

## Seasonality of Food Supply, Coping Strategies and Child Nutritional Outcome in Sabatia-Kenya

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**Abstract:** This study was conducted in Kenya. Samples of children and caregivers were selected using the EPI method. Food vendors and procurement strategy, demographic and socio-economic indicators of household were analyzed. A social economic index was derived. To understand the association between Dietary Diversity Score and mean anthropometric indices, confounding factors were identified on the basis of the UNICEF conceptual model of causes of malnutrition. A stepwise testing of confounders was done systematically resulting in a final multivariate model of regression on the mean nutritional indices. Only 32.8% were able to produce enough to last a year, most households did not meet their dietary needs. 48% of the households received food remittance as supplementary. Coping strategies within households were identified based on their frequency of occurrence. The observed poor breastfeeding beyond infancy underscores the need to stress on the contribution and benefits of breastfeeding to children, communities, and health systems. Dietary diversity positively correlated to household food availability. Increased consumption of common staples negatively correlated to food availability and dietary diversity. Stepwise regression identified access to roots and tubers, legumes and pulses, and carbonated drinks as the main determinants of food procurement and availability. Study shows that food production in households cannot meet food needs of even an area with adequate rainfall patterns. Low levels of education, employment and income observed among female caregivers constrain household purchasing power and knowledge required to select nutritious foods. Thus, empowering the women has far reaching benefits for nutritional outcomes of children.

**Key words:** Coping strategies, dietary diversity, food availability, food procurement, malnutrition

### INTRODUCTION

It is now a common knowledge that Africa suffers lack of food amidst plenty of natural resources more than any other continent in the world. Lack of adequate food at household level is a chronic problem and has become phenomenon in every province in Kenya. While world food supply is on the increase, there is limited access to the available food, (Eide, 1999). The major contributory factor in Kenyan communities is distribution made difficult by poor road networks and underdeveloped communication channels. As such food distribution to poor people living in rural and informal urban areas continues to be an impediment to optimization of the food and nutrition security at household, regional, national and global levels (Garrett and Ruel, 1999). Global hunger remains a grim reality even though world food output has nearly tripled in this century (World Watch Institute, 2001). In recent years, access to food by 841 million rural poor who dependent on agriculture and related socio-economic activities has been affected by unprecedented spike in world food prices

(Savy *et al.*, 2005). Of these, 799 million live in developing countries, (FAO, 2003). The increase in prices of food has been caused by the increased agricultural production costs and the ill-advised shift in land use in both developed and developing nations. Such programs have negatively impacted on economies, health and nutrition status among rural households in developing countries. Like in many developing countries, food security in Kenya is synonymous with availability of adequate cereal stocks, the staple diet and major cash crops for most of subsistence farmers in rural Kenya. The concern of this paper is food distribution and how it impacts on child nutrition in a Kenyan context.

### MATERIALS AND METHODS

The study was conducted in Sabatia Division, Vihiga District in Western Province of Kenya, in 2005 between April and August. Vihiga is lying within an altitude range of 1,300 m and 1,500 m with fairly distributed annual precipitation of 1900 mm. A total of 31 clusters of villages were identified in 31 sub-locations in the

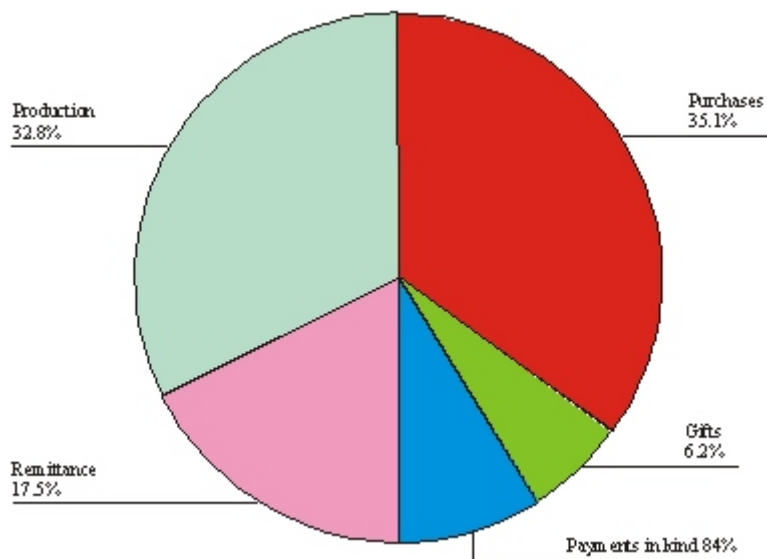


Fig. 1: Household food procurement methods in the division

division. Within each village, households were selected using the EPI sampling method (Bostoen and Chalabi, 2006). All children aged 24-59 months and their mothers or caregivers living in the same compound as the selected heads of households were included in the study. Also included were 20 small scale food vendors. Standard anthropometrical measurements for children under five were taken using standardized tools (Hauspie *et al.*, 2004). Ages of children was determined using birth records or a calendar of local events designed for the region. Nutrition status was analyzed using the 1978 National Center for Health Statistics/WHO reference using EpiNut software - Epi Info Version 6, Centers for Disease Control (Dean *et al.*, 1995) and food frequency questionnaire was used to assess food consumption at household level. A Dietary Diversity Score (DDS) was derived to describe the number and frequency of consumption of 8 food groups identified at household level. Thereafter, a social economic index was derived based on a matrix of indicator variables that code the housing quality (walls, roof, and floor), possession of current assets (electricity supply, petrol lamp, radio, bicycle, or and possession of cattle. To understand the association between DDS and mean anthropometric indices, potential confounding factors were identified on the basis of the internationally recognized UNICEF conceptual model of the causes of malnutrition. Factors that can influence both the DDS value and the children's nutritional status were considered as potential confounders. A stepwise testing of confounders was done systematically resulting in a final multivariate model of regression on the mean nutritional indices, together with the basic factors.

## RESULTS

**General socio-demographic characteristics:** A total of 179 children ages 24 to 59 months old were sampled for the study. Majority of children in the study population were aged between 36 to 47 months with a total of 78 children. Most of the interviewed female caregivers (85.6% of 150) had a mean age of 32.99 ( $\pm 10.207$ ) years, living in an average household size of 6.38 ( $\pm 2.55$ ). Majority of the caregivers (55%) had at least 8 years of schooling and another 35% had reached secondary level. Only 31% of the sampled female caregivers had employment in informal or formal job sectors

**Household food procurement strategies:** The overall contribution of food purchases, local production, and food remittances to household food procurement were fairly substantial (Fig. 1). With only 32.8% being able to produce enough to last a year, most households did not meet their dietary needs through household/domestic production. To supplement food procurement, 48% of the households received food remittance from relatives living outside the division.

The average household land size in the division was 1.12 ( $\pm 1.127$ ) acres. Yearly productivity of drought-resistant crops such as sorghum and millet by households was generally dismal. There were indications of increased food insecurity in households during the periods succeeding harvest of the short rains/season crop (Table 1). Up to 13% of households reported having harvested enough food in the long rains season in contrast to only 8% in the short rains season. Likewise, the proportion of households that did not harvest food at the

Table 1: Household food security based on duration of food stocks after the harvest in both long and short rains farming seasons

| Availability of harvested food stocks after the harvest | Caregiver households with food stock |       |             |      |
|---|--------------------------------------|-------|-------------|------|
|   | Long rains                           |       | Short rains |      |
|   | n                                    | %     | n           | %    |
| Available till next Season                              | 23                                   | 13.06 | 15          | 8.4  |
| Available for more than 1 month                         | 87                                   | 49.43 | 60          | 33.5 |
| Available for approx. 1 month                           | 32                                   | 18.18 | 46          | 26.2 |
| Available for less than 1 month                         | 18                                   | 10.22 | 31          | 17.8 |
| Did not harvest at all                                  | 16                                   | 9.09  | 24          | 14.1 |
| Total   | 176                                  | 100   | 176         | 100  |

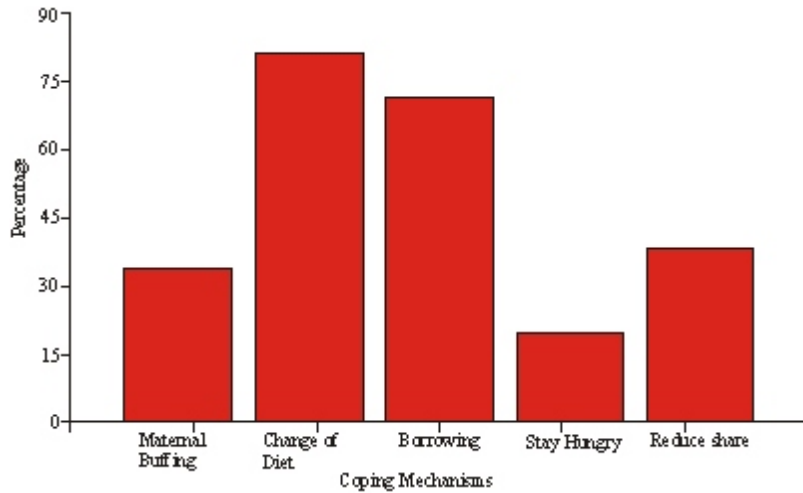


Fig. 2: Coping mechanisms of households during periods of food stress

end of the long rains season was only 9% compared to 14% who harvest additional produce at the end of the short rains season.

**Household responses to seasonality of food supply:**

Five key coping strategies within households were identified based on their frequency of occurrence. These include: periodically changing composition of their normal diet (70% of the households), borrowing food or money to purchase food (63% of the households), reducing amount and variety of food consumed (41% of the households), maternal buffing (38% of the households) while 28% of the households went without food for even a day (Fig. 2).

No single coping strategy was found sufficient to cushion families against food or nutrition shocks. Consequently, there were overlaps of two or more strategies that households adopted to combat food insecurity. Many households opted to change their diet in various ways such as through replacing staple foods consumed or altering the consistency or quality of the food served at the family dinner table. For instance, common staples such as maize meal were frequently replaced with roots and tubers or green bananas, and red

meat traded with dried small fish. Similarly, the consistency of food eaten was often changed by serving lighter meals such as light porridge instead ‘ugali’ (African bread made from ground cereals), or through serving diluted and sugarless black tea instead of the regular sweetened whole milk or tea with milk. Such practices reduced the variety and quantity of food ingredients and eventually compromised dietary quality of the food served especially for composite meals.

**Nutrition of preschool children:**

**Duration of breastfeeding:** Out of the sampled 176 children, 28 (16%) had been breast fed for less than year. As an option of providing nutrients to their babies, a total of 109 (61%) mothers breastfed up to 24 months (Table 2). However, only 21% of the children surveyed in this study continued to breastfeed after their second birthday. Only one child had never been breastfed.

**Consumption of complementary foods:** Mean frequency of consumption index score for milk and milk products was 7, while similar scores for meat and meat products and carbonated drinks were the least at 3 and 2 respectively (Fig. 3). The food groups consumed most

Table 2: Distribution of children based on duration of breast feeding in months after birth

| Duration of breastfeeding (Months) | 24-35 | 36-47 | 48-59 | Total |
|------------------------------------|-------|-------|-------|-------|
| 0                                  | 0     | 1     | 0     | 1     |
| < 13                               | 7     | 13    | 7     | 28    |
| 13- 24                             | 33    | 48    | 28    | 109   |
| > 24                               | 12    | 16    | 11    | 39    |
| Total                              | 52    | 78    | 46    | 176   |

Table 3: Prevalence of malnutrition indicators among preschool children by sex

|         |            | WHO/NCHS classification of malnutrition level |      |                |      |                   |      |
|---------|------------|---|------|----------------|------|-------------------|------|
|         |            | Wasted (WHZ)                                  |      | Stunting (HAZ) |      | Underweight (WAZ) |      |
| Gender  | Z score    | n   | %    | n              | %    | N                 | %    |
| Females | < -3       | 0   | 0.0  | 4              | 4.3  | 2                 | 2.1  |
|         | < -2 to -3 | 0   | 0.0  | 16             | 17.9 | 5                 | 5.3  |
|         | < -1 to -2 | 9   | 9.6  | 25             | 27.1 | 36                | 39.1 |
|         | > -1       | 82  | 90.0 | 46             | 50.6 | 49                | 53.5 |
| Males   | < -3       | 0   | 0.0  | 7              | 6.9  | 4                 | 3.9  |
|         | < -2 to -3 | 6   | 5.9  | 17             | 16.8 | 16                | 15.7 |
|         | < -1 to -2 | 21  | 20.4 | 35             | 34.7 | 33                | 32.6 |
|         | > -1       | 74  | 73.7 | 42             | 41.6 | 48                | 47.6 |

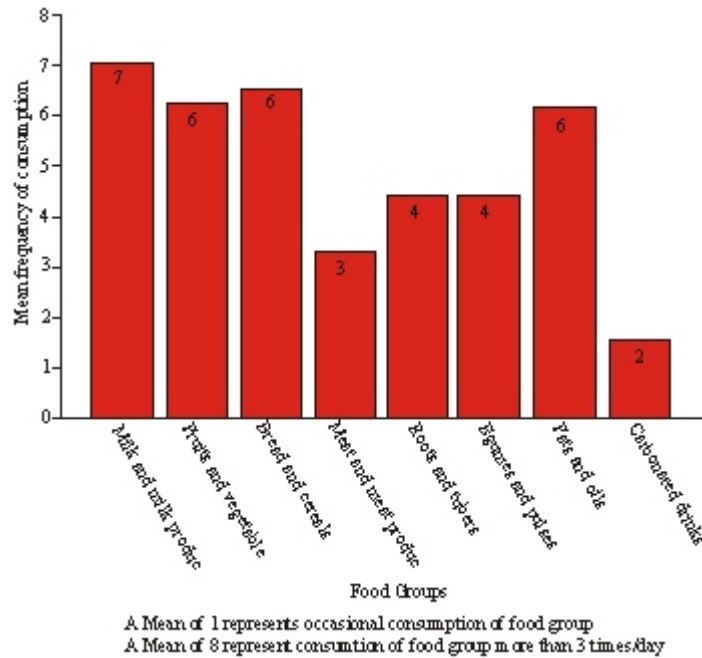


Fig. 3: Frequency of food consumption among preschool children

frequently by children were cereals and milk. In most households, children frequently ate legumes and pulses rather than proteins with higher biological value such as meat and meat products.

**Nutrition status of children:** Table 3 summarizes the nutrition status of the surveyed children. The mean age, height, and weight of children under five years old were 42 months, 93 cm, and 13.8 kg, in that order. The prevalence of wasting or Global Acute Malnutrition (GAM) levels at the -2 SD cut off point among boys and

the two gender combined were 6 and 3.6%, respectively. The prevalence of stunting was 23.7 and 22.2% for boys and girls respectively. The prevalence of underweight for boys was 19.6% and that of girls was 7.4%. On the whole, occurrence of stunting and underweight was 23 and 14.3%, respectively.

**Correlation of household food procurement and consumption:** It is assumed here that children were mainly fed on food items procured through purchasing or through household level production. Therefore, the

Table 4: The association between dietary diversity and the food availability index

| Food group        | Correlation coefficient | p-value |
|-------------------|-------------------------|---------|
| Roots and rubbers | 0.255                   | 0.041*  |
| Carbonated drinks | 0.248                   | 0.046*  |
| Bread and cereals | - 0.014                 | 0.913   |

\*: Statistically significant at the 0.05 probability level

needs of preschool children and other household members. Educated women are better able to process information, acquire new skills, and model positive child-care practices besides availing better health, nutrition, and education to their children (Engle *et al.*, 2003). Education also increases the ability of caregivers to earn income, even though the corresponding increase in opportunity household food procurement regime in the community affected food consumption among children under five years old (Table 4). Dietary diversity (frequency of consuming the eight food groups investigated) positively correlated to household food availability. However, increased consumption of common staples negatively correlated to food availability and dietary diversity. Stepwise regression identified roots and tubers, legumes and pulses, and carbonated drinks as the main determinants of food procurement and availability ( $F = 3.419$ ,  $p = 0.02$  (one tailed)). These food groups were the least consumed in households (Fig. 3).

**Determinants of nutrition status among the children:**

A series of five linear regression equations showed that the two most influential variables in predicting the nutrition outcome among preschool children were household socioeconomic status ( $R^2 = 0.189$ ,  $p$ -value = 0.012) and income levels ( $R^2 = 0.246$ ,  $p$ -value = 0.002) (Table 5). Overall a significant positive correlation was observed between nutrition status and socioeconomic status index, Yield of maize, Number of employed household members and Age of mothers (caregiver), ( $R^2 = 0.390$   $p = 0.000$ \*).

Table 5: Stepwise regression of nutrition status on explanatory variables

| Dependent variable | Explanatory variables   | Correlation coefficient (R) | F-value | p-value |
|--------------------|---|-----------------------------|---------|---------|
| Nutritional status | 1 Socioeconomic status index  | 0.189                       | 6.452   | 0.012*  |
|                    | 2 Income  | 0.246                       | 9.584   | 0.002*  |
|                    | 3 Socioeconomic status index<br>Yield of maize  | 0.306                       | 6.880   | 0.001*  |
| 4                  | Socioeconomic status index<br>Yield of maize<br>Number of employed household members                                    | 0.356                       | 7.380   | 0.000*  |
|                    | 5 Socioeconomic status index<br>Yield of maize<br>Number of employed household members<br>Age of mothers or caregivers. | 0.390                       | 6.821   | 0.000*  |

\*: Statistically significant  $p < 0.05$  confidence level

**DISCUSSION**

**Education and social economic status of female caregivers:**

The low levels of caregiver education observed in this study portend considerable challenges to the ability of affected households to meet the nutrition cost of their time may, at times, negate the attainment of some positive caregiver aspects such as breastfeeding. Education level of women or caretakers is an important determinant of household food procurement competencies in many countries (Qiuhsunbing, 1995). This is especially true in situations where household decisions on food production and acquisition depend on caretakers' knowledge of the nutrition benefits of different foods and ways of directing household resources towards the procurement of food for home consumption. Competencies acquired through quality education are thus very crucial in this rural community which largely depends on the markets to meet their food needs. Two studies (Hartmann, 2004; Wen-Jui and Wadfogel, 2001) showed that women with formal employment are often better educated, relatively younger and better caregivers than those who are not. This explains why socio-economic status, age of care giver, and formal employment emerged as leading determinants of nutrition status among children Under Five in this study.

**Household access to food:**

The observed prominence of household food purchases suggests that the contribution of small-scale food retailers to the diet in the area was generally substantial. The months running from January to July have previously been identified as the most difficult dispensation for the food-poor in many rural areas of Kenya (Narayan and Nyamwaya, 1995). These are the preceding months before the next harvesting season begins, a period of great food stress as affirmed by results of this study (Table 1). Other complementary methods such as remittances by relatives were significant

throughout the year probably because of fairly strong extended family structures. It is an age long practice for many resource-poor communities living in the rural areas of most developing countries which have strong extended family bonds that can be exploited in meeting foods needs during periods of adverse food shortages.

**Household food consumption and nutrition status:** The DDS index score in this study showed a higher demand for common staple foods such as Bread and Cereals, Fruits and Vegetables further advancing the argument of household low purchasing power and access to higher social-cultural value foods such as animal products. The DDS also exposed some degree of dietary inadequacies. This is a common diet in many resource poor countries registering high prevalence of Protein Energy Malnutrition and Micronutrient deficiencies. A study conducted in rural Abia state, Nigeria found out that cereals, legumes, roots and tubers were predominantly consumed, foods known to contain iron inhibitors that fuel Iron Deficiency Anemia especially among children under five, pregnant and lactating women (Ominawo *et al.*, 2010). Increased dietary diversity improves the capacity of individuals to meet their daily requirements for a large number of essential nutrients (Arimond and Ruel 2002).

The marked contrast of low acute malnutrition (Wasting) and chronic malnutrition underscore the exposure of children and the community at large to prolonged inadequate nutrition which may be a generation problem. However, a high prevalence of Protein Energy Malnutrition (Stunting and underweight) was attributed to multiple factors. Studies have singled out household socio-economic status, employment, and income levels as the key predictors of nutrition status even though complex interaction of factors often plays an important role in nutrition outcomes (Ayieko, 2007; Banjo *et al.*, 2006). In this study, nutrition status of preschool children was affected by a complex interaction of factors that included the poor capacity of women to influence household food selection and consumption levels (Table 5).

**Coping strategies during stress:** The inability of household income to cover average expenditure on food accounted for the disgrace of households borrowing food as a procurement strategy to ensure their survival. Households also resorted to reducing the share of food eaten by cutting down on the frequency of consumption of meals in a day and the amounts served per person. When the amount of food available was insufficient to feed all family members, older people in the family particularly mothers sometimes surrendered their food allocation to allow their young ones to feed in a practice

known as maternal buffing. These coping strategies followed a pattern were indicative of the severity of household food insecurity. The most popular strategies such as change of diet and borrowing were less severe compared to the least popular ones such as maternal buffing and choosing to remain hungry as dictated by fate.

## CONCLUSION AND RECOMMENDATION

Results of this study show that the level of food production in households cannot meet food needs of even an area with adequate rainfall patterns. The amount of land holdings seems to play a role in household food adequacy. Certain food crops such as cereals are better grown in large farms for mechanization for higher yields. Families may be encouraged to produce horticultural crops such as tomatoes, capsicums and onions for sale, or beans and lentils that are needed in smaller volumes in the home. They should be encouraged also to keep or collect mini-livestock such as edible insects that can significantly contribute towards protein foods in the home (Ayieko, 2007; Sikorsk *et al.*, 2002; Pisacane, 2005).

Most households in the rural areas cannot afford nutritious supplementary food items. Moreover, household incomes cannot support the necessary capacity to diversify their food intake. Protein foods of high biological nutrients such as beef, chicken or fish tend to be fairly expensive for an average family in the rural Kenya to afford one meal of each per week. In addition, Breastfeeding was not as optimal as possible to provide children with a good start, the good standard for infant feeding. Consequently, the main childcare givers who are women in most homes may not be economically solvent enough to influence the variety of the household food basket and adequately meet the nutrition needs of their households. The very low levels of education, employment and income observed in the division especially among female caregivers further constrained household purchasing power and knowledge required to meaningfully select nutritious foods. Thus, food remittances became invaluable component of household food procurement as most households often faced food deficits. Indeed, empowering the women has far reaching benefits for nutritional outcomes of children in rural Kenya.

The lead time to the subsequent harvesting season presented households with serious challenges in procuring adequate amounts of nutritious food. Such are the times when homemakers should be empowered with capacity to produce other fast growing horticultural produce such as paracely, dhania, duddi, brinjals or ockra for sale and feed families while waiting for the main harvesting season. These crops are normally in demand during raining seasons and fetch good prices in the urban centers.

Change of diet, borrowing of food, maternal buffering, reduction of food intake levels, and fasting were some of the common coping mechanisms used to combat food insecurity in the division. Such coping strategies only place stress and reduce the caregivers' strength and stamina to manage children. The caregivers also subject themselves to low nutritional status and opportunistic diseases common during famine.

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