ACCESS FOR ALL

VOLUME 1:
Is community-based treatment of severe acute malnutrition (SAM) at scale capable of meeting global needs?

SAUL GUERRERO & ELLIE ROGERS
I
n little over four decades, SAM treatment has gone from
a small-scale clinical endeavour to a global public health
service reaching over two million cases a year. Much of
this scale-up has occurred in the last decade following the
introduction of community-based SAM treatment approaches.
Since the rapid-scale up of such community-based approaches,
however, there have been few overarching reviews of their
performance over time.

This report, the first in a three part series, offers a comparative
assessment of the performance and effectiveness of the
model during two distinct periods of its development: from
2001-2006 when the majority of community-based treatment
projects were implemented by NGOs; and from 2007-2013
when many community-based treatment programmes were
integrated by ministries of health into regular health services.

For each period, three components of the community-based
 treatment model are assessed: the capacity of treatment services
to successfully cure SAM cases, their capacity to reach the
highest proportion of the affected population (coverage) and
their cost-effectiveness.

**THE REPORT HAS THREE MAIN CONCLUSIONS:**

1. **Community-based treatment models deliver exceptional
clinical outcomes.** The median cure rates of community-
based models in the 2001-2006 and 2007-2013 periods were
80% and 84% respectively. SAM cases admitted into treatment
services today are as likely to be successfully cured today
as they were a decade ago.

2. **In areas where SAM services are available, only a third of
affected cases actually access treatment.** The analysis shows
that whilst high coverage can be achieved by community-
based SAM treatment, the conditions necessary to do so are seldom
met. The capacity of treatment services to meet global
SAM needs depends on coverage being significantly and
consistently improved.

3. **Community-based models are more cost-effective than
in-patient models.** Cost-effectiveness analyses show that
some community-based models were two times more cost-
effective than in-patient models. In spite of their dependency
on context-specific operational factors, recent evidence
suggests that MoH delivered community-based SAM treat-
ment services continue to be cost-effective interventions.

**SUMMARY 3**

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Introduction

Today, a child suffering from severe acute malnutrition (SAM) is more likely to receive lifesaving treatment than at any previous point in history. Advances in the clinical understanding of SAM and the transition from inpatient to community-based care have been pivotal in making this possible. These advances have also facilitated the incorporation of SAM treatment into health systems in over 60 countries, turning what was once conceived as a humanitarian intervention into a feature of national health services worldwide. However, since the rapid scale-up of community-based SAM treatment, there have been few overarching reviews offering a comparative assessment of the performance and effectiveness of the community-based treatment model.

The first volume of this three-part series aims to provide a review. It focuses on three key components of the model: 1) The capacity of treatment services to successfully cure SAM cases; 2) The capacity to reach the highest proportion of the affected population (coverage); and, 3) Its cost-effectiveness. It reviews performance during two distinct phases: the period of NGO-implemented programmes (2001-2006) and the period of integrated, Ministry of Health (MoH) -implemented services (2007-2013). This classification is not without its problems; many programmes implemented between 2001 and 2006 had strong MoH involvement, whilst some programmes implemented after 2007 have had varying levels of NGO support. What is certain is that the implementation of community-based SAM treatment has gone from geographically-smaller, resource-heavy programmes to its delivery as part of broader national health services with decreasing levels of support and supervision. The essence of the model (e.g. promoting early identification and the treatment of most SAM cases on an outpatient basis) has remained the same, but the changes provide valuable evidence about the effectiveness of the model at scale.

The need to understand the opportunities and challenges of delivering SAM treatment at scale is rapidly growing. The recently published Lancet series on Maternal and Child Nutrition has made the scale up of SAM treatment services (at 90% coverage) a key feature of the proposed child survival framework. (1) UNICEF’s most recent estimates, however, suggest that less than 15% of the current SAM caseload around the world is accessing treatment. (2) Increasing the proportion of SAM cases that access treatment is essential, and this publication aims to contribute to the evidence-based analysis and action necessary to bring this about.

The identification of the current treatment protocol for SAM began with the work of JC Waterlow in the Tropical Metabolism Research Unit in Jamaica in the 1960s. (3) Their extensive research on kwashiorkor and marasmus in hospitalised children enabled the creation of more appropriate diets for nutritional rehabilitation which are the basis of treatment used today. (3-7)

As the number of humanitarian emergencies increased in the last decades of the 20th century, (8) the operationalisation of SAM treatment became increasingly important. The first service delivery model, introduced in the mid-1970s, (9) was the Therapeutic Feeding Centre (TFCs). This model replicated in the field the type of clinical care previously delivered in hospitals, providing inpatient care with medical equipment and trained medical staff. (10) These temporary structures were often set up, funded and run by international non-governmental organisations (INGOs) in parallel to the local health system.

By 1989 a specific diet to treat SAM in TFCs had been formalised. (11) The formula was primarily based on M Golden’s work and led to the commercial production of therapeutic milks F75® and F100® by Nutriset. (12,13) These milk-formulas, combined with the routine use of antibiotics, treatment for dehydration and the routine provision of measles vaccines and vitamin A, provided the first treatment protocol (11) and resulted in the first detailed manual to successfully rehabilitate SAM children. (14)

In spite of these significant clinical advances, major limitations affected the service delivery model. TFCs were considered efficacious, as the model could deliver acceptable results under ideal conditions, but in practice, they proved ineffective because these results were rarely achieved at scale. (15) Limited access to treatment, resulting in low coverage was the single biggest limitation of the TFC model (see box 1). Reliable and comparable data on TFC coverage is largely unavailable, but they are estimated to have reached between 4% (18) and 10% (17) of the affected population in their programme areas. TFCs could cure most of the SAM cases that it admitted, but the majority of SAM cases could not access TFCs.

There were six key factors limiting access to TFCs and keeping coverage low: limited case finding, distance to services, (18) high opportunity costs for carers, (20,21) increased risk of cross-infection, (22) fixed capacity of TFCs and increased security risks attached to seeking care. (23) Many of the limitations were linked to intrinsic features of the treatment protocol.

SAM rehabilitation required trained medical personnel, and the use of F75® and F100® milk which in turn required clean, safe water for its preparation. But whatever the cause, the effects were clear: by ignoring the ‘economic, psychological and social elements’ of SAM, (19) treatment services were inaccessible to many, resulting in late presentation and low coverage. To break away from this, a definitive move from the dependency on TFCs was needed.
therapeutic milks was required as part of a model that would put access at its core.

S Collins was the first to publicly address these issues and to develop a viable, alternative service delivery model. To do this the first issue to tackle was the limitations of therapeutic milks themselves. Led by A Briend, in 1996 the first Ready-to-use Therapeutic Foods (RUTFs) to treat SAM were developed (19,24-27). RUTFs gave those working on an alternative delivery model a product that was fit-for-purpose. What was now needed was a quick and reliable method to identify SAM cases. By the early 2000s, sufficient evidence had been collected on the Mid-Upper Arm Circumference (MUAC) to demonstrate arm muscle mass alone as the most sensitive predictor of mortality at high specificity levels, and better than weight-for-height, weight-for-age and height-for-age. (28-30) MUAC measuring tapes were shown to be easy, simple and accurate enough to be used by non-medical volunteers. (30,31) If RUTF offered a way of successfully treating SAM at home, MUAC offered a simple and transparent way of identifying them in the communities.

Using these tools, a new community-based model was piloted (by S Collins, his team and partners) in Ethiopia and then Sudan, providing the basis of what would eventually become the Community Therapeutic Care (CTC) model. (32-33) CTC relied on the involvement of national governments and the sustainability of programmes involved. (35) If RUTF working with other sectors will help to increase the coverage and simultaneously strengthen all of the programmes involved. (35)

Decentralised centres and community participation allowed treatment to reach the highest proportion of the population in need. (36)

The limited resources needed for start-up allows it to be quick, thus meeting the need at the peak of the crisis.

CAPACITY BUILDING
Where possible existing health system structures are used and developed instead of operating in parallel to the local health system.

By 2007 it had become clear that the key questions about community-based SAM treatment were how to ensure greater involvement of national governments and the sustainability of treatment services: Official endorsement of the model would be key, and in 2007 the World Health Organisation (WHO), the World Food Programme (WFP), the UNSCN and UNICEF issued a joint statement supporting the implementation of (the newly labelled) Community-based Management of Acute Malnutrition (CMAM). (36) By the end of 2007, the number of countries offering these services had quadrupled compared to just two years prior (see Figure 2).

In little over four decades, SAM treatment went from a small-scale clinical endeavour to a public health service reaching over two million cases a year around the world. The size and quantity of services available has grown exponentially throughout this period, but how has the quality of treatment changed or evolved?
Community-based SAM treatment aims to deliver good clinical outcomes (high cure rates and low defaulter and death rates) for a higher proportion of the SAM affected population (high coverage). With over ten years of public data now available, did NGOs succeed in delivering this? To answer this question, three different types of evidence are considered: (a) clinical outcomes, (b) cost-effectiveness and (c) coverage.

Clinical Outcomes

An analysis of publicly available records² (n=64) of community-based SAM treatment programmes implemented between 2000 and 2006, suggests that they successfully delivered high quality treatment (see Figure 3)³.

**Clinical Outcomes**

**CURE RATE**
The median cure rate of SAM in programmes implemented between 2000 and 2006 is 60.0%. 68.8% of programmes achieved the SPHERE standard (>75%), whilst 31.3% of the sample failed to do so. The data range is 45% (50.0% to 95.0%) demonstrating that the model is capable of achieving high cure rates.⁴

**DEFAULTER RATE**
The median defaulter rate is 8.0% for programmes implemented between 2000 and 2006 which is well below the SPHERE standard (<15%). 73.0% of programmes achieved the SPHERE standard. The data range is large at 36.2% (0.0% to 36.2%), with two records above 30.0%. Only one record failed to record a defaulter rate (n=63).

**DEATH RATE**
The median death rate of programmes implemented between 2000 and 2006 was 4.1%. This is lower than the SPHERE standard (<10%) and 95.3% of programmes in this period achieved it. However, the data range is 14% (1.0% to 15.0%) so some high death rates were reported during this period.

These early results demonstrate that the decentralisation of SAM treatment did not come at the expense of quality. The median cure, defaulter and death rates for this period all achieved SPHERE minimum standards. There were a number of very high performing programmes with reported cure rates of 95.0% (n=2), defaulter rates of 0.0% (n=2) and death rates of 1.0% (n=4). These show that the model was capable of achieving optimal programme outcomes. However, some low cure rates (50.0%) and high defaulter and death rates (36.2% and 15.0%) suggest that achieving optimal outcomes required specific conditions and practices.

The efficacy of early community-based SAM treatment programmes was crucial as this led to its eventual, wider uptake. Early programmes proved that it was safe. This in turn facilitated the process of bringing the medical community on-board with these decentralised approaches, which would prove essential within the Ministries of Health and other National Health Service providers. In doing so, meeting SAM needs would increasingly be defined less by the clinical outcomes and more by the capacity to put treatment within reach of the highest number of cases. (see box 1)

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¹ See Annex 3 in a full list of records used
²When collating/analysing the dataset, the review encountered the following limitations:
³ programme data is not systematically and accurately reported;
⁴ data is not disaggregated by gender;
⁵ clinical outcomes are calculated inconsistently (vis-à-vis admissions or exit Figures);
⁶ clinical outcome indicators are reported inconsistently;
⁷ There are often included in outcome indicators;
⁸ programme sample size was often not consistently included.

As a result: This review has not included an analysis of the non-recovery rate, weight gain or length of stay as this information has not been systematically recorded in published data used in this review.

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Programmes implemented during the CTC R&D phase are included. These received intensive financial and human resources which later programmes did not receive.

26 out of 64 programmes are from either Ethiopia or Malawi. Both of these countries received considerable external support in the early phase of CTC implementation.

Organisations publishing the data publicly may have favoured successful programme data. Underperforming programmes may not have been reported.

Programme (sample) size has not been accounted for so larger programmes with poor results would have a greater impact than smaller programmes with good results.

The median is the value lying at the mid-point of a frequency distribution of values. The range shows the variation between the highest and lowest values.
The SPHERE minimum standards for coverage, developed during the early days of community-based SAM treatment (and set at >50% for rural, >70% for urban and >90% for camp settings) (43) reflected the anticipated levels of success expected from this approach. Did programmes implemented directly by NGOs succeed in reaching a high proportion of SAM cases?

Coverage

A review of coverage surveys carried out by different NGOs between 2001 and 2006 provides valuable evidence about the coverage achieved by community-based SAM treatment programmes in both rural (n=19) and camp settings (n=1). The overall median point coverage is 35.8% (n=20) with a range of 72.3% (6.0% to 78.3%). The median period coverage is 62.6% (n=16) with a range of 87.5% (8.9% to 96.4%) with one programme reporting period coverage close to 100.0% (see Figure 46). A third of these programmes achieved coverage rates higher than their relevant SPHERE minimum standards. The decentralised approach coupled with regular detection and case-finding meant that the model had the potential to reach unprecedented levels of the affected population. Compared to previous centralised approaches, the median point coverage of 35.8% was a remarkable improvement. (45) High coverage, combined with good clinical outcomes, meant that programmes could effectively meet more needs than ever before.

The data from this period also provides a less evident but equally important point. Low coverage rates (6.0-7.0%) recorded during this early period suggest that the quality of programmes was only as good as the quality of support it received from its implementers6. The decentralisation of care improved availability but did not ensure accessibility. For the full potential of community-based SAM treatment to be realised, specific activities to enhance and facilitate access needed to be undertaken.

Figure 4

By moving away from a fixed-capacity model, CTC was also designed to offer more cost-effective treatment. Prior to the introduction of the community-based SAM treatment model, few studies were conducted to assess the most cost-effective type of intervention for treating SAM, comparing home based care with clinic based care. (47-48) These early assessments, which looked at different models of home based care and focused purely on monetary costs incurred by implementer and carer, generally found home based care to be the most cost-effective option. (50)

With the arrival of CTC, cost-effectiveness assessments began to provide more in-depth and useful analysis of costs of SAM treatment. Early cost comparisons of TFCs with the first CTC programmes showed that the cost of rehabilitating a SAM child under the CTC model was lower than in a TFC (€255 to €301 per child in CTC compared with €355 per child in TFC). (20) Subsequent and more comprehensive research also took into account indirect costs, by employing a societal perspective in the retrospective cost-effectiveness analysis. (51) Effectiveness was measured by comparing cure rates on patient follow-up care records that were very similar for each program (TFC: 95.36%, CTC: 94.30%). At €328.58 per child in CTCs, the institution costs for treating a child were lower than in TFCs, which averaged at €262.62. Similar results were seen when a monetary value was attached to indirect costs, where it was shown that the CTC model cost considerably less per child treated at $5.87 per carer compared to TFCs costing $21.01. (51)

These analyses found CTCs to be twice as cost-effective as TFCs and four times more cost-effective for the caretakers. The reduction of opportunity costs meant that a greater number of families would be able to afford SAM treatment. CTC made community-based SAM treatment more affordable and thus more accessible than the previous model.

The combined good clinical outcomes, higher coverage and cost-effectiveness demonstrated that when implemented properly, community-based SAM programmes could meet more needs than ever before. But could it continue to do so when implemented at scale?

**TABLE 4**

<table>
<thead>
<tr>
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<tr>
<td>Institutional cost per recovered case</td>
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<tr>
<td>Opportunity costs for caretakers, per recovered case</td>
<td>€21.01</td>
<td>€5.87</td>
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</table>

Source: Tekete A, Wondafrash M, Azene G, Deribe K. 2012 (51)

**FIGURE 5**

Cost-effectiveness of SAM treatment within a CTC programme in Ethiopia.

1 Based on a standalone TFC intervention.
2 A patient was categorised as cured when achieved fulfilling the criteria of weight-for-height ≥65% for two consecutive weighing and no oedema for ten days.
3 Costs of running CTCs are dependent on the following factors: density and prevalence of severe malnutrition, infrastructure present, the accessibility and maturity of the emergency and availability of locally produced RUTF. In the TFC/CTC comparison study the cost of therapeutic food per child was $42.94 for TFCs and $55.53 for the CTC. However, the total therapeutic food needs of the CTC made up 43.2% of the institutional costs per child while for the TFC it was only 30.3%.

**Box 4**

1. CTC was designed as a comprehensive, multi-level model which includes inpatient and outpatient SAM treatment, MAM treatment and community mobilisation activities. These elements were implemented as one, making separation of individual costs and investments difficult.

2. The use of direct costs as the sole metric also fails to recognise the broader societal perspective or the indirect costs (opportunity costs) on the community.

3. Economies of scale of CTC programmes mean relatively high initial fixed costs (recruiting, training, equipping mobile teams, interacting with and mobilising communities), yet expanding services only requires food and medicine costs. (16)
Clinical Outcomes

An analysis of publicly available records on MoH integrated programmes implemented between 2007 and 2013 (n=23) provides evidence to demonstrate good clinical outcomes, comparable to early NGO-implemented programmes.

**CURE RATE**
The median cure rate for MoH-integrated programmes is 84.0% (n=23) which is 4% higher than the previous NGO-implemented programmes (80.0%, n=64). 78.3% of the results reviewed were above SPHERE’s minimum standards (>75%) with 34.8% of the results exceeding 90% cure rates. However, there is a large range of 48% (51.0% to 99.0%) almost the same as the early NGO-implemented programmes (45%). In nearly every regard, integrated services are achieving equally or better cure rates than programmes prior to 2007.

**DEFAULTER RATE**
The median defaulter rate was 9% which is similar to early NGO-implemented programmes (8%). 69.6% of programmes achieved SPHERE standards (<15%). There was a large range of 45% (0.0% to 45.0%) with 6 out of the 23 programmes reporting high defaulter rates, greater or equal to 20%.

**DEATH RATE**
The median death rate is 1.5% with a range of 4% (0.0% to 4.0%) which is lower than the median rate of NGO supported programmes (4.1%). All (100%) of the programmes in the sample met SPHERE minimum standards (<10%), compared with 95.3% of early, NGO-supported programmes.

These results show that performance in integrated programmes is comparable to that of early NGO-implemented programmes. The medians for cure and defaulter rates show little variation, in spite of the different management structures and contexts. In fact, a greater proportion of integrated services achieved SPHERE standards for cure rates (78.3% compared to 68.8%). Additionally, the death rate was notably lower in more recent programmes, showing improved clinical performance in recent years. But have integrated services succeeded in delivering these good clinical outcomes to a high proportion of the affected population?
MoH-delivered services

Cost-Effectiveness

There are only two published studies evaluating the cost-effectiveness of MoH-implemented community-based SAM treatment. In Malawi, the cost-effectiveness ratio of implementing specific SAM services within existing health services was estimated to be $42 per Disability Adjusted Life Year (DALY) averted, which WHO classifies as a highly cost-effective intervention. A similar study in Zambia also supported these findings showing the cost of each DALY averted to be $53. These are considered cost-effective in comparison with other priority child health interventions in developing countries.

There is also a growing body of operational evaluations providing further evidence. In 2012 UNICEF undertook two country-wide evaluations in Nepal and Pakistan which included cost analyses of SAM treatment. In Pakistan the average cost per beneficiary was $145 (OTP) and $230 (SC), and in Nepal, the cost per beneficiary was slightly less for OTP varying from $125 per child down to $56. This suggests that further cost reductions have been made since the early CTC programmes (€255 to €301 per child). As expected, RUTF was a significant proportion of total programme costs.

This data shows that community-based SAM treatment at scale continues to be a low cost and cost-effective intervention.

Coverage

The introduction of easy-to-use coverage assessment techniques in 2008 significantly increased the availability of coverage data for MoH-integrated services implemented during this period. This large dataset (n=71), 8 in rural (n=58), urban (n=11) and camp (n=2) settings, provides valuable insights into the performance of programmes. The median point coverage for MoH-integrated programmes is 34.1% (n=63) with a range of 55.2% (5.1%-61.3%). The median period coverage is 55.6% (n=36) with a range of 60.4% (22.8% to 83.2%). A comparison shows little difference from the median point coverage of NGO-implemented programmes (35.8%). The median period coverage rates also show little variation, with NGO programmes having a median of 62.6%.

This analysis shows that although the proportion of the SAM population reached was considerably higher than with previous centralized models, community-based SAM treatment failed to consistently achieve the high levels of coverage initially expected. The number of “coverage failures” is also increasing; 40% of NGO-implemented programmes (n=8, point coverage) achieved coverage >50%, while only 7.9% of MoH-implemented programmes (n=5) reached the same threshold. The difference is further accentuated when a higher threshold is used (>70%); only 15% (n=3) of NGO-implemented programmes achieve this and no MoH-implemented programmes to date have reported such levels of point coverage. These results suggest that although MoH-implemented programmes are potentially capable of reaching a high proportion of the SAM population, the operational conditions to do so are seldom met.


11 This was under the ‘base case’ scenario for each variable. The worst case scenario would have increased the cost to $493.
12 Cost per beneficiary figures are dependent on a number of contextual factors and the methods of calculation can vary greatly.
13 Depending on the variation in capital costs and the rate of SAM. No SC data available.
Community-based SAM treatment has the potential to deliver cost-effective treatment with a good standard of care to a high proportion of the SAM affected population. Community-based clinical outcomes can deliver exceptional results comparable with the previous (high performing) TFC programmes, with cure rates greater than 90.0% and default and death rates close to 0.0%. The cure rate medians (80.0% and 84.0%) confirm the quality of the treatment protocols used and suggest that while these can still be optimised, (58) their overall efficacy is unlikely to be easily improved further. Available research shows the community-based model to be cost-effective with a low cost per DALY, and recent evaluations show that MoH-implemented services continue to be low cost interventions.

Consistently achieving optimal levels of coverage remains a challenge. Since the introduction of community-based SAM treatment models, only a handful of (mostly NGO implemented) programmes have achieved high coverage rates. In recent years, there have been large variations in the proportion of cases reached by MoH-delivered services, with most failing to reach minimum standards (i.e. <50%). This suggests that access (including both uptake and adherence) remains a key challenge. Ensuring that community-based SAM treatment services remain cost-effective and capable of meeting needs at scale depends on levels of coverage being significantly and consistently improved.

**Annex 1: Updated classification of malnutrition for Community-based Management of Acute Malnutrition.**

**Acute Malnutrition**

- **Severe Acute Malnutrition with Medical Complications**
  - Weight for height $<-3$ z score or MUAC $<11.5$cm or Bilateral pitting oedema $+/**$
  - AND
  - A medical complication

- **Severe Acute Malnutrition without Medical Complications**
  - Weight for height $<-3$ z score or MUAC $<11.5$cm or Bilateral pitting oedema
  - AND
  - Appetite, Clinically well, Alert

- **Moderate Acute Malnutrition**
  - Weight for height $<-3$ z score to $<-2$ z-score or MUAC $11.5$cm to $<12.5$cm

**Inpatient**

- Therapeutic care

**Outpatient**

- Therapeutic care

- Supplementary feeding

*Source: Harmonised Training Package, 2011. ESR*
### Annex 2: Coverage Data by Country.

#### NGO-supported programmes (2000 - 2006)

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### Annex 3: Efficacy Data by Country.

#### NGO-supported programmes (2000 - 2006)

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#### MoH-supported services (2007-2013)

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