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NORTH CAROLINA UNIVERSITY AGRICULTURAL MISSION TO PERU

INCOME ELASTICITIES OF DEMAND FOR PERU-- A PRELIMINARY ANALYSIS

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Introduction

Consumer purchases of a particular commodity depend upon a wide panorama of factors such as income, relative prices, family size, socio-ethnic background, advertising, age, religion, and geographical location. Prediction of future consumption levels requires an understanding of how these various factors influence the consumer in allocating his income. Unfortunately, we are never able to completely specify the influences of all these factors. Therefore, we must be more modest and select two or three factors and relate them to purchases.

One method of predicting the annual growth rate of demand (D) is to relate population growth (P), increase in income per capita (I), and the income elasticity of demand (E) by the following simple formula:

$$D = P + E\ (I)$$

This formula is somewhat restrictive in that changes in consumer preferences and relative prices are not incorporated. However, in absence of other information, it may give sufficiently accurate estimates.[1]

The relative importance of increases in income on increases in demand can be illustrated by an example. For Peru, we can approximate P by 2.9% and I by 2.0%.[2] Using these values, the projected percentage increase in demand for an income elasticity of .75 is 4.4%. The contribution of the income term is 1.5% per year or approximately one-third of the increase in demand. As the population growth rate slackens and the per capita income growth rate accelerates, the relative importance of the income term increases. The importance of incorporating the influence of income changes in demand projections is evident. Accordingly, the objective of this study was to provide some preliminary estimates for income elasticities of demand for selected food and non-food items in urban locations which can serve as a basis for demand projections and analysis.

Source of Data

The data used in this study were taken from the results of family expenditure surveys published in Resultados Preliminares de la Encuesta Sobre Las Condiciones de Vida de la Familia en: Lima-Callao, Arequipa, Cuzco, Huancayo, Chiclayo, e Iquitos, Informe I, 1ª Parte, Abril, Mayo, Junio, 1964, Instituto Nacional de Planification, Lima, Peru, Oct. 1964, and Patrones de Consumo en las Cuidades de Arequipa y Cuzco, PS/D/34, Vol. XV, Plan Regional Para El Desarrollo Del Sur Del Peru, Lima, Peru, 1959. (Hereafter referred to as 1964 data and 1959 data, respectively.)

The sample characteristics for the 1964 data are given in Table 1. The published results are for 327 families in the cities of Lima, Arequipa, Cuzco, Huancayo, Chiclayo, and Iquitos. Only families with two or more

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[1] See E. O. Heady, Agricultural Policy Under Economic Development, Iowa State University Press, Ames, Iowa, 1962, p. 645, and R.D. Stevens, "Elasticity of Food Consumption Associated with Changes in Income in Developing Countries", Foreign Agricultural Economic Report No. 23, USDA, March, 1965, p. 4.

[2] These estimates are based upon, respectively, La Poblacion, Los Recursos Humanos Y El Empleo En El Peru, Lima, Abril, 1964, Cuadro 1 and Analisis De La Realidad Socio Economica Del Peru, Vol. 1, Instituto Nacional De Planificacion, Lima, Julio, 1963, Cuadro 1.

members and that lived in urban residential areas were selected. In addition, certain families were eliminated because their incomes did not fall within the range established by a preliminary survey. Each of the selected families completed a detailed questionnaire during a one week period. The data were collected during the months of April, May, and June, 1964. Although data for all expenditure items were collected, only the data corresponding to family size, income, and food expenditures were published in the Resultados Preliminares.... Receipts from gifts and temporary aid were not included in income.

The 1959 study included a survey of a total of 437 families grouped into two classes of workers--employees (empleados) and laborers (obreros). Each of these two classes was stratified into three family income levels (Table 2). An initial sample was randomly drawn from pay-roll and social security data based upon employers records of manufacturing, construction, power, communication, banking, transportation, and service industries. On the basis of the initial sample, a preliminary survey was made to select those workers that met the following conditions: (1) was head of a family, (2) had resided in the city for more than six months, (3) had not been unemployed during the previous twelve months, and (4) did not eat the majority of meals away from home. In the basic survey schedule, data for 173 different expenditure items were collected. The data were collected in one interview and corresponded to the previous week's, month's or year's purchases depending upon the nature of the item. Family income included all the wages and bonuses, gifts, rents, and family produced items. In an effort to reduce errors introduced by under-reporting of income and/or over-reporting of expenditures, data from families whose annual expenditures were 100% greater or 50% less than their annual income were eliminated.

Certain characteristics of these data should be noticed. First, they correspond to the larger urban cities and therefore may not be representative of smaller cities or rural areas. Second, they correspond to families where the household head is employed. As a result family incomes are higher than the national average. Third, they were collected during a brief period of time and then expanded to an annual basis. Consequently, due to seasonal fluctuations in consumption, prices, and income, the data may not be representative of the entire year. Fourth, the prices and quantities correspond to the retail level and consequently, the elasticity estimates are also for the retail level. Fifth, the data were left in 1964 and 1959 current (undeflated) prices.

Expenditure Patterns

For many Peruvian households, food purchases require over half of the family's income. For the 1964 data, exceptions to this can only be found where a family's annual earnings exceeded S/.40,000 (Appendix Table 3). Indeed, for the lower income levels, food accounted for as much as 69% of family income. Similarly for the 1959 data, the below 50% mark was achieved only by the families corresponding to employees earning S/.30,000 annually (approximately S/.40,000 in 1964 soles, Appendix Table 4). Almost uniformly, families with higher incomes spent relatively less of their incomes on food.

Of total food expenditures, cereals and meats are the most important items.[3] Next in importance are milk and eggs, tubers, and fresh vegetables (Tables 3 and 4). Apparently tubers and alcoholic beverages are relatively

[3]Contents of the food groups are given in Appendix Tables 1 and 2.

Table 1. Sample characteristics by location and income for 1964 data[a]

Location	Annual family income (soles per year)														All income classes	
	less than 20,000		20,000 to 29,999		30,000 to 39,999		40,000 to 49,999		50,000 to 59,999		60,000 to 69,999		70,000 or more			
	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size	No. fam.	Fam. size
Lima	11	5.50	28	5.21	23	5.96	15	5.87	9	6.67	6	5.83	12	7.67	104	5.90
Arequipa	13	4.39	11	6.64	8	7.00	6	8.33	4	6.75	-[b]	--	--	--	42	6.26
Huancayo	10	3.90	14	5.86	8	6.50	5	5.60	3	4.67	2	7.00	2	7.00	44	5.52
Chiclayo	27	4.82	20	8.05	5	9.60	--	--	-	--	-	--	--	--	52	6.52
Cuzco	5	2.00	13	3.46	31	6.77	--	--	-	--	-	--	--	--	49	5.41
Iquitos	4	5.50	8	5.63	10	6.30	9	7.22	1	8.00	3	7.33	1	8.00	36	6.47
All cities	70	4.56	94	5.87	85	6.66	35	6.60	17	6.41	11	6.45	15	7.60	327	6.00

[a]Source: Resultados Preliminares....

[b]The data for this income group in Arequipa was not used in the analysis.

Table 2. Sample characteristics by location and income class for 1959 Cuzco and Arequipa data [a]

Family Income Groups (soles per year)	CUZCO			AREQUIPA			Total
	N° of families	Persons per family	Consumption units/ family	N° of families	Persons per family	Consumption Units/ family	N° of families
Employees 4,500-12,000	12	6.00	4.08	10	4.08	3.5	22
Employees 12,001 -30,000	57	5.56	4.14	38	5.11	3.6	95
Employees 30,000 or more	24	5.54	3.92	23	6.17	4.6	47
Laborers 2,808-7,800	38	4.39	3.20	24	4.29	3.2	62
Laborers 7,801-13,000	57	6.03	4.40	57	4.77	3.3	114
Laborers 13,001-54,887	51	5.73	4.25	46	6.46	5.0	97
TOTAL	239	5.54	4.05	198	5.33	3.90	437

[a] Source: Patrones de Consumo ...

Table 3. Annual food expenditures and percentage distribution per family by food groups for 1964 Lima, Chiclayo, Arequipa, Cuzco, Huancayo, and Iquitos data[a]

Food groups	Lima		Chiclayo		Arequipa		Cuzco		Huancayo		Iquitos	
	soles	%	soles	%	soles	%	soles	%	soles	%	soles	%
Family income	40,457	--	20,867	--	29,452	--	29,478	--	32,234	--	36,223	--
Total food expenditures	19,488	100.0	14,334	100.0	18,313	100.0	16,399	100.0	16,563	100.0	12,788	100.0
Cereals	3,554	18.2	3,620	25.3	3,313	18.0	3,023	18.0	3,530	21.0	1,885	15.0
Meat	5,272	27.0	3,099	22.0	5,909	32.2	3,952	24.0	3,837	23.0	4,230	33.0
Fish	690	3.5	650	4.5	258	1.4	290	2.0	665	4.0	451	3.5
Fats and oils	1,369	7.0	885	6.0	906	5.0	920	6.0	1,126	7.0	837	6.5
Milk and eggs	2,519	13.0	1,337	9.0	1,787	10.0	1,749	11.0	2,092	13.0	1,251	10.0
Fresh vegetables	1,379	7.0	1,179	8.0	1,150	6.0	1,357	8.0	2,045	12.0	812	6.0
Tubers	894	5.0	685	5.0	1,773	10.0	1,390	8.0	1,099	7.0	444	3.5
Fresh fruits	1,044	5.0	602	4.0	948	5.0	774	5.0	1,112	6.6	1,100	8.6
Dried vegetables	458	2.4	483	3.4	284	1.6	251	1.5	626	3.8	388	3.0
Preserved fruits and vegetables	97	0.5	40	0.3	66	0.4	109	0.7	16	0.1	18	0.1
Sugar, salt and condiments	831	4.2	733	5.1	935	5.0	1,047	6.0	178	1.0	833	6.5
Miscellaneous	140	0.7	67	0.5	70	0.4	138	0.8	47	0.3	46	0.4
Non-alcoholic beverages	869	4.5	683	4.9	460	2.5	607	4.0	155	1.0	327	2.6
Alcoholic beverages	370	2.0	271	2.0	453	2.5	794	5.0	35	0.2	166	1.3

[a]Source: Resultados Preliminares..., pp. 29-37. The averages for food expenditures differ somewhat from those used in the analysis since they are based upon ungrouped data.

Table 4. Annual expenditures and percentage distribution per family by expenditure groups for 1959
Cuzco and Arequipa data [a]

Expenditure groups	C U Z C O		A R E Q U I P A	
	Soles	%	Soles	%
Income	18,248	-	17,633	-
Total expenditures	24,018	100	22,339	100
All food	12,897	53.7	11,654	52.2
Alcoholic beverages	708	2.9	434	1.9
Heat	608	2.5	440	2.0
Household effects	720	3.0	689	3.1
Housing	1,978	8.2	2,132	9.5
Clothing	4,527	18.9	4,206	18.8
Education	428	1.8	480	2.1
Personal care	400	1.7	503	2.3
Personal health	440	1.8	602	2.7
Entertainment	354	1.5	260	1.2
Tobacco	135	0.6	185	0.8
Transportation	356	1.5	284	1.3
Cleaning products	467	1.9	470	2.1
All food and alcoholic beverages	13,605	100	12,088	100
Cereals	2,003	14.7	2,043	16.9
Meat	2,857	21.0	2,956	24.5
Fish	201	1.5	208	1.7
Fats and oils	641	4.7	504	4.2
Milk and eggs	1,537	11.3	1,588	13.1
Fresh vegetables	826	6.1	679	5.6
Tubers	1,419	10.4	1,118	9.2
Fruits	631	4.6	727	6.0
Dried vegetables	415	3.0	414	3.4
Sugar	503	3.7	534	4.4
Miscellaneous	1,864	13.8	883	7.4
Alcoholic beverages	708	5.2	434	3.6

[a] Adapted from Patrones de Consumo ..... and other unpublished data compiled in the Plan del Sur study.

more important in both Cuzco and Arequipa. Non-food expenditures, available only for the 1959 data, indicate that clothing and housing are the major items. Food, housing and clothing combined represent over 82% of total expenditures, leaving less than 18% for heating, education, health, etc.

This preliminary look at the expenditure patterns dramatizes the relative importance of food costs. Almost universally this trait is associated with relatively high (.6 to 1.) income elasticities for food. This, as we shall see below, is also true for Peru.

Methods and Procedures

Weighted regression procedures were used to specify the alternative demand relationships. Weighted regression was used because the basic data were for the averages for all the families in a particular income class where there were unequal numbers of families in each class. The percent of the number of families per income class with respect to the total number of families was used as the weights. In this way, it was possible to assign a greater relative importance to those observations corresponding to income classes containing a greater number of families and vice versa.

Several alternative function forms[a1] and specifications were used. Some 500 separate regression equations were estimated. The logarithmic equation was used with the greatest frequency with the linear or semi-logarithmic forms being used for comparison purposes. The logarithmic equation was used primarily because the use of many alternative functional forms would have made an excessive computational burden. Further, the logarithmic form was chosen because it has historically been used extensively, perhaps more extensively than any other type.

There is a wide choice of variables that potentially could be used to represent consumption and income. Calories, weight, and value are candidates for measuring consumption. Both income and total expenditures have been used as measures of income. For the 1964 data only estimates of income and expenditures on each food item were available. For the 1959 data the choice was wider. Expenditures and weight were used as measures of consumption while income and total expenditures were used for income. In many equations, the family size (number of persons per family) was also used as an independent variable.

Caution should be exercised in the interpretation of the elasticities since many different types are presented. The two basic types are "income" and "family size" elasticities with variations resulting when consumption is measured by quantities instead of expenditures and income by total expenditures. When both income or expenditures and family size are utilized, the resulting elasticities should be interpreted as partial elasticities. This distinction has not been made in the text.

Specification of Equation Form and Variables for 1964 Data

Since the 1964 data did not include estimates of the quantity of food consumed, expenditures were used as the dependent variable. Consequently, all the elasticities estimated from the 1964 data are income and family size elasticities of expenditures, i.e., the percent increase in expenditure due to a one percent increase in income and the percent increase in expenditures due to a one percent increase in the number of persons per family, respectively.

The income elasticity of expenditure is the sum of the income elasticity of quantity and the income elasticity of "quality".[4] The income elasticity of quality represents the percentage change in price per percent increase in income. Since higher income families generally are willing to pay more per unit in order to get a higher "quality" (eg. pasturized vs. fresh milk) the quality elasticity is generally positive. As a result, the income elasticity calculated by using expenditures usually is greater than that based upon quantities. The same argument holds for the family size elasticity. Consequently, the elasticity estimates given for the 1964 data probably overstate the response of changes in physical quantities to changes in incomes and family size.

Estimates from three types of equations were derived for the Lima data so as to check the sensitivity of the elasticity estimates to changes in functional form and specification (Appendix Tables 6, 7, and 8). A fourth semi-log was also used, but the estimates differed greatly from the other three and was, therefore, omitted. Two of the equations included both income and family size as independent variables. The T-values[5] of the family size coefficients were with few exceptions less than one and none of the coefficients significantly differed from zero at the 95% level. This may partially be attributed to the fact that family size appears to be positively correlated to income as is evidenced in Tables 1 and 2, and therefore, the income variable is accounting also for variations in family size. Houthakker[6] observed that income and family size may be correlated particularly when the data are from households that belong to the same social class. This he attributes to larger families having more wage earners and to the wage earner of a large family being more likely to be in his prime of life. Small families frequently correspond to newly established households where the family head is young or to older families where the children have left home and the family head is relatively old.

Houthakker[7] noted the tendency that items having high income elasticities ("luxuries") have small or negative family size elasticities, while items having low income elasticities ("necessities") have larger positive family size elasticities. The logic behind this is that for a given income level,

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[4] Demonstration: Let P = price, Q = quantity and Y = income. Income elasticity of expenditures is defined as the derivative of expenditures with respect to income multiplied by the ratio of income to expenditures, i.e., $\frac{d\,PQ}{d\,Y} \cdot \frac{Y}{PQ} = \frac{dP}{dY} \cdot \frac{Y}{P} + \frac{dQ}{dY} \cdot \frac{Y}{Q}$. The first term on the right is the quality elasticity and the second is the quantity elasticity.

[5] T-value refers to the "Student T" significance test which is the ratio of the regression coefficient to its standard error. The higher the absolute value of the T-value, the more confidence can be placed on the coefficient's estimate.

[6] H. S. Houthakker, "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," Econometrica, Vol. 25, No. 4, Oct. 1957, pp. 532-551.

[7] Houthakker, ibid., pp. 544-545.

increases in family size expand the requirements but also reduce per capita income. Therefore, the family is forced to reallocate its expenditures from the "luxuries" to the "necessities". This is generally confirmed by the results in Appendix Tables 7 and 8, although not unequivocally. Tubers, cereals, dried vegetables, having low income elasticities, have positive family size elasticities. Unexpectedly, the log (Appendix Table 7) equation yields a negative family size elasticity for all food. The estimate of 0.318 from the linear equation corresponds closely to Houthakker's estimate of 0.3.

Since family size is positively correlated with income, its omission as an independent variable will cause the income elasticity coefficient to increase or decrease depending upon whether the family size elasticity is respectively, positive or negative. Appendix Tables 6 and 7 support this observation. All the income elasticities of items in Appendix Table 7 that have negative family size elasticities are larger than those given in Appendix Table 6 where family size was not included as an independent variable. And, with the exception of fish and dried vegetables, the converse is true.

Judging on the basis of the coefficient of multiple correlation (R^2) of the two equations having the family size variable, the log equation (Appendix Table 7) appears to give the better fit. Excepting three of the R^2 values, the log equation gives at least as high R^2's as the linear equation (Appendix Table 8). In addition, the T-values of the income elasticity coefficients for the log equation are higher than those for the linear equation.

Most of the elasticity coefficients estimated by the log equation are somewhat higher than those estimated by the linear equation. Part of the divergence between the income elasticity estimates may be due to the influence of the family size variable.

The estimates of income elasticities conform fairly closely to a priori expectations. Milk and eggs and fresh fruits are the "luxury" foods with cereals, tubers, sugar, salt and condiments the "basic" ones. For Lima, the income elasticities of expenditures probably fall in the following ranges: all food (.6 - .7), cereals (.30 - .45), meat (.55 - .75), milk and eggs (1.10 - 1.30), fresh vegetables (.50 - .60), tubers (.20 - .35) and fresh fruits (1.40 - 1.60).

Combined and Inter-city Comparison for 1964 Data

When the data for the six cities were combined, the family size elasticity continued to be negative for the food groups having the larger income elasticity (Appendix Table 14). With two exceptions, all food and cereals, the T-values were non-significant. It is interesting that the elasticity of family size in Appendix Table 14 for all food of .247 again closely corresponds to Houthakker's estimate. The income elasticity estimates fall within the ranges set for Lima with the exception that the elasticity for meat is notably higher and tubers somewhat higher for the combined data.

Since the family size variable does not appear to be significant, it may be thought that transforming the data to a per capita basis may give similar results as where they are on a per family basis. This possibility was explored and the results given in Appendix Table 15. Generally, the income elasticity coefficients, T-values and R^2's are somewhat smaller

when per capita (Appendix Table 15) instead of per family data (Appendix Table 16) are used. There seems to be a closer relation between the per capita equation and the per family one that includes family size (Appendix Table 14) although over half of the per capita estimates are smaller. This suggests that estimates of income elasticities based upon per capita data may tend to be lower. This is corroborated by King's observation that in a U.S. study "the income elasticity of food expenditures...was .40 with family size as an explicit variable and .30 using per capita data."[8] Sparks has observed that "...the use of per capita data in the study of food demand may give nonmeaningful results."[9] Based on these findings and observations, it appears to be more appropriate to use per family instead of per capita expenditures.

Now we inquire: Are the elasticities uniform for all the six cities? To answer this question three sets of elasticity estimates will be examined. One set corresponds to elasticities estimated individually for each city (Appendix Tables 6, 9, 10, 11, 12, and 13). The second set is for all the cities combined (Appendix Table 16), while the third set is for all cities combined but with a dummy or shift variable for each city (Appendix Table 17). These estimates are summarized in Table 5. The set of income elasticities for Lima exhibit a tendency to be lower relative to the other cities with the exception of milk and eggs and fresh fruits. Conversely, those for Chiclayo are relatively higher. Since in this study average family income is highest in Lima (S/.40,457) and lowest in Chiclayo (S/.20,867), the estimates conform to the hypothesis that income elasticities tend to be lower at the higher levels of income. The variation in elasticities between cities is considerable. For example, the income elasticity for meat ranges from 0.56 to 2.82. The explanation for this wide variation arises in part from the differences in income levels. Certainly, other factors such as relative prices, availability, quality, etc. exert an influence which has not been possible to detect in this study. The next to the last column of Table 5 gives the estimates for the elasticities when all cities are combined. These estimates generally fall within the extreme points of those for the individual cities.

The last column of Table 5, which is taken from Appendix Table 17, gives the set of estimates where the elasticity coefficients of all cities is required to be the same, but where each city has its own dummy variable. A graphic interpretation of the dummy variable technique is given in Figure 1.[10] Suppose the "o's" and "x's" represent the data for Lima and Cuzco. If only one line is fitted, i.e., Lima and Cuzco data are combined, the regression result would be EF. However, if we use a dummy variable and assign it a value of zero for Lima observations represented by "o's" (i.e., Lima is the base city) and a 1 for Cuzcos' represented by "x's", we would get two parallel regression equations AB and CD. The coefficient

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[8] G. A. King, "An Appraisal of the Strengths and Weaknesses of the Econometric Approach," Journal of Farm Economics, Vol. 45, No. 5, December, 1963, p. 1412.

[9] W. Sparks, "Discussion: An Appraisal of the Strengths and Weaknesses of the Econometric Approach," Journal of Farm Economics, Vol. 45, No. 5, December, 1963, p. 1418.

[10] A detailed account of the dummy variable technique is given by W. G. Tomek, "Zero-one Variables in Regression Equations," Journal of Farm Economics, Vol. 45, November, 1963, pp. 813-822.

Table 5. Income elasticities of expenditures for food: log equation, 1964 Lima Arequipa, Cuzco, Huancayo, Chiclayo, and Iquitos data[a]

Food item	Lima	Arequipa	Cuzco	Huancayo	Chiclayo	Iquitos	All cities combined	All cities combined with dummy variables
All food	0.64	0.68	0.99	0.74	1.09	0.78	0.72	0.79
Cereals	0.44	0.52	1.19	0.62	0.68	0.38	0.37	0.55
Meat	0.56	0.68	1.37	0.65	2.82	0.71	0.80	1.03
Fish	0.52	1.57	1.12	0.75	-0.28	0.33	0.83	0.71
Fats and oils	0.45	0.68	1.22	1.46	1.32	1.31	0.97	1.01
Milk and eggs	1.16	0.81	1.00	1.03	1.05	1.33	1.16	1.18
Fresh vegetables	0.59	0.41	0.54	0.39	0.86	0.72	0.54	0.58
Tubers	0.34	0.47	1.15	0.34	1.12	0.75	0.32	0.65
Fresh fruits	1.39	1.19	0.57	1.01	0.83	0.86	1.06	1.12
Dried vegetables	0.10	-0.04	0.34	0.37	1.05	0.56	0.52	0.34
Sugar, salt and condiments	0.32	0.63	0.92	0.71	1.37	0.65	0.51	0.67

[a]Source: Appendix Tables 6, 9, 10, 11, 12, 13, 16, and 17.

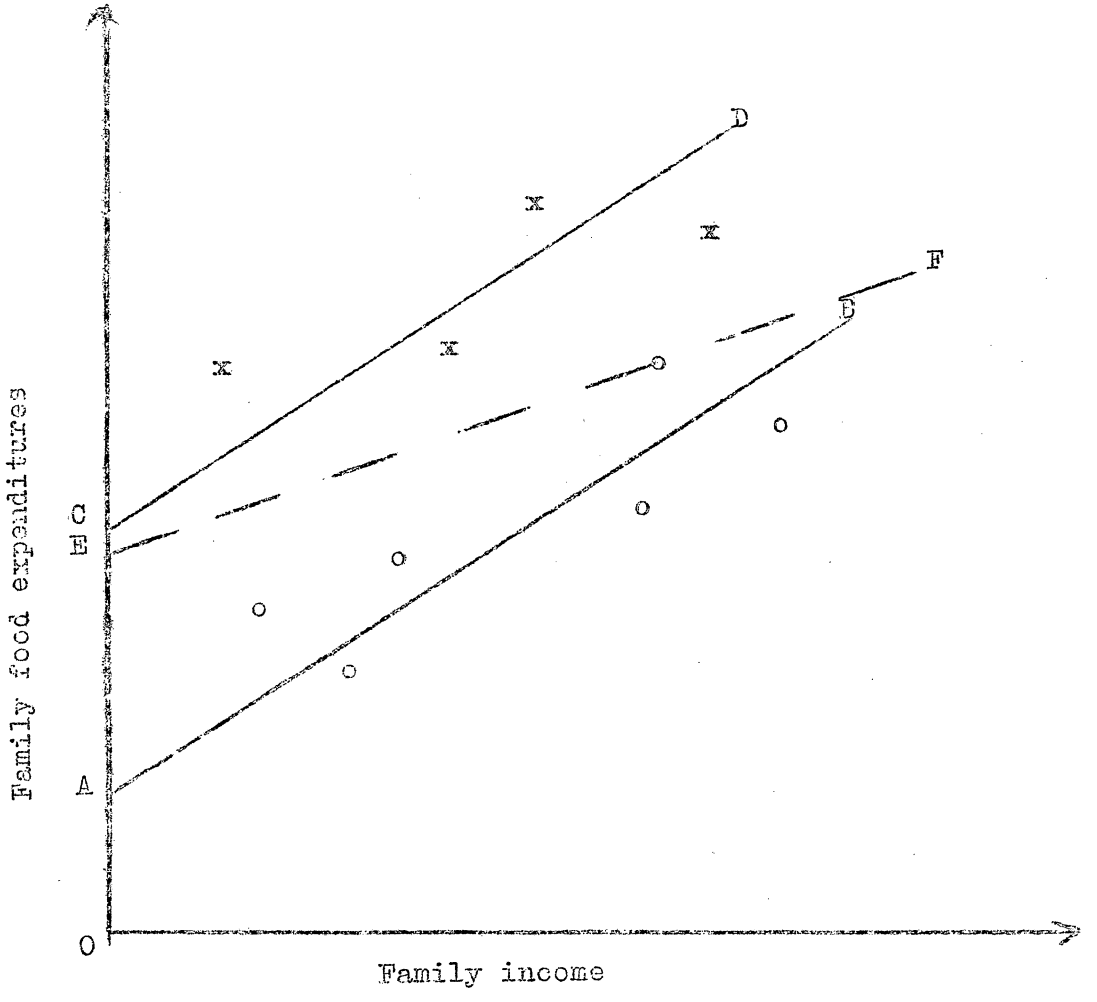

Figure 1. Illustration of dummy variable technique

of the dummy variable corresponds to AC--the distance between the two regression curves, which in this example represents for a given income level the amount by which Cuzco family expenditures are higher than Lima family expenditures.

The elasticity coefficients for the combined data with the dummy variables are higher than those without the dummy variable except for fish and dried vegetables (Table 5). Appendix Table 17 indicates that several of the dummy variables are significant.

As mentioned previously, the sign of the dummy variable coefficient indicates whether expenditures in a particular city as compared with Lima are greater or less for the same income level. Although no overall pattern of significant differences is suggested by Appendix Table 14, expenditure levels for fresh vegetables, tubers, and fresh fruits exhibit the most marked differences, while those for meat, dried vegetables, and milk and eggs are most homogeneous.

The significant differences in expenditures between cities for families with equal incomes may be a reflection of differences in physical consumption, market prices, combination of items within the food group, food quality, or a mixture of these. For these data, it is not possible to detect which of these influences is dominating.

Summary of Elasticity Estimates for 1964 Data

The analysis of the 1964 data suggests that log equations yield, statistically speaking, estimates equally as reliable if not more so than the linear equations. Inclusion of the family size variable tended to result in estimates somewhat larger for high income elasticity food groups and somewhat lower for low income elasticity ones. Although the family size elasticity was generally non-significant, the estimates of it for all food of .31 and .247 from the Lima linear equation and the combined log equation are compatible with Houthakker's estimates.

Due to the limited number of degrees of freedom, it was not practical to include the family size variables in the equations used for estimating the elasticities for individual cities. Therefore, the income elasticities appearing in Table 5 probably are too high for the necessities and too low for the luxuries. Table 5 suggests that the income elasticities may not be homogeneous among cities which in part may be due to different average income levels. This implies that the combined city elasticities may be more appropriately estimated by equations which do not require the elasticity to be uniform over the entire income range, i.e., something other than a log equation.

For summary purposes, the previous estimates have been utilized to set a probable range on the income elasticities which appear to be most suitable for prediction purposes. The set of elasticities for the upper limit may correspond more closely to families with lower incomes while the lower limit corresponds to those with higher incomes (Table 6).

Table 6. Probable ranges for income elasticities of expenditures for selected food items based upon 1964 data

Food item	Upper limit	Lower limit	Intermediate
All food	0.95	0.65	0.70
Cereals	0.65	0.40	0.50
Meat	1.00	0.55	0.80
Fish	1.00	0.50	0.70
Fats and oils	1.20	0.60	0.95
Milk and eggs	1.20	1.00	1.10
Fresh vegetables	0.70	0.40	0.50
Tubers	0.70	0.35	0.40
Fresh fruits	1.20	0.70	1.05
Dried vegetables	0.50	0.25	0.35
Sugar, salt and condiments	1.00	0.35	0.50

Specification of Equation Form and Variables for 1959 Data

Since the 1959 data included total family expenditures as well as food quantities, there were several alternatives to use as the dependent and independent variables. These data in addition provided the possibility of using the number of consumption units per family as an alternative measure of family size. The conversion factors used for defining consumption units were as follows: males over 15, 1; women and children over 11, .9; children 7 to 10, .75; children 4 to 6, .4; and children under 4, .15.[11] It was anticipated that consumption units might be a more appropriate measure than family size in that allowances were made for age differences. It is not obvious, however, which set of expenditures items should be used as a basis for converting to a common denominator members of different age groups. For example, a child's consumption of milk may even exceed that of an adult, while the child's consumption of, say, alcohol or tobacco may be zero. For these data, the use of consumption units instead of number of persons per family resulted in almost identical estimates. Consequently, consumption units were omitted from further consideration.

Provisionally, both income and total expenditures were considered as measures for total income. When total expenditures are utilized, the resulting elasticity gives the percentage change in the expenditures of any particular item per one percent increase in total expenditures. The two alternative measures of elasticity are related in the following manner: the income elasticity equals the expenditure elasticity multiplied by the income elasticity of total expenditure.[12] For the 1959 data, the income elasticity of total expenditures was about .9 for Cuzco and 1.1 for Arequipa, which indicates that the income elasticity should be somewhat smaller for Cuzco and somewhat larger for Arequipa than the expenditure elasticity.

As mentioned earlier, total expenditures for the 1959 data exceeded income, thus indicating a dissaving or more likely, under-reporting of income and/or over-reporting of expenditures. It was noted in the study that expenditures on certain items such as clothing and household effects tended to be exaggerated, while those for alcoholic beverages were reduced.[13] For these reasons, elasticities corresponding both to income and total expenditures are presented.

Income and Expenditure Elasticities of Food Expenditures 1959 Data

Estimates from alternative functional forms and specifications are included in Table 7. The elasticities with respect to family size were non-significant for Cuzco, but for Arequipa they were significant for fish, fats and oils, milk and eggs, and fruits (Appendix Tables 22 and 23).

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[11] Patrones de Consumo..., p. 39.

[12] Demonstration: Let Y = income, E = total expenditures and X = the expenditures on any item. By applying the chain law (cancellation) of derivatives we get $\frac{dX}{dY} \cdot \frac{Y}{X} = \frac{dX}{dE} \cdot \frac{E}{X} \times \frac{dE}{dY} \cdot \frac{Y}{E}$.

[13] Patrones de Consumo..., pp. 95 and 97.

Table 7. Income and expenditure elasticities of food expenditures for alternative equation forms: 1959 Cuzco and Arequipa data[a]

Food items	Cuzco				Arequipa		Cuzco and Arequipa		
	Income elasticity		Expenditure elasticity		Income elast.	Expend. elast.	Income elasticity		
	Family size			No fam. size	Family size		Family size	No fam. size	No fam. size dummy variable
	log	linear	log	log	log	log	log	log	log
All food	0.70	0.69	0.82	0.85	0.75	0.73	0.70	0.70	0.70
Cereals	0.33	0.26	0.39	0.46	0.38	0.37	0.48	0.43	0.43
Meat	0.55	0.44	0.65	0.70	0.68	0.68	0.58	0.59	0.60
Fish	1.35	1.31	1.65	1.54	-0.19	-0.12	1.08	0.98	0.98
Fats and Oils	0.87	0.73	0.98	1.03	0.17	0.15	0.68	0.75	0.75
Milk and Eggs	0.96	0.87	1.13	1.19	1.48	1.39	1.06	1.01	1.01
Fresh vegetables	0.52	0.47	0.61	0.67	0.39	0.40	0.47	0.54	0.54
Tubers	0.28	0.20	0.24	0.30	0.46	0.47	0.29	0.39	0.39
Fruits	1.15	1.26	1.40	1.32	1.84	1.69	1.33	1.09	1.09
Dried vegetables	0.36	0.26	0.38	0.44	0.88	0.90	0.47	0.54	0.54
Sugar	0.56	0.57	0.68	0.67	0.90	0.90	0.35	0.60	0.61

[a]Source: Appendix Tables 18 to 26.

For Cuzco, family size elasticity was negative for fruits, fish and sugar which, excepting sugar, have high income and expenditure elasticities. About one-half of the family size elasticities were negative for Arequipa with the negative ones corresponding to food groups with relatively high income or expenditure elasticities. Apparently the Arequipa family size variable for fish is relatively more important than income or expenditures and the result is a negative income and expenditure elasticity.

Among the various functional forms, the family size elasticity for food oscillates between -0.32 and 0.27 being generally smaller for Arequipa which is probably a reflection of a higher income or expenditure elasticity for food in Arequipa.

The relationships between the expenditure and income elasticities for comparable functional forms conform to the comments of the previous section. For Cuzco, the expenditure elasticities are greater than the income elasticities while with three exceptions the reverse is true for Arequipa.

The linear equation gives lower estimates of the income elasticity than the log equation for all food groups except fruits and sugar. These differences are not significant.

There are considerable differences between income elasticities except for all food, cereals, and meat for Cuzco and Arequipa as was also indicated by the 1964 data (Table 5). These differences do not appear to be attributable to differences in the allocation of expenditures. Both the 1959 and 1964 data (Tables 3 and 4) indicate that the percentage of income spent on selected items is fairly uniform for the two cities. Neither does the use of dummy variables provide additional insight as the last two columns in Table 7 are almost identical. We conclude that families in Cuzco and Arequipa appear to respond differently to income changes.

A few contradictions are encountered when the elasticities for Cuzco and Arequipa for the 1959 data (Table 7) are compared with those from the 1964 data (Table 5). Some of these are attributable to the fact that the elasticities for the 1964 data were estimated without the use of the family size variable. Accordingly, the relatively large elasticities for the 1964 data should be somewhat lower and the relatively small ones somewhat higher than those for the 1959 data. Still it appears that the 1964 data over-estimate the elasticities for all food, meat, cereals, and tubers for Cuzco and under-estimate the elasticity for milk and eggs for Arequipa. It is more comforting that the income elasticities corresponding to the combined data for the 1964 and 1959 data in Tables 5 and 7 are remarkably similar. Between 1959 and 1964, no noticeable downward shift in the income elasticities of expenditures becomes evident.

Income and Expenditure Elasticities of Food Quantities and Qualities 1959 Data

Tables 8 and 9 contain the "quantity" and "quality" elasticities for alternative functional forms and specifications. The average quantities consumed are given in Appendix Table 5. The "quality" elasticities were found by subtracting the quantity elasticities in Table 8 from the expenditure elasticities in Table 7. As expected, the majority of the quality elasticities are positive, indicating that the percentage variation in expenditures on a particular item tends to be greater than the percentage variation in the quantities consumed. This difference appears to be greatest for fats and oils, fruits and sugar and lowest for cereals, meat, tubers, and dried vegetables as is evidenced by the relative sizes of the

Table 8. Income and expenditure elasticities of food quantities for alternative equation forms: 1959 Cuzco and Arequipa data[a]

Item	Cuzco				Arequipa		Cuzco and Arequipa		
	Income elasticity		Expenditure elasticity		Income elast.	Expend. elast.	Income elasticity		
	Family size			No fam. size	Family size		Family size	No fam. size	No fam. size dummy variable
	log	linear	log	log	log	log	log	log	log
All food	0.35	0.25	0.36	0.44	0.59	0.57	0.38	0.47	0.47
Cereals	0.21	0.16	0.25	0.35	0.39	0.39	0.26	0.36	0.36
Meat	0.40	0.27	0.46	0.56	0.68	0.65	0.45	0.55	0.55
Fish	1.24	0.77	1.43	1.28	0.21	0.30	1.04	0.97	0.97
Fats and oils	0.31	0.32	0.25	0.35	-0.32	-0.26	0.16	0.30	0.30
Milk and eggs	0.69	0.54	0.80	0.92	1.14	1.09	0.76	0.77	0.77
Fresh vegetables	0.25	0.17	0.26	0.29	0.81	0.76	0.37	0.37	0.37
Tubers	0.40	0.25	0.34	0.38	0.28	0.30	0.35	0.40	0.40
Fruits	0.52	0.42	0.60	0.68	1.25	1.14	0.62	0.71	0.71
Dried vegetables	0.21	0.11	0.20	0.32	0.66	0.64	0.15	0.47	0.46
Sugar	-0.19	-0.17	-0.18	-0.05	0.25	0.27	-0.05	0.23	0.23

[a]Source: Appendix Tables 27 to 35.

Table 9. Income and expenditure elasticities of food quality for alternative equation forms: 1959 Cuzco and Arequipa data[a]

Food items	Cuzco				Arequipa		Cuzco and Arequipa		
	Income elasticity		Expenditure elasticity		Income elast.	Expend. elast.	Income elasticity		
	Family size			No fam. size	Family size		Family size	No fam. size	No fam. size dummy variable
	log	linear	log	log	log	log	log	log	log
All food	.35	.44	.46	.41	.16	.16	.32	.23	.23
Cereals	.12	.10	.14	.11	-.01	-.02	.22	.07	.07
Meat	.15	.17	.19	.14	0	.03	.13	.04	.15
Fish	.11	.54	.22	.26	-.40	-.42	.04	.01	.01
Fats and Oils	.56	.41	.63	.68	.49	.41	.52	.45	.45
Milk and Eggs	.27	.33	.33	.27	.34	.30	.30	.24	.24
Fresh vegetables	.27	.30	.35	.38	-.42	-.36	.10	.17	.17
Tubers	-.12	-.05	-.12	-.08	.18	.17	-.06	-.01	-.01
Fruits	.63	.84	.80	.64	.59	.55	.71	.38	.38
Dried vegetables	.15	.15	.18	.12	.22	.26	.32	.07	.08
Sugar	.75	.74	.86	.72	.65	.63	.40	.37	.38

[a] Calculated by subtraction of Table 8 from Table 7.

quality elasticities in Table 9. Apparently, there is relatively more substitution of higher priced commodities for lower priced ones as incomes increase for the food groups fats and oils, fruits and sugar.

As with the expenditure elasticities, the Arequipa elasticities tend to be higher except for fish, fats and oils, and fresh vegetables. Similarly, the income elasticities of quantities tend to be smaller than the expenditure elasticities of quantities for Cuzco and larger for Arequipa. The majority of the elasticities estimated from the linear equation are smaller than those for the log equation.

The family size elasticities with respect to quantities tend to be larger in absolute value than those for expenditures (Appendix Tables 18 through 35). This indicates that an increase in family size influences the quantity purchased more than it does the value purchased. The T-values are slightly higher for the quantity elasticities, although few are statistically significant.

The income and expenditure elasticities with respect to quantities of the important items appear to be of the following magnitudes: all food (.35 to .55), cereals (.20 to .35), meat (.40 to .60) milk and eggs (.70 to 1.00), fresh vegetables (.25 to .50), tubers (.30 to .40) and fruits (.55 to .70). Those for Arequipa may be a little higher than the upper boundary given. The quantity elasticities for sugar, dried vegetables, fish, and fats and oils seem to be too divergent between Cuzco and Arequipa to warrant speculation as to their magnitudes.

Income and Expenditure Elasticities for Non-food Items 1959 Data

As a complement to the elasticities for foods, an analysis was made for 12 non-food items. Those non-food elasticities are summarized in Table 10. With the exception of heat and alcoholic beverages, the non-food elasticities have a value of near one or greater. As a group, these non-food items have an elasticity of approximately 1.35.[14]

As before, the family size elasticities tend to be negative for those items having large income or expenditure elasticities and conversely, those having smaller income or expenditure elasticities tend to have positive family size elasticities (Appendix Tables 36 to 42). As Houthakker noted the sum of products of the family size elasticities multiplied by the expenditures must be zero.[15] Therefore, not all the family size elasticities can be positive or negative. Very few of the family size elasticities are statistically significant.

As explained previously, for Cuzco the income elasticities are less than the expenditure elasticities while the reverse is true for Arequipa. Generally, the elasticities for Arequipa are higher than those for Cuzco. Inclusion of the family size variable causes the values of the income and expenditure elasticities for the high elasticity items to increase and for the low elasticity ones to decrease. This may be explained by the reasoning used above for the food elasticities. Due to limited scope of these data, the applicability of these estimates to other locations and/or income levels is uncertain. In Houthakker's estimates, all expenditures were grouped into four categories--food, clothing, housing, and miscellaneous. He

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[14]This follows from the theorem that the expenditure weighted sum of income elasticities is unity.

Table 10. Income and expenditure elasticities of non-food for alternative equation forms: 1959 Cuzco and Arequipa data[a]

Item	Cuzco				Arequipa		Cuzco and Arequipa		
	Income elasticity			Expenditure elasticity	Income elast.	Expend. elast.	Income elasticity		
	Family size			No fam. size	Family size		Family size	No fam. size	No. fam. size dummy variable
	log	linear	log	log	log	log	log	log	log
Alcoholic beverages	0.71	0.70	0.71	0.74	0.92	0.64	0.71	0.80	0.80
Heat	0.22	0.22	0.23	0.29	0.27	0.23	0.18	0.38	0.37
Household effects	0.98	0.90	1.17	1.16	1.45	1.31	1.08	1.10	1.10
Housing	1.25	1.31	1.54	1.51	2.04	1.95	1.43	1.26	1.26
Clothing	1.01	1.10	1.18	1.14	1.31	1.22	1.08	1.05	1.05
Education	1.26	1.38	1.51	1.47	1.44	1.44	1.34	1.25	1.25
Personal care	0.89	0.87	1.06	1.09	1.35	1.25	1.01	0.93	0.93
Personal health	1.65	1.19	1.48	1.40	1.81	1.79	1.34	1.18	1.19
Entertainment	1.85[b]	1.74[b]	2.14[b]	2.03[b]	1.78	1.71	1.82	1.62	1.62
Tobacco	1.09	1.24	1.35	1.13	1.46	1.39	1.23	0.98	0.96
Transportation	--	--	--	--	2.04	1.88	1.82	1.62	1.61
Cleaning	0.95	1.05	1.05	1.01	0.57	0.53	0.86	0.76	0.76

[a]Source: Appendix Tables 36 to 42.

[b]Elasticity for entertainment and transportation combined.

concluded that "...one would not be very far astray by putting the partial elasticity with respect to total expenditure at 0.6 for food, 1.2 for clothing, 0.8 for housing, and 1.6 for all other items combined...."[16]

The estimates presented here suggest that the elasticity for housing is around 1.5 and for clothing 1.1, which are not too different from Houthakker's estimates for Cuba. For other major items, Table 10 suggests the following elasticities: education 1.4, entertainment and transportation 1.8, tobacco 1.2, and heat .25.

As incomes increase, one might expect that the elasticities for clothing and housing decrease in a manner similar to food. Conversely, the elasticities for education, entertainment, transportation and personal health may tend to increase. Certainly, the elasticities for the majority of non-food items are 1 or more and probably will be for sometime.

Summary

The analysis of family budget data for selected food and non-food items suggests the following relationships:

(1) Consumption is significantly related to income but not significantly related to family size.

(2) The income elasticity of expenditures for all foods is about .70.

(3) Non-food items have relatively higher income elasticities than food.

(4) Income elasticities for food have exhibited no tendency to decrease during the period 1959 to 1964.

(5) For foods, the income and expenditure elasticities with respect to quantities are approximately 20 to 50% lower than the elasticities in terms of expenditures.

(6) Families in higher income classes spend a lower proportion of their incomes on food.

(7) The major foods can be grouped according to their income elasticity of expenditures as follows:
   (a) 1.00 to 1.10: milk and eggs and fruits
   (b) 0.80 to 1.00: fish, fats and oils
   (c) 0.55 to 0.70: meat, sugar, fresh vegetables
   (d) 0.40 to 0.50: cereals and dried vegetables
   (e) 0.25 to 0.35: tubers

These findings imply that the demand for food in Peru's larger cities will grow at an annual rate of at least 4%. Since the larger cities are experiencing both a faster population and income growth rate, a more realistic estimate may be 6%. The annual expansion in demand for certain foods such as milk and eggs and fruits will be even greater, ranging between 5 and 7 percent. Increasing the supply of food to keep pace with the growing demand will continue to be one of Peru's major problems.

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[16] Houthakker, ibid., p. 550

APPENDIX

Appendix Table 1. Principal items contained in major food groups for 1964 data

Food group	Principal food items
Cereals	Bread, crackers, noodles, rice, wheat, corn, oats, quinua, flour and various cereal derivatives
Meat	Beef, pork, poultry, mutton and various meat preparations, etc.
Fish	Fresh and canned fish, shrimp and other types of sea food
Fats and oils	Cooking oil, lard, butter and margarine
Milk and eggs	Fresh, evaporated, condensed and powdered milk, cheese, ice cream and eggs
Fresh vegetables	Green habas, chile peppers, spinach, green beans, onions, greens, cabbage, tomatoes, lettuce, beets, squash, carrots, celery, etc.
Tubers	Sweet potatoes, olluco, Irish potatoes, yuca, dried potatoes, oca, etc.
Fresh fruits	Lemons, apples, oranges, avocados, bananas, limes, grapes, pineapple, pears, papaya, peaches, watermelon, etc.
Dried vegetables (menestras)	Dried shelled-out beans, peanuts, lentejas, and other pulses
Preserved fruit and vegetables	Catsup, canned vegetables and fruit
Sugar, salt and condiments	Sugar, salt, vinigar, pepper, garlic, va nilla etc.
Miscellaneous	Pickles, nuts, chocolates, jellies, dried fruits, candies, sweets, etc.

Appendix Table 2. Principal items contained in major expenditure groups for 1959 data

Expenditure groups	Principal items
All food	Includes items listed below and includes meats eaten outside the house and non-alcoholic beverages.
Alcoholic beverages	wines, whisky, and beers
Heat	Coal, wood, kerosene, candles, matches, electricity, lighting
Household effects	Textiles, kitchen equipment, rugs, bed clothing, lamps, electric pumps, glassware, ornaments
Housing	Rent, taxes, repairs, insurance, interest, etc.
Clothing	Shirts, sweaters, shoes, hats, socks, dresses, suits, etc.
Education	Books, newspapers, magazines, school expenses
Personal care	Soaps, toothpaste, brushes, combs, haircuts
Personal health	Drugs and medicines, medical, dental, and hospital expense
Entertainment	Movies, plays, etc.
Tobacco	
Transportation	
Cleaning Products	Brooms, soaps, DDT, etc.

Food group	Principal food items
Meat	Beef, pork, mutton, poultry, goat, and dried meats
Fish	Fresh and canned fish, shrimp
Milk and eggs	Fresh, evaporated, and condensed milk, cheese
Fats and oils	Peanut and olive oil, cooking oil, lard, margarine
Fruits	Lemons, oranges, bananas and apples
Fresh vegetables	Lettuce, cauliflower, tomatoes, carrots, squash, onions, chile peppers
Dried vegetables (menestras)	Peas, shell-out beans, habas, lentils
Tubers	Sweet potatoes, Irish potatoes, ocas, ollucos, yuca, dried and frozen potatoes
Cereals	Rice, oats, corn, quinua, bread, noodles, flour and various cereal derivatives
Sugar	Sugar
Miscellaneous	Sweets, non-alcoholic drinks, spices, meals eaten away from home.

Appendix Table 3. Percentage of income spent on food by city and level of income, 1964 data[a]

Family Income	Lima	Chiclayo	Arequipa	Cuzco	Huancayo	Iquitos
(Soles/yr.)			(percent)			
0-20,000	60.7	59.9	67.6	60.4	61.1	56.5
20,000-29,999	57.8	66.9	63.9	52.1	69.0	57.5
30,000-39,999	55.8	64.8	57.0	58.3	59.3	54.0
40,000-49,999	43.8	b	49.3	b	56.8	47.3
50,000-59,999	52.5	b	48.3	b	43.8	45.6
60,000-69,999	39.4	b	b	b	36.7	40.3
70,000 or more	36.5	b	b	b	54.4	48.1

[a] Source: Resultados Preliminares ..... pp. 6-19

[b] This level of income not represented in the sample.

Appendix Table 4. Percentage of total expenditures spent on food by city and level of income, 1959 data [a]

Family income groups (soles per yr.)	Cuzco (percent)	Arequipa (percent)
Employees 4,500 - 12,000	62	57
Employees 12,001 - 30,000	56	54
Employees 30,000 or more	49	45
Laborers 2,808 - 7,800	63	66
Laborers 7,801 - 13,000	64	66
Laborers 13,001 - 54,887	63	59

[a] Source: Patrones de Consumo ..... pp. 56-58.

Expenditures on alcohol have been included with food to facilitate comparisons with 1964 data.

Appendix Table 5. Annual quantities of food consumed per family for 1959 Cuzco and Arequipa data[a]

Item	Cuzco	Arequipa
	(kilograms per family per year)	
All food	3,108	2,853
Cereals	540	589
Meat	321	299
Fish	27	27
Fats and oils	42	36
Milk and eggs	454	455
Fresh vegetables	420	439
Tubers	755	629
Fruits	144	103
Dried vegetables	230	78
Sugar	175	198

[a]Source: Patrones de Consumo....

Appendix Table 6. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Lima data[a]

Items	R^2 (%)	Constant term	Family Income	
			Elasticity coefficient	T-value[b]
All food	92	1.34	0.644	7.74
Cereals	85	1.55	0.436	5.37
Meat	74	1.15	0.562	3.83
Fish	68	0.49	0.517	3.25
Fats and Oils	81	1.09	0.446	4.68
Milk and Eggs	93	-1.95	1.159	8.22
Fresh vegetables	77	0.42	0.592	4.15
Tubers	37	1.38	0.338	1.71
Fresh fruits	97	-3.42	1.392	12.36
Dried vegetables	03	2.24	0.100	0.41
Sugar, Salt and Condiments	61	1.43	0.324	2.80

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]T=2.571 for 95% significance level and 5 degrees of freedom.

Appendix Table 7. Regression statistics for relationship between family food expenditures, family income and family size: log equation, 1964, Lima data[a]

Item	R^2 (%)	Constant term	Family income		Family size	
			Elasticity coefficient	T-value b	Elasticity coefficient	T-value b
All food	96	1.013	0.734	5.65	- 0.113	- 0.20
Cereals	94	1.401	0.386	3.53	0.492	1.06
Meat	89	0.486	0.783	3.49	- 0.459	- 0.48
Fish	84	0.128	0.523	2.19	0.401	0.39
Fats and oils	92	0.682	0.625	4.35	- 0.529	- 0.87
Milk and eggs	96	-2.800	1.590	6.66	- 1.446	- 1.43
Fresh vegetables	89	0.393	0.507	2.83	0.304	0.40
Tubers	68	1.319	0.295	1.28	0.360	0.37
Fresh fruits	96	-3.320	1.546	6.52	- 1.015	- 1.01
Dried vegetables	31	1.417	0.194	0.47	0.521	0.30
Preserved fruits & vegetables	63	-6.161	1.764	1.44	- 0.093	- 0.02
Sugar, salt and condim.	83	1.081	0.427	2.63	- 0.150	- 0.22
Miscellaneous	90	-4.611	0.711	1.40	4.332	2.01
Non-alcoholic beverages	97	-1.211	0.899	5.89	0.018	0.03
Alcoholic beverages	54	-1.188	1.219	1.80	- 2.364	- 0.83

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditures, X_1 = family income and X_2 family size.

[b] T = 2.776 for 95% significance level and 4 degrees of freedom.

Appendix Table 8. Regression statistics for relationship between family food expenditures, family income and family size: linear equation, 1964 Lima data[a]

Item	R^2 (%)	Constant term	Family income		Family size		Income elasticity[c]	Family size Elasticity[c]
			Coefficient	T-value[b]	Coefficient	T-value[b]		
All food	91	2,790.47	0.279	2.52	940.77	0.31	0.649	0.318
Cereals	89	- 214.21	0.024	1.53	470.37	1.08	0.313	0.784
Meat	73	1,509.42	0.067	1.33	175.31	0.12	0.582	0.197
Fish	69	139.30	0.008	1.13	38.22	0.19	0.543	0.327
Fats and oils	80	936.62	0.016	1.87	- 36.90	-0.15	0.537	-0.160
Milk and eggs	96	291.57	0.068	4.58	- 90.79	-0.22	1.230	-0.213
Fresh vegetables	90	-263.92	0.015	1.90	185.16	0.86	0.490	0.768
Tubers	69	81.36	0.004	0.72	105.97	0.61	0.208	0.702
Fresh fruits	96	-126.26	0.037	4.74	- 46.92	-0.22	1.703	-0.261
Dried vegetables	26	-297.70	-0.003	-0.43	157.38	0.87	-0.328	1.810
Preserved fruits and vegetables	64	-541.05	-0.001	-0.44	115.56	1.56	-0.536	7.704
Sugar, salt, and condiments	70	482.86	0.007	1.26	13.10	0.10	0.388	0.093
Miscellaneous	92	-664.60	0.002	1.00	120.45	1.98	0.730	5.237
Non-alcoholic beverages	97	- 97.61	0.016	4.17	52.45	0.49	0.834	0.359
Alcoholic beverages	36	1,475.78	0.017	1.31	-297.86	-0.85	1.927	-4.728

[a]Equation form: $Y = a + b_1 X_1 + b_2 X_2$, where Y = family food expenditures, X_1 = family income, and X_2 = family size.

[b]T = 2.776 for 95% significance level and 4 degrees of freedom.

[c]Calculated for average levels.

Appendix Table 9. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Arequipa data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	98	1.179	0.684	13.26
Cereals	63	1.174	0.519	2.28
Meat	40	0.676	0.678	1.41
Fish	78	-4.703	1.569	3.25
Fats and Oils	70	-0.113	0.684	2.66
Milk and Eggs	99	-0.355	0.807	16.73
Fresh vegetables	45	1.235	0.406	1.56
Tubers	68	1.123	0.472	2.55
Fresh fruits	89	-2.390	1.191	5.03
Dried vegetables	--	2.547	-0.037	-0.04
Sugar, Salt, and Condiments	61	0.159	0.628	2.15

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_2 = family income.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 10. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Chiclayo data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	99	-0.571	1.086	11.99
Cereals	89	0.605	0.683	2.80
Meat	92	-9.026	2.820	3.38
Fish	24	4.013	-0.281	- 0.57
Fats and Oils	98	-2.732	1.315	6.65
Milk and Eggs	99	-1.394	1.047	19.28
Fresh vegetables	91	-0.646	0.863	3.14
Tubers	98	-2.028	1.125	7.72
Fresh Fruits	99	-0.761	0.829	27.83
Dried vegetables	80	-1.810	1.053	2.01
Sugar, Salt and Condiments	95	-3.074	1.375	4.19

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]$T = 12.706$ for 95% significance level and 1 degree of freedom.

Appendix Table 11. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Cuzco data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	95	-0.188	0.987	4.60
Cereals	97	-1.810	1.188	5.30
Meat	50	-2.601	1.368	0.99
Fish	95	-2.527	1.121	4.60
Fats and Oils	90	-2.483	1.224	3.10
Milk and Eggs	95	-1.197	0.998	4.20
Fresh vegetables	88	0.757	0.538	2.80
Tubers	99	-1.967	1.148	25.80
Fresh fruits	71	0.383	0.567	1.60
Dry vegetables	38	0.884	0.344	0.80
Sugar, Salt and Condiments	95	-1.079	0.923	4.50

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]T=12.706 for 95% significance level and 1 degree of freedom.

Appendix Table 12. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Iquitos data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	98	0.705	0.781	15.06
Cereals	35	1.708	0.379	1.63
Meat	78	0.571	0.706	4.22
Fish	11	1.262	0.328	0.77
Fats and Oils	28	-3.145	1.312	1.38
Milk and Eggs	82	-2.806	1.325	4.79
Fresh vegetables	93	-0.210	0.721	8.03
Tubers	90	-0.590	0.748	6.72
Fresh fruits	80	-0.750	0.862	4.50
Dried vegetables	80	0.177	0.559	4.43
Preserved fruits and vegetables	16	-6.842	1.627	0.98
Sugar, Salt, and Condiments	68	0.117	0.654	3.26
Miscellaneous	0	0.981	0.046	0.02
Non-alcoholic beverages	71	-0.693	0.741	3.53
Alcoholic beverages	0	1.672	-0.229	-0.09

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]$T=2.571$ for 95% significance level and 5 degrees of freedom.

Appendix Table 13. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Huancayo data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	80	0.917	0.741	4.44
Cereals	91	0.778	0.620	7.04
Meat	42	0.625	0.654	1.90
Fish	12	-0.629	0.749	0.84
Fats and Oils	77	-3.683	1.457	4.05
Milk and Eggs	74	-1.376	1.034	3.76
Fresh vegetables	59	1.535	0.393	2.70
Tubers	40	1.530	0.340	1.82
Fresh Fruits	55	-1.556	1.015	2.50
Dried vegetables	06	1.124	0.371	0.59
Sugar, Salt and Condiments	73	-0.245	0.707	3.73

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]T = 2.571 for 95% significance level and 5 degrees of freedom.

Appendix Table 14. Regression statistics for relationship between family food expenditures, total family income and family size: log equation, 1964 combined Lima, Arequipa, Cuzco, Huancayo, Chiclayo, and Iquitos data[a]

Item	R^2 (%)	Constant term	Family income		Family size	
			Elast. coeff.	T-value[b]	Elast. coeff.	T-value[b]
All food	95	0.924	0.695	17.08	0.247	3.15
Cereals	68	1.635	0.337	4.08	0.482	3.03
Meat	55	-1.347	0.996	3.99	0.607	1.26
Fish	32	-0.498	0.601	2.15	0.624	1.16
Fats and Oils	45	-1.122	0.822	3.21	0.538	1.09
Milk and Eggs	87	-1.774	1.130	11.63	-0.048	-0.26
Fresh vegetables	56	0.787	0.530	5.04	-0.042	-0.21
Tubers	29	0.805	0.473	2.66	0.076	0.22
Fresh fruits	80	-1.851	1.073	8.84	-0.011	-0.04
Dried vegetables	22	1.007	0.287	1.46	0.437	1.16
Preserved fruits and vegetables	22	-7.595	2.054	2.45	-0.359	-0.22
Sugar, Salt, and Condiments	61	0.394	0.528	4.77	0.234	1.09
Miscellaneous	21	-4.274	1.549	2.70	-1.155	-1.04
Non-alcoholic bev.	68	-0.922	0.851	6.60	-0.136	-0.55
Alcoholic beverages	2	1.354	0.409	0.49	-1.157	-0.72

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditures, X_1 = family income, and X_2 = family size.

[b]T = 2.045 for 95% significance level and 29 degrees of freedom.

Appendix Table 15. Regression statistics for relationship between per capita food expenditures and per capita income: log equation, 1964 combined Lima[a], Arequipa, Cuzco, Huancayo, Chiclayo and Iquitos data

Item	R^2 (%)	Constant term	Per capita family income	
			Elasticity coefficient	T-Value b
All food	88	0.950	0.674	14.93
Cereals	13	1.635	0.290	2.14
Meat	37	0.200	0.714	4.24
Fish	21	-0.911	0.752	2.80
Fats and oils	37	-1.079	0.881	4.18
Milk and eggs	82	-1.931	1.188	11.80
Fresh vegetables	41	0.395	0.524	4.53
Tubers	12	0.859	0.359	2.03
Fresh fruits	72	-1.816	1.083	8.71
Dried vegetables	08	0.535	0.359	1.64
Preserved fruits and vegetables	14	-6.650	1.896	2.24
Sugar, salt and condiments	38	0.525	0.449	4.30
Miscellaneous	07	-3.484	1.166	1.47
Non-alcoholic beverages	45	-1.035	0.806	4.95
Alcoholic beverages	01	3.929	-0.754	-0.68

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = per capita food expenditures and X_1 = per capita income

[b]T= 2.045 for 95% significance level and 30 degrees of freedom.

Appendix Table 16. Regression statistics for relationship between family food expenditures and family income: log equation, 1964 Lima, Arequipa, Cuzco, Huancayo, Chiclayo and Iquitos data[a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-value[b]
All food	89	1.020	0.716	15.53
Cereals	--	1.832	0.372	2.89
Meat	50	0.011	0.803	5.44
Fish	27	-1.060	0.828	3.32
Fats and Oils	54	-1.404	0.971	5.96
Milk and Eggs	85	-1.947	1.159	13.11
Fresh vegetables	52	0.692	0.544	5.72
Tubers	14	1.554	0.321	2.22
Fresh fruits	74	-1.777	1.060	9.34
Dried vegetables	15	0.391	0.502	2.33
Sugar, Salt and Condiments	44	0.695	0.508	4.83

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = family income.

[b]$T = 2.045$ for 95% significance level and 30 degrees of freedom.

Appendix Table 17. Regression statistics for relationship between family food expenditures, family income and a dummy variable each for Arequipa, Huancayo, Chiclayo, Cuzco, and Iquitos: semi-log equation, 1964 combined Lima, Arequipa, Huancayo, Chiclayo, Cuzco, and Iquitos data[a]

	R^2 (%)	Constant term	Family income		Dummy variables									
					Arequipa		Huancayo		Chiclayo		Cuzco		Iquitos	
			Elast. Coeff.	T-value[b]	Coeff.	T-value[b]	Coeff.	T-value[b]	Coeff.	T-value[b]	Coeff.	T-value[b]	Coeff.	T-value[b]
All food	95	0.669	0.790	20.73	0.036	1.46	0.039	1.64	0.036	1.75	-0.025	-0.70	-0.008	-0.31
Cereals	79	1.055	0.545	8.86	0.004	0.10	0.050	1.30	0.104	3.14	-0.051	-0.87	-0.098	-2.39
Meat	67	-0.977	1.027	5.13	0.109	0.85	-0.005	-0.04	-0.220	-2.03	-0.280	-1.47	0.101	0.75
Fish	63	-0.411	0.710	3.72	-0.506	-4.14	-0.062	-0.52	0.027	0.27	-0.355	-1.96	-0.053	-0.42
Fats and Oils	57	-1.488	1.013	4.82	-0.086	-0.64	-0.224	-1.70	0.028	0.24	-0.121	-0.61	-0.312	-2.22
Milk and Eggs	91	-2.034	1.176	15.63	0.041	0.85	0.035	0.73	0.069	1.71	0.039	0.55	-0.102	-2.03
Fresh vegetables	90	0.503	0.578	12.55	-0.038	-1.30	0.213	7.36	0.068	2.73	0.099	2.27	-0.069	-2.24
Tubers	76	-0.010	0.648	6.78	0.347	5.65	0.140	2.33	0.127	2.46	0.211	2.32	-0.131	-2.04
Fresh fruits	91	-2.185	1.124	14.41	0.088	1.77	0.146	2.99	0.126	2.98	0.111	1.50	0.253	4.85
Dried vegetables	54	1.162	0.339	2.41	-0.300	-3.33	0.061	0.69	-0.019	-0.24	-0.299	-2.24	0.008	0.09
Preserved fruits and vegetables	70	-8.212	2.199	4.50	-0.604	-1.93	-1.232	-4.02	0.198	0.75	0.526	1.13	-1.212	-3.71
Sugar, Salt and Condiments	77	-0.150	0.673	8.46	0.098	1.92	0.038	0.76	0.127	2.97	0.180	2.39	0.185	3.48
Miscellaneous	41	-4.359	1.389	2.99	-0.297	-0.99	-0.107	-0.37	0.115	0.46	0.417	0.95	-0.734	-2.37
Non-alcoholic beverages	86	-0.958	0.846	10.94	-0.163	-3.27	-0.102	-2.10	0.033	0.78	0.063	0.85	-0.210	-4.06
Alcoholic beverages	66	0.170	0.510	1.12	0.116	0.40	-0.343	-1.20	0.221	0.90	0.515	1.19	-1.818	-5.98

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6$, where Y = family food expenditures, X_1 = family income, X_2 = 1 if data is for Arequipa zero otherwise, X_3 = 1 if data is for Huancayo zero otherwise, X_4 = 1 if data is for Chiclayo zero otherwise, X_5 = 1 if data is for Cuzco zero otherwise, and X_6 = 1 if data is for Iquitos zero otherwise.

[b]$T = 2.064$ for 95% significance level and 25 degrees of freedom.

Appendix Table 18. Regression statistics for relationship between family food expenditures, family income, and family size: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Family income		Family size	
			Elast. coeff.	T-value[b]	Elast. coeff.	T-value[b]
All food	97	0.057	0.704	9.39	0.084	0.21
Meat	85	0.772	0.547	3.39	0.503	0.58
Fish	84	-2.370	1.354	3.84	-1.605	-0.85
Milk and Eggs	92	-1.176	0.955	5.08	0.406	0.40
Fats and Oils	94	-0.982	0.866	5.91	0.172	0.22
Fruits	88	-1.251	1.153	4.50	-1.234	-0.90
Tubers	50	1.638	0.281	1.32	0.466	0.41
Fresh vegetables	94	0.303	0.521	5.78	0.542	1.13
Dried vegetables	75	0.751	0.364	2.36	0.477	0.58
Cereals	83	1.398	0.329	2.77	0.706	1.11
Sugar	89	0.494	0.563	4.62	-0.240	-0.37

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditure items, X_1 = total family income, and X_2 = family size.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 19. Regression statistics for relationship between family food expenditures, total family income and family size: linear equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Family income		Family size		Income Elasticity	Family Size Elast.
			Coefficient	T-Value[b]	Coeffic.	T-Value[b]		
All food	97	93.412	0.489	9.27	536.069	0.54	0.692	0.230
Meat	66	-319.084	0.068	2.13	357.318	0.59	0.438	0.695
Fish	90	113.975	0.014	5.23	-35.345	-0.69	1.305	-0.976
Milk and eggs	84	-164.979	0.072	3.85	73.371	0.21	0.866	0.265
Fats and oils	83	- 60.531	0.025	3.59	47.005	0.35	0.728	0.407
Fruits	91	402.736	0.043	5.58	-109.151	-0.75	1.260	-0.961
Tubers	27	24.759	0.015	0.76	213.420	0.55	0.201	0.836
Fresh vegetables	91	-113.926	0.021	4.99	97.332	1.22	0.473	0.654
Dried vegetables	48	- 3.525	0.006	1.31	60.113	0.70	0.264	0.805
Cereals	61	-168.435	0.028	1.71	305.981	0.97	0.264	0.849
Sugar	88	200.732	0.015	4.53	3.356	0.05	0.565	0.037

[a] Equation form: $Y = a + b_1 X_1 + b_2 X_2$, where Y=family food expenditures, X_1 = total income, and X_2 = family size

[b] T= 3.182 for 95% significance level and 3 degrees of freedom.

[c] Calculated at average values.

Appendix Table 20. Regression statistics for relationship between family food expenditures, total family expenditures and family size: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Total family expenditures		Family size	
			Elast. coeff.	T-value[b]	Elast. coeff.	T-value[b]
All food	99	-0.713	0.822	28.13	0.316	2.40
Meat	88	0.153	0.645	3.90	0.671	0.90
Fish	94	-4.070	1.652	6.69	-1.286	-1.15
Milk and Eggs	96	-2.269	1.130	7.56	0.692	1.02
Fats and Oils	92	-1.850	0.984	5.20	0.502	0.59
Fruits	97	-2.677	1.400	10.28	-0.950	-1.54
Tubers	37	1.591	0.242	0.88	0.707	0.57
Fresh vegetables	96	-0.265	0.607	7.11	0.714	1.85
Dried vegetables	66	0.491	0.379	1.86	0.676	0.73
Cereals	86	1.016	0.391	3.17	0.802	1.44
Sugar	97	-0.190	0.680	9.24	-0.093	-0.28

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditures, X_1 = total family expenditures, and X_2 = family size.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 21. Regression statistics for relationship between family food expenditure and total family expenditures: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Total family expenditures	
			Elasticity coefficient	T-value[b]
All food	99	-0.594	0.848	21.28
Meat	85	0.404	0.702	4.71
Fish	91	-4.553	1.543	6.51
Milk and Eggs	95	-2.010	1.189	8.56
Fats and Oils	91	-1.661	1.026	6.43
Fruits	95	-3.033	1.319	9.04
Tubers	30	1.856	0.302	1.31
Fresh vegetables	92	0.002	0.668	6.69
Dried vegetables	60	0.744	0.436	2.46
Cereals	76	1.317	0.459	3.58
Sugar	97	-0.225	0.672	11.28

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family food expenditures and X_1 = total family expenditures.

[b]T = 2.776 for 95% significance level and 4 degrees of freedom.

Appendix Table 22. Regression statistics for relationship between family food expenditures, total family income and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Family income		Family size	
			Elast. coeff.	T-value[b]	Elast. coeff.	T-value[b]
All food	94	1.141	0.750	4.22	-0.322	-0.49
Meat	91	0.842	0.684	3.56	-0.349	-0.50
Fish	91	0.347	-0.195	-0.67	3.824	3.60
Milk and Eggs	96	-1.692	1.478	6.81	-1.901	-2.40
Fats and Oils	99	0.669	0.171	3.62	1.811	10.49
Fruits	97	-2.700	1.838	8.40	-3.085	-3.85
Tubers	83	1.051	0.463	2.08	0.089	0.11
Fresh vegetables	90	0.809	0.386	2.20	0.554	0.87
Dried vegetables	79	-0.613	0.884	2.30	-0.690	-0.49
Cereals	94	1.375	0.382	3.07	0.468	1.03
Sugar	85	-0.398	0.898	2.96	-0.930	-0.84
Miscellaneous	34	-0.143	0.613	0.74	-0.178	-0.06

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditures, X_1 = total family income, and X_2 = family size.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 23. Regression statistics for relationship between family food expenditures, total family expenditures, and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Family expenditures		Family size	
			Elast. coeff.	T-value[b]	Elast. coeff.	T-value[b]
All food	98	0.826	0.727	8.83	0.135	0.49
Meat	98	0.514	0.679	8.13	0.025	0.09
Fish	90	0.248	-0.116	-0.42	3.524	3.79
Milk and Eggs	99	-2.210	1.391	31.40	-0.899	-6.04
Fats and Oils	99	0.624	0.155	3.48	1.941	12.98
Fruits	98	-3.250	1.693	10.65	-1.745	-3.27
Tubers	89	0.808	0.468	2.79	0.322	0.57
Fresh vegetables	95	0.576	0.403	3.52	0.719	1.87
Dried vegetables	88	-1.079	0.895	3.29	-0.247	-0.27
Cereals	96	1.221	0.368	3.99	0.707	2.28
Sugar	93	-0.841	0.897	4.93	-0.450	-0.74
Miscellaneous	43	-0.756	0.737	1.05	-0.151	-0.06

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family food expenditures, X_1 = total family expenditures, and X_3 = family size.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 24. Regression statistics for relationship between family food expenditures, family income and family size: [a] log equation, 1959 combined Cuzco and Arequipa data

Item	R^2 (%)	Constant term	Family Income		Family size	
			Elasticity coefficient	T-Value [b]	Elasticity Coefficient	T-Value [b]
All food	95	1.148	0.703	10.63	-0.044	-0.15
Meat	86	0.937	0.577	5.68	0.121	0.28
Fish	60	-1.805	1.078	3.15	-0.694	-0.47
Milk and eggs	91	-1.086	1.057	7.59	-0.300	-0.50
Fats and oils	85	-0.475	0.681	5.11	0.489	0.85
Fruits	87	-1.624	1.332	7.34	-1.703	-2.17
Tubers	57	1.377	0.292	1.91	0.696	1.05
Fresh vegetables	89	0.518	0.469	5.69	0.517	1.45
Dried vegetables	70	0.271	0.475	3.11	0.474	0.72
Cereals	87	1.433	0.347	4.82	0.570	1.83
Sugar	84	0.183	0.645	5.66	-0.274	-0.56

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$ where Y = family food expenditures, X_1 = family income, and X_2 = family size

[b] T = 2.262 for 95% significance level and 9 degrees of freedom.

Appendix Table 25. Regression statistics for relationship between family food expenditures and family income: log equation, 1959 combined Cuzco and Arequipa data [a]

Item	R^2 (%)	Constant term	Family income	
			elasticity coefficient	T-value b
All food	95	1.142	0.697	14.19
Meat	86	0.953	0.595	7.86
Fish	59	-1.895	0.978	3.80
Milk and eggs	90	-1.124	1.014	9.69
Fats and oils	84	-0.411	0.752	7.32
Fruits	81	-1.844	1.086	6.53
Tubers	52	1.467	0.392	3.26
Fresh vegetables	86	0.584	0.544	8.01
Dried vegetables	68	0.332	0.544	4.67
Cereals	82	1.506	0.430	6.86
Sugar	83	0.147	0.605	7.04

[a] Equation form: $\log Y = \log a + b_1 \log X_1$ where Y = family food expenditures and X_1 = family income

[b] T= 2.228 for 95% significance level and 10 degrees of freedom.

Appendix Table 26.- Regression statistics for relationship between family food expenditures, family income and dummy variable for Cuzco: semi-log equation,[a] 1959 combined Cuzco and Arequipa data

Item	R^2 (%)	Constant term	Family Income		Dummy var. for Cuzco	
			Elasticity coefficient	T-Value[b]	Coefficient	T-Value[b]
All food	96	1.133	0.696	14.00	0.020	0.86
Meat	86	0.959	0.595	7.51	-0.140	-0.38
Fish	71	-1.803	0.983	4.29	-0.207	-1.90
Milk and eggs	90	-1.129	1.013	9.21	0.011	0.20
Fats and oils	87	-0.441	0.750	7.67	0.066	1.42
Fruits	84	-1.802	1.089	6.74	-0.097	-1.26
Tubers	69	1.419	0.390	3.85	0.109	2.26
Fresh vegetables	90	0.560	0.542	9.05	0.056	1.96
Dried vegetables	70	0.313	0.543	4.56	0.044	0.78
Cereals	83	1.512	0.430	6.57	-0.012	-0.39
Sugar	83	0.152	0.605	6.70	-0.010	-0.23

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 X_2$, where Y= family food expenditures, X_1 = family income, and X_2 = 1 if data is for Cuzco zero otherwise.

[b] T= 2.262 for 95% significance level and 9 degrees of freedom.

Appendix Table 27. Regression statistics for relationship between quantity of family food consumption, family income and family size: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Family Income		Family Size	
			Elasticity Coefficient	T-Value b	Elasticity coefficient	T-Value b
All food	78	1.485	0.348	2.39	0.755	0.97
Meat	76	0.044	0.402	2.17	1.039	1.05
Fish	91	-2.189	1.236	5.40	-2.189	-1.79
Milk and eggs	87	-1.068	0.691	3.53	1.089	1.04
Fats and oils	47	-0.343	0.310	1.12	0.886	0.60
Fruits	83	-0.622	0.521	2.96	0.808	0.86
Tubers	40	1.125	0.401	1.25	0.115	0.07
Fresh veg.	50	1.372	0.249	1.42	0.266	0.28
Dried veg.	61	0.511	0.211	1.06	1.314	1.24
Cereals	74	1.056	0.212	1.57	1.081	1.50
Sugar	36	1.786	-0.189	-0.77	1.689	1.29

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = quantity of family food consumption, X_1 = total family income, and X_2 = family size.

[b] T = 3.182 for 95% significance level and 3 degrees freedom.

Appendix Table 28. Regression statistics for relationship between quantity of family food consumption, total family income and family size: linear equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Family income		Family size		Income Elasticity[c]	Family Size Elasticity[c]
			Coefficient	T-Value b	Coefficient	T-Value b		
All food	52	-605.94	0.0430	1.32	559.82	0.92	0.253	1.001
Meat	49	-123.48	0.0059	1.22	65.92	0.88	0.272	1.141
Fish	80	24.14	0.0016	3.49	-44.29	-0.52	0.775	-0.874
Milk and eggs	64	-215.03	0.0135	2.02	80.41	0.64	0.540	0.984
Fats and oils	32	- 16.05	0.0006	0.87	8.58	0.62	0.320	1.129
Fruits	60	- 42.18	0.0034	1.79	24.44	0.70	0.419	0.941
Tubers	18	29.24	0.0107	0.63	109.38	0.35	0.254	0.805
Fresh veg.	30	108.08	0.0038	0.85	43.91	0.53	0.165	0.581
Dried veg.	37	-113.73	0.0014	0.50	59.51	1.10	0.111	1.439
Cereals	54	-152.02	0.0047	1.00	114.51	1.31	0.157	1.177
Sugar	37	-105.31	-0.0017	-0.68	57.48	1.26	-0.165	1.827

[a] Equation form: $Y = a + b_1 X_1 + b_2 X_2$, where Y = quantity of family food consumption, X_1 = total family income, and X_2 = family size.

[b] T= 3.182 for 95% significance level and 3 degrees of freedom.

[c] Calculated at average values.

Appendix Table 29. Regression statistics for relationship between quantity of family food consumption, total family expenditures and family size: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Total family expenditures		Family size	
			Elasticity Coefficient	T-Value b	Elasticity Coefficient	T-Value b
All food	71	1.231	0.364	1.89	0.942	1.08
Meat	76	-0.370	0.460	2.15	1.186	1.23
Fish	91	-3.493	1.426	5.64	-1.755	-1.53
Milk and eggs	89	-1.819	0.805	3.79	1.320	1.37
Fats and oils	37	-0.353	0.252	0.72	1.177	0.74
Fruits	83	-1.162	0.598	2.94	0.997	1.08
Tubers	26	1.079	0.338	0.82	0.473	0.25
Fresh vegetables	43	1.206	0.256	1.19	0.409	0.42
Dried vegetables	56	0.430	0.197	0.81	1.469	1.34
Cereals	75	0.812	0.251	1.66	1.144	1.68
Sugar	32	1.875	-0.181	-0.62	1.559	1.19

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = quantity of family food items, X_1 = total family expenditures and X_2 = family size.

[b]T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 30. Regression statistics for relationship between quantity of family food consumption and total family expenditures: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Total family expenditures	
			Elasticity coefficient	T-Value[b]
All food	60	1.585	0.444	2.44
Meat	64	0.075	0.561	2.68
Fish	85	-4.151	1.277	4.72
Milk and eggs	82	-1.324	0.917	4.23
Fats and oils	25	0.088	0.353	1.16
Fruits	76	-0.789	0.683	3.56
Tubers	24	1.257	0.378	1.14
Fresh vegetables	40	1.359	0.291	1.64
Dried vegetables	30	0.981	0.322	1.31
Cereals	52	1.242	0.348	2.07
Sugar	01	2.459	-0.049	-0.17

[a] Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = quantity of family food consumed and X_1 = total family expenditures

[b] T = 2.776 for 95% significance level and 4 degrees of freedom.

Appendix Table 31. Regression statistics for relationship between quantity of family food consumption, total family income and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Family Income		Family Size	
			Elasticity Coefficient	T-Value b	Elasticity Coefficient	T-Value b
All food	95	1.123	0.590	4.48	-0.205	-0.43
Meat	96	-0.270	0.680	5.34	-0.170	-0.37
Fish	81	-1.538	0.205	0.43	2.859	1.62
Milk and eggs	94	-0.946	1.142	5.44	-1.696	-2.21
Fats and oils	28	1.306	-0.324	-0.50	2.261	0.96
Fruits	96	-2.029	1.246	7.04	-1.676	-2.59
Tubers	83	1.277	0.284	1.55	0.462	0.69
Fresh vegetables	88	0.200	0.813	3.99	-1.377	-1.85
Dried vegetables	68	-0.859	0.661	1.47	-0.076	-0.05
Cereals	90	0.981	0.388	2.54	0.231	0.41
Sugar	96	0.073	0.249	1.83	1.612	3.24

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = quantity of family food consumed, X_1 = total family income, and X_2 = family size.

[b] T= 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 32. Regression statistics for relationship between quantities of family food consumption, total family expenditures and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Total family expenditures		Family Size	
			Elasticity Coefficient	T-Value b	Elasticity Coefficient	T-Value b
All food	99	0.873	0.572	12.83	0.151	1.01
Meat	99	-0.536	0.651	22.13	0.263	2.66
Fish	82	-1.868	0.297	0.71	2.740	1.94
Milk and eggs	99	-1.379	1.088	15.44	-0.955	-4.04
Fats and oils	27	1.302	-0.258	-0.44	1.924	0.97
Fruits	97	-2.384	1.140	7.24	-0.750	-1.42
Tubers	88	1.087	0.304	2.16	0.564	1.19
Fresh vegetables	91	-0.076	0.762	4.81	-0.817	-1.53
Dried vegetables	71	-1.142	0.643	1.64	0.320	0.24
Cereals	94	0.784	0.390	3.78	0.431	1.24
Sugar	98	-0.101	0.269	2.92	1.693	5.46

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = quantity of family food consumption, X_1 = total family expenditures and X_2 = family size

[b] T= 3.182 for 95% significance level and 3 degrees of freedom.

Appendix table 33. Regression statistics for relationship between quantity of family food consumption, family income and family size: log equation, 1959 combined Cuzco and Arequipa data[a]

Item	R^2 (%)	Constant term	Family income		Family size	
			Elasticity coefficient	T-Value b	Elasticity coefficient	T- value b
All food	81	1.434	0.383	3.84	0.596	1.39
Meat	82	0.059	0.448	3.99	0.738	1.52
Fish	74	-2.602	1.038	4.19	-0.497	-0.46
Milk and eggs	83	-0.617	0.764	5.11	0.051	0.08
Fats and oils	27	0.222	0.159	0.66	0.971	0.93
Fruits	66	-0.994	0.618	2.80	0.653	0.68
Tubers	47	1.110	0.348	1.89	0.385	0.49
Fresh vegetables	60	1.060	0.375	2.88	-0.026	-0.05
Dried vegetables	24	-0.132	0.147	0.31	2.246	1.10
Cereals	76	1.162	0.260	2.84	0.688	1.74
Sugar	56	1.029	-0.052	-0.32	1.977	2.82

[a]Equation form: $\text{Log } Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = quantity of family food consumption, X_1 = family income and X_2 = family size.

[b]T = 2.262 for 95% significance level and 9 degrees of freedom.

Appendix Table 34. Regression statistics for relationship between quantity of family food consumption and family income: log equation[a] 1959 combined Cuzco and Arequipa data

Item	R^2 (%)	Constant term	Family Income	
			Elasticity coefficient	T-Value[b]
All food	77	1.511	0.469	5.76
Meat	78	0.154	0.555	5.94
Fish	73	-2.667	0.966	5.20
Milk and eggs	83	-0.610	0.772	6.96
Fats and oils	20	0.348	0.299	1.60
Fruits	64	-0.909	0.712	4.24
Tubers	46	1.160	0.404	2.93
Fresh vegetables	60	1.056	0.371	3.84
Dried vegetables	14	0.159	0.472	1.26
Cereals	68	1.251	0.360	4.58
Sugar	17	1.284	0.234	1.41

[a] Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = quantity of family food consumption and X_1 = family income.

[b] T = 2.228 for 95% significance level and 10 degrees of freedom.

Appendix Table 35. Regression statistics for relationship between quantity of family food consumption, family income, and dummy variable for Cuzco: semi-log equation, 1959 combined Cuzco and Arequipa data[a]

Item	R^2 (%)	Constant term	Family Income		Dummy variable for Cuzco	
			Elasticity coefficient	T-value[b]	Coefficient	T-Value[b]
All food	82	1.485	0.467	6.27	0.061	1.71
Meat	80	0.133	0.554	5.98	0.048	1.08
Fish	73	-2.649	0.967	4.99	-0.039	-0.43
Milk and eggs	83	-0.622	0.771	6.69	0.028	0.50
Fats and oils	21	0.340	0.299	1.52	0.019	0.20
Fruits	86	-0.996	0.707	6.29	0.195	3.65
Tubers	55	1.121	0.402	3.03	0.086	1.37
Fresh vegetables	60	1.052	0.371	3.65	0.011	0.22
Dried vegetables	88	-0.072	0.459	3.15	0.522	7.54
Cereals	69	1.262	0.360	4.46	-0.026	-0.68
Sugar	18	1.296	0.235	1.35	-0.027	-0.32

[a]Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 X_2$, where Y = quantity of family food consumption, X_1 = family income, and X_2 = 1 if data is for Cuzco zero otherwise.

[b]T= 2.262 for 95% significance level and 9 degrees of freedom.

Appendix Table 36. Regression statistics for relationship between family non-food expenditures and family income: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Family Income		Family Size	
			Elasticity Coefficient	T-Value[b]	Elasticity Coefficient	T-Value[b]
Alcoholic beverages	72	- 1.053	0.711	2.56	- 0.166	- 0.11
Heat	91	0.400	0.223	3.85	0.611	1.97
Household effects	88	- 1.993	0.977	4.34	- 0.415	- 0.34
Housing	83	- 2.582	1.246	3.60	- 0.685	- 0.37
Clothing	96	- 1.083	1.006	8.05	- 0.766	- 1.15
Education	90	- 3.216	1.263	4.80	- 0.841	- 0.60
Personal care	92	- 2.217	0.890	5.38	0.034	0.04
Personal health	71	- 2.515	1.165	2.62	- 1.156	- 0.49
Entertaiment and Transportation	96	- 4.668	1.846	8.04	- 1.944	- 1.59
Tobacco	82	- 1.486	1.090	3.70	- 2.805	- 1.78
Cleaning products	99	- 1.630	0.948	20.46	- 0.927	- 3.74

[a] Equation form: $\log Y = -\log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family expenditure items, X_1 = total family income, and X_2 = family size

[b] T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 37. Regression statistics for relationship between family non-food expenditures, total family income and family size: linear equation, 1959 Cuzco data [a]

Item.	R^2 (%)	Constant term	Family Income		Family size		Income[c] elasticity	Family[c] Size Elasticity
			Coefficient	T-Value[b]	Coefficient	T-Value		
Alcoholic beverages	67	0.093	.00272	2.34	3.871	0.18	0.697	0.30
Heat	91	2.762	.00073	4.27	8.304	2.57	0.221	0.76
Household effects	82	18.780	.00351	3.65	-1.927	-0.11	0.900	-0.15
Housing	88	83.281	.01409	4.75	-28.324	-0.51	1.305	-0.79
Clothing	96	201.209	.02724	8.63	-46.686	-0.79	1.098	-0.57
Education	91	17.558	.00318	5.48	- 6.736	-0.62	1.383	-0.87
Personal care	91	3.322	.00191	5.39	0.262	0.04	0.868	0.04
Personal health	76	28.383	.00286	3.08	- 6.744	-0.39	1.192	-0.85
Entertaiment and transportation	94	50.996	.00660	7.05	-18.486	-1.06	1.737	-1.44
Tobacco	89	18.687	.00087	4.93	- 3.982	-1.21	1.243	-1.64
Cleaning products	99	23.248	.02740	36.83	- 3.835	-2.76	1.054	-0.46

[a] Equation form: $Y = a + b_1 X_1 + b_2 X_2$, where Y = family expenditures, X_1 = total family income, and X_2 = family size

[b] T = 3.182 for 95% significance level and 3 degrees of freedom.

[c] Calculated at average values.

Appendix Table 38. Regression statistics for relationship between family non-food expenditures, total family expenditures and family size: log equation, 1959 Cuzco data [a]

Item	R^2 (%)	Constant term	Total family Exp.		Family Size	
			Elasticity Coefficient	T-Value [b]	Elasticity Coefficient	T-Value b
Alcoholic beverages	58	- 1.478	0.712	1.81	0.270	0.15
Heat	84	0.237	0.233	2.58	0.730	1.79
Household effects	95	- 3.170	1.174	7.26	-0.156	-0.21
Housing	95	- 4.212	1.542	6.98	-0.429	-0.43
Clothing	99	- 2.198	1.178	20.09	-0.442	-1.67
Education	96	- 4.708	1.509	8.28	-0.489	-0.59
Personal care	98	- 3.270	1.064	12.64	0.280	0.74
Personal health	86	- 4.151	1.479	4.12	-0.980	-0.60
Entertaiment and transportation	97	- 6.649	2.140	10.49	-1.314	-1.42
Tobacco	95	- 2.901	1.345	7.25	-2.574	-3.07
Cleaning products	93	- 2.502	1.051	6.05	-0.520	-0.66

[a] Equation form: $\log Y = a + b_1 \log X_1 + b_2 \log X_2$, where Y = family expenditures, X_1 = total family expenditures, and X_2 = family size.

[b] T= 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 39. Regression statistics for relationship between family non-food expenditures and total family expenditures: log equation, 1959 Cuzco data[a]

Item	R^2 (%)	Constant term	Total family expenditures	
			Elasticity coefficients	T-value[b]
Alcoholic beverages	57	-1.576	0.736	2.32
Heat	67	0.512	0.295	2.84
Household affects	95	-3.229	1.162	8.90
Housing	94	-4.374	1.506	8.27
Clothing	99	-2.364	1.141	17.51
Education	96	-4.893	1.468	9.53
Personal care	98	-3.166	1.089	14.87
Personal health	84	-4.520	1.396	4.59
Entertainment and transportation	96	-7.143	2.029	9.60
Tobacco	78	-3.867	1.126	3.73
Cleaning products	92	-2.697	1.008	6.77

[a]Equation form: $\log Y = \log a + b_1 \log X_1$, where Y = family expenditure items and X_1 = total family expenditures.

[b]T = 2.776 for 95% significance level and 4 degrees of freedom.

Appendix Table 40. Regression statistics for relationship between family non-food expenditures, total family income and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Family Income		Family size	
			Elasticity Coefficient	T-Value b	Elasticity Coefficient	T-Value b
Alcoholic beverages	71	-1.190	0.924	1.52	0.042	0.02
Heat	78	0.707	0.272	0.95	1.035	0.99
Household effects	99	-2.859	1.446	13.64	-0.640	-1.65
Housing	93	-3.184	2.041	4.99	-3.042	-2.04
Clothing	97	-1.598	1.313	6.02	-0.488	-0.61
Education	87	-3.151	1.442	2.80	-0.505	-.27
Personal care	96	-1.890	1.346	6.62	-1.565	-2.10
Personal health	81	-3.492	1.814	2.65	-2.086	-0.83
Entertainment	87	-4.104	1.783	3.36	-1.588	-0.82
Tobacco	83	-2.859	1.464	2.80	-1.593	-0.83
Transportation	91	-5.154	2.038	2.77	-1.662	-0.84
Cleaning products	96	0.119	0.567	4.68	0.233	0.53

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y= family expenditures, X_1 = total family income, and X_2 = family size.

[b] T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 41.- Regression statistics for relationship between family non-food expenditures, total family expenditures and family size: log equation, 1959 Arequipa data[a]

Item	R^2 (%)	Constant term	Family expenditures		Family size	
			Elasticity coefficient	T-Value b	Elasticity coefficient	T-value b
Alcoholic beverages	.62	-1.055	0.640	1.00	1.241	0.59
Heat	.77	0.682	0.228	0.85	1.290	1.44
Household effects	.99	-3.244	1.312	9.93	0.462	1.04
Housing	.98	-3.969	1.949	10.92	-1.729	-2.88
Clothing	.98	-2.016	1.218	7.85	0.443	0.85
Education	.94	-3.858	1.439	4.34	0.270	0.24
Personal care	.98	-2.323	1.252	9.70	-0.613	-1.42
Personal health	.98	-4.331	1.789	3.66	-1.060	-0.65
Entertaiment	.93	-4.799	1.707	4.44	-0.450	-0.35
Tobacco	.87	-3.404	1.391	3.28	-0.633	-0.44
Transportation	.92	-5.776	1.881	4.01	-0.189	-0.12
Cleaning products	.97	-0.059	0.526	5.37	0.638	1.94

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y- family expenditure items, X_1 = total family expenditures, and X_3 = family size.

[b] T = 3.182 for 95% significance level and 3 degrees of freedom.

Appendix Table 42. Regression statistics for relationship between family non-food expenditures, family income and family size: log equation, 1959 combined Cuzco and Arequipa data[a]

Item	R^2 (%)	Constant term	Family income		Family Size	
			Elasticity coefficient	T-Value b	Elasticity coefficient	T-Value b
Alcoholic beverages	60	-0.748	0.705	2.49	0.684	0.56
Heat	54	0.945	0.184	1.05	1.338	1.77
Household affects	90	-1.849	1.079	7.08	0.125	0.19
Housing	84	-1.978	1.427	6.08	- 1.170	-1.16
Clothing	94	-0.835	1.082	9.54	- 0.196	-0.40
Education	87	-2.669	1.336	6.45	- 0.608	-0.68
Personal care	90	-1.267	1.012	7.56	- 0.549	-0.95
Personal health	73	-2.269	1.345	4.30	- 1.116	-0.83
Entertainment	90	-4.323	1.821	8.04	- 1.390	-1.42
Tobacco	75	-1.727	1.233	4.94	- 1.891	-1.75
Transportation	82	-4.362	1.818	5.64	- 1.402	-1.01
Cleaning products	96	- 0.446	0.862	13.00	- 0.691	-2.41

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 \log X_2$, where Y = family expenditures, X_1 = family income, and X_2 = family size.

[b] T = 2.262 at 95% significance level for 9 degrees of freedom.

Appendix Table 43. Regression statistics for relationship between family non-food expenditures and family income: log equation, 1959 combined Cuzco and Arequipa data [a]

Item	R^2 (%)	Constant term	Family income	
			Elasticity coefficient	T-Value[b]
Alcoholic beverages	59	-0.660	0.804	3.77
Heat	38	1.118	0.378	2.50
Household effects	90	- 1.832	1.097	9.69
Housing	82	- 2.129	1.258	6.75
Clothing	.94	- 0.861	1.054	12.42
Education	.86	2.747	1.248	7.92
Personal care	89	- 1.338	0.933	8.96
Personal health	71	- 2.413	1.183	4.92
Entertainment	.83	- 4.503	1.620	8.72
Tobacco	67	- 1.971	0.960	4.47
Transportation	80	- 4.543	1.615	6.40
Cleaning products	94	- 0.536	0.763	12.08

[a] Equation form: $\log Y = a + b_1 \log X_1$, where Y = family expenditures and X_1 = family income

[b] T = 2.228 for 95% significance level and 10 degrees of freedom.

Appendix Table 44. Regression statistics for relationship between family non-food expenditures, family income and dummy variable for Cuzco: semi-log equation, combined 1959 Cuzco and Arequipa data[a]

Item	R^2 (%)	Constant term	Family Income		Dummy var. for Cuzco	
			Elasticity Coefficient	T-Value b	Coefficient	T-Value b
Alcoholic beverages	75	-0.750	0.799	4.61	0.204	2.48
Heat	81	1.034	0.373	4.28	0.190	4.59
Household effects	91	-1.858	1.095	9.73	0.056	1.06
Housing	82	-2.117	1.258	6.44	-0.027	-0.30
Clothing	94	-0.870	1.053	11.93	0.020	0.49
Education	88	-2.714	1.250	7.94	-0.074	-1.01
Personal care	91	-1.305	0.935	9.75	-0.076	-1.68
Personal health	72	-2.377	1.185	4.80	-0.080	-0.69
Entertainment	90	-4.556	1.617	9.15	0.120	1.43
Tobacco	71	-1.920	0.963	4.57	-0.117	-1.16
Transportation	82	-4.584	1.613	6.26	0.092	0.75
Cleaning products	94	-0.528	0.763	11.64	-0.016	-0.52

[a] Equation form: $\log Y = \log a + b_1 \log X_1 + b_2 X_2$, where Y = family expenditures, X_1 = family income, and X_2 = 1 if data is for Cuzco zero otherwise.

[b] T= 2.262 for 95% significance level and 9 degrees of freedom.