Technical Brief:

Karaga District, Ghana: Infant and Young Child Feeding and Food-Based Recommendations

Findings from an Optifood Analysis and Focused Ethnographic Study

1. Introduction

This technical brief presents findings from research conducted by the Global Alliance for Improved Nutrition (GAIN) during 2014, in support of the U.S. Agency for International Development (USAID) and its development partners in Northern Ghana. Among the aims of USAID's development assistance in Ghana is the improvement of infant and young child feeding (IYCF) practices by establishing more-effective links between agriculture and nutrition. GAIN's research sought to identify strategies to improve the nutritional quality of the diet of infants and young children using locally available and affordable foods. Specifically, it aimed to identify a set of evidence-based, population-specific food-based recommendations (FBRs) that can be promoted to improve IYCF among farming communities in Ghana's Northern Region. In addition, this information will help contextualise community-based IYCF guidelines for this population and identify nutrition-specific and nutrition-sensitive strategies that can support improved IYCF.

The research described here was conducted concurrently with a similar study in Gomoa East District, in Ghana's Central Region. Outcomes from Gomoa East are summarised in a separate technical brief (GAIN 2016). A combined report containing a fuller account of findings from both districts is available on the GAIN website.

2. Infant and Young Child Feeding in Ghana

The importance of adequate nutrition in the period between conception and a child's second birthday for achievement of optimal growth, health, and behavioural development is well established (World Health Organisation [WHO] 2010). Child malnutrition, particularly stunting and micronutrient deficiencies, results primarily from diets that do not meet energy and nutrient requirements to support the rapid growth during this '1,000-day window'. For most of the past two decades, the prevalence of childhood stunting in Ghana has hovered around 30%, leading to the country's inclusion in the list of 36 high-burden countries for malnutrition (Black et al. 2008). Recent estimates show some reduction in malnutrition rates, but anaemia (often used as a proxy indicator for micronutrient deficiencies) still affects 70% of children under 5 years (GSS et al. 2015). Using the minimum acceptable diet as an indicator, optimal IYCF appears to be worsening: Whereas 64% of infants and young children 6–23 months were inappropriately fed in 2008, the 2014 estimate is 87%.

3. The Karaga District Context

Karaga District is one of 26 administrative districts in Ghana's Northern Region, which is classified among the poorest and most underserved regions of the country. Thirty-four percent of Northern Region's households are in the lowest income quintile (GSS 2014a), and the literacy rate amongst those aged 15 and above in the Northern Region is just 33%, compared with a corresponding national rate of 72% (GSS 2012). The severe forms of both chronic and acute malnutrition are also most prevalent in the Northern

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Region, where the rates of severe stunting (10.7%) and severe wasting (1.6%) were recorded in 2014 (GSS et al. 2015). Due to Karaga's status as a recently created district, there is a paucity of district-specific nutritional data. Available district-level data indicate that 11% of Karaga's households were moderately or severely food insecure, similar to the 9.7% recorded for Northern Region as a whole (World Food Programme [WFP] 2012). In 2012, the district had a population of about 77,706 (48% male and 52% female) and an average household size of 10 (GSS 2012), and its inhabitants are predominantly subsistence farmers dependent on a single annual rainfall that normally peaks during August/September (Karaga District Assembly 2006). Major traditional crops cultivated include cereals (maize, sorghum, millet, and rice), legumes (soya beans, groundnuts, and cowpeas), and starchy roots (cassava and yam).

4. Study Methods

This study was conducted among caregivers in Karaga District with infants and young children 6–23 months of age. The Ghana Health Service (GHS) has divided the district into four sub-districts. For this study, the Karaga sub-district was randomly selected from the four sub-districts. The sample was subdivided into four distinct groups: breastfed children 6–8 months old, 9–11 months old, and 12–23 months old and non-breastfed children 12–23 months old. Two separate, complementary study methods were used: 1) an Optifood analysis of dietary intake data and 2) a focused ethnographic study (FES) of IYCF practices (Pelto and Armar-Klemesu 2014).

Dietary Intake Assessment and Optifood Analysis. Dietary intakes of the children were assessed using a quantitative multi-pass 24-hour recall (Gibson and Ferguson 2008). Data derived from the dietary assessment were modelled using Optifood software (Ferguson et al. 2006). Optifood applies a linear programming approach to model a series of possible diets based on the prevailing dietary patterns of the target children to formulate FBRs that aim to optimise nutrient intake adequacy. The analysis also identifies problem nutrients for which adequate intakes cannot be achieved with currently consumed foods and within the boundaries of current dietary patterns. In addition to total fat and protein, 11 key nutrients are considered in the analysis: iron, zinc, calcium, vitamin A, vitamin C, thiamine, riboflavin, niacin, vitamin B6, folate, and vitamin B12. The Food and Agriculture Organization of the United Nations (FAO)/WHO Recommended Nutrient Intakes (RNIs) were used for all nutrients (FAO/WHO 2004) except zinc (International Zinc Nutrition Consultative Group [IZiNCG] 2004). Based on the diet types in these regions, low bio-availability was assumed for iron and zinc. For analysis of fat intakes, an average requirement of 30% of total energy was assumed.

Breast milk intake was not measured directly, and low levels of intake were assumed for this population (defined as the mean breast milk intake minus 2 SD; WHO/UNICEF 1998) given the relatively high rates of wasting among children under 5 years observed in this population (13.7% overall). As this assumption affects estimated dietary intakes and interpretation of results, some comparisons are made with results when average breast milk intake is assumed.

Children eligible for inclusion in the study were randomly selected from a household census listing. Sampling for the dietary survey called for the inclusion of 400 children, with 100 infants and young children per age sub-group, while the attained final sample was: breastfed children 6–8 months old, 103; 9–11 months old, 98; 12–23 months old, 108; non-breastfed children 12–23 months old, 29. As the number of non-breastfed children was limited, a total sample of only 338 infants and young children was ultimately obtained. It is important to note that the non-breastfed children 12–23 months old were, as a group, an average of 4 months older than their breastfed age counterparts.

Focused Ethnographic Study Method. The FES uses classic ethnographic techniques, including in-

depth interviews and open-ended questions, together with more-structured rating and ranking tasks intended to elicit respondents' cognitive or cultural models (Pelto and Armar-Klemesu 2014; Romney and Weller 1988). The FES method can provide insight into the local factors that constrain and influence IYCF practices. These may be cultural, environmental, social, or technological (Pelto et al. 2013). The sample used in the FES interviews was 40 respondents, including 8 caregiver key informants and 32 caregiver respondents.

Data collection for both the Optifood and FES components of the study was carried out during June/ July 2014. These months fall in the middle of the annual May–October rainy season, a period characterised by pre-harvest food insecurity, although it is typically more secure than the months immediately preceding the harvest. Approval to carry out the research was granted by the Institutional Review Board of the Noguchi Memorial Institute for Medical Research, University of Ghana.

5. Findings

5.1 Food Consumption Patterns

The main food types and average daily portion sizes of foods consumed, by food group, are summarised in **Table 1**.

Prevalence of consumption by food group. On the day of recall of dietary intakes, nearly all children consumed foods from the 'Grains' food group (predominantly maize), while foods from the 'Dairy', 'Fruits', and 'Starchy roots' groups were consumed by few children, regardless of age (Table 1). Foods from the 'Meat, fish, and eggs' (almost exclusively represented by fish), 'Vegetables', and 'Added fats' groups were consumed by little more than one-quarter of infants 6–8 months old, but consumption increased substantially with age.

Portions consumed by food group. The daily amounts of foods consumed from nutrient-dense food groups like 'Meat, fish, and eggs', 'Legumes', 'Fruits', 'Vegetables', and 'Dairy' were relatively small (Table 1). Among breastfed children, the mean portion sizes for these groups were each less than 10 grams, and among infants 6–8 months old, the 'Meat, fish, and eggs' group were as little as 1 gram. Portion sizes do not increase consistently with age among breastfed children, but become noticeably larger among non-breastfed compared to breastfed children at 12–23 months of age.

Table 1. Percentage of children consuming food groups and average daily portion sizes per food group consumed by children, per age group and breastfeeding status, Karaga District, Ghana

		Infants and young children consuming foods by food group in previous 24 hours (%)				Mean daily portion size (grams/day)*			
Food groups	**Food types consumed**	**6–8 BF** n=103	**9–11 BF** n=98	**12–23 BF** n=108	**12–23 NBF** n=29	**6–8 BF** n=103	**9–11 BF** n=98	**12–23 BF** n=108	**12–23 NBF** n=29
Grains	Maize, guinea corn, millet, rice	92	96	97	100	33	23	40	65
Bakery and breakfast cereals	Bread, biscuits	8	10	9	28	9	0	50	73
Starchy roots	Cassava	9	17	18	17	3	6	9	34
Meat, fish, and eggs	Dried pounded anchovies, canned mackerel	27	60	86	93	1	1	2	12
Dairy	Cow milk powder	12	11	17	21	3	2	5	274
Fruits	Watermelon	6	9	11	17	0	72	126	118
Legumes, seeds, and nuts	Groundnut, cowpea, pigeon peas, soya bean	28	54	85	100	3	5	9	17
Vegetables	Green leafy vegetables (*ayoyo*, *bra*, baobab, cowpea leaves), tomato, okro	27	62	88	97	5	4	9	11
Added fats	Vegetable oil (vitamin A fortified and non-fortified)	17	37	63	62	14	9	8	12
Added sugar	White sugar	52	52	59	66	6	9	14	16

BF=breastfed; NBF=non-breastfed

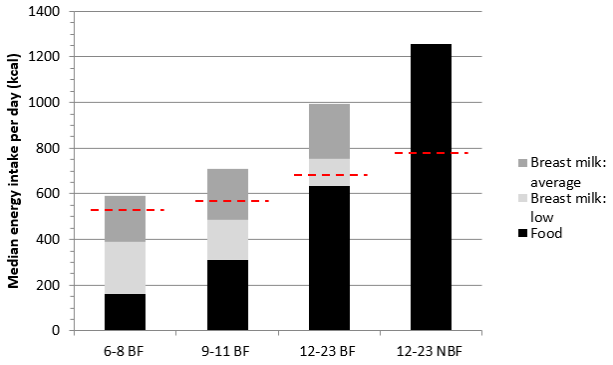
* Mean daily portion sizes were calculated only for consumers of those food groups and did not include zero values.

5.2 Dietary Energy Intake

Overall, when low breast milk intakes are assumed, the energy intakes for all breastfed children under 1 year of age are below the estimated energy requirements (hatched line in **Figure 1**) and for children who are fully weaned, intakes from diet alone are above the requirements. However, when average breast milk intake (mean; WHO/UNICEF 1998) is assumed, estimated median energy intakes meet or exceed the energy requirements among all groups. It is likely that the actual breast milk intakes lie between these two estimates, and the selection of the mean minus 2 SD amount is used here as the more conservative estimate and representative of nutritional status.

Grains are the main source of energy, accounting for approximately two-thirds of total energy intake (**Table 2**). The next most important food group sources of energy are the 'Added fats' and 'Legumes, seeds, and nuts', which provided a modest (<15%) of intake.

Figure 1. Median daily energy intake from food and breast milk compared to daily energy requirements per age group and breastfeeding state, Karaga District, Ghana



BF=breastfed; NBF=non-breastfed

The columns show the estimated total mean energy intake from food and breast milk using two different assumptions for breast milk intake: average (mean) breast milk intake and low (mean minus 2 SD) breast milk intake (WHO/UNICEF 1998). Hatched lines represent daily energy requirement calculated from age, sex, and body weight (FAO 2004).

Table 2. Percentage contribution of food groups to energy intake of children per age group and breastfeeding status (assuming low breast milk intake), Karaga District, Ghana

Food groups	6–8 BF n=103	9–11 BF n=98	12–23 BF n=108	12–23 NBF n=29
Grains	68	62	61	60
Added fats	8	13	15	10
Legumes, seeds, and nuts	7	7	10	13
Added sugars	7	6	5	4
Dairy	1	3	2	2
Bakery and breakfast cereals	2	2	2	3
Starchy roots	1	2	2	1
Vegetables	2	2	1	2
Others	4	3	2	5

BF=breastfed; NBF=non-breastfed

5.3 Nutrient Intake Adequacy

For many of these infants and young children, the adequacy of intakes for key nutrients was low, which is indicative of very poor quality diets, particularly among the infants. For more than half of all infants 6–8 and 9–11 months old, nutrient intakes were inadequate for all 11 nutrients. Among breastfed and non-breastfed children 12–23 months of age, the intakes of eight and five nutrients, respectively, were inadequate[1] for more than 50%. As noted in the discussion of energy intake above, these results assume below-average breast milk intake. Under a scenario of average breast milk intake, the percentage of breastfed children with micronutrient intakes below the RNI was reduced to 11, 10, and 4 nutrients among infants 6-8 and 9-11 months and children 12-23 months of age, respectively. The greatest reductions in percentage with low intakes occurred for vitamins A, B12, and C. For other nutrients, especially iron, zinc, calcium, and thiamine, the differences were small and would not change the overall interpretation of nutritional risk.

The Optifood analysis identifies problem nutrients, or those nutrients for which requirements are difficult to meet with the available local foods and dietary patterns among the target groups. A

[1] 'Inadequate' is defined as intakes below the RNI for infants 6-8 and 9-11 months of age, and below the Estimated Average Requirement (derived by adjustment of the RNI) for children 12-23 months of age.

summary of problem nutrients by sub-group is presented in **Table 3**.

For the breastfed children, 6–8 of 11 nutrients were considered to be problem nutrients and therefore either additional nutrient-dense foods would need to be introduced to these children's diets or existing nutrient-dense foods would need to be consumed with serving sizes or frequencies well beyond those observed in the dietary survey. The problem nutrients common across all three age sub-groups were calcium, iron, riboflavin, vitamin B12, and vitamin C. For the non-breastfed children 12–23 months, requirements for all 11 micronutrients considered could be met with changes in the diet using commonly consumed local foods.

Table 3: Summary of problem nutrients in the diet of children by age group and breastfeeding status, assuming low breast milk intake, Karaga District, Ghana*

Micronutrients	6–8 BF	9–11 BF	12–23 BF	12–23 NBF
Calcium	■	■	■	■
Iron	■	■	■	■
Zinc	■	■	■	■
Vitamin A	■	■	■	■
Niacin	■	■	■	■
Riboflavin	■	■	■	■
Thiamine	■	■	■	■
Vitamin B6	■	■	■	■
Folate	■	■	■	■
Vitamin B12	■	■	■	■
Vitamin C	■	■	■	■

■ = Nutrient requirements cannot be met by any combination of local foods

■ = Nutrient requirements could be met but may require changes in the diet

BF=breastfed; NBF=non-breastfed

* Problem nutrients will be fewer if average breast milk intakes are assumed, especially vitamin C and vitamin B12 and, to a lesser extent, vitamin A.

5.4 Food-Based Recommendations

The solutions to the nutrient gaps identified by the Optifood linear programming method are constructed around foods in the existing diet found to provide more than 5% of the RNI for at least 1 of the 11 micronutrients. Initially, these are generated without regard for consistency of recommendations across age groups. They are then adapted into a set of harmonised dietary modifications with the aim of achieving greater consistency across age groups for simplicity of messaging.

Table 4 presents the final, adapted FBRs for Karaga expressed as the number of servings per day of specific foods or food groups that should be incorporated as part of the infant and young child (IYC) diet. As the Optifood approach limits the recommendations to foods that are already consumed in the target population and the frequency to within the upper boundary of frequency observed, these recommendations are considered to be realistic, but may be more easily attainable for some, while still difficult for others. Although the proposed increase in frequency of 'Meat, fish, and eggs' constitutes a significant change in feeding habits, the portion sizes assumed are small.

Incorporating these FBRs into the IYC diet in Karaga would significantly improve the nutritional adequacy of several, but not all, micronutrients. Shaded cells in **Table 5** highlight nutrients that could reach 70% or more of the RNI by adopting the FBRs. The unfulfilled nutrients number between 3 and 8 of 11, depending on the target group. Even for households where cost presents no barrier and the recommendations are successfully adopted in full, a comprehensive solution to micronutrient deficiencies clearly entails the introduction of foods not already consumed in Karaga. It should be acknowledged that collecting data during either a less insecure or a more insecure period in the agricultural calendar might alter either the problem nutrients or the number of micronutrients reaching adequacy.

While the FBRs were not determined for the average breastmilk intake assumption, it is likely that the adequacy of nutrient intakes of a diet incorporating these FBRs would be greater.

Table 4. Food-based dietary recommendations for young children per age group and breastfeeding status, to be included as part of the IYC diet*, Karaga District, Ghana

Foods	Servings per day			
	6–8 BF	9–11 BF	12–23 BF	12–23 NBF
Breast milk	on demand	on demand	on demand	
Fortified chocolate beverage powder	1			
Vegetables	2 (of vitamin A-rich vegetables)	2 (of green leafy vegetables)	2 (of green leafy vegetables)	5 (of which 2 are green leafy vegetables)
Dairy	1	1	1	1
Grains (preferably whole grains and not including rice)		3	3	3
Fruits		1	1	1
Meat, fish, and eggs		2 (of which 1 is small fish)	2	2
Beans, nuts and seeds		3	3 (of nuts and/or seeds)	3 (of which 1 is of beans)

BF=breastfed; NBF=non-breastfed

* Recommendations are presented as number of servings per day to be included as part of the IYC diet.

Table 5. Nutrient composition of the harmonised FBRs per target group in Karaga District, Ghana*

Target group	Percentage RNI											# Nutrients ≥ 70 % RNI
	Calcium	Vitamin C	Thiamine	Riboflavin	Niacin	Vitamin B6	Folate	Vitamin B12	Vitamin A (RAE)	Iron	Zinc	
6–8 BF	47.8	69.8	73.6	72.6	47.6	75.0	51.7	74.6	47.7	11.0	20.3	4
9–11 BF	3.71	62.0	142.1	74.0	69.8	131.6	68.8	56.2	45.4	21.7	42.8	3
12–23 BF	39.7	74.4	116.9	79.7	85.2	130.4	47.9	52.1	44.6	47.9	105.3	6
12–23 NBF	63.6	72.8	151.8	117.1	96.3	163.0	93.5	64.2	31.5	84.3	163.1	8

BF=breastfed; NBF=non-breastfed

* Nutrient composition shown as a percentage of the RNI reflects the lowest nutrient content possible in a diet that achieves the FBRs being modelled. Shaded cells indicate nutrients ≥70% of the RNI in modelled diets.

5.5 Barriers and Enablers for IYCF

The FES interviews with caregivers revealed several positive aspects of the IYCF environment in Karaga that can offer a sound foundation for nutrition interventions and related behaviour change communications (BCC). They also identified practices and beliefs that may have the effect of compromising the adequacy of IYC diets. Observations with positive implications include the following.

- **The provision of special foods for infants and young children is already an established practice in Karaga.** Mothers and other caregivers are already in the habit of preparing 'soft' dishes intended specifically for children too young to chew family foods, including *molikoko*[2] rice and stew, beans, and palm oil. Some of these preparations involve considerable time commitment, such as additional pounding or sieving of flours to achieve a degree of fineness considered suitable for infants or fermenting porridge doughs over several days. The concept of a dedicated IYC food is thus an established part of the feeding culture that can be expanded on by health and nutrition stakeholders.

[2] A maize porridge prepared especially for children, in which the dough is fermented and then sieved before cooking

- **There is a considerable range of food types contained in the most common family food recipes, which could be leveraged in efforts to expand dietary diversity among older children.** Although dietary diversity scoring was not a feature of this study, it is clear from the FES that the core family dishes consumed in Karaga encompass a broad range of food types, including staple grains (usually the maize dumpling *tuozaafi*[3], accompanied by sauces or soups that combine dried fish, cooking oil, onions, tomatoes, green leafy vegetables known locally as *bra*[4] or *ayoyo*[5], and, in some dishes, groundnuts in paste or powdered form. The variety of ingredients contained in the most common stews and sauces means that efforts to increase the consumption of some healthy foods (e.g. fish or leafy greens) can be achieved by focusing on expanding the quantities used in the preparation of standard dishes, rather than promoting the consumption of entirely new dishes or ingredients.
- **The common beliefs about foods and their nutritional properties are consistent with several tenets of nutritional science.** The prevailing ideas about individual foods are not always accurate, but the process by which Karaga caregivers evaluate the foods to offer or withhold from children shares some important elements with modern nutritional science. The commonalities include a recognition of the importance of balancing dietary components; a notion of the therapeutic power of particular foods, such as fruits; and the superior ability of some foods to supply energy and support growth (in the view of caregivers by 'building' or 'making' blood). This common foundation, likely due at least in part to the efforts of local health workers, provides a good basis for further efforts to address variances (examples noted below) through community nutrition education.

[3] A thick porridge prepared with maize flour and consumed as a staple with vegetable-based sauces by older children and adults.

[4] A leafy green vegetable (*Hibiscus sabdariffa*), usually consumed in soups, often together with groundnut paste.

[5] Another leafy green, also usually consumed in soups.

Among the sub-optimal features of IYCF in Karaga are the following,

- **Porridges prepared for infants and younger children consist mostly of maize or millet, un-enriched by any more nutritious ingredients.** Sugar is normally the sole addition, although caregivers are aware of advice to add milk to infant porridge. Their failure to do so is partly attributable to the cost of milk. Fresh milk is not readily available in Karaga, so milk is purchased mainly in powdered form. Caregivers rated porridge enriched with milk among the most expensive foods.
- **Fruit rarely appears in the IYC diet.** This is despite the fact that caregivers recognise that fruit has many healthy properties and, in a ratings exercise, judged it to be among the more affordable foods. It may be that the seasonal increase in the cost of fruit was captured by in the ratings. Caregiver narratives, however, suggest another reason for why IYC are not consuming fruit, even if it is not deemed costly: Fruit appears to be reserved more for therapeutic use, to improve or recover IYC appetite, and is not considered a food for everyday use. If the low consumption is related more to this perception of fruit than to its cost or availability, this would appear to be fertile ground for BCC stressing the health benefits of regular consumption by infants and young children.
- **Common food storage practices are unsafe.** Caregivers were very aware of the importance of preparing and feeding IYC foods under hygienic conditions. This appears to originate from their interactions with local health workers, who are well respected by caregivers and were rated by them to be the most reliable source of information on child health. However, despite the care that is generally taken to ensure that water is safe, that receptacles are clean, and that food is stored with a cover against contamination, the storage of leftovers in uninsulated containers introduces some health risks. The common practice is to cook IYC porridge once a day and keep this to be consumed by the child

later, either when the caregiver is away from the home working or once she has returned. Stored at ambient temperatures and served as much as 10 hours later without reheating, these porridges may be placing some children at risk of diarrhoea.

- **Local custom militates against the introduction of solid foods.** Caregivers expressed a concern (which they say has its origin in traditional beliefs) about introducing solid foods before a child is walking. They believe that a too-early introduction of these 'heavy' foods will delay or even prevent children from walking. It is conceivable that this belief is delaying the introduction of solid foods beyond the appropriate time, but how the magnitude of this problem compares to the barriers of affordability or seasonal scarcity is not clear.
- **The relationship between vitamins and foods is not well recognised.** Despite the receptive environment for nutrition information and advice noted above, the concept of vitamins is not well understood. When it comes to the health properties of individual foods, most caregivers recognise two potential outcomes in children: A healthy food is often thought to 'build blood', while the frequently cited reason to avoid a food is that it causes diarrhoea. The minority of caregivers who recognised the term 'vitamins' associated it not with foods but with vitamin syrups prescribed by health workers for children—often to recover appetite after an encounter with illness. Only 10% of caregivers were familiar with the idea that vitamins or other fortificants could also be added during the processing of foods to make them more nutritious.

Of the barriers to optimum IYCF identified above, some may be overcome by measures based on information and behaviour change messaging alone (e.g. the tendency to delay introduction of solid foods). However, most will require a combination of measures that include both improved nutritional counselling and concrete actions to address the material circumstances of Karaga's caregivers. For instance, knowledge alone will not increase IYC consumption of fruit so long as it is hard to obtain year-round. Awareness about hygienic food storage will have greater impact if it is combined with access to affordable thermal containers or improved child care options for working caregivers.

5.6 The IYCF Environment

The importance of markets. Although agriculture employs 95% of the workforce in Karaga, farming families cannot subsist on food produced by the household alone. Family foods consumed by older children invariably require the purchase of some ingredients, including cooking oil, dried fish, bouillon cubes, and tomato paste—even if the bulkier staples (maize or millet) and green vegetables are often secured from the family farm or garden. For infant foods, the sugar or (less often) milk that is added to cereal porridges must also be bought. An important feature of the daily village markets in foods are the local village vendors who can offer credit (which 31% of caregivers reported relying on from time to time) and who subdivide standard retail packaging into smaller units—reflecting the purchasing patterns of Karaga consumers (e.g. single tea bags or small quantities of milk or sugar knotted into cellophane).

The limits of seasonal coping mechanisms. Markets play an especially important role during Karaga's lean season, when supplies of own-farmed staple foods are exhausted and rain-fed vegetable gardens are not yet producing. However, this is also a time of the year with very limited cash, since cash is derived mainly from sales of agricultural produce. Thus, despite a variety of recipe alterations and ingredient substitutions described by caregivers, it is difficult for some households to buffer infants and young children from the effects of seasonality on the family diet.

6. Recommendations

The FBRs discussed in Section 5.4 are designed around energy and micronutrient gaps, as well as solutions to these gaps available from commonly consumed local foods. These recommendations offer a concrete, evidence-based starting point for the nutrition education activities of the Ghana Health Service (GHS) and its development partners in Karaga. Whilst these modifications may be within the reach of some households, others are likely to face difficulty in accessing these foods due to affordability. Additionally, even where affordability does not present a problem, there remain some micronutrient gaps that cannot be closed using foods already in the local diet. Nutrition education to promote the modifications must therefore be accompanied by practical strategies to overcome the barriers to problem nutrients. These strategies must encompass both **nutrition-specific** approaches and activities that are indirect, that is, **nutrition-sensitive**.

6.1 Nutrition-Specific Actions

Within the realm of nutrition-specific actions, the following measures should be prioritised.

Overcome the impasse around enrichment of IYC porridges by using more locally appropriate counselling. For the youngest children, promote the addition of nutrient-dense foods, such as milk powder or legumes, to the plain maize and millet porridges currently being consumed in Karaga. Recognising that the cost of milk will be a concern for some families, counselling needs to remind caregivers of the full range of locally available options for this modification, including groundnut paste, cowpeas, and soya flour.

Support the modification of family foods for older children. The FBRs particularly highlight daily servings of fish and leafy greens for older children. These ingredients are already contained in the common family foods; however, the quantities consumed by children are very small. Since caregivers are already in the habit of separating out an IYC portion during cooking (e.g. before dishes receive strong spices), nutrition education can build on this practice and encourage the preparation of a softer portion with increased amounts of nutritious ingredients reserved for infants and young children.

Ensure timely introduction of solid and semi-solid foods. Counselling messages and materials should address the prevalent belief that too-early introduction of solid or 'heavy' foods will retard physical development, manifested as a failure to walk. Caregivers—and possibly some counsellors—require assurance that child development will not be impaired if they follow the recommended practice and gradually increase the density of IYC foods, and that this should begin before the child is crawling or walking.

Revise BCC materials currently in use to include locally appropriate content and examples. The effectiveness of the GHS community IYCF counselling tools, which draw on generic material provided by UNICEF (UNICEF 2013a; UNICEF 2013b), can be maximised through the addition of locally appropriate content based on insights generated by this study. Some recommended adaptations to the GHS 2013 IYCF counselling package are highlighted in the sidebar on the next page.

Guard against food contamination by improving food storage and preparation practices. Currently, the long duration of IYC food storage and the lack of reheating represent a potential hazard to child health. This risk could be increased if, as recommended, caregivers begin to enrich IYC porridges more consistently with milk and other animal-source foods (making prolonged storage at room temperature more risky). BCC will be needed to generate a wider awareness among Karaga caregivers of the importance of reheating IYC foods before serving and to encourage the addition of animal-source foods only at the moment of consumption, and only for the portion being consumed, not stored.

Revisit blended multigrain cereal flours. The standard 4:1 cereal/legume flour mixes (popularly known as 'Weanimix') promoted heavily by the GHS have gained little traction in Karaga or in the rest of Ghana. Yet Karaga caregivers rate these

Adding Locally Appropriate Content to Ghana's Community IYCF Counselling Materials

Fish. Of the many animal-source foods recommended in the GHS community IYCF counselling materials (UNICEF 2013a; UNICEF 2013b), the only one that features in the Karaga diet is fish. The current emphasis on other animal-source foods should be balanced by a more locally appropriate depiction of fish in its many commonly available forms (smoked, tinned, dried, and powdered), in addition to the whole fresh fish currently featured in the materials.

Fruits. Fruits are currently viewed by caregivers as a solution to occasional problems of child appetite and not as a food for children to consume daily. They need special emphasis in the counselling materials so that they can be understood and adopted as a daily food with preventive as well as therapeutic properties.

Food safety. Not all community IYCF counselling materials contain messages on the importance of reheating foods that have been stored after the initial feed. In view of Karaga's high levels of illiteracy, it is important that counsellors' prompts and visuals include this information, because much counselling content will be transmitted verbally. Counselling materials and messages about adding milk to IYC porridges should specify that this should take place after cooking, and only for the portion consumed at that time.

blends reasonably favourably on most dimensions, including cost, ease of acquisition, and ease of preparation. Further investigation is required into the reasons why these blended porridges make virtually no appearance in the feeding repertoire in Karaga, to determine if there is any opportunity to reverse the low usage.

Explore micronutrient fortification options. The FBRs have identified a fortified chocolate beverage powder already being consumed in Karaga as a low-cost option to address existing nutrient gaps amongst children in the 6–8 month age category. Promotion of a commercial chocolate drink may not be deemed appropriate by nutrition stakeholders, however. This recommendation is therefore best regarded as a placeholder for a fortified product yet to be selected. Among the additional options that may be explored is the use of micronutrient powders for home fortification. Detailed instructions to caregivers on how to add micronutrient powder to complementary foods are already a feature of the community IYCF counselling package (UNICEF 2013a; UNICEF 2013b). (Useful operational lessons may also be available from Nigeria, where micronutrient powders are distributed during national vitamin A and vaccination days.) A product with little in the way of an operational track record as of the publication date of this report, but that may have since completed efficacy testing, is KOKO Plus, a soya-based fortified complementary food supplement, which was reported to be in the research and development phase in Ghana in 2013 (Ghosh et al. 2014).

6.2 Nutrition-Sensitive Actions

Within the realm of nutrition-sensitive actions, the recommended priorities include both material interventions that could help make implementing the FBRs more attainable for Karaga caregivers and soft components focused on behaviour and understanding that can reinforce nutrition messaging of the sort discussed in Section 6.1. These actions would be implemented in the agriculture, water and sanitation, and environment or community development sectors.

Agricultural extension. Actors in the field of agricultural extension can help make the food-based

modifications more feasible through the following measures.

- Expand horticulture to support the more consistent availability and affordability of the green leafy vegetables prioritised in the FBRs. This may include improved seed varieties, improved water management practices, or other measures to interlink the FBRs with dry-season agricultural practices that can smooth the seasonal variation in price and availability.
- Investigate whether improved drying and storage practices could reduce post-harvest loss of green leafy vegetables compared to the traditional passive solar drying currently in use in Karaga.
- Explore small-scale processing of soya bean into soya bean milk, which would provide an alternative to using expensive cow's milk to enrich traditional maize and millet porridges. Soya is a common crop in Karaga, and, although inferior to cow's milk in several respects, soya bean milk contains more iron, niacin, and folate.
- Given the near complete absence of meat in both the IYC and the family diet despite the presence of livestock in some homes, efforts to encourage greater household production of livestock for consumption are warranted.
- Explore the feasibility of improved crop varieties to address specific nutrient intake gaps identified in the FBRs. The inadequacy of vitamin A intake might be reduced through the adoption of dark orange maize biofortified with pro-vitamin A. The problem nutrients iron and zinc might be addressed with a millet variety biofortified with these two nutrients. As neither of these crops has yet to be introduced to Ghana, this must be viewed as a long-term strategy.

Water, sanitation, and hygiene. The work of Karaga's water, sanitation, and hygiene (WASH) sector needs to be closely co-ordinated with nutrition initiatives because of the important role that diarrhoea and its avoidance play in the food choices made by caregivers for their infants and young children. Concurrence of an IYC diarrhoeal episode with the adoption of new foods, ingredients, forms of storage, or preparation regimes might cause caregivers to abandon a positive practice.

Community development and environment. The introduction of fuel-efficient stoves and other appropriate technology solutions for cooking and rapid reheating can be supported by community development or other sectoral actors (for example, forestry or environment staff). The time and fuel requirements associated with current cooking techniques are a potential barrier to the consistent reheating of IYC leftovers recommended in Section 6.1. For caregivers who are unable to reheat porridges before feeding due to an agricultural or other work schedule that leaves them no choice but to feed their infants and young children at the work site, a low-cost insulated container might reduce the hazards.

All sectors. Health and nutrition sector personnel, along with personnel from the allied sectors (agriculture, water and sanitation, and environment or community development) should develop a strategy and activities to broaden the audience for nutrition messages beyond caregivers, who can more effectively take actions to improve child nutrition if they are supported by other segments of rural society, including husbands, religious figures, traditional institutions, local extension services, and local governments. The finding on withholding of solid foods (Section 6.1) is instructive in this regard: Even if a caregiver is convinced that it is safe to feed her infant or young child 'heavy' foods before he or she walks, there may be other local opinion makers (mothers-in-law, grandmothers, healers, and religious figures) who could object and who could need persuading.

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