



Semi-Quantitative Evaluation of Access & Coverage (SQUEAC)

Twic County
Warrap State

Republic of South Sudan

December 2011



EUROPEAN COMMISSION



Humanitarian Aid

ACRONYMS

ACF	- Action Against hunger
CMAM	- Community management of acute malnutrition
CSAS	- Centric systematic area sampling
CI	- Confidence Interval
CNV	- Community nutrition volunteer
CNW	- Community nutrition worker
ECHO	- European Commission Humanitarian Organization
IYCF	- Infant and young child feeding
MUAC	- Mid upper arm circumference
OTP	- Outpatient therapeutic programme
PHCC	- Primary health care centre
SAM	- Severe acute malnutrition
SQUEAC	- Semi quantitative evaluation of access and coverage
RUTF	- Ready to use therapeutic food
SD	- Standard deviation

ACKNOWLEDGEMENTS

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We wish to thank the individual families who pleasantly allowed the survey team members to assess their children and provided the survey team with the information required that made this exercise a success, further we acknowledge the contribution of the local authorities, parents and care takers, community guides and the community as a whole for their cooperation, time and provision of information.

ACF – USA expresses its sincere appreciation to the entire assessment team for the high level of commitment, diligence and integrity demonstrated during all stages of the assessment.

EXECUTIVE SUMMARY

The Twic County coverage investigation using SQUEAC methodology was conducted on 1st – 16th December 2011. This is the third assessment conducted by the South Sudan mission using the SQUEAC approach changing from its long time methodology – CSAS (Centric systematic area sampling). The objectives of the investigation were:

1. Estimating the overall coverage of nutrition programme catchment areas in Twic County.
2. Identifying barriers to access and uptake of the CMAM services provided by the nutrition treatment programme in the County
3. Giving recommendations to the nutrition treatment programme based on the investigation findings to improve access to the IMAM services and increase programme coverage in the project areas

The evaluation used a simplified version of the standard, 3-stage; Bayesian beta-to-binomial conjugate analysis. CMAM coverage in Twic County was estimated to be:

Point Coverage 27.3% (19.7% - 36.6%)

The Nutrition program in Twic is a complex one since there are external factors such as conflicts and population movements; these result to the program having more non-resident beneficiaries. The investigation in summary recommends;

- The program has an influx of IDPs and returnees; there is need for increased screening activities and rapid assessments in the area to monitor the nutrition situation of the County.
- Prepositioning of sufficient supplies and increased remote management especially in times of increased insecurity for some identified OTPs. These will not affect OTP services even when movements have been curtailed.
- Strengthen community mobilization and defaulting follow up and as well standardising and sustaining the motivation strategy for volunteers.
- Increased on-job training for CNWs by the OTP supervisor, increased contact with the program officer and manager. This is both motivational and has an impact of streamlining the shortcomings of the CNWs in manning OTP centres, handling of referrals and monthly reporting.
- Uniform nutrition education messages for improving knowledge of community members on malnutrition.

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1. BACKGROUND

ACF-USA South Sudan mission has an integrated approach to addressing acute malnutrition and its underlying causes. The South Sudan mission started its intervention in June 2007 to save the lives of children, women and men threatened by hunger and diseases in Warrap state. We implement a fully integrated strategy, whereby the links between nutrition, food security and water and sanitation activities are strengthened to achieve a higher level of impact for our beneficiaries.

ACF Nutrition treatment program runs life saving activities through the running of Out-patient Therapeutic Program (OTP) in Wunrok, Turalei, Mayen abun, Aweng, Molbang, Majok noon and Anyiel Kuac. The inpatient/stabilisation centre (SCs) is located in Wunrok centre for treating severely malnourished children with medical complications. In addition, the program runs community mobilization activities in order to involve the targeted communities in the detection and referral of acutely malnourished children. ACF - USA is recognized the need to engage in the treatment of Moderate Acute Malnutrition and in 2011 it began addressing these cases in its implementation areas, in consultation with the other partners.

The mission moreover maintains a comprehensive nutrition surveillance component not only to detect nutrition emergencies but also to provide information on the socio-economical context, health, food security and livelihoods, water and sanitation, and care practices trends that lead to increased levels of acute malnutrition in the population.

During the fifth population census in 2008, the population of the county was estimated at 204,905. The annual increment of 2.05% brings the population in 2011 to 217,780 and adding the returnee's number of 13,592, the total population in 2011 comes to 231,372 persons. The findings of a multi-indicator nutrition, health, wash, livelihoods and mortality cluster survey conducted by GOAL South Sudan in Twic County in March 2011 showed that the GAM and SAM rates were 24.9 % (21.3 – 28.9 95% C.I.) 6.2 % (4.4 - 8.5 95% C.I.) respectively and reported as per the WHO, 2006 standards. The results clearly show the humanitarian situation in Twic County and thus give a picture of high caseloads in the County.

The Twic County coverage investigation using SQUEAC (Semi-Quantitative Evaluation of Access and Coverage) methodology was conducted on 1st – 16th December 2011. This is the third time ACF – USA South Sudan mission was adopting the SQUEAC approach changing from its long time methodology - CSAS. The objectives of the investigation were as mentioned in the executive summary.

Briefly, the Semi-Quantitative Evaluation of Access and Coverage¹ (SQUEAC) tool was developed to provide an efficient and accurate method for identifying existing barriers to service access and evaluating coverage in a non-emergency context. The approach places a relatively low demand on logistical, financial and human resources to provide detailed information regarding overall coverage, areas of low and high coverage and the principle factors preventing higher coverage in a given target area. It is therefore possible to implement the method in a medium to long-term programme integrated with national Ministry of Health (MoH) operations rather than a short-lived, NGO funded programme not aiming to achieve long term sustainability. Methods previously available such as the CSAS approach create a far larger demand on resources and therefore cannot be viably integrated into MoH run programmes in the long-term.

¹ Mark Myatt, Daniel Jones, Ephrem Emru, Saul Guerrero, Lionella Fieschi. SQUEAC & SLEAC: Low resource methods for evaluating access and coverage in selective feeding programs.
<http://www.brixtonhealth.com/SQUEAC.Article.pdf>

The SQUEAC investigation is based on the principle of triangulation. This means that data need to be collected and validated by different sources and different methods. The exercise ends when there is redundancy; i.e. no new information is gained from further investigation using different sources or methods.

SQUEAC achieves its efficiency by using a three stages approach: the development of the *Prior*, the development of the *Likelihood* and the generation of the *Posterior*. The first two stages aim to identify potential barriers and provide two individual estimations of coverage. During the *Prior* building process, existing routine data which have previously been collected and compiled are combined with qualitative data to produce a coverage “picture”; the “picture” can be drawn by hand or by using the xMind software. Building the *Prior* provides a projection of coverage levels for both the entire target area and also specific areas suspected of relatively high or low coverage within the programme’s target zone.

The *Likelihood* is built with data collected during a wide area field survey in randomly selected villages. The *Active and adaptive Case Finding (AACF)* method is used to identify severely malnourished children as well as children enrolled in the programme who are still malnourished or recovering. During the wide area survey, additional qualitative data are collected in order to explain why some severely malnourished children are not enrolled in the OTP.

The last stage, the generation of the *Posterior*, combines the two initial stages and provides the overall coverage estimation, including Confidence Interval² (C.I), by taking into account the “strength” of each component of the equation. The *Posterior* is calculated using the Bayesian calculator.

2. STAGE ONE

The first stage of this investigation began with analysis of routine programme monitoring data which may include charts of trends in admission, exits, recovery, in-programme deaths, and defaulting and data that is already collected on beneficiary record cards such as admission MUAC and the physical address (home villages) of programme beneficiaries.

The objective of Stage One was to identify areas of low and high coverage and the reasons for coverage failure using routine programme data or easy-to-collect quantitative and qualitative data.

2.1. Programme Admissions

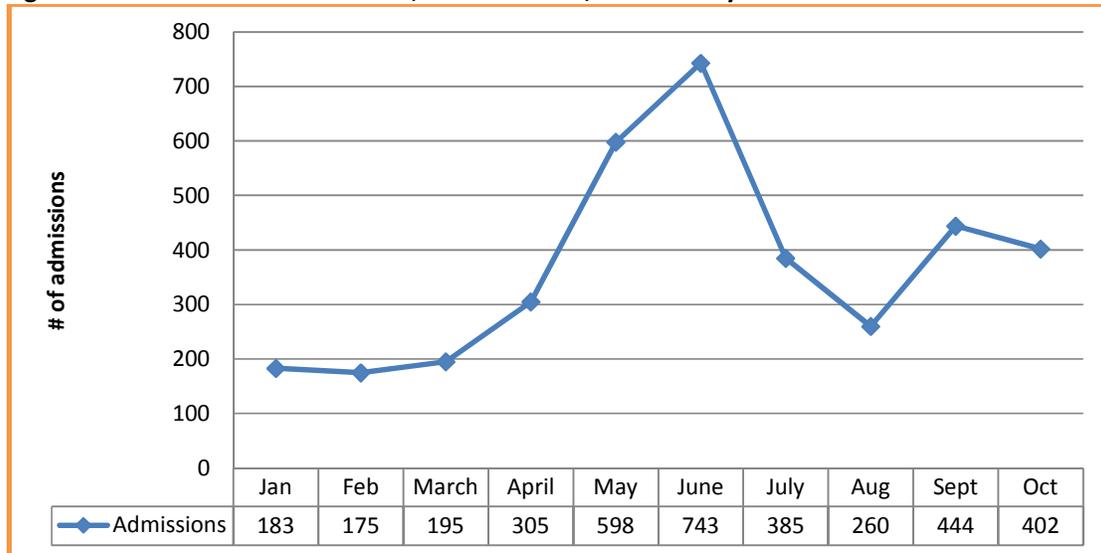
Since ACF – USA began its operations in Twic County; there are a lot of children that have been treated by the program. The analysis focused on Jan – Oct 2011, in this period the programme admitted 3690 children to its seven operational OTPs.

Evolution of overall admissions is illustrated in Figure 1. A glance at the trend reveals a steady increase in admissions from January up until April 2011. In May and June there is observed a shot up in admissions and a decrease thereafter with a slight come back in September. Admissions in January were low and were attributed to the referendum which had caused scale down of activities and at some point the activities were suspended for a period of two weeks and after that there is observed increase in trend. Pronounced peak in admissions in April 2011 was explained by the investigation as the period when the reserve stocks for the household are depleted and that there is migration to the big centres which increases the population in places like Turalei and Mayen Abun.

² The Bayesian approach is about beliefs and updating beliefs with data, the estimation interval is called the credible interval.

The May and June sharp increase in 2011 attributed to the influx of IDPs from the war-torn areas of Abiyei that caused and increased population in big centres and as such being more vulnerable contributed to high case loads as observed in Figure 1 below. Admission patterns in Twic are highly influenced by population movements (displacement and migration) and insecurity in the area.

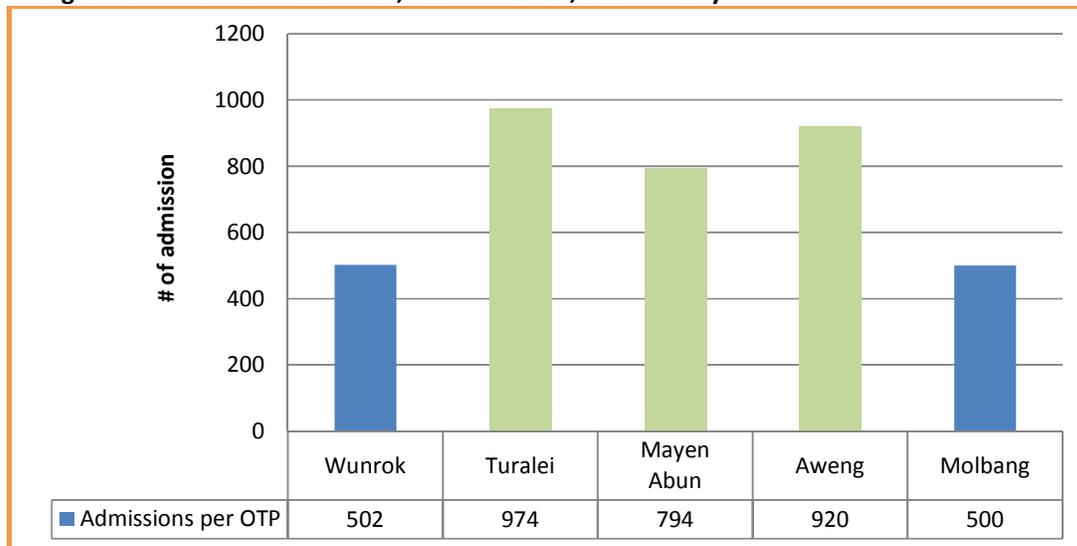
Figure 1: OTP Admissions over Time, Jan - Oct 2011, Twic County



2.2. Admission by Service Delivery Unit (OTP)

Looking at the overall admission trends, admissions were further analysed by service delivery unit in order to identify potential disparities in admissions across the different facilities.

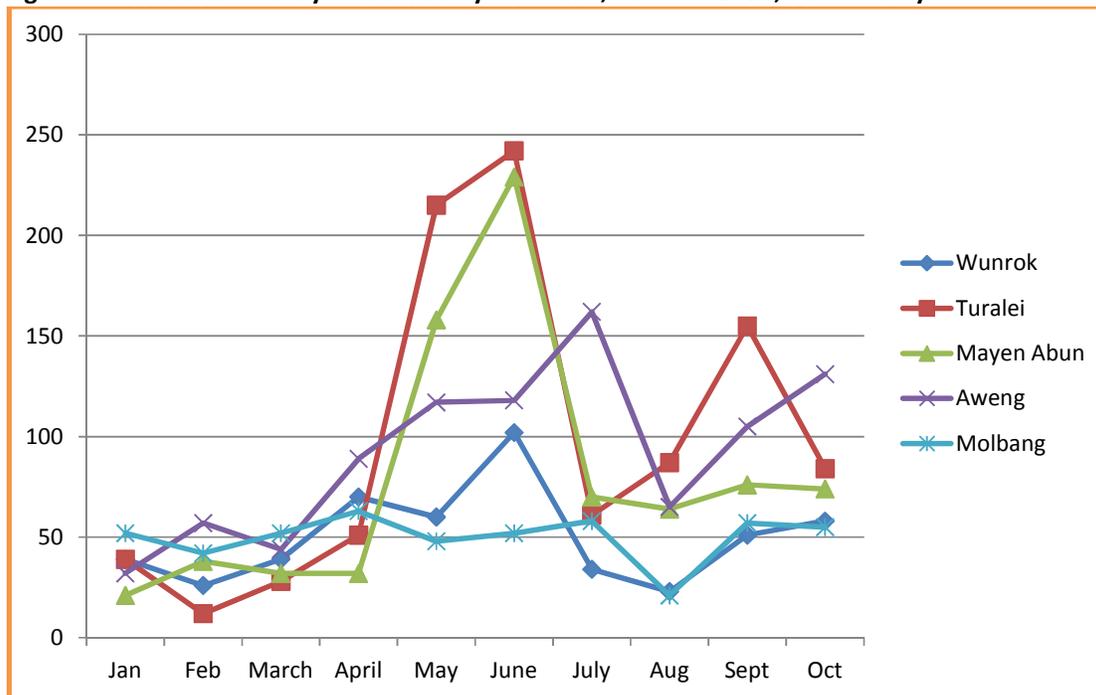
Figure 2: Total OTP admissions, Jan - Oct 2011, Twic County



The analysis identified a clear difference between the sites whose series is light green and those in blue as shown in figure 2 above. The investigation concluded this to be the result of these facilities hosting the IDPs and populations from insecure areas of the County. Moreover these facilities are in big centres in the region and they experience in-migration during the hunger gap and are places with primary health care especially Turalei. This makes it possible to receive many cases as the

beneficiaries seek medical care. The admission trends over time per health facility are illustrated in Figure 3 below.

Figure 3: OTP admissions by health facility over time, Jan - Oct 2011, Twic County



The figure indicates similar trends over time, all health facilities show an increase between Jan and April and a shot up in May and June the reasons are as explained above. Turalei and Mayen Abun show the highest in May and June because; the centres had IDP camps for people displaced by conflicts in the border town of Abiyei.

2.3. Admissions vs. Needs

Time bound trends, are clear in the trends of admissions though the external populations seem to have interfered with the resident population patterns. Seasonal peaks are based on the local seasonal calendar and critical events, which highlights highest food insecurity (i.e. hunger season) and in-migration to big centres peak periods to be between March and April. In linking admission trends and the seasonal calendar, one can see the trends correspond to needs as in Annex 2, though largely based on assumptions as the time frame is not long enough (over years) to illustrate this adequately.

The investigation has also ascertained that admissions drop with increasing agricultural responsibilities. This is twofold; first there is out-migration to the cultivation fields and second the labour intensive nature of cultivation and foreseen benefit does give little chance to seeking OTP services.

2.4. Spatial Coverage of Admissions

A geographical mapping exercise of admissions, defaulters and volunteers is used to assess the pattern of spatial coverage across the programme area. This is usually followed by a series of small area surveys to test hypotheses of heterogeneity of coverage. However, due to limitations on availability of good quality maps, the spatial coverage assessment was modified. A pivot table was generated from the database to get villages with corresponding admissions, defaulters and volunteers

Following the overall admission trend analysis, the home locations of admissions were to indicate the spatial coverage of CMAM activities in the seven operational OTPs.

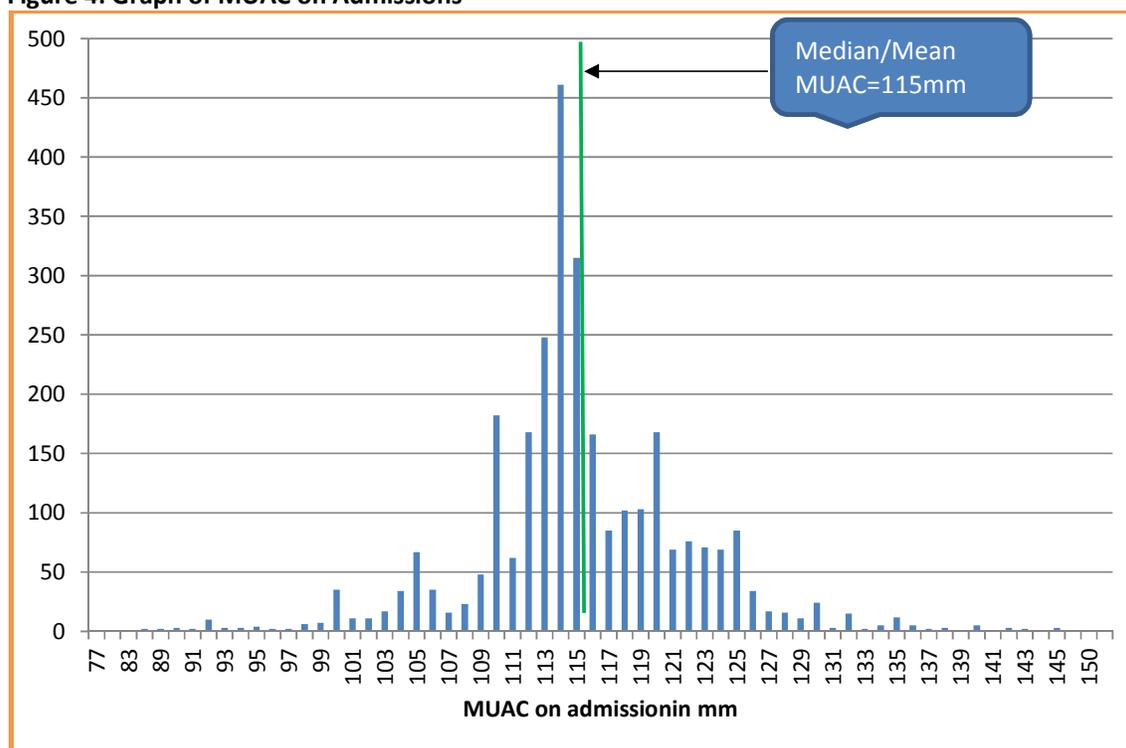
The analysis showed that admissions were higher in communities along the network of roads within the County and from the more densely populated areas. This was a key exercise towards guiding the investigation in the formulation of the hypotheses as indicated in section 2.9.

2.5. MUAC at Admission

The measurement of the MUAC at admission is also part of the data available on the individual admission card and as well captured by the database. The compilation of data collected from each OTP site makes it possible to investigate the *timeliness of treatment seeking behaviours*.

In order to further understand whether the programme is reaching SAM children early, the MUAC at admission was plotted for all recorded admissions between Jan – Oct 2011. The results are as shown in the figure 4 below. The median MUAC at admission was 115mm and the mean MUAC was 115 mm. The mean and median MUAC is the same 115mm implying that the community is seeking services early.

Figure 4: Graph of MUAC on Admissions



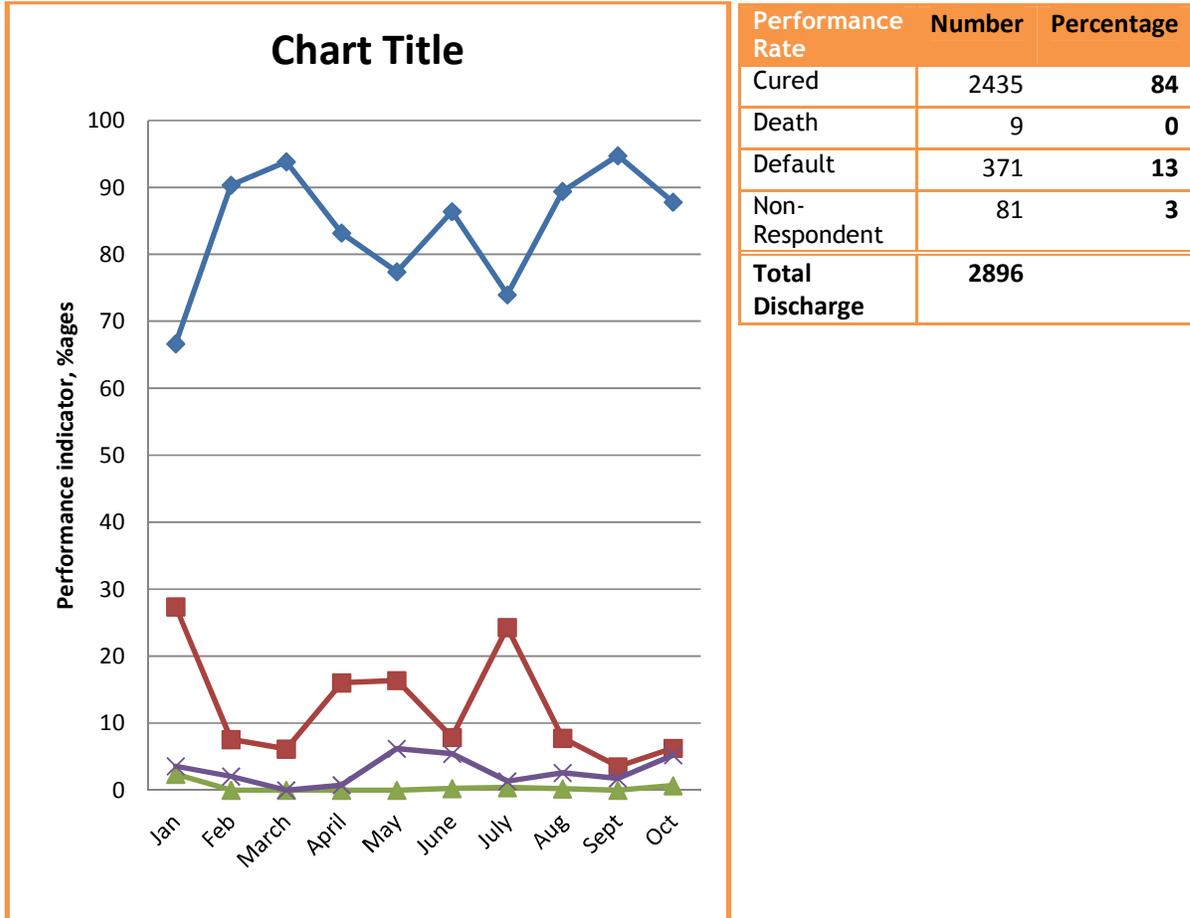
Overall, children appear to be arriving in a relatively timely manner for treatment, the median MUAC on admission can be used as an indicator of beneficiaries' treatment-seeking behaviour. More specifically, it reflects how early or late they seek care. The closer to the admission criteria the MUAC on admission the earlier they seek care and the lower the MUAC on admission the later they seek care. A median MUAC on admission of < 115 mm usually indicates late treatment-seeking behaviour. For the above analysis in the Twic IMAM programme, the admission median MUAC is 115 mm shows that the programme is able to capture SAM children early.

This early arrival seems to be positively influenced by use of z-score in admission criteria, the investigation found out that slightly above 50% of admission are by z-score. This implies that the children are admitted early before they reach the <115 mm which is the MUAC admission criteria.

2.6. Programme Exits

The following graph and table presents cumulative programme performance indicators Jan – Sept 2011.

Figure 5: Performance over time



Programme exits meet the SPHERE standards³, the proportion of discharges from therapeutic care who have died is <10%, recovered is >75% and defaulting rate is <15% with exceptions of Jan and July which is explained by the fact that activities were slowed in Jan and July when the conflicts displaced persons were beginning to return back to their areas.

2.7. Review of Defaulter Records

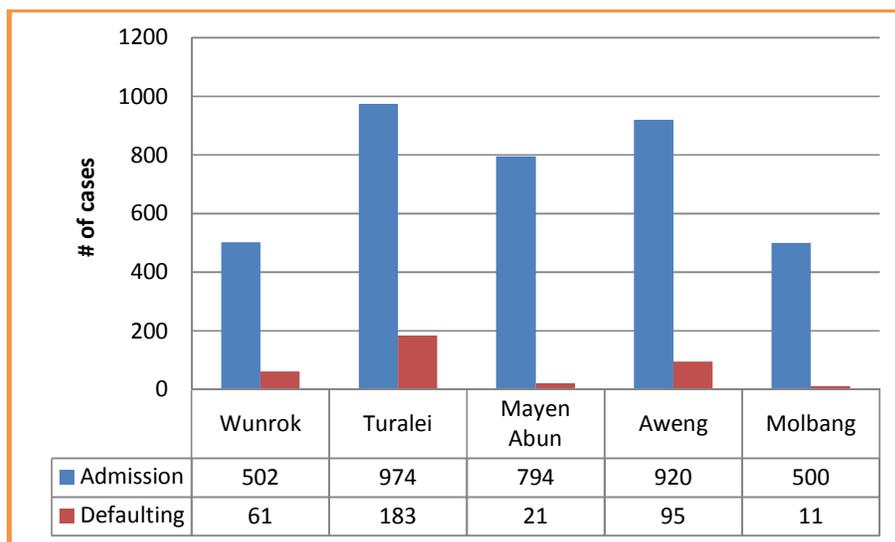
To better understand the factors effecting defaulting and potentially affecting coverage, various stages of analysis were conducted specific to defaulting. This was a key exercise towards guiding the investigation in the formulation of the hypotheses on coverage for testing as part of Stage Two. The number of defaulters is examined for signs of worryingly high trends over time.

2.7.1. Defaulter versus admission and over Time

In bringing together admissions and defaulters per health facility it is possible to identify a few trends in the graph below.

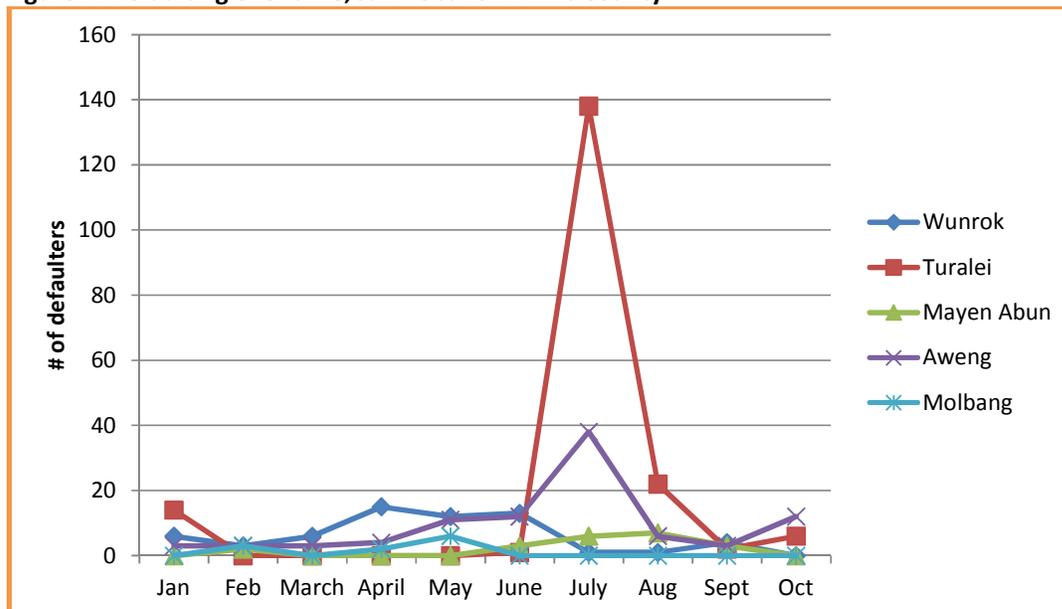
³ SPHERE Standards Handbook 2011

Figure 6: Defaulters versus Admissions per OTP, Jan - Oct 2011, Twic County



Health facilities with higher number of admissions also have a higher number of defaulters, such as Turalei and Aweng with exception of Mayen Abun which is attributed to the awareness of the OTP services and proximity. On the same note, health facilities with lower admissions also have lower defaulting, such as Molbang. Such trends suggest a possible correlation between the levels of admissions and the levels of defaulting. The potential correlation seems to be corroborated by the trends in defaulting over time by health facility (Figure 7 below) which follows a similar pattern to admissions. The sharp defaulting in July is as a result of movement of Conflict displaced populations.

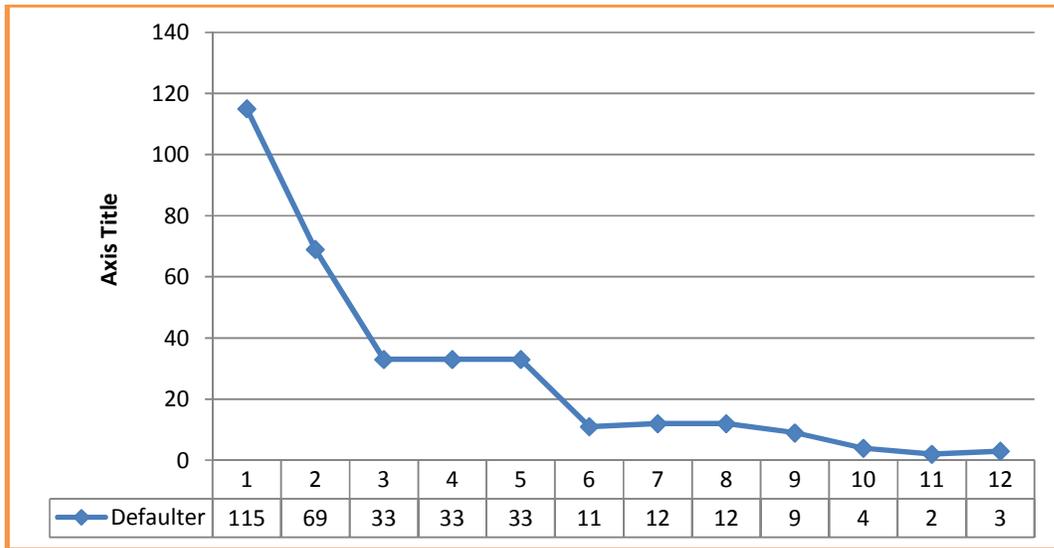
Figure 7: Defaulting over time, Jan - Oct 2011 Twic County



2.7.2. Early versus Late Defaulter

The investigation also analysed the timing of defaulting, in an effort to determine possible reasons behind it⁴. Discharged defaulter cards were gathered and separated into categories according to number of visits recorded (Figure 8). The analysis concluded that most defaulting is occurring early on, with some defaulters never returning for a single follow-up visit after admission.

Figure 8: Time of defaulting, overall, Jan - Oct 2011, Twic County



2.7.3. Defaulters by Home Location

The investigation also considered the need for locating where the programme has high defaulting by mapping the villages from which defaulters come from.

Generally defaulting was low and most of the villages had 1 – 3 defaulters for the period Jan – Oct 2011. Abyei, Youth Centre, Wunrok, Turalei and Majak Aher however showed a high defaulting and are corroborated by the volumes of admissions in Turalei and Mayen abun OTPs.

2.8. Qualitative Data

2.8.1. Synthesis of Quantitative and Qualitative Data

In this investigation a mind mapping exercise was used to synthesise all quantitative data analysed and qualitative information gathered. The exercise allowed the investigation team to collate all the data in such a way that it facilitated discussion and interpretation. The exercise was done by putting together pieces of flip chart paper to create a “wall” to write on. The theme or topic being investigated, which for this case is coverage, was put at the centre of the wall and then sub-topics based on the various sources of quantitative data and qualitative information were written down branching out from the central theme. Corresponding data and information was then written down per sub-theme or topic and the process was continued until all points of investigation were exhausted. The mind mapping exercise was also facilitated and captured using XMind⁵, a mind mapping software that allows for the recording of a mind map electronically. Annex 1 shows the XMind version of the mapping exercise for the Twic County SQUEAC.

⁴ Early defaulters generally suggests; 1) that the child did not recover on its own after (i.e. is affecting coverage) and; 2) it happened most likely for significant reasons. If it happened late it generally means that; 1) the child probably recovered on its own and; 2) it probably happened precisely because “sufficient” progress had been made and cost-benefit balance shifted

⁵ XMind can be downloaded free at www.xmind.com.

2.8.2. Understanding of Malnutrition

Malnutrition is not recognized in Twic County communities as a distinct and easily recognisable condition, which can affect early detection. The mothers cannot at the first instance think of malnutrition when the child is unwell. In listing the common diseases in the community, malnutrition was not mentioned as a disease. The terms used to refer to malnutrition are: *Dor* which means thin; *Thiang* which refers to a child who is thin, vomiting and has diarrhoea and *Chala* – thin and lacks appetite. The community recognizes that malnutrition is caused by: Lack of food/balanced diet, Poor care by mothers, Diseases, Poor Feeding and ignorance of good feeding practices and generally malnutrition. The signs for malnutrition mentioned were Loss of weight, loss of appetite growth failure and the child becomes thin and weak.

2.8.3. Health Seeking Behaviour

During the community discussions, the respondents were asked what they do when their children are sick so as to assess their health or treatment seeking behaviour. Overall, these informal discussions revealed a complex health seeking behaviour across the programme area.

The majority start with home remedies by giving local herbs and when this does not work then they go to health facilities. The home remedies administered include: Local herbs-*long'chuk*; Ajuet-lack off appetite and general sickness; Grains roots and Facial cuts. The facial cuts are believed to be able to remove the sick blood.

When the situation becomes very serious, the child will then be taken to the PHCC, where they receive nutrition advice and medication for other identified illnesses. Some of the cases are brought to the health facility too late.

Reasons given by the respondents on why they begin with home remedies are: the distance which in some villages is 2-3 hour walk, the costs for registration in PHCC, permission from the husband; Lack of drugs /medication /especially injection and belief that tablets do not cure and prefer injection. The community is aware of drug shortages in the health facilities and in most cases they have always been referred to buy drugs from the shops and pharmacies in the market this has effect since they would prefer home remedies to coming to the PHCCs and the worse scenario is the belief that they must get injection because according to them that is what can cure.

2.8.4. Barriers to Access

In order to understand health seeking behaviour in Twic County, a series of cultural and programmatic factors linked to malnutrition were reviewed. The table 2 below summarizes key findings on possible reasons for defaulting and non-attendance.

Table 2: Reason for Defaulting and non-attendance

Awareness on malnutrition & treatment available	Malnutrition is not recognized as a distinct disease by communities. Thus, when a child presents malnutrition signs and symptoms, caregivers begin home medication first and when it is not improving they go to the PHCC and from there is when they get to the OTP. There is still need for continued mobilization and awareness creation of malnutrition. The programme is known and accepted, however this is the case for villages around the OTP; those distant are still having a challenge coming to the OTP and mobilization activities have not reached them
OTP service provision	The OTP services are well accepted and mothers are happy about it, however some complaints of rejection (wrongly referred cases). This may have an impact where mothers will feel they have been turned back and also the communication they take home may impact the uptake of the services and further, the mother may not come back to the facility even when the child nutritional status decline.
Insecurity, population	Twic county is bordering Unity state and Abiyei areas that have experienced

displacements and frequent population movements	conflicts and in addition interclan conflicts have also created insecurity in some areas. Movement of troops and some rebel group soldiers have also hampered security in the area. The impact of this is that, it slows IMAM activities as movements are sometimes not allowed and mothers as well would not be able to come to the facilities with fears of being attacked or leaving other siblings at home.
Distance	A common barrier to accessing OTP services is distance. Since the settlement structures in Twic are clustered they tend to be spread far from one another. Some villages are very far from the OTP with almost 2 – 4 hours walking to reach the OTP where CMAM services are provided.
Physical Barrier	During the rainy season, seasonal rivers become a main barrier to access. In addition, road networks also become worse, limiting access during the rainy season. In some sites flooding becomes the main barrier
Community Mobilization	Most of the villages visited away from the OTP reported having not seen someone doing the screening in their villages. This was further corroborated by the CNVs focus groups that complained of distance to the villages and were asking for transportation during mobilization days. The CNW also reported issues of follow up by the community mobilizer in confirming whether it is taking place
RUTF Perceptions / Acceptance	Some community members refer to RUTF as food, which can have implication in that caregivers will attend the health facility without understanding the admission criteria/malnutrition treatment, be rejected and relay this information back to communities. Others refer to it as medicine and have attested that it cures and the child improves very fast, just a few weeks after being put on RUTF.

2.9. Areas of High and Low Coverage

Based on the information collected and analyzed in Stage One, there were observations of high and low coverage as seen in the admissions per home location. The investigation concluded that coverage is likely to be relatively low in some villages in the county but high admissions were observed in villages around the OTPs.

The hypothesis was therefore that:

- **Coverage is high** in areas around the OTPs with less than an hour walk.

To test this hypothesis, eight areas were selected, based on the investigation, as the most representative of the hypotheses. The second stage was undertaken to confirm the hypothesis.

3. STAGE TWO

The objective of Stage Two was to confirm the locations of areas of high and low coverage as well as the reasons for coverage failure identified in Stage One (above) using small area surveys.

Eight villages were sampled where four were hypothesised as having high admission and the others with low admissions. Four teams were formed for the small area survey which was conducted in two days.

3.1. Active and Adaptive case Finding

Active = Target SAM cases instead of doing house to house screening

Adaptive = Use key informants to help find SAM cases

= Key informants:

- Village leader/elder
- Traditional healer
- Senior women and elders
- Religious leaders
- Beneficiaries

3.2. The Definition of a Case

The case was defined as children aged 6 – 59 months with either:

- MUAC less than 115 mm
- Pitting Bilateral oedema
- <-3 Z-score; in this investigation, the criterion of Z-score was not considered to identify cases since it is a criterion generally used at the health facility level only and this measurement is not part of the community based approach.⁶

The local terms used were as defined in section 2.8.2. Based on the information collected, coverage was classified against a threshold of 50%⁷. A decision rule (d) was calculated using the following formula:

$$d = \left[n \times \frac{p}{100} \right]$$

n = total number of cases found
p = coverage standard set for the area

3.3. Stage Two – Small Area Survey

In the test of hypothesis exercise for high coverage areas, the following results were found and calculations made in order to classify coverage as follows:

3.3.1. High coverage areas

Total SAM found = 14; IN programme = 4; NOT in programme = 10; D = 50/100*14=7

Since 4 is <7, then coverage is below 50% and thus we do not accept the hypothesis

3.3.2. Low coverage areas

Total SAM = 19; IN programme = 4; NOT in programme = 15; D = 50/100*19=9.5=9

Since 4<9, then the coverage is below 50%.

The actual numbers for each village are represented in the table 3 below.

Table 3: Results of the small area survey

Cov e rage	Village	OTP	Tea m	Malnourishe d	In progra m	Not in Progra m	Recover ing
Low	Mayen Guot Juor	Mulbang	2	0	0	0	0
	Apiot	Mayen Abun	1	5	0	5	0
	Mading Abiel	Turalei	4	4	0	4	2
	Bul yom	Aweng	3	10	4	6	0
High	Marial Guot Juor	Mulbang	1	2	0	2	0
	Nyin deng Ayen	Mayen Abun	3	2	1	1	0
	Wul chum	Turalei	2	9	3	6	0
	Marial Maper	Aweng	4	1	0	1	1
				33	8	25	3

⁶ Duffield A, & Myatt M, 2007, Weight-for-height and MUAC for estimating the prevalence of acute under-nutrition: a review of survey data.

⁷ Threshold was set at 50% based on the SPHERE minimum standard for coverage in rural areas.

The results of the small area survey indicated we do not have sufficient evidence to accept the hypothesis and thus our hypothesis that coverage is high in areas around the OTPs required more data or further investigation of why it is not the case. The findings are corroborated by the prior belief that coverage is low at around 30% and this is confirmed by the wide area survey.

3. STAGE THREE

The objective of Stage three was to provide an estimate of overall programme coverage using Bayesian techniques. To do this, the evaluation relied on the standards Bayesian beta to binomial conjugate analysis.

4.1. Developing a Prior

All the positive and negative factors identified as affecting the coverage are listed, ranked and weighted according to their relative contribution to the overall coverage. Positive and negative factors ranked highest are automatically given a $\pm 5\%$ weight while lowest ranked factors are weighted $\pm 1\%$. Factors ranked in between were given weights of between $\pm 2\%$ to $\pm 4\%$ according to their perceived positive or negative contribution to the coverage. The weights are then summed for the positive factors as well as the negative factors.

All positive factors were added to the minimum possible coverage (0%) while all the negative factors were subtracted from the highest possible coverage (100%).

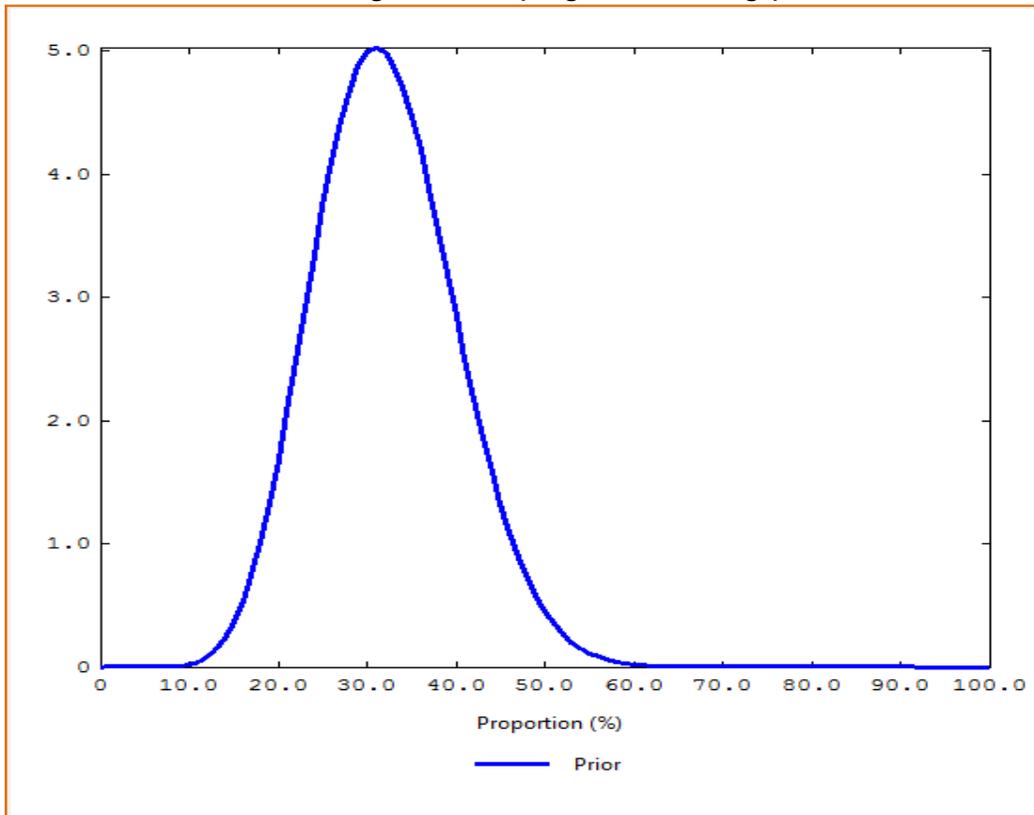
Table 4: Measuring Contributing Factors (Prior)

Positive Factors	Value		Negative Factors
Awareness of CMAM	1	5	Distance
Perception of CMAM	3	3	Rejection
Referral	1	3	Defaulting
Understanding of Malnutrition	3	3	Plumpy nut stock out
		1	Overcrowding /more work
Communication	1	3	Health seeking behavior
Outreach	1	5	Insecurity
Standards	1	4	Movement of population
		1	flooding
Added to Minimum Coverage (0%)	11	29	Subtracted from Maximum Coverage (100%)
Median	30		
α value	11.1	23.5	β value

The distribution of prior coverage estimate is determined through a beta distribution of the belief of perceived coverage estimates. This is done by using the Bayes SQUEAC calculator⁸ to plot the mode and all the perceived other possible coverage proportions. An average was calculated and used as the median for a trial distribution curve (Prior) plotted using the Bayes SQUEAC Calculator. The final curve that was generated is as shown in figure 9.

⁸ Software specifically designed and developed for SQUEAC investigations and can be downloaded free at www.brixtonhealth.org

Figure 9: Prior (Programme Coverage)



4.2. Sampling Methodology

4.2.1. Minimum Sample Size

To estimate the minimum number of cases (children) needed in the small area survey (n), the following formula is used:

$$n = \left| \frac{\text{mode} \times (1 - \text{mode})}{(\text{precision} / 1.96)^2} - (\alpha + \beta - 2) \right|$$

Using α (13.1) and β (12.9) values and a mode of 50.5% (see section 3.1), the following minimum sample is as follows:

$$\begin{aligned} n &= [(0.3 \times (1 - 0.3)) / (0.1 / 1.96)^2 - (11.1 + 23.5 - 2)] \\ n &= (0.21 / 0.002603) - 32.6 \\ n &= 80.67614 - 32.6 \\ n &= 48.076 \\ \mathbf{n} &= \mathbf{48} \end{aligned}$$

In order to achieve a confidence of +/- of 10%, a minimum of 43 cases needs to be identified.

4.2.2. Minimum number of villages

The minimum number of villages to be sampled was then calculated with the use of the following values.

Target Sample Size:	48
Average village population:	371
Prevalence of SAM:	3.5%
% Children aged 6-59 months:	18%

Values were used in the following formula

$$n_{\text{villages}} = \frac{n}{\text{average village population}_{\text{all ages}} \times \frac{\text{percent of population}_{6-59 \text{ months}}}{100} \times \frac{\text{prevalence}}{100}}$$

$$n_{\text{villages}} = 48 / (371 \times 0.18 \times 0.035)$$

$$n_{\text{villages}} = 48 / 2.3373$$

$$n_{\text{villages}} = 20.5365$$

$$n_{\text{villages}} = \mathbf{21}$$

As a result, a minimum of 21 villages was to be sampled in order to reach the minimum sample size of children.

4.2.3. Spatial Representation

In order to achieve spatial representation, the Stage Three investigation involved a two-stage sampling:

- 1) Village selection: First, a list of all the villages in the catchment areas was generated. The following procedure was then followed in selecting villages to be surveyed:
 - i. listed all villages in the catchment per OTP
 - ii. Sort them according to distance to the respective OTP
 - iii. Assigned numbers 1- 224
 - iv. The required number of villages is 24, the sampling interval was 9.
 - v. Randomly selected the beginning number, which was 8
 - vi. Added 9 to the starting number 8 and continued adding 9 till 215
 - vii. From those numbers, the villages were identified.

The list of the sampled villages is attached in the appendices.

2) Within-community sampling method: a combined active and adaptive case-finding and mass screening approach was used in Stage Three to ensure selected communities were sampled exhaustively. The wide area survey was carried out over four days (Dec 12th – 15th) by four teams of four people, each composed of three enumerators and was overseen by the surveillance and Nutrition programme officers and Surveillance programme manager. Case definition used in Stage Two was reviewed with field teams and replicated in this stage of the process.

4.3. Wide Area Survey Results

Main results for the wide area survey are summarised in Table 5.

Table 5: Stage Three (wide area survey) Main Findings

Types of Cases	Number of cases
Number of current (SAM) cases	71
Number of current (SAM) cases attending the programme	18
Number of current (SAM) cases not attending the programme	53
Number of recovering cases attending the programme.	52

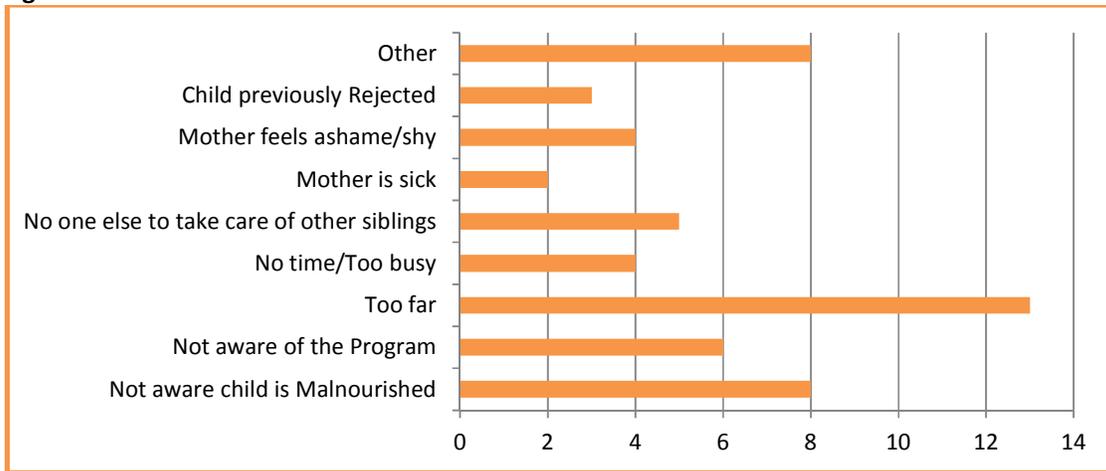
The actual results are shown in table 6 below.

Table 6: Wide area survey results per village

Team	Day	Village	Malnourished	Covered	Not in Program	Recovering
1	1	Ajiei	5	0	5	2
2		Malou Amoul	1	0	1	1
3		weruol	1	0	1	5
4		Malou hol	4	0	4	0
1	2	Pan noor	2	1	1	4
2		Pawiel	2	2	0	5
3		Malual Achot	1	0	1	2
4		Pannot	6	1	5	0
1	2	Achel	1	1	0	3
2		Rumchuor	3	2	1	2
3		Teny kou	2	0	2	7
4		Nyiel Abiyei	5	1	4	0
1	3	Makuach Malual	4	0	4	1
2		Apath Amoul	0	0	0	0
3		Dunyanip	2	2	0	8
4		Mulbang	7	4	3	2
1	3	Lil Adiang	2	1	1	2
2		Machar Amoul	6	1	5	1
3		Rumrit	2	1	1	2
4		Majok guot juor	4	0	4	1
1	4	Nyier	2	1	1	2
2		Maper	2	0	2	2
3		Rokngor	1	0	1	0
4		Kuoi Yuom	6	0	6	0
			71	18	53	52

The main reasons for not attending CMAM services available are summarised.

Figure 10: Main reasons for Non-Attendance



4.4. Overall Coverage Estimation (Point Coverage)

Point coverage is presented as it provides a more accurate picture of the actual coverage of SAM cases at the time the investigation was conducted. This is corroborated by the fact distance is a massive issue, and case finding is weak coupled with the fact that most program beneficiaries were not residents rather conflict displaced persons. Period coverage⁹ is as shown in the foot note 12.

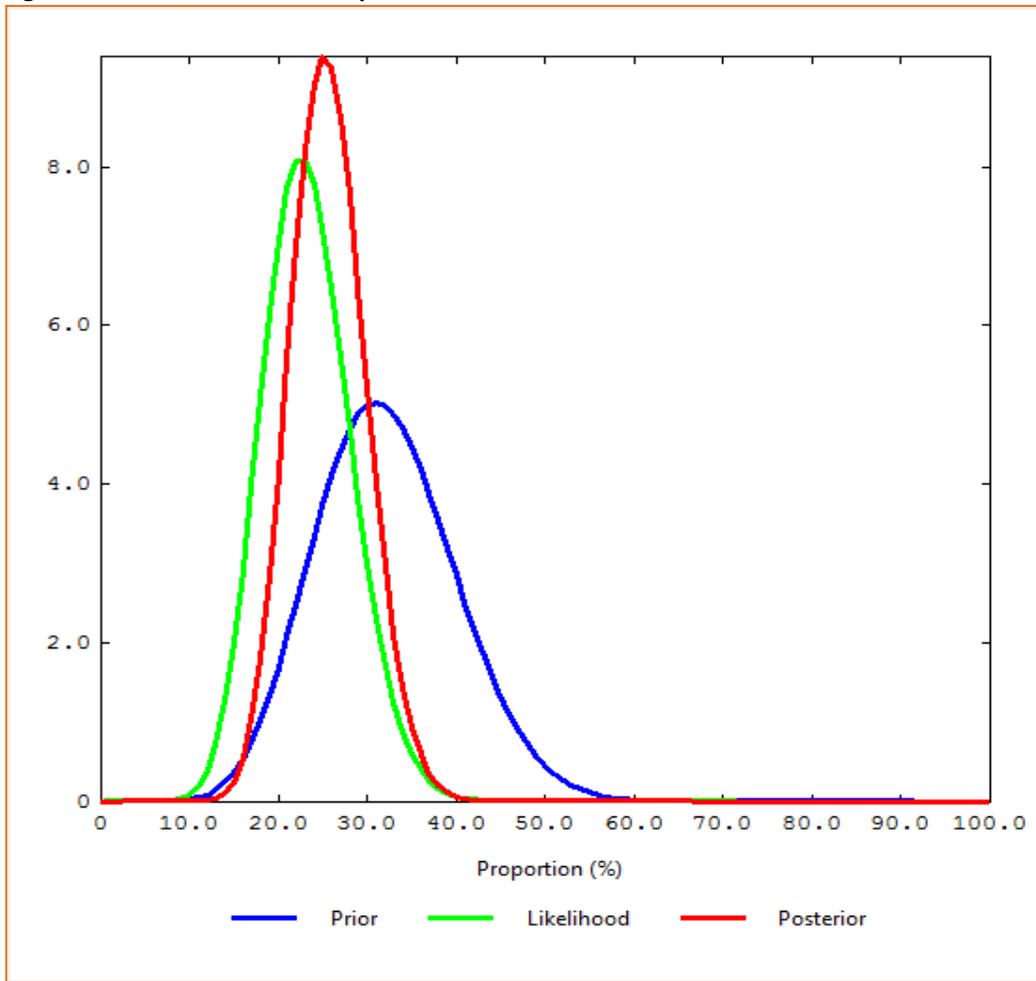
Point coverage provides a snapshot of programme performance and places strong emphasis on the coverage and timeliness of case-finding and recruitment. To calculate point coverage, the numerator and the denominator were selected from the results for the wide area survey using the formula

$$\frac{\text{No. of current (SAM) cases attending the programme}}{\text{No. of current (SAM) cases}}$$

Selected data was used as a denominator (71) and numerator (18) when inputted into the Bayes SQUEAC Calculator.

⁹ Period Coverage = 51.8% (44.0% – 59.5%; 95% C.I.)

Figure 11: Prior, likelihood and posterior curves.



Based on the existing prior and wide area survey (likelihood) **point coverage** was estimated to be **27.3% (19.7% - 36.6%; 95% C.I.)**¹⁰

4. CONCLUSIONS & RECOMMENDATIONS

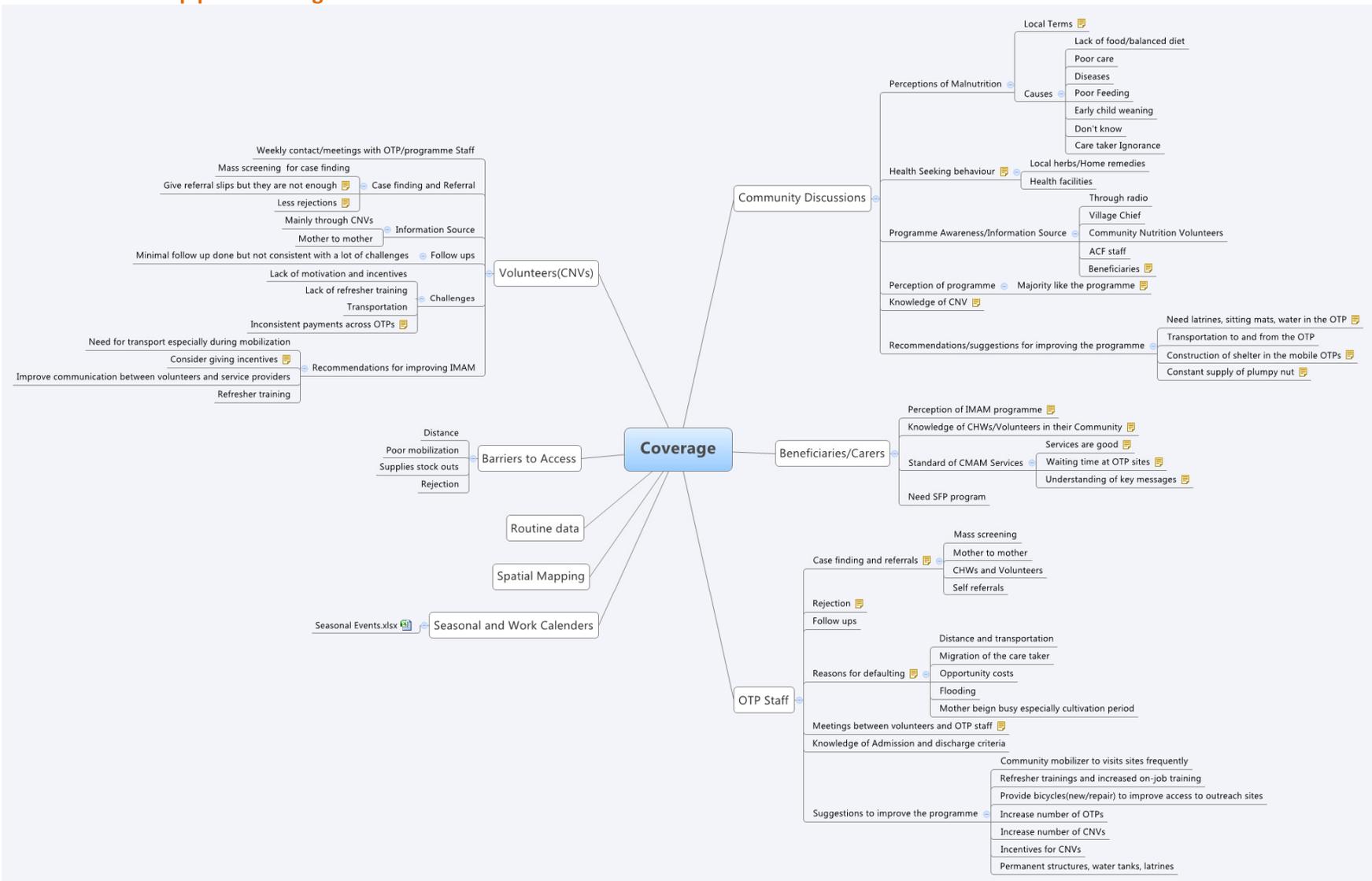
The SQUEAC investigation in Twic highlights a number of concerns and therefore recommends:

- Twic has an influx of IDPs and returnees and currently still has quite a number of displaced persons: There is need to:
 - Increase screening activities and rapid assessments in the area to monitor the nutrition situation of the County.
 - Put in place contingency measures such as creating mobile OTPs during the high influx periods
- Repositioning of supplies and increased remote management especially in times of increased insecurity for some identified OTPs. These will not affect OTP services even when movements have been curtailed.
- Some villages are quite distant from the current existing OTPs, the team requests;

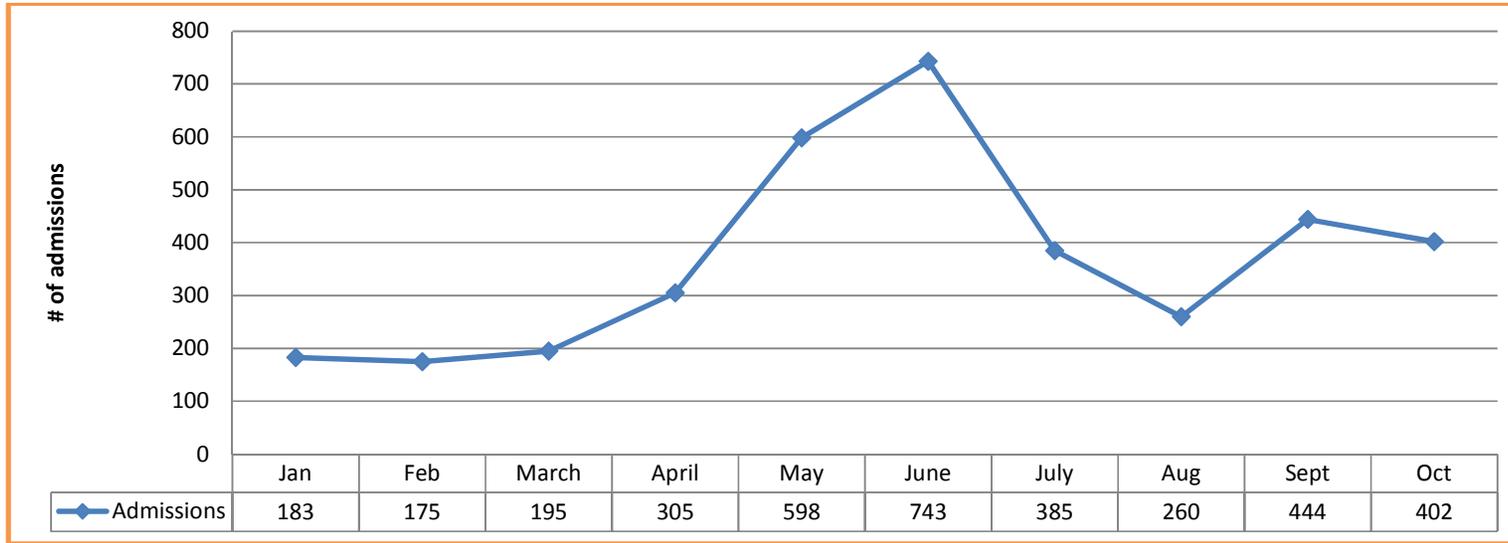
¹⁰ All values were calculated using the Bayes SQUEAC calculator.

- Having more outreach services during the peak of malnutrition to capture more children and reduce distance travelled by the beneficiaries. The impact may be two-fold: first, access is improved and second, further decentralization can make caseload more manageable for overcrowded facilities.
- Improve community mobilization and defaulting follow up.
 - There is need for synergy between community mobilization officer, CNWs and CNVs; this link needs strengthening and will be able to improve awareness.
 - Mapping of all villages per OTP catchment and plan for community mobilization, Follow up and spot check to be conducted by the community mobilizer on areas that have been mobilized and identify villages that have not been visited and plan.
 - Volunteers' need to be spread across the catchment and thus selection of volunteers from villages near the OTP should be reviewed
- Consider standardising and sustaining the motivation strategy for volunteers through;
 - CNVs motivation and incentives being standard across all CNVs and OTPs
 - Refresher trainings
 - Provision of incentives e.g. t-shirts, caps, raincoats etc.
 - Transportation during mobilization days
- The supply chain of the program has been experiencing breakages, there is need to ensure constant supply of the commodity. This is vividly pronounced in the program and was voiced by the beneficiaries as well as the OTP staff and further corroborated by the numbers of criteria non-reached and defaulters.
- Increased on-job training for CNWs by the OTP supervisor, increased contact with the program officer and manager. This is both motivational and has an impact of streamlining the short comings of the CNWs in manning of OTPs, handling of referrals and monthly reporting.
- Uniform nutrition education messages for improving knowledge of community members on malnutrition.

Annex 1: Mind Map picture using xMind Software



Annex 2. Admissions versus Seasonal & main events calendar, Twic County



	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Seasonal Illness						Malaria						
				Diarrhoea								
			ARI									
Food security					Hunger Season							
					Cultivation							
						Weeding						
							Harvest					
						Rains					Rains	
			Burning of Bushes									
			Fishing									
			Drought									
Other Important seasonal events					Abiyei Conflict			Flooding				
		Migration										

Annex 3. List of Villages Sampled for the Wide area Survey



Catchment Villages
Twic.xlsx

The sampling procedure is as explained in section 4.2.3