

**ajfand** SCHOLARLY, PEER REVIEWED  
AFRICAN JOURNAL OF FOOD, AGRICULTURE,  
NUTRITION AND DEVELOPMENT

PUBLISHED BY **AFRICAN  
SCHOLARLY  
SCIENCE  
COMMUNICATIONS  
TRUST** ISSN 1684 5374

Volume 14 No. 2  
April 2014

## IMPLEMENTING NUTRITION INTERVENTIONS IN GHANA AT DISTRICT LEVEL: GAPS AND OPPORTUNITIES

Gongwer CR<sup>1</sup> and R Aryeetey<sup>1\*</sup>



**Cameron R. Gongwer**

\*Corresponding author email: [raryeetey@ug.edu.gh](mailto:raryeetey@ug.edu.gh)

<sup>1</sup>School of Public Health, University of Ghana Box LG 13 Legon, Accra, Ghana

## ABSTRACT

Malnutrition among women and children is an underlying cause of high morbidity and mortality in the developing world. Ghana is one of 36 countries with a high prevalence (> 20%) of chronic stunting in childhood. Although proven and inexpensive technologies and interventions exist to address maternal and child malnutrition, their implementation remains at a low scale in many developing countries, including Ghana. In Ghana, barriers to scaling up nutrition actions have been identified at the national level, yet little is known about the situation at the district and sub-district levels where nutrition interventions are directly delivered. The current study assessed district-level capacity and commitment for accelerating implementation of effective nutrition interventions to address the high burden of maternal and child malnutrition. In June 2010, key informant interviews involving technical officers, clinicians, nurses, and administrative staff, and a desk review of program and administrative reports were conducted in the Omanye District (pseudonym). Using the framework from the WHO landscape analysis of readiness to scale up nutrition actions, interviews explored questions of commitment (financial, planning, collaborations) and capacity (human resources, job aids, skills) to implement nutrition actions in the district. Most key nutrition interventions were being implemented in the Omanye District including growth promotion, micronutrient supplementation, behavior change communication on infant and young child feeding, and a pilot project for community management of severe acute malnutrition. Interventions are challenged, however, by barriers including inadequate financial commitment, low prioritization of nutrition, inadequate personnel, and insufficient job aids. Because nutrition was relatively underfunded in the district, nutrition technical officers had been shifted to perform other or additional tasks. Insufficient investment and inadequate capacity prevents delivery of quality nutrition services in the Omanye District. Interventions that prioritize and improve investment in nutrition actions are needed to optimize nutrition services at the district level in Ghana.

**Key words:** Nutrition, Capacity, Commitment, District, Ghana

## INTRODUCTION

Maternal and child undernutrition contributes an estimated 45% of deaths in children under five [1] and 11% of the global burden of disease [2]. There is strong evidence demonstrating that undernutrition in mothers and children results in both short and long term adverse outcomes, including physical growth faltering, cognitive impairment, and diminished work productivity [3]. Left unchecked, maternal undernutrition can be transmitted across generations in a vicious cycle that perpetuates undernutrition and poverty and diminishes progress towards meeting developmental goals (MDGs 1 and 4).

Childhood undernutrition remains a major public health challenge in Ghana. In 2008, Ghana was classified among the global set of thirty-six countries which account for 90% of all stunting among children under five [4]. This classification is not surprising because in the last decade, stunting prevalence among Ghanaian children below 5 years has decreased only marginally, from 34% to 28% [5]. In addition, micronutrient deficiency rates remain high with about 60% of children under 6 years estimated to have subclinical vitamin A deficiency [6]. Additionally, more than 70% of children under five were anaemic [5]. Among women ages 15-49 years, anaemia prevalence has worsened, increasing from 45% (2003) to 59% (2008) with anaemia occurring in about 70% of pregnant women [5]. Additionally, the rate of undernourishment (BMI < 18.5 kg/m<sup>2</sup>) among women in Ghana has also remained unacceptably high at about 9% since 2003 [5].

The national response to these nutrition challenges by multiple institutions led and implemented by the Ministry of Health has included interventions such as behavior change communication in Infant and Young Child Feeding, the Baby Friendly Hospital Initiative, micronutrient supplementation and fortification, growth promotion, and management of severe acute undernutrition [7, 8]. In addition, legislation has been passed that promotes improved nutritional status. For example, Act 523 (1996) supports iodated salt usage and Legislative Instrument 1667 protects infants and young children from uncontrolled exposure to infant formula. Implementation of these interventions are, however, linked to the capacity of the health system to deliver them, leading to wide disparities in favor of communities with better access to services [9].

Despite these interventions, progress at reducing maternal and child undernutrition in Ghana has been sluggish. In their country-level landscape assessment of readiness to accelerate nutrition actions, Brantuo *et al.* [9] reported the existence of a plethora of policies, legislation, strategies and interventions developed with the support of donor funds to address undernutrition. Some of these policies and strategies have contributed to enhanced recognition of nutrition as an important development issue and incorporation of nutrition into the national development agenda. However, translation of the intents into action has been impeded by challenges that include inadequate human capacity (numbers and skills), logistics, and financial investment.

The study also identified inadequate prioritization of nutrition and the lack of a national nutrition policy as key barriers to accelerating nutrition actions.

Poor performance in nutrition is not unique to Ghana. Insufficient prioritization of nutrition within the National development agenda of many countries has been identified as a key barrier [3]. Additionally, investment in less effective interventions, inadequate implementation of efficacious strategies, and inadequate numbers of trained personnel have been identified as barriers to attaining optimal nutrition at the country level [10]. Further, the scale at which proven interventions has been delivered has not been large enough to reach most at-risk segments of the population [10]. Indeed, there is adequate evidence demonstrating a stall in the scale up of effective nutrition actions in many developing countries [11]. While most of the nutrition interventions are implemented at the local level through the district health administration, limited evidence exists on the factors that limit scale up of the interventions at the district level.

In the current study, capacity and commitment for nutrition programming were measured as indicators of the district's ability and willingness to take action using available technologies and resources, as reported elsewhere [12, 13]. The aim of the current study was to assess the district level capacity and commitment for implementing nutrition programs in a district (undisclosed identity) in Ghana. The authors sought to identify the gaps and opportunities for accelerating proven nutrition interventions at the district level, since the district is the basic operational unit of the health system in Ghana.

## METHODS

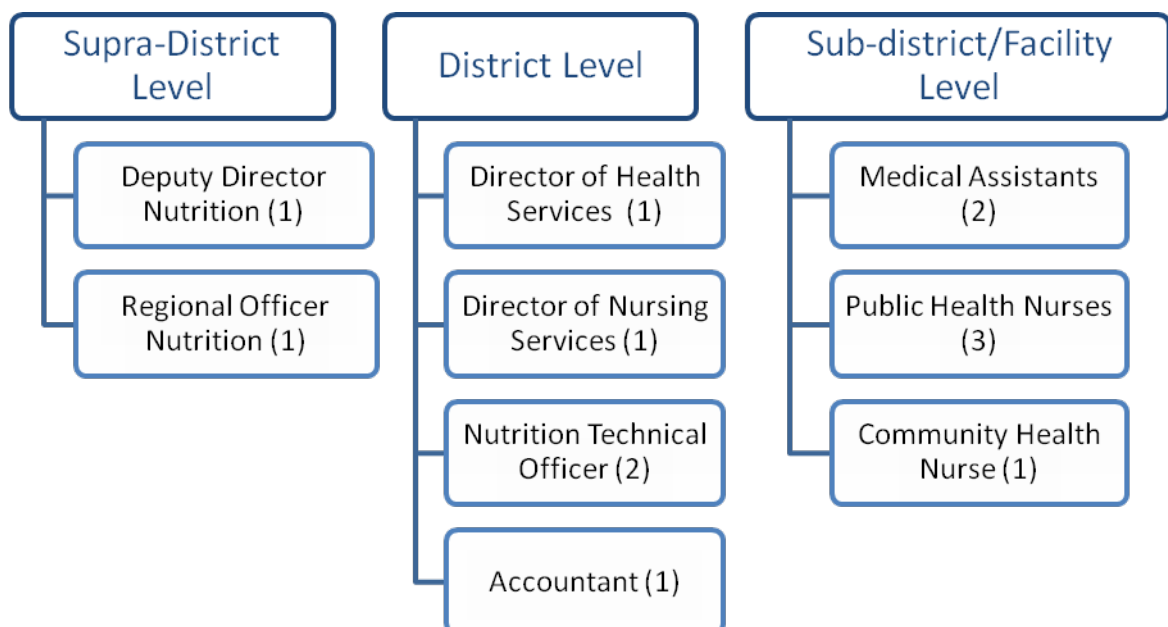
### Study Area, Population and Demographics

Data for the study was collected in a district in southern Ghana. Hereafter, this district is referred to as Omanye in order to keep the identity of the district undisclosed. The Omanye District is one of 10 administrative units in the region. The district comprises 34 distinct communities with an estimated population of 307,062 and a growth rate of about 4.0% [14]. Health services in the district are provided through 7 public and 32 private facilities. Preventive and curative nutrition services are, however, mainly accessed through the public health system.

Although limited evidence of the nutrition situation exists at the district level, available reports, including the District Health Directorate Annual Report of 2009, suggest that undernutrition remains a major challenge. Anaemia prevalence among children under-five was found to be very high (72%) in 2009 [14]. Among pregnant ante-natal registrants, anaemia prevalence was 26% in 2007, increasing to 34% in 2009 [14, 15]. In 2007, severe childhood undernutrition was estimated at about 5% [15].

Data for the current study was collected using desk reviews and key informant interviews conducted during June 2010. Key informants were purposely selected

from different levels of the Ghana Health Service based on their position and knowledge of how district-level activities and programs are implemented. Each informant's ability to speak to issues of commitment and capacity for nutrition implementation was the primary criterion. Permission to recruit interviewers came from the District Director of Health Services. Each key informant was contacted directly for permission to conduct the interview. Key informant interviews were conducted individually with the same interviewer using semi-structured questionnaires and typically lasted 30-60 minutes. The time and location for interviews was selected based on the key informant's preference, usually at a local health center, clinic or administrative office. The thirteen interviews included key personnel involved directly or indirectly with nutrition program implementation in the Omanye District. Key informants included nutrition technical officers, clinicians (medical assistants), nurses (public health, general, and midwives), the District accounts officer, and the District Director of Health Services (Figure 1). In addition, the Regional Director of Nutrition and the National Deputy Director in charge of the nutrition department were also interviewed (Figure 1).

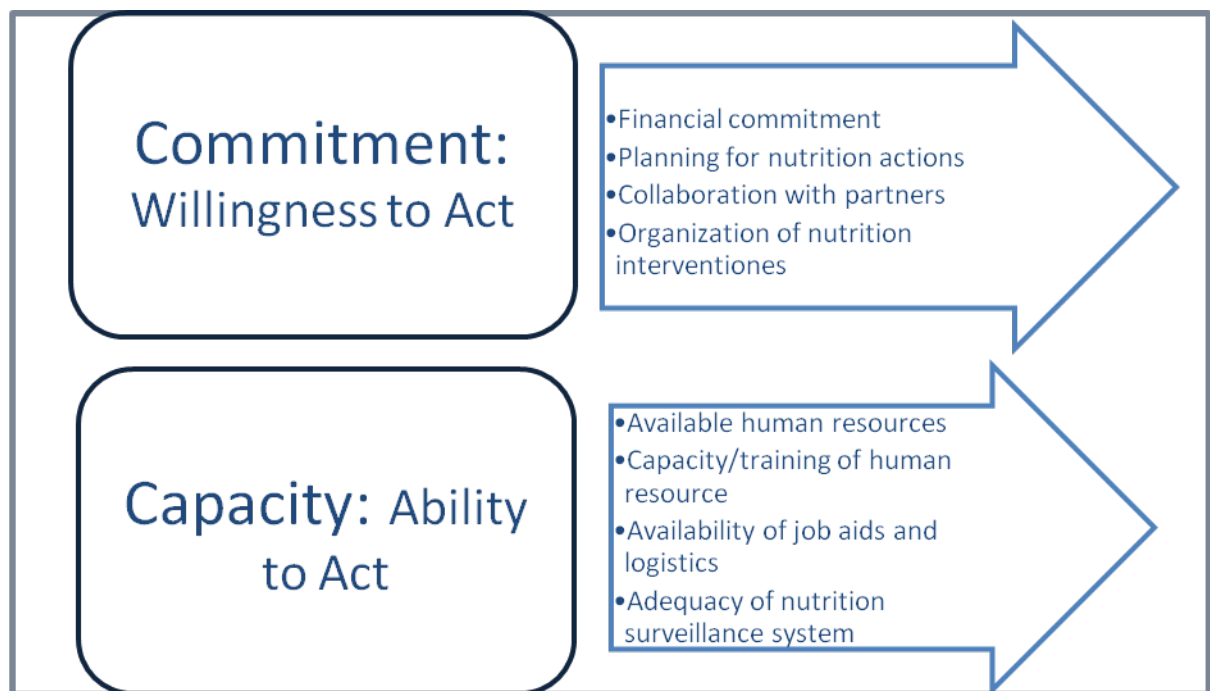


**Figure 1: Key Informants included in the Study**

### Data Collection

Figure 2 shows the conceptual framework of the current study based on WHO landscape assessment tools [16]. The key variables of interest in the study were capacity and commitment to implement proven nutrition interventions at the district level. Semi-structured interview guides were adapted from the tools used in the national level landscape assessment for the current study [9]. Prior to carrying out interviews, the annual reports and financial reports of the Omanye District health directorate were reviewed to extract data relevant to commitment and capacity for

implementing nutrition interventions. In addition, available district health strategy documents relevant to nutrition interventions were analyzed with reference to the conceptual framework. Information gathered included details of the district profile, facilities, health services, nutrition programs, in-service training events, nutrition action plans and nutrition expenditure. Regarding commitment, key informants were asked questions on the types and coverage of nutrition interventions in the district, the planning and organization of nutrition interventions, collaboration between and within public and private sector stakeholders, and financial expenditure in nutrition programs. Concerning capacity, informants answered questions on human resource availability and skills, supervision and adequacy of job aids. A checklist was used to observe availability of job aids needed for nutrition interventions.



**Figure 2: Study a priori Conceptual Framework**

### Data Processing and Analysis

The study analysis used an inductive qualitative analysis approach. Interviews were transcribed verbatim from digital tape recordings. The interviewer organized on spreadsheets the notes and transcribed recordings of informants' responses to questions into relevant themes, which were categorized according to the roles of key informants, and counted. Collated groups of responses pertaining to commitment and capacity for implementing nutrition interventions as indicated in the conceptual framework were analyzed individually and collectively by the authors in order to explain the findings.

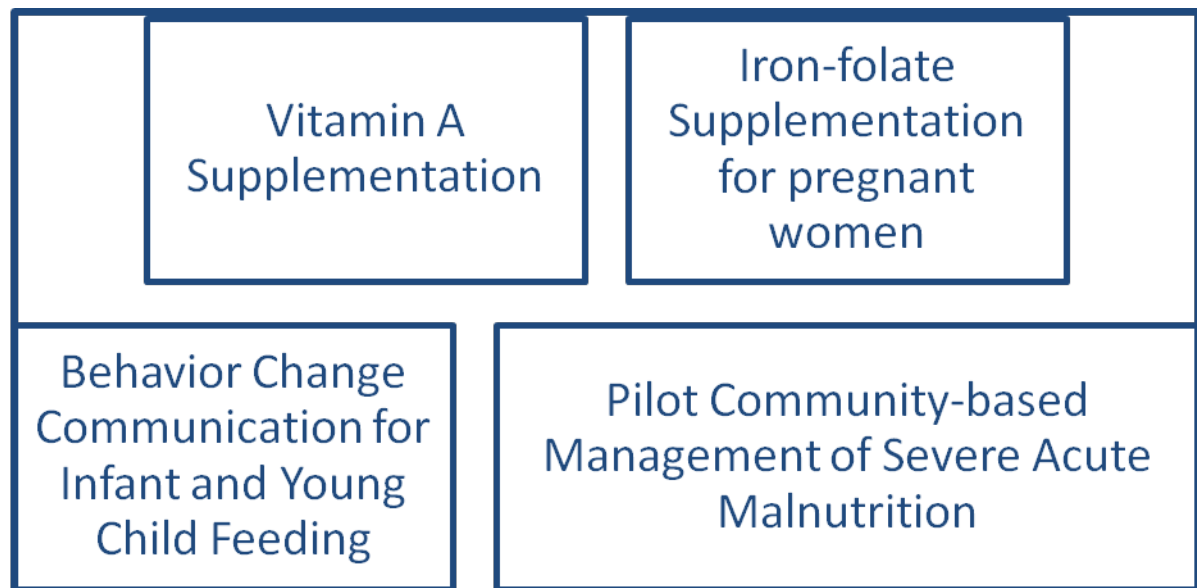
### Ethical Considerations

The study design and procedure would not pose any ethical risk to the respondents. However, authors applied to the Ghana Health Service ethics review committee and ethical approval was granted. Also, permission was obtained from the Omanye District Health Directorate and heads of facilities to implement the study. Informed consent was obtained from all key informants.

### FINDINGS

#### Nutrition Interventions

At the time the study was carried out, nutrition-specific interventions being implemented in the Omanye District included Behavior Change Communication (BCC) targeted at caregivers of young children to improve Infant and Young Child Feeding (IYCF), Growth promotion, Vitamin A supplementation for young children and lactating mothers, Iron-folate supplementation for pregnant women, and Community-based Management of Acute Malnutrition (CMAM) (Figure 3). The listed interventions were implemented through daily or weekly facility-based and outreach clinics. Additionally, a District Nutrition Technical Officer provided dietary counseling services in two locations on a weekly basis, and sometimes by arrangement. Some nutrition commodities like vitamin A, iron, and folate are paid for at a National level and given to clients at no cost. Locally prepared and low cost ready-to-use therapeutic food (RUTF) for undernourished children was provided in the Omanye District.



**Figure 3: Key Nutrition Interventions implemented in Omanye District, June 2010**

In all sub-districts, nutrition interventions were implemented through task-shifting between Midwives, Public Health Nurses (PHN), General Nurses (GN), and Community Health Nurses (CHN), depending on the skills required for implementing the particular intervention. For example, BCC for IYCF was implemented by PHNs and CHNs while iron and folate supplementation was carried out by midwives and PHNs. All nutrition intervention activities were implemented under the direct supervision of the District Nutrition Technical Officer (NTO).

*“So much of the work she (the NTO) has to do really is done together with nursing, the community health nurses, the public health nurses.”* (Regional Nutrition Officer)

The NTO’s activities were also supervised by the District Director of Health Services and the Regional Nutrition Officer (RNO). It was surprising to note that the District has a mobile health monitoring team that visits facilities and outreach sites but does not include monitoring of nutrition activities in their quarterly assessments. Instead, nutrition activities are monitored and reported by the NTO during quarterly and annual review meetings of the DHMT. The RNO in turn visits the District for supervision once each year.

The District Health Administration also played an advisory role in the implementation of the school feeding program (SFP) as evidenced by participation of the District Director of Health on the board that administers the SFP. In addition, the health administration partnered with UNICEF in providing Plumpy Nut as treatment for severe acute undernutrition in a pilot of the national Community-based Management of Acute Malnutrition program in children. Apart from the SFP and the use of Plumpy Nut, a lack of awareness existed within the district Nutrition Unit of additional nutrition actions taken outside the health sector. The study found almost no collaboration with civil society organizations or with the private sector regarding nutrition programmes. The District Assembly oversees all sector activities but reasons for the limited intersectoral collaboration in nutrition are unknown. At the community level, there was no data source to estimate coverage of nutrition interventions being implemented since a baseline survey had not been conducted. District Child Welfare Clinic figures were, however, subjectively reported by the Nutrition Technical Officer to approximate 80-85% coverage.

### **Availability of Job Aids for Implementing Nutrition Interventions**

Table 1 shows the availability of job aids needed for providing nutrition services in the District. At all facilities, scales for measuring child weight as well as growth charts were available. In addition, commodities such as vitamin A capsules and iron-folate tablets were available for children and women. However, none of the health facilities had available protocols, guidelines and strategy documents on site that should guide the implementation of preventive and curative nutrition interventions. These program documents are typically developed centrally and disseminated to the periphery. When the Regional Nutrition Officer was asked why the district did not have these job aids, her response indicated that:

*“... at the district level we don’t have a lot of [job] aids; visual aids, even for the Nutrition Officer to use.”* (Regional Nutrition Officer)



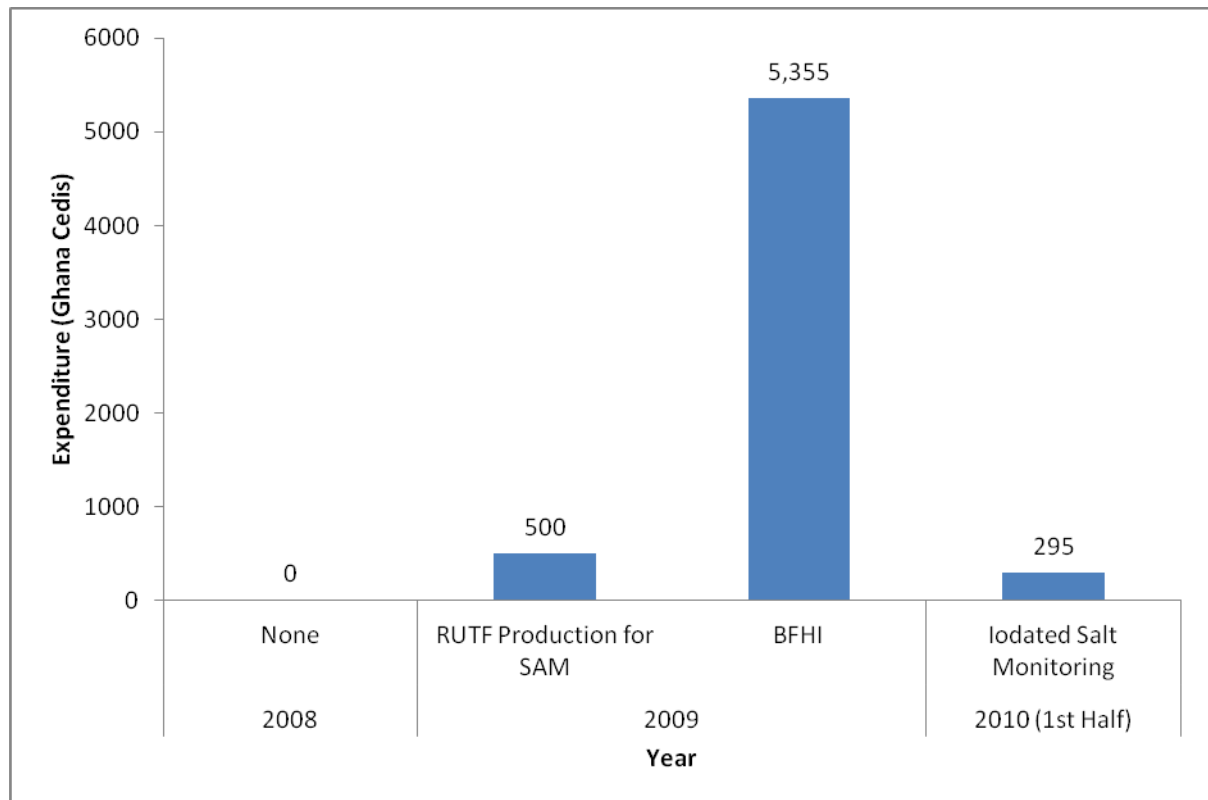
### **District Commitment to Implementing Nutrition Interventions**

A key demonstration of commitment to implementing nutrition interventions in the Omanyé District was identified as the existence of a process for developing an annual Action Plan for nutrition (AAPN).

*“In the plan of action, we look at the previous years’ [data]. We use those figures to actually set up our targets and then we start from there.”* (District Nutrition Technical Officer)

The AAPNs were developed by the Nutrition Technical Officer (NTO) in consultation with the District Director of Health Services. The most recent AAPN developed for year 2010 outlined a number of nutrition activities for implementation during the year, including designation of four maternity facilities as ‘Baby Friendly’, increasing Vitamin A supplementation coverage, and reduction of anaemia prevalence among pregnant women attending antenatal clinic. However, the activities in the AAPN were not linked to any budgetary allocations. As a result, there was no guarantee that the plan will be implemented.

Evidence from actual expenditures for nutrition actions in the three years preceding the study demonstrated that relatively limited resources were invested in nutrition interventions in the Omanyé District (Figure 4). This outcome was observed because much of the funding received by the District was earmarked for specific interventions, usually for infectious disease control. Because no budget lines were allocated for nutrition interventions at the district level, internally generated funds often became the only source for nutrition interventions. Ultimately, the AAPN’s remain unimplemented due to inadequate financial commitment.



RUTF = Ready to Use Therapeutic Food; SAM = Severe Acute Malnutrition; BFHI = Baby Friendly Hospital Initiative

**Figure 4: District Investment in Nutrition interventions in Omanye, 2008-2010**

### **District Capacity to Deliver Nutrition Interventions Human Resources**

At the time of the study, the District had two Nutrition Technical Officers (NTOs) working together to implement nutrition programs. Traditionally, one NTO is assigned to a district. In this case, the second NTO had joined the District two months prior to the study. In addition to implementing nutrition interventions, however, the NTOs in the Omanye District had other responsibilities which were not core nutrition activities. For example, one of the NTOs was also acting as the malaria control coordinator. This role required a commitment of 30% of her working hours.

The NTOs and Public Health Nurses (PHNs) were of the opinion that there was inadequate capacity at the various facilities and outreach sites in the District to implement the full complement of nutrition interventions. According to one NTO,

*“The community health nurses are not enough.”*

The NTOs and PHNs estimated that at least 19 additional community health nurses will be required in addition to the existing staff to adequately implement nutrition interventions in the Omanyé District.

Nutrition-related training for PHNs and Community Health Nurses (CHNs) in Omanyé District has occurred at least yearly since 2007. The National Nutrition Department and the Nutrition Unit of the Regional Health directorate have provided training on the Baby Friendly Hospitals Initiative (BFHI) and also training on the Community-based Management of Acute Malnutrition (CMAM) occurring in 2009 and 2010, respectively. Other nutrition-related training occurring between 2007-2010 focused on Integrated Management of Childhood Illness, new Child Health Record books, Iodated Salt survey, Reproductive and Child Health reporting format, and training on how to promote exclusive breastfeeding by women's support groups. While nutrition training is covered in Omanyé, not all district health staff were included. Also, some staff indicated an inadequate transfer of knowledge to those who did not have opportunity to participate directly in the training sessions although they were required to provide services related to the subject of the training.

*“So we expect at least the knowledge that they went and acquired, that knowledge would impart to those in the sub-districts so they can also utilize the knowledge.”*  
(Public Health Nurse)

Respondents at all levels in the District suggested the need for additional training in counseling skills, complementary feeding, general nutrition and Regenerative Health and Nutrition.

### **Barriers to Capacity**

Key informants from all service points interviewed identified inadequate staff numbers and suboptimal financial support as the two most important requirements to optimize implementation of nutrition actions in the Omanyé District. Additional unmet needs noted by staff included inadequate supply of nutrition assessment equipment, and Information, Education and Communication (IEC) job aids to guide their work.

### **Nutrition Surveillance System**

Identification and monitoring of nutrition indicators enhances the ability to effectively plan and implement nutrition programs. In Omanyé District, access to nutrition data was found to be limited and in most cases unavailable due mainly to poor management of the existing routine data system. Key relevant challenges to the data system were identified as sub-optimal record keeping, differential reporting format requirements leading to duplication of reporting channels, insufficient feedback on coverage, and also inadequate dissemination of data across all units of the District Health Administration. While these information limitations were not unique to nutrition, they were identified as hindering effective planning and implementation of interventions.

## DISCUSSION

The present study was designed to identify gaps and opportunities in the Omanye District's ability to implement proven nutrition interventions. This is the first study implemented at the district level to identify local gaps in the implementation of systemic, district wide nutrition interventions in Ghana. The study found that five key interventions were routinely implemented through the facilities and child welfare clinics in the district. In addition, two interventions were being implemented on a pilot scale. The adequacy of implementation of these interventions, however, was challenged by the relative inadequacy of funding for nutrition activities, inadequate staff numbers and skills, and inadequate availability of job aids. Key indicators of commitment included the annual formulation of a district AAPN to guide implementation of nutrition actions. The district, however, must take the next step of investing more resources into its AAPN in order to realize the goals of the plan.

The divided responsibility of the NTO between nutrition and disease control remains a human resource challenge, not only in the Omanye District but in almost all districts in Ghana. It is not difficult to understand that unlike other technical officers who are kept engaged and fulfilled while implementing funded health programs, NTOs become bored and disillusioned from not having resources to implement nutrition programs that they plan. As reported in the National Landscape analysis, over the course of time NTO's begin to re-prioritize by becoming involved in non-nutrition-specific programs, a more rewarding prospect for their careers than the alternative of doing almost nothing because their nutrition programs were not funded [9]. In this reprioritization process, nutrition programming often loses out to a better-funded disease control unit at the district level. Eventually, this state of affairs creates a situation where nutrition programming is perceived as secondary to disease control. The study findings at district level point out similar gaps identified within national planning studies in Burkina Faso [19], Ghana [9], Guatemala [20], Madagascar [17], and Peru [18]. This suggests that effective actions at the district level may translate into improved nutrition results at the national level. Important gaps were found in human resources, training, supervision, information management and program performance.

Major human resource gaps found in this study include inadequate nutrition staff numbers and training. This finding agrees with the national Landscape Analysis [9], which found inadequate distribution, skills mix, motivation and technical capacity of staff as important constraints. Landscape Analyses from Madagascar [17] and Burkina Faso [19] also identified at the local level a shortage of staff with formal nutrition training. The present study identified the need for at least 19 more Community Health Nurses in Omanye District to provide daily nutrition services at all public health facilities and outreach points. Without these additional personnel, accelerating the reduction of undernutrition and scaling up district coverage will remain a challenge.

The present study found that access by all district health staff to in-service nutrition training is limited partly due to trained staffs that do not pass on their training to colleagues resulting in an incomplete distribution of knowledge within the District. The main issue is not a lack of desire or unrecognized need for additional nutrition training among staff, but the capacity for providing it at the district level. Improved opportunities for staff training and knowledge transfer that better match district resources with needs are required.

The supervision gap in Omanyee District's nutrition program consists of insufficient monitoring by established regional and district monitoring teams. The Ghana [9], Peru [18], and Guatemala [20] Landscape Analyses also identified inadequate monitoring at the local level. Supervisory structures already exist in Omanyee District, but improved operational capacity to supervise from both the region and district level is needed. The lack of nutrition indicators on the District monitoring checklist, the number of additional competing work duties for district and regional supervisory staff, limited funding, and limited transportation contribute to this challenge.

Another important gap is the inadequate management and flow of information collected in the District for nutrition surveillance. Although information is used in forming AAPNs and setting targets in the District, the amount, quality and accessibility of nutrition information limits its usefulness to effectively plan and evaluate progress. Record keeping inefficiencies with different reporting formats, duplicate reporting, inadequate collection, dissemination and feedback strain already limited resources thus becoming an additional burden to the system. These findings agree with the Ghana Landscape Analysis [9], which found nutrition information not readily available, no standard reporting form with duplication of reports, and an uncoordinated information management system. Landscape Analyses from Burkina Faso [19] and Madagascar [17] identified similar deficiencies.

Major gaps in nutrition program performance in the Omanyee District include coverage determinations limited only to attendants at health service points, inadequate anaemia control among children and pregnant women at first attendance to Antenatal Clinic, and insufficient management of severe acute undernutrition. While targets based on attendance at facilities and outreach points serve as a surrogate measure of coverage, a more accurate baseline community nutrition survey with regular progress monitoring is necessary. High anaemia levels among children and mothers indicate deficiencies to address anemia at an early stage. Laboratory capacity is a critical factor for the accurate diagnosis, monitoring and treatment of anemia.

A positive indication of commitment and capacity to initiate and sustain a limited scale nutrition program in the Omanyee District was the DHMT's recognition of children severely underweight and intervention with a locally prepared RUTF. The subsequent introduction of CMAM in 2010 and the use of Plumpy Nut in Omanyee have further addressed this gap. Early indications suggest this pilot program has improved the nutritional status of severely underweight children and has fostered greater enthusiasm in nutrition programs among health staff. Severely

undernourished children who otherwise would remain hidden within communities now receive treatment at the local level.

A finding from the study that differs from the Ghana Landscape Analysis is the gap of limited job aids, such as the quantity of IEC materials and food demonstration models needed by staff for teaching and promoting optimum nutrition practices. These findings differ from Brantuo *et al.* [9], who found that information materials were generally available in health facilities. Possible reasons for this difference may include regional variations and priorities for district health facilities, as well as availability of material and financial resources.

In summary, the present study focusing on nutrition program implementation at the district level agrees generally with national level studies in Ghana and other countries in that capacity for implementing nutrition interventions is weak at the basic operational level. Current nutrition programs implemented in Ghana indicate a moderate level of commitment to reducing maternal and child undernutrition. In the present study in Omanye District, notable differences from the National analysis include the priority role for nutrition over disease control by NTO's, the limited availability or use of vertical program funding for nutrition, limited IEC materials, and the unmet need for staff to provide daily nutrition programs at all health facilities and outreach sites. The present study thus revealed two predominant gaps: inadequate nutrition staff numbers and suboptimal financial expenditure. These were recognized by all levels of the health service (such as from the sub-district to region) as priority needs. Other important gaps identified include nutrition planning and policy, equipping staff with appropriate training and resources, and involving patients and communities to effectively implement nutrition programs. These capacity needs are essential for effectively delivering nutrition programs and deserve urgent attention. Although findings from this study are limited to the Omanye District, they may be relevant to other districts in Ghana.

**Table 1: Availability of Nutrition Job Aids and Guidance at Selected Facilities in the Omanyé District, June 2010**

	Baako Health Center	Mienu Health Center	Miensa Polyclinic	Enan Polyclinic	Enum Hospital
Vitamin A protocol					
CMAM protocol		√	√		
IYCF strategy document					
Guidelines for HIV & Infant Feeding		√			
Guidelines for ENA's (booklet)					
Available and Functioning weighing scales	√	√	√	√	√
Measuring Boards (infantometer)					
MUAC Tapes	√	√	√	√	
Stock of Child Growth Records	√	√	√	√	√
Vitamin A capsules	√	√	√	√	√
Iron and Folic Acid Tablets	√	√	√	√	√
RUTF	√	√	√	√	

√ = Availability of Tools; CMAM = Community based Management of Acute Malnutrition; IYCF =

Infant and Young Child Feeding; ENA = Essential Nutrition Actions; MUAC = Mid Upper Arm

Circumference; RUTF = Ready to Use Therapeutic Food.

Names of facilities are pseudonyms

## REFERENCES

1. **Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, Onis M, Ezzati M, Grantham-Macgregor S, Katz J, Martorell R and R Uauy** Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*; Published online June 6, 2013 [http://dx.doi.org/10.1016/S0140-6736\(13\)60937-X](http://dx.doi.org/10.1016/S0140-6736(13)60937-X).
2. **Black RE, Allen LH, Bhutta ZA, Caulfield LE, Onis M, Ezzati M, Mathers C and J Rivera** Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* 2008; **371**: 243–60.
3. **UNICEF.** Tracking Progress on Child and Maternal Nutrition: A Survival and Development Priority. UNICEF, New York, 2009.
4. **Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, Haider BA, Kirkwood B, Morris SS, Sachdev HPS and M Shekar** What works? Interventions for maternal and child undernutrition and survival. *Lancet* 2008; **371**: 417–40.
5. **Ghana Statistical Service (GSS), Ghana Health Service (GHS), and ICF Macro** Ghana Demographic and Health Survey 2008. Accra, Ghana: GSS, GHS, and ICF Macro, 2009.
6. **Micronutrient Initiative** Ghana: Vitamin and Mineral Deficiency Status and Actions. Available from <http://www.micronutrient.org/VMD/Ghana.asp>. Retrieved on 28 February 2012.
7. **Ghana Health Service** Imagine Ghana Free of Malnutrition: A Concept Paper for Addressing Malnutrition in Ghana as a Development Problem Using Health as an Entry Point. 2005.
8. **Ghana Health Service** National Infant and Young Child Feeding for Ghana Strategy Document. 2007.
9. **Brantuo MNA, Okwabi W, Adu-Afuawuah S, Agyepong E, Attafua NT, Brew G, Gomez V, Dawson A and J Ashong** Landscape Analysis of Readiness to Accelerate the Reduction of Maternal and Child Undernutrition in Ghana. *SCN News* 2009; 31- 37.
10. **Bryce J, Coitinho D, Darnton-Hill I, Pelletier D, and P Pinstруп-Andersen** Maternal and child undernutrition: effective action at national level. *Lancet* 2008; **371**: 510–26.
11. **Nishida C, Shrimpton R and I Darnton-Hill** Landscape Analysis on countries' readiness to accelerate action in nutrition. *SCN News* 2009: 4-9.



12. **Hughes R, Black C and NP Kennedy** Public Health Nutrition Intervention Management: Capacity Assessment. *JobNut Project*, Trinity College Dublin, 2008: 1-27.
13. **Heaver R** Strengthening Country Commitment to Human Development: Lessons from Nutrition. World Bank. 2005: 1-91.
14. **Ghana Health Service** Omanye District Health Administration Annual Report. 2009.
15. **Ghana Health Service** Omanye District Health Administration Annual Report. 2008.
16. **Chopra M, Pelletier D, Witten C and M Dieterich** Assessing countries' readiness: Methodology for in-depth country assessment. *SCN News* 2009: 17-22.
17. **Raveloharison A and SC Rakotonirina** Landscape Analysis on Countries' Readiness to Accelerate Action to Reduce Maternal and Child Undernutrition: the Madagascar Assessment. *SCN News* 2009: 43-48.
18. **Lutter C, Casanovas C, Pena M and A Diaz** Landscape Analysis on countries' readiness to accelerate action to reduce maternal and child undernutrition: The Peru Assessment. *SCN News* 2009: 49-54.
19. **Tapsoba S** Towards Nutrition MDGs in Burkina Faso: Will Capacity to Act Follow the Commitment? *SCN News* 2009: 23-30.
20. **Aguilar JR, Alvarez E, Lutter C and M Fischer** Landscape Analysis on Countries' Readiness to Accelerate Actions to Reduce Maternal and Child Chronic Malnutrition: The Guatemala Assessment. *SCN News* 2009: 38-42.