

Dietary Studies for Assessment of the Nutritional Status of Populations in Nonmodernized Societies

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BECAUSE accurate quantitative studies of the food consumption of populations are complex and time-consuming, some people underestimate the need for this type of study in the evaluation of the nutritional status of population groups. Superficial or rough estimates of the food intake of people are unreliable for such evaluations and often lead to wrong interpretations.

Several methods have been devised to obtain accurate data, and Bigwood¹ and Leitch² have published the well known classic articles about both the methodology of nutritional surveys and the problems involved in making such studies. Emphasis is placed on family dietary studies in these papers, since studies of individuals are not regarded as good instruments for assessing nutritional status unless they are combined with family studies. To arrive at correct estimates on an individual basis is more difficult and requires a great deal of skill and experience. The works of Young and co-workers³ and Becker et al.⁴ offer us a great amount of information on the methodology of individual dietary studies. These authors concluded that the effectiveness and accuracy of various methods depend greatly on the type of population involved.

The technics of individual surveys are obviously impractical for undeveloped areas. Working in less modern societies in which illiteracy and poverty are general characteristics of most of the groups, the classic inventory and recall methods are inappropriate, and the skill of the field worker becomes more important than the subjects.

It is not easy to select a method to obtain accurate data from people who have never been subjected to social investigation, but who, on the contrary, have learned from previous experiences to avoid outside visitors. A research nutritionist working in technically undeveloped countries is unable to estimate food consumption merely from a description, because standardized measurements do not exist; they differ from place to place. In some instances, it is difficult to obtain any measurements because the weighing of food is believed to bring bad luck. Recipes and methods of food preparation among all groups in Latin American countries have their origin in the cooking technology of Spain and France, but in many cases they are modified by native customs and so there is a great diversity of dishes even though all use the same basic foods.

FAMILY DIETARY SURVEY

In some highly developed countries, such as the United States and England, family studies were carried out some years ago on a nationwide basis to establish the consumption levels of the people. Record and recall methods were used principally, and forms giving specific instructions on how to record the food intake were distributed among the families. An effort was made to have a nutritionist visit the fam-

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ilies in the survey once or twice to assure that the explanations given were fully understood.

Studying some of the forms used in these surveys, one concludes that the validity of the data is questionable. Although many housewives are willing to accept the additional task of keeping special records, most of them do not have the time to keep a detailed budget and to record the intake for all the family. In addition, the study has no interest for her because she, unlike the investigator, does not understand its purpose. Leitch,⁵ reporting her experience with English workers in Britain's National Food Survey, says that "there is a residue of housewives who are incapable of keeping accurate records even with help and supervision." Consequently, there are many difficulties in interpreting the results of such studies.

According to Mann⁶ in England food weighing was considered to be the most accurate method to assess nutritional status; therefore, it is the one most commonly used. This method has also been used for smaller groups in the United States,⁷ primarily for the purpose of obtaining data on the amount of edible food discarded by a household.

A few studies have been made in which daily food consumption was recorded by the field worker in order to assure accuracy, but such studies have been limited because of the high costs involved. When the nutritionists themselves keep the daily records, the questionnaire method for collecting dietary information can be used. However, this method is unreliable in the hands of the unskilled and as Cooper has indicated, "it may be the medium of collecting a vast amount of useless, meaningless, and often definitely misleading information." A skilled person can obtain valuable data in one home visit and an idea about the living conditions and food consumption of the family. At this point it is important to emphasize that there is no substitute for personal contact with the housewife in obtaining reliable information. In most cases the housewife will accept the visit as a pleasant hour with someone who is interested in her problems. Nevertheless, various psychological reactions on the part

of the housewife may result in misleading information.⁸

The literature suggests that a week is the minimum length of time required to secure a reliable study of family food consumption.⁹⁻¹¹ A longer period is certainly desirable in some areas, but this is seldom acceptable either to the families or to the field worker because of the hardships and amount of labor involved. In our experience the family diet appeared to retain its main nutritional characteristics in two widely separated investigations as we show later by giving some recent results.

The ideal dietary survey method is one in which the nutritionist keeps a daily record of food consumption of the entire family and of each member. The time expended with each family is necessarily quite long, and the mother's collaboration is limited by the interference of her home duties.

In both purely quantitative studies and those correlating dietary data to biochemical and clinical data, it may not be possible to obtain large samples. Small samples make it possible to do the field work much more carefully permitting the employment of better trained and more skilled workers since only two or three are needed. There is really no point in using large samples if small ones will supply the same data as illustrated by Bransby in his studies on milk consumption.¹² He strongly believes that more precise and detailed data can be obtained from small samples than is ordinarily possible from large samples. Yates, discussing the size of samples, indicated that "in the past there has been an entirely unreasonable trust in large samples and distrust of small ones, and it is gratifying to find that this belief is shaken. Problems too complex for investigation in large samples can be successfully tackled when small samples are used."¹²

Data gathered in these areas have proved that the major errors come from material collected in the field rather than from the size and selection of the sample. Some of these errors are caused by psychological problems (such as apprehensiveness and pride of the subject). There are also accidental errors caused by the forgetfulness or carelessness of the field worker.

DESCRIPTION OF THE RECOMMENDED METHOD

Before describing the dietary survey method recommended for Latin America by FAO and INCAP, it is important to point out that this modified method was developed by Miss Emma Reh,* FAO nutritionist who has worked with the personnel of INCAP. It takes into account the limitations of all dietary surveys: lack of trained personnel, money and time, and the type of populations involved.

Using a small sample of the population, a dietary survey is carried out on a family basis in the area selected for a nutritional study. To obtain the sample, a census is made with two purposes in mind: (1) to compile a list of the families in the community, and (2) to secure a general idea of the characteristics of the population. In this census not only are the names, ages and occupations of the family heads recorded, but also the main traits of the people and their living conditions. Such general information makes possible a stratified sampling on the basis of occupation, family structure, type of house, ethnic differences and other criteria.

Using a small population sample, taken at random, minimizes the problem of refusals to cooperate because it is possible to establish relationships with these families which make them willing to cooperate. This is confirmed by Woolf,¹³ who states "there is no point in having very big samples with a high proportion of refusals to cooperate."

In order to determine the size of the sample, it is necessary to obtain information about the variability in nutrient intake in the area. If some dietary data already exist, the standard deviation can be calculated to establish the number of cases that should be included in the sample.

For seven consecutive days food data are collected during daily visits to the family. The aim is to secure the most realistic picture of the usual food intake; the less the housewife is disturbed the more typical will be the diet. A simple explanation of the purpose of the study is given to the housekeeper, pref-

erably when the head of the family is present. Without exception, the success of the interview depends upon the personality and sensibility of the field worker. She must be able to understand, or at least to recognize, the psychological problems of the woman she is interviewing. She must know how to ask questions in a quiet, reassuring manner so that the person being questioned will react and respond adequately whether she is literate or illiterate.

Simple forms are used for recording the required information. The first page allows a sufficient number of columns to record all the family members: their name, sex, age, height, weight, physical activity, occupation, and an outline of the family relationships. Some additional socioeconomic information is obtained on other simple forms based on some already known specific characteristics of the area. The forms for recording the daily food intake are plain pages divided into three or four transverse spaces with the names of the meals as headings. This allows enough space to write all food details given by the housekeeper during the week.

No food is mentioned by the interviewer, the housekeeper being required to remember all the food she has prepared for the two previous meals. First the total amounts of ingredients are recorded as well as a description of the food, the sources (production, purchase or collection), the places where they were secured (stores, markets or fields), the prices paid and the methods of cooking each dish. Next, every item of food that is to be prepared for the following meal is weighed on manual scales in the raw or cooked form. Because the portion of food considered edible varies tremendously even within single communities, the investigator must record exactly what is used. For example, in the same town, one family eats the beet and leaves; another eats the beet and part of the top; while a third family discards the tops and eats only the root. Questions are asked about outside meals, foods consumed between meals, food given to the animals, the number of persons and the visitors who have shared each meal.

To summarize the data, all foods are con-

* FAO will soon publish a manual of Dietary Surveys in which this method is described in more detail.

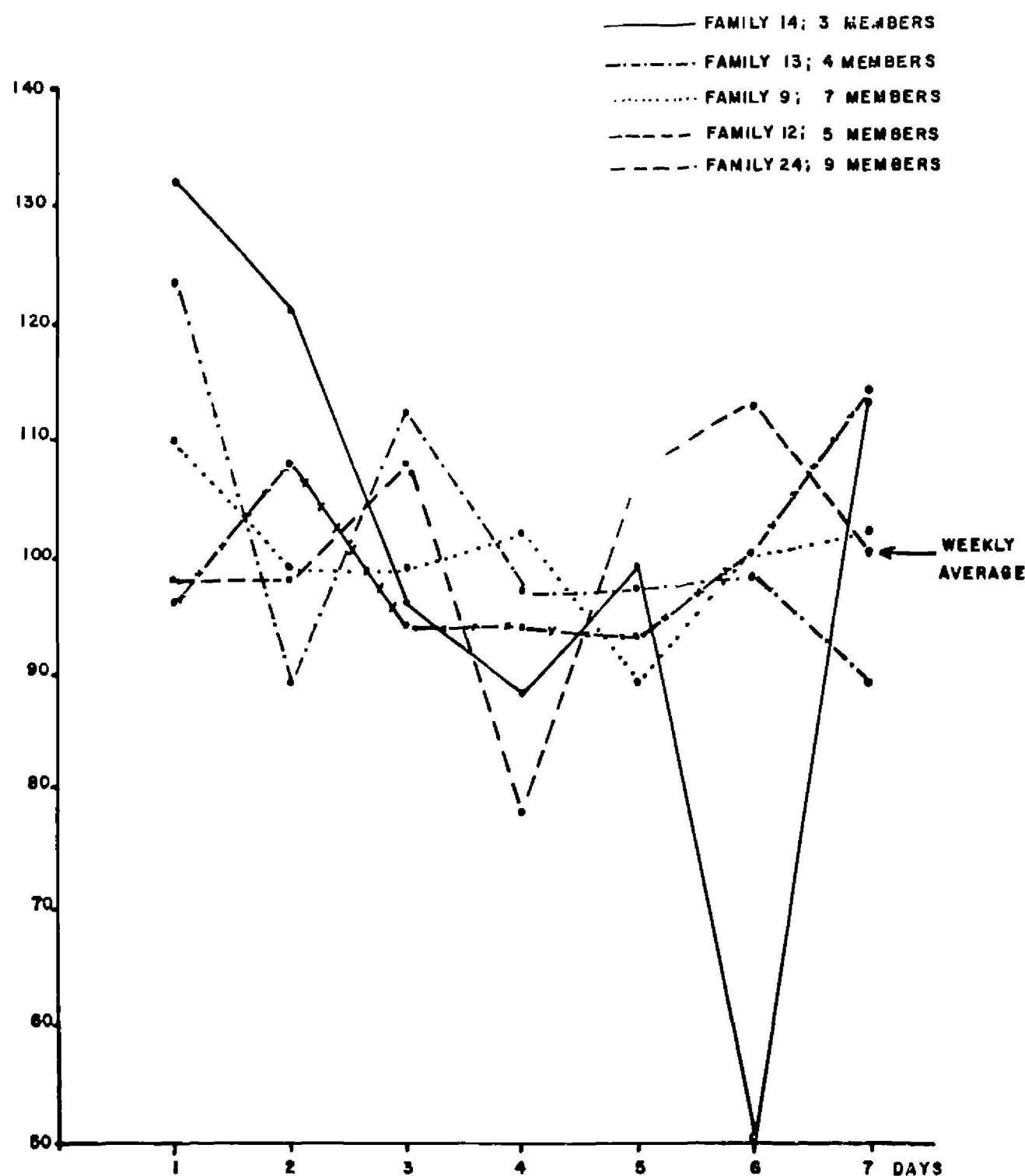


FIG. 1. Daily variations of calorie intake.

verted into edible portions and the day by day amounts are totaled to determine the entire amount of food used by the family during the survey period. Using local food tables or international ones when no local values are available, the nutritive value of the diets is calculated on the basis of the calories and all nutrients.

The physiological needs of each individual in the family are estimated using tables of requirements and recommendations adopted for the area. The adequacy or inadequacy of the food consumption of each family is determined by comparing their physiological needs with the availability of calories and nutrients.

Family results are averaged to find the intake per person per day. The criticism that family

surveys are of limited value because they do not provide information about individual distribution of food within the family is justified, but these surveys are not designed for this purpose. Family surveys carried out in the described form represent a unique opportunity to obtain basic data on actual intake of a population group including cost of diets, food sources and the potentialities for improving consumption. Visiting and observing the daily cooking activities of the family produces priceless data.

INDIVIDUAL DIETARY STUDIES

As already suggested, the most comprehensive information can be obtained when individual surveys are carried out in con-

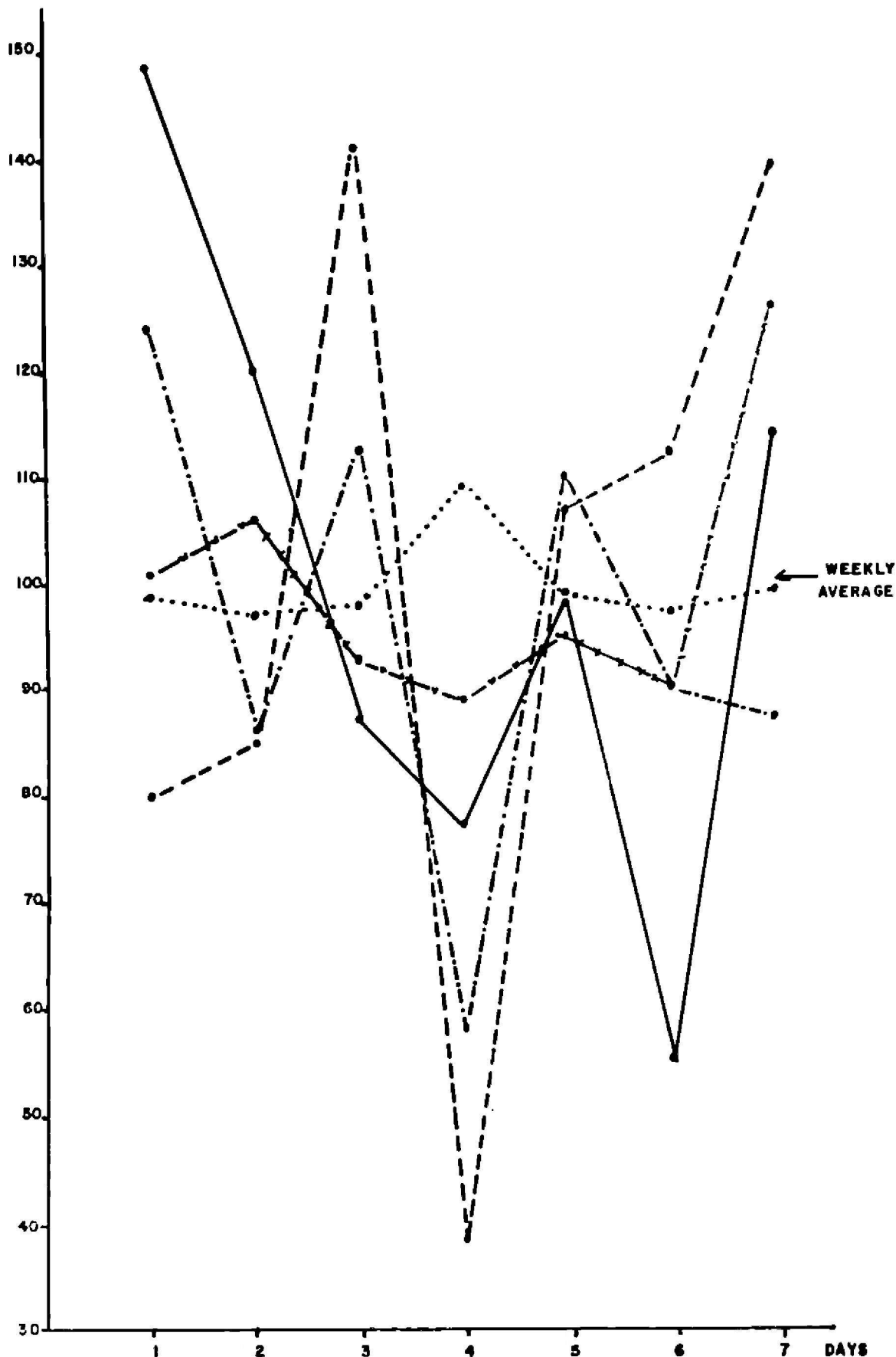


FIG. 2. Daily variations of total protein intake.

junction with family surveys. In working with preschool children, for example, the only possible way to estimate accurately the portions of a dish consumed by the child is to secure this information while making the family survey.

For the majority of individual studies in England, the food weighing method, which requires the subject to supply the exact amount of each food consumed during a period of seven days, is used. Since the food is weighed

in the homes, the possibility of obtaining accurate measurements is greater. However, when meals are eaten outside the home the information obtained is less reliable since the people in charge of the food preparation are not involved in the study. This weighing method is more scientific than the recall procedure, which usually does not give a reliable estimate of food quantities.^{14,15} In our experience, most of the errors which occurred when using the

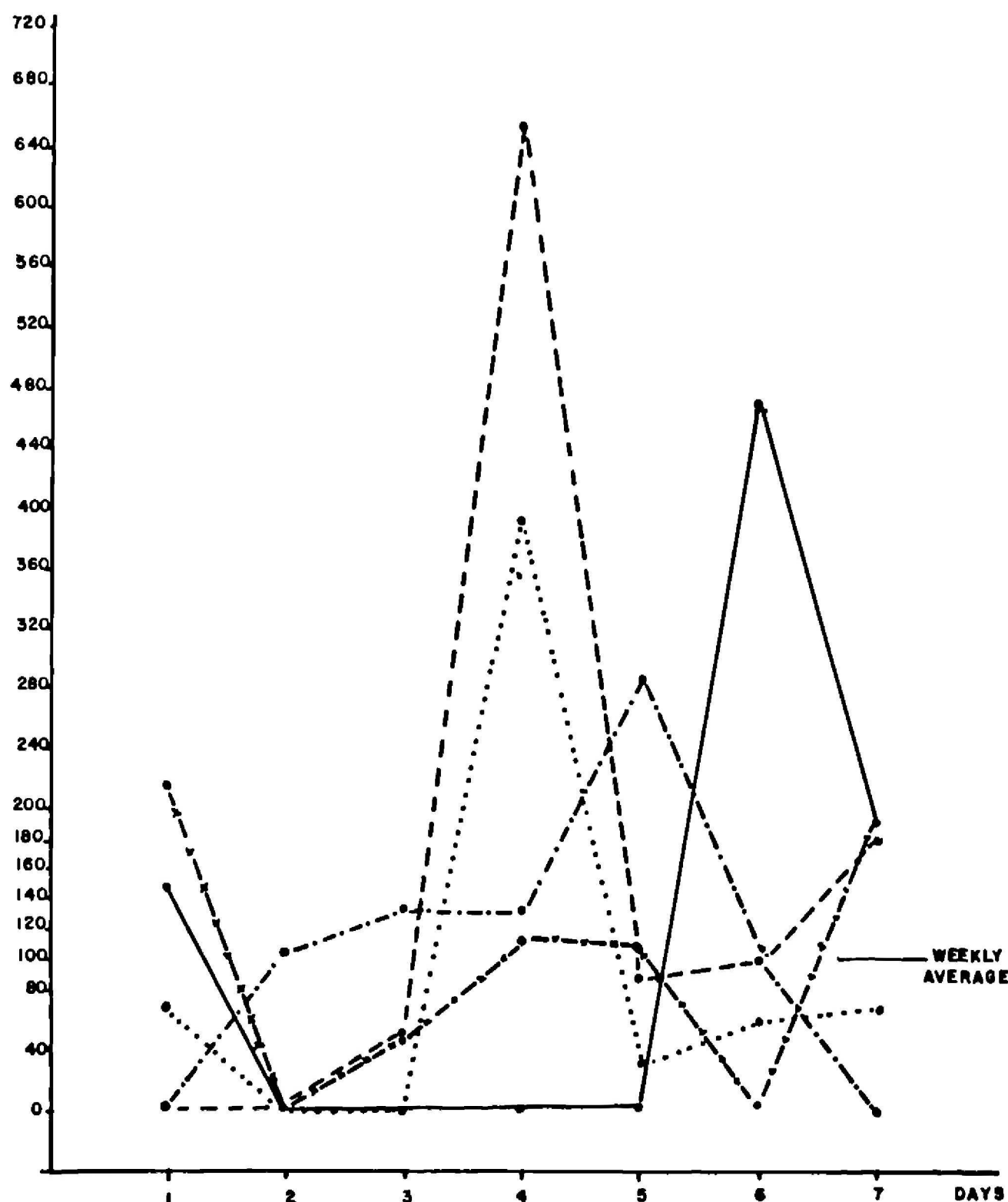


FIG. 3. Daily variations of per cent animal protein intake (relative figures).

recall method arose from defects of memory or from lack of precision because ordinary household measures are not reliable.

In some areas of Latin America two different procedures, both providing family studies at the same time, have been used to measure the intake of the preschool child. The first procedure is more accurate because every item of food consumed by the child during the day is measured by the nutritionist. To do this it is necessary to spend most of the day with the mother because there is no fixed meal schedule for these children. The investigator has plenty of time, however, to observe meal preparation and is even able to weigh all the family food. The number of

cases that can be studied in this way is very small, because one person can visit only one or two families each day. It is obvious, too, that family life is disrupted by having a visitor all day long. If the nutritionist visits the home for such long periods of time during seven days, the mother will surely alter her menu and the true picture of food intake will be lost. We have been able to carry out this type of study with some families without interfering too much with the mother's household duties, but we have noticed changes in the child's behavior.

The second procedure for determining the intake of the individual child consists of securing information from the mother about what the child has eaten. The worker visits

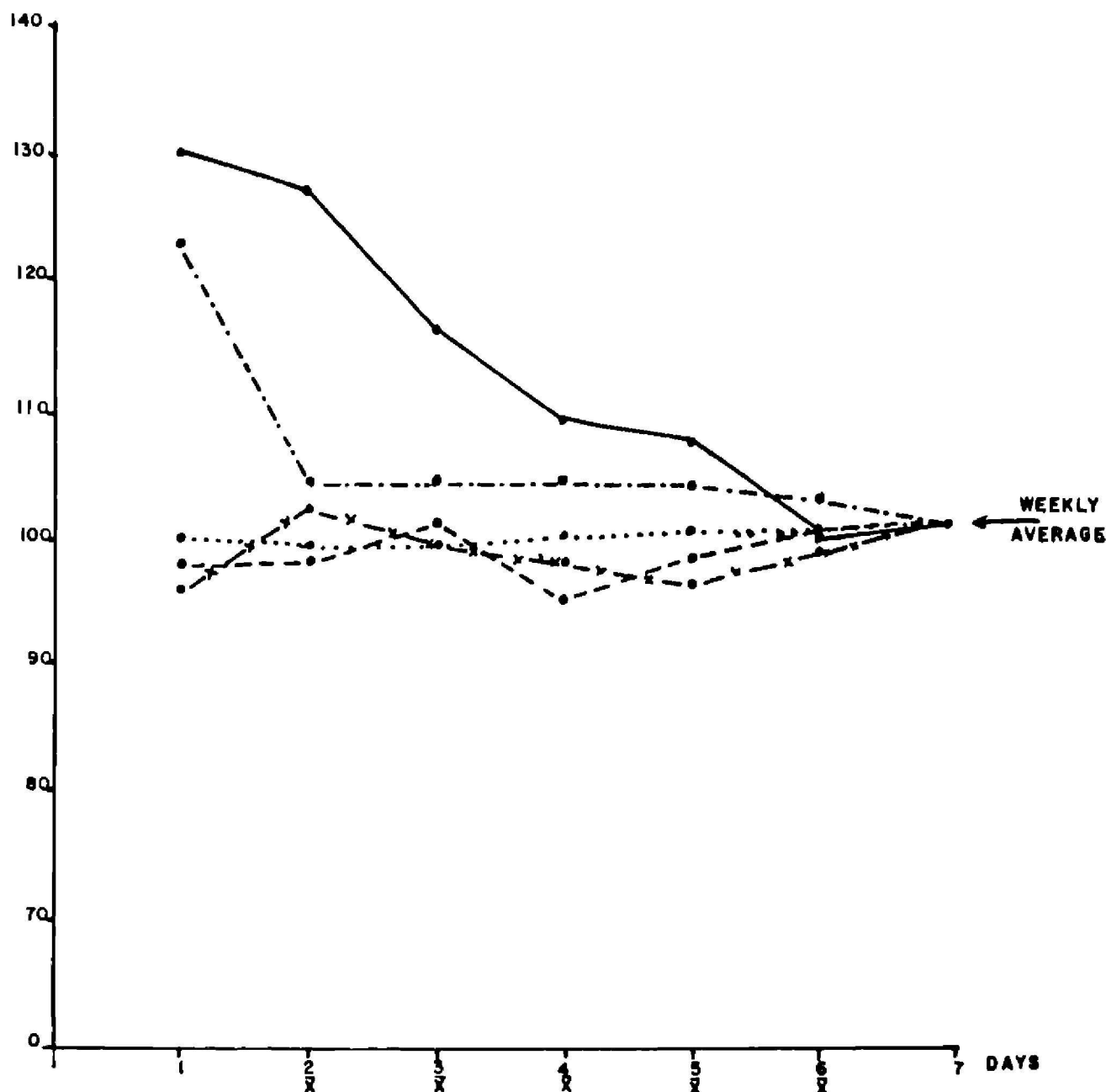


FIG. 4. Rate of convergence of the cumulative days (calories per capita per day).

the home twice a day for this purpose. First the food intake for the entire family is recorded; later the mother is asked to show the approximate amounts of foods she served to the child, using the child's plates, spoons and cups. This technic sometimes results in an underestimate because the mother can easily forget about the foods eaten by the child between meals. The advantage of this procedure over the first is that the child is not aware of being observed. In addition, it enables the field worker to study more families during the same day.

Transcribing the data on the child's food intake to the dietary analysis sheet requires additional work because the weight of cooked food must be converted into the amounts of raw edible portions served. The similarity of individual calculations in school age children to those obtained from family units has been

surprising. In preschool children, estimation of food intake by consumption units offers entirely different data, as proved by our studies. There is no relation between the availability of food within the family and the small child's intake, which is drastically reduced in most cases.¹⁶

The shortest period for these individual studies should be a week,^{17,18} if the objective is to find the average individual intake, since daily intake varies considerably. If the purpose is to obtain the average intake of a group, the number of days can be reduced depending upon the variability of the family's nutrient intake. Unfortunately, people working in Public Health Services have a tendency to believe only in large numbers; and when they plan dietary research studies, they ask for the most impractical procedures. They prefer a shorter period and a larger number of families,

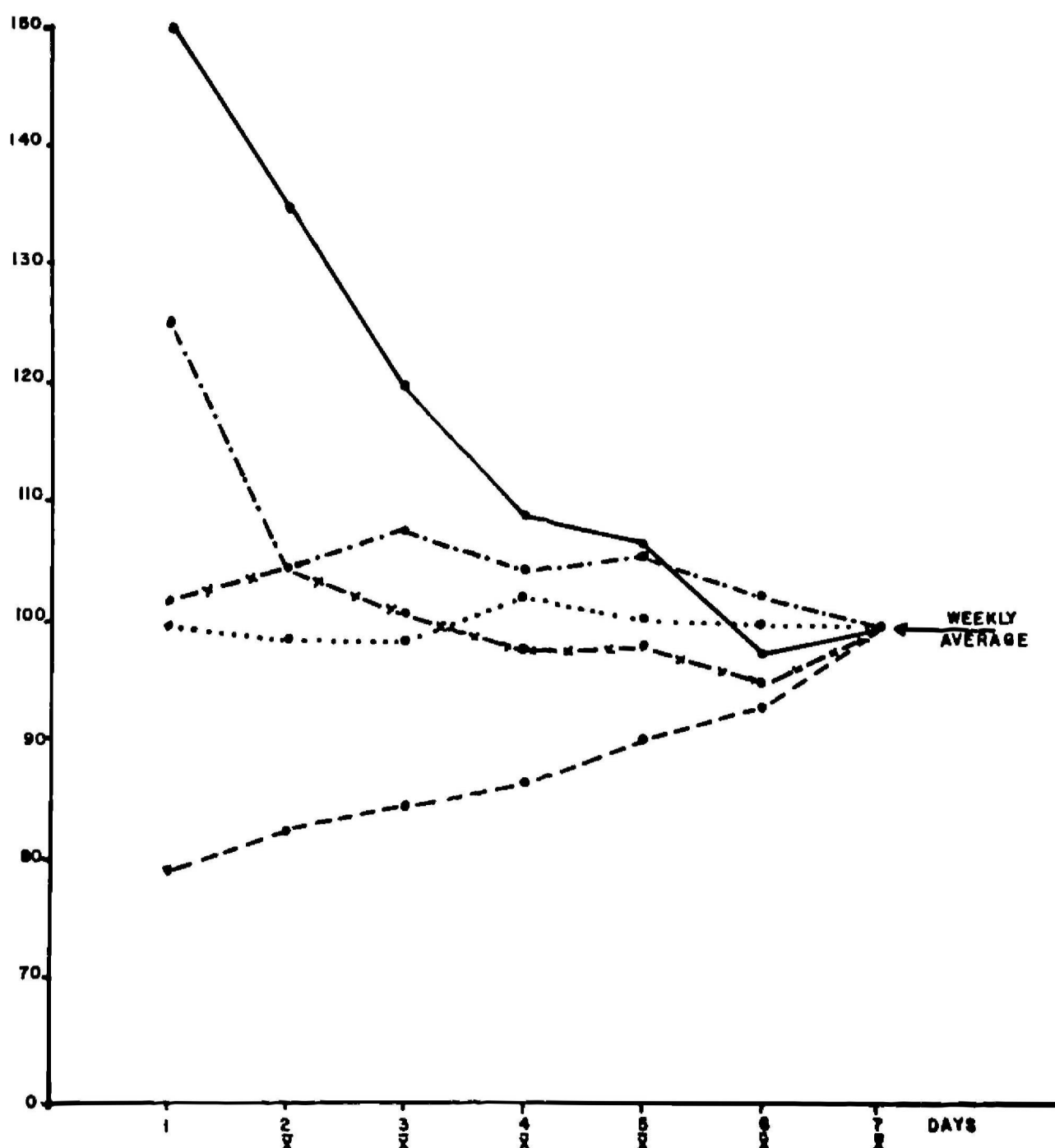


FIG. 5. Rate of convergence of the cumulative days (total protein per capita per day).

which increases the nutritionist's burden tremendously. Since success in the interview depends on the willingness and ability of the subject to cooperate, it is logical to reduce the number of families to be interviewed and to increase the number of days in which the study is to be made in order to obtain more reliable information. For the nutritionist, the field work is the most difficult and taxing; tabulating the data is the most relaxing and easiest phase of the study.

For some long-term epidemiologic studies, we have made combined family and individual dietary surveys over a period of only three days,¹⁹ because data were available from previous family dietary surveys. Even when the data collected gave group averages, we were not able to use individual averages for some nutrients because of the great variability

in food consumption during the week despite the monotonous diet. To illustrate this point, the data obtained from a seven-day family dietary survey made some years ago were analyzed again to determine the daily nutrient intake.²⁰ Five families were taken at random from twenty-five families divided into three economic groups. Each family record was tabulated in two ways, intake day by day and cumulative intake first for two days, then for three days and so on. The averages for seven days were taken as 100 per cent, and individual daily results and cumulative results were compared with the seven-day averages. The variability of the nutrient intake based on the deviations of the daily and cumulative results from 100 per cent is represented in Figures 1 through 6.

In most dietary studies, vitamin intake

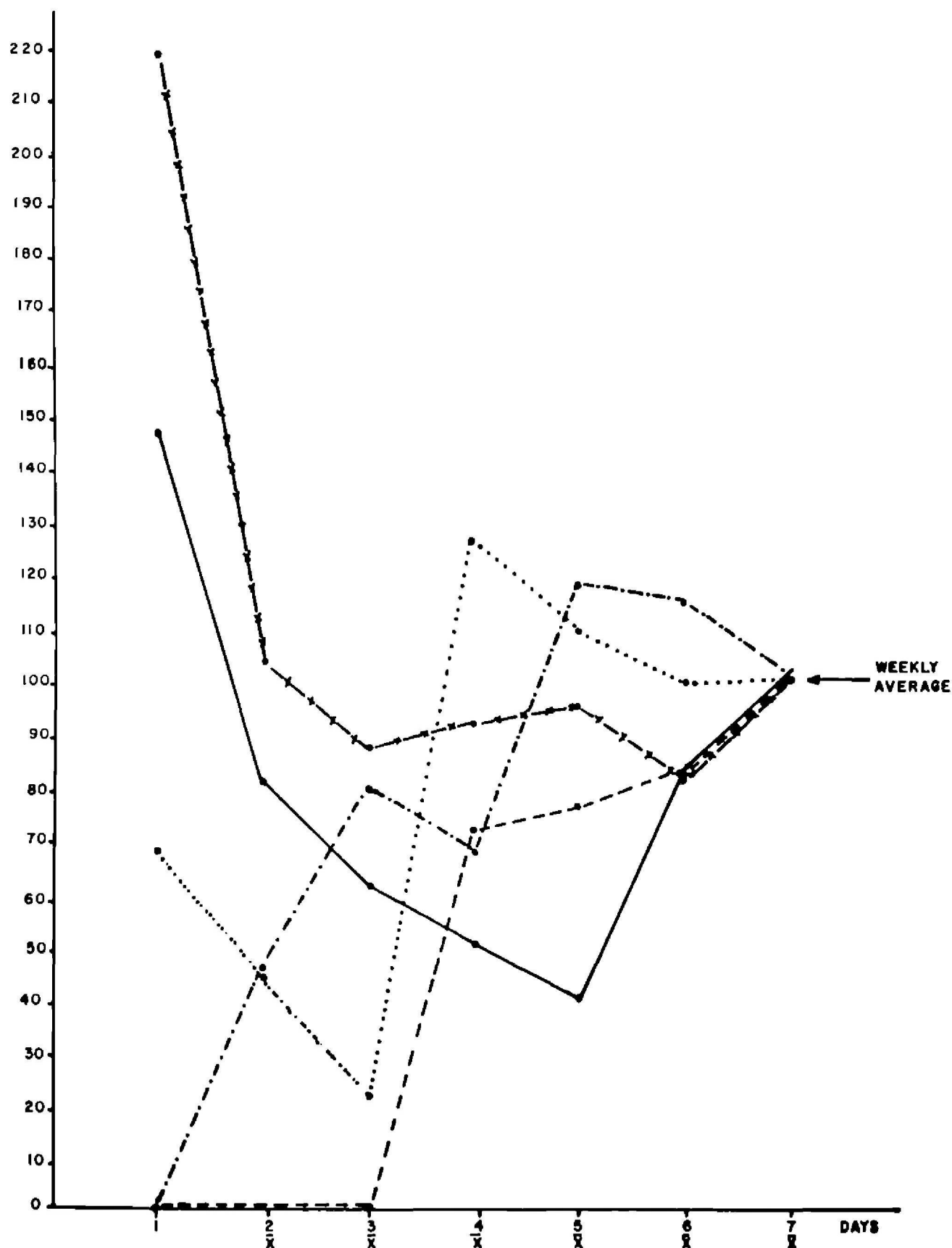


FIG. 6. Rate of convergence of the cumulative days (per cent animal protein) (relative figures).

shows a great variability while calorie and protein intake are more stable. In our study of the monotonous diets of the Indians four of the five families analyzed (Fig. 1) showed considerable calorie variation day by day. On the first day of the survey, two families differed remarkably from the weekly average. This shows the inaccuracy of one day's survey data as compared with data obtained over a seven-day period. Figure 2 shows that for total protein intake, which is mainly derived from

corn, the day to day variability was larger in all families. When animal protein percentages were calculated and daily intakes were compared with the seven-day average (Fig. 3), a puzzling problem appeared which requires great attention from investigators.

When results from different periods or averages from cumulative days were plotted, the deviations from the weekly averages are not so great. Calories, for example (Fig. 4), gave averages from three days, four days and so on,

TABLE I

Amounts of Foods Consumed per Person per Day on Family Levels (averages in grams of edible portion)

Foods	Santa María Cauqué		
	1959	1960	1961
Liquid milk.....	4	10	10
Eggs.....	4	4	4
Meats.....	24	21	23
Beef.....	20	20	20
Others.....	4	1	3
Pulses.....	79	73	77
Beans (black).....	65	65	64
Beans (others).....	14	8	13
Fresh vegetables.....	52	45	60
Tomatoes.....	29	19	28
Green leaves.....	8	8	9
Others.....	15	18	23
Fruits.....	29	7	9
Tubers (potatoes)....	3	6	2
Cereals*.....	460	465	489
Sugars.....	58	55	67
Fats.....			
(lard).....	1	2	1

* Total expressed in terms of water content of corn.

which were quite similar to seven-day averages. Figure 5, representing total protein, shows that averages from three or more days were not very different from weekly averages. But in Figure 6, which shows the percentage of animal protein, none of the families had had stable consumption during the various periods.

Because of these findings it was necessary, in making our preschool individual dietary surveys, to study the families on different days of the week. The results had to be expressed in terms of group averages to cover the weekly cycle already known in these communities.

By repeating the same surveys in different samples of the population over a period of three years the validity of those results has been proved. To avoid any variation in the collection of data, these studies have been carried out during the same month of the year using the same personnel and the same technic. Averages of food consumption for families and for the children were surprisingly alike for each year. Tables I and II present these averages for one of the communities; similarity of results for the three years is evident. These findings served

TABLE II

Amounts of Foods Consumed per Child per Day (averages in grams of edible portion)

Foods	Santa María Cauqué		
	1959	1960	1961
Liquid milk.....	5	27	28
Eggs.....	4	3	4
Meats.....	14	10	11
Beef.....	11	10	9
Others.....	3	0	2
Pulses.....	20	15	28
Beans (black).....	18	13	23
Beans (others).....	2	2	5
Fresh vegetables.....	33	24	27
Tomatoes.....	17	10	12
Green leaves.....	4	4	2
Others.....	12	10	13
Fruits.....	17	17	8
Tubers.....			
(Potatoes).....	4	3	1
Cereals*.....	178	164	198
Sugars.....	34	34	40
Fats.....			
(Lard).....	1	1	0

* Total expressed in terms of water content of corn.

as guide lines to test the validity of the results, the kind of population samples taken and the degree of stability of food intake among the families.

A BRIEF METHOD

For special groups in our areas several other methods have been applied which require careful elaboration of the questionnaires to make them appropriate to that area. One of these methods, called the Global Method, has given valuable results for both family and individual dietary surveys when used by skilled workers. This method combines the "food list" and recall method with the use of non-direct and open questions and covers a one-week period. Individual foods are never mentioned by the nutritionist; the subject is encouraged to give a picture of the usual breakfast, lunch and dinner of the past week. The interview takes place in the subject's home, and the nutritionist must be very careful in estimating the food portions in relation to the family's recipes and food preparation. The food list, placed on the left side of the forms, must be

elaborated according to the food habits of the group. To jog the memory of the person being interviewed, only food groups such as fruits, green leaves and others easy to forget, are mentioned.

The main purpose of this method is to secure information during a single home visit; the person who collects the data must also translate it into terms of daily intake. Because the memory of the subject plays an important role in this method, reliable estimates of food quantities are difficult to obtain. We agree with Thomson²¹ who strongly recommends that for studies of pregnant women direct measurements must be relied on, not recall.

CONCLUSIONS

For assessing nutritional status there is no substitute for family dietary surveys, especially when a new area is being investigated. The minimum number of days for such a study must be a week, the normally universal period during which the cycle of the family's customary life is repeated.

If quantitative data are required in individual dietary studies, they should be obtained in conjunction with family surveys.

To have some information about the population and to be able to select a satisfactory sample, a census is always advisable before any dietary survey. Providing that the sample is to be drawn statistically, the dietary survey should be carried out in small samples to obtain the most reliable information with the fewest trained personnel.

The most advisable method is a combination of recalling previous meals and weighing the food that is to be consumed by the family or the individual.

To assure a successful interview, the field worker should be well trained and should possess a high degree of sensibility in order to understand the person with whom she is to work. She must be alert to the psychological problems involved in the interview. She must have a great sense of responsibility and mental discipline, and accuracy in mathematics, because small details are extremely important in estimating accurate amounts of food intake.

Shorter periods for dietary surveys may be used when enough information is secured from seven-day dietary studies to permit estimation of the standard deviation of the intakes.

If other methods are used, they should be handled only by skilled workers to assure that the information is reliable and useful.

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