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

SAUL GUERRERO & ELLIE ROGERS
In 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 treatment services continue to be cost-effective interventions.

ACKNOWLEDGEMENTS:
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The CMN project is an inter-agency initiative to improve nutrition programmes through the promotion of quality coverage assessment tools, capacity building and information sharing.
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 an overview of the current state of SAM treatment and action necessary to bring this about. 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. (1) 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 of the 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, they are estimated to have reached between 4% (16) and 10% (17) of the affected population in their programme areas. TFCs could cure most of the SAM cases they 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, high opportunity costs for caregivers, increased security risks attached to seeking care, and many of the limitations were linked to intrinsic features of the treatment protocol. The authors recognize that the CTC/CMAM model was designed to provide treatment for both severe and moderate acute malnutrition and an analysis of its performance requires a review of both treatment components. This review focuses exclusively on SAM treatment, as whenever possible.

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 relationship between coverage, cure rate and met need (impact) in the treatment of SAM.

Coverage is commonly defined as the proportion of all people needing or eligible to receive a service who actually receive that service. It is considered a vital indicator of programme success and impact. Together with programme efficacy, coverage determines the proportion of needs met by an intervention. Lower cure rates and high coverage can actually lead to greater met needs than high cure rates and low coverage (see figure 1). Coverage is also used as a reliable proxy indicator of the level of accessibility of a given service. The lower the coverage, the less accessible a health programme

Figure 1

Cure Rate:

Met Need:

Coverage: 70% Cure Rate: 50% Met Need: 35%

Coverage: 30% Cure Rate: 90% Met Need: 27%

Source: Sadler, K. 2008 (16)
Background

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 community Therapeutic Care (CTC) model. (32-33) CTC relied on the community to provide the basis of what would eventually become the Community Therapeutic Care (CTC) model. (32-33) CTC relied on the community as the primary treatment provider. In 2000, the Lancet published the first of its Maternal and Child Nutrition series. The series focused global attention on SAM, by recognising it as a major public health issue responsible for a high proportion of child deaths. (35) It prompted the inclusion of SAM treatment in the package of interventions promoted by the SUN movement, (40) the way SAM treatment was understood not only by NGOs but also by national health authorities.

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 2008, the Lancet published the first of its Maternal and Child Nutrition series. The series focused global attention on SAM, by recognising it as a major public health issue responsible for a high proportion of child deaths. (35) It prompted the inclusion of SAM treatment in the package of interventions promoted by the SUN movement, (40) the}

BOX 2

CTC Guiding Principles

[‘CTC] aims to provide rapid, effective, low cost assistance that is least disruptive to affected communities and builds a foundation to link relief and development interventions for long-term solutions to food insecurity and threats to public health’ (18).

1 MAXIMUM ACCESS AND COVERAGE

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

2 TIMELINESS

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

3 SECTORAL INTEGRATION

The program does not stand-alone but aims to work alongside health, food security and conflict resolution programs as well as provide nutrition and health education for cases. Another component is the local production of RUTF. Working with other sectors will help to increase the coverage and simultaneously strengthen all of the programmes involved. (38)

4 CAPACITY BUILDING

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

FIGURE 2

Distribution of the number of new countries implementing CMAM programmes from 2000-2010.

Number of new countries

Ethiopia, Sudan Juba, Sudan Khartoum, Malawi, Uganda, Zambia, Haiti, Niger, Bangladesh

Source: UNICEF/Valid International (2011), (52)
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 records\(^2\) (n=64) of community-based SAM treatment programmes implemented between 2000 and 2006, suggests that they successfully delivered high quality treatment (see Figure 3)\(^3\).

CURE RATE
The median cure rate of SAM in programmes implemented between 2000 and 2006 is 80.0%. 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)

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

\(^4\) 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 value.

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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) (42) 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 4). 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 implementers. 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**

**Coverage estimations (2000-2006).**

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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 $128.58 per child in CTCs, the institutional 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 carer 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?

**Cost-Effectiveness**

<table>
<thead>
<tr>
<th>Box 4</th>
<th>3 Challenges in comparing the cost effectiveness of CTC with TFC</th>
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<tbody>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
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</table>

**Figure 5**

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

<table>
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<tr>
<th></th>
<th>TFC</th>
<th>CTC</th>
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<tbody>
<tr>
<td>Institutional cost per recovered case</td>
<td>$262.62</td>
<td>$128.58</td>
</tr>
<tr>
<td>Opportunity costs for caretakers, per recovered case</td>
<td>$21.01</td>
<td>$5.87</td>
</tr>
</tbody>
</table>

Source: Teketel A, Wondaladi M, Azeno G, Debbke R. 2012 (51)

1 Based on a standalone TFC intervention

2 A patient was categorised as cured if discharged fulfilling the criteria of weight-for-height ≥85% 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 36.3%.
In 2007, following the WHO/UNICEF/WFP/UNSCN Joint Statement, community-based treatment of SAM (under the rebranded Community-based Management of Acute Malnutrition, CMAM) was rolled out across a number of countries. Labelling aside, treatment services were built on the same key principles: delivering high quality care to the highest proportion of the SAM-affected population, through the promotion of early presentation and the treatment of uncomplicated SAM cases on an outpatient basis using RUTFs. The high performance of early community-based SAM treatment programmes was an integral part of the reason for its scale-up and integration into national health systems. But have integrated community-based SAM treatment services continued to deliver similar levels of performance?

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% - 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?
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,\(^{11}\) which WHO classifies as a highly cost-effective intervention.\(^{(53)}\) A similar study in Zambia also supported these findings showing the cost of each DALY averted to be $53.\(^{(54)}\) These are considered cost-effective in comparison with other priority child health interventions in developing countries.\(^{(54,55)}\)

There is also a growing body of operational evaluations providing further evidence.\(^{12}\) 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),\(^{(56)}\) and in Nepal, the cost per beneficiary was slightly less for OTP varying from $125 per child down to $56.\(^{13}\) 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.

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**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 56.2\(\%\) \((5.1\%-61.3\%)\). The median period coverage is 55.6\(\%\) \((n=36)\) with a range of 60.4\(\%\) \((22.8\%\text{-}83.2\%)\). A comparison shows little difference from the median point coverage of NGO-implemented programmes \((36.8\%)\). The median period coverage rates also have 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 \((n=4)\), 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.

**Cost-Effectiveness**

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\(^{11}\)This was under the ‘base case’ scenario for each variable. The worst case scenario would have increased the cost to $483.

\(^{12}\)Cost per beneficiary figures are dependent on a number of contextual factors and the method of calculation can vary greatly.

\(^{13}\)Depending on the variation in capital costs and the rates 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, the 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 $++/+/
- A medical complication

**SEVERE ACUTE MALNUTRITION WITHOUT MEDICAL COMPLICATIONS**
- Weight for height $<-3$ z-score or MUAC $<11.5$ cm or Bilateral pitting oedema
- 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**
**Outpatient supplementary feeding**

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

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

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

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### Annex 3: Efficacy Data by Country.

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

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