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Improving Young Child Feeding in Eastern and Southern Africa

Household-Level Food Technology

Proceedings of a workshop
held in Nairobi, Kenya,
12-16 October 1987

Proceedings

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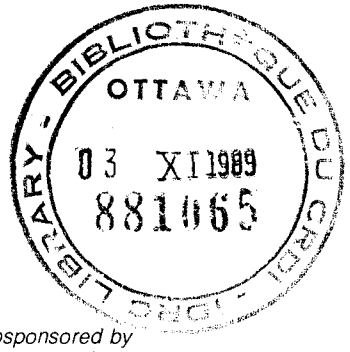
Editors: D. Alnwick, S. Moses,
and O.G. Schmidt



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Abstract

The weaning period, that is the period in a young child's life when supplementary foods are introduced to complement breast milk, poses great nutritional risk to children in developing countries. By the end of the second year of life, one-third of children in eastern and southern Africa are chronically malnourished. The following factors contribute to the growth faltering commonly observed in weaning-age children: low nutrient intake, high incidence of diarrheal disease (often caused by contaminated weaning foods), and recent declines in duration and intensity of breastfeeding.

Food scientists, nutritionists, and health planners working in Africa and South Asia met in an international workshop to examine household-level food technologies that hold promise for improving nutrition of infants and young children. After reviewing current knowledge of breastfeeding and weaning practices in eastern and southern Africa, participants discussed the use in weaning diets of fermented foods and germinated flour, for both improved nutrient intake by young children and decreased risk of food contamination. Research that should be conducted into the effectiveness of the food technology was identified and its diffusion at the community level discussed.

This publication contains the proceedings, conclusions, and recommendations of the workshop. It is directed at scientists and health planners who are involved in nutrition research and developing programs to improve feeding of infants and young children in developing countries.

Résumé

Le sevrage, c'est-à-dire la période où l'on commence à donner des aliments solides à un jeune enfant en complément du lait maternel, présente de graves risques nutritionnels pour les enfants dans les pays en développement. Dès la fin de leur deuxième année, le tiers des enfants en Afrique orientale et australe souffrent de malnutrition chronique. Les facteurs suivants sont à l'origine du retard de croissance que l'on retrouve couramment chez les enfants en âge d'être sevrés : carence nutritionnelle, forte prévalence des maladies diarrhéiques (qui s'expliquent souvent par la contamination des aliments) et diminution récente de la durée et de l'intensité de l'allaitement maternel.

Des spécialistes des sciences de l'alimentation, des nutritionnistes et des planificateurs de la santé travaillant en Afrique et en Asie du Sud se sont réunis dans le cadre d'un atelier international afin d'examiner des technologies alimentaires applicables au niveau des ménages qui semblent prometteuses pour améliorer la nutrition des nourrissons et des jeunes enfants. Après avoir examiné les connaissances actuelles en matière d'allaitement au sein et les pratiques de sevrage en Afrique orientale et australe, les participants ont discuté de l'utilisation, au cours du sevrage, d'aliments fermentés et de farine germée, tant pour améliorer l'apport nutritionnel chez les jeunes enfants que pour diminuer les risques de contamination des aliments. Ils ont également discuté des recherches qu'il y aurait lieu d'entreprendre sur l'efficacité des technologies alimentaires et sur leur diffusion dans la collectivité.

Cette publication fait un compte rendu des discussions de l'atelier et présente ses conclusions et ses recommandations. Elle s'adresse aux scientifiques et aux planificateurs de la santé qui participent à des recherches en matière de nutrition et à l'élaboration de programmes visant à améliorer l'alimentation des nourrissons et des jeunes enfants dans les pays en développement.

Resumen

El período de destete, es decir, aquel período en la vida de un niño en que se introducen en su dieta alimentos suplementarios para complementar la leche materna, representa un gran riesgo nutricional para los niños de países en vías de desarrollo. Hacia el final de su segundo año de vida, un tercio de los niños en Africa oriental y del sur muestran señales de malnutrición crónica. Los siguientes factores contribuyen al crecimiento vacilante que se observa comúnmente en los niños que se encuentran en edad de dejar la lactancia materna: baja ingestión de nutrientes, alta incidencia de diarrea (a menudo causada por alimentos para el destete contaminados), y nuevas disminuciones en la duración e intensidad de la alimentación proveniente del pecho de la madre.

Científicos del campo de los alimentos, especialistas en nutrición y planificadores de la salud que trabajan en Africa y en el Sur de Asia se reunieron en un taller internacional para examinar las tecnologías de alimentos que se utilizan en el hogar y que prometen buenos resultados en el mejoramiento de la nutrición de lactantes y niños pequeños. Después de analizar el conocimiento que existe actualmente sobre la alimentación recibida a través del pecho de la madre y las prácticas que se utilizan para el destete en el oriente y sur de Africa, los participantes discutieron el uso en dietas para el destete de alimentos fermentados y harina germinada para que los niños pudan ingerir nutrientes mejorados y haya una disminución en el riesgo causado por la contaminación de los alimentos. Se identificó la investigación que se debe realizar sobre la efectividad de las tecnologías de alimentos y se discutió su difusión en el seno de la comunidad.

Esta publicación contiene las actas, conclusiones y recomendaciones del taller. Está dirigida a científicos y planificadores de la salud que participan en lainvestigación nutricional y en programas de desarrollo para mejorar la alimentación de lactantes y niños en los países en desarrollo.

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CHILD FEEDING PATTERNS IN TANZANIA WITH REFERENCE TO FEEDING FREQUENCY AND DIETARY BULK

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Abstract *This paper reviews the data from food intake studies of young children in Tanzania. The purpose of such a review is to assess the relative importance of factors such as feeding frequency and type of food, in relation to feeding adequacy. The analysis shows that feeding frequency is by far the most important factor in determining adequate energy content in the diets. For children under 24 months of age, stiff porridge ("ugali") seems to offer advantages not found with meals based on rice or tubers. Two separate feeding trials provide evidence on the potential of germinated cereals to increase the dietary energy of soft porridges, and thus to improve energy intake for healthy and for sick young children.*

Protein energy malnutrition (PEM) in Tanzania is a major public health problem, and one of the direct causes of the high infant and child death rates observed (UNICEF 1985). Available information shows that 40-60% of children under 5 years of age have a weight-for-age below 80% of the Harvard standard; 4-6% are below 60% of the same standard (UNICEF 1985).

The main dietary reason behind these high levels of PEM in Tanzania is inadequate intake of "total food," or energy; the nutrient content per energy unit is usually found to be satisfactory (Sheshamani 1981; Lukmanji 1985). The following three factors were observed by Ljungqvist (1988) to be determinants of low total food intake:

- Low feeding frequency during the weaning and postweaning stages;
- Insufficient dietary therapy during and immediately after the mild and severe illnesses that frequently occur; and
- The low energy density of the diet, due to high dietary bulk.

The low feeding frequency is primarily a result of the mothers' heavy work load; these mothers are left with little time to prepare food and to feed their children. In many cases, the problem is exacerbated by poor availability of food and fuel, and by a lack of proper facilities for food preparation in the households.

Constraints on the mothers' time also make difficult the proper feeding and care of sick children. Because of insufficient awareness of and attention to this factor by health workers and by the caretakers themselves, the full potential of food intake during illness and convalescence is not realized.

The low energy density of the diet is a result of the high starch content of the foods consumed. The amount of fats or foods of animal origin in the children's diet is usually very low. As a result, the food given to the children is high in "dietary bulk" (Ljungqvist et al. 1981); this means that even when they fill their stomachs, the children will consume very little dietary energy at each meal. The use of germinated cereals has recently attracted attention as a means of overcoming the problem of dietary bulk in child feeding (UNICEF 1987). This technique could have great potential for the situation in Tanzania: germination of cereals is already widely practiced throughout the country, usually in the preparation of local beer; in some instances, these germinated cereals are also in use for child feeding.

Methods and Materials

Review of Food Intake Studies of Children

A number of food intake studies of young children have been conducted in Tanzania. The results of these studies are usually presented in terms only of total daily intakes of energy and nutrients. This makes it difficult to assess the relative importance of feeding frequency, dietary bulk, food composition, and other feeding factors in relation to total feeding adequacy. For some of these studies, however, the original data were available in the archives of the Tanzania Food and Nutrition Centre; this allowed a more detailed analysis of the above-mentioned factors.

The studies selected for the analysis all used a "weigh and record" methodology, whereby the following weights were recorded: that of the raw ingredients of the dish prepared for the child or for the whole family; that of the total prepared amounts of each dish of the meal; and that of the actual amount of each dish consumed by the child.

The total energy, fat, and protein content of the meals, and the child's intake of these nutrients, were then calculated by using food tables (Platt 1962). Other relevant information was collected, such as the age and sex of the child, and the type of meal (breakfast, lunch, evening meal, or snack).

The studies initially entered into the system were all carried out in village households. The children were followed for 3-4 days by an enumerator who stayed throughout the day with the family. The studies covered the regions of Iringa, Mbeya, and Morogoro. The total number of child-intake days came to 254, with a total of 445 individual meals, involving 100 children under 5 years of age.

Community Food Intake Trials

The child-feeding trials were carried out in two locations (Ifupira village and Stone Valley Tea Estate) in Iringa Region; at the

same time, the household "weigh and record" diet survey was being conducted. The children were gathered at the respective sites and fed different porridge formulas. The trials were initially intended for children 12-36 months of age; their older and younger siblings arrived with them, however, and were included in the trial. In Ifupira village, the trial was carried out for 3 days, and in Stone Valley, 1 day. Although 75 children had been expected to take part daily for 3 days, only 17-28 children attended in the Ifupira village feeding trial. On the first 2 days, these children were divided into two groups, one receiving plain maize porridge and the other receiving maize porridge with added germinated flour. On the 3rd day, all the children received stiff maize porridge ("ugali") with relish.

In the Stone Valley trial, 69 children participated. They were randomly divided into 3 groups, and each group was fed either on fluid porridge or on stiff porridge: the 1st group was given maize porridge; the 2nd group, maize porridge with germinated flour; and the 3rd group, maize stiff porridge with relish. The composition of the maize porridge without germinated flour was as follows: maize flour (70 g/child); sugar (20 g/child); groundnuts (10 g/child); and water (800 mL/child). The maize porridge with germinated flour included the following ingredients: maize flour (70 g/child); sugar (20 g/child); groundnuts (10 g/child); water (400 mL/child); and germinated millet flour (5-10 g/child). The germinated flour was added after the porridge had been cooked and cooled to a temperature suitable for consumption, as described by Mosha and Svanberg (1983). Before these two porridges were served, it was ensured that both had the same consistency. The maize stiff porridge consisted of maize flour (100 g/child) and water (300 g/child). About 200 g of each of the two porridges were served to the children. Any leftover or extra helpings were weighed.

About 300 g of stiff porridge ("ugali") was served with a relish prepared from pumpkin leaves, tomatoes, and onion, with a little oil added. The contribution made by the relish to the total food and energy intake was not recorded: there was too great a problem in measuring exactly how much of this relish was consumed. Earlier studies have shown that because of the way in which children are fed the relish, it provides very little extra food or energy.

Results and Discussion

Review of Food Intake Studies

The data from the food-intake studies will be reviewed according to the framework proposed by Ljungqvist (1988). This framework defines the daily energy and nutrient intakes of children as functions of the following factors: number of meals per day, amount of food consumed per meal, energy/nutrient density of the prepared meal, and bioavailability of the energy/nutrient. An assessment of feeding inadequacies according to these factors will help to identify crucial underlying causes of problems and direct corrective measures.

Table 1 shows the number of meals provided per day. The vast majority of the children received two meals a day; many were given only one meal. There was no difference in feeding frequency between the age groups. Three children did not receive any meals on the days

studied; although it is likely that they were breastfed, the records do not provide reliable information on this.

Apart from the meals shown in Table 1, snacks given to the children between meals were also recorded. In all the 254 days of child intake records, however, snacks were given only 17 times. They consisted mainly of roasted maize or cashew nuts.

Table 2 shows the average amount of food and the energy intake consumed by the children at each meal. It is clear that although both the amount of food consumed and the energy intake increase with increasing age, the average amount of food consumed at each meal and the corresponding energy densities (Table 3) may be assumed to be slightly high.

This may be attributed to discrepancies arising from the survey methodology itself: because no food composition tables were available for raw foods, the cooked food intake data obtained through weighing had to be converted to the equivalent for raw foods; some families felt that because of the diet survey, they had to eat at certain times; and the meals consumed in the evening were often difficult to weigh in inadequate light.

Table 3 gives the energy densities of the meals consumed by the children. These energy densities were almost the same for all age groups, indicating that very similar types of meals are consumed

Table 1. Number of children of different ages fed 0-4 meals per day.

Age (months)	Number of meals					Total
	0	1	2	3	4	
6-12	1	3	6			10 (2.2)[a]
13-24	2	20	71	4	3	100 (22.5)
25-36	-	19	113	23	-	156 (35.1)
37-60	-	32	135	12	-	179 (40.2)
Total	3 (0.8)	74 (16.6)	325 (73.0)	39 (8.8)	3 (0.8)	445 (100.0)

[a]Figures in parentheses are percentages of total.

Table 2. Total food intake and energy intake per meal in children of different ages (mean ± SD).

Age (months)	Total food intake (g/meal)	Total energy intake (kcal)	No. of meals
6-12	179 ± 96	288 ± 166	10
13-24	284 ± 183	330 ± 210	100
25-36	343 ± 168	406 ± 220	156
37-60	448 ± 233	520 ± 223	179

throughout early childhood. It is most often the case that the children feed on the same foods as that eaten by the adults. A high energy density is observable in the food consumed by the youngest age group (6-12 months); this may be due to the fact that these meals were, in a few instances, rich in fat.

Table 4 shows the total daily energy intakes of the children studied. In all the age groups, the observed energy intake is well below recommended allowances. Unfortunately, there was no reliable information in the study records regarding breastfeeding. Other studies conducted under similar conditions have shown that 80-90% of children stop breastfeeding between 12 and 24 months. This probably means that when breastfeeding is stopped, there will be an abrupt decrease in energy intake.

Table 5 shows the total daily energy intake in relation to feeding frequency. Table 6 shows the amount of food eaten per meal, in relation to feeding frequency. From these tables, it is clear that the amount consumed in each meal does not differ very much if one or two more meals are given. There is some evidence that those children between 25 and 60 months of age can compensate by eating more when they are fed fewer meals. In general, however, total daily intake is strongly related to the number of meals eaten. It can be concluded that under the given circumstances, feeding frequency is by far the most important factor determining adequacy of energy intake.

Table 3. Energy density in meals of children of different ages (mean ± SD).

Age (months)	Energy density (kcal/g prepared food)	Number of meals
6-12	1.40 ± 0.64	10
13-24	1.19 ± 0.40	100
25-36	1.19 ± 0.34	156
37-60	1.22 ± 0.29	179

Table 4. Total daily energy intake (mean ± SD) in children of different ages.

Age (months)	Total energy intake (kcal/day)	Number of days
6-12	479 ± 185	6
13-24	523 ± 463	29
25-36	665 ± 397	50
37-60	833 ± 393	169
Total		254

Table 5. Total daily energy intake (kcal) in children, according to number of meals per day for 254 food-intake days (mean ± SD).

Age (months)	Number of meals per day		
	1	2	3 + 4
6-12	427 ± 59 (3)[a]	532 ± 272 (3)	0
13-24	195 ± 253 (14)	768 ± 389 (13)	1236 ± 257 (20)
25-36	403 ± 203 (11)	734 ± 425 (34)	772 ± 310 (5)
37-60	513 ± 225 (53)	964 ± 345 (106)	1156 ± 530 (10)

[a]Number of days is given in parentheses.

Table 6. Food consumed per meal (g) by children receiving a different number of meals per day for 254 food-intake days (mean ± SD).

Age (months)	Number of meals per day		
	1	2	3 + 4
6-12	233 ± 31	182 ± 63	0
13-24	220 ± 178	361 ± 198	372 ± 64
25-36	358 ± 151	306 ± 179	212 ± 73
37-60	449 ± 174	402 ± 173	357 ± 139

We will now consider in more detail the types of diet consumed in relation to the total energy intakes of the children. The meals given to the children were classified according to consistency: "solid" (rice and tubers), "semisolid" (stiff porridge, or "ugali"), and "liquid" (soft porridge, milk, and tea). When foods were combined, the dominant component of the meal (in terms of amount) determined the classification.

Table 7 shows the energy density of the meals according to consistency. It is clear that there is only a small difference between solid and semisolid meals; the liquid meals have a much lower energy density.

Tables 8 and 9 give the total food intake and the total energy intake per meal, respectively, for foods of different consistencies. It is interesting to note that compared with meals of solid consistency, semisolid meals are higher in total food as well as in total energy intake. This difference is significant only for the youngest age groups; for children 6-24 months of age, therefore, there would seem to be a clear advantage in providing stiff porridge ("ugali") with relish, rather than meals based on rice or tubers. Meals of liquid consistency provide much less energy per meal than do those of solid or semisolid consistency.

The fat content of the meals was also analyzed. It was found that in the vast majority of the meals (89%), there is scarcely any fat at all. Only 6% of the meals contained significant amounts of fat

Table 7. Energy density of prepared food for meals of different consistencies (mean ± SD).

Consistency	Energy density (kcal/g)
Solid	1.29 ± 0.38 (264)[a]
Semisolid	1.14 ± 0.33 (167)
Liquid	0.28 ± 0.19 (8)

[a]Number of observations is given is parentheses.

Table 8. Total food intake in children given meals of different consistencies (mean ± SD).

Age (months)	Solid	Semisolid	Liquid
6-12	261 ± 162 (5)[a]	393 ± 62 (4)	- (0)
13-24	322 ± 209 (67)	388 ± 190 (29)	30 ± 18 (4)
25-36	423 ± 229 (96)	431 ± 194 (55)	138 ± 109 (3)
37-60	533 ± 244 (99)	508 ± 188 (79)	484 (1)

[a]Number of children studied is given in parentheses.

Table 9. Total energy intake (kcal) in children given meals of different consistencies (mean ± SD).

Age (months)	Solid	Semisolid	Liquid
6-12	187 ± 104 (5)[a]	214 ± 31 (4)	-
13-24	262 ± 188 (67)	343 ± 169 (29)	225 ± 61 (4)
25-36	330 ± 164 (96)	377 ± 171 (55)	265 ± 129 (3)
37-60	445 ± 275 (99)	456 ± 168 (79)	145 (1)

[a]Number of children studied is given in parentheses.

Table 10. Protein content per energy unit in meals with different consistencies, expressed as percentage of energy provided by proteins (mean ± SD).

Consistency	Protein/energy (%)
Solid	13.4 ± 6.4 (264)[a]
Semisolid	11.0 ± 3.5 (167)
Liquid	21.5 ± 39.8 (8)

[a]Number of observations.

(10 g or more) in the form of coconut milk, cashew nuts, unprocessed seeds, or cooking oil.

The protein content of the meals, expressed as percentage protein/energy, is given in Table 10. In the meals with solid or semisolid consistency, the energy provided by protein was 13.4 and 11.0%, respectively. In meals based on rice or tubers, the intake of relishes was higher, thus providing some extra protein. The liquid meals had a higher percentage protein/energy (21.5); this may be because tea with milk was classified as a liquid meal.

Community Food Intake Trial

The total intakes in the child-feeding study in Ifupira and Stone Valley are summarized in Table 11 below. It is evident that there is no significant difference between the intake of plain porridge and that of porridge with germinated flour. The intake of stiff porridge is, however, higher in all age groups.

It is possible that the feeding procedure, in which the children were offered first 300 and then 200 g of food, may have aimed at having them finish what they were served and feel satisfied. This is further indicated by the fact that many of the actual intakes are clustered around these amounts. Because, however, the sample size was small and other factors affecting a child's food intake were not considered, no firm conclusions can be drawn.

For the 2 younger age groups, the amounts consumed increased slightly by age for the 3 preparations tested. No differences in intake according to sex or nutritional status (weight-for-age) were found with any of the preparations or age groups.

The intakes of energy and protein from the same meals are given in Table 12. The concentration of energy and protein per unit of prepared food is twice as high in the porridge with germinated flour as in the untreated porridge. Given an equal consumption of both types of porridge, the energy and protein intakes are therefore also about twice as high when germinated flour is used. The energy and protein concentrations in the stiff porridge are even higher than those in the preparation with germinated flour; moreover, higher amounts of the stiff porridge were consumed. Energy and protein

Table 11. Average intake of children receiving three different types of food based on maize flour.

Age (months)	Plain porridge (g)	Porridge with germinated flour (g)	Stiff porridge (g)
6-12	128 ± 55 (4)[a]	135 ± 84 (6)	185 ± 163 (2)
13-24	150 ± 85 (15)	166 ± 64 (15)	223 ± 80 (9)
25-36	151 ± 57 (11)	176 ± 65 (11)	300 ± 0 (8)
37-60	169 ± 67 (11)	172 ± 106 (14)	222 ± 92 (12)

[a]Number of children.

Table 12. Average intake of energy (kcal) and protein (g) of children receiving three different types of food based on maize flour.

Age (months)	Plain porridge		Porridge with germinated flour		Stiff porridge	
	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)
6-12	54.6	1.0	114.7	2.0	200.4	4.8
13-24	64.0	1.2	141.0	2.5	248.2	5.8
25-36	65.0	1.2	150.0	2.6	334.0	8.0
37-60	72.0	1.3	154.7	2.7	247.0	5.8

intakes with the stiff porridge were therefore about twice as high as those from the porridge with germinated flour, and about 4 times as high as those from plain maize porridge. It may be noted that all the children who participated in this study were apparently healthy, and were accustomed to eating stiff porridge with relish.

Food Intake of Hospitalized Children

The intakes of hospitalized children are given in Table 13. The researchers studied children who had been admitted to the pediatric unit of a hospital in Morogoro Region. The established schedule of this unit already included feeds of porridge with and without germinated flour. Every day at 0800, the children were fed maize porridge with germinated flour added after cooking; at 1100, they received maize porridge with dried, ground fish added. The total intake for 1 day of both porridges was weighed. On the morning of the following day, sugar was added to the porridge with germinated flour, to test whether the sweeter taste would lead to a higher intake.

The composition of the three types of porridge was as follows:

- 1st day - Porridge with germinated flour was given at 0800 (30 g maize flour/100 g prepared porridge, with a small amount of germinated flour added after cooking) (Mosha and Svanberg 1983);
- 1st day - Porridge with fish was given at 1100 (10 g maize flour/100 g prepared porridge; 5 g dried, ground fish/100 g prepared porridge); and

Table 13. Intake of three types of maize-based porridge by hospitalized children (mean ± SD).

Age (months)	Porridge with germinated flour (g)	Porridge with germinated flour/ sugar (g)	Porridge with fish (g)
5-15	70 ± 45 (23)[a]	72 ± 41 (20)	81 ± 22 (19)
16-48	107 ± 45 (11)	95 ± 29 (8)	87 ± 19 (9)

[a]Number of children given in parentheses.

- 2nd day - Porridge with sugar was given at 0800 (30 g maize flour/100 g prepared porridge; 7 g sugar/100 g prepared porridge, with a small amount of germinated flour added after cooking).

The three porridges had a similar consistency when served to the children.

The ingredients were weighed by the ward nurse, and the porridges were cooked by two mothers under the supervision of the nurses. All children were weighed, and their clinical condition diagnosed by the pediatrician in charge. A total of 41 children were included in the study. Because of the turnover (admitting and discharging) of children in the ward, however, only 23 received all three types of porridge. The average amounts consumed by the children were quite small for all three types of porridge. It seems that adding sugar to the porridge did not improve the intake. For two of the three types of porridge, significantly higher amounts were consumed by the older age group.

Table 14 gives the energy and protein intakes of the meals presented in Table 13. It is clear that the addition of germinated flour helps to achieve similar protein intake levels as supplementation with fish flour. It was found, however, that the germinated flour preparations provide about twice the amount of energy. The addition of sugar to the germinated flour porridge increases the energy intake still further.

Table 15 shows the difference in intake between children with diarrheal diseases and those with other illnesses (primarily pneumonia, anemia, and tuberculosis). All 23 children included in Table 15 consumed the 3 types of porridge. There seems to be a reduced intake of porridge during acute diarrhea, as compared with the other illnesses; the differences are, however, small.

Table 16 shows that although the amounts of porridge consumed do not vary much for the 3 types, the energy and protein content can be increased by the addition of germinated flour and sugar. At this stage, however, one cannot be certain as to the impact of power flour porridge on child growth: we need to consider both the intake of other foods and the effects of associated factors. Further studies are warranted, involving larger samples.

Table 14. Energy and protein intake in hospitalized children from three types of porridge.

	Porridge with germinated flour		Porridge with germinated flour/ sugar		Porridge with fish	
Age (months)	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)
5-15	75.6	1.7	94.0	1.7	41.5	2.0
16-48	115.0	2.6	128.0	2.2	44.0	2.0

Table 15. Total intake of three types of porridge in children with acute diarrhea and with other illnesses (mean ± SD).

	Porridge with germinated flour (g)	Porridge with germinated flour/sugar (g)	Porridge with fish (g)
Age, 5-15 months			
With diarrhea (9)[a]	62 ± 40	64 ± 23	82 ± 21
With other diseases (8)	85 ± 43	66 ± 31	84 ± 26
Age, 16-48 months			
With diarrhea (3)	95 ± 20	72 ± 25	78 ± 6
With other diseases (3)	113 ± 46	101 ± 39	106 ± 31

[a]Number of children.

Table 16. Protein and energy intakes of all three types of porridge for the amounts consumed, as indicated in Table 15.

	Porridge with germinated flour		Porridge with germinated flour/sugar		Porridge with fish	
	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)	Energy (kcal)	Protein (g)
Age, 5-15 months						
With diarrhea	67	1.5	86	1.5	42	2.0
With other diseases	71	1.6	84	1.6	42	2.0
Age, 16-48 months						
With diarrhea	102	2.3	97	1.7	40	1.8
With other diseases	122	2.7	135	2.4	54	2.5

Conclusions

The review of the child intake data confirmed the direction of child survival and development planning and action in Tanzania. Feeding frequency seems to be the most decisive factor in determining energy intake and therefore feeding adequacy. Special meals for the children are primarily in the form of watery porridges; snacks are mainly of roasted maize. These are given very rarely, however, and do not contribute much to an improvement in dietary intake. Fat-rich food components are, moreover, seldom used in food preparations.

It is interesting to note that stiff porridge ("ugali") dipped in a relish seems to be more readily consumed by small children than are meals based on rice or tubers.

The computer-based system established for analyzing data on food intake for children can be further developed to include other factors

such as breastfeeding, illness, and nutritional status. This system would then provide a very important means of assessing child-feeding adequacy under special conditions and circumstances.

The child-feeding trials included in this report investigate the means whereby soft porridges may improve the diet intake in healthy and in sick children. It seems that even when the children consume large quantities, the watery porridges sometimes prepared for them do not provide much in the way of energy or nutrients. The use of germinated cereals in the preparation of these porridges increases the energy and nutrient intakes by about 100%. This approach has great potential for child feeding, especially during acute illness, when food intake is reduced and liquid diets are often preferred.

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