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RELATIONSHIP BETWEEN CAREGIVERS' INCOME GENERATION ACTIVITIES AND THEIR CHILDREN'S ANIMAL SOURCE FOOD INTAKE

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ABSTRACT

Enhancing Child Nutrition through Animal Source Food Management (ENAM) project provided financial and technical support for caregivers' Income Generation Activities (IGA) with the aim of increasing their access to Animal Source Foods (ASF) for improved child nutrition. Using baseline data from the ENAM project, this study assessed the relationship between the type of caregivers' IGA -whether it is related to ASF [ASF-R] or unrelated [ASF-U] - and the quantity and diversity of ASF consumed by their children. Structured questionnaire was used to obtain data on household socioeconomic and demographic characteristics and children's ASF consumption in the past week from 530 caregivers of children 2-to5 years old in 12 communities in three agro-ecological zones of Ghana. A weighed food record of children's dietary intakes was also completed during two 12-hour home observations on a randomly selected sample of 117 children. Approximately 6% (n=32) of caregivers were not engaged in any IGA. Of the caregivers who were involved in an IGA (n=498), approximately one-third of them were engaged in an ASF-R IGA, such as selling smoked fish, selling eggs and the selling cooked food that included ASF. Caregivers (67%) were engaged in ASF-U IGA, such as crop farming, petty trading in non ASF items and artisanal work. The quantity and diversity of ASF consumed by the children did not differ ($p=0.988$ and $p=0.593$, respectively) by the type of caregiver IGA. However, after accounting for agro-ecological zone, being involved in an ASF-R IGA positively predicted children's ASF diversity ($p<0.001$). The number of children in the household negatively predicted children's ASF diversity ($p=0.011$) whereas high/medium household wealth status tended to be positively associated with ASF diversity ($p=0.064$).The study suggested that there is need to promote ASF-R IGA among caregivers to increase the ability to purchase more varied and nutritious food items for improving children's growth.

Key words: Income-generation activity, Animal source foods

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INTRODUCTION

The high prevalence of micronutrient deficiencies among children in sub-Saharan Africa has been associated with diets low in Animal Source Foods (ASF) [1]. Compared to plant foods, ASF are richer sources of bioavailable micronutrients such as iron, zinc, calcium, vitamin A, vitamin B-12, and riboflavin [2].In Ghana, the diets of rural families consist primarily of starchy staples eaten with small quantities of soups and sauces that typically contain tiny amounts or no ASF. The little ASF that may be available in household meals are typically reserved for adult males [3]. In an assessment of the constraints to ASF in children's diets in rural Ghana, caregivers of young children suggested that children's ASF intakes would improve if their mothers or other caregivers had adequate incomes to purchase ASF for preparing household meals that are shared with children [4]. This prompted recommendations to support caregivers' Income-Generation Activities (IGA) to enhance their incomes with the expectation that this would result in children consuming more ASF. Enhancing Child Nutrition through Animal Source Food Management (ENAM) project implemented a microcredit and education intervention to provide financial and technical support for caregivers IGA as well as education on the importance of ASF for children.

Studies have demonstrated a positive impact on household food security when women engage in IGA and control the income from these activities [5]. It has been reported that when women had access to household income, they were likely to purchase relatively expensive food items such as ASF for their household [6].

While the link between women's income earnings from IGA and household food security and children's nutritional status is reasonably well established, there is little information on how the type of IGA a caregiver undertakes influences specific aspects of household food availability and children's diets. Given that caregivers' IGA may influence what foods are present in the home, it is plausible that women's IGA that involve production or processing of ASF may affect children's ASF intake and hence the overall diet quality of the child. Baseline data from the ENAM project were used to assess whether caregivers` IGA type (ASF-related [ASF-R] or ASF-unrelated [ASF-U]) influenced the amount (grams) and diversity of ASF consumed by their young children.

MATERIALS AND METHODS

This was a cross-sectional baseline survey completed in all 12 communities of the ENAM project, four selected from each of the following three ecological zones of Ghana: Coastal Savannah, Forest-Savannah Transitional, and Guinea Savannah. The three zones were selected to represent the diversity of ASF production and availability in the country and the communities were selected based on (i) presence (through production or trade) of the ASF typical of the ecological zone); (ii) presence of animal rearing activities (livestock, small ruminants, and poultry) in the communities; and (iii) logistical accessibility.

Study participants

The study participants were caregivers with 2- to 5-year-old children identified through community mapping and household wealth ranking exercises held in the communities. Detailed description of the community mapping and household ranking have been published elsewhere [4]. For the purposes of this study, a caregiver was defined as the person with whom the child lived and who had primary responsibility for child care (including feeding) most of the time. **In each community, one caregiver with an eligible child was invited from each household to participate in the baseline survey.** In situations where there was more than one child eligible in a household, the youngest child and their caregiver were selected. A total of 530 caregiver-child pairs participated in the baseline survey [4]. Written informed consent was obtained from each caregiver prior to data collection. Ethical approval for the study was obtained from the Institutional Review Boards of Iowa State University and the Noguchi Memorial Institute for Medical Research at the University of Ghana.

Data collection

Data were collected through one- on- one interviews with the caregivers in their homes using a semi-structured questionnaire. The questionnaire focused on household and caregiver socioeconomic and demographic characteristics, frequency of consumption of ASF in the past week by the child, and caregivers' child nutrition knowledge. Socioeconomic and demographic characteristics documented were composition of the household, caregiver and household head's primary and subsidiary occupations, and caregiver's weekly income. Additional information on total dietary and ASF intakes was obtained through weighed food records. All foods and beverages, except water, consumed by a subsample of the children (n=117) were weighed during two non-consecutive 12-hour home observation days [7]. The weighed food record provided information on the amount (grams) of ASF consumed by the child on two days (one market day and one non-market day). Regarding children's ASF frequency, caregivers were asked the number of times in the past week that the index child consumed ASF from a list of 10 ASF categories comprising livestock meats (goat, sheep and beef), organ meats and offal, bush meats (wild game such as grasscutters, deer), whole fish, fish powder, shell fish, snails, poultry (chicken, guinea fowl), eggs, and milk and milk products.

With respect to caregivers' child nutrition knowledge, caregivers were asked to select local food items that were rich sources of iron (or foods for blood), calcium (or foods for strong bones and teeth), and vitamin A (or foods for good eyesight) using a card sort process with pictures of local foods. Caregivers' selections were recorded on the questionnaire.

Data analysis

Data entry, management and analysis were completed using SPSS version 15.0. The outcome variables of interest were the children's (i) ASF intake (in grams) and (ii) ASF diversity score, defined as the sum of individual ASF categories (maximum of 10) the child consumed during the week preceding the survey.

Caregiver average weekly income from primary and subsidiary IGA was divided into terciles in order to categorize income as 'Low', 'Medium' and 'High'. Caregivers' child nutrition knowledge was scored according to the scoring scheme shown in Table 1.

Student's t-test and the Chi-square statistic were used to test socioeconomic and demographic differences between children whose caregivers were involved in ASF-R IGA or ASF-U IGA.

Multiple linear regression was used to assess household and caregiver factors that predicted the quantity and diversity of ASF consumed by the children. Significance for all statistical tests were conducted at $\alpha = 0.05$.

RESULTS

Characteristics of the caregivers

Approximately 6% of caregivers interviewed (n= 32) indicated not being engaged in any IGA and were excluded from the present analysis. Of the caregivers who reported having an IGA (n=498), about one-third of them were engaged in an ASF-R IGA and the remainder had an ASF-U IGA status (Table 2). Compared to caregivers from the Coastal and Guinea Savannah zones, caregivers from the Forest-Savannah Transitional zone were least likely to be engaged in ASF-R IGA. Significantly more caregivers who engaged in ASF-R IGA lived in female-headed households (25.6% vs. 16.2%: p=0.012) compared to caregivers with ASFU- IGA. Also significantly more caregivers engaged in ASF-R IGA were unmarried (15.9% vs. 8.4%: p=0.012) compared to caregivers engaged in ASF-U IGA. Caregivers engaged in ASF-R IGA did not differ from those in ASF-U IGA with respect to formal education completed, number of children less than 5 years in the household, household wealth status, and average weekly income.

Quantity (grams) and diversity of ASF in children's diets

The quantity and diversity of ASF consumed by the children did not differ by the type of caregiver IGA (Table 1). Children from the Guinea Savannah zone consumed significantly less ASF (both quantity and diversity) than children from the coastal and Forest-Savannah Transitional zones ($p<0.001$). The mean ASF intake of children belonging to high/medium wealth households was significantly higher than for children from low wealth rank households (quantity: 57.1± 6.7 g vs. 35.1± 5.2 g, $p=0.010$; diversity: 5.4 ± 0.2 vs. 4.4 ± 0.1 ASF groups, $p<0.001$).Compared to those with less educated caregivers, children whose caregivers had completed at least primary education also consumed a wider diversity of ASF (4.5 ± 0.1 vs. 5.4 ± 0.4; $p<0.001$) and tended to consume greater quantities of ASF (35.8 ± 5.7 vs. 51.9 ± 6.2: $p<0.06$).

Factors predicting children's ASF intake

Table 3 shows the factors from the multiple linear regression analysis that predicted the diversity of ASF consumed by the 2- to 5-year-old children. Compared to living in the Guinea Savannah zone, living in Forest-Savannah Transitional and Coastal

Savannah zones were significant positive predictors of children's ASF diversity (P<0.001). Having a caregiver engaged in ASF-R IGA positively predicted children's ASF diversity after accounting for ecological zone. Number of children in the household negatively predicted children's ASF diversity (p=0.010).High/medium wealth households tended to be positively associated with children's ASF diversity (P=0.058). These three variables explained approximately 27% of the variance in children's intakes. The same variables were entered in a model to determine predictors of quantity (grams) of ASF intake. Only living in the Coastal Savannah zone (P=0.050) and high/medium wealth households (P=0.055) approached significance in predicting quantity of ASF taken by child. However these variables explained less 10% of the variance in the quantity of ASF consumed by children.

DISCUSSION

The present study, demonstrated for the first time that caregivers engagement in an ASF-R IGA increased the likelihood of a caregiver feeding her young child a more varied ASF diet. The diversity of ASF that any individual child was fed, however, was limited by the availability of the different types of ASF in that locality. Agro-ecological zone had the strongest influence on ASF diversity (partial R^2=24.7%; P<0.001) in the regression model; thus, the consumption of a more varied ASF diet by children in this study was influenced greatly by the location of the child. Study communities in the Forest-Savannah Transitional zone served as an important food hub for the country; hence there was a wide range of ASF in the markets including many varieties of *bush meats* [4]. In addition, this zone had one of the largest food markets in West Africa (in Techiman) and, therefore, residents had access to other ASF that were produced in the other ecological zones of the country. In an earlier study, it was revealed that fish which was predominately produced at the Coastal Savannah zone was the most commonly consumed ASF in the Forest-Savannah Transitional zones because it was less expensive compared to other ASF [4].

Most ASF consumed in the households that participated in this study were purchased within study communities or nearby market centres. The increase in earnings of caregivers in ASF-R compared to ASF-U IGA was about US$1.42 per week. Although this difference was not significantly different, US$1.42 is sufficient for a caregiver to purchase reasonable quantities of a variety of ASF to diversify the diet beyond the specific ASF used in her IGA. Some examples of ASF that could be purchased with this increased income include eggs (US$0.25/unit), milk (US$0.25/16.0g milk powder sachet. Considering that a child's daily requirement for energy, iron, or zinc can be met by consuming only 60 grams of meat per day[8], the extra income could be used to purchase a significant amount of ASF for children's optimum growth.

Overall, the relationship between caregivers' specific IGA on the household consumption remains inconsistent in the literature, depending on the specific IGA that the caregiver is involved in and other socioeconomic factors. Increased income for caregivers does not always translate into better food intake and nutritional status of children, due to the trade-off between mother's income and the cost of reduced time

spent with the child [9]. However, increased income is often used to purchase the relatively more expensive food items like ASF [10] as observed in the present study.

In other studies, increased intake of ASF occurred because of increased income from the IGA; this observation is similar to our present study. A similar study in rural Tanzania reported some beneficial effect of women's engagement in agricultural work on child's intake of agricultural produce [11]. The study however, did not examine the pathway by which children consumed the agriculture produce (whether by increased availability of agriculture produce in the home or by increased market purchases with income generated from the farm). In a review, it was concluded that although there was insufficient evidence to show that the promotion of an animal-related IGA was an effective means to improve the overall nutrition of children, there was sufficient evidence to show a positive effect on dietary intake and household income [12]. Also another study indicated that when women had access to household income, they were likely to purchase relatively expensive food items such as ASF for their household [6].

No relationship between caregivers' nutrition knowledge and their children's ASF intake was observed. This was not surprising as an earlier pilot study in the same communities identified caregivers' poor knowledge about the benefits of ASF as an important barrier to the feeding of ASF to 2- to 5-year-old children [4]. The mean knowledge score for caregivers in both groups was below 30% of the maximum, indicating that caregivers' nutrition knowledge may not have been at a threshold to influence children's ASF consumption.

Household characteristics and ASF intake

Self-reported measures of total income are unlikely to be accurate because of a reluctance to reveal such information to a stranger (enumerator) as well as the difficulty in recalling numerous transactions undertaken by self-employed people in rural communities[13].An alternative economic indicator, household wealth status, was also used in this study. The household wealth status provides an overall estimate of the household resources based on assets and other agreed-upon social ratings by peers in the locality. This gave us the opportunity to examine through two different estimates of economic status the effect of purchasing power on children's ASF intake. Findings suggested that belonging to a medium/high wealth household increased both the quantity and diversity of ASF children consumed. The trend of ASF consumption observed in this study supports Bennet's Law which stipulates that increase in household income is associated with consumption of high-value foods such as ASF. [14]. Results from this study are consistent also with findings from a study conducted in China that reported an increase in ASF intake among household members when their wealth and income levels rose [15]. The consumption of meat in many societies symbolises wealth; the poorer the household, the less meat-based meals are consumed [16].

An increase in the number of children in a household was associated with decreased ASF diversity in this study. Food allocations per child generally decrease with increased numbers of children in low-income households. [17], especially allocation

of high-value foods such as ASF, because of the increased demand related to other household expenditures (such as clothing, education). The influence of household size shown here is comparable to results obtained by other authors [18]. In their study in Sudan, as family size increased, the share of basic foods such as sorghum bread increased while there was a decrease in the share of higher-value foods (animal source foods).

CONCLUSION

This study assessed the differential benefit of caregivers' IGA (ASF-R or ASF-U) on the quality of children's diets. While any ASF in the diet is good, diversity is important as different ASF have varied levels of micronutrient concentrations. Some interventions aimed to enhance micronutrient density of children's diets have failed because of the absence of diverse source of ASF [19]. Thus, attempts to increase both the quantity and diversity of ASF in children's diets should be encouraged. Results obtained from this study emphasize the need to promote ASF-R IGA among caregivers, which is likely to increase the ability to purchase more varied and nutritious food items for improving children's growth. Interventions that focus on raising education of women are also likely to help families improve their children's nutrition. Lastly, family planning education for rural and peri-urban populations may yield positive impacts on the diet quality of children when resources are too meagre to support a large family.

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Table 1: Scoring scheme used to assess caregivers' nutrition knowledge

Caregiver's response (selection) to food pictures[1] presented	Score
Correctly chose a food picture corresponding to a good source of iron, calcium or vitamin A	+2
Did not choose a food picture corresponding to a good source of iron calcium or vitamin A	-2
Correctly did not choose a food picture that is a poor source of iron, calcium or vitamin A	+1
Incorrectly chose a food picture that is a poor source of iron, calcium or vitamin A	-1

[1]Food pictures used in the card sort activity were: Plantain, Cassava, Yam, Corn, Koko (cereal porridge), Rice, Cabbage, Green leafy vegetables, Tomatoes, Okra, Palm nut, Beans, local eggplant, Small fish, Whole fish, Boiled egg, Liver and Red meat

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Table 2: Characteristics of Ghanaian caregivers, by type of IGA

Characteristics	Caregivers' IGA Classification				P-value[1]
	ASF-R (n=164)		ASF-U (n=334)		
Ecological zone					
Coastal Savannah	35.4	(58)	12.9	(43)	<0.001
Forest-Savannah Transitional	25.0	(41)	47.6	(159)	
Guinea Savannah	39.6	(65)	39.5	(132)	
Household wealth					
Low	62.2	(102)	64.1	(214)	0.683
Medium /High	37.8	(62)	35.9	(120)	
Household head					
Female	25.6	(42)	16.2	(54)	0.012
Male	74.4	(122)	83.8	(280)	
Marital Status					
Married	84.1	(138)	91.6	(306)	0.012
Unmarried	15.9	(26)	8.4	(28)	
Caregiver's formal education					
None	51.8	(85)	52.4	(175)	0.337
Primary	42.7	(70)	38.6	(129)	
Above primary	5.5	(9)	9.0	(30)	
Children under 5y (#)	1.6	± 0.1	1.6	± 0.1	0.231
Weekly income (GHcedis)[2]	15.3	± 1.9	12.1	± 1.5	0.202
Child nutrition knowledge score (#)[3]	16.7	± 0.9	18.3	± 0.5	0.124
Child's age (mo)	42.1	± 0.9	43.2	± 0.6	0.316
Child's ASF intake					
Quantity (g, n=117)	44.6	± 6.3	44.5	± 5.6	0.988
Diversity (#)	4.9	± 0.2	4.7	± 0.1	0.593

Values represent % (n) or means ± SEM

ASF-R=ASF-related; ASF-U=ASF-unrelated

[1] Group differences were tested using Chi-square Goodness of Fit or Student's t-test

[2] GH¢1.00 ≡ US $ 0.77

[3] Scoring scheme explained with Table 1

Table 3: Predictors of ASF diversity of children's diet in Ghana in a multiple linear regression model (n=498)

	Child's ASF diversity score	
	Beta	Significance
(Constant)	3.371	<0.001
Ecological zone[1]		
Forest-Savannah Transitional	2.507	<0.001
Coastal Savannah	0.914	<0.001
Household		
High/ medium wealth[2]	0.357	0.058
Children ≤ 5 y (#)	-0.267	0.010
Caregiver		
ASF-related IGA	0.495	0.010
	Adjusted R^2=0.265, P<0.001	

Nutrition knowledge was tested but was not a significant predictor in this model.

[1] Guinea Savannah was the reference

[2] Low wealth rank was the reference

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