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Semi-Quantitative Evaluation of Access and Coverage: Urban Maroua Health District, Far North Region, Cameroon, 2013

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Acronyms

ACDEV	Action et Dévelopment
ACF	Active and Adaptive Case Finding
BBQ	Boosters, Barriers and Questions Framework
CBV	Community-Based Volunteer
CL	Community Liaisons
CMAM	Community Management of Acute Malnutrition
CRC	Cameroon Red Cross
CSAS	Centric Systematic Area Sampling
DMC	District Medical Center
ECHO	Humanitarian Aid and Civil Protection Department of the European Commission
FRC	French Red Cross
GAM	Global Acute Malnutrition
GIS	Geographic Information Systems
HD	Health District
HF	Health Facility
HS	Health Sector
HW	Health Worker
IHC	Integrated Health Center
LQAS	Lot Quality Assurance Sampling
MAM	Moderate Acute Malnutrition
MPH	Ministry of Public Health
MUAC	Middle Upper Arm Circumference
MWG	Mean Weight Gain
NGO	Non–government organization
OTP	Outpatient Therapeutic Feeding Program
RUTF	Ready-to-Use Therapeutic Food
SAM	Severe Acute Malnutrition
SC	Stabilization Center
SFP	Supplementary Feeding Program
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SQUEAC	Semi-Qualitative Evaluation of Access and Coverage
UMDH	Urban Maroua Department of Health
UNICEF	United Nations Children's Emergency Fund
WFP	World Food Program
WTH	Weight-to-Height

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Summary

The Urban Maroua Health District is location in the Far North Region of Cameroon (one of two regions located in the Sahel) with an estimated population of 257,853 inhabitants, 16% of which are children between 6 and 59 months of age. The prevalence according to the weight-for-height indicator in the region is 6.3% for global acute malnutrition according and 1.3% for severe acute malnutrition.[1]

A coverage study was conducted within the community management of acute malnutrition program in the district between March 15th and April 10th 2013 using the semi-qualitative evaluation of access and coverage (SQUEAC) method. It was the first of its kind for the area. It was conducted at the end of the dry season, immediately following the harvest, when food availability is apparently good.

The coverage investigation conducted in the Urban Maroua Health District revealed a point coverage estimate of 34.9% (CI 95 % ≈ 22.4%; 47.6%). The table below presents the main barriers on which the program must act to improve coverage as well as specific recommendations how to do so.

Barriers	Recommendations
1. General lack of community awareness about malnutrition and its causes	1. Promote malnutrition and program sensitization efforts in the community
2. Prioritization of weight-to-height ration over MUAC as admission and discharge criteria	2. Ensure comprehensive treatment for children with severe acute malnutrition
3. Caregiver opportunity costs (fieldwork, domestic obligations, etc.)	3. Promote early care uptake in the integrated health centers
4. Late service uptake (secondary to traditional medicine and self-medication)	4. Explore alternative options to reduce caregiver opportunity costs
5. General lack of community awareness about the CMAM program	5. Repeat the SQUEAC investigation in six months to one year

Résumé

Le District Sanitaire de Maroua Urbain est situé dans la région de l'extrême-nord du Cameroun (l'une des deux régions composant la bande sahélienne) avec une population estimée de 257 853 habitants en 2013, dont 16% d'enfants de 6 à 59 mois. Les prévalences selon d'indice poids/taille de la malnutrition dans la région de l'extrême-nord étaient estimées en 2012 à 6,3% pour la malnutrition aigue globale et à 1,1% pour la malnutrition aigue sévère (MAS).[1]

Une investigation de la couverture du programme de prise en charge de la MAS dans le District Sanitaire a été conduite du 15 mars au 10 avril en utilisant la méthodologie « Semi Quantitative Evaluation of Access and Coverage » (SQUEAC). Elle constitue une première expérience pour le district sanitaire et elle a été réalisée à la fin de la saison froide où la disponibilité alimentaire est sensée être bonne car elle fait suite à la période des récoltes (en février).

L´investigation de la couverture menée dans le District Sanitaire de Maroua urbain a abouti à une estimation de la couverture ponctuelle 34.9% (CI 95 % ≈ 22.4%; 47.6%). Le tableau ci-dessous présente les barrières sur lesquelles le programme doit agir pour améliorer la couverture ainsi que les recommandations spécifiques pour le faire.

Barrières	**Recommandations**
1. Méconnaissance de la malnutrition et ses causes	1. Renforcer la sensibilisation sur la malnutrition et la connaissance du programme
2. Priorité du rapport P/T sur PB pour les admissions et les sorties	2. Assurer le traitement complet des enfants MAS
3. Occupation des mères (travaux champêtres, obligations domestiques, etc.)	3. Renforcer le recours précoce au CSI
4. Recours tardif au CSI (recours précoce au guérisseur ou automédication)	4. Approfondir sur les alternatives aux occupations des mères
5. Méconnaissance du programme du CNA pour les MAS	5. Répéter l'investigation SQUEAC dans six mois à une année

1. Introduction

1.1 Evaluation context

The Republic of Cameroon is a country in west Central Africa. It is bordered by Nigeria to the west; Chad to the northeast; the Central African Republic to the east; and Equatorial Guinea, Gabon and the Republic of the Congo to the south. It's coastline lies alongside the Bight of Biafra within the Guinean Golf of the Atlantic Ocean. In 2011, the total population was estimated at 20 million inhabitants.[2]

The Far North Region of Cameroon is one of 10 semi-autonomous, administrative divisions that constitute the country and one of two regions situated within the Sahel. With a surface area of 13,333 square miles and an estimated population of 3,669,624 inhabitants, it is the country's most populated region.[3,4] It is bordered by Nigeria to the west and Chad to the east, and subdivided into five departments: Logone-et-Chari, Mayo-Danay, Mayo-Kani, Mayo-Sava, Mayo-Tsanaga and Dimaré, the capital of which is Maroua.

The Far North is characterized by a Sudano-Sahelian type climate with two seasons: a rainy season lasting 4 months (June – September) and a dry season lasting 8 months (October – May). The dry season is subdivided into a cold period (October – February) and a hot period (March – May).

In 2012, widespread famine affected nearly 18 million people in the Sahel, 5.9 million of which reside in the North and Far-North regions of Cameroon; a combination of drought, crop failure, insect plagues, high food prices and conflict, lead what is known as the "Sahel Crisis in 2012".[5]

Food insecurity in Sahelian region of Cameroon was linked primarily to cereal deficits brought on by widespread flooding in the area, which occurred between August and November 2012. Crops were completely destroyed. A total of 90,203 internally displaced people were relocated.[6] Consequently, the crippled agriculture yield led to a sharp increase in grain prices in local markets, devastating market-dependent families.[7]

Preliminary findings from the 2012 SMART regional, nutritional, anthropometric survey conducted by the Ministry of Public Health (MPH), UNICEF and the FRC report severe acute malnutrition (SAM) and global acute malnutrition (GAM) surpass the WHO alert threshold for a state of emergency.[1]

- GAM = 6.3% (CI 95% = 4.4; 9.0)
- SAM = 2.9% (CI 95% = 0.5; 3.6)

Today, those living in the Far North Region face what the UN calls the 'triple crisis' of 2013 due to: 1. The continued impact of drought, high food prices and low agriculture production in 2012; 2. Persistent food insecurity, malnutrition and the general erosion of resilience in the region; and 3. The current political crises in Mali, the Central African Republic and Nigeria that have resulted in an on-going exodus of refugees into Cameroon.[7]

1.2 Community management of severe acute malnutrition (CMAM)

SAM is one of the major killers of children under five years of age. It is defined by a very low weight-for-height ratio (below –3 z scores of the median), visible, severe wasting or by the presence of bilateral, pitting edema of nutritional origin.[8,9] Additionally, children between 6 and 59 months with a with a middle upper arm circumference (MUAC) of less than 115 mm are considered SAM.[8]

The WHO estimates that globally, nearly 20 million children are living in a chronic state of severe, acute malnourishment.[8] Despite it's large role in the burden of child mortality, SAM remains largely absent from the international health agenda. Few countries, even those with a high SAM prevalence, have comprehensive and specific, national protocols aimed to address it.[8]

For the past 30 years, SAM was addressed almost exclusively with an inpatient care model. SAM children were admitted to an inpatient therapeutic feeding program called a stabilization center (SC). This approach was facility-based and targeted the clinical aspects of the condition with intensive medical and nutritional protocols monitored by highly trained health care professionals.[8,9] Children stayed in the SC for the entire treatment duration, for sometimes as long as 30 days. Caregivers (usually the mother) were required to stay with the child at all times. Because of this, SCs had limited impatient capacity, came at high opportunity cost for caregivers, and promoted cross infection among immunosuppressed SAM children in close quarters.

Consequently, the inpatient model had limited coverage and impact, and proved to be successful only when sufficient attention, resources and skilled staff were available. Many of these problems remain the same today.

At the turn of the millennium, mounting evidence began to show that large populations of malnourished children could be successfully treated in their communities without admission to a health facility or therapeutic feeding center.[8] This community based-model, known today as community management of severe acute malnutrition (CMAM) quickly replaced the traditional inpatient model as the preferred standard of care for all countries and international relief agencies.[9] It consists of the following of four elements:

1. Community mobilization measures to encourage screening, early presentation and compliance;
2. Outpatient supplementary feeding programs (SFP) for children with moderate acute malnutrition (MAM) and no serious medical complications;
3. Outpatient therapeutic programs (OTP) for children with SAM and no serious medical complications; and
4. Inpatient therapeutic programs provided at the SC for children with acute malnutrition and associated medical complications.[9]

CMAM programming is designed to consider the socio-economic factors and context that contribute to malnutrition, specifically poverty, high workloads for women and limited health and education services. It requires strong community mobilization and stakeholder participation, between: 1. Local government institutions like the Ministry of Public Health (MPH) and the Urban Maroua Department of Health (UMDH); 2. Non-government organizations (NGOs) like the FRC, CRC and UNICEF; and 3. A strong network of community-based volunteers (CBVs) and community liaisons (CLs).

CMAM activity takes place at OTP and SFP sites which, in Urban Maroua, operate out of the district's integrated health centers (IHCs). OTPs and SFPs are decentralized to minimize geographical barriers to access and to maximize participation.[10] Beneficiaries come to the once a week for a medical consultation and receive a weekly ration of ready-to-use therapeutic food (RUTF), an energy-sense, micronutrient-enriched paste that is easily consumed at home.

1.3 Intervention zone

The French Red Cross (FRC) became engaged in partnership with the Cameroon Red Cross (CRC) in the fight against severe acute malnutrition (SAM) brought on by the 2010 Sahel drought and famine. Having received 599,000 euros from the Humanitarian Aid and Civil Protection Department of the European Commission (ECHO) in June 2013 the FRC launched it's "project to reinforce the community management of severe acute malnutrition" in four health districts (HDs) in the Far North Region of Cameroon: Urban Maroua, Rural Maroua, Meri and Bogo.

The main objective of the intervention is to improve the nutritional status of children under five and to reduce mortality associated with SAM. Specifically, the program is designed to reinforce community management of severe acute malnutrition (CMAM) via three main axes:

1. Free access to quality medical and nutritional care for all SAM children under five in health facilities (HFs) targeted by the intervention.
2. Hygienic conditions for all targeted health facilities including better water and sanitation.
3. Capacity building within the Regional Health Departments to reinforce the monitoring and evaluation of CMAM programming[1].

Today the FRC provides technical support to 40 outpatient therapeutic feeding programs (OTPs) in charge of CMAM activity in various health facilities throughout the four HDs. HDs are subdivided into health sectors (HSs) that house at least one health facility of some type; these include 38 integrated health centers (IHCs), 33 of which are private and five of which are public, and two district medical centers (DMCs). The FRC also supports one stabilization center (SC) located at the Maroua Regional Hospital.

One year following the program's introduction, this semi-qualitative evaluation of access and coverage (SQUEAC) is the first of its kind conducted by the FRC.

It should be noted that following the kidnapping of a French family in the Far North region on March 19th, 2013, travel in the area became highly restricted. The remaining 3 rural HDs

supported by the FRC (Rural Maroua, Meri and Bogo) were out of bounds for FRC personnel. Originally, the scope of the investigation included all four HDs; this was unfortunately reduced to just Urban Maroua for security reasons.

2. Objectives

2.1 Main objective

The main objective of this study was to evaluate CMAM programming access and coverage for children ages 6 to 59 months with SAM in the Urban Maroua Health District using the SQUEAC methodology.

2.2 Specific objectives

The specific objectives of this study are the following:

- To train program partners (FRC, CRC, MPH) to conduct coverage and access investigations using the SQUEAC methodology;
- To determine the baseline program coverage in the Urban Maroua HD;
- To identify possible boosters and barriers influencing program access and coverage in Urban Maroua; and
- To develop feasible recommendations to improve program access and coverage in Urban Maroua.

3. Methods

SQUEAC is an evaluation tool designed to examine two core determinants of CMAM programming: access and coverage. It is a methodology developed by Valid International, FANTA, Brixton Health, Concern Worldwide, Action Contre le Faim, and World Vision to estimate the coverage for nutrition programs and to identify barriers to service access that exist within them.[11]

The methodology is “semi-qualitative” in nature, meaning that it draws from a mixture of both quantitative data from routine program monitoring activities as well as qualitative data collected on the field. This mixed methods approach combines data sources to estimate program coverage and to developed practical measures that can improve access and coverage.[11]

- Quantitative data came mainly from routine monitoring information that the program already collected including: admissions, defaulting*, recovery, middle upper arm circumference (MUAC), and geospatial information. Routine program data was coupled with “complementary data” like agriculture, labor, and disease calendars, anthropometric nutritional surveys, and agricultural and food security assessments.

*Defaulters are SAM cases that have been admitted to the program but leave without either being formally discharged, transferred to another service, or having died.

- Qualitative data collected came from interviews, focus groups and questionnaires with various key informants.

Together, the data were triangulated by source and method to formulate hypotheses about coverage and access. Data triangulation is a powerful technique that helped validate our findings through cross verification. Hypotheses were then tested with small-area surveys and small sample surveys. Then, a wide area survey was conducted in the community to determine the point coverage estimate.

Lastly, the results from the quantitative and qualitative analyses and the wide-area likelihood survey were combined the overall global coverage estimate was calculated using Bayesian statistical techniques. In the Bayesian paradigm, one draws results by combining all available prior information with the information provided by the data to produce the posterior distribution—the final coverage estimate.

The SQUEAC method emphasizes the collection and analysis of diverse data intelligently; in doing so, it achieves rapidity, low cost and robust results compared to similar, resource intensive coverage evaluation tools like *centric systematic area sampling* (CSAS). As CMAM programming transitions from what was traditionally a donor-funded, emergency intervention and continues to be integrated into routine, primary health service, the resources available for monitoring and evaluation are certain to decrease.[11] Therefore, it is essential to use low-resource, appropriate and efficient evaluation tools, like SQUEAC, to improve CMAM success.

3.1 Three-stage screening test model

SQUEAC uses the "three-stage screening test model". These stages are described in the following sections.

3.1.1 Stage one

The goal of stage one is to identify areas of high and low coverage and reasons for coverage failure using quantitative, routine program data, complementary data and qualitative data. Quantitative data included routine program monitoring data and complementary data accumulated in the district HFs. Qualitative data came from semi-structured interviews, structured interviews and focus groups with various key-informants, both directly and indirectly implicated in the program. Using geographic information systems (GIS) technology, results were geospatially distributed across the intervention zone (Urban Maroua). This allowed us to both identify the factors influencing coverage and to elaborate hypotheses about areas of high and low coverage in the Urban Maroua HD. These hypotheses are then verified with small-area and small sample surveys during stage two.[12]

Quantitative data

Quantitative, routine program data helped to evaluate the general quality of CMAM service, to identify admission and performance trends and to determine if the program adequately responds

to need. It also helped point out problems in screening and admission. Lastly, routine program data analysis provided the first insights into variation in program performance between HSs.

Route program data analysis included the following:

- Admission over time (September 2012 – February 2013)
  - Global program admission trends
  - Admission trends by HS
- Admission trends compared to the agricultural calendar, the lean period, child epidemics and diseases, workload, weather patterns
- Discharge by type by OTP (recovery, default, death, non-response)
- Program performance indicators over time (recovery rate, default rate, etc.)
- The mean length of stay before recovery
- The mean length of stay before defaulting
- Monthly screening reports from CBVs
- OTP of origin for SAM cases referred to the SC (June 2012 – March 2013)
- Community screening data from CBVs (July 2013 – February 2013)

Complementary data

Complementary data analyzed included:

- Home neighborhood for new admissions and at default
- Village lists and village populations belonging to each OTP
- MUAC at the time of admission, recovery and default
- Mean weight gain (MWG)

The investigation period was limited to 6 months (September 2012 – January 2013). This decision was made to account for the 3-month start-up phase of the program (June 2012 – August 2012) during which it is common to see a prolonged duration of the treatment episode. This is because, during the first few months of program operations, both prevalent and incident SAM cases are found and admitted. Therefore, when investigating the coverage of a newly established program, it is common to tailor the analysis to account for this period.[11]

Qualitative data

Qualitative data was collected investigate program operations, to unravel the opinions and experiences of personnel involved in CMAM and to identify any potential barriers to access. The following methods were used: focus groups, semi-structured interviews, structured interviews, case studies, and observation.

Interviews and focus groups were conducted with key informants either directly or indirectly involved in the CMAM program. These included:

- CRC-FRC personnel
- The men's and women's community
- Traditional, religious and administrative authorities
- Traditional healers
- Caregivers
- CBVs, (CRC)
- CLs (UNICEF)
- IHC personnel
- Partner NGOs: SAILS, ACDEV, UNICEF
- District managing team, UMHD
- Health committee, UMHD

The BBQ framework

Throughout the investigation, the data were organized, analyzed and triangulated using the "boosters, barriers and questions (BBQ) framework"; it is a tool that facilitates iterative data collection that is then categorized into one of three categories: 1. "Barriers" are negative findings that deter from program coverage and complicate access to service; 2. "Boosters" contribute to a higher coverage and facilitate access; and 3. "Questions" are those elements that to be investigated further, and either become a barrier or booster or remain inconclusive.

3.1.2 Stage two

The goal of stage two is to test the hypotheses about coverage and access elaborated in stage 1. These hypotheses usually take the form of identifying areas where the combined data suggest that coverage is likely to be either high or low.[11] The following methods were used to test hypotheses:

1. **Small sample surveys** were conduced in population groups that are hypothesized to have high or low coverage;[11] and
2. **Small-area surveys** are essentially small sample surveys that are used to test hypothesis regarding the spatial distribution of coverage.[11]

Both small sample surveys and small-area surveys used the same sampling and data collection method. Results were analyzed using a simplified classification technique developed specifically for SQUEAC called *lot quality assurance sampling* (LQAS). Because SAM is a relatively rare phenomenon with a low prevalence, it is therefore impossible to *estimate* coverage with sufficient precision (like the standard 95 % confidence interval) using these surveys because the sample size is too small. Instead, coverage is accurately and precisely *classified* as either above or below a standard using the simplified LQAS classification technique. Survey sample size was not calculated in advance. The sample size was simple the number of cases found SAM cases were found using the active and adaptive case finding (ACF) method.[11]

Small-area survey

A small-area survey was conducted to test hypotheses about high and low coverage. Two neighborhoods belonging to two health sectors (four total) were chosen based on the admission and default rates. It was hypothesized to that two of these neighborhoods had high coverage while the other two had low coverage.

Small sample survey

A small sample survey was conducted to evaluate potential variation in service access between Muslim and Christian communities.

3.2.3 Stage three

The goal of stage three is to calculate the overall coverage estimate. This was done using a Bayesian statistical technique called "beta-binomial conjugate analysis." Conjugate analysis begins with a beta distributed, probability density called the "prior." The prior is essentially an intelligent guess at the overall program coverage, considering all available data from stages one and two. The prior is then combined with a binomial distributed, likelihood function called the "likelihood." The likelihood was determined by a wide-area coverage survey that was conducted across the entire program catchment area; the mode of the likelihood was, in fact, the point coverage estimate from the survey. Because the prior and the likelihood are mathematically expressed in similar ways (as probability distributions) they can be combined through conjugate analysis, the result of which is the posterior probability density—the "posterior." The mode of the posterior is the final coverage estimate.

The Prior

The prior was constructed by combining the results from stages one and two, that is: routine program data analysis, qualitative data analysis and all relevant findings from the small-area and small sample surveys. It was calculated by taking the mean coverage estimate from the following four SQUEAC tools:

I. The Simple BBQ

The simple BBQ is the first and simplest approach to calculating the prior. A uniform score of 5 points was attributed to each element (either a barrier or booster). The total booster and total barrier scores were summed. The total booster score was then added to the minimum possible coverage (0%) and the total barrier score was subtracted from the maximal possible coverage (100%). The coverage estimate was calculated by taking the mean of these two percentages.

II. The weighted BBQ

In the weighted BBQ approach, a score from 1 to 5 was attributed to each element. The score reflected the relative importance or likely effect that the element had on coverage. The coverage estimate was calculated by the method explained above.

The weighted approach requires a more thorough review and analysis of the data. In doing so, it is likely to yield a more credible value for the mode of the prior compared to the simple method.[11]

III. The concept map

Concept mapping is a graphical analysis technique that was used to organize the data.[11] he final product, the concept-map, is a diagram that visualizes relationships between findings. It was elaborated within a *context frame*, which is defined by an explicit focus topic. Links were drawn between each concept, representing the relationship between them. The various relationships types traced included: results in, leads to, encourages, helps create, allows, etc.

Two concept maps were created. The focus topic of the first map, the barrier concept map, was decreased program coverage. The 28 triangulated barriers from the BBQ framework were organized around the focus topic and the relationships were traced between them.

The focus topic for the second map, the booster concept map, was increased program coverage. The same process was replicated.

For each map, the total number of 'linkages' was counted. Like before the booster linkage sum was added to the minimum possible coverage value (0%) while the barrier linkage sum was subtracted from to the maximum possible coverage value (100%). The coverage estimate was calculated by taking the mean of these two percentages.

IV. The histogram prior

During a participatory working group, the investigation team designed a histogram representing the prior mode. This was done realistically and democratically. The mode, minimum and maximum coverage values were chosen credibly.

The likelihood

The likelihood came from a wide-area survey "likelihood survey" that was conducted to estimate point coverage using equation 1:

$$Coverage = \frac{Number\ of\ current\ SAM\ cases\ attending\ the\ program}{Number\ of\ current\ SAM\ cases} \quad 1$$

The survey used a special "within-community case-finding" sampling method developed for SQUEAC. [11] This an active and adaptive case-finding method, in that cases were actively perused throughout the investigation and that information uncovered during the survey period was immediately used to inform and improve the search for more cases. The sampling method was exhaustive and designed to find all or nearly all SAM cases. However, because the investigation was conducted in an urban context, the sampling was adapted to incorporate a door-to-door census sampling method for feasibility purposes.

The SAM case definition for the likelihood survey was any child between the age of 6 and 59 months with a MUAC less than 115 mm and/or the presence of bilateral, pitting edema.

For SQUEAC investigations conducted in the urban context, the sample size for the likelihood survey is typically calculated to achieve a precision of ± 12 percentage points on the posterior estimate.[13]

The posterior

The final coverage estimate and the 95% credible interval was determined by from the posterior probability density.

3.2 Limitations

The investigation was limited by the following elements:

- Due to the security situation in the Far North, the SQUEAC began three weeks later than anticipated. The SQUEAC intern recruited to conduct the investigation was repatriated to Yaoundé where he coordinated the activity at distance.
- No current map of the Urban Maroua HD was available.
- The population estimates from the UMDH seemed overestimated to what was encountered during ACF
- Poor register keeping in OTPs made it impossible to differentiate from between discharge types (either fully recovered or transferred to the SFP).

4. Results

4.1 Stage one

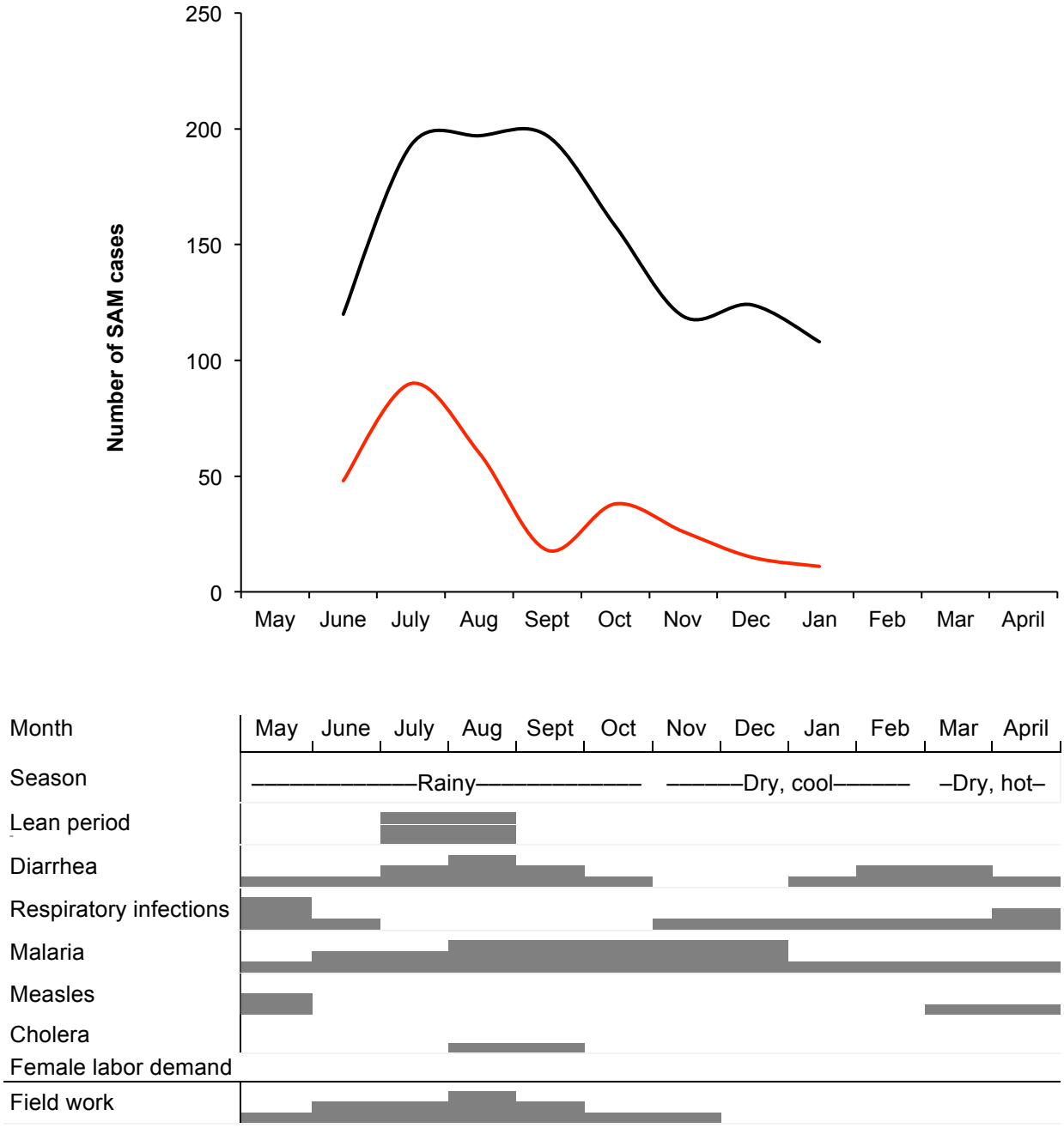
4.1.1 Qualitative data

Needs response

Since the program's launch, 1,216 SAM children have been admitted to OTPs with a mean of 152 children admitted per month. Three hundred and six of these children defaulted (i.e. left the program without being formally discharged) with a median of 36 defaulters per month.

The most important item of routine program data is the number of admissions over time. CMAM programs with sufficient coverage display a distinctive pattern in the plot of program admissions over time; that is, the number of admissions increases rapidly, falls slightly before stabilizing and finally drops away.[11] The initial peak in admissions represents the prevalent and incident SAM cases admitted at the start of the program; as the program effectively responds to need, program admissions stabilize and gradually decrease. This trend is reflected in figure 1; it reports admission and defaulting patterns in Urban Maroua over an 8-month period (June 2012 – February 2013). This graph is aligned with a seasonal event calendar developed by the investigation team, for reference. The key events included are: weather patterns, seasonal calendar of human diseases associated with SAM in children, food availability, and workload. Together these two figures helped evaluate to what extent the program responds to seasonal needs.

Figure 1. OTP admission and default patterns over time with seasonal event calendar, Urban Maroua Health District, Far North Region, Cameroon, 2013

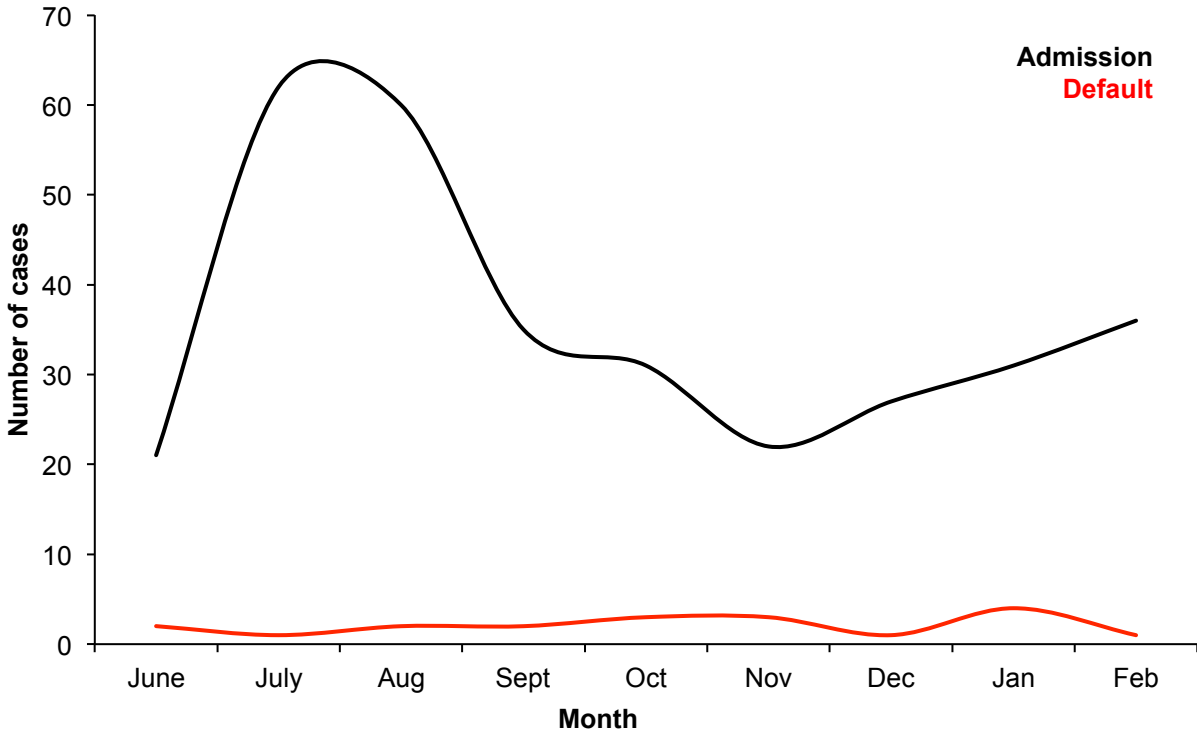


Beginning with the program's launch in June, there was a sharp increase in admissions, the result of effective community mobilization, outreach activities and SAM screening. This increase reached a maximum in July. Admissions did not fall slightly, as would have been expected, yet remained plateaued through September. This was the result of the lean period (July – August 2012), the time from planting season until when crops have reached maturity, when food is scarce; this plateau was also linked to the increased prevalence of SAM associated diseases, specifically diarrhea and malaria in August.

Because the pattern of defaulting over time is directly correlated with the number of admissions, there was a parallel increase in defaulting in the months immediately following the program's launch, before subsiding. Program defaulting increased again in October following an increase in women's workload and fieldwork, during which time it was difficult for caregivers to bring their SAM children to the OTP.

Figure 2 presents the pattern of admission and default over time in the SC. It must be noted that these data include all SAM cases referred to the SC across all 4 HD supported by the FRC, and are not restricted to Urban Maroua; separate data concerning only those SAM cases from Urban Maroua were not available.

Figure 2. SC admission and default patterns over time, Urban Maroua, Rural Maroua, Meri and Bogo Health Districts, Far North Region, Cameroon, 2013

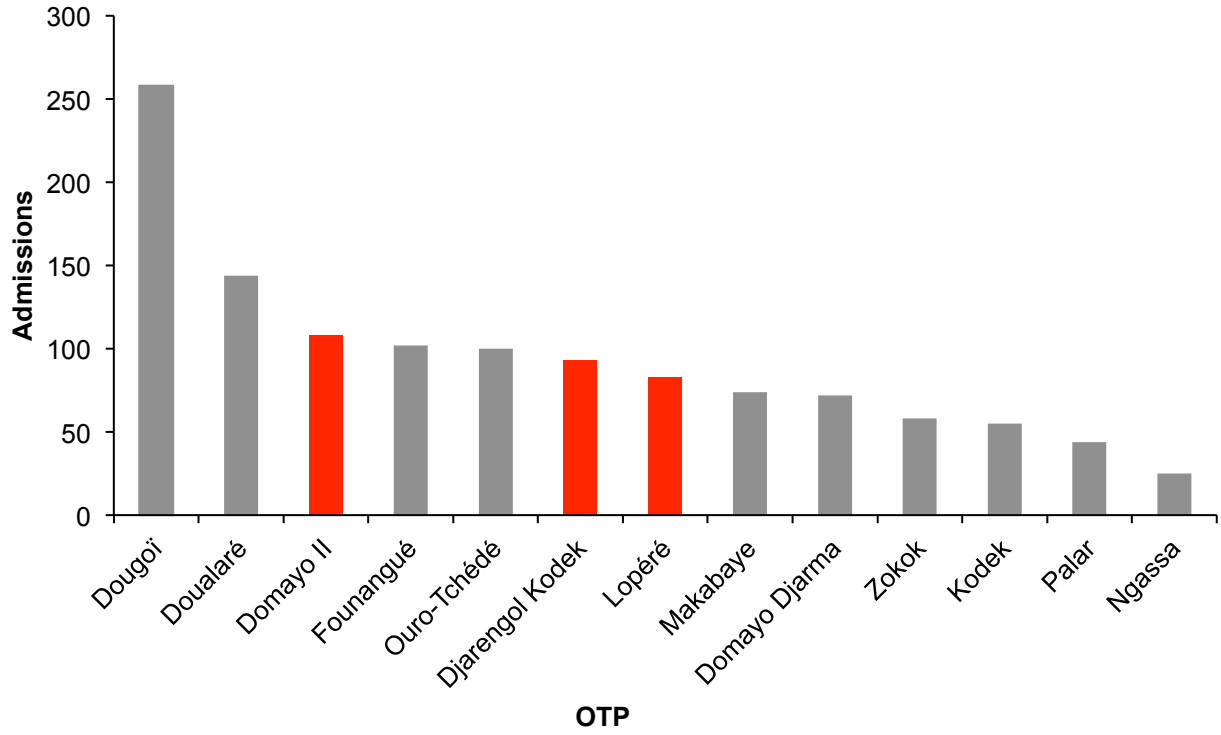


There was a sharp increase in admissions to the SC following the launch of the program. Admissions reached a maximum in between July and August, coinciding with the lean period, before beginning to stabilize. A gradual increase in program admissions in November was marked with the beginning of the cold season; this could be explained by an increased prevalence of respiratory illness and diarrhea, both of which lead to medical complications and would land a SAM child in the SC. Program defaulting remained relatively low throughout the entire period.

OTP admissions

Figure 3 shows admissions by OTP (June 2013 – January 2013). The FRC supports a total of 13 health facilities Urban Maroua that house the OTP, ten are public and three are private. All of these facilities are IHCs, with the expectation of Founangué, which is a district medical center. The three private centers are in red.

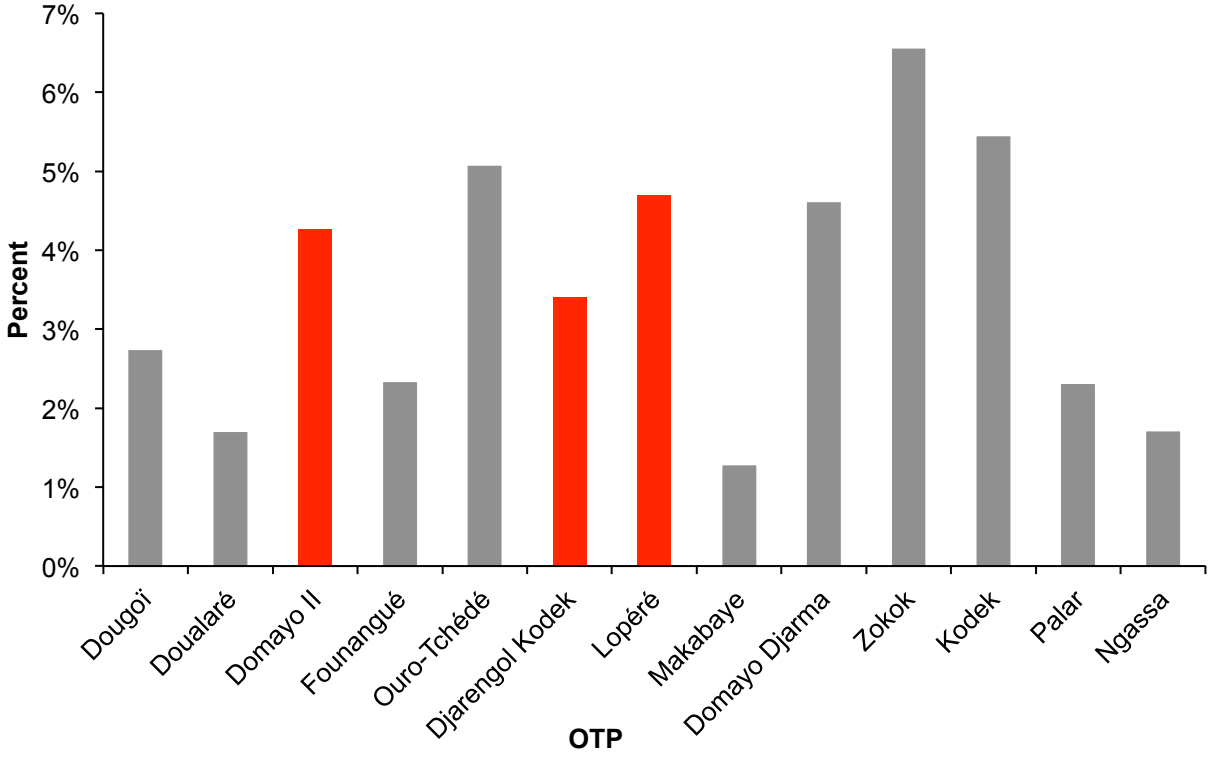
Figure 3. OTP admissions per health sector (June 2013 – January 2013), Urban Maroua Health District, Far North Region, Cameroon



The OTP in Dougoï had the highest number of program admissions during the evaluation period, a total of 258 cases, followed by the OTPS IN Doularé and Domayo II. The OTPs in Palar and Ngassa had the lowest number of SAM admissions.

Figure 4 reports the percentage of the population aged 6 to 59 months that was admitted to the OTP for SAM in each health sector. The OTPs with the highest admission percentages were those in Zokok, Kodek and Ouro-Tchédé; the OTP in Makayabe has the lowest percentage of its population admitted for SAM.

Figure 4. Percentage of the population admitted to OPT per health sector (June 2012 – January 2013), Urban Maroua Health District, Far North Region, Cameroon



The figure was calculated using population estimates from the Urban Maroua Health Department. Due to a lack in confidence in the integrity of these estimates, this figure should be considered with caution.

It was impossible analyze admission criteria upon which children were enrolled in the OTP (i.e. either MUAC, edema) and the mode of reference (i.e. CBV/CL reference, medical consolation, auto-reference) because this information is not part of IHC routine monitoring data is not collected.

SC admissions

The percentage of children admitted to the SC is an indicator of the *timeliness of admissions*. It is directly related to the percentage of SAM cases that arrive at the OTP with associated medical complications. Children remaining untreated for long periods with declining nutritional status develop medical complications and end up needing SC care. A high percentage of SAM cases with medical complications is often the product of a late presentation and uptake of services. It is common to see an increase in this percentage in the months following the program's debut; however, it should never exceed 5% afterwards.

Figure I* reports that 5% SAM cases were admitted to the SC from the beginning of the program. It is important to note that the percent of SC admissions is slightly overestimated due to a

*Note: Figures that are numbered with Roman numerals are reported in the annex 7.

discrepancy in the timeline between the OTP and the SC; OTP data was collected between June 2012 and January 2013 while SC data was collected between June 2012 and March 2013.

It was impossible to analyze SC admission criteria due to a due to a lack in consistent data collection.

Admission MUAC

Admission MUAC is an indicator for late presentation and service uptake. It is a measure of direct coverage failure because late admissions are those non-covered SAM cases that went untreated for a significant period of time. Late admissions almost always require inpatient care and are associated with prolonged treatment, defaulting and poor outcomes.[11]

Figure II reports the MUAC distribution for SAM cases < 115 mm at the time of admission from (September 2012 – February 2013).

During the analysis of MUAC data, an over-representation of rounded values (i.e. 105 mm, 110 mm, etc.) was observed, indicating imprecision in the MUAC measurement. The MUAC median at admission was 107 mm (in red), revealing that half of the children were admitted with an increased risk of mortality, a possible indicator of late service uptake.

Figure III reports the median MUAC at the time of admission for each OTP. It shows a wide variation in MUAC admission for among OTPs, ranging from 111 mm at Ouro-Tchédé to 103 mm at Founangué.

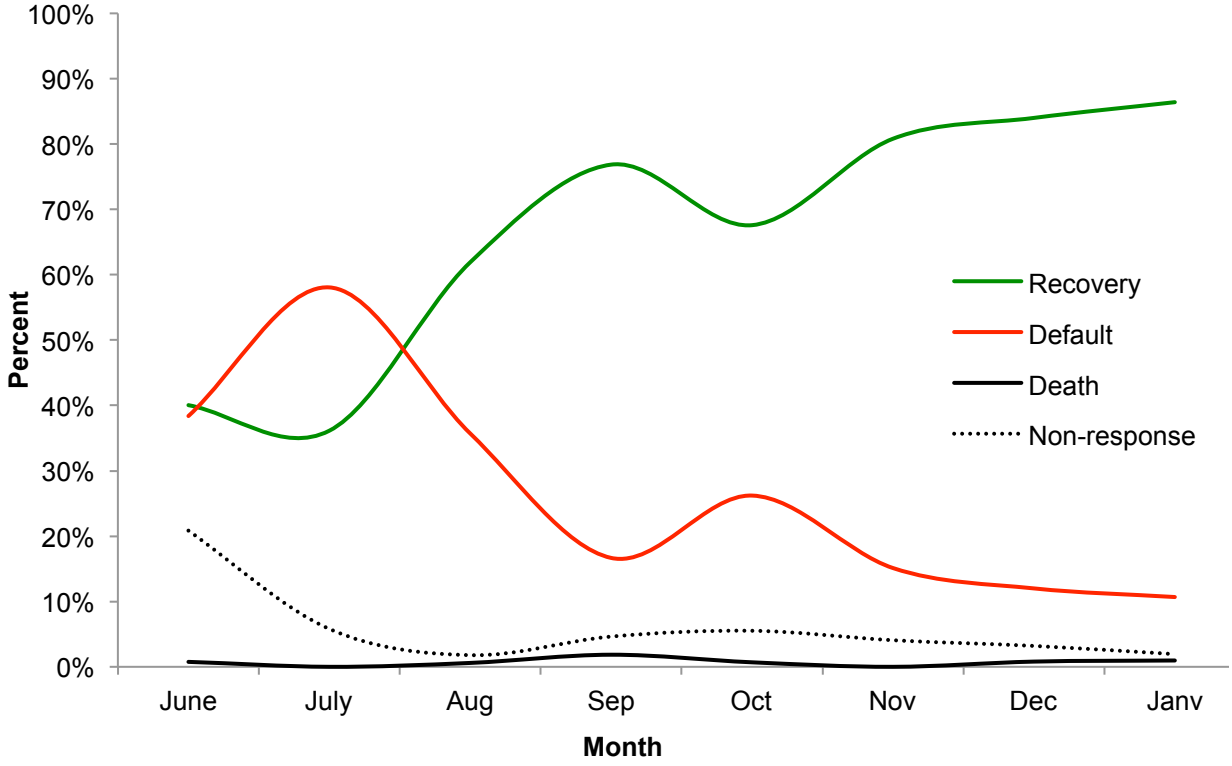
OTP performance indicators

Following are the four main OTP performance indicators (June 2012 – January 2013):

- Recovery rate: 65.8%
- Default: 27.8%
- Death: 0.6%
- Non-response: 5.8%

Figure 5 is the standard OTP performance indicator graph (June 2012 – January 2013). It reveals a steady, constant amelioration in care over time that attains sufficient standards in January.

Figure 5. Evolution of OTP performance indicators (June 2012 – January 2013), Urban Maroua Health District, Far North Region, Cameroon



SC performance indicators

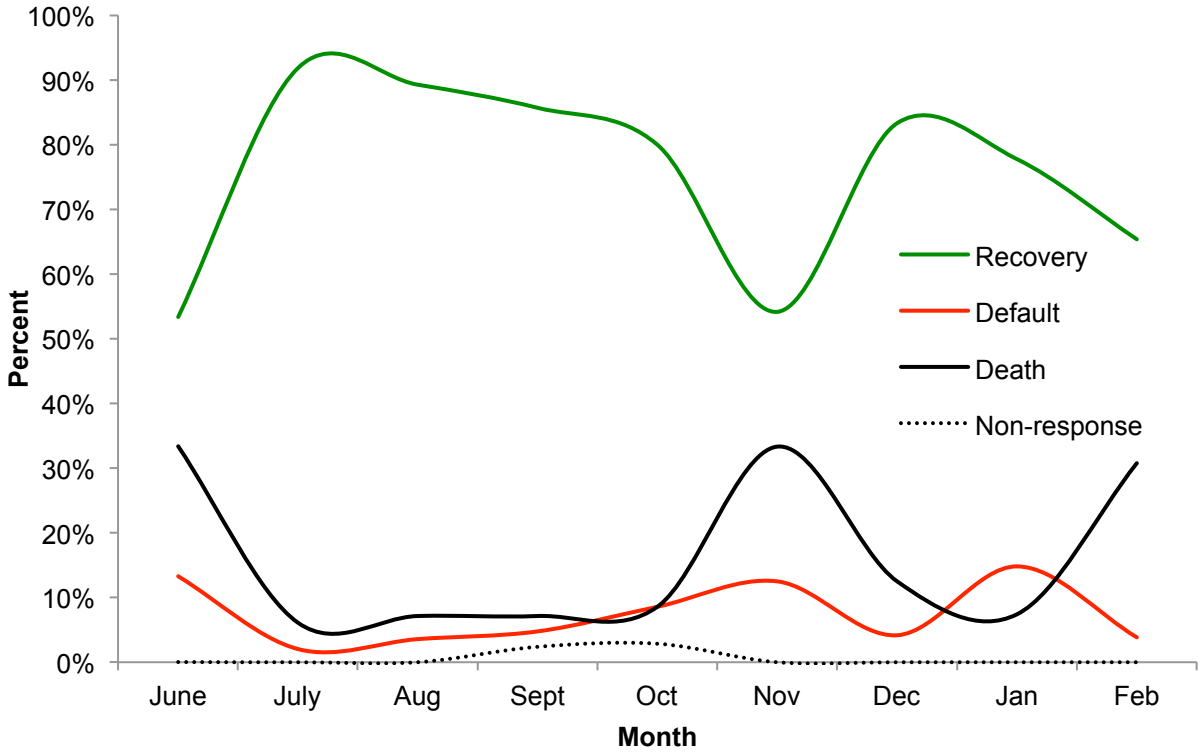
Following are the four main SC performance indicators (June 2012 – January 2013):

- Recovery rate: 79.9%
- Default: 6.4%
- Death: 13.1%
- Non-response: 0.7%

These values correspond with the total number of children referred from all four health districts supported by the FRC and are not exclusive to Urban Maroua.

Figure 6 is the standard SAM SC performance indicator graph (June 2012 – February 2013). It reveals a steady, constant amelioration in care over time that attains sufficient standards in January.

Figure 6. Evolution of SC performance indicators (June 2012 – February 2013), Urban Maroua Health District, Far North Region, Cameroon



In November 2012 and February 2013 the percent of death increased to 30% because there was no trained physician to monitor SC activity throughout the preceding months. During this time, the supervising physician was in training in Yaoundé and the center was overseen my untrained physicians on an irregular basis.

OTP length of stay before recovery

The length of stay before recovery provides helpful insight into *the duration of the treatment episode* (e.g. the time from admission to discharge). Long treatment episodes indicate late-phase malnutrition at the time of admission, late service uptake and are associated with poor outcomes.

Figure IV reports the median length of stay before recovery from (September 2012 – January 2013) at 5 weeks; this value is inferior to the 8-week benchmark standard.[14]

Due to a lack of the appropriate data, it was impossible to distinguish between those cases discharged from the program as truly recovered, and those cases that were transferred to the OTP for severe malnutrition to the supplementary therapeutic feeding program for moderate malnutrition. Furthermore, it is possible that the length of stay was underestimated as many cases were discharged early; this will be elaborated on in the in the discussion.

Recovery MUAC

Analysis of the MUAC at recovery is one way to assess that SAM cases are appropriately discharged.

Figure V reports that 89 of the 514 children discharged between September 2012 and January 2013 had a MUAC < 115 mm; in other words, 17.3% of children deemed recovered and discharged from the OTP were if fact they were still considered SAM according to the MUAC criteria. The median MUAC value at discharge was 110 mm, ranging 99 mm to 125+ mm.

Figure VI shows that the majority of prematurely discharged SAM cases occurred in the OTPs of Doualaré, Dougoï and Founangué (with 17, 25 and 14 cases respectively).

It should be noted that was impossible to differentiate between those SAM cases that were truly recovered at OTP discharge and those transferred to the SFP for MAM because the distinction was always not clear in the SAM registers.

Mean weight gain

The MWG throughout the investigation period (September 2012 – January 2013) was 5.6 g/kg/day; this value was superior to the MWG benchmark standard of 4 g/kg/day.[14]

Median length of say before default

Figure VII reports the median length of stay before default (September 2012 – January 2013) at 2 weeks. There was significant variation in this value of stay among the OTPs. Yet, none of which of exceeded 5 weeks (that of the OTP in Lopéré). A short length of stay before default usual suggests that there are problems with reception and communication in the OTP.

Spatial distribution of admission and default

Spatial distribution of admissions and default could not be evaluated because the most up-to-date map of Urban Maroua available dated to 1973.

Community screening

Between July 2012 and February 2013, 53,049 children were screened for SAM in the Urban Maroua Health District. 695 children screened positively for SAM and were referred, of which 71% (494 cases) arrived at an OTP. Following, 83% (409 cases) of these children were confirmed as SAM cases after a medical consultation and were enrolled in the program.

Stock-out

No history of stock-outs in the RUTF supply distributed to SAM patients (PlumpyNut®) was recorded at any time since the program's lunch in June 2012. A stock-out in the RUTF distributed to MAM patients (PlumpySup®) occurred between July 2012 and December 2012 and in March 2013.

4.1.2 Qualitative data analysis

Qualitative data was triangulated by both method and source and religion. The qualitative methods used included focus groups, semi-structured and structured interviews, cases studies and observations. Doing so revealed boosters and barriers. Interviews and focus groups were conducted in neighborhoods across the Urban Maroua Health District specifically chosen to maximize representivitiy. Questionnaire guides were adapted and oriented to facilitate the collection of data pertinent to program coverage and access. The investigation team also elaborated a list of terminology in the local language (Fufuldé) related to malnutrition and the RUTF.

All findings were indexed daily into the three-pane BBQ framework. Table 1 lists the numerous sources, methods and religions used during qualitative data collection.

Table 1. SQUEAC BBQ framework legend, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.

Source	**Method**
1. Women's community	A. Focus groups
2. Men's community	B. Semi-structured interview
3. Local authorities	C. Structured interview
4. Caregivers	D. Case study
5. CBVs (CRC)	E. Observation
6. CLs (UNICEF)	F. Data analysis
7. Health workers	**Religion**
8. Traditional healers	✝ Christian
9. Partner NGOs	☪ Muslim
10. UNICEF	
11. District management team	
12. Health Committee	
13. Program personnel (CRC, CRF)	

Table 2 details the principal factors that either negatively or positively influenced program coverage and access uncovered during the qualitative data analysis; these are the main barriers and boosters.

Table 2. Main SQUEAC barriers and boosters, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.

Barriers	Boosters
1. Poor understating of malnutrition and it's etiology	1. CBV and CBA effectiveness
2. The caretaker's occupation	2. RUTP stock-piling to prevent stock-breaks
3. Lack of motivation provided to CBAs	3. Continuous CMAM support and free care provision
4. Late service uptake at the IHC	4. Coordination and collaboration between partners and IHCs
5. Poor understanding of the CMAM program	5. Coordination, trainings and weekly meetings between the FRC and the CRC supervisors
6. Stigma	6. Strong local partner integration and cluster participation
7. Non-acknowledgement of RUTF as a medication leading to it's misuse	7. Malnutrition screening integrated within IHCs
8. Identification of malnutrition as a "traditional illness"	
9. Difficulties tied to access	

The investigation also elaborated two concept-maps to summarize the findings throughout the SQUEAC. Relationships among barriers and boosters (independently) were drawn and modified as the investigation proceeded. These maps can be found in annex 8.5 and 8.6.

4.2 Stage two

The routine program, quantitative and qualitative data collected in stage one, when combined, helped identify areas within the intervention zone where coverage was likely to be unsatisfactory and contrarily, where it was likely to be satisfactory. These data also uncovered information about possible barriers to service access. This information was used to formulate hypotheses about coverage that were tested.

4.2.1 Small sample survey: religion

A small sample survey was conducted to determine the any variation in coverage between the Muslim and Christian communities.

A recurring finding throughout the qualitative investigation suggested a contrast in attitudes about malnutrition between the Muslim and Christian communities. It was found that malnutrition is highly culturally stigmatized for Muslims; it is perceived as poor persons' illness. This stigma was thought to lead to reluctance to accept malnutrition and delayed care uptake in the IHC. This led to the following hypothesis:

Malnutrition stigma is a major barrier to access and contributes to reduced coverage in the Muslim community.

The Doualaré Mal Yaouba neighborhood (serviced by the IHC in Doualaré) was selected for the small sample survey based on heterogeneity; there is a relatively equal representation of Muslim and Christian residents in Doualaré Mal Yaouba. Neighborhood selection was difficult for the

investigation team because Maroua neighborhoods are extremely segregated and tend to be either predominantly Muslim or Christian.

- **Muslim community**: Zero non-covered SAM cases were found within the Muslim community. However, two Muslim children were found in the process of recovery.
- **Christian Community**: Two non-covered SAM cases were found in the Christian community. One of these cases was a child with a Christian mother and a Muslim father.

In conclusion, the prevalence of SAM in the Doualaré Mal Yaouba neighborhood was too low to draw any significant results. Furthermore, the ACF was not successful because the sampling area was so restricted. Therefore, a question pertaining to religion was integrated into the caregiver questionnaire protocol in stage three to further investigate this topic.

4.2.2. Small-area survey: heterogeneity

The small-area surveys are essentially small sample surveys used to test hypotheses regarding the spatial distribution of coverage.[11] A small-area study was conducted in 4 neighborhoods within the health zones of Lopéré and Dougoï.

Analysis of the routine program and quantitative data revealed a significant variation in admissions and defaulting among OTPs. This cause of this variation needed investigating because admission and defaulting are among the most important coverage and access indicators. Low admission could denote inadequate community outreach initiatives like insufficient screening and lack of program visibility. Conversely, high defaulting sometimes indicates poor reception and inadequate communication at admission. These observations led to the following hypothesis:

Coverage is heterogeneous across the intervention zone; certain areas benefit from good coverage while others suffer due to poor coverage.

Two neighborhoods serviced by the IHC of Lopéré, Matakamré and Mbarmaré Gorsala, had very little to no admissions; they were selected because the data suggested that coverage is likely to be unsatisfactory in this area. Two other neighborhoods serviced by the IHC of Dougoï, Dougoï Sarki Yaya and Lougguéo, had high admissions and little defaulting, suggesting that coverage is likely to be satisfactory. The minimum standard for coverage was (*p*) defined at 40% for LQAS.

- **Poor coverage**: Two SAM cases were found; of these one case was covered and in the SC and the other 4 were not. Zero cases were found in the process of recovery.
- **Good coverage**: Two SAM cases were found, both of which were non-covered. One of these cases had refused a referral to the SC the week prior. The other was currently in the program for MAM. Four cases were found in the process of recovery.

Both hypotheses were confirmed using the LQAS calculation detailed in annex 8.2.

4.3 Stage three

4.3.1 The prior

As explained in the methods, the prior mode is calculated using by taking the mean of the four coverage estimates: 1. The simple BBQ; 2. The weighted BBQ; 3. The concept map; and 4 the histogram prior. Table 3 details the calculation of the prior mode.

Table 3. Prior probability mode calculation, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.

Technique	Booster	Barrier	Calculation	Result
Simple BBQ	15	28	$prior\ mode = \frac{(15 \times 5\%) + [100\% - (28 \times 5\%)]}{2}$	17.5%
Weighted BBQ*	52	83	$prior\ mode = \frac{52\ \% + (100\ \% - 83\ \%)}{2}$	34.5%
Concept map	23	42	$prior\ mode = \frac{23\ \% + (100\ \% - 42\ \%)}{2}$	40.5%
Histogram	—	—	—	38.0%
Prior mode				**32.6%**

Next, using the equations presented in Box 3, the shape parameters α_{prior} and β_{prior} were calculated with a prior mode of 32.6% about which the range of uncertainty was –20% and +25%. The distribution of the prior probability density has a mode at 32.6% and a 95% "credible interval" (i.e. the Bayesian equivalent of the 95% confidence interval) from 12.6% to 57.6%, shown in figure 6.

Box 1. Shape parameter calculations

$$\mu = \frac{minimum + 4 \times mode + maximum}{6}$$

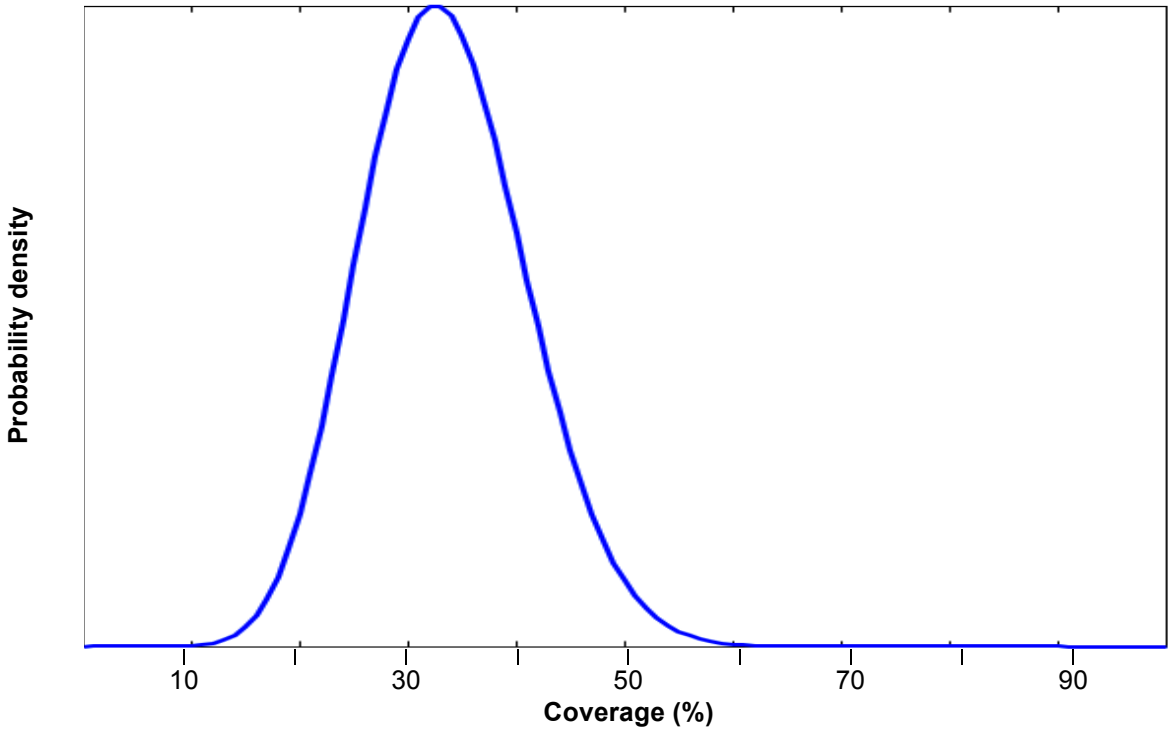
$$\sigma = \frac{maximum - minimum}{6}$$

$$\alpha_{prior} = \mu \times \left(\frac{\mu \times (1 - \mu)}{\sigma^2} - 1\right)$$

$$\beta_{prior} = (1 - \mu) \times \left(\frac{\mu \times (1 - \mu)}{\sigma^2} - 1\right)$$

*The weighted BBQ framework is reported in annex 8.3.

Figure 6. Prior binomial probability density, Distribution = *Beta*(12.9, 25.7), Mode = 32.6% (95% CI ≈ 12.5%; 57.5%), Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.



Distribution = *Beta*(12.9, 25.7), Mode = 32.6% (95% CI ≈ 12.5%; 57.5%)

4.3.2 The likelihood

Sample size

The sample size was calculated using equation 2:

$$n_{likelihood} = \left\lceil \frac{mode \times (1 - mode)}{(precision \div 1.96)^2} - (\alpha_{prior} + \beta_{prior} - 2) \right\rceil \quad 2$$

where $mode$ is the prior mode, α_{prior} and β_{prior} are the prior shape parameters and $precision$ is the desired precision of the posterior estimate. In SQUEAC, the sample size for the likelihood survey is usually calculated to achieve a precision of ± 12 percentage points around the posterior estimate, as was in this case.[11] The sample size for the likelihood survey was 23 children.

The sample size was then translated into the minimum number of villages needing to be sampled to achieve the sample size using equation 3:

$$n_{villages} = \left\lceil \frac{n_{likelihood}}{mean\ village\ population \times \frac{percent\ of\ population_{6-59\ months}}{100} \times \frac{SAM\ prevalence}{100}} \right\rceil \quad 3$$

With a SAM prevalence of 0.5% in the Far North Region and an average neighborhood population of 1696 inhabitants (16% of which are between 6 and 59 months) the minimum number of villages to be sampled was 17.

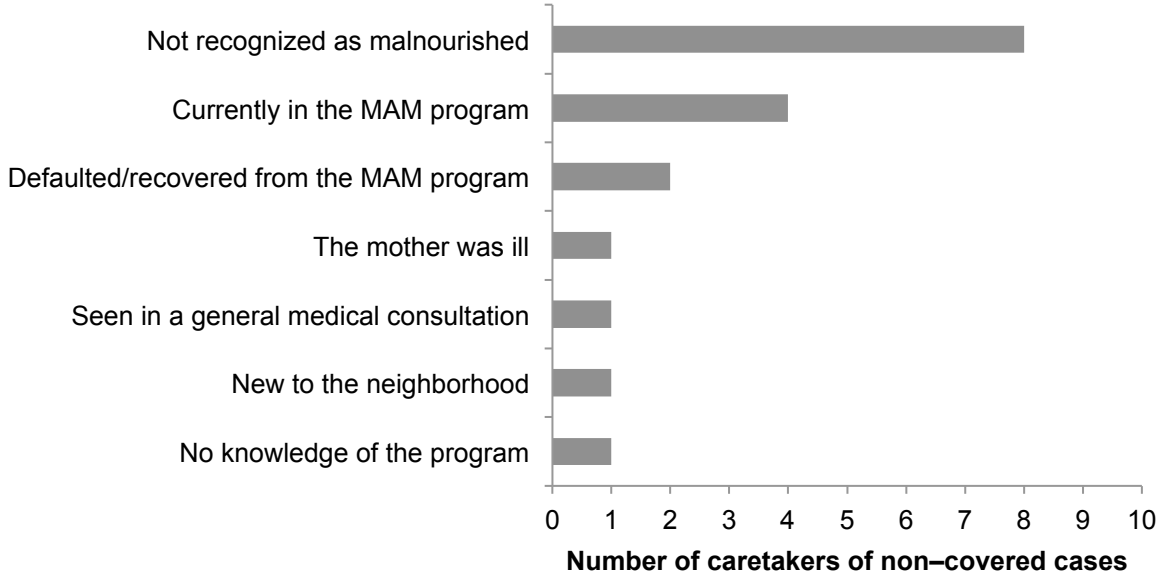
It must be noted that, during the investigation, the minimum number of villages was augmented from 17 to 28 due to the fact that the neighborhood population provided by the Urban Maroua Health Department was inaccurate and overestimated. Neighborhoods were selected randomly.

Active case-finding

The 28 selected neighborhoods were divvied up among the investigation team. ACF lasted 10 days. In total, 29 SAM cases were identified. Eleven of these children were covered and in an OTP. Eighteen children were non-covered cases.

A questionnaire was administered to caregivers (all of which were mothers) of the 18 non-covered cases to find out why (annex 8.4). Of the 18 women questioned, 44.4% (8) did not realize their children were malnourished. Fifty percent of the women questioned (9) knew their children were ill, 8 of which were knew of the CMAM program, yet choose not bring their children to it; the reasons for which are detailed in figure 7.

Figure 7. Barriers to service uptake found by the likelihood survey, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.



It should be noted that 50% (9) of the non-covered, SAM children had, at one time, already been admitted to the OTP. Table 8 reports the various reasons for which these children left the program.

Table 4. Reasons for which non-covered SAM cases left the OTP, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.

Reason	Total	Percent
Transferred to the SFP	5	55.6%
Discharged as recovered from the OTP	2	22.2%
Defaulted, caregiver unable to accompany the child to the OTP	1	11.1%
Transferred to another HD where the child was monitored	1	11.1%

Religious community affiliation was also evaluated. Of the 29 SAM children, 72.4% (21) were Muslim and 27.6% (26) were Christian. Of these, 42.9% (9) of the Muslim children were covered while only 25.0% (2) of the Christian were covered. According to the questionnaire:

- **Muslim community**: 76.2% (16) of Muslim mothers of non-covered SAM cases did not recognize their children as malnourished. Of the five women that identified their children as ill, one did not know where to take her child for care, two were currently treating their children in the SFP for MAM, one was ill.
- **Christian community**: 37.5% (3) of Christian mothers of non-covered SAM cases did not recognize their children as malnourished. Of the five women that identified their children as ill, all of which knew of an IHF where their child could be treated. Four of these children were enrolled in the SFP and one had been discharged as recovered from the SFP.

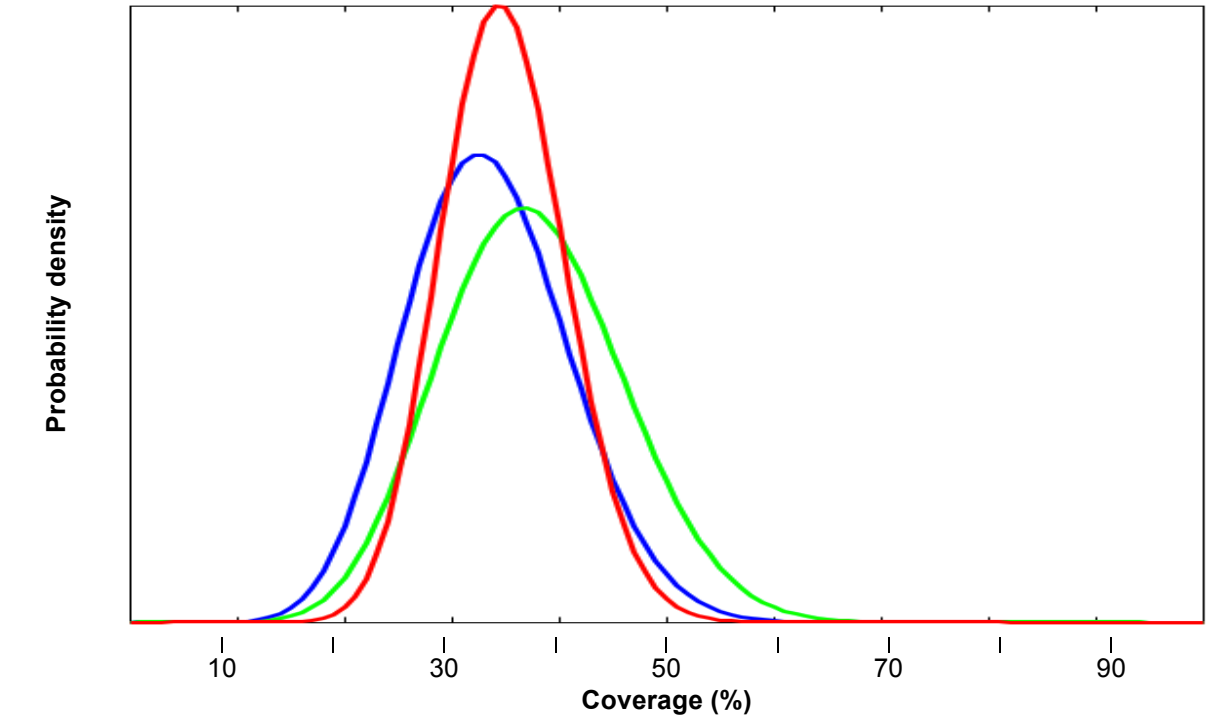
4.3.3 The posterior

The point coverage estimate was selected as the most appropriate indicator for this investigation because no cases in process of recovery were discovered during ACF.

By method of Bayesian beta-binomial conjugate analysis the prior probability density was combined with the likelihood function to calculate the posterior—the final coverage estimate: 34.9% (95% CI ≈ 22.4%; 47.6%).

Figure 8 is a graph of the three probability densities. It shows that both the prior and posterior probability densities are very accurate; that is, their modes coincide with the mode of the likelihood survey. The narrow distribution of the prior indicates that is very strong. Moreover, the prior and the likelihood do not conflict, as there is considerable overlap between the two distributions. The posterior distribution is narrower than the prior distribution, indicating that the likelihood survey even reduced investigative uncertainty. Lastly, as the prior was extremely accurate, the strength of the prior did not overestimate (and effectively bias) the resulting coverage estimate, as is often the case in beta-binomial conjugate analysis.

Figure 8. Plot of beta-binomial conjugate analysis, Urban Maroua Health District, Far North Region, Cameroon. March – April 2013.



Prior, Distribution = *Beta*(12.9, 25.7), Mode = 32.6% (95% CI ≈ 12.5%; 57.5%)
Likelihood, Distribution = *Binomial*(29, 11), Mode = 37.9% (95% CI ≈ 15.1%; 63.1%)
Posterior, Distribution = *Beta*(12.9, 25.7), Mode = 34.9% (95% CI ≈ 24.4%; 47.8%)

5. Discussion

This SQUEAC investigation was conducted halfway through the dry season and before the lean period, a time at which food availability is expected to be adequate. The overall coverage estimate was 34.9% (95% CI ≈ 22.4%; 47.6%) which is inferior to the internationally accepted SPHERE coverage standard for CMAM programs in urban contexts of 70%.[13]

General lack of community awareness of malnutrition was a major barrier that surfaced repeatedly throughout the investigation; this was coupled with the tendency to consider malnutrition as a traditional or folk illness. This was identified during community focus groups and also during ACF in stage three. When questioned, 44% of the mothers of SAM cases did not realize their children were malnourished; this percentage was higher in the Muslim community (78%) compared to the Christian community (37.5%). It was also revealed that malnutrition is highly culturally stigmatized, especially within the Muslim community; it is seen as an illness of the poor or a consequence of a negligent mother who is incapable of properly caring for her child. Together, these two barriers have made it common for mothers to bring their children to the traditional healer for care, or to self-medicate. Firstly because to them, it is evident that a traditional illness it best treated by a traditional healer. Secondly, because it is easier for a mother go self-medicate at home or to discreetly take her child to see the healer, versus to the very public, busy, local IHC where she might be stigmatized by her community or even the

medical personnel. Lastly, certain communities expressed a general dissatisfaction with the quality of care and service in the district health facilities in stage one.

These barriers must be addressed through awareness building and community sensitization campaigns in partnership with local authority figures. Research has demonstrated the important role that traditional leaders can play in building awareness and increasing program uptake.[15] Religious leaders and traditional healers in Urban Maroua seemed willing and able to collaborate. Active involvement of these groups could help dispel doubts and false impressions about malnutrition and stigma and increase community engagement.

It is less evident to address the community's dissatisfaction with care and service quality in the district (either the IHCs or Maroua Regional Hospital) because these structures are managed by the MPH. However, a general appreciation for the health services provided in the OTPs and the SC was observed. This observation favors coverage because it suggests that positive information about the program's reputation circulated throughout the community by word of mouth.

The tendency for SAM children to be prematurely transferred from the OTP to the SFP for MAM was a second major barrier identified. During ACF in stage tree, of the 9 non-covered SAM cases whose mothers were familiar with the program, 66.6% of them were being inappropriately treated for MAM. Additionally, routine program data analysis in stage one reported that 17.3% of children discharged as recovered had a MUAC less than 115 mm (September 2012 – January 2013). This is because:

1. The discharge criteria for SAM are not well defined in national protocol for. It says that SAM children between 6 and 59 months can be discharged: 1. "When the weight-to-height (WTH) ratio is > –2 z-scores from the standard for 2 consecutive visits"; and 2. "with a WTH ration > –3 z-score if OTP referral is possible". No minimum MUAC value is indicated and no reference is made to edema presence.
2. During a recent training that took place in Urban Maroua, it was recommended that recovering SAM cases be discharged from the OTP program and transferred to the SFP to prevent PlumpyNut® stock-breaks in the OTP.

It should be noted that Cameroon's *National Protocol for Malnutrition* is currently under revision. In the mean time, MUAC measurement should be required before discharge from the OTP to assure that SAM cases are not mistakenly transferred to the SFP.

Strong community mobilization efforts led by the CRC volunteers was identified as an important program booster. These efforts contribute to program awareness, and participation. However, certain misunderstandings about screening identified throughout the investigation suggests that there is room for improvement. During the investigation, the CRF was actively working to engage religious and community leaders. This initiative could have a serious, positive impact on coverage and should be encouraged. Public service announcements about malnutrition were

broadcasted on the local radio in both French and Fulfulde to raise awareness. These efforts could be complemented with community discussion groups, theater performances and radio messages directly about the CMAM program. Lastly, the CL network managed by the MPH and UNICEF needs to be strengthened. Coordination between the CLs and the CRC CBVs could have a positive impact. However, it should be noted that the CLs do not receive any motivation at the present time. Moreover, all current CLs have no formal training. These issues should be worked out between the MPH and UNICEF.

6. Recommendations

Based on the results above there are several factors that negatively contribute to program coverage. The following recommendations were developed to address them.

1. Strengthen community sensitization on malnutrition

Activities and comments	Monitoring and follow-up	Institution in charge
- Conduct malnutrition information sessions with local leaders (i.e. Imams, priests, neighborhood chiefs, etc.). - Engage local leaders in formulating sensitization messages and disseminating these messages. - A special focus should be made on the Muslim community (through Imams) as it is the predominant community in the region and has poor malnutrition awareness.	- Activity reports (monthly)	CRC-FRC
- Conduct community sensitization activities like debates on the local radio, public discussion sessions, or theater performances to increase malnutrition awareness in the community. - Sensitization messages should be adapted for the urban context and use local language and terminology. - Promote the identification of PlumpyNut® as a medicine prescribed to treat malnutrition in children.	- Activity reports (monthly)	CRC-FRC
- Facilitate coordination between the MPH and UNICEF to strengthen CBV and CL networks.	- Meeting minutes and - (trimestral)	CRC-FRC, MPH and UNICEF
- Strengthen collaboration between CBVs and CLs	- Activity reports (monthly)	CRC-FRC, MPH and UNICEF

2. Ensure that MAS treatment is comprehensive

Activities and comments	Monitoring and follow-up	Organization in charge
– Work with IHC medical personnel, CBVs, CLs to emphasize the MUAC > 115 mm discharge criterion; SAM children should be discharged *if and only if* their MUAC is ≥ 115 mm.	– Monthly activity reports – Require MUAC measurements before discharge	CRC-FRC
– Discuss with the MPH the possibility of including admission criteria in the routine program data that is collected. – This would allow admission type to be monitored and studied.	– Working group minutes – Quarterly	CRC-FRC and MPH
– Improve SAM medical register keeping in the OTPs with a special focus on discharge information. – This would help differentiate those children discharged as fully recovered from those who were transferred to the SFP. This is valuable information used for evaluation purposes.	– Activity reports (monthly)	CRC-FRC and MPH
– Inform caretakers that, in the event of a move, an inter-OTP transfer can be easily arranged so that the MAS child can remain in treatment and avoid defaulting.	– Activity reports (annual)	CRC-FRC and MPH

4. Promote early SAM presentation and service uptake at the IHF

Activities and comments	Monitoring and follow up	Organization in charge
– Encourage traditional healers to immediately refer SAM children to the IHC. – Conduct training sessions with traditional healers to help them identify the signs of SAM. – Work with traditional healers to build better understanding of OTP program objectives and treatment options.	– Activity reports (monthly) – Meeting minutes	CRC-FRC
– Investigate the perceptions that traditional healer's have about referring SAM children to the IHC. Do they readily refer SAM children to the IHC? Is doing so seen as direct competition and a poor business decision? – According to the results of the investigation, explore possible options to eliminate competition and encourage immediate referral (e.g. compensation)	– Investigation findings – Activity reports (quarterly)	CRC-FRC and MPH

5. Develop alternative options for the working caregiver

Activities and comments	Monitoring and follow-up	Organization in charge
- Conduct a small study with SAM caregivers to investigate how to reduce the impact of opportunity cost (i.e. field work, domestic work) on coverage. - According to the findings, develop alternative options that accommodate work or domestic obligations and that promote program adherence. - For example, if the labor burden is high during the harvest period and it is difficult for caregivers to bring their children to the OTP at this time, then maybe a two-week supply of PlumpyNut® should be given rather than a one-week supply	- Study findings - Activity reports (quarterly) - Proposed measures	CRC-FRC and MPH

6. Repeat the SQUEAC in six months or one year

Activities and comments	Monitoring and follow-up	Organization in charge
- Conduct another SQUEAC in the Urban Maroua Health District; expand the investigation zone to include the other neighboring HDs supported by the FRC if the security situation permits. - Consider other less labor-intensive coverage evaluation tools and their feasibility; for example an abbreviated mini-SQUEAC with only stages one and two. - The tools used in SQUEAC (i.e. small studies and small-area surveys) should be used regularly to improve the program.	- Investigation report (March – April 2014) - Small study or small-area survey reports (when necessary)	CRC-FRC in collaboration with MPH and UNICEF

7. References

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8. Annexes

8.1 Figures

Figure I: Percentage of SAM cases admitted to the SC (June 2012 – January/March 2013), Urban Maroua Health District, Far North Region, Cameroon

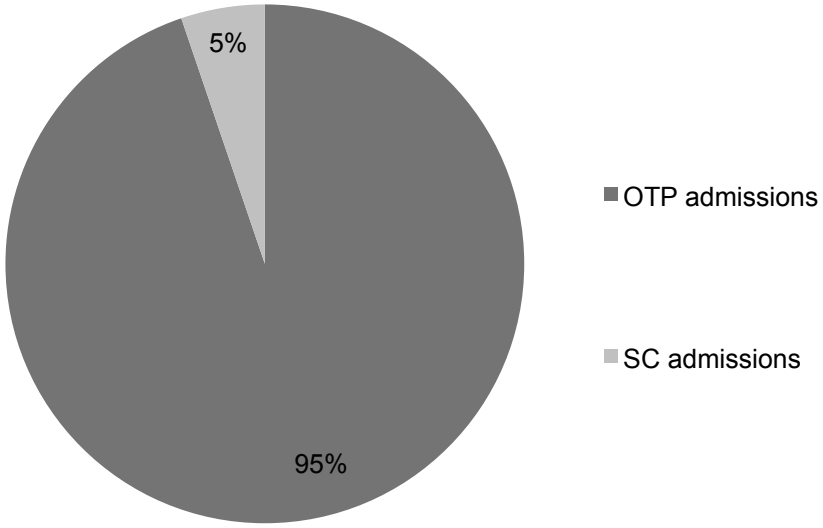


Figure II. MUAC distribution < 115 mm at OTP admission (September 2012 – February 2013), Urban Maroua Health District, Far North Region, Cameroon

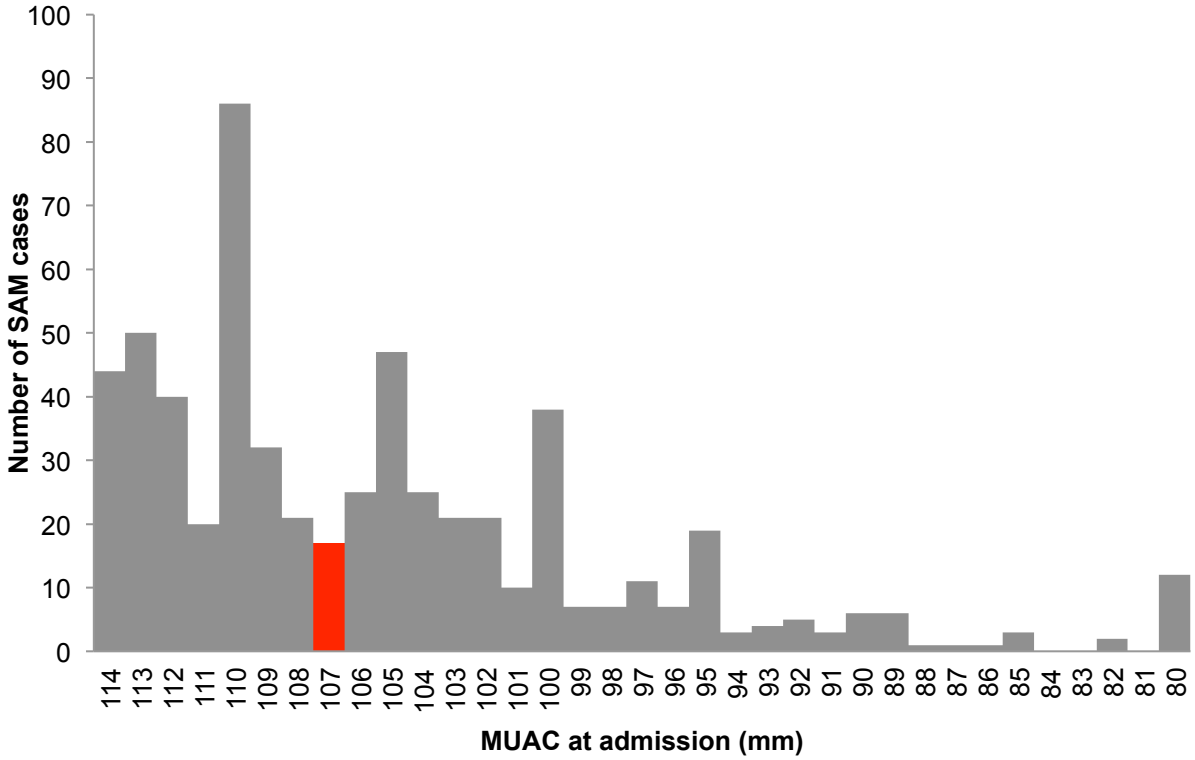


Figure III. Median MUAC at OTP admission per HS (September 2012 – February 2013), Urban Maroua Health District, Far North Region, Cameroon

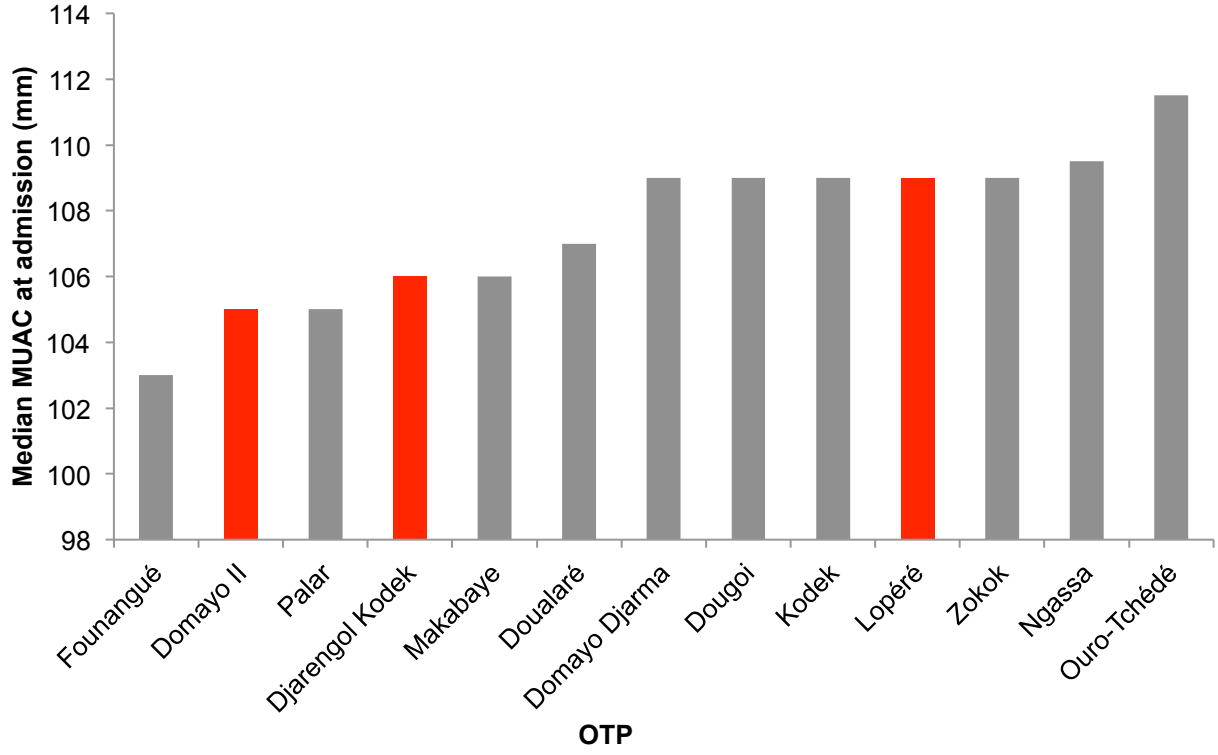


Figure IV. Median length of stay at OTP before recovery (September 2012 – January 2013) Urban Maroua Health District, Far North Region, Cameroon

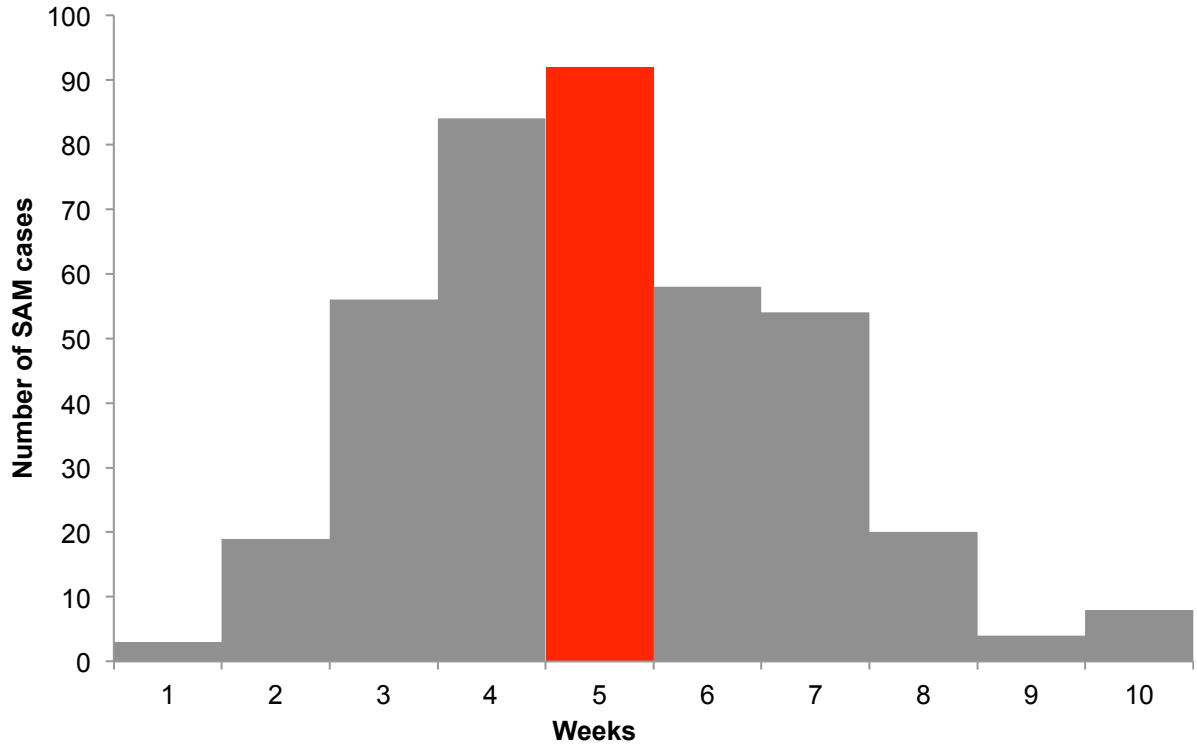


Figure V. MUAC distribution at OTP discharge for recovery (September 2012 – February 2013), Urban Maroua Health District, Far North Region, Cameroon

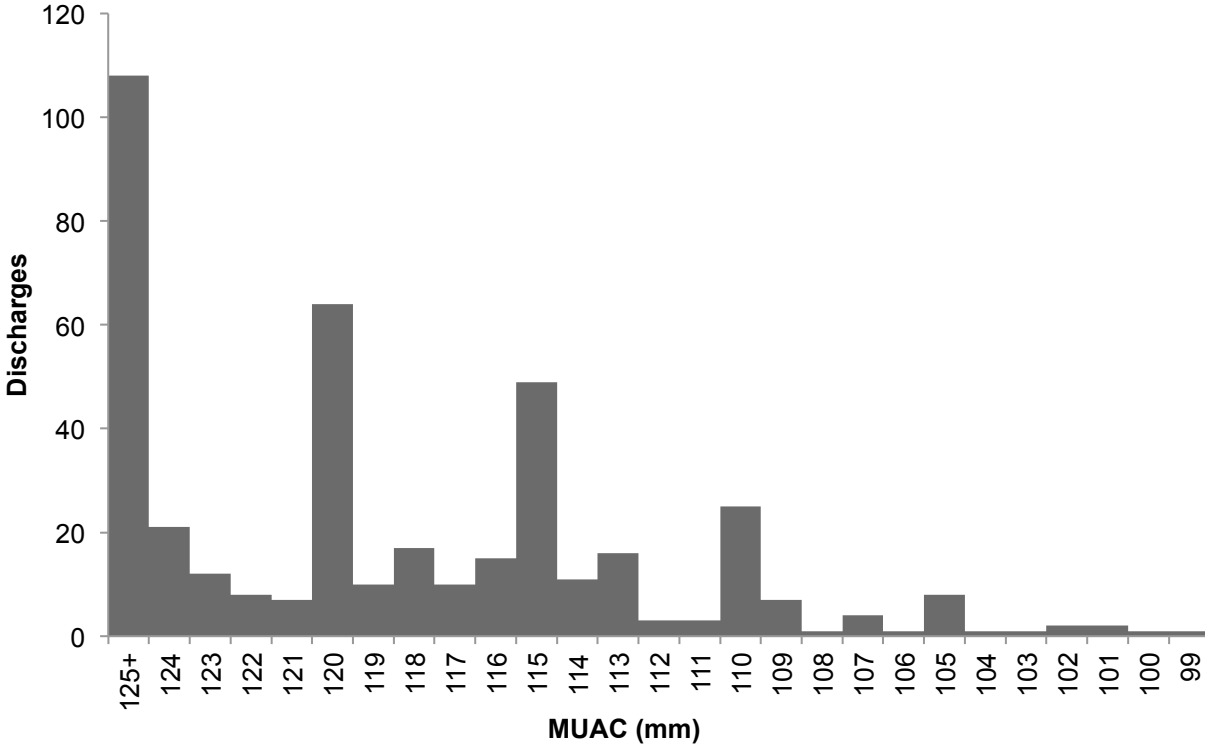
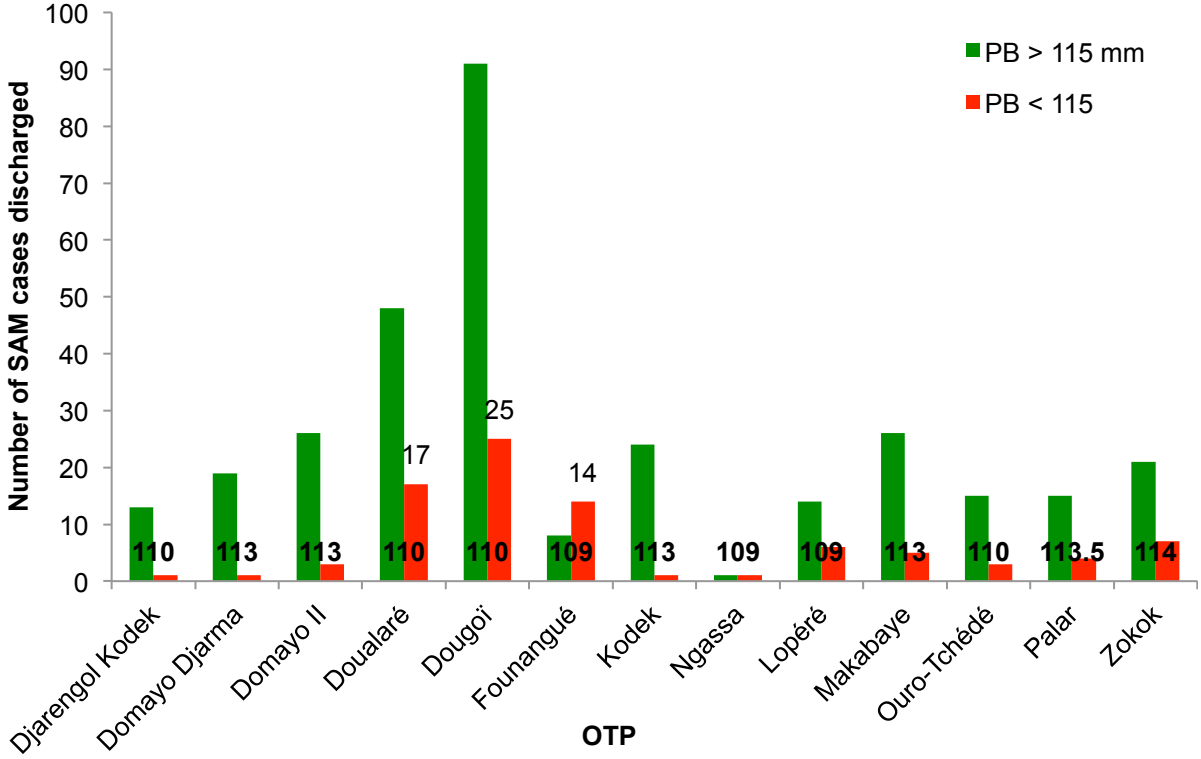


Figure VI. Proportion of discharges at recovery above/below 115 mm MUAC threshold per OTP (September 2012 – February 2013), Urban Maroua Health District, Far North Region, Cameroon



The bars correspond with the number of SAM cases discharged. Those cases discharged with a MUAC > 115 mm are shown in green. Those with a MUAC < 115 mm are shown in red. The median MUAC at the time of discharge is reported in back just above the OTP site.

8.2 LQAS calculation

The LQAS classification technique analyses data using the following formula:

$$d = \left\lfloor n \times \frac{p}{100} \right\rfloor$$

where

$d =$ the threshold value ; $n =$ number of cases found ; $p =$ coverage standard

- If the number of covered cases found (that is, those cases in the program) is greater than d then then the coverage of the surveyed area is classified as being greater than or equal to the coverage standard p
- If the number of covered cases found (that is, those cases in the program) is less than d then then the coverage of the surveyed area is classified as being less than or equal to the coverage standard p

8.3 Weighted BBQ

	Points	Barrier	Source	Method	Religion	Points	Booster	Source	Method	Religion
1	5	**Caregiver opportunity cost** (labor burden, domestic obligations, illness, ceremonies, weddings, funerals)	1, 3, 4, 5, 6, 7, 13	A, B, C	✝ ☪	5	**Effective CBVs and CLs** (dynamicism, active screening)	1, 3, 4, 5, 6, 7, 8	A, B	✝ ☪
2	4	**Late service uptake** (traditional medicine and self-medication)	1, 2, 3, 4, 8, 11	A, B	✝ ☪	4	**Inter-partner coordination and collaboration** (CLs, Health Committee, health workers, IHCs	3, 5, 6, 7, 11, 12, 13	B, D	✝ ☪
3	5	**Poor CL network** (no material or financial motivation; no supervision)	3, 6	B	✝ ☪	4	**Weekly meetings, trainings and coordination** (CRC-CRF team and supervisors)	13	B	
4	5	**Lack of malnutrition awareness and causes**	1, 2, 3, 8, 10, 13	A, B	✝ ☪	3	**General appreciation for CMAM programming**	1, 4	A, C	✝
5	4	**Unfamiliarity with CMAM programming**	1, 2, 3, 4, 8	A, B, C	✝ ☪	3	**CBV-CL collaboration**	3, 5, 6, 12, 13	B	☪
6	3	**Lack of coordination in trainings for HWs**	10, 13	B		1	**Willingness to collaborate** (traditional healers, men's community, neighborhood chiefs)	2, 3, 8	B	✝ ☪
7	3	**Lack of personnel in the OTP** (and frequent mobility)	2, 4, 5, 6, 7, 11, 13	A, B	✝ ☪	1	**RUFT is seen as effective**	1, 3, 4	A, B	✝ ☪
8	4	**Malnutrition stigma**	2, 3, 4, 5, 6, 7,	A, B	✝ ☪	4	**Strong local partner integration** (cluster	4, 11, 13	B, D	

			12, 13				participation)			
9	2	**PlumpyNut® misappropriation**	3, 8	B, D	☪	4	**Malnutrition screening integrated into IHC consultation**	4, 7, 11	A, B, C	✝ ☪
10	4	**Misuse of PlumpyNut®** due to non-identification as medicine	1, 3, 4, 7, 11, 13	A, B, C	✝ ☪	3	**Quality OTP care**		D	
11	4	**Malnutrition identified as folk illness** (“tandao” and “nnt”)	1, 2, 3, 4, 13	A, B	✝ ☪	3	**OTP retraining for HW**	7, 13	B	
12	2	**Insufficient communication between HWs and CBVs**	7	B, D		3	**Educative talks at the IHC**	4, 7	B, C	
13	4	**Difficult to access OTPs** during the rainy season	1, 3, 4, 5, 7	A, B, C		3	**General appreciation for IHC reception**	1, 4	A, C, D	
14	2	**Weak organization** in the OTPs	3, 4, 6	B, C		3	**RUTF stock-piling to avoid stock breaks**	9, 10	B	✝ ☪
15	2	**Lack of experience and competence in partner NGOs** specifically SALID	9, 10	B		5	**Continued CMAM support and to ensure the provision of free CMAM care**	7, 4, 10, 11, 13	B, D	
16	2	**WFP RUTF delivery shortages**	6, 9	B						
17	2	**Discharge criteria inconsistencies and confusion**	7	B, D						
18	2	**High community mobility**	7, 12	B, D						
19	3	**Priority given to WTH ratio over MUAC** for admission and discharge	7, 13	B, D						

20	3	**Gender problems** (certain fathers forbid their wives to go to the OTP)		B, D	
21	2	**Problems associated with OTP care** (lack of systematic, medical consultation, MUAC errors)	3, 4	B, C	
22	2	**Sale of health record notebooks** in SFP	5, 13	B, D	
23	2	**Social problems tied to maternal alcoholism**	3, 5	B, D	
24	2	**Difficulty generating quality, routine statistics** due to errors in the OTP registers	7, 11	B, D, E	
25	3	**Weak communication in the IHCs** between the IHC head, HWs,	7, 11, 13	B, D	
26	2	**Lack of CBV supervision**	7	B	
27	3	**Communication difficulties due to language**	13	B, C	
28	2	**Socio-cultural influences and beliefs**	1, 3, 7, 13	A, B	

8.4 Caregiver questionnaire

Région Sanitaire: _____
District de Santé: _____
CSI : _____

Village : _____
Nom de l'enfant: _____ _____

1A. EST-CE QUE VOUS PENSEZ QUE VOTRE ENFANT EST MALADE? SI OUI, DE QUELLE MALADIE SOUFFRE VOTRE ENFANT? _____

1. EST-CE QUE VOUS PENSEZ QUE VOTRE ENFANT EST MALNUTRI?

☐ OUI ☐ NON (**—> STOP!**)

2. EST-CE QUE VOUS CONNAISSEZ OÙ ON PEUT SOIGNER/ QUI PEUT AIDER LES ENFANTS MALNUTRIS?

☐ OUI ➘ ☐ NON (**—> STOP!**)

Si oui, quel est le **nom du service**? _____

3. POURQUOI N'AVEZ VOUS PAS AMENÉ VOTRE ENFANT EN CONSULTATION POUR BÉNÉFICIER DE CE SERVICE?

☐ Trop loin ➡ Quelle distance à parcourir à pied? _____ Combien d'heures? _____
☐ Je n'ai pas de temps/trop occupé(e)
➡ Spécifier l'activité qui occupe la gardienne/ le gardien dans cette période _____
☐ La mère est malade
☐ La mère ne peut pas voyager avec plus d'un enfant
☐ La mère a honte d'atteindre le programme
☐ Problèmes de sécurité
☐ Personne d'autre dans la famille qui pourrait s'occuper des autres enfants
☐ La quantité d'ATPE donnée est trop petite pour justifier le déplacement
☐ L'enfant a été rejeté auparavant. ➡ **Quand?** (période approximative) _____
☐ L'enfant d'autres personnes a été rejeté
☐ L'enfant est actuellement dans le programme CNA pour les Modérés
☐ Mon mari a refusé
☐ Je croyais qu'il fallait être admis à l'hôpital en premier
☐ Le parent ne croit pas que le programme peut aider l'enfant (elle/il préfère la médecine traditionnelle, etc.)
☐ Autres raisons:
_____

4. EST-CE QUE L'ENFANT A DÉJÀ BÉNÉFICIÉ DU CNA AU CSI?

☐ OUI ☐ NON (➡ **STOP!)**

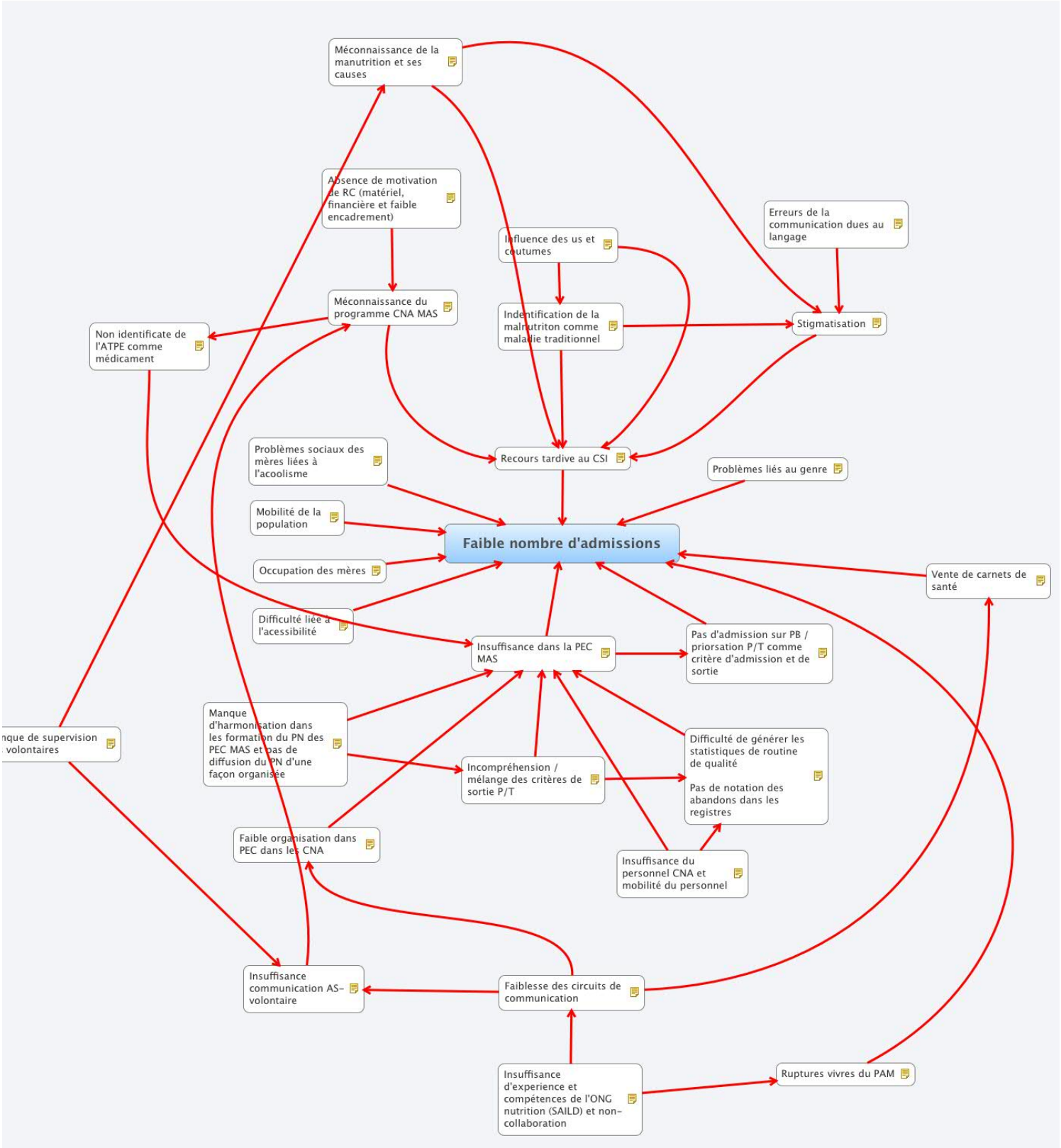
Si oui, pourquoi n'est-il plus inscrit présentement?

☐ Abandon, quand? _____ **Pourquoi?**
_____
☐ Guéris et déchargé ➡ **Quand?** _____
☐ Déchargé car pas de guérison ➡ **Quand?**
_____

Autres:_____

(Remercier le parent)

8.5 Barrier concept map



8.6 Booster concept map