GLOBAL LIVESTOCK CRSP

Assessment of Snack Acceptance during a School Feeding Intervention in Rural Kenya

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Although many feeding interventions have been carried out in developing countries, the literature reporting the results of these interventions seldom describes the level of acceptance of the foods by the populations being served. The Child Nutrition Project (CNP) provided an opportunity to assess the acceptance levels of snacks served at elementary school settings in rural Kenya. Involving the Embu community members in sharing their views during snack development stages, snack preparation and snack delivery; and the use of locally available ingredients helped ensure high levels of snack acceptance through out the study period.

Background

This analysis is part of the Child Nutrition Project (CNP) of the Global Livestock Collaborative Research Support Program (GL-CRSP), which was conducted in Embu District, Kenya between May 1998 and August 2000. The CNP was a research study conducted to assess the effects of animal source foods on the health, growth, and cognitive development of primary school children in Kenya. Three types of supplementary snacks were provided to three experimental groups, thus providing an opportunity to assess the level of acceptance of different snacks served.

Method

The CNP study design consisted of 12 schools which were randomized to four study groups, one control and three treatment groups, and has been described in detail elsewhere (Neumann et al., 2003). The study's three treatment groups from the first cohort enrolled constituted the three feeding groups and are the focus of this analysis. The feeding groups were named "Energy", "Milk" and "Meat" corresponding to the type of ingredient added to a given snack. Prior to the commencement of recipe development, field visits were made to solicit the views of the local community members on the types of snacks that would be most acceptable to the target children. Views were sought from primary school children, secondary school students, teachers and women at the local market. Based on these discussions, the community's staple dish *githeri*, a maize and bean mixture, was chosen as a vehicle through which to deliver the added energy as milk, meat or extra githeri. Field-based pretests were carried out to ensure the acceptability of taste, texture and appearance. School children, in a similar age group and grade level from two non-study schools within the same location, took part in the feeding pilot test. The total nutrient content supplied by the snacks has been described elsewhere (Murphy and Allen, 2003). Table 1 provides a summary of the recipe ingredients and target nutrients by each snack type. The developed snacks were isocaloric providing an average of 250 Kcal per serving portion in the first school feeding term. The serving amounts were later increased thereafter to ~320 Kcal in the second school feeding term.

The snacks were prepared at a central kitchen within the study area. The snack preparation was based on the pre-tested recipes with all the ingredients measured using a 2 kilogram Chatillon scale, 25 kilogram Salter hanging scale and 1 liter measuring jugs.

Grade 1 children from 9 of the 12 study schools participated in the intervention feeding with three schools being randomly assigned to either "Energy", "Meat" or "Milk" feeding group. Once assigned to a particular feeding group, all the school children in grade 1 in that school were served the same type and amount of snack. The supplementary snacks were provided only during the school term and were served for 6 consecutive terms from September 1998 to August 2000. In Kenya, a school term is approximately 3 months long, and a school year consists of 3 terms with a 3-4 week break between the terms. No snack was provided on the weekends or during the school breaks. The snacks were

Table 1: Snack ingredients and target nutrients.

Feeding Group	Ingredients	Target Nutrients
Energy	Maize, Beans, Kale, Onions, Vegetable fat, Iodized Salt	Primarily Calories
Milk	Maize, Beans, Kales, Onions, Vegetable fat, Iodized Salt, Cow's milk	Calories, Calcium, Vitamin B12, Vitamin A, Riboflavin
Meat	Maize, Beans, Kales, Onions, Vegetable fat, Iodized Salt, Ground beef	Calories, Available Zinc, Heme Iron, Available Iron, Vitamin B12

served to the study children between 9:30 am and 10:00 am on all the school days. Each child received a weighed portion of the intervention food, in an individual container labeled with the child's name and identifying number. Cold ultra heated (UHT) whole cow's milk was portioned out to individual children at school in individual cups labeled with children's names and numbers. Project-trained feeding assistants served the snacks to the children. The assistants stayed in the classrooms during the feeding sessions and collected information on any occurrences such as any food spillages during the feeding sessions. Any milk leftovers were measured at the end of feeding session at school using calibrated measuring cylinders, while any *githeri* leftovers were kept in the original containers and returned to the central kitchen for measurement and recording. For each feeding session, data were collected on whether child was present, type and amount of snack served, and amount of snack leftover.

Table 2. Number of children served, child-feeding sessions and snack servings by school term and feeding groups.

School Term	Feeding Group	Number of children	Total Child-feeding sessions	Amount of daily snack Served	
				Githeri (gms)	Milk (mls)
Term 3 1998	Energy	146	7312	185	
	Milk	135	7045	100	200
	Meat	125	6759	184	
Term 1 1999	Energy	145	7023	230	
	Milk	131	6484	100	250
	Meat	118	5775	225	
Term 2 1999	Energy	142	8227	230	
	Milk	125	7548	100	250
	Meat	114	6774	225	
Term 3 1999	Energy	141	6527	230	
	Milk	122	5646	100	250
	Meat	104	5046	225	
Term 1 2000	Energy	140	7069	230	
	Milk	123	6540	100	250
	Meat	104	5841	225	
Term 2 2000	Energy	131	7278	230	
	Milk	121	6441	100	250
	Meat	103	5851	225	

Initially, 406 children received snacks, but the sample decreased to 355 children by the end of the two-year intervention, due to the loss of children who moved out of the study area or no longer attended school. No significant differences were found in the percent of boys and girls between feeding groups in all the feeding terms. A total of 16 children changed feeding groups over the feeding the period and were excluded from the analysis presented in this paper, once they made the change. Table 2 shows the number of children served, total child-feeding sessions, and amount of daily snack served by feeding groups and school terms. The total number of child-feeding sessions ranged from 5046 in term 3, 1999 for the meat group to 7548 in term 2, 1999 for the milk group.

Table 3. Percent of child-feeding sessions when snack was completely eaten.

School Term	Snack Type		
	Energy	Milk	Meat
Term 3 1998	99.8	98.8	99.3
Term 1 1999	99.7	99.2	99.6
Term 2 1999	99.7	99.1	99.7
Term 3 1999	99.9	99.5	99.8
Term 1 2000	99.5	99.7	99.5
Term 2 2000	99.9	99.7	99.5

Quality Control

Various steps were taken to ensure the hygienic and nutrient quality of the snacks. Medical examination of all food handlers was done on a regular basis. The area Public Health Officer visited the kitchen area to ensure high levels of cleanliness, food storage and handling methods. The UHT milk and meat were refrigerated in the project kitchen store. Round the clock supervision was done at both the kitchen and school levels to ensure standard procedures. Quarterly re-training sessions and regular meetings were also held between the staff and the supervisors. Proximate analyses of each type of snack were performed 2 to 3 times per year to ensure standard nutrient content. Snack acceptance was evaluated by assessing the percent of feeding sessions when all of the snack was eaten and assessing the proportion of snack consumed when snack served was not completely eaten.

Table 4. Mean percent of snack consumed when snack not completely eaten.

School Term	Feeding Group		
	Energy (Mean±SD)	**Milk (Mean±SD)**	**Meat (Mean±SD)**
Term 3 1998	32.4±37.5	48.4±14.8	26.2±29.9
Term 1 1999	40.3±29.5	51.7±16.1	38.8±26.4
Term 2 1999	35.7±34.7	53.8±17.2	29.6±31.5
Term 3 1999	18.5±26	36.3±26	23.8±32
Term 1 2000	33.3±27.1	37.6±28.5	31±33.5
Term 2 2000	16.3±22.5	31.4±29.3	23.8±33.2

Major Findings

Table 3 examines the percent of feeding sessions when all snack served was consumed by the school children. The percent of child-feeding sessions when snack was all completed is very high, ranging from 99.1 percent in term 2, 1999 for the milk group to 99.9 percent in term 2, 2000 for the energy group.

Table 4 examines sessions when snacks were not completely consumed by assessing percent of snack consumed. The average snack consumed on these sessions ranged from 16.3 percent in term 2, 2000 for the Energy group to 53.8 percent in term 2, 1999 for the Milk group. The Milk group experienced higher consumption levels, on these occasions when snack was not completely consumed, for all the feeding terms. However, the consumption of the Meat snack was not significantly different from the Energy snack.

Policy Implications

Snacks were not completely consumed on less than 2% of the child-feeding sessions. The main reason given by the school children on these occasions were that they were not feeling well. The results show a high level of snack acceptance with the snacks being wholly consumed on more than 98% of the child-feeding sessions. As mentioned in the methodology section, the snacks were developed based on the feedback that was received from the community members. The high levels of snack acceptance are largely a result of using the community's staple foods as the vehicle for delivering the nutrients of interest and working together with the members of the Embu community during the snack development stage. Men and women from the community were also involved in the snack preparation, delivery and serving. Working with members of community helped build the trust between research team and the community members. These findings demonstrate that, even in research settings, involving the community in the development, preparation and delivery of a feeding intervention is possible and results in high acceptance levels of the intervention. Working with communities helps to ensure more appropriate interventions resulting in delivery of the intended treatment doses.

Further Reading

Neumann, C. G., Bwibo, N.O., Murphy, S.P., Sigman, M., Whaley, S., Allen, L.H., Guthrie, D., Weiss, R.E., & Demment, M.W. 2003. "Animal source foods improve dietary quality, micronutrient status, growth and cognitive function in Kenyan school children: background, study design and baseline findings." *J Nutr*, 133(11 Suppl 2): 3941S-3949S.

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About the Project: The GL-CRSP Child Nutrition Project (CNP) was established in 1997 and was built on a decade of research conducted by the Nutrition CRSP (USAID) in the 1980s. CNP research addresses food-based approaches to micronutrient deficiencies, particularly of children, with respect to both the quantity and quality of food intake. The Child Nutrition Project was centered on a controlled intervention feeding trial of school children in Embu, Kenya. The Child Survival Study of toddlers was supported by funds from USAID as a follow-up to the study of school children. The project is directed by Dr. Charlotte G. Neumann, Dr. Suzanne P. Murphy, and Dr. Nimrod O. Bwibo as Principal Investigators and Dr. Marian Sigman, Dr.. Lindsay H. Allen, and Dr. Shannon Whaley as Co-Investigators. Jonathan H. Siekmann, Ph.D., Ana Zubieta, Ph.D. former doctoral students and Erin Reid, a doctoral candidate, made significant contributions to the nutrition biochemical analyses. Email contact for Dr. Charlotte Neumann is: cneumann@mednet.ucla.edu.

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 Africa, Central Asia and Latin America.

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