

# Preliminary study of income and nutritional status indicators in two Ethiopian communities

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## INTRODUCTION

Malnutrition is associated with poverty in many communities. Increasing individual income and purchasing power is therefore regarded as an important prerequisite for improved nutritional status of the community [1,2]. Observation of the development of young children using anthropometric measurement has been used by many investigators as an indicator of changes in community nutritional status [3,4]. This study uses differences in anthropometric measurements of children in two rural Ethiopian communities to describe the relationship between income and malnutrition.

Farmers in a number of areas in Ethiopia grow *khat* (*Catha eculis*), which is used as a stimulant [5,6], and which provides considerably greater incomes than can be achieved with the cultivation of other cash crops, including coffee. Less labour and fewer other inputs are required for the cultivation of *khat* than for other cash crops.

In Ethiopia, the region of Harrarghe is considered to be the main area for cultivation and trade. Production of *khat* has increased considerably over the last ten years, as shown by increasing values of exports to neighbouring countries [7] (table 1). (The exports recorded by the Ethiopian National Bank do not include illegal consignments.) *Khat* production appears to be increasing in other countries as well [8].

**Table 1. Khat export through Dire Dawa [in thousands of birr]**

Year	Birr	Year	Birr
1975	5,424	1980	24,732
1976	6,468	1981	17,892
1977	5,331	1982	32,858
1978	5,803	1983	28,862
1979	10,508		

The cultivation of *khat* appears to have changed the

life style of many farmers in the region [9]. Many have replaced thatched roofs by corrugated iron sheets and have acquired prestige items such as transistor radios and vehicles. Similar changes have been observed among *khat* farmers in Kenya [10].

If income determines nutritional status, then children from *khat*-producing families are expected to show a higher nutritional status than children from families producing other crops.

## METHODS

Two communities were studied from Harar Zuria district, located in the Harrarghe administrative region. The study communities correspond to two farmers' associations in the district. Selection of the communities was based on (a) the cultivation patterns adopted by the majority of farmers and (b) similarity in food habits, ethnicity, language, and religion. Farmers in the Kile farmers' association grew staple food crops and little or no *khat*, while farmers from Miayi farmers' association grew few staple food crops and cultivated mainly *khat*. Differences between the cultivation patterns of the two communities were due to the fact that the soils in the Kile farmers' association were unsuitable for *khat* cultivation. Social and cultural differences between the communities were slight and not expected to influence the growth performance of young children.

All households with children less than 60 months old in each of the two communities were included in the study. There were no refusals. From Kile, 128 households were interviewed, and from Miayi, 131 households. The head of the household was interviewed to record the number and type of livestock owned, family size, type of house, type of light source used, and radio ownership. Farmers also stated which of the three staple crops—maize, groundnuts, and sorghum—they themselves cultivated, with the amount of each sold in the market. These amounts were converted to cash values on the basis of local market prices.

The same prices were used in the conversion of production of all households. The woman in the household was

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interviewed to determine income from the sale of milk and firewood.

Khat production and sale was estimated from the area of land under cultivation. A fixed number of khat trees (450) were assumed to be planted per unit area (timed). This number represents the average number of khat trees counted on five randomly chosen areas, each one timed in size. The fixed yield was assumed for all of the khat trees planted and the same market value for each unit measure of khat was used for all households. This procedure allows comparison of the market value of produce, including khat, between the various farm families. Estimates of income from khat cultivation are directly derived from the area of land planted with khat trees.

Height, weight, sex, and age were recorded for all children between 0 and 60 months in all of the households studied. A total of 193 children from Kile and 196 children from Miayi were included. Weight was recorded to the nearest 100 grams with a hanging spring balance scale. Height and length were recorded with a vertical measuring rod and a wooden length-board respectively, to the nearest 0.1 cm. All three measurements were carried out using techniques described by Jelliffe [3]. Age was estimated with the use of a local calendar of events.

Weight-for-age was compared to the Gomez standard [11], and weight-for-height and height-for-age to the Waterlow standard [12].

Regression analysis was carried out using any of the three anthropometric variables as single dependent variables and various estimates of economic status as independent variables.

## RESULTS

The community growing khat earned approximately three times more per farm family than did the community growing other crops only (table 2). It is also apparent that the incomes of farmers who do not grow khat are skewed to lower values whereas the khat growers show a centred

distribution. Income from different sources shows that khat farmers ignore other crops (table 3).

The income from milk and firewood is generally earned by the woman. The combined value of earnings for these two items, averaged per household, is similar in both communities.

The distribution of ages among children less than 60 months old is the same in both communities. Family size is significantly greater among khat farmer households (table 4).

The two communities show marked differences in the pattern of investment indicated by type of house owned, source of light used, radio ownership, and livestock owned (tables 5, 6, 7, and 8). For each of the first three indicators, it is apparent that khat cultivators can afford a higher level of investment than cultivators of other crops. Farmers who do not grow khat appear to own more expensive livestock, which is consistent with the requirements of their farming practices.

Differences in weight-for-height by age of all children in each of the two communities are shown in figure 1.

TABLE 2. Total incomes in two communities (birr)

	No.	Mean	Min	Max	Mid point
Khat-growing	196	2,704	568	5,035	2,801
Non-khat-growing	193	875	120	2,220	1,170

TABLE 3. Incomes in two communities by source (percentage of total income,

	Khat-growing (n=196)	Non-khat-growing (n=193)
Khat	76.8	0.0
Crops	8.8	50.2
Milk	1.8	23.5
Firewood	12.6	26.3

TABLE 4. Age and family size in two communities

	No.	Age (months)					Family size (no. of members)				
		Mean	SD	Min	Max	Mid point	Mean	SD	Min	Max	Mid point
Khat-growing	196	25.1	16.6	2	59	30.5	5.54	1.70	2	9	5.5
Non-khat-growing	193	26.4	16.9	1	60	30.5	4.87	1.51	2	8	5.0

Weight-for-height indicates impaired growth around the weaning age in both communities. The children of khat farmers appear to show a slightly improved nutritional status at four and five years compared to the children of other farmers. However, these differences are

small in practical terms. Height-for-age indicates minor differences between the communities.

In regression analysis, total household income was split between the income generally earned by the man

(from khat, maize, groundnuts, and sorghum crops) and by the woman (from milk and firewood sales). In addition the number of large animals in the household was used as one measure of household resources.

**TABLE 5. Type of house by community**

Community	Corrugated iron-roofed houses	Thatched houses	Others	Total
Khat-growing	104	27	-	131
	(79.4) <sup>a</sup>	(20.6)	-	(100)
Non-khat-growing	16	24	88	128
	(12.5)	(18.8)	(68.7)	(100)

a. Figures in parentheses are percentages.

**Table 6. Radio ownership by community**

Community	Owned	Not owned	Total
Khat-growing	27	104	131
	(20.6) <sup>a</sup>	(79.4)	(100)
Non-khat-growing	-	128	128
		(100)	(100)

a. Figures in parentheses are percentages.

**TABLE 7. Source of light by community**

Community	Lantern	Kerosene lamp	Total
Khat-growing	87	44	131
	(66.4) <sup>a</sup>	(33.6)	(100)
Non-khat-growing	5	123	128
	(3.9)	(96.1)	(100)

a. Figures in parentheses are percentages.

**TABLE 8. Livestock ownership by community**

Community	Ox	Cow	Calf	Sheep/goat	Camel	Total
Khat-growing	28	88	76	55	-	248
	(11.7)	(35.5)	(30.6)	(22.2)	-	(100)
Non-khat-growing	74	130	98	15	45	362
	(20.4)	(35.9)	(27.1)	(4.1)	(12.4)	(100)

a. Figures in parentheses are percentages.

Table 9 shows the percentage variation in two anthropometric measurements explained by the sum of squares of the regression when data from children in both communities was combined. The data shows that once age and sex are already entered in the equation, the indicators of income fail to explain additional variation.

Table 10 shows the percentage variation explained for children in khat- and non-khat-growing communities separately. The variation explained by the income variable is negligible when age, sex, and family size have been taken into account. The four variables together explain almost 40 per cent of variation in height-for-age in non-khat-growing families.

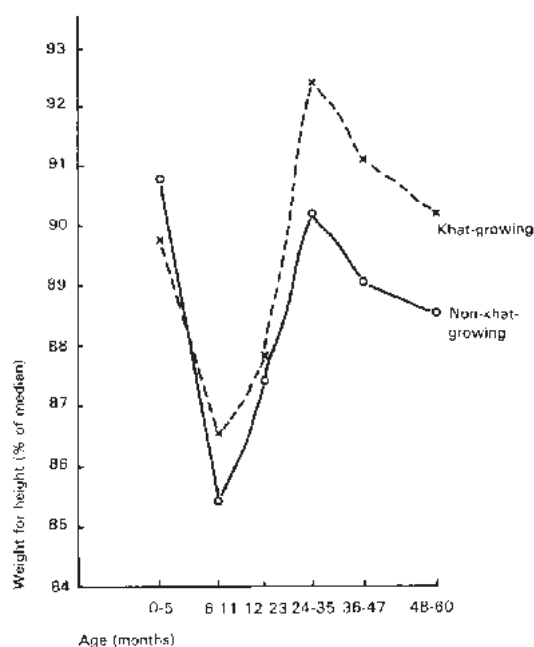


FIG.1. Weight-for-height in khat- and non-khat-growing communities

TABLE 9. Percentage variation in weight-for-height and height-for-age, explained by age, sex, man's income, and woman's income

Child in household	Variable			
	Age	Sex	Man's income	Woman's income
Youngest				
Weight-for-height	0.0	0.0	0.9	1.8
Height-for-age	4.1	4.1	4.2	4.2
Second-youngest				
Weight-for-height	3.9	5.9	6.3	6.4
Height-for-age	14.9	20.3	20.4	21.3

TABLE 10. Percentage variation in weight-for-age and height-for-age, of children with one younger sibling, explained by age, sex, family size, and woman's income

	Variable			
	Age	Sex	Family size	Woman's income
Khat-growing				
Weight-for-age	0.3	6.4	6.5	6.6
Height-for-age	11.5	13.9	14.1	14.1
Non-khat-growing				
Weight-for-age	1.0	12.8	19.9	20.7
Height-for-age	22.6	35.7	35.8	39.1

Regression analysis using weight-for-age as the dependent variable was carried out using all income variables in one model: income, man's income, woman's income, possession of large animals, house, light,

radio. The model explained approximately 4 per cent of variation in the measurements of either youngest or second-youngest children.

## DISCUSSION

Farmers cultivating khat have a total cash income around three times the income of farmers who do not grow khat in Harar Zuria district. They also possess a considerably greater number of market goods such as radios, lanterns, and tin-sheet house roofs. These findings corroborate those of other authors [9,10].

The nutritional status of children in khat-producing farm families is similar to that of children in other farm families. Differences are smaller than might be expected from the large differences in cash income between the families.

Khat production in the area has grown sharply in the last ten years and increased income does not appear to have changed the nutritional status of the children. Similar findings on nutritional status from the effect of changes in economic status have been reported by Hernandez et al. [13].

None of the indicators used to express cash income or the financial resources of the household predict nutritional status in a practical sense. This finding is consistent with the observation that neither anthropometric measurement of the youngest child in the household nor that of the second-youngest child is predicted by income. Neither the man's income nor the woman's income shows any influence. Differences between the communities as regards the nutritional status of children appears to be related to other than economic factors.

A study in Ghana [14] points to the influence of income being controlled by the woman of the households on the nutritional status of her children. The increased ability of the mother to provide snacks and other additional food to young children throughout the day has been suggested as the reason for this association. The relationship between the woman's income and the nutritional status of her child was not of practical importance for the families in Harar Zuria. Mothers who engage in the sale of milk or firewood often leave their children in the care of family members, which may account for the lack of association. Popkin [15] mentions the fact that the absence of the mother influences the nutritional status of the child.

The data on the nutritional status of children who have one younger sibling in the household shows almost 40 per cent of the variation height-for-age as predicted by age, sex, family size, and woman's income, if the children live in households that do not cultivate khat. The same variables predict only half the variation in khat-growing households, of which most variation is contributed by sex and family size. In the households of farmers who do not cultivate khat, most of the variation is predicted

by age and sex. It appears that the small reduction in longer-term nutritional status in non-khat-growing communities is related to environmental or child-care habits that were not measured in this study. Whether the low level of resources available to these families enhances the effect of these factors remains to be confirmed.

## REFERENCES

1. A. Berg, *The Nutrition Factory* (Brookings Institution, Washington, D.C., 1973).
2. L. Joy and P. Payne, "Food and Nutrition Planning," Document ESN: CRS/75/35, (FAO, Rome, 1975).
3. D.B. Jelliffe. *The Assessment of the Nutritional Status of the Community*, WHO Monograph Series, no. 53 (WHO, Geneva, 1966).
4. Joint FAD/UNICEF/WHO Expert Committee, *Methodology of Nutrition Surveillance*, WHO Technical Report Series, no. 593 (WHO, Geneva, 1976).
5. J. L. Zelger et al., "Behavioural Effects of Cathinone, an Amine Obtained from *Catha edulis* Forsk: Comparisons with Amphetamine, Norpseudoephedrine, Apomorphine and Nomifensine," *Bulletin on Narcotics*, 32(13): 67-81 (1980).
6. W. Lugman and T. S. Danowski, "The Use of Khat (*Catha edulis*) in Yemen: Social and Medical Observation," *Annals of Internal Medicine*, 85: 246-249 (1975).
7. Ethiopian National Bank, Annual Report (Government of Ethiopia, Addis Ababa, 1984).
8. T. Baasher and R. Sadoun, "The Epidemiology of Khat," *Proceedings of the International Conference on Khat* (ICAA, Lausanne, 1983), pp. 161-178.
9. M. Assefa, "Socio-economic Aspects of Khat in the Hararge Administrative Region (Ethiopia)," *Proceedings of the International Conference on Khat* (ICAA, Lausanne, 1983), pp. 7278.
10. C. K. Maitai, "Country Report—Kenya," *Proceedings of the International Conference on Khat* (ICAA, Lausanne, 1983), pp. 8791
11. F. Gomez et al., *Advances in Pediatrics* (Year Book Publishers, Inc., Chicago, 1955), p. 131.
12. J. C. Waterlow, "Classification and Definition of Protein Energy Malnutrition," in G. H. Beaton and J. M. Bengoa, eds., *Nutrition in Preventive Medicine*, WHO Monograph Series, no. 62 (WHO, Geneva, 1976), pp. 530-556.
13. M. Hernandez, C. P. Hidalgo, J. R. Hernandez, H. Madrigal, and A. Chavez, "Effect of Economic Growth on Nutrition in a Tropical Community," *Ecol. Food and Nutr.*, 3: 283-291 (1974).
14. R. B. Tripp, "Farmers and Traders: Some Economic Determinants of Nutritional Status in Northern Ghana," *J. Trop. Pediatr.*, 27: 15-22 (1981)
15. B. M. Popkin, "Time Allocation of the Mother and Child Nutrition," *Ecol. of Food and Nutr.*, 9: 1-14 (1980).