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THE LEVEL AND DETERMINANTS OF NUTRITION

By

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Introduction

The purpose of this paper is to determine the standard of food consumption as measured by the nutritional level reached by families of each income class and to try to explain observed differences in nutritional sufficiency among families. In an earlier report (Tan and Tecson, 1973), the behavior patterns of food consumption as family size and income increase were observed. Size and income elasticities were computed, using data for the nation as a whole and for white and blue collar workers in rural and urban areas.

From the Bureau of Census Statistical Household Surveys of Income and Expenditure, we find the per family consumption by income class in 1961, 1965, and 1971. In 1961, the range of food consumption per day ranged from P1.32 to P9.74 for the families in the extreme ends of these income strata (i.e., for families earning less than P500 to those earning P10,000 or more). In 1965, the range of food consumption per day was from P2.13 to P13.04, and in 1971, from P3.10 to P17.81. The question remains unanswered, however, as to whether or not these levels of food consumption actually met the recommended nutritional requirement of Filipino families.

The Food and Nutrition Research Council (FNRC) undertook regional surveys of food consumption. From these surveys the

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region's level of nutritional intake of each of ten nutrie (carbohydrates, protein, fats, riboflavin, calcium, iron, thiami niacin, Vitamin A, and ascorbic acid), and of calories was estima The actual intake of each was then compared to the recommend requirement for each of the families in the sample. This was based the recommended requirement for Filipinos of various categorie for the adult male and adult female, classified into sedenta moderately active, and very active; and for children of ages 0-3, 4 8-12, 13-18 and by sex. The nutrient ratings were computed for e family in consideration of their age and sex composition. Rating w defined as the ratio of actual to recommended intake.

The FNRC surveys revealed that, in general, the Filipino diet deficient, especially in the case of some nutrients. There are wi variations in the degree of adequacy among nutrients. For instanc the degree of deficiency in calories and protein is not as high as th deficiency in fats, calcium, and riboflavin. Regional differences a also great, as Table 1 shows. For example, Region V meets on th average 75.4 per cent of recommended intake, while Region I achieves only 57.9 per cent. In addition, the degree of adequacy o intake in each nutrient also shows some variation by region. Regio families (Western Visayas), for instance, take in more protei calcium, thiamine, and niacin, and less of everything else than th Central Luzon families. This fact may be explained by region differences in taste, relative prices of alternative food items, incom and knowledge of nutrition. The following sections try to determi how the latter two variables determine nutritional level.

Determinants of Nutrient Rating

We know that the preference ordering of an individual fo alternative food items is influenced by many factors; among the local traditions, demonstration effect from surrounding and oth areas, and nutrition education. We also know that local traditions o food are partly determined by the available variety and the state o food technology. The classic example of the effect of the latter a the Moslem and Jewish taboos on pork and shellfish. In this study we want to isolate the effects of nutrition education on taste.

Nutrition education involves the dissemination of basic knowledg of nutrition; namely, the identification of major nutrients require by the body, the function of each of these nutrients, and th corresponding quantities required by particular types of individual

Such knowledge can be expected to alter the individual's preference. Whereas previously, preferences for alternative goods involved no scientific normative standards, food items are now valued for their contribution to health. While personal taste might at first clash with the scientific value of some food, (say camote tops, a good source of many vitamins), this dislike can be changed over time through nutrition education. There would also be some dynamic impact on the production of recommended new sources of nutrients. With nutrition education, we can therefore expect a change in the eating habits of the population and consequently, in the composition and level of food output and their prices.

Nutritionists have identified nutrients and their functions. They have arrived at a list of recommended requirements for each of these nutrients for each particular type of individual. For the Philippines, the Food and Nutrition Research Center gave the following table of recommended requirements (see below).

For the housewife to follow these recommendations, she must also consult the nutritionists' food table which describes the nutrient content of food readily available in the community. To simplify the difficult calculation that would be needed in order to meet the recommended diet for a family consisting of individuals of different types, nutritionists have come up with alternative food baskets that would meet the typical individual's requirement. An example of this is "Your Guide to Eating":

"This Guide to Good Eating will tell you what foods are needed by your family and the kinds and amounts they should eat everyday. Our foods have been classified under six basic groups. *If you include one or more foods from each group in the proper amounts everyday you can be sure you are on the way to good eating. . ."*

Leafy and Yellow Vegetables

One or more servings daily
(1 serving = 1/2 cup cooked, 1 cup raw)

malunggay leaves	pechay
ampalaya leaves	mustard
kamote tops	lettuce

Vitamin C-Rich Foods

One or more servings daily
(1 medium-size fruit or 1 slice of a big fruit per serving)

cashew	pomelo
guava	papaya
guyabano	durian

Other Fruits and Vegetables

Two or more servings daily
(1 serving = 1/2 cup cooked, or 1 cup raw)

okra	mabulo
papaya	pineapple
kadyos	chico

Fat-rich Foods

(3 tablespoons daily)

butter	coconut milk
enriched margarine	coconut oil
lard	coconut

Protein-rich Foods

Whole Milk (all kinds)
for children, pregnant, and nursing mothers .... 1 cup daily
Meat, fish, or poultry
(1 serving = as big as a matchbox)
Eggs ..... 2-3 a week
Dried Beans or nuts ..... 1 serving daily
(1 cup cooked)

beef	sausage
pork (lean)	ham

Rice and other Energy Foods

Rice — 3 to 3 1/2 servings (1 serving = 1/2 cup raw or 1 to 1 1/4 cup packed, cooked)
root crops — 1 serving daily (1 small size or 1/2 cup, sliced)
sugar — 1 serving daily (1 serving = 2 tablespoons)

enriched rice	gabi
corn	pinipig
sweet potato	bread

These requirements are recommended with less than 100 per cent certainty. Although it is true that some medical symptoms are associated with deficiency in each of these nutrients, the exact amount normally required by individuals is still unknown. The requirements also differ in individuals, not just by reason of weight, sex, age, or activity. For this paper, we ask the reader to keep this qualification in mind, and to interpret the results as based on a set of recommended nutritional allowances for the average Filipino of given age and sex.

It is to be noted that each of the recommended nutrient requirements must be met. Yet it is likely that the nutrients that were identified earlier and those that are regarded to have major functions as tissue builders and energy sources will be more known than others. Inadequacy in these nutrients will be more keenly and immediately perceived than inadequacy in other nutrients like Vitamin A or C. For instance, physical weakness is immediately felt when calorie intake is below the required level, whereas the effect of inadequate protein and calcium intake is observed only after some time. In the case of other nutrients, the effect of inadequate intake is not even obvious to lay men. This fact would then result in varied compliance with the various nutrient requirements, in spite of widespread nutrition education.

Income also determines the level of nutrition reached by families. Higher income families consume more food quantitatively and qualitatively. They are, therefore, likely to meet the recommended requirements of some nutrients more adequately than poor families. This is true for calorie and protein requirements. It is also possible that because they have a more varied diet, higher income families are able to consume a greater variety of nutrients. On the other hand, it may be true that what is popularly considered better-quality food may have poor nutritional value. In this case, income would have a negative effect on the level of nutrition. In general, however, income-nutrient relationship is positive for nutrients that come from superior items and negative for nutrients that come from inferior items.

Families must now meet two constraints — income and the set of recommended nutrient requirements. The housewife's calculation becomes more complicated for she has to consider the preference ordering of her family among substitutes for a particular nutrient, and its own preference ordering for particular foods irrespective of

nutrient contents. A stereotyped Western meal practice is to bri child to eat his vegetables by promising him his favorite des Other than this, the housewife may serve a balanced diet wh includes a favorite dish, or serve this dish on top of the balanced meal.

From the discussion, we see that two factors may prevent achievement of the recommended nutritional requirement: l income and lack of knowledge of basic nutrition. Either one or b can explain poor nutrition of families.

There has been some effort to spread nutrition education thro both formal and non-formal education media. The extent effectiveness of the country's nutrition education may be glea from the level of nutrition attained by families who could otherw afford to meet the nutrient requirement. In view of the count low per capita income and very unequal income distribution, cannot be assumed that all families can afford a nutritous diet. this case, we have to find out what would be the minimum cost meeting the nutrient requirement of the typical family and see wh proportion of families can meet the requirement. This was don this paper by the application of a linear cost-minimization prog to selected localities.

Minimum Cost Diet for Manila, Legaspi, Roxas City, and Ilocos

The Food and Nutrition Survey also collected the prices of fo items in the locality surveyed. There is a detailed food table for t Philippines which includes processed and fresh food items. From t raw data, we tabulated the food items consumed by families in t locality studied and their corresponding prices. We assumed th items to be the available substitutes in the locality. From the fo table, we obtained for each of these food items, their correspond nutrient contents. Eight nutrients were used, namely: carbohydra protein, fats, calcium, iron, thiamine, riboflavin, Vitamin C, and to calories.

We performed this exercise for a family of six consisting o moderately active couple and children, one belonging to each of t ages 0-3, 4-7, 8-12, 13-18. We estimated the recommended da requirement of each nutrient for this model family. Given the pri of the food items available in the market and their correspond nutrient contents (obtained from the food table), we solved for t

minimum cost food combination that would meet all the nutrient requirements for this type of family. To reduce programming costs, 42 items that were obviously expensive sources of nutrients were eliminated. Cucumber, some popular varieties of squash and cheese, for instance, were eliminated. Peripheral items such as sugar, coffee, and spices which cannot form the bulk of the diet even if they happen to be rich in either fats or principal nutrients such as calories and protein were also not included. This was done to avoid getting absurd results. When we included sugar in the first exercise, for instance, the solution showed that sugar is the main source of calories. This obviously proved to be an impractical solution.

This exercise was repeated in Manila for two sets of data: 1958 and 1973 prices; Ilocos Sur 1960 prices; Roxas City 1964 prices; and Legaspi City 1962 prices. The resulting minimum cost combination of food items and the minimum cost budget for these localities are given in Table 4. The list of food items used in the program consisted of about 25 items.

The results are not encouraging in the sense that the minimum cost budget for a family of six in the province until 1969 was about P4.00 per day. In 1969, the minimum non-farm wage being P6.00 per day, the minimum cost basket could absorb about 1/3 of the wage. In 1958, the minimum wage was P4.00 per day. Food consumption needed to meet the recommended diet could be met by just a little over 1/3 of the minimum wage. In 1973, however, after the long stretch of great inflation beginning in 1969, the required budget went up to P6.86. This absorbed almost 7/8 of the prevailing minimum wage of P8.00 per day. These results show the worsening condition of the real income as a consequence of the recent inflation.

From the Bureau of Census survey, we could see the proportion of families which could meet the recommended requirement as determined by their food expenditure. Assuming that families have the same family composition as our model family and that, on the average, P2.00 could buy the minimum cost diet in 1960, and P4.00 in 1970, the proportion of families that could meet the recommended diet was 90 per cent for 1960 and 100 per cent for 1970. In contrast, we find in Tables 1 and 2 and Charts 1-5 that a substantial proportion of families do not achieve an adequate diet in spite of their capacity to meet the nutritional requirement. In Charts 1-5, we plotted the nutrient intake against income for families of six. The level of adequacy is shown not to be too strongly related to the budget for food.

How attractive is the solution basket likely to be for Philip families? In Manila, for instance, it may not be very attractive, typical basket of Manila families which belong to the lower inc groups is much more varied than the solution basket. Instead eating one kind of vegetable, Manilans usually combine a variet them. The "sinigang" or "bulanglang" is a very popular recip mixed vegetable stew which may contain either fish, pork, or beef simply a dash of fish paste as the budget permits. So we find in baskets bought by many families a little of a number of things, never a number less than the five items we have in our solution.

In the provinces, farmers and fishermen spend on fewer ite This might be explained by the non-availability of many alternati But in general, families prefer mixed vegetable dishes.

Nutritionists must find a way then to substitute our solution f items as the basic items in the recipes. For example, in place eggplant or white squash, they may suggest kangkong, malunggay, camote tops or in place of a smudging of pork, they can adv families to buy a larger quantity of anchovies or mackerel or tuna.

The approach suggested here for nutrition education is to be with instruction on the required diet, and to find low-c combinations that would meet this required diet. The recipes shou follow the recommended combinations, rather than the other w around, which is what is being done now. This approach would b big improvement on the "Guide to Good Eating" as discussed earli

The program may also be applied to increasingly more varied die such that we specify some minimum amounts of popular items constraints. The resulting cost minus the minimum cost combinati using an unconstrained selection of items could be considered t marginal cost of the more varied diet. The cost minimizati program may as well apply to the choice between artificial feeding breastfeeding of babies.

Determinants of Nutritional Levels

The nutritional level achieved by a family depends on the bask of food it decides to buy. This, in turn, depends on the family taste, the relative prices of available alternatives, and income. As w discussed earlier, knowledge of nutrition is likely to influence th family's taste for food and push the family to attain higher rates o

nutritional requirements. Since we have no information on knowledge of nutrition, we will use as a proxy variable the number of years of schooling of the household head, assuming that nutrition education is included in the content of formal education, and that learning about nutrition through non-formal education media increases with the level of schooling.

The linear program results show that families of six members whose food expenditures fell below P2.00 per day between 1964 and 1969 simply could not meet the nutritional requirements. But since the majority of families fall above this expenditure, they can be expected to meet the nutritional requirements if they decide to do so. Hence, we can hypothesize the following function:

$$NR_i = f(C, E)$$

where NR_i = the nutrient rating defined an intake as a ratio of the recommended nutrient i for the particular family

C = per capita food consumption (the variable used instead of family income, the latter not being available

E = the level of schooling of the head of the family given in number of years of schooling

i = 1, 2, ... , 10 nutrient types

This equation was tested for the nine nutrients and total calories using linear regression. About 500 individual observations were used in regressing

$$R_i = a + b_i E + b_2 C + u$$

where E is the education of the head of the family, C is its per capita food expenditure, and u is the error term.

The results show that education is not a significant determinant of nutritional level except in the case of fats. The coefficients are not significant and have the wrong sign. (Table 5)

Per capita consumption consistently explains the nutrient rat achieved by families. The positive sign for each of the 10 nutri tested is as expected; and the t values are all very high, indicati significance level of one per cent for the regression coefficie However, the explanatory power of per capita consumption is very high and varies among nutrients, ranging from as low $R^2 = 0.02$ for thiamine to $R_2 = 0.41$ for protein. The inco elasticities are all less than one. These results — low R^2 and income elasticities — indicate that we cannot rely too much changes of income to improve the level of nutrition in Philippines. In fact, nutrition education can achieve a lot in initiat positive attitudes that are more consistent with nutritional requi ments because of the very limited nutrition education program. T results of the linear program exercises undertaken in this stu indicate that it is possible for almost all Philippine families to achi a nutritious diet. We have found out that even families in the low income bracket (less than P500 per year) spent more than P2.00 day for food in 1965. The minimum cost solution for ma provinces was about P2.00 in 1965-1969. Many rich food items su as malunggay, camote tops, and kangkong are rich in all nutrie except fats and protein and these are relatively cheap in the mark Yet, these are considered inferior items in the Philippines.

An alternative test of the hypothesis is to regress nutrient int with the recommended allowance and income variable. The mo nutrition education communities receive, the closer will be the between recommended and actual intake. The results are given Table 6.

We divided the sample into two education groups — those with 1 and those with 7-10 years of schooling. We would expect a strong correlation between recommended and actual intake for famili with longer years of schooling. For the more poorly educated grou the explanatory power of recommended intake is very low except f calories and niacin. We may interpret these results for calories a niacin as spurious. As argued earlier, the deficiency or excess calorie intake is manifested clearly in the individual even without h knowledge of nutrition. Hence, we can expect a significant f between recommended and actual intake. The stronger correlati between these two variables for those with more schooling may b due to their higher income.

For both education groups, there is significant correlation betwe the recommended and actual intake for two unknown nutrients

[illegible] and niacin. This significant correlation could be due to [illegible] eating habits which happen to include food rich in [illegible] and niacin. The over all results seem to show a spurious [illegible] between recommended and actual intake. We may [illegible] from these results either a lack of or ineffectiveness of [illegible] education.

[illegible] Nutrient Intake

As we see in Table 3, the recommended requirements are set for [illegible] age groups, sex, and intensity of activity. These requirements [illegible] also be considered as the marginal required nutrients, so that, [illegible] instance, if a family adds to its membership a child of age 0-3, the [illegible] increase in the set of recommended nutrient requirement [illegible] be 40 grams of protein, 1 gram of calcium, 1,200 grams of [illegible].

In the nutrition survey, the age and sex composition of the family [illegible] given. If we regress the nutrient intake with the number of [illegible] in each age — sex group, we can see the actual marginal [illegible] intake of families. The observed marginal intake for each age [illegible] is then compared with the recommended intake for the same [illegible]. We have the following function:

$$Q_i = f(S_1, S_2, S_3, S_4)$$

where Q_i = the nutrient intake expressed in grams

$i = 1, 2, 3 \ldots\ldots 10$ nutrients

S_1, S_2, S_3, S_4 = Number of members of ages 0-3, 4-7, 8-12, 13-18

The regression is performed with income controlled using individual observations from the surveyed Visayan region. We see the results in Table 6. In the table, the recommended intake is written above the observed marginal intake. The observed intake is, as explained above, the regression coefficient for each age — sex group when the linear regression specification is used. By controlling the budget, we are able to isolate the effect of the size of a particular age — sex composition on intake.

The signs of the regression coefficients are practically all negati This is opposite of what could be expected. It would seem that a addition to the family lowers the total family intake. This is t even for families with total daily food expenditure of P6.00 or mo These results complement the regression results relating actual recommended intake for the families in the sample.

Summary of Results

In this paper we investigated the nutritional content of fo consumption in a number of regions surveyed by the National Fo and Nutrition Research Council. As a whole, the diet of majority Filipino families is inadequate. The rate of inadequacy is particular bad for some nutrients including calcium and fats. This finding unfortunate considering especially that the average expenditure majority of families can buy a nutritious basket of food as shown the results of our cost minimization programs applied to so localities.

We tried to explain the standard of nutrition in terms of per capi consumption and education of the head of the family. This was do using individual observations for one region — Western Visayas. W wanted to see a strong explanatory power of education, b unfortunately, the coefficient of this variable is insignificant. Th result seems to point to the need for an expanded and more effecti nutrition education. This program may, of course, be complement by the on-going green revolution.

The surveys included biological and clinical phases from which th effects of poor nutrition in particular nutrients can be studie further. The work can, therefore, be extended to include incidenc of particular diseases related to inadequacy of some substance, and cost benefit analysis of a better diet. This part of the study invite students in health economics.

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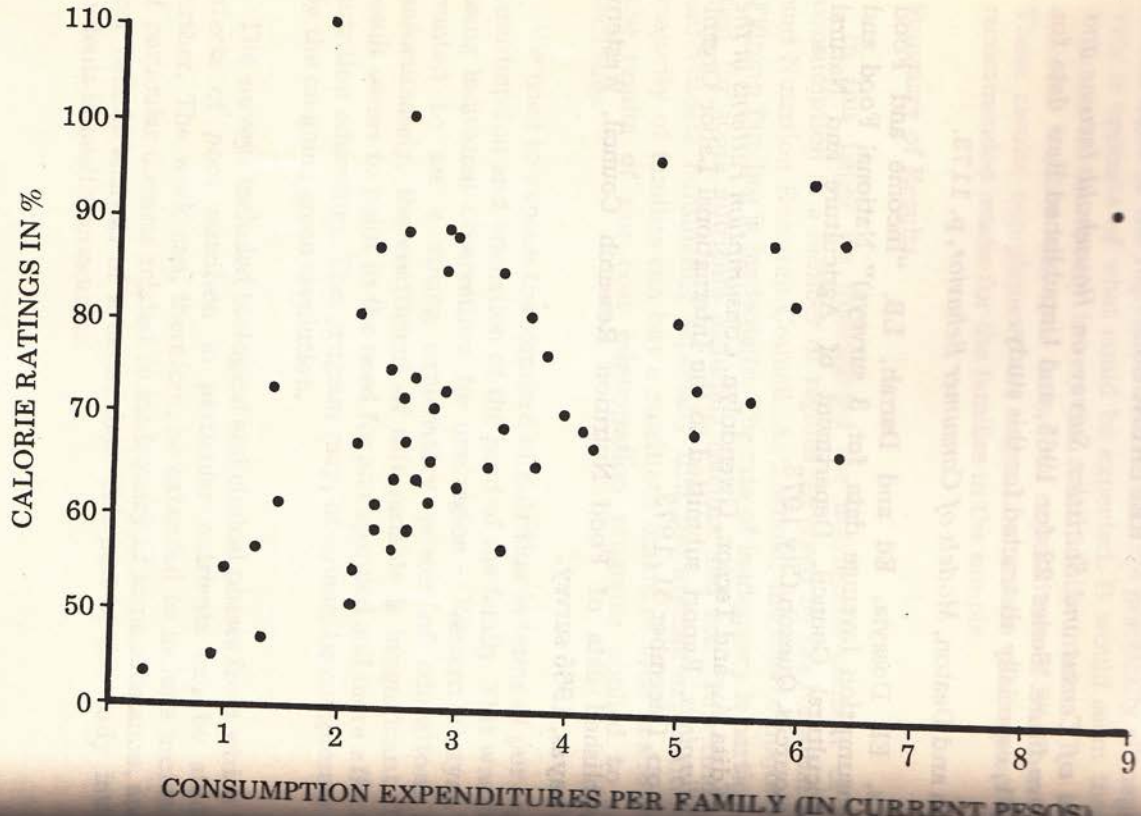
110
100
90
80
70
60
50
0
CALORIE RATINGS IN %
1
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3
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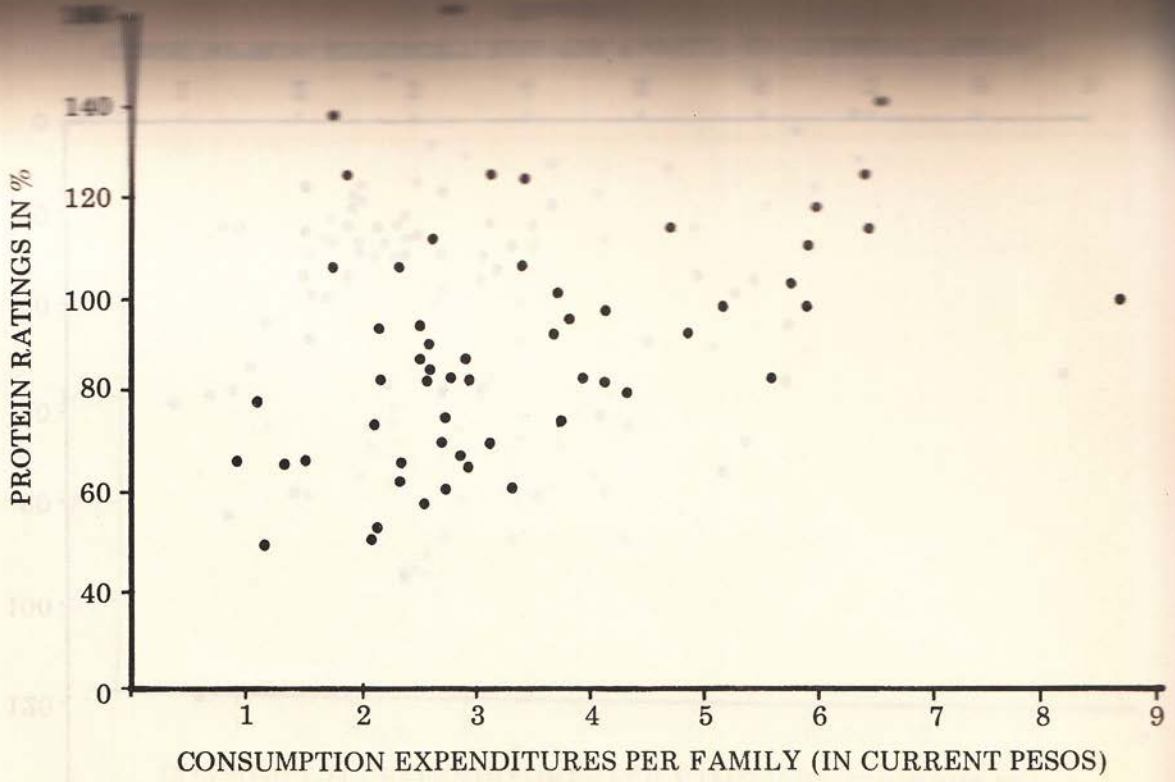
5
6
7
8
9
CONSUMPTION EXPENDITURES PER FAMILY (IN CURRENT PESOS)


PROTEIN RATINGS IN %
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120
100
80
60
40
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3
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7
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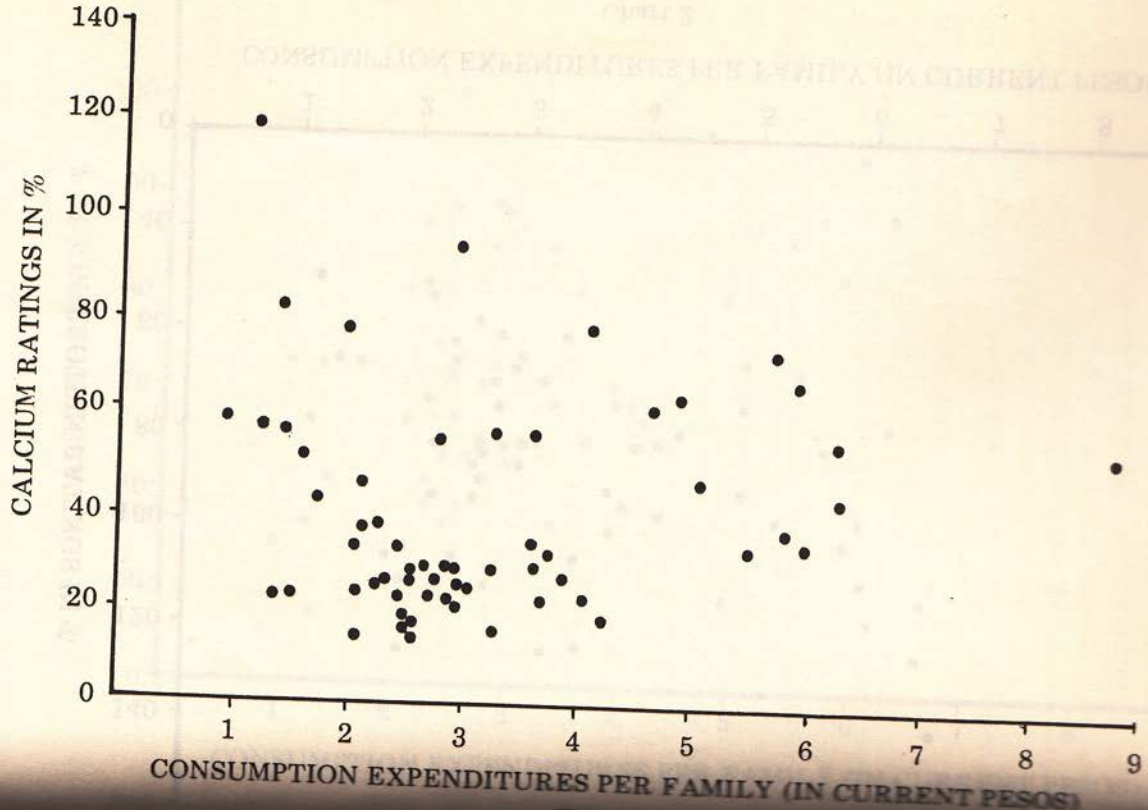
9
CONSUMPTION EXPENDITURES PER FAMILY (IN CURRENT PESOS)

Chart 2


CALCIUM RATINGS IN %
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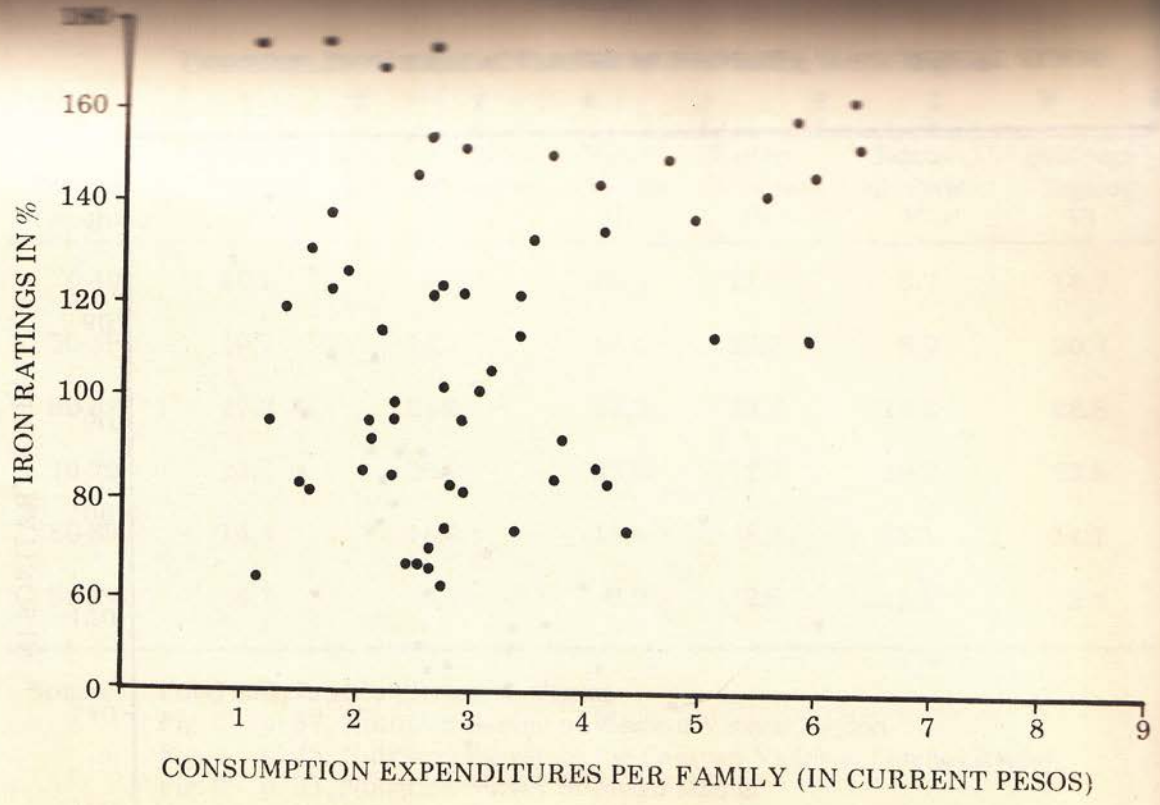
CONSUMPTION EXPENDITURES PER FAMILY (IN CURRENT PESOS)


IRON RATINGS IN %
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100
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7
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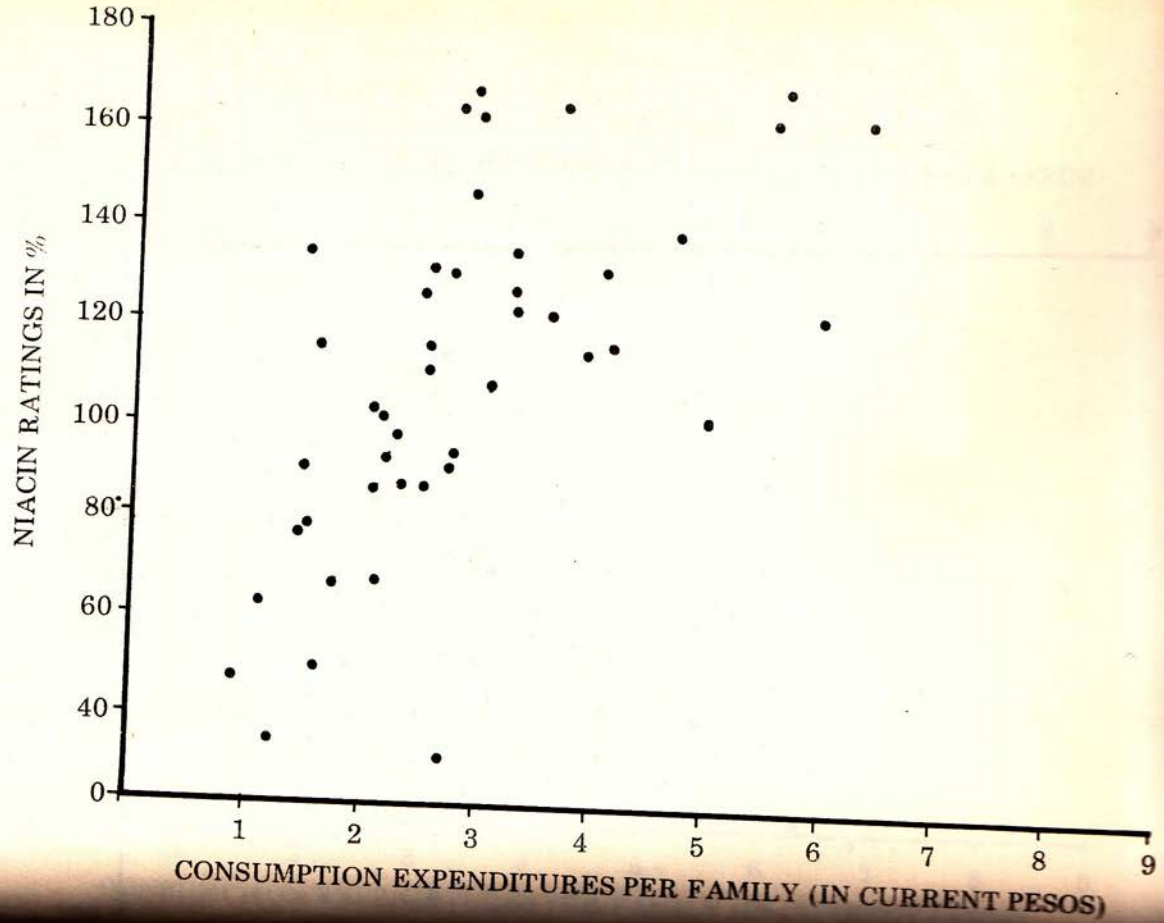
CONSUMPTION EXPENDITURES PER FAMILY (IN CURRENT PESOS)

Chart 4


NIACIN RATINGS IN %
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160
140
120
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5
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8
9
CONSUMPTION EXPENDITURES PER FAMILY (IN CURRENT PESOS)

Percentage Distribution of Families by Diet Rating in Six Regions

Percentage Adequacy	Western Visayas I	Cagayan Valley Batanes Region II	Metro Manila III	Eastern Visayas IV	Ilocos Mt. Prov. V	Southern Tagalog VI
0-49	10.2	9.9	10.5	21.6	3.7	14.7
50-59	19.7	14.3	15.4	26.5	6.9	20.4
60-69	27.2	24.6	19.2	23.8	18.3	28.8
70-79	23.8	28.7	27.6	17.3	29.9	22.6
80-89	14.4	18.4	18.4	8.2	28.1	11.1
90-100	4.7	4.1	8.9	2.6	13.1	2.4

Source: Food and Nutrition Research Center
Fig. 7 p. 37, Nutrition Survey of Western Visayas Region
Fig. 8 p. 45, Nutrition Survey of the Cagayan Valley & Batanes Region
Fig. 8 p. 39, Nutrition Survey of Metro Manila
Fig. 7 p. 39, Nutrition Survey of Eastern Visayas Region
Fig. 8 p. 42, Nutrition Survey of Ilocos — Mt. Prov. Region
Fig. 7 p. 39, Nutrition Survey of Southern Tagalog Region

TABLE 2

Percentage Distribution of Families by Percent Distribution in Various Nutrients Western Visayas, & Cagayan Valley

Percentage Adequacy	Calories		Protein		Calcium	Iron		Vitamin A		Thiamine		Ribo-flavin	Niacin		Ascorbic Acid
0-49	6.6	2.3	3.3	2.3	66.7	74.4	1.3	.3	56.9	45.0	32.9	29.0	76.9	71.3	4.2	9.8	37.1	23.2
50-59	10.3	6.5	6.6	6.4	13.2	8.5	1.3	2.0	8.3	12.9	15.8	22.8	10.9	13.9	3.7	3.0	9.1	7.8
60-69	21.0	17.0	9.9	12.2	5.6	6.4	3.3	1.0	5.8	9.8	10.1	16.0	6.0	6.4	3.7	3.0	6.4	7.5
70-79	24.0	26.9	15.3	19.4	2.9	4.0	6.4	3.0	5.8	6.8	6.4	10.9	2.1	4.0	3.5	3.0	5.0	9.2
80-89	17.5	16.0	15.6	16.3	2.1	1.3	7.8	5.8	4.4	6.8	8.8	7.1	1.7	3.4	5.8	7.8	7.2	7.8
Above 90	20.3	31.3	49.0	43.0	9.1	5.1	79.6	87.7	18.5	18.4	26.9	13.9	2.1	.6	78.9	63.4	34.9	44.3

Source: Food and Nutrition Research Center
Survey of Western Visayas
Table 8 p. 29
Survey of Cagayan Region
Table 8 p. 36

TABLE 4

Minimum Cost Basket for Ilocos Sur, Roxas City, Legaspi City, and Manila

	Required Quantity in 100 g.	Carbohydrates		Proteins		Fats		Calories	
		per 100 g.	total	per 100 g.	total	per 100 g.	total	per 100 g.	total
Minimum requirements (grams)			1675		300		135		11600
Ilocos Sur — 1960									
X_1 Rice	26.432	80.8	2136	7.4	196	0.5	13	368	9727
X_3 Malunggay	7.693	12.8	98	5.9	45	1.8	114	0.75	6
X_4 Mongo	0.387	64.6	25	24.4	9	1.0	1	356	138
X_{12} Camote	4.427	32.3	143	1.1	5	0.4	2	136	602
X_{17} Bagoong	3.000	0.2	1	14.9	45	1.0	3	73	219
X_{22} Oil	1.029	0.0	0	0	0	99.9	102	883	909
			2403		300		135		11601
Roxas City — 1964									
X_1 Rice	14.204	80.6	1148	7.4	105	0.5	7	368	5227
X_8 Kangkong	21.030	4.4	93	3.4	71	0.6	13	30	631
X_{21} Dilis	3.000	0	0	17.9	64	1.1	3	86	258
X_{24} Milk	39.173	11.1	445	7.0	274	7.9	302	140	5484
			1686		514		325		11600
Legaspi City — 1969									
X_2 Rice	10.000	80.8	808	7.4	74	0.5	5	368	3680

Manila — 1958										
X_1	Rice	10.000	80.8	808	7.4	74	0.5	5	368	3680
X_8	Camote Tops	17.270	10.3	178	2.8	48	0.5	9	53	915
X_{18}	Banana	23.552	29.0	683	1.4	33	0.2	5	111	2614
X_{31}	Sardines	7.535	0.3	2	19.2	145	13.3	100	202	1522
X_{34}	Margarine	3.511	1.1	4	0	0	91.9	32	817	2869
				1675		300		151		11600
Manila — 1973										
X_1	Rice	24.491	80.8	1979	7.4	181	0.5	12	368	9013
X_8	Camote Tops	25.892	10.3	267	2.8	73	0.5	13	53	1372
X_{26}	Galunggong	3.000	0	0	18.7	56	1.5	4	93	279
X_{34}	Margarine	1.146	1.1	1	0.0	0	91.9	106	817	936
				2247		310		135		2706

	Calcium		Iron		Thiamine		Riboflavin		Vit. C		Price	
	per 100 g.	total	per 100 g.	total	per 100 g.	total	per 100 g.	total	per 100 g.	total	per 100 g.	Minimum cost in pesos
Minimum requirements (grams)		5.6		36		4.91		7.5		365		
Ilocos Sur												
X_1 Rice	8	211	1.2	32	0.1	2.64	0.05	1.32	0	0	0.045	1.189
X_3 Malunggay	353	2717	3.5	27	0.2	1.54	0.73	5.62	232	1785	0.016	.123
X_4 Mongo	125	48	5.7	2	0.66	.26	0.22	.08	10	4	0.085	.033
X_{12} Camote	57	252	0.7	3	0.10	.44	0.04	.18	35	154	0.018	.080
X_{17} Bagoong	469	1407	5.4	16	0.01	.03	0.10	.30	0	0	0.046	.138
$X_{\_}$ Oil	2.0	2	0	0	0	0	0	0	0	0	115	.118

											1943		1.681
Roxas City — 1964													
X_1 Rice	8	144	1.2	17	0.1	1.42	0.05	0.71	0	0	0.065		.923
X_8 Kangkong	71	1491	3.2	67	0.09	1.89	0.24	5.05	49	10.9	.005		.105
X_{21} Dilis	469	1407	0.7	2	0.01	.02	0.08	.24	0	0	.053		.159
X_{24} Milk	425	16660	0.3	12	0.04	1.57	0.39	15.28	0	0	.015		.588
		19672		98		4.91		21.28		10.9			1.775
Legaspi City — 1969													
X_2 Rice	8	80	1.2	12	0.1	8.08	0.05	0.50					
X_7 Sitaw	42	658	0.9	14	0.12	1.88	0.13	2.04	0	0	0.075		.750
X_8 Kangkong	71	1007	3.2	45	0.09	1.28	0.24	3.40	22	345	0.012		.188
X_9 Camote	57	705	0.7	8	0.10	1.24	0.04	0.50	49	695	0.013		.184
X_{18} Galunggong	75	225	0.9	3	0.14	0.42	0.19	0.59	35	433	0.020		.247
X_{25} Coconut (mature)	28	461	1.5	25	0.04	.66	0.03	0.49	0	0	0.070		.210
		3136		107		13.56		7.50	3.0	49	0.020		.329
										1522			1.909
Manila — 1958													
X_1 Rice	8	80	1.2	12	0.10	1.00	0.05	0.50	0	0	0.057		.570
X_8 Camote Tops	107	1848	6.0	104	0.12	2.07	0.20	3.45	32	553	0.015		.259
X_{18} Banana	15	353	0.8	19	0.03	0.71	0.05	1.18	35	823	0.020		.471
X_{31} Sardines	359	2704	2.2	17	0.01	.08	0.10	0.75	0	0	0.020		.150
X_{34} Margarine	13	46	0.0	0	5.57	19.56	0.46	1.62	0	0	0.040		.140
		6031		152		23.42		7.50		1376			1.591
Manila — 1973													
X_1 Rice	8	196	1.2	29	0.10	2.45	0.05	1.22	0	0	0.180		4.408
X_8 Camote Tops	107	2270	6.0	155	0.12	3.11	0.20	5.18	32	728	0.040		1.035
X_{26} Galunggong	75	225	0.9	3	0.14	0.42	0.19	.57	0	0	0.251		.753
X_{34} Margarine	13	15	0	0	5.59	6.48	0.46	0.53	0	0	0.575		.659

TABLE 5

Regression Parameters of Determinants of Nutrient Rating

Nutrient	a	$b_1(E)$	$b_2(\frac{C}{N})$	E_1	E_2	R^2
Calories	58.534	−0.289	33.996	−0.016	0.250	**0.272**
		(−0.766)	(11.954)			
Protein	58.265	−0.387	65.652	−0.018	0.394	**0.411**
		(−0.718)	(16.146)			
Calcium	28.077	1.364	23.837	0.124	0.283	**0.065**
		(1.663)	(3.855)			
Iron	91.876	−0.916	87.458	−0.029	0.358	**0.159**
		(−0.676)	(8.562)			
Vitamin A	33.352	0.791	38.525	0.058	0.370	**0.051**
		(0619)	(3.998)			
Thiamine	66.838	−2.512	28.529	−0.150	0.222	**0.038**
		(−2.947)	(4.441)			
Riboflavin	16.890	0.781	35.428	0.084	0.495	**0.274**
		(1.753)	(10.548)			
Niacin	83.119	−1.832	96.434	−0.061	0.418	**0.286**
		(−1.843)	(12.867)			
Ascorbic	58.743	−1.980	58.311	−0.103	0.394	**0.052**
		(−1.276)	(4.982)			
Fats	−2.211	1.697	36.246	0.287	0.800	**0.135**
		(2.146)	(6.080)			

Figures in parenthesis are t values

E is educational level

$\frac{C}{N}$ is per capita consumption of the family

E_1 and E_2 are the elasticities of E and $\frac{c}{n}$, respectively

TABLE 6

Regression Parameters of the Relationship between Actual Intake and Required Intake

Variable	Intercept A	Regression Coefficient B	R^2	E
Schooling: 7-10				
Calories	142.430	0.769 (6.372)	0.340	0.925
Protein	38.811	0.390 (1.303)	0.021	0.354
Fats	28.664	0.021 (0.695)	0.006	0.060
Calcium	1.114	−0.600 (−2.229)	0.063	−1.037
Iron	8.635	0.405 (1.008)	0.013	0.281
Vitamins	3554.987	−0.209 (−0.448)	0.403	−0.298
Thiamine	−0.009	0.671 (3.503)	0.134	1.011
Riboflavin	0.660	0.030 (0.138)	0.00024	0.058
Niacin	3.995	1.096 (4.133)	0.178	0.775
Ascorbic	32.772	0.467 (88.517)	0.990	0.716
Schooling: 1-6				
Calories	301.719	0.610 (8.822)	0.155	0.817
Protein	39.27	0.169 (1.627)	0.006	0.190
Fats	13.950	0.013 (2.621)	0.016	0.067
Calcium	0.788	−0.348 (−2.988)	0.021	−0.807
Iron	5.929	0.556 (2.459)	0.014	0.417
Vitamins	857.006	0.320 (1.716)	0.007	0.583
Thiamine	−0.102	0.819 (5.640)	0.070	1.115
Riboflavin	0.420	0.065 (0.526)	0.001	0.173
Niacin	−3.249	1.547 (7.930)	0.129	1.216
Ascorbic	38.503	0.256 (0.979)	0.002	0.319

Regression Estimates Of Marginal Nutrient Intake For Each Age Group

Nutrients	Consumption Per Capita	Intercept A	Number in age 1-6	Regression Number in age 9-12	Coefficient for Number in age 13-26	Adults	Elasticity R^2	
Calories	required amount		1200.00	2050.00	2800.00	2450.00		
	0 — 1.99	1930-40	—148.77	—137.29	37.60	—30.47	0.27	
	2.00 — 2.99	2154.25	—154.58	—110.96	—53.67	—56.86	0.27	
	3.00 — 3.99	2447.68	—222.92	—86.15	—65.72	—51.17	0.47	
	4.00 — 4.99	2370.79	—198.05	—77.03	—79.64	—32.39	0.51	
	5.00 — 5.99	2359.43	—133.81	—126.45	—27.34	—45.73	0.37	
	6.00 — above	2531.06	—121.95	—130.97	—29.55	—41.45	0.38	
Protein	required amount		42.50	51.50	72.50	50.00		
	0 — 1.99	56.01	—4.61	—5.16	0.29	—0.02	0.27	
	2.00 — 2.99	67.86	—5.42	—4.84	—3.34	—1.82	0.36	
	3.00 — 3.99	76.42	—7.68	—2.56	—3.43	—1.83	0.51	
	4.00 — 4.99	82.45	—6.51	—4.06	—2.82	—2.99	0.55	
	5.00 — 5.99	67.71	—3.06	—3.93	—1.29	—0.52	0.35	
	6.00 — above	81.58	—4.08	—4.16	—1.57	—1.16	0.37	
Fats	required amount		12.50	35.00	97.50	40.00		
	0 — 1.99	16.22	—1.78	—1.79	—0.97	—0.67	0.11	
	2.00 — 2.99	25.54	—2.30	—3.67	—2.31	—0.92	0.22	
	3.00 — 3.99	27.18	—2.65	—2.39	—1.32	—0.72	0.18	
	4.00 — 4.99	49.36	—3.33	—4.69	—5.59	—3.26	0.42	
	5.00 — 5.99	56.99	—4.78	—3.74	—3.27	—4.43	0.52	
	6.00 — above	58.48	—5.58	—6.41	—1.55	—0.60	0.45	
Calcium	required amount		1.00	1.10	1.25	7.00		
	0 — 1.99	0.52	—0.07	—0.03	0.02	0.04	0.08	
	2.00 — 2.99	0.61	—0.06	—0.04	—0.06	0.001	0.09	
	3.00 — 3.99	0.54	—0.05	0.01	—0.06	0.02	0.13	
	4.00 — 4.99	0.66	—0.03	—0.05	—0.05	0.001	0.09	
	5.00 — 5.99	0.71	0.01	—0.10	—0.002	—0.04	0.29	
	6.00 — above	0.69	—0.02	—0.05	—0.01	—0.02	0.16	0.16
Iron	required amount		5.00	5.00	9.50	8.00		
	0 — 1.99	11.42	—1.34	—0.65	0.04	0.39	0.23	
	2.00 — 2.99	15.63	—1.35	—1.29	—0.67	—0.73	0.15	
	3.00 — 3.99	18.59	—2.22	—0.34	—1.43	—0.85	0.31	
	4.00 — 4.99	16.72	—1.36	—0.68	—1.12	—0.72	0.45	
	5.00 — 5.99	16.74	—0.83	—0.85	0.27	—0.91	0.17	
	6.00 — above.	17.72	—0.65	—1.55	0.41	—0.30	0.25	
Thiamine	required amount		0.50	0.90	1.25	1.50		
	0 — 1.99	1.12	—0.13	—0.12	—0.08	0.01	0.19	
	2.00 — 2.99	0.90	—0.04	—0.003	—0.04	0.02	003	
	3.00 — 3.99	1.00	—0.06	0.00005	0.04	—0.02	0.06	
	4.00 — 4.99	0.99	—0.05	—0.05	0.04	0.03	0.07	
	5.00 — 5.99	0.73	—0.05	0.02	0.12	0.03	0.09	
	6.00 — above	1.00	—0.05	—0.02	—0.004	0.005	0.10	
Riboflavin	required amount		1.00	1.50	1.80	1.25		
	0 — 1.99	0.54	—0.05	—0.06	0.01	0.005	0.17	
	2.00 — 2.99	0.87	—0.07	0.11	—0.05	—0.05	0.15	
	3.00 — 3.99	0.73	—0.06	—0.03	—0.04	—0.01	0.20	
	4.00 — 4.99	1.02	—0.06	—0.09	—0.06	—0.05	0.39	
	5.00 — 5.99	1.03	—0.05	—0.05	—0.03	—0.05	0.14	
	6.00 — above	1.11	—0.06	—0.11	—0.01	—0.03	0.43	
Niacin	required amount		5.00	9.00	12.50	15.00		
	0 — 1.99	21.02	—3.19	—2.07	—2.16	—0.75	0.43	
	2.00 — 2.99	22.43	—2.14	—0.70	—1.24	—1.23	0.26	
	3.00 — 3.99	25.54	—2.62	—0.95	—1.33	—0.95	0.34	
	4.00 — 4.99	24.36	—2.03	—1.13	—0.25	—0.20	0.29	
	5.00 — 5.99	19.64	—0.90	—0.96	0.49	0.10	0.16	
	6.00 — above	24.07	—1.31	—0.91	—0.36	—0.35	0.24	
Ascorbic	required amount		42.00	67.50	87.50	76.50		
	0 — 1.99	47.68	—0.84	2.22	16.45	5.54	0.07	
	2.00 — 2.99	39.88	30.47	—37.41	—13.98	18.54	0.03	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	