanzania and Rwanda. As evidenced in SENS surveys, food cuts have had a negative impact on the food security and nutrition situation of refugees, in the short term forcing them to use negative coping strategies to meet basic needs, such as missing or reducing meals; selling assets; taking loans with interest; child labour; and involvement in risky and harmful activities. In addition, UNHCR was unable to provide adequate supplies of non-food assistance which resulted in shortfalls in the supply of firewood for cooking, water containers and soap; reduced access of all households to latrines, and inadequate shelters in some of the refugee sites in the region. These factors increase the risk of protection-related issues among refugee women and children. Prolonged insufficient assistance will likely contribute to an increase in the prevalence of acute malnutrition and micronutrient deficiencies among refugee populations.

Products for treatment of acute malnutrition

Problems with the supply chain can compromise the continuum of acute malnutrition treatment. There have been some challenges in the supply

cases. A related challenge is limited nutrition screening for active case-finding and referral of acute malnourished cases at community level in refugee-hosting communities.

National guidelines variation in admission and discharge criteria

UNHCR and its project implementing partners apply standard nutrition guidelines for the detection, referral and treatment of SAM and MAM cases, including the use of WHZ (< -2SD) and MUAC (<125mm) as independent admission criteria. Results from the regional UNHCR SENS in 2017 (following standard criteria) indicated that, in around 84% of refugee sites, the prevalence of acute malnutrition was higher (two to four fold) based on WHZ (< -2 SD) criteria versus MUAC (<125mm); in 16% of surveys the converse was found. These results indicate the considerable proportion and number of children who meet WHZ criteria for treatment, most of whom would be excluded if MUAC only was used. Given this, UNHCR advocates and continues to use WHZ and MUAC as independent criteria for detection, referral and treatment of acute malnutrition, and programme planning in the refugee sites. However, in most of the countries in the region, only MUAC is recommended for screening detection and referral, according to the national nutrition guideline. This reduces enrolment coverage for SAM and MAM cases in nutrition programmes and raises concerns regarding missing treatment for most of the cases identified using WHZ only.

Discussion and conclusions

UNHCR's experience in the region confirms a strong positive impact of interagency, multi-sector nutrition interventions on the overall health and nutritional wellbeing of refugees and other persons of concern. However, considering the very challenging context of this region, with acute and chronic humanitarian emergencies,

huge need remains for continued and increased funding, technical support and partnership to ensure refugee and host community food and nutrition security. Enhanced, expanded, preventative and curative nutrition interventions, integrated and aligned to national systems where possible, are crucial. UNHCR's experience underlines the importance of a multi-sector approach with a specific focus on protection, promotion and support of IYCF practices and treatment of acute malnutrition and micronutrient deficiencies. UNHCR welcomes the opportunities created by the CRRF and GCR globally and in the region and seeks to expand collaboration to collectively work towards greater refugee inclusion in national social protection systems and improve refugee self-reliance.

In our experience, key enabling factors for a continuum of care for acute malnutrition treatment include:

- Coordination and collaboration among key UN agencies in the field of nutrition and food security for joint assessment, design/planning/implementation of interventions and monitoring and evaluation, with active involvement of MoH and national nutrition programmes.
- One implementing partner delivering on all acute malnutrition treatment programming.
- Linkages, referral mechanisms and integration of the nutrition programme with the existing healthcare programme should be considered from the start of programme design and carried through all phases of programme implementation.
- Support for training, capacity-building and coaching of health and nutrition personnel on management of all forms of malnutrition in the refugee-hosting communities.
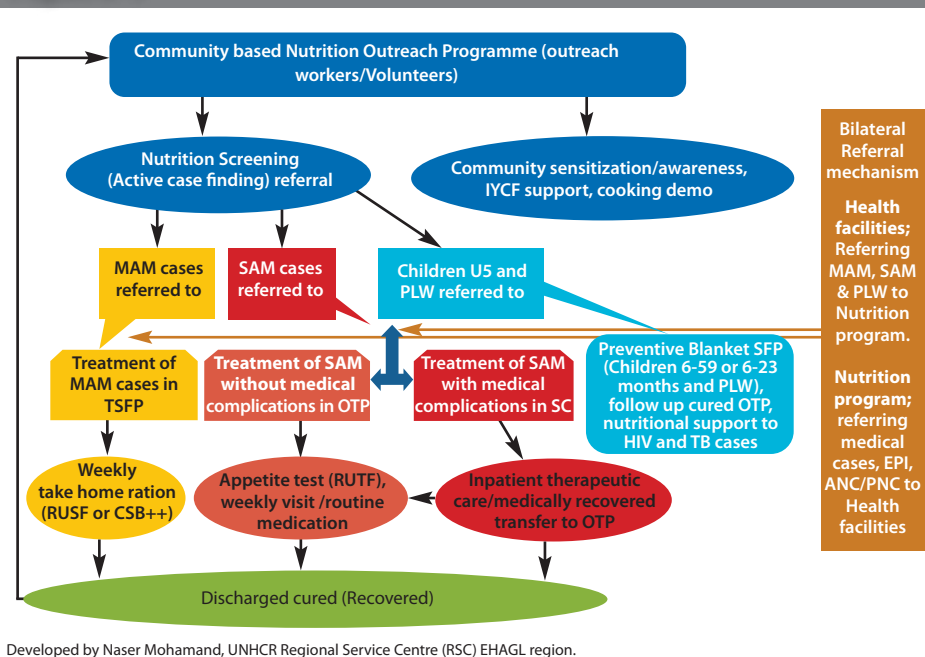- Harmonised data management to allow tracking of children through services.

- Involve and consult with the beneficiaries in all phases of implementation to ensure buy-in and sustainability.

Several areas of action are needed to improve on continuity of acute malnutrition treatment, including:

- Adequate and timely delivery and supply of nutritional products for prevention through BSFP and cure through TSFP, OTP and SC remains a challenge and needs attention and prioritisation. UNHCR may not be able to continue with direct procurement of nutrition products as contingency to fulfil the gaps in the supply and delivery; therefore this requires partner contribution.
- Given refugees dependency on food assistance and limited livelihood and agriculture opportunities, there is a strong need to continue provision of adequate food assistance to refugees, while working on better livelihood and agriculture programming. In situations where resources are limited, this requires prioritisation of refugees based on resources, as well as targeting food assistance based on needs.
- There is a strong need to continue interagency efforts in building the national health and nutrition system and capacity in the countries in this region (both in countries of origin and host countries).
- Strengthen regular joint supportive supervision and monitoring of nutrition interventions in the refugee sites/refugee-hosting communities.
- Standardisation and harmonisation of nutrition protocols in the different countries in the region is needed to align with standard WHO guidelines for management of acute malnutrition (use of WHZ and MUAC as independent criteria).
- Mainstream nutrition-sensitive interventions across other sectors (healthcare, WASH, livelihood/agriculture, education, child protection and community services) to help prevent malnutrition, increase self-reliance and reduce dependency on in-kind assistance.

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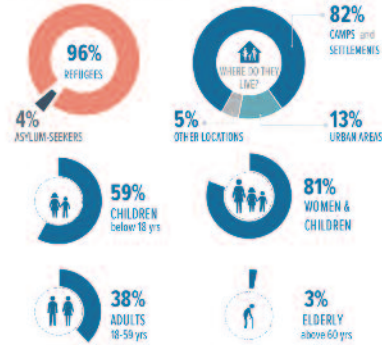
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Figure 1 UNHCR mapping of SAM and MAM treatment services in refugee operations 2017-2018

Developed by Naser Mohamand, UNHCR Regional Service Centre (RSC) EHAGL region.

Figure 2   Refugees and asylum seekers in EHAGL region (UNHCR data, March 2019)

UNHCR The UN Refugee Agency

5.21 MILLION
REFUGEES AND ASYLUM-SEEKERS

KEY STATISTICS

- 96% REFUGEES
- 4% ASYLUM-SEEKERS
- WHERE DO THEY LIVE?
- 82% CAMPS and SETTLEMENTS
- 5% OTHER LOCATIONS
- 13% URBAN AREAS
- 59% CHILDREN below 18 yrs
- 81% WOMEN & CHILDREN
- 38% ADULTS 18-59 yrs
- 3% ELDERLY above 60 yrs

TOTALS BY COUNTRY OF ORIGIN
(to the nearest 100)

South Sudan	2.30M
DRC	641,000
Somalia	558,700
Burundi	407,200
Sudan	333,100
Eritrea	310,900
Rwanda	236,600
Other	427,200
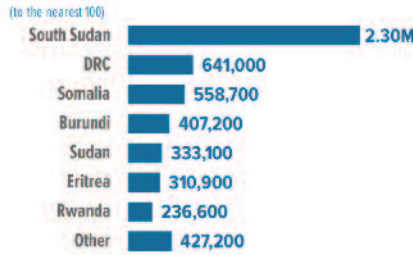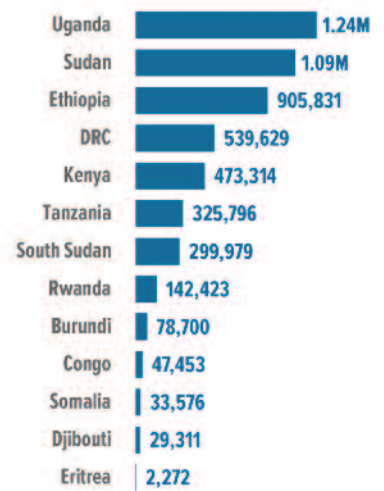
ANNUAL TREND OF DISPLACEMENT
2010 to 2019 (Mar) (in millions)

1.49 M (2010), 1.87 M (2011), 1.99 M (2012), 2.10 M (2013), 2.64 M (2014), 3.32 M (2015), 4.02 M (2016), 5.23 M (2017), 5.15 M (2018), 5.21 M (2019)

* The decrease in population in 2018 is attributed to the completion of a countrywide biometric verification exercise in Uganda as well as spontaneous refugee returns to Burundi and South Sudan.

TOTALS BY HOST COUNTRY

Uganda	1.24M
Sudan	1.09M
Ethiopia	905,831
DRC	539,629
Kenya	473,314
Tanzania	325,796
South Sudan	299,979
Rwanda	142,423
Burundi	78,700
Congo	47,453
Somalia	33,576
Djibouti	29,311
Eritrea	2,272

Number of refugees and asylum-seekers

Major refugee movements (>1,000 persons/year)

Minor refugee movements (< 1,000 persons/year)

Note: Arrows do not reflect size of population flows or actual routes of movement

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Final boundaries between the Republic of Sudan and the Republic of South Sudan and Somalia and Ethiopia has not yet been determined. Final status of the Abyei area is not yet determined.

Creation date: 26 Apr 2019   Sources: Geographic data: UNCS. Population statistics: UNHCR Monthly Statistical Reports 28 February 2019 or latest available. *Pending the completion of countrywide population verification exercises in Ethiopia and Congo, statistics shown are as 31 August and 31 October 2018 respectively. Statistics should be considered provisional and subject to change.   Author: UNHCR Regional Service Centre in Nairobi   Feedback: kensgis@unhcr.org

WFP provides supplementary feeding and other nutrition support to several vulnerable groups at a Health Center in Kalabankoro, Mali

WFP/Cecilia Aspe

Lessons learned from evaluations of the impact of WFP programmes on moderate acute malnutrition in the Sahel

By Jonas Heirman, Mica Jenkins and Jennifer Rosenzweig

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Location: *Chad, Mali, Niger and Sudan*

What we know: There is insufficient understanding of the relationship between moderate acute malnutrition treatment and prevention programmes.

What this article adds: World Food Programme (WFP) commissioned a four-country evaluation series in the Sahel, conducted by International Initiative for Impact Evaluation, to assess the relationship between treatment and prevention in emergency and post-emergency contexts. Key lessons included the importance of timing, sequencing and the roll-out schedule of an intervention package to enhance effectiveness; the benefit of close partnerships and coordination; understanding of barriers to coverage and access, including infrastructure and quality of services; and awareness of challenges related to monitoring and evaluation data. WFP has acted on practical recommendations on strategic relationships, communication with beneficiaries and communities, contextualised intervention packages, data sharing, and monitoring and evaluation systems as part of an ongoing process of learning and improvement.

Context

Recent estimates show that more than one quarter of wasted children under five years old live in Africa (UNICEF, 2019). Among these 18.2 million children, 14 million suffer from moderate wasting. While there is evidence of the effectiveness of interventions to treat moderate acute malnutrition (MAM) (Lazzerini *et al*, 2013; Gera *et al*, 2017; Fabiansen *et al*, 2017), there remains insufficient understanding of the relationship between MAM treatment and prevention programmes. In response to this knowledge gap, World Food Programme (WFP) commissioned a four-country evaluation series in the Sahel to assess the relationship between treatment and prevention in emergency and post-emergency contexts (WFP, 2018).

The findings from this evaluation are relevant to the ongoing global effort to improve the continuum of care for acute malnutrition. In particular, the findings related to prevention programmes, through blanket supplementary feeding alone or in combination with food assistance for assets and/or targeted supplementary programmes, support a better understanding of specific mechanisms to reduce the prevalence and incidence of acute malnutrition.

Summary of the four evaluations

Although considerable evidence exists on the effectiveness of MAM interventions in controlled environments, more evidence is needed on the effectiveness of these interventions in the contexts

in which WFP operates. To address these evidence needs, the MAM impact evaluation series was commissioned by WFP's Office of Evaluation and managed by International Initiative for Impact Evaluation (3ie).

High rates of poverty and insecurity in the Sahel pose particularly significant challenges for nutrition interventions. Chad, Mali, Niger and Sudan were selected by WFP and ongoing programmes were paired with researchers. This approach created limitations for the feasibility of certain impact evaluation methods and no study could use a randomised controlled trial. Despite this, each study provided useful evidence for WFP's nutrition programming. The following is a summary of each evaluation.

Targeted and blanket supplementary feeding programmes in Chad (Saboya et al, 2018)

The evaluation in Chad focused on the impact of WFP's targeted supplementary feeding programme (TSFP) and blanket supplementary feeding programme (BSFP) in a region with high levels of MAM. BSFPs are a preventative intervention, whereas TSFPs are a MAM treatment intervention. The primary evaluation question was:

What is the impact of interventions for preventing moderate acute malnutrition on the incidence and prevalence of moderate acute malnutrition in children under two years with varying levels of access to moderate acute malnutrition treatment?

The evaluation used propensity-score matching to compare beneficiaries of the BSFP with non-recipients. Distance to nearest health centres was used to estimate the additional effect of access to the TSFP.

The evaluation found raw correlation between BSFP and MAM of 5 percentage point reduction (from 17% to 12%). Testing for significance, the evaluation found a 4.7 to 8 percentage point (comparing OLS, PROBIT, IPW and IPWRA models) reduction in propensity to become MAM in households benefitting from the BSFP,

which is significant at the 5% level when accounting for false discoveries. It also found that the incidence of MAM is 3.6 percentage points lower (significant only in PROBIT model) when there is good access to the TSFP. Lack of reliable census data and maps meant that the identification of areas with good or poor access to TSFP had to be done directly in the field.

Food assistance for food-insecure populations during conflict in Mali (Gelli et al, 2018)

Mali faces significant development and security challenges. The impact evaluation examined the effects of general food distribution and school feeding on populations in conflict-affected areas. The primary evaluation questions were:

- What are the impacts of conflict and food assistance on child malnutrition and other development outcomes?
- What are the effects of food assistance on conflict-affected populations?
- What coping strategies were most effective in mitigating the effects of conflict?
- How did humanitarian aid influence the effectiveness of coping strategies at household and community level?

The evaluation relied on a longitudinal study of a population in the Mopti region. The population was subdivided according to: i) extent of humanitarian assistance received since conflict; and ii) extent to which areas were affected by conflict. Data was collected through two household surveys (2012 and 2017). WFP food-assistance activities in northern Mali during the period evaluated included BSFP, TSFP, general food distribution (GFD) and school feeding. The effect of food assistance on populations was analysed by combining propensity-score matching and difference-in-difference estimations.

The evaluation found no significant effects of food assistance on the prevalence of MAM in the population surveyed. However, all forms of assistance were found to increase the consumption of vitamin A and monthly food and non-food expenditures.

Treatment and prevention of moderate acute malnutrition in Niger (Brück et al, 2018)

In Niger WFP's Protracted Relief and Recovery Operation (PRRO) employed a wide range of interventions, including targeted food assistance (TFA), blanket supplementary feeding (BSF), food assistance for assets (FFA), and targeted supplementary feeding (TSF). The impact evaluation assessed to what extent FFA in combination with other interventions is more effective at addressing MAM than prevention or treatment alone. The primary evaluation question was:

What are the impacts on nutrition outcomes of various combinations of programme components in WFP's protracted relief and recovery operation?

The evaluation relied on quantitative and qualitative methods of analysis. Quantitative analyses relied on panel survey data collected in 2014 and 2016. To analyse impact, the evaluation used difference-in-difference analysis to compare three groups: i) people receiving FFA at baseline but no assistance by end-line; ii) people receiving FFA at baseline who stopped receiving FFA and instead received TFA, BSF and/or TSF at end-line; and iii) people receiving FFA at both baseline and end-line and receiving another intervention at end-line.

The evaluation found that children who received both FFA and treatment and/or prevention assistance at the end-line of the evaluation (group three) were 20% less likely to suffer MAM than children receiving no assistance at end-line (group one). Additionally, children in group three were 15.5% less likely to suffer from MAM than those in group two. These findings suggest the FFA is potentially a valuable addition to MAM interventions. However, data availability and the non-random assignment of individuals made the evaluators cautious not to overstate the validity of findings.

MAM treatment and prevention programmes in Sudan (Guevarra, 2017)

In Sudan WFP delivers both MAM treatment and prevention interventions. In 2015 WFP expanded the use of food-based prevention of MAM (FBMAM) in areas already receiving TSFP interventions. WFP has also explored the relative effectiveness of integrating food-based interventions with social and behaviour change communications (SBCC) and water, sanitation and hygiene (WASH) interventions. The primary evaluation question was:

What is the impact of different MAM treatment and prevention interventions on the incidence and prevalence of moderate and severe acute malnutrition in children under 5 years and pregnant and lactating women?

The evaluation relied on a stepped-wedge, cluster-controlled trial design that followed the expansion of FBMAM interventions in areas receiving TSFP. However, the assignment of clusters to individual expansion rounds was not

A young child undergoes a Mid Upper Arm Circumference (MUAC) test, to measure malnutrition, in Boulonguouri, Niger

WFP/Simon Pierre Diouf

random and expansion also faced implementation delays. In addition, the evaluation nested a two-arm, parallel cluster-controlled design to assess the prevalence of malnutrition in areas with treatment compared to those with both treatment and prevention.

The evaluation was unable to detect any significant difference in the prevalence of global acute malnutrition (GAM), MAM or severe acute malnutrition (SAM) in populations receiving prevention interventions. The importance of ensuring quality and delivery of services was highlighted as an area for future WFP attention. However, the evaluation did find up to a 12% reduction in the number of at-risk individuals after the fourth round of FBMAM interventions. The evaluators offer three interpretations for these findings: i) there is a time-lag between at-risk reduction and prevalence rates; ii) prevalence rates remained high in areas with prevention interventions because cases shifted from SAM back to MAM; or iii) prevention coverage was not high enough to reduce population-level prevalence rates. Also, no significant effects were found for SBCC interventions due to implementation challenges and low participation.

Lessons and recommendations from the MAM series (WFP, 2018)

The MAM series was particularly useful for WFP because it provided significant new evidence related to operational challenges and the impact of treatment and prevention interventions in the Sahel. A synthesis of the four evaluations identified the following lessons:

1. Greater attention to the timing, sequencing and roll-out schedule of a package of interventions is likely to result in enhanced effectiveness.
2. Closer partnerships and coordination can support more effective and efficient delivery.
3. Barriers to achieving better coverage and access include, but are not limited to, infrastructure deficits. Awareness of the availability of quality services is also important.
4. The quality, availability and lack of monitoring and evaluation (M&E) data are problematic.

These lessons informed the following recommendations for WFP:

1. WFP should invest in the strategic deepening of its relationships with partners and stakeholders, providing capacity-strengthening where relevant;
2. WFP interventions should pay greater attention to communication with target groups, effectiveness of case-finding, and community sensitisation, all of which may improve targeting, efficiencies and effectiveness of MAM treatment and prevention programmes;

3. MAM programme components (e.g., packages) should be better tailored to context and may need to be integrated into longer-term, multi-sector solutions;
4. Greater effort should be made to share data among agencies working towards Sustainable Development Goal 2 and mainstream compatibility of tools and systems;
5. Greater support and attention are needed to improve the collection and use of monitoring and cost data.

WFP/Giulio d'Adamo

WFP has been operating a Mother and Child Health Nutrition (MCHN) Programme in Chad since 2012

These recommendations point to the importance of considering MAM treatment and prevention interventions along the continuum of care. The layering of treatment, prevention and other interventions such as FFA were found to have significant benefits in terms of effectiveness, depending on the combination and context. In addition, all studies highlighted the importance of improving the collection of comparable cost data to enable more strategic decision-making. After the synthesis in 2018 many of these lessons and recommendations were immediately taken onboard by WFP.

Acting on recommendations

The MAM series provided WFP with evidence and recommendations to support improvements in the planning and delivery of malnutrition treatment and prevention interventions. WFP Nutrition accepted all five recommendations made by the synthesis report and immediately began incorporating them into partnership,

policies, guidance and support. The following are examples of how MAM series recommendations influenced WFP's nutrition programming.

Recommendation 1: Deepen strategic relationships and support capacity-strengthening of partners

At the corporate level, the WFP Nutrition Policy (2017-2021) made partnerships a central priority and recognised the need for nutrition actors to work jointly to identify and improve upon delivery platforms to ensure that all vulnerable groups have access to healthy diets. WFP's partners in nutrition are diverse and include national governments, other UN agencies, non-government organisations, academic institutions and the private sector, all of which bring important strengths to WFP's nutrition programmes.

In 2018 WFP piloted its external digital learning platform (nut[x]), which is designed to share the organisation's experiences and expertise in nutrition with external partners, including governments, UN agencies, national and international NGOs, academic institutions and private sector actors[1]. This platform offers a broad range of e-learning courses and activities aligned with WFP's nutrition priorities, with the aim of promoting capacity-strengthening of partners and fostering the achievement of SDG2. nut[x] will be officially launched in quarter four of 2019.

Recommendation 2: Enhance communication with target groups and community sensitisation

The MAM series identified weaknesses in WFP's communications, particularly in the implementation of SBCC. To address these and other weaknesses in SBCC across contexts, WFP is investing in SBCC in multiple ways. Since finalising and launching its comprehensive, field-oriented SBCC Guidance Manual for Nutrition programmes in 2018[2], WFP Nutrition has focused on country-level actions to improve the quality, reach and impact of its SBCC programmes, including training for over 350 staff and partners in five regions. As a result of the evaluation recommendation to review SBCC interventions, actions and delivery platforms in Sudan, WFP expanded its efforts to include a nutrition-oriented TV show, radio programme and the sending of bulk SMS messages to the target population. These innovative media-based approaches build on the traditional approaches of community mobilisation, nutrition or health days, care groups and targeted SBCC training to strengthen staff and partner capacity.

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1   nutx is accessible at: https://cdn.wfp.org/nutrition/nutx/
2   Social and Behaviour Change Communication: Guidance Manual for WFP Nutrition. Available at: https://docs.wfp.org/api/documents/WFP-0000102103/download/

WFP's Juba Urban Programme provides cash assistance to vulnerable urban households

WFP/Gabriela Vivacqua

In Chad WFP is piloting a peer-to-peer model in remote areas through which 'role mothers' share good practices on hygiene and nutrition with a group of 12-15 women over 12 days. The model includes the use of 'nutricards' used by role mothers to teach other mothers how to prepare nutritious meals using local foods, as well as interactive games with their children to stimulate cognitive development. The approach builds community ownership and aims to improve the coverage and efficiency of the MAM treatment programme.

Recommendation 3: Tailor responses to context

WFP's new country strategic plan (CSP) approach has encouraged every country office to ensure its programmes are tailored to country context and needs. In West Africa the formulation of the CSP process was used as an opportunity to embed nutrition-sensitive thinking into country portfolios. WFP's Sahel resilience scale-up initiative embedded nutrition-sensitive thinking and actions into the selection of all activities. Findings from Niger on the benefits of layering FFA with other interventions also encouraged the integration of activities in the Sahel.

Nutrition analysis is being aided by WFP's Fill the Nutrient Gap[3] assessment, which reveals context-specific barriers to the consumption of healthy and nutritious foods and supports multi-sector decision-making on the prevention of malnutrition. The assessment focuses on gaps in nutrient intake to inform country-level policies and actions that can be taken to improve nutrition among the population, with a focus on the most vulnerable.

Recommendation 4: Improve inter-agency data collection methods and enhance data sharing

WFP is making significant efforts to improve the quality of nutrition data collected for monitoring and analysis. SCOPE CODA is WFP's cloud-based innovation, with the potential to transform data management in malnutrition treatment programmes. The application gives a digital identity to patients and tracks healthcare services, replacing paper-and-pen records, ration and referral cards and reports in healthcare centres with a personalised smartcard linked to an electronic database. It reduces human error, streamlines data and improves the effectiveness of treatment of acute malnutrition. SCOPE CODA strengthens partner coordination by providing a unified platform and linking to existing systems for all stakeholders in community-based management of acute malnutrition (CMAM), including governments, UNICEF, international organisations and implementing partners, to access and share programme information. It is being developed as a single data system across treatment programmes for SAM (managed by UNICEF) and MAM (managed by WFP) and thus will result in better partner coordination, integrated data management and reduced loss at referral.

Recommendation 5: Improve use of monitoring and cost data

Although an effort was made to collect and analyse cost data in this evaluation series, the findings were inconclusive and point to a need for more rigorous cost studies. WFP is improving the quality and usefulness of nutrition intervention monitoring and cost data. To improve cost analysis, WFP recently launched a new costing tool that supports countries to collect comparable data on interventions. The tool uses both monitoring and financial data from within WFP to generate estimates for MAM treatment programming, using a globally standardised methodology. This ensures consistency in both data sourcing and calculations across countries to enable global comparison. Furthermore, the tool analyses additional information, such as cost drivers, to support programmers in the field as they work to improve cost-effectiveness over time.

The tool will be used to estimate the cost to WFP to treat a child for MAM. With partner collaboration it can also be used to determine the full cost to treat a child for MAM. The tool is internal as it is built around WFP data systems in order to minimise burden as well as encourage consistency between countries. However, the methodology and results of the tool will be available to partners.

Conclusion

The findings from the MAM impact evaluation series are supporting a process of learning and improvement in WFP. The synthesis of these evaluations provided practical recommendations that are currently guiding WFP's efforts to improve acute malnutrition treatment and prevention interventions. These improvements also provide new opportunities to test theories and generate new evidence to answer questions raised by the MAM evaluation series.

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[3] https://www1.wfp.org/publications/2017-fill-nutrient-gap?_ga=2.217522065.62125258.1558712434-190838471.1546502188

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Front cover
An Anganwadi Worker and her helper teach pre-school children how to wash their hands, India; Soumi Das

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About ENN

ENN is a UK registered charity, international in reach, focused on supporting populations at high risk of malnutrition. ENN aims to enhance the effectiveness of nutrition policy and programming by improving knowledge, stimulating learning, building evidence, and providing support and encouragement to practitioners and decision-makers involved in nutrition and related interventions.

ENN is both a core team of experienced and academically able nutritionists and a wider network of nutrition practitioners, academics and decision-makers who share their knowledge and experience and use ENN's products to inform policies, guidance and programmes in the contexts where they work.

ENN implements activities according to three major workstreams:
Workstream 1: Experience sharing, knowledge management and learning. This includes ENN's core products: Nutrition Exchange and en-net, as well as embedded knowledge management within two key global nutrition fora (the Scaling Up Nutrition Movement (SUN) and the Global Nutrition Cluster (GNC)).

Workstream 2: Information and evidence on under-researched nutrition issues. This comprises ENN's research and review work on filling gaps in the evidence base for improved nutrition policy and programming.

Workstream 3: Discussion, cooperation and agreement. This includes a range of activities for discussing and building agreement and consensus on key nutrition issues. It includes ENN's participation in and hosting of meetings, its activities as facilitator of the IFE Core Group and its participation in the development of training materials and guidance, including normative guidance.

ENNs activities are governed by a five year strategy (2016-2020), visit www.ennonline.net

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