



## Research Article

# Community-Based Management of Acute Malnutrition Programme: Rural and Urban Maternal Socio-Demographic and Implementation Differentials in Ghana

Joana Apenkwa<sup>1</sup>, Samuel Kofi Amponsah<sup>2,3\*</sup>, Anthony Edusei<sup>1</sup>, Emmanuel Nakua<sup>1</sup>, Sam Newton<sup>1</sup>, Easmon Otupiri<sup>1</sup>, Chukwuma Chinaza Adaobi<sup>2</sup>

<sup>1</sup>Kwame Nkrumah University of Science and Technology (School of Public Health, KNUST), Kumasi, Ghana

<sup>2</sup>Catholic University College of Ghana, Fiapre (Health and Allied Sciences), CUCG, Sunyani-Fiapre, Ghana

<sup>3</sup>Christian Health Association of Ghana (Health Information Department), Accra-Labone, Ghana

**\*Corresponding Author:** Samuel Kofi Amponsah, Christian Health Association of Ghana, Health Information Department, Accra-Labone, Ghana

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### Abstract

Malnutrition is a public health problem in Ghana, and is estimated to contribute indirectly to more than half of under-five deaths. This study was designed to describe how implementation of the Community-based Management of Malnutrition (CMAM) programme in Ghana differs in the rural and urban parts of the country. A mixed methods approach was used in a community-based survey that studied 497 mothers/caregivers and under-five pairs

quantitatively, 25 health service providers qualitatively, and 25 mothers/caregivers qualitatively. Quantitative data were analysed descriptively with Stata 14.0 (Stata Corp, Texas, USA) while the qualitative data were analysed thematically with Atlas.ti, version 7.5 (Scientific Software Development GmbH, Berlin). Programme implementation was assessed using the following variables: availability of CMAM tools, availability of

CMAM supplies, organization of out-patient therapeutic and supplementary feeding programmes, personnel availability, availability of community-based components of CMAM and maternal experience with CMAM services. While the number of children alive, provision of nutrition education and counselling, and demonstration of food preparation significantly influenced program effectiveness ( $p < 0.05$ ) in the urban site, no variables were found to do similar in the rural district. The rural facilities were more likely than the urban ones to be without tools. Less than 10% of mothers/caregivers in both study sites acknowledged the availability of the community-based components of CMAM. Programme implementation in the two study districts is poor; in order to ensure that the CMAM intervention translates into a reduced malnutrition burden among children under-five in Ghana, the programme implementation should be revised to address the identified shortcomings.

**Keywords:** Community-based Management of Acute Malnutrition; Implementation; Maternal socio-demographics and experience; Effectiveness; Ghana

## **1. Introduction**

In spite of remarkable global reductions in under-five mortality over the last two decades, the United Nations Inter-Agency Group for Child Mortality Estimation (UN IGME) estimates that 5.3 million children under-five died in 2018, with the highest burden in sub-Saharan Africa (SSA), where the average under-five mortality rate is 78 per 1,000 live births; one in 13 children dies in SSA before her/his fifth birthday. Nearly half of these deaths have malnutrition as an underlying factor [1]. Malnutrition in children under-five years is an important public health issue that contributes greatly to morbidity

among children globally and there is insufficient progress to achieve the Sustainable Development Goals [2]. Globally, Severe Acute Malnutrition (SAM) is one of the commonest causes of morbidity and mortality among children under-five as it affects at least 19 million children worldwide [3], and accounts for 8.0% of annual child deaths [4]. A severely wasted child is nine times more likely to die than a child who is not wasted [5]. The Community-based Management of Acute Malnutrition (CMAM) programme was therefore introduced to achieve early detection of SAM (without complications), and to appropriately manage cases with the help of ready-to-use therapeutic foods (RUTFs) or other nutrient-dense foods at the community level [1]. In Ghana, according to the 2014 Demographic and Health Survey, among children under-five years, 19.0% are stunted, 5.0% are wasted, 11.0% are underweight and 4.0% are overweight [6]. CMAM was introduced in Ghana in June 2007 to manage cases of SAM recorded at the community level [7,8]. Four learning sites were established in the Greater Accra and Central regions to train workers for the programme. Ashanti Region of Ghana piloted this project in 2010 at the Maternal and Child Health Hospital (MCHH), Kumasi, and trained a number of health workers in the Kumasi metropolis and the Ahafo Ano South district for scale up to other areas in the region [9]. Data at the MCHH, the main referral centre for the Ashanti region, only show the cases that arrived at the hospital; it is plausible that the community and household levels could have a much greater burden of malnutrition among children under-five. This study therefore sought to assess the effects of maternal socio-demographics and experience with CMAM services on the effectiveness of the CMAM intervention in two districts in the Ashanti region, Ghana- Kumasi Subin sub-metropolis and the Ahafo

Ano South district - to ascertain whether there are differences within these areas.

## **2. Materials and Methods**

### **2.1 Study area**

The survey was carried out from July 2017 to January 2018 in communities and public health facilities within the Kumasi Subin sub-metropolis (KSSM-urban setting) and the Ahafo Ano South district (AAS-rural setting). Prior to 2019 KSSM was one of the ten sub-metropolitan areas within the Kumasi metropolis. It has 66 communities with an estimated projected population of 238,005. Eighteen percent (18%) of the population is aged 6-59 months with an estimated SAM prevalence of 8%. The lowest level of health care is provided through 10 functional Community-based Planning and Health Services (CHPS) zones. The doctor to patient ratio is 1:57,183 while the nurse-to-patient ratio is 1:2,383. ASS is one of the 43 administrative districts of the Ashanti region with Mankranso as its capital. The district has 6 sub-districts with a total of 32 CHPS zones in 141 communities.

### **2.2 Study design and population**

The study had a community-based analytical cross-sectional design with a mixed-methods approach. The study participants were mothers/caregivers and their malnourished children under-five, and frontline health care providers who were directly involved in the CMAM intervention. To be included in the study, the mother/caregiver with a malnourished child under-five must have been resident in the study area for at least three years. The health worker had to be a CMAM frontline health worker. Mothers/caregivers with malnourished children under-five who had underlying conditions or severe co-morbidities such

as cleft palate, or who were seriously ill at the time of the study were excluded. Additionally, mothers/caregivers who had malnourished children under-five but the mothers/caregivers were not emotionally stable or had depression or were unwell during the time of the survey were also excluded. Health workers who were CMAM frontline health workers but were not on duty at the time of the survey were excluded.

### **2.3 Sample size and sampling technique**

The study adopted the Simplified Lot Quality Assurance Sampling Evaluation of Access and Coverage (SLEAC) [10], method to sample communities for the study. The SLEAC sampling method is a quick non-expensive method, which classifies coverage at the community level. The community could be a health center, a community-based Health Planning and Services (CHPS) compound or zone, a sub-district, a district, a region or a country; any clearly defined cluster. This method was adopted because it reaches a wider study area therefore making the sample a true representation of the population under study. With the SLEAC method, the health districts (Ahafo Ano South - AAS and Kumasi Subin sub-metropolis - KSSM) were considered as sampling zones with a sample size of 40 communities each. The minimum numbers of communities to be sampled were calculated using the Spatially Stratified Sampling Method provided by the Coverage Monitoring Network [11]. In AAS, because there were no available maps for the area to show all the communities, the Spatially Stratified Sampling Method was used to select the study communities. All the names of the sub-districts together with their CHPS zones were listed, then all the communities under the zones were also listed. The grouping of the communities under the various zones ensured a

spatially representative sample [12]. The sampling interval was then calculated by dividing the total number of communities by the sample size ( $141 \div 40 = 3.525$  which was rounded up to 4). A random number was generated with Excel (3) which served as the starting point for the counting and identification of sampled communities. The third community on the list was chosen as the starting point and the sampling interval was applied till the sample size was achieved. These calculations were not done for KSSM because the communities were not many so all the 66 communities were included in the study sample. KSSM has 10 CHPS zones with 66 communities and AAS has 32 CHPS zones with 141 communities. Three approaches were used to ensure that all the households (census) in the study communities were visited, and all children aged 6 – 59 months were screened for their nutritional status with the aid of the United Nations Children’s Fund (UNICEF) mid-Upper Arm Circumference (MUAC) tape; the children were classified under either severe acute malnutrition (SAM) cases or moderate acute malnutrition (MAM) cases or not malnourished. First, the names of mothers/caregivers captured in the community-based CMAM attendance register were followed up to their homes where they were invited to participate in the study if they consented to be studied, and if any of the children under-five was assessed to be SAM or MAM. Second, a snow balling sampling approach was also used to reach mothers/caregivers whose children were malnourished. The snow balling was facilitated by the mothers/caregivers who had been identified in the register, followed up and interviewed; these mothers/caregivers directed the research team to another mother until the last person was interviewed. Third, the rest of the households within the study communities, which had not been reached either

through the register or through snow balling, were identified, and the children under-five in these households were assessed so that the mothers/caregivers with malnourished children were surveyed.

#### **2.4 Variables**

We derived our dependent variable, program effectiveness, from the responses mothers/caregivers provided to a specific question: CMAM has been operational in your community at least for the past three years. Would you say it has been very effective, effective, not so effective or not at all effective? We coded the responses from the 4-point Likert scale into a binary outcome; very effective and effective as ‘effective’ and not so effective and not all effective as ‘not effective.’ For the independent variables we examined factors identified as associated with CMAM program effectiveness: maternal socio-demographics (age, education level, occupation, religion, ethnicity, relationship with child, child’s age, number of children under 18), and program implementation (availability of supplies and tools, organization of out-patient therapeutic and supplementary feeding programs, personnel availability, availability of community-based components and maternal experiences with CMAM services).

#### **2.5 Data collection**

Eight enumerators were trained to use a structured questionnaire to survey mothers/caregivers of the 497 malnourished children identified in both districts (240 in KSSM and 257 in AAS). The respondents decided on a suitable time and place for the interviews. The interviews were conducted in English or Twi as preferred by the respondent; the interviews lasted up to 30 minutes. A data capture form was

used to obtain additional data on coverage through a review of consulting room registers, child welfare clinic (CWC) registers, monthly CWC reports, and CMAM registers at the CMAM centres. Qualitative interviews, in the form of knowledgeable informant interviews (KIIs) and focus group discussions (FGDs), were carried out among service providers and mothers/caregivers respectively. The knowledgeable informants were purposefully selected due to their in-depth knowledge about the topic as service providers; one paediatrician and one physician assistant, five nutritionists, 12 community health officers/nurses and six nurses all drawn from the two study sites. The KIIs assessed programme implementation and the perceived challenges. These interviews, as well as the FGDs, investigated the availability of CMAM services. The mothers/caregivers who participated in the focus groups were not studied in the quantitative survey; they were invited to participate in the FGDs as they accessed services at the CMAM centers.

## **2.6 Quality control**

As a data quality check, 10% of the mothers/caregivers of the quantitative component of the study were re-surveyed; they were asked questions related to variables that would not have changed within two weeks of being interviewed, such as, whether they had been surveyed by an enumerator, whether they had a malnourished child/children under-five, and examples of questions they had been asked.

## **2.7 Data analysis**

The analysis of the quantitative datasets was carried out at three stages, the univariate, bivariate and multivariate stages, using STATA version 14 (StataCorp, Tx, USA), for the statistical analysis, and

Microsoft Excel, for generating tables and figures. At the univariate stage, the characteristics of the sampled (study) population were summarized using descriptive analyses to determine the frequencies of study variables of interest. At the bivariate level, cross tabulations with chi-square tests were employed to show associations between the dependent and independent variables. In addition, the chi-square independence test was used to test for independence between the dependent variable and the independent variables. Finally, binary logistic regression models were employed at the multivariate level of the analysis to determine the statistically significant predictors of the dependent variable (thus, either there has been improvement in the management of malnutrition (programme effectiveness) among children in the study communities or not). It is important to state that since this study is using two different datasets, the univariate, bivariate and multivariate analyses were employed in two stages, thus the KSSM and the AAS datasets were run separately. The regression models were assessed using Hosmer and Lemeshow's goodness-of-fit test ( $p \leq 0.001$ ). Statistical significance was set at 0.05 with 95% confidence interval. At the end of the qualitative survey, the data were analysed using Attride-Stirling's thematic network analysis framework. The Attride-Stirling thematic network framework allows for an open and methodical realization of emergent themes and concepts through the application of inductive reasoning and deductive coding to shape the analysis and interpretation of qualitative data [13]. The qualitative analysis went through several steps: all audio-recorded interviews were transcribed. The transcriptions were read and reviewed alongside the field notes to ensure a clear understanding of the data. Then codes were generated by assigning symbolic meaning to descriptive or

inferential information compiled during the study. The aspect of the data to be coded during first cycle coding processes, the portions coded can be exact same units, longer passages or text, analytic memos about the data, and even a reconfiguration of the codes themselves developed. The coding of transcripts was guided by list of organising themes (deductive) which were modified and expanded based on information derived from reading the transcripts (inductive). Coding was done by two data entry clerks with each coding all transcripts. After coding all transcripts, a review of generated codes was done to ensure consistency in coding (constant comparison approach). The process continued with a more nuanced linkage of codes, this was done by the relationship between codes and the underlying meaning across codes. Representative quotes that best captured the idea were presented for illustration. The data were analysed with the qualitative software package, Atlas.ti, version 7.5 (Scientific Software Development GmbH, Berlin).

### **3. Results**

#### **3.1 Descriptive analysis**

In the Kumasi Subin sub-metropolis (KSSM) which is urban and a business hub, about 48% of respondents were into petty trading whereas in the Ahafo Ano South (AAS) district, which is rural, only 16% were traders. The unemployment figure was marginally higher in AAS (14.4%) when compared with KSSM (11.7%). Asantes are the major ethnic group in the Ashanti region, and as expected, the majority of the respondents in KSSM and AAS were Asantes; 60% and 55% respectively. The education status of caregivers/mothers varied between the rural and urban areas; even though a higher proportion of rural residents (39.3%) had an education level higher than Junior High School/Middle School Leaving

Certificate (JHS/MSLC) when compared with their urban counterparts (15.4%), in terms of education lower than JHS/MSLC, the rural residents were worse off when compared with their urban colleagues (37% versus 25.4%). In KSSM, virtually all the women were mothers to the index child (93.3%) compared with 60.3% in AAS. The modal age group in both study districts was the 21-35 group. The modal age group for children under-five in both study districts was 12 – 23 months. The number of children under-18 who were alive ranged from one to more than five. A much higher proportion of respondents had five or more living children under-18 in AAS when compared with KSSM; 27.6% and 12.9% respectively. This pattern was maintained when the number of children under-five was considered (Table 1). In both districts, the demographic characteristics of the FGD participants were not far different from that of the mothers/caregivers who participated in the quantitative survey. The ages of the discussants in both districts of this study ranged between 19 and 64 years. With regards to the level of education, about a half of them had completed primary/junior high schools. In terms of occupation, majority (two thirds) were traders or farmers. The discussants were mostly mothers of the malnourished children, with Asantes as the most common tribe in the group.

#### **3.2 Availability of CMAM tools**

We used a checklist to verify the availability of tools such as: SAM protocols, Out-patient Therapeutic Program (OTP) quick reference, mid-Upper Arm Circumference (MUAC) classification table, MUAC tape, functioning weighing scale with basin or pants and weight for height reference card; none of the facilities, neither urban nor rural, had these tools. In addition to the tools listed as not available at both rural and urban facilities, the rural facilities did not



have the following: OTP card, SAM classification algorithm, F-75 reference card, F-100 reference card, Ready-to-use Food (RUTF) ration reference card, Therapeutic Feeding Program (TFP) multi-chart, and the TFP monthly form (Table 2)

**3.3 CMAM supplies**

RUFs and supplementary foods were supplied in adequate quantities by donor agencies to the AAS health facilities but in short supply in KSSM. In KSSM, mothers/caregivers had to buy the supplies themselves. The combined vitamin/mineral mix supplies were commonly found in the rural setting; however, mothers/caregivers were made to buy vitamin/mineral mix in the urban setting. There was a

severe shortage of beds/cots for SAM children on admission in both study sites. During the focus group discussions, mothers/caregivers in both districts mentioned inadequate supplies as a major challenge. “We really get frustrated when we travel with our little money to come here only to be told there are no supplies, our families don’t even trust us when we tell them we came to the facility “FGD in rural district 2 R1 (a thirty-two-year-old mother). “We come here because of supplies so if there are no supplies, then we will spend out transportation fare to buy food for the kids rather than making useless trips” FGD in urban district 3 R3 (a twenty-six-year-old mother).

Characteristics	KSSM		AAS	
	Frequency	Percentage	Frequency	Percentage
	240	100	257	100
<b>Respondent's occupation</b>				
Artisan	65	27.1	13	5.1
Farmer	32	13.3	166	64.6
Trader	115	47.9	41	16
Unemployed	28	11.7	37	14.4
<b>Ethnicity</b>				
Asante	144	60	142	55.3
Others	96	40	115	44.7
<b>Education level</b>				
Below JHS/MSLC	61	25.4	95	37
JHS/MSLC	142	59.2	61	23.7
Above JHS/MSLC	37	15.4	101	39.3
<b>Relationship with child</b>				
Caregiver	16	6.7	102	39.7
Parent (Mother/Father)	224	93.3	155	60.3
<b>Respondent's religion</b>				
Christian	187	77.9	206	80.2
Islam	53	22.1	51	19.8
<b>Respondent's age</b>				
≤20	17	7.1	15	5.8
21-35	168	70	179	69.7

≥36	55	22.9	63	24.5
<b>Child's age (months)</b>				
0-11	62	25.8	26	10.1
Dec-23	94	39.2	124	48.3
24-59	84	35	107	41.6
<b>Number of children alive (under-18)</b>				
1	79	32.9	31	12.1
2	63	26.3	49	19.1
3	40	16.7	55	21.4
4	27	11.3	51	19.8
5 or more	31	12.9	71	27.6
<b>Number of children under-five</b>				
One	167	69.6	128	49.8
Two or more	73	30.4	129	50.2

**Table 1:** Socio-demographic characteristics of the mothers/caregivers

Item	Urban area	Rural area
	(KSSM)	(AAS)
SAM protocol	Yes	Yes
OTP quick reference (in the appropriate local language)	Yes	No
SAM classification algorithm	Yes	No
MUAC classification table	Yes	Yes
ICCM protocol	No	Yes
IMNCI protocol	No	Yes
MUAC tape	Yes	Yes
Functioning Salter weighing scale with basin or pants	Yes	Yes
Functioning electronic weighing scale	No	Yes
Length board	No	No
Stadiometer	No	No
Weight-for-height reference card	Yes	Yes
F-75 reference card	Yes	No
F-100 reference card	Yes	No
RUTF ration reference card	Yes	No
OTP card	No	No
TFP multi-chart (for in-patient or SC)	Yes	No
TFP registration book	No	No
TFP monthly statistics report form	Yes	No
Referral form	Yes	Yes

**Table 2:** Availability of tools for the CMAM programme by district



### **3.4 Out-patient therapeutic and supplementary feeding programmes**

The out-patient therapeutic component serves mothers/caregivers only at the referral centre on specific days. A knowledgeable informant in the urban setting noted that Wednesdays were for out-patient clients but throughout the week, they received referrals from around the region. “We organize Out-patient Therapeutic Programme. The cases are referred to the nutrition rehabilitation centre of our facility and they have clinic days on which the mothers are served”. [Nutritionist 2, urban area]. Two knowledgeable informants in the rural study site highlighted that their implementation of the supplementary feeding programme (SFP) was dependent on the availability of RUTFs. When the RUTFs are available, they are given to the Community Health Officers (CHOs) to give out as supplementary feeds but one of them explained that this is not often. “Sometimes when we have enough Plumpy Nuts and the CHOs come with a client who is poor and cannot afford balanced diet for the child, then we will give the client some of the Plumpy Nuts and educate her on how to prepare balanced diet for the child”. [Nutrition Officer 2, rural area]. With reference to treating SAM with complications, these children were stabilized at the children’s ward in the rural district hospital and then transferred to the Regional Referral Centre (MCHH-Kumasi) for management, in that the rural hospital does not have paediatricians to take care of such severe childhood illnesses. Knowledgeable informants raised concerns that although CMAM programmes are supposed to be available at the CHPS level, it is only screening and referrals that is done in such facilities by Community Health Nurses and CHOs.

### **3.5 Trained frontline workers**

AAS knowledgeable informants mentioned that due to limited resources (both human and material), they were compelled to operate only the out-patient and community mobilization components of the programme. The Nutrition Officers in the rural district who were interviewed explained that the community used to have volunteers who were demanding wages for every activity so the district only engages them when provision is made for volunteers to be paid. A knowledgeable informant in KSSM mentioned that though they have frontline workers for community mobilization, the numbers are not encouraging for work within the urban setting. When it comes to the treating of children under-five years old, it must be noted that it goes beyond treating children and their families but the whole community. A Nutrition Officer from the urban district noted that doctors and nurses are trained to take care of in-patient cases whereas the nutritionist manages the out-patient section. She explained that resource persons are usually invited to the facility for training and she had attended one of such trainings. In the urban district, with the exception of the paediatrician who was on study leave, they had all the categories of nurses needed as well as doctors at the stabilisation centre. In AAS there were suggestions that the district should be served with at least a paediatrician to take care of the children whereas the adults could be managed by the physician assistant; a specialist should visit the district hospital once or twice a month to take care of special cases to prevent the patients from travelling to Komfo Anokye Teaching Hospital all the time for special services. “The district should have specialist for special services, paediatrician for the kids, and another specialist for the grownups while we manage the OPD cases. The community-based volunteers

should be considered as part of the CHPS workers to assist the CHOs /CHNs carryout their work at the community levels.” [Physician Assistant, rural district]. Though CHOs in AAS maintained that they all have general training on malnutrition as well as informal tutorials from the nutritionist they have never had CMAM-specific training. One of them had this to say: “The district has not come here or invited anyone of us for any CMAM programme or activity before. It is our female Nutritionist who updates us on issues from time to time. Sometimes too at our usual workshops we learn about malnutrition in infants and breastfeeding, complementary feeding but not CMAM” [Community Health Officer 1, rural district].

**3.6 Community-based components**

In the quantitative survey, mothers/caregivers were asked about the availability of the three community-

based components of the CMAM programme; outpatient treatment of severe acute malnutrition without complications, management of moderate acute malnutrition and outreach. Both study districts recorded very low levels of availability regarding the three community-based components; in both places, for each of the components, not more than 10% of mothers/caregivers acknowledged the availability of the components (Table 3). Here is a comment from a discussant from the urban district on community outreach services by health workers: “I don’t even know health workers go out to visit sick children in their homes; never in my life have I seen one before unless it is national immunization day (NID)” FGD 1 in rural district R5. (A 36-year-old mother). “Once a month a health worker does visit to give education, encouragement and invites my auntie to hospital if there is the need”. FGD 2 in urban district R5. (A 30-year-old trader).

Characteristics	KSSM		AAS	
	Frequency	Percentage	Frequency	Percentage
	240	100	257	100
<b>Availability of out-patient treatment of SAM without complications</b>				
Yes	7	2.9	5	2
No	233	97.1	252	98
<b>Availability of MAM management</b>				
Yes	8	3.3	16	6.2
No	232	96.7	241	93.8
<b>Community outreach availability</b>				
Yes	10	4.2	2	0.8
No	230	95.8	255	99.2

**Table 3:** Availability of community-based components of CMAM

**3.7 Maternal experience with services**

As part of the coverage assessment of the CMAM project implementation, mothers/caregivers were asked about their experiences with CMAM services;

the questions bordered on services that mothers/caregivers were likely to remember easily. Across both study sites, the service component which most mothers/caregivers acknowledged as present

(having experienced it), was the nutrition education and counselling component; even then, in both sites, less than 50% of mothers/caregivers acknowledged having experienced this service (42.5% in KSSM versus 47.9% in AAS). The service, least likely to have been experienced by mothers/caregivers and their under-five children was supervised feeding;

91.2% of mothers/caregivers in KSSM and 94.5% in AAS had reportedly not experienced this service. Overall, mothers/caregivers reported the following services as the least likely to have been offered: supervised feeding, home visits and screening for malnutrition (Table 4).

CMAM services	KSSM		AAS	
	Frequency	Percentage	Frequency	Percentage
	240	100	257	100
<b>Provision of nutrition education and counselling</b>				
Yes	102	42.5	123	47.9
No	138	57.5	134	52.1
<b>Provision of food supplies for malnourished children</b>				
Yes	62	25.8	128	49.8
No	178	74.2	129	50.2
<b>Demonstration of food preparation</b>				
Yes	64	26.7	94	36.6
No	176	73.3	163	63.4
<b>Monitoring of children’s weight</b>				
Yes	69	28.8	84	32.7
No	171	71.2	173	67.3
<b>Visiting of malnourished children in their homes</b>				
Yes	13	5.4	42	16.3
No	227	94.6	215	83.7
<b>Supervised feeding of children enrolled in the programme</b>				
Yes	21	8.8	14	5.5
No	219	91.2	243	94.5
<b>Screening children for malnutrition</b>				
Yes	39	16.3	20	7.8
No	201	83.7	237	92.2
<b>Referring sick children to a health facility/clinic</b>				
Yes	72	30	53	20.6
No	168	70	204	79.4

**Table 4:** Maternal experiences CMAM services

**3.8 Maternal socio-demographics and experiences associated with program effectiveness**

A bivariate logistic regression model was run to determine the predictive effect of maternal socio-demographics and maternal experience of CMAM services on programme effectiveness. The relationship between the availability of CMAM community-based components (proxy for coverage), and programme effectiveness was not assessed as the cell values were too small and hence the model output was impossible to interpret. All socio-demographic variables and maternal experience of CMAM services were considered in the model as predictors of the effectiveness of the CMAM programme. The Hosmer and Lemeshow (H-L) goodness of-fit test of 0.001 for both districts was statistically significant and that implies the model estimates fit the data at acceptable level and thus the model is a good fit. The inclusion of all the explanatory variables yields a better fit and the model predicts 66.7% and 85.6% of the correct categorization of children enrolled in the CMAM

centres in urban and rural respectively with a Nagelkerke’s R2 value 77.70%. This means that the model explains 77.70% of the variation of the effectiveness of CMAM in KSSM. In KSSM, number of children alive (with increasing number of children alive, mothers/caregivers were significantly less likely to find the programme effective), provision of nutrition education and counselling (when compared with mothers who had experienced provision of nutrition education and counselling, those who had not, had significantly lower odds of reporting programme effectiveness), and demonstration of food preparation (mothers who had not experienced demonstration of food preparation for the malnourished child were significantly less likely to report programme effectiveness), significantly influenced programme effectiveness. Yet these same socio-demographic and other co-variates that affect the effectiveness of CMAM in KSSM, did not significantly predict CMAM effectiveness in AAS (Table 5).

Indicator variables	KSSM		AAS	
	OR [ 95% CI]	P-Value	OR [95% CI]	P-Value
<b>Occupation</b>				
Earning income (ref)	1		1	
Not earning income	1.023 [0.190, 5.506]	0.979	0.671 [0.120, 3.734]	0.648
<b>Ethnicity</b>				
Asante (ref)	1		1	
Others	0.704 [0.170, 2.916]	0.629	0.898 [0.304, 2.651]	0.846
<b>Education level</b>				
Below JHS/MSLC (ref)	1		1	
JHS/MSLC	0.497 [0.076, 3.263]	0.466	1.435 [0.428, 4.810]	0.559
Above JHS/MSLC	0.398 [0.087, 1.827]	0.236	0.770 [0.244, 2.427]	0.655
<b>Relationship with child</b>				
Caregiver (ref)	1		1	
Mother	0.889 [0.134, 5.899]	0.903	1.330 [0.425, 4.160]	0.624
<b>Religion</b>				

Christian (ref)	1		1	
Islam	5.298 [0.954, 29.426]	0.057	1.556 [0.409, 5.922]	0.517
<b>Respondent's age (years)</b>				
<20 (ref)	1		1	
20-35	3.195 [0.128, 79.690]	0.479	0.139 [0.010, 2.004]	0.147
36+	2.484 [0.511, 12.078]	0.259	0.584 [0.150, 2.280]	0.439
<b>Child's age (months)</b>				
0-11 (ref)	1		1	
Dec-23	0.594 [0.133, 2.662]	0.496	1.808 [0.425, 7.696]	0.423
24-59	2.328 [0.575, 9.429]	0.237	1.069 [0.367, 3.112]	0.902
<b>Number of children alive</b>				
1 (ref)	1		1	
2	0.022 [0.002, 0.282]	<b>0.003</b>	5.899 [0.662, 52.583]	0.112
3	0.033 [0.003, 0.370]	<b>0.006</b>	1.837 [0.343, 9.857]	0.478
4	0.087 [0.009, 0.796]	<b>0.031</b>	0.786 [0.141, 4.387]	0.784
5 or more	0.149 [0.015, 1.465]	0.103	0.895 [0.207, 3.878]	0.882
<b>Number of children under-five</b>				
Below 2 (ref)	1		1	
Two or above	2.414 [0.609, 9.574]	0.21	0.819 [0.279, 2.403]	0.716
<b>Provision of nutrition education and counselling</b>				
Yes (ref)	1		1	
No	0.009 [0.001, 0.065]	<b>0.001</b>	0.137 [0.004, 5.207]	0.284
<b>Provision of food supplies for malnourished children</b>				
Yes (ref)	1		1	
No	0.566 [0.144, 2.229]	0.416	0.129 [0.003, 4.773]	0.226
<b>Demonstration of food preparation</b>				
Yes (ref)	1		1	
No	0.227 [0.065, 0.793]	<b>0.02</b>	0.634 [0.196, 2.053]	0.447
<b>Monitoring of children's weight</b>				
Yes (ref)	1		1	
No	0.497 [0.143, 1.603]	0.232	0.604 [0.201, 1.818]	0.37
<b>Visiting of malnourished children in their homes</b>				
Yes (ref)	1		1	
No	0.255 [0.016, 4.125]	0.336	1.083 [0.382, 3.066]	0.881
<b>Supervised feeding of children enrolled in their programme</b>				
Yes (ref)	1		1	
No	0.740 [0.091, 6.048]	0.779	1287844952.936 [0]	0.998
<b>Screening children for malnutrition</b>				
Yes (ref)	1		1	
No	1.940 [0.437, 8.599]	0.383	1.801 [0.453, 7.157]	0.403

<b>Referring sick children to a health facility/clinic</b>				
Yes (ref)	1		1	
No	1.552 [0.468, 5.148]	0.473	0.778 [0.286, 2.119]	0.624
<b>Model summary</b>				
Constant (β)	70.067	<b>0.029</b>	0	0.998
Correct % prediction	66.7		85.6	
Nagelkerke R2	77.70%		0.435	
model Chi square (df)	196.911 (23)	<b>0.001</b>	72.035 (23)	<b>0.001</b>
H Lemeshow Chi square (df)	5.212 (8)	0.735	3.511 (8)	0.898

**Table 5:** Socio-demographics and maternal experience associated with CMAM programme effectiveness

**4. Discussion**

A community-based strategy is predicted to thrive in the Community-based Management of Acute Malnutrition (CMAM). Three of the four CMAM components are community-based, according to the UNICEF (2013a) framework, and the promotion of the community-based idea was to encourage early detection and management of malnutrition cases at the community level, in order to avoid progression to Severe Acute Malnutrition (SAM); community engagement is one of the key tenets of Primary Health Care. Improper organisation/implementation of the intervention simply means that cases which always start as Moderate Acute Malnutrition (MAM) and or uncomplicated SAM, will be missed, and progression to SAM with complications means that community participation will be a challenge. As an assessment of the CMAM programme implementation, this study focused on how the community-based components of the CMAM intervention were implemented in the study districts; availability of tools and supplies, out-patient treatment organisation, trained staff availability and availability of the community-based CMAM services were used as proxy indicators for implementation assessment. It is important to note that, effective

health care provision in any health care system is based on the availability of the required human resource, infrastructure and equipment. Therefore, the quality of CMAM service delivery is linked to the available tools at the CMAM centre and within the CMAM coverage area [14,15]. The current study in the Kumasi Subin sub-metropolis (KSSM) and the Ahafo Ano South district shows that rural (AAS) facilities were more likely than the urban (KSSM) ones to be without the CMAM tools; in addition to the tools listed as not available at both rural and urban facilities, the rural facilities did not have the following: OTP quick reference, SAM classification algorithm, F-75 reference card, F-100 reference card, RUTF ration reference card, TFP multi-chart, and the TFP monthly statistics form. Less than half of the 20 items assessed were available in the rural setting, and only in three instances did the rural area have a tool that the urban facilities did not have – Integrated Community Case Management protocol, Integrated Management of Newborn and Childhood Illness protocol and a functioning electronic weighing scale were the only three items. The qualitative results corroborated these quantitative findings; a good number of the knowledgeable informants in both districts reported the non-availability of essential

tools for CMAM implementation. It is pleasing to note that one of the most basic but very important tools required for successful implementation of the community-based CMAM component, the mid-Upper Arm Circumference tape, was available in both study sites; the comforting fact here is that if the programme was being implemented successfully, the lowest cadre of CMAM-specific health workers, the Community Health Workers (CHWs), would have a tool with which they could screen children at the household level for malnutrition and refer appropriately; CHWs have been at the centre of the CMAM programme since they identify the malnourished children at the household level [16]. However, it is difficult to imagine how the children on the programme were documented since the Out-patient Therapeutic Programme card was missing in both places. Additionally, it is mind boggling to reconcile the absence of tools such as SAM classification algorithm, Length Board, and Stadiometer with the tracking of improvements made by children on the programme; how do the facilities track weight and height gain, and determine the RUTF ration based on weight and specific for each child? Inconsistencies in record keeping, outright zero record keeping, and non-use of monitoring information will collectively contribute to poor programme implementation in the study areas. Even if programmes have well-trained and qualified staff, and in the numbers required, this human resource will be limited in its output by lack of tools (materials) with which to work hence we cannot expect successful CMAM programme implementation. Low tool stocks can be expected to negatively impact the effectiveness of the CMAM intervention in both urban and rural settings in Ghana. Supplies (materials) constitute a required input for processes within systems to yield the desired output. In

CMAM, supplies such as RUTF and other food supplements are essential for the process to reverse mortality in Severe Acute Malnutrition (SAM) cases. Out-patient care (OPC) is an integral part of the CMAM project as most cases of SAM are usually screened at the OPC facility [18,19]. To provide a better understanding of the Out-Patient Therapeutic Programme of the CMAM intervention in KSSM and AAS, this study assessed the out-patient treatment component of the programme by looking at the availability of supplies such as: RUTF, F-75, F-100, routine medication and measuring tools for height and weight. In the current survey, RUTFs and supplementary foods and vitamin/mineral mix were found to be in adequate quantities in the rural district, and this was because donors/development partners supported the provision of such supplies but the donor support was not enough to meet the F-75 and F-100 needs of the rural setting. Meanwhile, RUTFs and supplementary foods were not in adequate quantities in the urban district due to high patronage and over reliance on donor support; mothers/caregivers were buying supplies from shops at prices that were beyond the reach of poor households [20]. The urban health facilities asked parents to buy RUTFs, F-100, F-75 and vitamin/mineral mix to support the programme however, the National Health Insurance Scheme (NHIS) covered the cost of medications. It is worthy to note that, the presence or absence of a donor for each input has implications for programme implementation in the study districts. Park et al. and UNICEF are strong advocates of the notion that, children with Severe Acute Malnutrition without medical complications, should be referred to a Supplementary Feeding Programme (SFP), where they can receive RUTFs, take-home dry rations and immunisation; especially in the urban study area



(KSSM), these supplies were not available at the centres, and one wonders how mothers/caregivers were expected to follow referral instructions [21]. In Ethiopia, the Out-patient Therapeutic Programme is considered as the heartbeat of the CMAM intervention, and the country ensures that RUTFs and other supplies are always available to children who are referred. Unfortunately, the CMAM programme in KSSM and AAS do not have this focus, and mothers/caregivers are likely to be frustrated at having to travel long distances and to pay for the transportation costs only to arrive at the centres to be told that supplies are stocked out. In the qualitative survey in both study sites, mothers/caregivers poured out their anger at this gap; they would rather spend the little money they had to buy food for the children than to waste money on transport to pick up zero supplies. Frustrated mothers/caregivers can be expected to be very harsh with health workers at the centres, and this will lead to mistrust between the two key parties in the quest to address malnutrition at the household/community levels; mothers/caregivers are unlikely to return to these centres to seek treatment for their malnourished children. Shortages of Plumpy Nuts for malnourished children impeded progress being made by CMAM since mothers/caregivers did not go back after long breaks of shortages of the nuts [22]. Some mothers/caregivers will also gain maltreatment and strong vituperations from their male partners when the women, after being trusted to fetch such supplies with meagre household earnings, return only to report stock out of supplies. Shanka, Lemma and Ayu [23] found that in some CMAM programmes, RUTFs were being distributed to non-SAM children and in the current study, such misapplication of supplies and false enrolment may be contributing to shortages in supplies. English et al. and Nolan et al. report that availability of resources

in health institutions had a great impact on the quality of care provided to malnourished children [24,25]. Stock outs of essential supplies may lead to programme ineffectiveness. The out-patient therapeutic component serves mothers/caregivers only at the referral centre on specific days, and mothers are to feed their children in their homes with visits and counselling by the CHWs. This has been documented by Frankel, Roland and Makinen as a solution to prolonged hospital stay and its related challenges [26]. According to Tadesse, Ekstrom and Berhane, these children come once a week or twice a month to the OTP site to receive RUTF, a course of oral broad-spectrum antibiotics, anti-helminthic treatment, folic acid and vitamin A supplementation, measles vaccination and antimalarial drugs where appropriate. According to UNICEF (2013a), the OTP is also intended for children presenting with SAM with good appetite and without medical complications, and for children who are transferred from in-patient care after they recover. On their part, Park stated that, OTP involves admissions of children with SAM but with no complications, who are referred from the targeted communities by CHWs, and severely malnourished children with complications who are provided appropriate medical care to prevent further complications [27]. Ethiopia has embedded the OTP services into their Primary Health Care facilities, therefore bringing OTP closer to target communities [19]. The qualitative findings from the current study support the findings in literature with reference to the OTP component serving mothers only on specific days; knowledgeable informants in the urban setting noted that Wednesdays were for out-patient clients but throughout the week, they received referrals from around the region. However, since the OTP services are rendered at the district health directorate and

regional referral centres instead of CMAM centres in the communities, both KSSM and AAS were not implementing the concept in the communities; the CMAM programme in the study sites is heavily weighted towards the facility-based component because there are not enough health staff (Community Health Nurses and Officers) and neither are there functional Community Health Workers to effect the community-based component of CMAM. This may not allow many MAM cases to be identified early enough for treatment before they progress into SAM with complications, and this will contribute to poor outcomes/programme effectiveness. Human resources make up the most important input for any system. The CMAM services go beyond treating children under-five years and their families to the inclusion of the whole community. According to the World Vision International [28], community leaders, volunteers, health staff and families participate in the screening, care and follow up of children with acute malnutrition. In Ethiopia, Health Extension Workers and Community Health Workers are the drivers of CMAM services in the local health facilities [29]. On a weekly basis, these CHWs update their supervisors at the health posts, meet fortnightly with their HEWs in their localities, and have monthly meetings at the corresponding health posts. An evaluation report by UNICEF (2012) shows that as at August 2011, over 7,000 Community Health Volunteers had been trained to provide OTP services in Ethiopia. In support of getting the critical mass needed to achieve programme effectiveness, the FANTA III project trained a total of 3,063 health care providers and 6,753 community volunteers, opinion leaders and traditional and spiritual healers six months after the implementation of CMAM in Ghana. In the Asante Akim North district of Ghana, five scores of volunteers and traditional healers

including traditional birth attendants were trained to aid early detection, referral, and treatment of acutely malnourished children in their communities. The results of this survey paint a different picture about the current situation in KSSM and AAS. The two districts appear not to have enough trained workers for the community-based activities; since the programme inception in 2012, only eight health workers have been trained in the urban district. It appears the regional scale up in the Ashanti region that must have resulted in the Food and Nutrition Technical Assistance (FANTA) III trainings in the Asante Akim North district, did not ensure that the training covered all the districts within the region. Frequent staff transfers, staff rotations and staff desire for further training/schooling would deplete some districts off CMAM trained staff. The training status in the rural district was despicable; there has never been any formal CMAM training for health staff. It is plausible that poorly trained and untrained staff would misapply anthropometric tools in case detection which would affect admission into, and exit from the CMAM programme in the study districts [30]. Community Health Workers/Volunteers were not functional in any of the districts because the districts cannot afford to pay for their “voluntary services.” This raises serious concerns because the front-line workers such as CHWs are key in the screening and early case detection for referral of uncomplicated cases; CHWs and volunteers have been at the centre of the CMAM programme since in the target communities, they identify the malnourished children at the household level. The success (programme effectiveness) of a CMAM intervention is accurately predicted by active case finding, referral to the community-based component of the programme, and effective follow up measures at the community and household levels, and the

CHWs provide the well-oiled nexus between these predictors. With this link missing in the study areas, SAM cases may not be picked up early enough to meet the aim of the CMAM programme and this may lead to low programme effectiveness. Since the Alma Ata Conference in 1978, community participation has been identified as a pillar for primary health care especially in developing countries where populations are the poorest and the most powerless to have the right and the duty to participate in the planning and implementation of their health care. Community participation helps the community recognize the problem at hand and possible ways to solve it on their own, with or without help from professionals [31]. Myatt and Guerrero [32], in their model that looked at the relationship between factors affecting coverage and effectiveness, conceptualised that all the four components of the CMAM programme need to function optimally for the attainment of positive results, as in programme effectiveness. They opined that health services programmes do better when there is community sensitisation and mobilisation by trained professionals. This will translate to early case detection with fewer complications and therefore managed at the OTP units with all the accruing benefits. The implementation of the community-based components of CMAM has been uninspiring in the two study districts (KSSM and AAS). As a proxy, the availability of three community-based components were assessed in the current survey; out-patient treatment of Severe Acute Malnutrition (SAM) without complications, management of Moderate Acute Malnutrition (MAM) and community outreach. Women/caregivers from both study districts were asked whether services within the three components were available to them – were these services there any time the women went to access the services? The survey found very low

levels of availability regarding the three community-based components; in both places, for each of the components, quantitative data suggest that not more than 1-in-10 mothers/caregivers acknowledged the availability of the components. The component with the highest availability rating was management of MAM in the Ahafo Ano South (AAS) district; a disappointing 6% of mothers/caregivers reported that this component was available to them. Community outreach in AAS was the least likely available component to women and their malnourished children under-five; virtually no woman reported this component as available (0.8%). Surprisingly, the least available component to women in the rural setting (Ahafo Ano South), community outreach, received the highest availability rating in the urban setting (Kumasi Subin sub-metropolis). It is possible that in the face of zero CHWs and few CHNs, KSSM with the smaller number of communities was easier to cover with outreach. Another issue that could be responsible for the low outreach availability was tendency of some mothers/caregivers, for reasons unknown, to give wrong home addresses as Choudhury et al. report from their study in Bangladesh; women/caregivers may feel uncomfortable with home visits to dwelling places that house many households that are a bit unfriendly towards each other. With very low community outreach levels, it follows that out-patient treatment of SAM cases without complications and management of MAM will both have very low availability levels; without the SAM and MAM cases being picked up through community outreach, there would be no cases to offer them these treatment services. Qualitative data from the FGDs with the mothers/caregivers backed this finding of very low availability; when a mother, who is a resident of the rural study area, reports that she has never in her

lifetime as a mother, observed any health worker visit a sick child (malnourished) in the home then the quantitative finding is difficult to dispute. The effectiveness of the CMAM programme in the two study districts is likely to be affected by non-availability of supplies and service components as affirmed by qualitative data; mothers bemoaned issues such as: inadequate staff, recurrent shortages of Plumpy Nuts, F-75, and F-100, and the obligation to buy ingredients for health staff to prepare milk (F-75 and F-100) for their children. In our study, we asked to rate the effectiveness on an ordinal scale, and the relationships between socio-demographics, maternal experiences with CMAM services and effectiveness were determined. The results were very different in the two study districts; while socio-demographics such as number of children alive, and maternal experience variables such as provision of nutrition education and counselling, and demonstration of food preparation, significantly affected programme effectiveness in the urban setting, no variables was found to do similar in the rural district. This finding may suggest that different variables, other than those studied, may be the determinants of programme effectiveness in the rural district [33].

### **Strengths and weaknesses**

This study has limitations. First, we had no way of verifying the answers given by the mothers/caregivers since their contacts with health workers may have resulted in the mothers/caregivers providing socially desirable answers. Second, the period of recall for some of the issues studied was over a decade and respondents may have been unable to vividly recollect the related events. Third, it is difficult to determine cause and effect with cross-sectional surveys. However, the mixed methods

approach and the fact that this is the very first attempt at assessing CMAM at sub-national levels within urban and rural settings is a great plus for the study.

### **5. Conclusions**

The community-based component of the Community-based Management of Acute Malnutrition (CMAM) programme in the Kumasi Subin sub-metropolis (KSSM) and the Ahafo Ano South (AAS) district of Ashanti region, Ghana, has serious implementation challenges. The health administrations in both settings should use effective community entry approaches to engage the community gate keepers and other relevant stakeholders to determine contextualised community-directed pathways to improve programme impact while ensuring that adequate numbers of CMAM-trained health staff are operational in the study districts.

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### **Conflict of interest**

None to declare.

### **Ethical Statements**

This study does not involve any human or animal testing. The Kwame Nkrumah University of Science and Technology/Komfo Anokye Teaching Hospital Committee on Human Research, Ethics and Publications approved the study (CHRPE/AP/314/15). Administrative clearance was sought from the Regional Health Directorate and the Metropolitan/District Health Directorates as well as

the Medical Directors of the study hospitals. Only consenting participants were studied. The purpose of the study, benefits and risks (if any) were explained to study participants. Privacy and confidentiality were assured during all the data collection activities.

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