

Methods Used in Dietary Survey of Civilians in Ecuador

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Dietary studies constitute an essential part of any complete nutrition survey. Populations which for extensive periods subsist on dietary intakes marginal in protective nutrients may fail to reveal any recognized specific nutritional deficiency lesions, and, at the same time, have a relatively low life expectancy, lowered physical and mental health, increased disease rates, and other manifestations of ill health. Under such conditions, where clinical observations are insensitive for detecting basic nutritional problems, nutrient intake studies are essential.

Reliable information concerning food and nutrient intakes in civilian populations is generally more difficult to obtain during a short period of time than in institutional or military feeding situations. Since small family units rather than large mess units are involved, a much longer survey period is needed to obtain reliable data on a comparable number of people, if the same methods and procedures are employed. The fact that different members of the family (adults, children, infants, and pregnant or lactating women) have different nutrient requirements is still another difficulty.

It has been necessary in such studies, there-

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fore, either to obtain good information on a few individuals or to adopt less accurate procedures which give some information about a large number of people in a short period of time. Very little information exists concerning the relative reliability of these different approaches. Such comparisons were made during the Interdepartmental Committee on Nutrition for National Defense (ICNND) survey of the nutritional status of the armed forces and civilians in Ecuador during the summer of 1959 (1). Data on civilians were obtained by a relatively small number of team personnel, using three different dietary survey methods, each based on the family unit and designed to give nutrient intake data. Military messes were surveyed by two methods.

Methodology

Two dietary teams, each consisting of one American nutritionist, two trained Ecuadorian female encuestadoras (interviewers), and one Ecuadorian male interpreter, obtained food intake data for 341 families including 2,087 people by the 24-hour recall questionnaire method and for 28 of these families by the recipe and food composite analysis methods. This was part of a total ICNND survey involving clinical, biochemical, and dietary assessment of their nutritional status. The survey was accomplished during a 7-week period concurrently with or

between dietary surveys conducted in nine military installations. Eight major locations in Ecuador were involved, including 29 specific locations where the 24-hour recall questionnaire method was used and 12 specific locations where the recipe and food composite analysis methods were used.

The design of the study made possible a direct comparison of the three different methods involving the same 28 families (184 people) and a comparison of the results obtained by each of these methods for the 28 families with those obtained by the 24-hour recall questionnaire method for all 341 families.

All three methods used in obtaining food intake data were restricted to 1 day's food supply (three consecutive meals) for the family or household. The nutrient intake was calculated on the basis of the average daily intake for each individual. Information was collected concerning age, sex, and number of lactating or pregnant women, in order to characterize adequately each family unit or group of family units. Heights and weights of individuals also were determined for most of the families surveyed by the recipe and food composite analysis methods.

Each encuestadora was able to collect data for the recipe and the food composite analysis methods in two households for the same three-consecutive-meal period. The selection of families or households to be surveyed by the recipe and food composite analysis methods, as well as the 24-hour recall by questionnaire, was accomplished through the help of local public health officials. In each instance a typical section of a village or part of a city was located, and nearby homes were selected at random just as the three-meal survey was to start. Households containing fewer than four people were not studied. In Guayaquil and in Quito, only areas representative of the lower economic stratum were selected. The location, date, number of families, and number of persons surveyed are given in table 1.

Since the information was collected on a family basis and the families varied markedly as to number of adults, number and age of children, sex, and number of pregnant or lactating women, it was necessary to calculate the allowances for calories and other nutrients by groups of families based on their specific composition

and location. The procedure for calculation of the calorie requirement of this mixed population differed from that suggested by the Food and Agriculture Organization (2) in that the proportional difference in body size was considered to apply to all age groups over 1 year of age instead of only to those over 16 years of age.

Twenty-four-hour recall questionnaire method. A questionnaire was completed by the Ecuadorian encuestadoras during an interview with the mother or equivalent of each family or household studied. Many of these were completed during interviews with women who had been examined clinically by other members of the survey group. Some were obtained at special clinics for pregnant and lactating women. Others were completed in the homes selected for the more detailed dietary studies.

This questionnaire included a listing of the quantities of specific foods consumed by the entire family or household during the previous day (24-hour recall). In addition, it included a section concerning frequency of use of various food items by the family, and was designed to

Table 1. Location, date, number of families, and number of persons surveyed by three methods in 1-day food intake studies in Ecuador, 1959¹

Location	Date	Number of families	Number of persons
Esmeraldas			
Tabiazo.....	July 31	2	17
Santo Domingo....	Aug. 3	4	25
Ibarra			
Andrade Marin...	July 30	1	9
Chaltura.....	July 31	1	11
Ambato			
San Bartolome...	Aug. 7	2	15
Riobamba			
Guano.....	Aug. 10	2	17
Loja			
El Valle.....	Aug. 17	3	18
Cuenca			
Ricaurte.....	Aug. 12	2	8
Machala.....	Aug. 15	2	12
Guayaquil			
Jose Salcedo			
Delgado.....	Aug. 25	3	17
Santa Ana.....	Aug. 26	2	13
Quito.....	Sept. 2	4	22
Total.....		28	184

¹ Three methods used were recipe, food composite analysis, and 24-hour recall questionnaire.



Skin-thickness reading at Juan Montalvo School, Portoviejo, Ecuador, during nutrition survey

obtain specific information concerning family income, beliefs concerning foods, and practices of feeding babies and young children.

The food intake data, by families, were summarized by areas according to geographic location. Three of these were on the coast and five in the Sierra region of Ecuador, each summary contributing a minimum of 25-family survey questionnaires. The average amounts of each food item consumed per person per day were used to calculate the average intake of various nutrients per person per day, using tables of nutrient composition prepared by the National Institute of Nutrition of Ecuador (3). U.S. Department of Agriculture Handbook No. 8 (4) was used for data pertaining to foods not included in the local tables.

Recipe method. For this method the encuestadoras obtained the weights of the edible portion of each food consumed separately or used in the preparation of a particular recipe or dish. These were obtained after preparation waste, if any, was discarded but before the food was cooked. The weights of the prepared

foods were also determined after cooking, if the food was cooked. Although seldom encountered, any leftover foods not consumed also were weighed. From these data the average daily food and nutrient intake was calculated using the food composition tables mentioned above (3,4).

Food composite analysis method. Each prepared food item was weighed after cooking, if the food was cooked. Any food remaining after the meal also was weighed. From the weight of each prepared food consumed by each family, the average amount consumed per person was obtained. Samples of each prepared food, equivalent to approximately one-fifth to one-half of the amount consumed per person, were obtained at mealtime. From these samples, two food composites were prepared in which each food item was represented on the basis of the average amount actually consumed by each member of the household. One food composite sample was preserved with oxalic acid and the other with alcoholic potassium hydroxide.

Each food item was homogenized in a Waring

Dietary Questionnaire

CARD NO _____ DATE _____

FAMILY NAME _____

TOWN _____ PROVINCE _____

ETHNIC GROUP _____ RELIGION _____

FATHER'S OCCUPATION _____

NUMBER IN HOUSEHOLD:

Total _____ Adults _____ Children _____

Number males over 16 years _____ Ages _____

Number pregnant women _____ Ages _____

Number lactating women _____ Ages _____

Number other women (over 16 years) _____ Ages _____

Number children (under 16 years):

Babies under 1 year _____

Breast fed. Yes _____ No _____

Number other boys _____ Ages _____

Number other girls _____ Ages _____

5. Do you prepare your food on an open fire---- or stove----?
6. How long does it take to cook a meal? ----hours
7. Do you breast feed your babies? ----Yes ----No
8. If there is no mother's milk, what is the young baby fed?
9. At what age are your babies weaned? ----months
10. At what age are other foods given to the baby? ----months
11. What foods would a breast-fed baby receive at
 - 6 months of age?
 - 12 months of age?
12. What foods help produce more milk during nursing?
13. What foods should not be eaten during lactation?
14. What foods should be eaten during pregnancy?
15. What foods should not be eaten during pregnancy?
16. What foods, if any, are best during menstruation?
17. Do you give your children any special food? Yes---- No---- If yes, what kinds?
18. Are any of your children in school at any time during the year? Yes---- No---- If yes, do they receive milk at school? Yes---- No---- Any other foods?
19. At what age (year) do your children begin to drink coffee---- cocoa---- chocolate---- beer---- other----

QUESTIONS

1. What is the total cash income for the family per week?
2. How much is spent on food per week?
3. How many times per week do you buy food?
4. What are the main foods you buy?

<i>Food item</i>	<i>Amount purchased per week</i>	<i>Value</i>
_____	_____	_____
_____	_____	_____
_____	_____	_____

20. What foods did your family eat yesterday? (Day of week-----)

Meals	Menu items	Food items, kinds	Amounts, if known	P, H, F ¹	Comments
Breakfast-----	_____	_____	_____	_____	_____
Lunch-----	_____	_____	_____	_____	_____
Supper-----	_____	_____	_____	_____	_____
At other times-----	_____	_____	_____	_____	_____

¹ P=Purchased. H=Home-grown or gathered. F=Free gifts or supplements.

	<i>Breakfast</i>	<i>Dinner</i>	<i>Supper</i>
Number guests present-----	_____	_____	_____
Number family members absent-----	_____	_____	_____

blendor. One-tenth of the average amount consumed per person was weighed and combined into each composite sample for three consecutive meals. The three-meal food composites also were blended after the addition of either 5 percent oxalic acid or 50 ml. of alcoholic potassium hydroxide (1 percent KOH in 95 percent ethanol) plus 5 ml. of chloroform for each 200 ml. of food slurry. In some instances, food for two or three families was prepared into one 3-day composite. These composites were then shipped to the laboratory where the samples were held under refrigeration (or frozen) until actual nutrient analyses were performed. For some locations duplicate composites, each containing one-tenth of the average daily ration for one or more households, were submitted to two separate laboratories. One of these was the National Institute of Nutrition in Quito, Ecuador, and the other was the Wisconsin Alumni Research Foundation in Madison.

Results and Discussion

The data necessary to characterize the families involved in the 28 households studied in detail as well as all 341 families surveyed by questionnaire are given in tables 2 and 3. The data obtained by direct questioning of the housewife

revealed that the average size of the family was 6.4 persons on the coast and 6.1 persons in the Sierra. The average number of children per family was 3.6 on the coast and 3.1 in the Sierra. The average age of children under 16 years was 6.2 on the coast and 7.5 in the Sierra.

The average amount of money earned weekly per family was found to range from 86 to 212 sucres (approximately \$5.15 to \$12.70), with an average of 79.3 percent of this spent for food in the coastal area and 75.7 percent in the Sierra. This ranged only from an average of 67.5 to 81.4 percent for the eight different locations. Food was purchased an average of 6 times per week on the coast and 4.4 times per week in the Sierra. According to data from the questionnaire, 65.4 and 94.7 percent of the women with babies under 1 year of age were breast feeding them in the coastal and Sierra areas, respectively. Babies were weaned at an average age of 12.3 months on the coast and 13.7 months in the Sierra. Other foods were given to the baby at an average age of 7.8 months on the coast and 6.9 months in the Sierra. On the coast, 58.9 percent of the children of school age attended school; in the Sierra, 61.7 percent. Of these, only 1.3 percent on the coast and 21 percent in the Sierra region received milk at school.

The average age of men over 16 years in the

Table 2. Characteristics of participants in nutritional studies of Ecuadorian civilians by two survey methods, according to location, 1959

Location	Number of families	Number of persons		Average number of children per family	Percent of women pregnant	Percent of women lactating	Average age (years)		
		Total	Average per family				Children	Men	Women
<i>Questionnaire method</i> ¹									
Coast.....	111	714	6.4	3.6	8.5	2.7	6.2	32.8	29.1
Guayaquil.....	67	427	6.4	3.5	10.3	2.1	6.6	33.9	30.1
Esmeraldas.....	23	163	7.1	4.2	7.9	2.5	5.9	24.0	26.0
Machala-Salinas.....	21	124	5.9	3.1	3.2	4.8	5.4	31.0	26.4
Sierra.....	217	1,331	6.1	3.1	2.4	4.5	7.5	36.3	35.2
Cuenca.....	52	312	6.0	3.1	3.2	4.8	7.0	36.3	35.3
Tulcan.....	84	476	5.7	2.7	2.0	4.2	7.9	37.5	36.6
Ambato-Riobamba.....	24	195	8.1	4.1	2.6	4.1	7.8	31.5	32.3
Loja.....	32	198	6.2	3.3	3.0	5.6	7.3	36.9	33.7
Quito.....	25	150	6.0	3.3	1.3	4.0	7.6	36.7	34.1
<i>3-meal recipe method</i> ²									
Coast.....	9	56	7.0	3.2	9.0	.0	6.3	31.7	27.3
Sierra.....	19	118	6.2	2.9	5.0	2.0	7.5	36.6	30.7

¹ 341 families.

² 28 selected families.

28 families studied by means of 24-hour recall questionnaire method, recipe method, and food composite analysis method was 35 years. The corresponding age for women was 30 years. The average height for men and women studied was 62.9 and 60 inches, respectively. Males over 16 years of age averaged 133 pounds, women, 118 pounds. These are somewhat less than the weights of the reference man weighing 65 kilograms and the reference woman weighing 55 kilograms at 25 years, used by the FAO Second Committee on Calorie Requirements (2).

The energy requirements for the reference man and woman also assumed a mean annual ambient temperature of 10° C. In estimating the caloric requirements for Ecuadorians according to the method suggested by the FAO

committee, average weights of 60 kilograms for men and 50 kilograms for women were used. Mean temperatures of 20° C. for the Sierra and 30° C. for the coast were also used. Table 4 gives the calculated average per capita caloric requirement for the Sierra and coastal areas of Ecuador.

A comparison of the nutrient intake data obtained by the three different methods for the 28 families selected for multiple dietary studies with those obtained by the 24-hour recall questionnaire method for all 341 families surveyed is given in table 5. The first three columns present nutrient intake data for exactly the same families. The data for the recipe method and the food composite analysis method include the same day's food supply. The 24-hour recall

Table 3. Participants in nutritional studies of Ecuadorian civilians, percentage of total population, by age and location, 1959

Age group (years)	Questionnaire method ¹										Three-meal recipe method ²	
	Coast				Sierra						Coast	Sierra
	Guayaquil	Esmaldas	Machala-Salinas	Average	Cuenca	Tulcan	Ambato-Rio-bamba	Loja	Quito	Average		
<i>Children</i>												
All ages-----	54.3	58.3	52.3	54.9	53.2	46.8	50.7	54.6	54.6	51.0	57.0	50.0
0-1-----	3.7	3.1	4.0	3.6	3.8	4.4	4.1	5.6	3.3	4.3	.0	3.0
1-3-----	12.2	17.2	16.1	14.0	10.6	6.5	8.7	9.1	8.0	8.3	18.0	11.0
4-6-----	12.4	16.0	16.1	13.9	10.6	7.8	9.7	11.6	13.3	9.9	14.0	10.0
7-9-----	11.7	6.7	5.6	9.5	11.9	8.4	7.2	10.6	10.7	9.6	11.0	8.0
10-12-----	8.0	11.0	7.3	8.5	9.6	10.7	9.7	8.6	10.0	9.9	11.0	8.0
13-15-----	6.3	4.3	3.2	5.3	6.7	9.0	11.3	9.1	9.3	8.9	4.0	9.0
<i>Men</i>												
All ages-----	20.6	17.2	22.6	20.2	22.1	26.7	23.1	18.2	19.3	23.0	23.0	20.0
16-19-----	4.5	2.9	2.5	2.4	3.5	4.8	6.0	3.5	2.7	4.1	1.8	2.8
20-29-----	7.6	11.5	7.5	6.9	6.0	5.9	6.7	3.1	4.6	5.3	9.7	8.2
30-39-----	5.2	1.9	8.8	5.7	4.2	4.5	3.7	2.5	5.4	4.1	7.6	2.8
40-49-----	1.4	1.0	3.8	3.4	3.3	4.8	3.7	5.6	1.4	3.9	1.8	1.0
50-59-----	1.2	.0	.0	.8	3.3	3.2	1.8	2.0	4.1	3.0	.0	1.8
60 and over-----	.4	.0	.0	.8	1.5	3.7	1.0	1.5	1.2	2.3	1.8	3.0
<i>Women</i>												
All ages-----	25.0	24.5	24.9	24.9	24.7	26.6	26.2	27.3	26.0	26.1	20.0	30.0
16-19-----	2.5	9.8	4.5	5.2	3.7	4.5	4.5	3.3	5.5	4.4	3.6	8.4
20-29-----	8.5	9.8	13.7	11.0	6.9	6.7	9.4	9.6	4.7	7.0	11.0	9.3
30-39-----	6.8	.0	6.7	5.7	5.7	4.5	3.7	8.5	4.7	5.0	1.8	4.8
40-49-----	4.3	4.9	.0	1.5	3.7	4.5	6.3	4.1	7.3	4.7	3.6	3.9
50-59-----	1.5	.0	.0	1.2	2.7	3.5	1.3	.0	2.6	2.6	.0	1.8
60 and over-----	1.3	.0	.0	.5	2.0	2.7	1.3	2.2	1.3	2.3	.0	1.8

¹ 341 families.

² 28 selected families.

questionnaire method for these 28 families yielded data for the food supply of the previous 24-hour period. The food composite analysis method, of course, involved cooking losses, whereas no cooking losses have been considered in calculating the data by the other two methods.

In general, the agreement is quite good. Considering calories alone, the food composite analysis method yielded 9 percent more and the 24-hour recall method 8 percent less calories per person per day than the recipe method. The relatively very close agreement between the three methods is considered sufficient to validate completely the usefulness of the data collected by means of the 24-hour recall questionnaire procedure.

The fact that both the recipe method and the food composite analysis method yielded slightly higher caloric intakes than the 24-hour recall suggests that the food consumed in the home during the three-meal survey was slightly greater than that which might normally have been consumed. This might be expected in homes surveyed for a 1-day period only. Nevertheless, relatively good agreement in most of the data makes this rather unimportant in interpretation.

The average daily caloric intake as given in

table 5 for all 341 families was 1,967 calories per person as compared with 1,639 calories per person, or 17 percent less, for the 28 selected families as measured by the 24-hour recall method. Since the survey method is the same, the data suggest that the 28 families selected for more detailed studies were slightly below the average economic level of the total 341 family sample. This was expected since the 28 families were selected as either typical or below typical families of the general economic level of the community. In the two major cities, Quito and Guayaquil, the selected families were considered typical of a lower economic stratum of the city.

It should be pointed out, perhaps, that, even in the nine military messes in which the survey period averaged 2 days and larger food samples could be taken for the preparation of composite food samples, there was as much or more difference between the nutrient intake data based on the results of the two laboratories performing the analyses as there was between the recipe method and the food composite analysis method. This difference was primarily noted with respect to the values for fat, carbohydrate, calories, and riboflavin. This is emphasized to prevent the assumption that the data derived from the food composite analysis method necessarily are the most nearly correct (1).

Table 4. Calculated average daily caloric intake of Ecuadorian civilians in two major areas, by age group and sex, 1959

Age group (years)	Calculated caloric requirements (FAO) ¹			Calculated average per capita daily caloric intake					
				Sierra (20° C.)			Coast (30° C.)		
	Male	Both	Female	Male	Both	Female	Male	Both	Female
0-1		1, 120			1, 120			1, 126	
1-3		1, 300			1, 185			1, 097	
4-6		1, 700			1, 515			1, 435	
7-9		2, 100			1, 871			1, 773	
10-12	2, 500	² 2, 450	2, 400		2, 183			2, 068	
13-15	3, 100	² 2, 850	2, 600		2, 539			2, 406	
16-19	3, 600		2, 400	3, 226		2, 128	3, 056		2, 016
20-29	3, 200		2, 300	2, 867		2, 039	2, 717		1, 932
30-39	3, 104		2, 231	2, 781		1, 978	2, 635		1, 874
40-49	3, 008		2, 162	2, 695		1, 917	2, 554		1, 816
50-59	2, 768		1, 990	2, 480		1, 764	2, 350		1, 672
60 and over	2, 528		1, 817	2, 265		1, 611	2, 146		1, 526

¹ Based on FAO method of calculating energy requirements as reported in "Calorie Requirements," Rome, 1957.

² Average for males and females used, as sex data were not obtained on the 10- to 15-year-old groups.

NOTE: Adult weight: male, 60 kg; female, 50 kg.

In order to test further the reliability of the 24-hour recall questionnaire data, the calculated average daily caloric intake per person for the eight areas, together with the calculated FAO caloric requirements obtained for each of these specific populations, are shown in table 6. The caloric requirements were determined on the basis of the values shown in table 4 for the specific population samples as characterized in tables 2 and 3.

The agreement between the intakes determined by the 24-hour recall questionnaire method and the respective calculated caloric requirements was excellent for all but one location, averaging 99 percent of the requirement calculated for the entire population sample. Comparison of data obtained by the three methods also is made in tables 7 and 8 for the civilian samples in the coastal and Sierra regions of Ecuador, respectively. Since minimum require-

Table 5. Average daily nutrient intake data for Ecuadorian civilians, obtained by three methods, 1959

Nutrient ¹	Recipe method (3 meals)	Food composite analysis method (3 meals)	Questionnaire, 24-hour recall	Questionnaire, 24-hour recall
Calories.....	1, 776	1, 937	1, 639	1, 967
Protein, total (gm.).....	58. 3	66. 6	59. 1	57. 9
Protein, animal (gm.).....	23. 2	-----	22. 7	16. 5
Fat (gm.).....	33. 5	41. 1	29. 8	38. 1
Carbohydrate (gm.) ²	322	315	309	376
Calcium (gm.).....	0. 40	0. 61	0. 33	0. 38
Phosphorus (gm.).....	1. 09	-----	1. 01	1. 09
Iron (mg.).....	15. 5	27. 2	19. 7	19. 3
Carotene (mg.).....	1. 38	1. 61	1. 92	2. 25
Vitamin A activity (I.U.).....	2, 666	3, 068	3, 500	4, 358
Thiamine (mg.).....	0. 85	0. 62	0. 81	0. 99
Riboflavin (mg.).....	0. 79	1. 25	0. 68	0. 77
Niacin (mg.).....	20. 1	17. 9	20. 7	18. 3
Vitamin C (mg.).....	79	51	64	107

¹ Cooking losses considered only in food composite analysis method.

² Nitrogen-free extract only.

NOTE: Columns 1, 2, and 3 present data on 28 families including 84 persons; column 4 covers 341 families including 2,079 persons.

Table 6. Calculated average daily caloric intake of Ecuadorian civilians in eight areas, obtained by 24-hour recall questionnaire, 1959

Location	Number of persons	Calculated caloric re- quirements (FAO) ¹	Caloric intake shown by 24-hour recall	Relative per- cent of calculated requirement
Coast.....	714	² 1, 878	1, 791	95
Guayaquil.....	427	1, 896	1, 909	101
Esmeraldas-Santo Domingo.....	163	1, 855	1, 334	72
Machala-Salinas.....	124	1, 870	1, 990	106
Sierra.....	1, 331	² 2, 057	2, 068	101
Tulcan-Ibarra.....	476	2, 118	2, 123	100
Quito.....	150	2, 036	1, 756	86
Ambato-Riobamba.....	195	2, 110	2, 295	104
Cuenca.....	312	1, 920	1, 991	104
Loja.....	198	1, 963	2, 102	107
Total, Ecuador.....	2, 045	² 1, 995	1, 971	99

¹ Based on FAO method of calculating energy requirements as reported in "Calorie Requirements," Rome, 1957.

² The families selected for detailed dietary studies yielded a calculated caloric allowance of 1,905 and 2,010 for the 13 families in the coastal area and 15 families in the Sierra, respectively, with an average of 1,976 for the total 28 family samples.

ment data are not available, these tables also show the calculated nutrient allowances based on the National Research Council recommended allowances for each population and considering the percent of each age and sex category. Energy and protein requirements were calculated as described. The actual intakes as determined by the three different methods are expressed as a percentage of these calculated allowances. The agreement among the three methods is considered highly satisfactory. Not only do these

methods agree well with each other but the nutrient levels also agree quite well, when considered area by area, with those obtained in a previous dietary study reported by Thomason and associates (5).

In Guayaquil, a 7-day survey of 25 families was conducted by the National Institute of Nutrition of Ecuador in June 1959 using the recipe method. The average amount of each of approximately 50 different food items consumed daily per person during this study was ascer-

Table 7. Average daily nutrient intake of Ecuadorian civilians in the coastal area, obtained by three methods, 1959

Nutrient	Calculated standards based on NRC allowances (116 families)	24-hour recall questionnaire (116 families)		3-meal recipe method (13 families)		Food composite analysis method, 3 meals (13 families)	
		Amount	Percent of calculated allowance	Amount	Percent of calculated allowance	Amount	Percent of calculated allowance
Calories ¹ -----	1, 878	1, 791	95	1, 769	94	1, 940	103
Protein (gm.) ² -----	53. 3	58. 2	109	57. 2	107	63. 3	119
Calcium (gm.)-----	1. 04	0. 32	31	0. 32	31	0. 6	58
Iron (mg.)-----	11. 0	14. 0	127	14. 1	128	21. 0	191
Vitamin A activity (I.U.)-----	4, 042	4, 554	113	3, 524	87	2, 614	65
Thiamine (mg.)-----	1. 13	0. 68	60	0. 68	60	0. 39	35
Riboflavin (mg.)-----	1. 57	0. 69	44	0. 65	42	0. 73	47
Niacin (mg.)-----	14. 0	11. 5	82	19. 4	139	15. 1	108
Vitamin C (mg.)-----	62. 0	97. 0	154	86. 0	138	47. 0	76

¹ Based on values shown in table 4.

² 86 percent of NRC allowances used, due to weight differences.

Table 8. Average daily nutrient intake of Ecuadorian civilians in the Sierra area, obtained by three methods, 1959

Nutrient	Calculated standards based on NRC allowances (213 families)	24-hour recall questionnaire (213 families)		3-meal recipe method (15 families)		Food composite analysis method, 3-meals (15 families)	
		Amount	Percent of calculated allowance	Amount	Percent of calculated allowance	Amount	Percent of calculated allowance
Calories ¹ -----	2, 057	2, 068	101	1, 783	87	1, 935	94
Protein (gm.) ² -----	55. 0	57. 8	105	59. 3	108	69. 2	126
Calcium (gm.)-----	1. 04	0. 49	47	0. 47	45	0. 61	59
Iron (mg.)-----	11. 0	22. 3	203	17. 1	155	32. 5	296
Vitamin A activity (I.U.)-----	4, 287	4, 245	99	1, 453	34	3, 450	80
Thiamine (mg.)-----	1. 18	1. 17	99	1. 0	85	0. 82	70
Riboflavin (mg.)-----	1. 64	0. 81	49	0. 91	55	1. 68	102
Niacin (mg.)-----	16. 0	22. 2	139	20. 8	130	20. 3	127
Vitamin C (mg.)-----	71. 0	112. 0	158	77. 0	108	54. 0	76

¹ Based on values shown in table 4.

² 86 percent of NRC allowances used, due to weight differences.

Table 9. Average daily nutrient intake per person for 25 families in Guayaquil, Ecuador, obtained by two methods in a survey conducted by the National Institute of Nutrition of Ecuador, June 1959

Nutrient	7-day recipe method	Food composite analysis method ¹	
		Laboratory A	Laboratory B
Calories-----	2,360	2,361	2,299
Protein (gm.)-----	79.2	74.4	66.5
Fat (gm.)-----	49.7	66.2	42.8
Carbohydrate (gm.)-----	398	367	412
Calcium (gm.)-----	0.50	0.34	0.42
Iron (mg.)-----	22.0	23.2	16.2
Vitamin A activity (I.U.)-----	5,143	2,070	-----
Thiamine (mg.)-----	1.17	0.94	0.96
Riboflavin (mg.)-----	0.92	1.31	0.59
Niacin (mg.)-----	23.2	21.7	-----
Vitamin C (mg.)-----	95	37	-----

¹ Food items obtained in the local market and composited without further preparation. Quantity of foods based on the 7-day recipe method.

Table 10. Intake data on certain nutrients (average per person per day) obtained by the food composite analysis method, Ecuador, 1959

Nutrient	9 military messes	16 Sierra families	12 coast families	25 Guayaquil families
Iodine (mcg.)-----	190	230	180	100
Lysine (gm.)-----	3.1	4.1	3.2	4.3
Methionine (gm.)-----	1.4	1.2	0.8	1.1
Tryptophan (gm.)-----	0.7	0.6	0.5	0.6
Vitamin B ₁₂ (mcg.)-----	2.3	1.6	1.1	2.5
Biotin (mcg.)-----	63	42	27	46
Folacin (mcg.)-----	74	77	82	119
Pyridoxine (mg.)-----	2.0	1.4	1.1	1.3
Pantothenic acid (mg.)-----	1.1	1.0	0.6	1.5

tained locally, and food composites were prepared for analysis. Table 9 shows the data obtained from the analyses of these composites at two laboratories (identified as A and B), as well as those obtained in the original recipe method study. Again the agreement is quite good. One particular advantage of the food composite analysis method is that it provides a means of obtaining intake data concerning

certain nutrients for which satisfactory tabular data are unavailable for most food items. This would include certain highly variable minerals and certain vitamins.

Table 10 includes average daily intake information obtained in the Ecuador survey concerning military and civilian dietaries with regard to the average daily intakes of iodine, lysine, methionine and tryptophan, vitamin B₁₂, biotin, folacin, pyridoxine, and pantothenic acid. Although complete information concerning requirements is not available for some of these, it does not lessen the possibility that certain of them might be marginal.

Summary

Three different methods of collecting dietary intake data among the civilian population of Ecuador have been compared. These are the recipe method, the food composite analysis method, and the 24-hour recall questionnaire method. In general, very good agreement was obtained between the three methods when the same 28 families were studied. The close agreement between the data obtained by these methods made reliable a larger body of data obtained from 341 families by the 24-hour recall questionnaire method alone. The results of this survey indicate that considerable information of a highly reliable nature can be obtained in a relatively short period of time with a minimum of skilled personnel.

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