

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 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 Central 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 Karaga District, in Ghana's Northern Region. Outcomes from Karaga 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, result 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 Gomoa East District Context

Gomoa East District is one of 17 administrative districts in Ghana's Central Region. According to Ghana's 2014 Demographic and Health Survey (DHS), mean annual household income in the Central Region, at

12,004 cedi (GHC), falls roughly in the middle of Ghana's 10 regions, whose mean annual household incomes range from 7,240 GHC to 22,599 GHC (GSS et al. 2015). The DHS nutrition data indicate that there has

This report is made possible through support provided by the Bureau for Global Health and the Bureau for Food Security, U.S. Agency for International Development (USAID), under the terms of Grant No. GHA-G-00-06-00002, as amended, to the Global Alliance for Improved Nutrition (GAIN). The contents are the responsibility of GAIN and do not necessarily reflect the views of USAID or the United States Government.

been significant progress since 2008 on some fronts, but little movement on others. Along with several other regions, the Central Region has achieved a considerable reduction in nutritional stunting, from 34% to 22%. The proportion of children in the Central Region receiving vitamin A supplementation is also the highest of any region in the country (79% vs. the national average of 59%). However, the prevalence of anaemia persists unchanged at 70%, and, although the Central Region has also recorded the highest proportion of children receiving the minimal acceptable diet outside of Greater Accra, it is still low, at 22%, leaving much to be done to establish a foundation for the healthy growth and development of infants and young children (GSS et al. 2015).

Although Gomoa East is located in the Central Region, the district borders the Atlantic Ocean in

the southernmost part of the country. The district population is 52% urban and 48% rural. Average household size is 3.8 persons compared to the regional average of 4.0 and a national average of 4.4 (GSS 2014). Agriculture is the main economic activity in the district, employing about 63% of the active population (GSS 2014). Like other parts of southern Ghana, Gomoa East District experiences both a major rainy season (March/April to June/July) and a minor rainy season between September and November. Common crops for domestic use are cassava, maize, sugar cane, rice, vegetables (tomatoes, pepper, garden eggs, okra), citrus, yam, and plantain. Commercial farms produce pineapple, pawpaw, and Asian vegetables for export (GSS 2014).

4. Study Methods

This study was conducted among caregivers in Gomoa East District with infants and young children 6–23 months of age. Buduatta sub-district was selected randomly to represent Gomoa East. 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) a dietary intake assessment and 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 (12%). 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, 87; 9–11 months old, 97; 12–23 months old, 99; non-breastfed children 12–23 months old, 84. As the number of non-breastfed children was limited, a total sample of only 367 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 toward the end of the major rainy season, a period normally characterised by pre-harvest food insecurity. 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, most children consumed foods from the ‘Grains’ food group (predominantly maize) (Table 1). For most age groups, at least half or nearly half of all children consumed foods from the ‘Vegetables’, ‘Meat, fish, and eggs’ (primarily fish), and ‘Starchy roots and other plant foods’ food groups. Fruits were rarely consumed. The greatest percentage of children

consuming added sugars was in the 6–8 month age group, and this decreased in the older age groups.

Portions consumed by food group. The daily amounts of foods consumed from nutrient-dense food groups like ‘Meat, fish, and eggs’, ‘Dairy’, ‘Fruits’, and ‘Vegetables’ were very small—mostly less than 10 grams for the breastfed age groups (Table 1). Portion sizes did not increase consistently with age among breastfed children, but did become noticeably larger among non-breastfed compared to breastfed children at 12–23 months of age, particularly for ‘Grains’, ‘Bakery and breakfast cereals’, and ‘Starchy roots and other plant foods’.

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, Gomoa East District, Ghana

Food groups	Food types consumed	Infants and young children consuming foods by food group in previous 24 hours (%)				Mean daily portion size (grams/day)*			
		6–8 BF n=87	9–11 BF n=97	12–23 BF n=99	12–23 NBF n=84	6–8 BF n=87	9–11 BF n=97	12–23 BF n=99	12–23 NBF n=84
Grains	Maize, millet, rice	87	86	95	93	35	56	56	93
Bakery and breakfast cereals	Bread, biscuits, instant fortified infant porridge	24	22	22	35	46	46	14	72
Starchy roots and other plant foods	Cassava, plantain	32	46	54	65	57	62	36	70
Meat, fish, and eggs	Smoked herring, dried fish, smoked mackerel, eggs	48	63	70	90	5	8	5	10
Dairy	Cow milk (evaporated, powdered)	37	36	33	26	4	5	3	4
Fruits		1	6	5	2	0	0	0	0
Legumes, seeds, and nuts	Groundnut, cowpea, melon seeds	16	18	23	35	4	4	6	11
Vegetables	Vitamin A-rich vegetables (cocoyam leaves, tomato paste, palm nut pulp), onion, eggplant, turkey berries	48	68	78	89	6	7	10	16
Added fats	Red palm oil	29	44	44	45	4	7	5	6
Added sugar	White sugar	60	43	34	29	7	9	15	19

BF=breastfed; NBF=non-breastfed

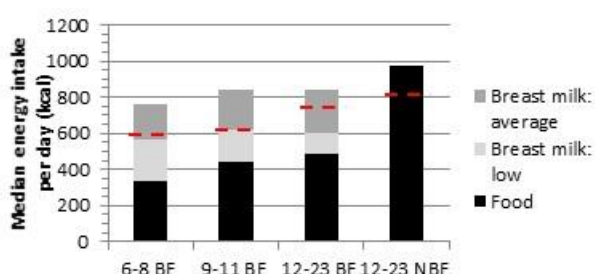
* Mean daily portion sizes were calculated only for consumers of those food groups and did not include zero values.

5.2 Dietary Energy Intake

Overall, when low breast milk intakes are assumed, the energy intakes for all breastfed children 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 the requirements of all children in Gomoa East District. It is likely that the actual breast milk intakes lie between these two estimates, and the selection of the lower level of breast milk intake (mean minus 2 SD) is used here as a conservative estimate.

Grains provide the largest contribution to the energy intake of all children, ranging from 38% in non-breastfed children 12–23 months of age to 49% in breastfed infants aged 6–8 months (**Table 2**). The second largest contributors to energy intake are added fats and starchy roots, although the contribution is modest compared to that of grains.

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

Food groups	6–8 BF n=87	9–11 BF n=97	12–23 BF n=99	12–23 NBF n=84
Grains	49	41	47	38
Added fats	7	12	12	10
Legumes, seeds, and nuts	3	1	3	4
Added sugars	6	6	4	4
Dairy	3	1	1	1
Bakery and breakfast cereals	13	6	8	11
Starchy roots	13	22	15	17
Vegetables	3	5	4	6
Others	3	6	6	9

BF=breastfed; NBF=non-breastfed

5.3 Nutrient Intake Adequacy

The adequacy of intakes for key nutrients was very low for all sub-groups, which is indicative of very poor quality diets. For breastfed infants and young children 6–8, 9–11, and 12–23 months of age, the prevalence of inadequate nutrient intakes¹ exceeded 50% for 11, 10, and 10 out of 11 nutrients, respectively. Among non-breastfed children 12–23 months of age, the intakes of six nutrients were inadequate 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 8, 5, and 6 nutrients among infants 6-8 and 9-11 months and breastfed children 12-23 months of age, respectively. The greatest reductions in percentage with low intakes occurred for the younger age groups, in particular for vitamins A, C, and B12. For other nutrients, especially calcium, iron, zinc, 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

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.

dietary patterns among the target groups. A summary of problem nutrients by sub-group is presented in **Table 3**. For the breastfed children, 2–3 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 breastfed age sub-groups were iron and zinc. For the non-breastfed children 12–23 months, requirements for 10 of 11 nutrients considered could be met with changes in the diet using commonly consumed local foods; calcium was the only nutrient for which requirements could not be met within current dietary patterns.

Table 3: Summary of problem nutrients in the diet of children by age group and breastfeeding status, assuming low breast milk intake, Gomoa East 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 Gomoa East 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 Gomoa East 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 for each age group by adopting the FBRs. The nutrients for which adequacy is unlikely to be achieved, even with incorporation of the FBRs, number between 3 and 6 of 11, depending on the target group, with calcium and iron intakes presenting a persistent problem across all target groups. Even for households where cost presents no barrier and the recommendations are successfully adopted in full, a comprehensive solution to nutrient deficiencies clearly entails the introduction of nutrient-dense foods not already consumed in Gomoa East. It should be acknowledged that collecting data during a less 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*, Gomoa East 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	
Red palm oil			1	1
Legumes		1	1 (beans and peas)	1
Starchy roots (preferably vitamin C-rich)	1 (cassava)	1	2	2
Green leafy vegetables	1	1	1	1
Fish	1 (small whole fish)	2 (small whole fish)	3 (1 small whole fish and 2 fish with bones)	3 (fish without bones)
Grains (preferably whole grains and not including rice)	1	2	2	2

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 in the worst-case scenario of the harmonised FBRs per target group in Gomoa East 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	44	161.2	67.6	76.2	54.3	88.4	97.9	193.1	62.1	12	28.2	5
9–11 BF	31.4	62.4	125.2	79	100.6	156.8	77.8	240.5	51.9	30.1	44.1	6
12–23 BF	26.9	113.4	71	68.4	54	107.6	55.8	195.3	150	54.1	70.5	6
12–23 NBF	28.5	184.4	82.6	73.3	74.7	149	64.9	116.7	124.3	68.8	87	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 Gomoa East 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 for IYCF include the following.

- **The provision of special foods for infants and young children is already an established practice.** Caregivers prepare foods that they consider particularly suitable for infants and young children. These include mashed *kenkey*

(ready-to-consume fermented maize dumplings, usually sold wrapped in dried corn husks or dried plantain leaves) porridge for the youngest children and, for slightly older children, rice or *banku* (fermented maize dumplings) with stew incorporating powdered fish or eggs. These IYC foods are similar to but distinct from adult foods, adapting their ingredients to make them safe and palatable for infants and young children. *Kenkey* are mashed through special muslin cloth to remove the chaff and obtain a smooth-textured mixture used to prepare porridge specifically for infants and young children. Once children start to eat adult stews, the cooking techniques for staple accompaniments, such as *banku* or rice, may

be altered to produce a softer texture, while standard stews are modified by some caregivers by adding powdered fish (as advised by health workers). These are positive practices that could be reinforced and possibly extended to increase the diversity of the core IYC diet.

- **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 Gomoa East contain a broad range of food types, including staple grains (maize, cassava, plantain, yam, cocoyam, and rice) accompanied by stews or soups that usually combine fish, red palm oil or cooking oil, onions, tomatoes, pepper, *kotomire* (green leafy vegetable), and other vegetables, such as garden eggs or okra. In some dishes, palm nut juice, groundnut paste, or ground melon seeds are also added. The range 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 the nutritional or health value of individual foods are not always accurate, but the process by which Gomoa East caregivers evaluate the foods to offer or withhold from children shares some features 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 perception that some foods have a superior ability to supply energy and support growth (in the view of caregivers by ‘building’ or ‘making’ blood). Caregivers are

also aware of key advice concerning the home environment for feeding infants and young children, including child-centred feeding practices and the need to introduce new IYC foods in an unhurried, stress-free setting. This basic knowledge of foods and feeding—likely due at least in part to the efforts of local health workers—provides a good basis for further efforts to address more limiting beliefs and practices (examples noted below) through community nutrition education.

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

- **Porridges prepared for infants and younger children consist mostly of plain maize or millet, un-enriched by more nutritious ingredients.** Sugar is normally the sole addition to these porridges. Caregivers are well aware of advice to add milk; however, they consider this to be beyond their means (enriched porridge was rated the most expensive of all food items in an exercise conducted with Gomoa East FES informants). Improvement in the nutritional value of infant porridges will require efforts to break the impasse between the cost of enriched ingredients and the benefits of following health workers’ advice. If milk is out of reach for most households, providing alternative options for enrichment may be one way to address the dietary adequacy of the youngest infants and children.
- **Bottle feeding is practiced by some Gomoa East caregivers.** A variety of utensils are used by Gomoa East caregivers to feed porridge to their infants and young children. These include: spoon and cup; spoon and bowl; cup only; hands only; and—for some parents—infant formula bottles, despite advice to the contrary from local health workers. Some caregivers also described using the porridge-vendor polythene bags to the same effect—cutting a small hole in it, and letting the child suck directly on the bag. Whilst these practices do not constitute breast milk substitution (they do not involve infant formula), they are potentially unhygienic and should be discour-

aged, notwithstanding that caregivers consider them highly convenient.

- **Fruit rarely appears in the IYC diet.** Only 3 of 32 infants and young children had consumed fruit in the previous 24 hours—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. Caregiver narratives suggest one reason for this apparent contradiction is that 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.
- **Prolonged storage resulting from bulk cooking strategies may be compromising the safety of IYC foods.** 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 prolonged storage of IYC foods may be introducing risk. Stews and soups, including special IYC stews, are cooked in bulk and consumed by the infants and young children over several days. Although daily heating in the mornings and evenings is the common practice, feeding infants and young children food stored over such long periods poses potential food safety and health risks for them; their resistance to contaminated food is not fully developed.
- **Local custom militates against the introduction of solid foods.** Caregivers expressed a concern (which may have its origin in traditional beliefs) about introducing ‘heavy’ foods before a child is walking. They believe that a too-early introduction of these foods will delay

or even prevent children from walking. This belief is more emphatically held in Ghana’s Northern Region (where GAIN also conducted a FES), but is evident too in Gomoa East, and it is conceivable that caregivers are delaying the introduction of solid or semi-solid foods beyond the appropriate time. 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.** The common perception of foods in Gomoa East is that they can provoke two possible outcomes, one good and one bad. The good outcome is that some foods help infants and young children ‘build blood’, while the frequently cited reason to avoid a food is that it causes infants and young children to suffer from diarrhoea. Within this system, the concept of vitamins has not established a place. Two-thirds of respondents did recognise the term ‘vitamins’, but they were inclined to associate it more with the vitamin syrups prescribed to infants and young children by health workers after illness than with foods. However, about 50% of the sample was aware that nutrients can be added to certain foods during the manufacturing process, and some caregivers were able to provide examples of locally available foods that they believed to be fortified in this way, including instant cereals, commercial malt beverages, and the wheat-soya flour blend distributed by the child welfare clinics. Awareness-raising around the role of vitamins in IYC health and the availability of vitamins in both locally grown and commercial foods may help support the uptake of any nutritional products introduced in the future to improve the adequacy of IYC diets.

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 more closely targeted nutritional counselling and concrete actions to address the material circumstances of Gomoa East’s

caregivers. For instance, knowledge alone will not increase IYC consumption of fruit so long as it is hard to obtain year-round. Advice to reduce the duration of food storage will have greater impact if it is combined with efforts to understand and address the time and resource pressures that underlie current practice.

5.6 The IYCF Environment

The importance of markets. Although agriculture employs 63% of the workforce in Gomoa East, 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 is local vendors who can offer credit (which 47% of caregivers reported relying on from time to time) and who subdivide packaged foods into smaller units for sale at the community level—reflecting the purchasing patterns of Gomoa East consumers (e.g. single tea bags or small quantities of milk or sugar knotted into polythene).

The limits of seasonal coping mechanisms. Markets play an especially important role during Gomoa East’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 of reduced cash availability, since cash is derived mainly from the sale 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 Gomoa East. 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 these problem nutrients. The 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 the enrichment of IYC porridges. Use more locally appropriate counselling to promote the addition of nutrient-dense foods, such as milk powder or legumes, to the plain maize and millet porridges currently being consumed by Gomoa East’s youngest children. Recognising that cost 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 increasing the daily consumption of fish of different types as young children grow. Fish are already contained in the common family foods in a variety of forms, including smoked mackerel, tinned herring and tuna, frozen fish, and whole or powdered small, dried fish. But despite the variety of these forms, 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 to

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 Gomoa East 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 (frozen, 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. Messages discouraging the prolonged storage of foods that is common in Gomoa East should be added to the discussion of feeding hygiene in Ghana's community IYCF materials. Messages stressing the importance of reheating foods after storage are currently confined to take-home brochures. Counsellors' prompts and visuals should also include this information, since much of the counselling content will be transmitted verbally. Counselling materials and messages encouraging enrichment of IYC porridges with milk or other animal-source foods should state that this should take place after cooking and only for the portion consumed at that

encourage the preparation of a softer portion with increased amounts of the specified types of fish, as well as other ingredients identified in the FBRs.

Ensure timely introduction of solid and semi-solid foods. Counselling messages and materials should address the belief that too-early introduction of solid or 'heavy' foods will retard physical development, manifested as a failure to walk. Caregivers—and possibly some health workers and 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 can and should begin before the child is 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 adjacent sidebar.

Guard against food contamination by improving food storage practices. Currently, the very long duration of food storage in Gomoa East represents 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 caregivers of the hazards related to child health from prolonged storage and to reinforce current messages on the importance of reheating IYC foods before serving. For the porridges consumed by the youngest children, BCC should encourage the addition of animal-source foods only at the moment of consumption, and only for the portion being consumed.

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 Gomoa East. Yet caregivers rate these blends reasonably favourably

on most dimensions, including healthiness, 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 Gomoa East, to determine if cost is the only barrier and whether there is any opportunity to reverse the low usage.

Explore micronutrient fortification options to provide the ‘problem’ nutrients. Among the 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.

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 Gomoa East 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.

- Explore 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 Ghana, 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 (infants and young children 6–12 months of age) might be reduced through the adoption of dark orange maize biofortified with pro-vitamin A. The problem nutrients iron and zinc (infants and young children 6–13 months of age) 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 Gomoa East District water, sanitation, and hygiene (WASH) sector agents needs to be closely coordinated 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 specific combination of time and resource constraints underlying the bulk cooking and extended storage of IYC foods in Gomoa East needs to be better understood. If it is determined that the introduction of fuel-efficient stoves and other appropriate technology solutions for cooking and

rapid reheating would change the calculation of caregivers, these 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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