



Impact of Interventions on Caregivers' Nutrition Knowledge and Animal Source Food Intake in Young Children in Ghana

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Animal source foods (ASF) intake in young children has been associated with improved dietary quality and growth outcomes. The Enhancing Child Nutrition through Animal Source Food Management (ENAM) project provides Income Generating Activities (IGA), development services, and nutrition and health education to caregivers of two-five year old children in rural Ghana. The objective of this study was to assess the interventions' impact on caregivers' knowledge and ASF intake in their two-five year old children. Longitudinal panel data was collected at baseline and four follow-ups of four-month intervals each from project participant caregivers (n=104) and matched non-participants in intervention communities (n=75) and control communities (n=210) in three ecological zones in Ghana. Analysis involved comparison of means of differences of scores using ANOVA and relationships using Pearson's correlation(r), and standard multiple regression. The ENAM project's interventions have significant positive knowledge and nutrition outcomes on participants; however there has not been significant diffusion to populations not directly involved with the ENAM project. The benefits of the approach can be multiplied by including cost-effective strategies to enhance diffusion. Examples of such strategies are peer education and partnerships with the private sector.

Background

Intake of animal source foods (ASF) in young children has been associated with improved dietary quality and growth outcomes (Murphy and Allen, 2003; Neumann *et al.*, 2003). It has been widely acknowledged to be one way of bridging the micronutrient gap which exists among low-income households (Allen, 1993). Children grow better when fed ASF because they are a rich source of high-quality and readily digested protein and energy, and essential micronutrients such as riboflavin, iron, zinc, vitamin A, and vitamin B-12 (Gibson *et al.*, 2003; Murphy *et al.*, 2003). Neumann *et al.* (2003) have indicated that a child must consume more plant foods (in kilograms) to meet his/her daily energy requirements compared to ASF.

Micronutrient deficiency leads to malnutrition which is one of the foremost causes of deaths among children under five years in developing countries (World Bank, 1998). In sub-Saharan Africa alone, nutrient deficiency causes almost a third of children under five years to be stunted and a quarter to be underweight. There is widespread prevalence of multiple micronutrient deficiencies in Sub-Saharan African countries, in part attributable to diets low in ASF (Siekman *et al.*, 2003). Childhood malnutrition is widespread among low-income households in Ghana because of two reasons. First, children eat meals with the rest of the household, resulting in a low feeding frequency. In addition, children are not fed special foods; they consume the

diet of the family which in low-income households is plant-based (Colecraft *et al.*, 2006). The poor nutrient quality and bioavailability of the typical plant-based diet contributes to childhood malnutrition.

Methods. To address this widespread nutritional problem, a multi-disciplinary team of scientists from Iowa State University, McGill University, and the University of Ghana, Legon have been working together to understand the constraints to the availability, accessibility, and utilization of ASF in children's diets in Ghana, and to identify intervention priorities to overcome these constraints. The main barriers to the inclusion of ASF specifically in children's diets included poverty, lack of knowledge of the benefits of ASF for children, inadequate production systems, poor producer and consumer linkages, lack of processing and storage technologies and facilities, and cultural beliefs and practices related to child feeding (Colecraft *et al.*, 2006).

Based on these findings, the Enhancing Child Nutrition through Animal Source Food Management (ENAM) project was developed with the goal of increasing the availability, accessibility, and utilization of ASF in targeted communities in Ghana. The project supported a microfinance program for mothers of children between the ages of two and five years in conjunction with nutrition education and training in business development. The rationale was that by increasing the



Caregivers demonstrate knowledge gained from nutrition lessons in a cooking competition. Entries were scored on appropriateness of food for a child, inclusion of ASF, and hygiene and feeding practices used during food preparation and serving. Photo by Kimberly Harding.

amount of money controlled by women and enhancing their understanding of child nutritional needs, women will channel more income towards the purchase and increase feeding of ASF, especially to their children.

Health and nutrition educational activities of the ENAM project started in May 2006, in each of the three locations – coastal savannah zone (in the south), forest transitional zone (in the middle belt) and the interior savannah zone (in the north). Each round of training was 16 weeks and was repeated in three rounds. The training was provided during the mandatory weekly meetings of the caregivers, where the microfinance activities were also undertaken. A nutrition education flip chart specifically was developed from the training needs identified through a needs assessment in the beneficiary communities. The educational activities themselves involved use of participatory learning and action (Pretty *et al.*, 1995) and consensus building methods to ensure that the participant caregivers acquired in-depth knowledge and skills in the requisite areas.

The content of the health and nutrition education activities included: (i) feeding and nutrition problems of two to five year olds, (ii) what makes a balanced diet (iii) how to

Table 1. Effect of household variables and participation on frequency of ASF consumed at the fourth follow-up.

Predictors	Beta	t	Sig.
Caregivers' nutrition knowledge	0.170	2.569	0.011
Caregivers' years of schooling	0.105	1.712	0.088
Participated in ENAM	0.404	5.859	0.000

Dependent Variable: Total mean frequency of ASF consumption
F (10.67), p = 0.000
R²=0.263
Adjusted R² = 0.239

combine plant and ASF to improve diets, (iv) preparation of appropriate meals for children, and (v) feeding practices and making the meal time happy.

Data were collected at baseline and four follow-ups of four-month intervals starting from April – July 2006 and ending in November 2007 from project participants (n=104), matched non-project participants in project communities (n=75), and matched non-project participants in control communities (n=210). Nutrition knowledge was measured by asking caregivers to select from a list those foods that were high in iron, vitamin A, and calcium. The ASF diversity consumption for each child was measured by the number of different ASF food groups consumed in the past seven days. The ten categories of the ASF were livestock meats (goat, sheep and beef), organ meats and offal, bush meats, whole fish, fish powder, shell fish, snails, poultry (chicken and guinea fowl), eggs, and milk and milk products. A cross-sectional analysis at baseline and each of the follow-ups and a longitudinal analysis over the entire study period were performed. Analysts compared project participants, matched non-project participants in project communities, and matched non-project participants in control communities. Multiple regression analysis was used to determine the predictors of caregiver child feeding behavior. All statistical significance was set at P<0.05.

Major Findings

The household and caregivers' characteristics were similar between participants and non-participants at the start of the intervention. Participant caregivers acquired significantly higher nutrition knowledge than non-participants (p<0.01) (Figure 1), adopted more frequent ASF feeding of their two to five year old children (p<0.01) (Figure 2), and fed with more diverse sources of ASF than non-participants (p<0.01) (Figure 3).

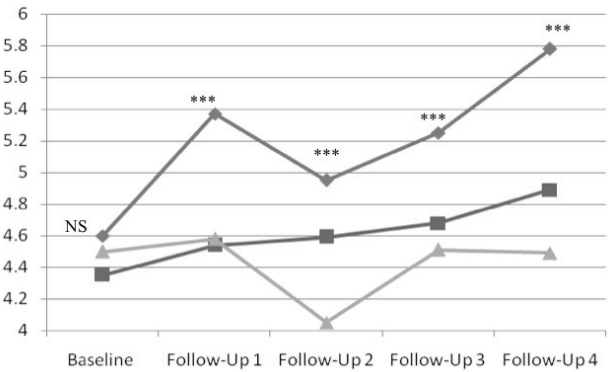
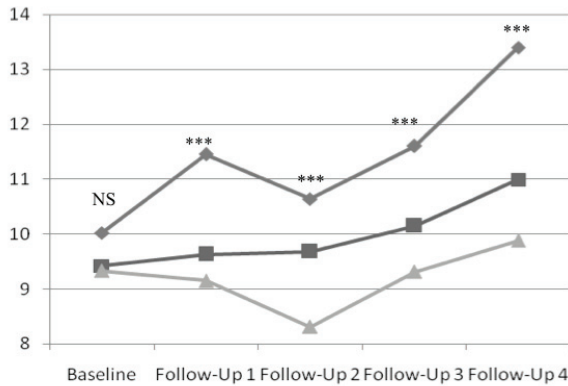
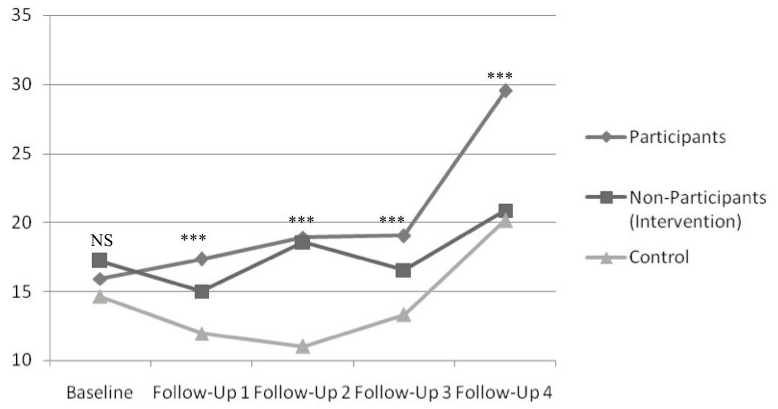
There was no significant difference between matched non-participants in intervention and control communities with regards to acquisition of nutrition knowledge (Figure 1), changes in ASF frequency (Figure 2) and ASF diversity

Table 2. Effect of household variables and participation on diversity of ASF consumed at the fourth follow-up.

Predictors	Beta	t	Sig.
Caregivers' nutrition knowledge	0.140	2.050	0.042
Caregivers' years of schooling	0.212	3.361	0.001
Participation in ENAM	0.290	4.081	0.000
Number of children of below 5 years under caregivers' care	-0.236	-2.228	0.027

Dependent Variable: Total Mean Diversity of ASF Consumption
F (8.211), p = 0.000
R²=0.216
Adjusted R² = 0.189

Figure 1 (Right). Caregivers' nutrition knowledge score plots. Figure 2 (bottom left). ASF consumption frequency scores for caregivers' two to five year olds. Figure 3 (bottom right). ASF consumption diversity scores for caregivers' two to five year olds. Legend (Figure 1) remains the same for Figures 2 and 3.



(Figure 3) fed to two to five year old children. This implies that there has been no significant diffusion from the ENAM intervention participants to non-participants even when they share communities

Researchers found that caregivers' nutrition knowledge was positively correlated with ASF feeding frequency ($r=0.402$; $p<0.01$) and ASF diversity ($r = 0.550$; $p<0.01$). Furthermore, the multiple regression analysis results showed that caregivers' nutrition knowledge score and participation in the ENAM interventions significantly predicted ASF frequency ($p<0.01$). Similarly, participation in the ENAM project's intervention ($p<0.01$) and caregivers' nutrition knowledge ($p<0.05$) significantly positively predicted ASF diversity. In addition, household characteristics such as years of schooling ($p<0.05$) and numbers of children below five years that caregivers care for predicted ASF diversity ($p<0.05$) (Table 2).

Table 1 confirms that participation in ENAM activities leads to the incorporation of more frequent ASF in children diet, and this happened as a result of increased caregivers' nutrition knowledge. It predicts that a unit increase in caregiver's nutrition knowledge is likely to increase the frequency of feeding children with ASF by 0.17 units. Table 2 shows that caregivers' nutrition knowledge, caregivers' years of schooling, and participation in the ENAM project, positively predicted the diversity of ASF fed to two to five

year olds. The number of children below five years who were cared for by the caregivers negatively predicted ASF diversity. The results also show a significant positive influence of participation in the ENAM interventions, caregiver nutrition knowledge on ASF diversity feeding behavior, with a unit increase in knowledge predicting 0.14 increase in ASF diversity.

In conclusion, participation in the ENAM project interventions resulted in participants acquiring more nutrition knowledge with regards to ASF. With improved financial resources resulting from the increased incomes from their economic activities, caregivers fed their children more diverse types of ASF, more frequently.

Practical Implications

The ENAM project intervention which is an integrated nutrition and enterprise development approach addressing childhood malnutrition made significant increases in nutrition knowledge and improved ASF feeding outcomes. The integration of both nutrition education and enterprise development was positive for sustaining the caregivers' interest and assuring an attentive audience. This implies that for nutrition programs which require voluntary behavioral changes, can benefit from the inclusion of knowledge and skills acquisition and increased access to financial or physical resources.

The development of the training content from the needs assessment conducted in the beneficiary communities, the development of the nutrition education flip chart in an iterative way to the point where it was able to convey the appropriate content, as well as the conduct of the training activities in a participatory way all ensured that the participant caregivers acquire in-depth knowledge and skills in the requisite areas. The regular repetition of the training is also likely to reinforce the learning process. All these aspects of the nutrition education are worthy of emulation.

Despite the project's effectiveness with the participants in the interventions, it was found that diffusion to other non-participant communities was not significant. Complex information cannot diffuse autonomously, but requires direct active dissemination. From a research and development point of view, some of the cost effective strategies of direct dissemination are peer education and utilizing the private sector. Efforts at institutionalizing these strategies are necessary for achieving long term sustainability of the outcomes of the ENAM interventions and similar ones in the future.

Further Reading

Allen, L.H. 1993. "The Nutrition CRSP: "What is marginal malnutrition, and does it affect human function?" *Nutrition Review* 51:255-267.

Colecraft, E., G.S. Marquis, R. Aryeetey, O. Sakyi-Dawson, A. Lartey, B. Ahunu, E. Canacoo, L.M. Butler, M.B. Reddy, H. Jensen, and E. Huff-Lonergan. 2006. "Constraints on the use of animal source foods for young children in Ghana: A participatory rapid appraisal approach." *Ecology of Food and Nutrition* 45: 351-377.

Gibson R.S., F. Yeudall, N. Drost, B.M. Mtitimuni, and T.R. Cullinan. 2003. "Experiences of a community-based dietary intervention to enhance micronutrient adequacy of diets low in animal source foods and high in phytate: A case study in rural Malawian children." *Journal of Nutrition* 133: 3992S-3999S.

Murphy, S.P. and L.H. Allen. 2003. "Nutritional importance of animal source foods." *Journal of Nutrition* 133: 3932S-3935.

Neumann, C. and D.M. Harris. 1999. "Contribution of animal source foods in improving diet quality for children in the developing world." Prepared for the World Bank, Washington D.C.

Neumann, C.G., N.O. Bwibo, S.P. Murphy, M. Sigman, S. Whaley, L. Allen, D. Guthrie, R.E. Weiss, and M.W. Demment. 2003. "Animal source foods improve dietary quality, micronutrient status, growth and cognitive function in Kenyan school children." *Journal of Nutrition* 133: 3941S-3949S.

Siekmann, J.H., L.H. Allen, N.O. Bwibo, M.W. Demment, S.P. Murphy, and C.G. Neumann. 2003. "Micronutrient status of Kenyan school children: Response to meat, milk, or energy supplementation." *Journal of Nutrition* 133: 3972S-3980S.

World Bank Group. 1998. "Nutritional status and poverty in sub-Saharan Africa: Findings." Africa Region: Number 108.

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The GL-CRSP Enhancing Child Nutrition through Animal Source Food Management (ENAM) project was established in 2003 and, through research, training and outreach, monitors the multiple pathways that might increase availability, accessibility and utilization of animal source foods in the targeted communities of Ghana. The project is led by Dr. Grace Marquis, Iowa State University and McGill University. Email: grace.marquis@mcgill.ca.



The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, Central Asia and Latin America.

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