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Unit Equivalent Scales for Specific Food Commodities: Kinshasa, Zaire

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ABSTRACT

Unit Equivalent Scales for Specific Food Commodities: Kinshasa, Zaire*

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In demand analysis a per capita specification of the household is not always adequate. Per capita expenditures do not reflect the wide differences in the amount spent on food attributable to differences in the household's age and sex composition. Unit equivalent scales incorporate these differences. Unit equivalent scales are estimated for three food categories and for total foods for Kinshasa, Zaire from monthly household expenditure data. The effects of household composition on food expenditures, economies of scale and differences between nuclear and non-nuclear household members are examined.

† † †

Une spécification par tête des données sur le ménage n'est pas toujours suffisante dans une analyse de la demande. Les dépenses par tête ne reflètent pas les larges différences existant dans la somme dépensée en nourriture attribuables à celles existant dans la composition du ménage du point de vue âge et sexe. Des échelles d'équivalence unitaire incorporent ces différences. Des échelles d'équivalence unitaire sont estimées pour trois catégories d'aliments et pour la nourriture totale de Kinshasa au Zaire à partir de données sur les dépenses mensuelles d'un ménage. Les effets de la composition du ménage sur les dépenses alimentaires, l'économie d'échelle et les différences entre membres du ménage au sens restreint et large sont examinées.

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I. Introduction

In the determination of demand for specific food commodities, a household's size and age-sex composition are strongly influencing factors. Elimination of the demographic characteristics is often taken as a first step to examining the influence of economic demand variables. The most common way of achieving this elimination is through the use of consumer equivalence scales. By employing these scales family members of a given age and sex are expressed as a proportion of a base consumption unit, usually an adult male. The use of age-sex equivalence scales enables comparison to be made of the levels of food consumption of households of different demographic composition. In addition, groups of households based on different criteria may be examined. Valid comparison may thus be made between households of different economic or social levels, or ethnic backgrounds.

The scales conventionally used are based on nutritionists' estimates of food requirements for different age levels as a proportion of the food consumption of a typical adult, and thus independent of the sample to which they are applied. Moreover, these estimates are based on what an ideal consumer should require, not what an actual consumer purchases in the marketplace. Many such scales have been formulated for developed nations, and attempts have been made to adapt these to food requirements in less developed tropical countries. These encounter three main difficulties: (1) the conversion problems inherent in adapting a temperate zone ideal to a tropical ideal under conditions of varying temperature, humidity and food availability, (2) an ignorance of the intra-familial allocation of the undernourishment often found among low-income urban populations, and (3) the limited applicability stemming from a basis of caloric or protein needs and not that of specific commodity groups.

Alternative methods have been proposed, whereby true economic equivalence scales may be calculated using information derived from household budget surveys. These have the decided advantage of being based on actual consumer behavior. Such scales have been estimated with British data by Prais (1953), Prais and Houthakker (1955) and by Brown (1954), and with U.S. data by Price (1967, 1970).

The main objective of this study will be to estimate age-sex equivalence scales for expenditures on three commodity categories, cereals and starches, legumes and vegetables, and meat and fish, as well as total food expenditures using Kinshasa, Zaire data. Till now little work with African statistics has been done because of the reduced size of most urban budget surveys or limitations in their validity or degree of reliability. Consequently, these scales fill a major gap in the personal consumption literature for developing countries.

II. The Model

The most widely used method is that developed by Prais and Houthakker. Their procedure was based on the assumptions that consumption per adult equivalent of a specific commodity is a function of income per adult equivalent, and that the functional form of the relationship is known. In general, the household demand equation is expressed as follows:

$$\frac{x_j}{\sum_{i=1}^{t} \beta_{ij} n_i} = f_j \left(\frac{M}{\sum_{i=1}^{t} \alpha_i n_i} \right) \qquad (1)$$

where x_j = expenditure on the j^{th} commodity,

n_i = the number of members of the household in the i^{th} age-sex category,

M = income,

β_{ij} = the coefficient of adult equivalence for the j^{th} commodity and the i^{th} age-sex group,

α_i = the coefficient of adult equivalence for income of the i^{th} age-sex group,

t = the number of age-sex groups.

Prais and Houthakker employed two explicit forms of $f_j(m)$ where m represents the term in parentheses in equation one:

a semi-logarithmic form

$$f_j(m) = d_j + B_j \log m \qquad (2)$$

and a constant elasticity form,

$$f_j(m) = A_j m^{\eta_j}. \tag{3}$$

Manipulation of equation (1) enables x_j/f_j to be expressed as a linear combination of the age-sex categories,

$$\frac{x_j}{f_j(m)} = \sum_{i=1}^{t} \beta_{ij} n_i. \tag{4}$$

The following converging iterative procedure was employed by Prais and Houthakker to obtain coefficients for the β_{ij}: (a) a value was assumed for d_j or η_j, (b) the value was computed for $x_j/f_j(m)$, (c) the value of the computed variable was regressed on the n_i's and the correlation coefficient computed, (d) the procedures of a, b, c were repeated for different values of d_j or η_j chosen as a function of previous d_j or η_j, (e) the values of d_j or η_j were chosen to maximize the correlation coefficient.

While it is possible to choose initial values of α_i and, using a similar iterative procedure arrive at a reliable estimate by expressing the $\Sigma\alpha_i$ as a weighted sum of the specific food scales $\Sigma\beta_{ij}$, Prais and Houthakker choose to assume a fixed value of $\alpha_i = 1$ for all i. Both functional forms gave markedly similar results for the adult equivalence food scales for total food and some specific commodities using 1938 data on family budgets gathered by the Ministry of Labour.

Brown divided households into 16 types and employed a similar methodology with 1951 British working class data. For same-type households, Brown showed that it was possible to estimate the income elasticities independently of the scale parameters using the constant elasticity form (3) of the consumption function,

$$x_j = A_j \frac{\sum_{i=1}^{t} \beta_{ij} n_i}{\left(\sum_{i=1}^{t} \alpha_i n_i\right)^{\eta_{jk}}} M^{\eta_{jk}} = a_j M^{\eta_{jk}}. \tag{5}$$

For constant household composition, the sums are constant and absorbed into the term,

$$a_j = A_j(\sum_i \beta_{ij}n_i)\ (\sum_i \alpha_i n_i)^{-\eta_{jk}}, \tag{6}$$

where the subscript k refers to household type. This estimate of η_{jk} is then used to adjust the dependent variable for income, expressing the adjusted expenditure as a linear function of family composition,

$$\frac{x_j}{A_j}\left(\frac{\sum_{i=1}^{t} \alpha_i n_i}{M}\right)^{\eta_{jk}} = \sum_{i=1}^{t} \beta_{ij} n_i . \tag{7}$$

Least squares estimates of the expenditure scales can be made free from the effects of income. Since the error term in estimating equation (7) is multiplicative and not additive, Brown weighted the observations in inverse proportion to the squared mean of the transformed variable by household type. Brown avoided the iterative procedures used previously. He found that during the same season, income elasticities were approximately constant across household groups, but differed significantly from one season to another.

Price in an early paper used the urban portion of a 1955 USDA food consumption survey to determine scales for U.S. households. Using the data he tested the Prais-Houthakker methodology for application to thirteen household types and found two problems:

(1) The form of the best-fitting equation varied with size of household. The semi-log form yielded higher R^2's for one and two member households while the double-log did so for households having three or more members. Further, (2) income coefficients were significantly different across household types.

Price modified the method of computing scales to take account of his findings. He used the double log form exclusively (after having eliminated one-person households) and postulated a distinct constant term and income elasticity for each household type.

$$\frac{x_j}{A_k}\left(\frac{\sum_{i=1}^{t} \alpha_i n_i}{M}\right)^{\eta_{jk}} = \sum_{i=1}^{t} \beta_{ij} n_i . \tag{8}$$

An iterative procedure was employed to determine the value of the constant term. In addition to the assumption of fixed values for the α_i, values are assumed for the β_{ij} to seed the equation. The scales then found after regression were used to correct the initial estimates and final scales were computed. In addition, he included the standard number of meals consumed by the individual households as a second independent variable to correct for the variation in food expenditures while computing the scales. To increase the efficiency of his estimates, Price weighted each observation in inverse proportion to the size of the standard deviation of the independent variable within its household type. The assumed income scale was the same as that used by previous authors $\alpha_i = 1$ for all i. An alternative "guesstimate" was made of an income scale which resulted in lower scale values for all age-sex categories other than initial male and female.

In a later paper, Price employed his basic methodology and the latter income scales to find unit equivalent scales for five food commodities and total food expenditures. He verified the existence of economies of scale in family size by comparing scales constructed for individuals in different sized households. In addition he examined differences in scales by income level.

The work by these four authors comprises the basis for present computation of food equivalence scales. Some additional theoretical work has been done, but has not been applied. In a short note McShane (1971) proposed inclusion of certain psychological characteristics of demand strength by constructing a scale based on differences in consumption from a group norm. The method was not examined empirically.

Two authors have expanded the theoretical foundation to the construction of adult equivalence tables. Barten (1964) and later Muellbauer (1974) approached the question from an attempt to construct price elasticities from cross-sectional data. Barten found that the traditional equivalence scales represent composite effects which have already absorbed substitution and complementarity between goods. These effects are not separable using the Prais-Houthakker method. In addition, the traditional method cannot incorporate price effects which Barten showed to be similar to family effects for infinitesimally small changes in the composition of the family. Muellbauer simplified Barten's method of analysis and developed parallels between household equivalence scales and a cost of living index. A subsidiary result of the Barten-

Muellbauer contribution is the ability to simultaneously estimate price and income scales. However, identification problems make it impossible to empirically estimate equivalence scales using this method without prior restrictions on the magnitude of the scales, or use of time-series information.

Because of the identification difficulties inherent in the Barten-Muellbauer methodology and lack of time series budget data, this paper will employ the earlier Prais-Houthakker technique.

III. The Data

A. The Sample. The data used for the empirical estimates consisted of 1238 budgets each provided by one household, which covered one month's expenditures. These came from the Socio-Economic survey[1] of Kinshasa carried out from January 1969 to January 1970. The survey was a random sample of one percent of the African households in Kinshasa, stratified by administrative units called zones.[2]

An interesting aspect of the sample is the notion of a sampling unit based in part on commensality. The household was defined as "the set of people who live from the same revenues and eat from the same casserole." Such a definition, which is quite common in African statistical enquiries, was chosen since extended family members may be dispersed to several dwelling units, yet form part of the same household. This choice of sampling unit is fortunate, as it permits a more systematic examination of the role of extended family members within an urban environment than a strict interpretation based on lodging.

Initially socio-demographic information was collected from household members. Later each household was interviewed twice daily for thirty days to collect information on receipts and expenditures. Daily visits and interviews were employed since most African housewives are illiterate and do not maintain

[1]The reader desiring full particulars of the survey is referred to chapters II and III of Houyoux, 1973. The survey was done for a doctoral dissertation, based on an updated 1967 list of compounds in Kinshasa.

[2]In the higher revenue areas, the sample rate was doubled, to one in fifty to compensate for the tendency of higher income households to understate income and luxury expenditures.

records of expenses. Current market values were imputed after careful measuring to produce from family gardens or received as gifts.

For purposes of this analysis foreign African households were eliminated from the original sample due to their non-static situation. These represented 15.6% of the total and were composed mainly of Angolan refugees living in Kinshasa. In addition, four households whose head was less than 20 years old were also eliminated.

B. Formation of the Dependent Variable. The food expenditure variable (x_i) was money value of food purchased, harvested or received as gifts. The income variable (M) is the sum of all expenditures.[1]

The nutritional categories include cereals and starches, legumes and vegetables, and fish and meat. These account for approximately 80% of total food expenditures.

Income scales may be computed as a weighted sum of specific commodity scales, but the procedure for so doing requires a clumsy set of iterations involving computation of the age-sex scales and readjustments to the income scale. All authors have employed as assumed scale, and the scale where $\alpha_i = 1$ for all i will be employed here, so that income per capita (m) is the expenditure variable.

C. The Formation of the Independent Variables. The independent variables used in calculating unit equivalence scales are the number of individuals in each family who fall into different age-sex categories. Previous authors have employed widely varying age-sex categories for determining equivalence scales. These ranged from Brown's six categories which he claimed were the minimum necessary for worthwhile analysis, (p.450) to Price's 13 categories to examine differences within the life-cycle of the family (1967, p. 30).

The explicit criteria employed in setting forth the particular categories have never been adequately stated, and are usually a function of the available data, rather than a structure imposed on it. Price gave two norms (p. 51) for data manipulation: 1) having a sufficient number of observations in each category, and 2) having categories of a sufficient degree of homogeneity, but he

[1]For an explanation of the institutional problems in the determination of leisure expenditures, and hence actual income, see Houyoux and Houyoux, 1970, p. 101, and Caprasse and Bernard, 1965, p. 415.

did not make the transition from the abstract criteria to the choice of types.

Both Brown and Price found a high degree of intercorrelation between adult males and adult females which was eliminated by employing a composite type consisting of the first adult male and the first adult female. As a consequence, one-person households were eliminated from the analysis.

Seventeen age-sex categories were employed in the Kinshasa analysis. They were chosen to facilitate comparison with previous work using the Kinshasa data. (Houyoux, 1973). These classes are more homogeneous than those used by other authors, and because of their detail, avoid the earlier correlation problem. Table A lists the categories employed.

The intercorrelation matrix for the independent variables was computed (Table B). The results show a satisfactorily low degree of intercorrelation between the various age-sex types.

D. Formation of the Household Types. Brown showed that by holding age-sex composition constant, it was possible to estimate the income elasticity independently of the scale parameters. This estimate could be used to adjust the food expenditure variable for differences in income levels before regressing to obtain scale values. Price (1967) extended this reasoning to include the constant term for each household type as well.

Brown employed 16 types where the age-sex composition was (p. 451) held constant for 6 of these, while Price allowed for more within-type variation to increase the number of observations. Formation of such categories was possible given the rather homogeneous family types found in the samples of U.S. and U.K. samples.

In Africa, however, the range of family types is much more varied. The nuclear family is larger on the average than that found in surveys in western nations. In addition, the extended family ties mean that there will be a larger number of non-nuclear adults and/or children present in the household. Consequently, no conclusions may be drawn about family life cycle from the composition of household types, as older children or adults may be visitors.

Constrained by the data, 7 types were employed where substantial within-type variation was permitted. A description of the types may be found in Table C. Only 129, or slightly above 10% of the households did not fit into any of these categories.

IV. Results

A. The Income Elasticity of Food Expenditure Estimates by Household Types. Equation (6) was tested for the 7 household types detailed earlier. Since the error term is multiplicative and not additive, each observation was weighted in inverse proportion to the standard deviation of the dependent variable for the household type in order to obtain more efficient estimates.

The results are presented in Table D. Several comments are in order. First, the explanatory power of the income variable is considerably higher for Kinshasa households than it was for U.K. or U.S. ones. Price found that his income and meals variables together accounted for approximately 30% of the variation in food expenditures. Brown found the income and household size parameters together accounted for 70% of the variation for U.K. households. For Kinshasa households the corresponding figures for an income variable alone is .85. Second, the income elasticities show much less variation between types than those found by either Brown from U.K. data, or Price from U.S. data. This may stem from the more homogeneous nature of the Kinshasa population's economic levels than those found in other surveys. The population averaged total expenditures of $62.86 per month, and less than 10% of the population spent more than $240 per month. Such an income structure is representative of African urban areas. Third, the income elasticity is slightly lower for couples with only young children than for other groups, which is more in accord with Brown's findings than with Price's, but the magnitude of this inequality is lower than for either of the two previous studies. This may stem from the high budget incidence of non-food costs of establishing a household, as well as economies of scale in non-food expenditures for later children.

Tests were made on the equality of the residual variances and the equality of the income parameters. Price found that the residual variances were negatively correlated with family size, but that is not shown in these results. In fact, the lowest residual variances are for one-person households.

Bartlett's test was used for examining the equality of the residual variances. A computed χ^2_6 of 7.38 was obtained, which, compared with a χ^2_6 of 8.558 at the 20 percent level, did not show significant differences among the residual variances. These findings disagree with those of Price.

A test for the equality of the income elasticities (Lyttkens, 1964) gave a χ^2_6 of 47.76 which showed significant differences at the one percent level.

The results of the analysis of household types show that some of the variations in expenditure which stem from age-sex composition may be accounted for by household type. The parameters estimated using Equation (6) may be used to adjust food expenditures for differences in household income levels before computing the age-sex scales.

B. Age-Sex Equivalence Scales. Age-sex equivalence scales were computed in the following manner. First, raw values of the $\hat{\beta}_{ij}$ were computed using Equation (8). Then the dependent variable was divided by the $\hat{\beta}_{ij}$ for the standard age-sex groups, in this case that of the 30 to 39 year old adult males. The regressions were again performed to find the scales. The results are presented in Table E.

For total foods, cereals and starches, legumes and vegetables, and meat and fish, the scales show that a child represents only slightly less for the food budget than does an adult male, and that this importance generally increases to the age of 12. Adolescent males (13-19) and young adult males (20-29) represent less than do older children (7-12). Females have higher weights in total food expenditures, legumes and vegetables, and meat and fish than do men. The high scale values for women over fifty may indicate some special expenditures for visiting older female relatives who account for 20 percent of women in this category.

Scale values for cereals and starches are generally higher than those for the other food categories and total food. Scale values for meats and fish are lower for children and higher for females than for the other categories.

The scale values found for children are higher than those found in previous studies. While problems arise for the strict comparability of the scales stemming from differences in the construction of the age-sex or commodity categories, Table F gives the ranges of values found for children under 15. These high values seem to imply a family food allocation policy biased toward children in the face of low per capita incomes and possible malnutrition.

The low scale values for adolescent males and young adult males may be due to their eating more frequently away from home, and the inability of the survey to adequately assess the value of food eaten. The values for female consumption in the corresponding age-sex groups are higher, with the exception of cereals, than those of males, an indication of underestimation of the latter.

C. Economies of Scale. Another topic of interest is the existence of economies of scale within the family. Price found sizeable economies of scale for total food, and some meats, questionable economies for vegetables and grain products, and none for milk and fruit for children under 20 years of age (1970, p. 229). In his earlier study he found slight economies of scale for adults, other than the first male and/or female (1967, p. 71). Brown found lower scale values for men and women other than the nuclear couple (p. 454). Forsyth constructed his age-sex categories by distinguishing between first, second and third children in order to verify the existence of economies of scale within the family. Using composite age-sex scales constructed for different family sizes, he found economies of scale for food and drink (p. 383) using the single or double log model.

To examine the hypothesis of the existence of economies of scale in Kinshasa, families were classified by size. Scales were computed as shown in Table G, for individuals in different size households. The results indicate that for intermediate size families (5-7 members) diseconomies of size exist for children under 12, adolescents, and adult females. Economies of scale exist only for older females. Older males show almost constant scale size. For large families (8 members or more) the situation is somewhat different. Economies of scale begin to appear for children under 7, but diseconomies continue for children 7-12. Economies are present for adolescents, adult females, and older females, while diseconomies become apparent for older males.

A test proposed by Chow was performed to examine the equality of the scale values for the different family-size types. Equality between types a and b, and b and c may be rejected at the one percent level. Equality between types a and c may not, thus supporting the hypothesis of diseconomies of scale in intermediate size families.

D. Nuclear versus Non-Nuclear Family Members. The question has arisen as to whether non-nuclear household members are treated in the same manner as are nuclear family members. The universal prevalence of the extended family system and the accommodation of visitors for varying periods of time force one to examine the distribution of food expenditures between the two groups. Differences in treatment would imply the existence of differing age-sex equivalence scales between nuclear members and others of the same age-sex category. The following modifications of Equation (1) were introduced to examine this hypothesis. The family equivalents were disaggregated to nuclear and non-nuclear members as shown in Equation (9):

$$\frac{X_j}{\sum_i \gamma_{ij} n_i + \sum_i \delta_{ij} n_i} = f_j \left(\frac{M}{\sum_i \alpha_{ij} n_i} \right) \tag{9}$$

where γ_{ij} refers to nuclear family members, and δ_{ij} refers to other members of the household.

Table H gives the equivalence scales for aggregated age-sex groups. For all groups except adult males, the scale values are similar, as may most readily be seen in the last column. The only significant difference was that between nuclear and non-nuclear adult males, which had a t-value of 3.54, with 8 degrees of freedom, which compares to a t-value of 3.355 at the one percent level. For other categories, there is no evidence to reject the hypothesis of equality of equivalence scales. One explanation of the lower value for non-nuclear adult males may be the excessive representation of 20-29 year olds who account for 89 percent of the individuals. It was found earlier that scale values for that age-sex category were lower than expected. The lower scale value may thus be a function of the age structure of the individuals, not their membership within the extended family.

V. Summary

Unit equivalent scales have been estimated to show the effects of age and sex, household size, and membership in the nuclear family on household food expenditures.

Scale values indicate that the cost of feeding a child is approximately three-fourths that of feeding an adult. This proportion is higher for cereals and starches (almost 90 percent) and lower for other categories.

Food expenditures for young males and adolescent males are lower than for similarly aged females, indicating an underestimation of their food expenditures away from home. Other than in those categories, the females consume approximately as much as males, except for meat and fish, where female consumption is higher.

Diseconomies of family size were found for children under twelve for families up to seven members. Families of eight or larger showed economies for children under seven, adolescents and adult females, and diseconomies for male adults over 40.

Membership in the extended family was not found to have effects on scale values, except for adult males. Non-nuclear adult males have lower values, though this may be due to the disproportionate influence of the young age group.

Table A: Description of Age-Sex Categories for Which Equivalence Scales Were Calculated

Category	Description		Number of individuals in sample
1	Child	less than 2 years old	517
2	Child	2 to 3 years	620
3	Child	4 to 6 years	846
4	Child	7 to 9 years	802
5	Child	10 to 12 years	697
6	Male	13 to 15 years	283
7	Male	16 to 19 years	306
8	Male	20 to 29 years	476
9	Male	30 to 39 years	463
10	Male	40 to 49 years	292
11	Male	50 years or older	158
12	Female	13 to 15 years	288
13	Female	16 to 19 years	293
14	Female	20 to 29 years	606
15	Female	30 to 39 years	430
16	Female	40 to 49 years	166
17	Female	50 years or older	71

Table B: Correlation Matrix of the Age-Sex Categories Used in Computing Equivalence Scale

Category	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.0000																
2	.1751	1.0000															
3	.1857	.2584	1.0000														
4	.1097	.1941	.3225	1.0000													
5	.0696	.1072	.2783	.3343	1.0000												
6	.0484	.0038	.0921	.1970	.2626	1.0000											
7	-.0280	-.0343	.0454	.1191	.1725	.1939	1.0000										
8	-.0267	-.0563	-.1313	-.1453	-.0898	-.0438	.0786	1.0000									
9	.1426	.2112	.1855	.1648	-.0306	-.0476	-.1586	-.2646	1.0000								
10	-.0067	.0127	.1299	.1543	.2549	.1360	.2032	-.1330	-.3965	1.0000							
11	-.1055	-.1039	-.0734	-.0270	.0955	.0802	.1318	.0757	-.2571	-.1897	1.0000						
12	-.0498	.0292	.0678	.1828	.3016	.0217	.2387	.0345	-.1363	.1946	.1526	1.0000					
13	.0020	-.0295	-.0688	.0459	.0812	.1246	.0717	.0780	-.1481	.1000	.1104	.1629	1.0000				
14	.1751	.2275	.1271	.0194	-.1314	-.1299	-.0348	.0734	.1834	-.2072	-.1145	-.0815	-.1282	1.0000			
15	-.0108	.0344	.1609	.2180	.3407	.1966	.1059	-.2190	-.0197	.3153	-.0591	.1730	-.0202	-.4672	1.0000		
16	-.0821	-.0879	-.0079	.0480	.1987	.1413	.2048	.0837	-.2769	.0818	.3911	.2065	.1714	-.1022	-.2484	1.0000	
17	-.0849	-.1069	-.1300	-.0913	-.0324	.0412	-.0170	.0090	-.1225	-.0705	.2559	.0034	.0520	-.1052	-.0891	-.0448	1.0000

Table C : Description of Household Types

Type Number	Description	Average Number of Persons	Number of Households
1	Single adult male or female (20+)	1	69
2	Male (20+) and female (20+)	2	47
3	Female (20+), one or more children (under 20)	3.5	72
4	Male (20+), female (20+), one or more children (under 7)	4.05	130
5	Male (20+), female (20+), one or more children (7-12) _or_ one or more children (7-12) and one or more children (under 7)	6.02	214
6	Male (20+), female (20+), one or more children (13-19) _or_ one or more children (13-19) and one or more children (under 12)	7.48	316
7	Male (20+), female (20+), one or more adults (20+), one or more children (under 20)	8.42	261

Table D -- Description of Food Expenditure-Income Parameters by Household Type

Household Type	Constant[1]	Income Coefficient[1]	R^2	Standard Error	Average Expenditure[2]	Average Family Size
1	1.7675 (.61851)	.87001 (.02633)	.94217	.19377	1709.2	1
2	2.4347 (/69089)	.83232 (.03360)	.86965	.20475	1462.7	2
3	3.5766 (.74209)	.78395 (.03366)	.79249	.22066	1871.7	3.5
4	7.0048 (.55816)	.69498 (.02005)	.82326	.22296	1753.6	4.05
5	3.1399 (.34385)	.80144 (.01406)	.85461	.20376	1888.0	6.02
6	3.3515 (.3.364)	.80158 (.01406)	.83772	.22362	2475.1	7.48
7	3.9181 (.32754)	.78667 (.01393)	.85990	.22037	2905.6	8.42
Σ	3.1315 (.15207)	.80545 (.00698)	.84709	.23168	2206.0	.5.91

[1] Standard error in parentheses

[2] Makuta (K), 1 K = $0.02 at the time of the survey

Table E -- Age-Sex Expenditure Scales for Total Food Expenditure and Food Categories*

Category	Expenditure on: Total Food	Cereals and Starches	Legumes & Vegetables	Meat and Fish
Child (under 2)	.68143 (.04867)	.92795 (.07616)	.67224 (.04930)	.57918 (.07079)
Child (2-3)	.69806 (.04939)	.83614 (.07774)	.63139 (.05049)	.77190 (.07269)
Child (4-6)	.66499 (.04039)	.89928 (.06303)	.64021 (.04043)	.66384 (.05822)
Child (7-9)	.85250 (.03950)	.93693 (.06257)	.64959 (.04109)	.93653 (.05933)
Child (10-12)	.81304 (.04249)	.83554 (.06976)	.60255 (.04503)	1.0439 (.06589)
Male (13-15)	.68582 (.05887)	1.0112 (.09626)	.61542 (.06303)	.65199 (.10032)
Male (16-19)	.57380 (.05463)	.82474 (.09088)	.56343 (.05886)	.59383 (.09518)
Male (20-29)	.79336 (.03796)	1.0273 (.06639)	.54636 (.04218)	.79589 (.06359)
Male (30-39)	1.0000 (.05386)	1.0000 (.08531)	1.0000 (.05760)	1.0000 (.08201)
Male (40-49)	.99435 (.06635)	1.0264 (.10655)	1.0086 (.07181)	1.0607 (.10377)
Male (50+)	.90985 (.07945)	1.3476 (.13302)	1.0475 (.08808)	.77070 (.12915)
Female (13-15)	.69235 (.06051)	.72037 (.10139)	.61343 (.06542)	.88480 (.10459)
Female (16-19)	.87353 (.05638)	.63475 (.09292)	.60109 (.06306)	1.1948 (.09839)
Female (20-29)	1.0269 (.05462)	.79401 (.07583)	.68679 (.04891)	1.4203 (.07191)
Female (30-39)	1.1310 (.05854)	1.2021 (.09314)	.95644 (.06312)	1.3698 (.09144)
Female (40-49)	1.0346 (.07864)	1.3154 (.12965)	1.1449 (.08670)	1.1074 (.12785)
Female (50+)	1.2264 (.08405)	1.1328 (.13713)	.76339 (.09463)	1.6116 (.13599)
R^2	.88099	.64807	.59189	.69411

*Standard error in parentheses.

Table F: Ranges of Scale Values for Children 15 and Under

Category	U.S.	Kinshasa	U.K.[1]	U.K.[2]
Total Food	.46 - .57	.66 - .85	.32 - .69	.58 - .67
Vegetables	.41 - .50	.60 - .67[d]	.33 - .85	---
Farinaceous	.52 - .98[e]	.72 - 1.01[f]	.38 - .88	---
Meat & Fish	.22 - .54[g]	.57 - 1.04	-.03 - .83[h]	

a. Price, 1970, p. 228. This applies to Chilldren 14 and under.
b. Prais, 1953, p. 803. This applies to Children 13 and under.
c. Brown, 1954, p. 454. This applies to Children 13 and under.
d. Vegetables and legumes
e. Grains only
f. Cereals and starches
g. Meat and Pork
h. Fish: -0.03 - .83; Meat: 0.05 - .48

Table G -- Age-Sex Equivalence Scales for Total Food Expenditures by Family Size*

Category	A 4 or less	B 5-7	C 8 or more
	Family Size		
Child (under 7)	.73675 (.04362)	1.0177 (.05484)	.81006 (.06992)
Child (7-12)	.55770 (.07313)	.85832 (.08149)	.87424 (.09544)
Males (13-19)	1.0794 (.10276)	1.1262 (.11451)	.84253 (.10353)
Males (20-39)	1.0000 (.04750)	1.0000 (.11803)	1.0000 (.11755)
Males (40+)	1.0391 (.08786)	1.0486 (.19570)	1.3024 (.22117)
Females (13-19)	1.1611 (.07588)	1.5693 (.12639)	.94382 (.11216)
Females (20-39)	1.3556 (.05933)	1.5599 (.16418)	1.2639 (.15943)
Females (40+)	1.3942 (.09022)	1.2773 (.25646)	1.2198 (.23039)
Average Family Size	2.73	5.95	9.55
N	418	460	360
F value for equality of scale values		8.86 (a, b)	1.11 (a, c) 13.18 (b, c)

*Standard Error in Parentheses

Table H. Age Sex Equivalence Scales for Total Food Expenditure: Nuclear vs. Non-Nuclear Family Members*

Category	Nuclear Scale	Nuclear N	Non-Nuclear Scale	Non-Nuclear N	Non-Nuclear Scale ÷ Nuclear Scale
Child (0-12)	.82615 (.01397)	3337	.83642 (.06581)	145	1.0124
Child (13-19)	.80006 (.02873)	918	.77597 (.05385)	252	.96989
Male (20+)	1.0000 (.03950)	1230	.71101 (.00689)	159	.71101
Female (20+)	1.1780 (.04208)	1206	.96237 (.11654)	67	.81695

R^2 = .87800

*Standard error in parentheses.

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