

PROGRAMS TO IMPROVE THE NUTRITION OF PREGNANT AND LACTATING WOMEN¹

Carlos H. Daza² and Aaron Lechtig³

Nutritional deficiencies common in Latin American populations constitute a leading public health problem and appear to pose a serious obstacle to social and economic development in many countries. The problem of maternal malnutrition is especially acute, partly because pregnant women tend to experience particularly severe malnutrition, and partly because a mother's nutritional problem tends to affect the nutritional state of her child. This article presents some basic guidelines for programs seeking to improve the nutritional status of pregnant and lactating women in Latin America.

Introduction

Available evidence suggests that maternal malnutrition during pregnancy and lactation may create enough of a social and economic burden to make it a leading public health problem and a serious obstacle to development in many Third World countries. Conversely, investment in programs for improving women's nutritional status during pregnancy and lactation could yield enough of an economic and social return to stimulate national development.

Thus, especially since the remarkable adaptability of the human reproductive process is no reason for public health inaction, our aim should be to determine, under operational conditions, which programs directed at this problem are likely to be effective and feasible.

This article seeks to narrow the gap between academic research and practical policies by discussing some guidelines for programs and strategies aimed at improving the nutritional status of pregnant and lactating women.

Developing a Nutrition Program

A nutrition program is a whole complex of activities organized for specific purposes. Therefore, the process of developing a program implies making a detailed selection of objectives and of measures for achieving those objectives in a given length of time. This, in turn, implies making an orderly distribution of the resources, activities, and tasks needed to carry out the chosen course of action while keeping the established objectives continually in mind (1).

The steps taken to design, implement, and evaluate programs for improving the nutritional status of pregnant and lactating women are necessarily similar to those normally taken to deal with any health problems, namely:

- a) analysis of the current nutrition and food situation;
- b) definition of objectives and targets;
- c) identification of human and material resources required;

¹Condensed from a paper presented at the PAHO-INCAP Workshop on Maternal Nutrition and Infant Health: Implications for Action, held in Panajachel, Guatemala, 12-16 March 1979, to be published in *Arch Latinoam Nutr* 29(4) (Supplement No. 1), 1979 (in press). Also appearing in Spanish in the *Boletín de la Oficina Sanitaria Panamericana*, 1980.

²Chief, Nutrition Section, PAHO, Washington, D.C.

³Chief, Program of Human Development, Division of Human Development, Institute of Nutrition of Central America and Panama (INCAP), Guatemala City, Guatemala.

- d) program implementation; and
- e) continuing evaluation and feedback to improve the program.

The remainder of this article is devoted to considering each of these steps in turn.

Analysis of the Current Situation

Such analysis, which includes a food and nutrition assessment, should be based upon thorough understanding of several inter-related factors—the geographic, sociocultural, demographic, and health features of the specific population; the administrative structure and organization involved; and the economic and financial implications of the nutritional problem itself (1).

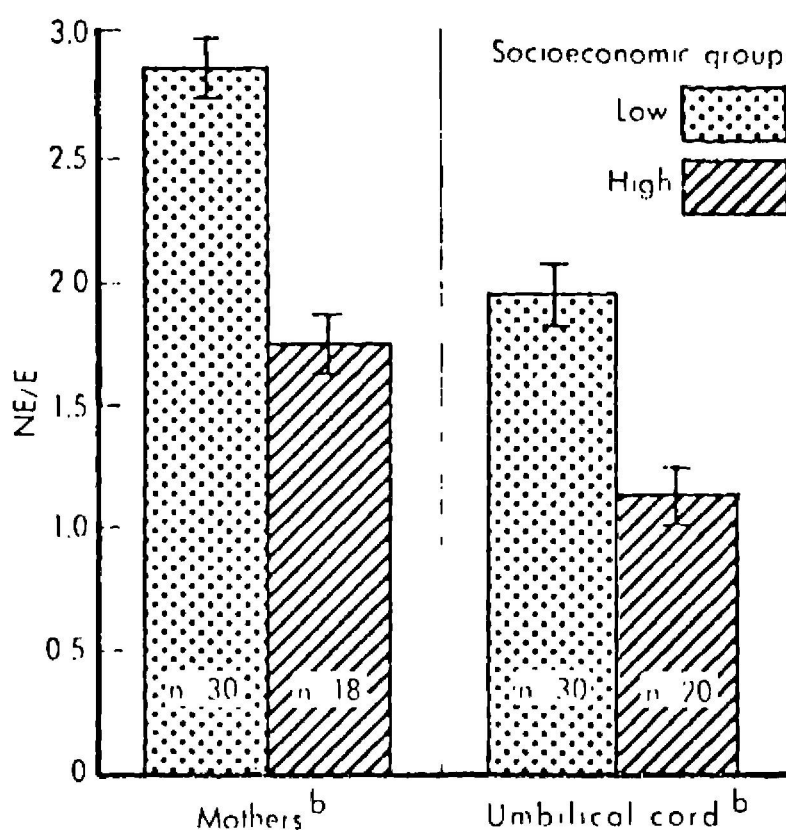
A review of the main nutritional problems in the Americas (2) recently concluded that although the countries of Latin America differ markedly in many respects, on the whole their people have a diet notably deficient in energy, protein, vitamin A, riboflavin, iron, folates, and iodine (3-13). Although these deficiencies are especially pronounced among poor socioeconomic strata, both urban and rural, wherever they exist they are likely to have a dramatic impact upon maternal and child health (14-17).

Various food intake studies of pregnant women in Latin American population groups with low socioeconomic status have been made over the past decade (18, 19, 5, 20). These studies indicate continuing dietary deficiencies, especially with regard to energy, vitamin A, riboflavin, and iron.

Only a small proportion of the pregnant women studied in such populations have shown adequate excretion of riboflavin (21). Moreover, blood samples from these women have shown low levels of vitamin A, carotenes, and hemoglobin as well as low hematocrits (18).

Although no significant differences in levels of serum protein have been detected (22), complementary data (Fig. 1) show an abnormally high ratio of nonessential to

Figure 1. Ratio of nonessential to essential (NE/E) amino acids in the sera of pregnant women^a and in blood from the umbilical cord.



Source: INCAP.

^a Serum sample obtained at delivery

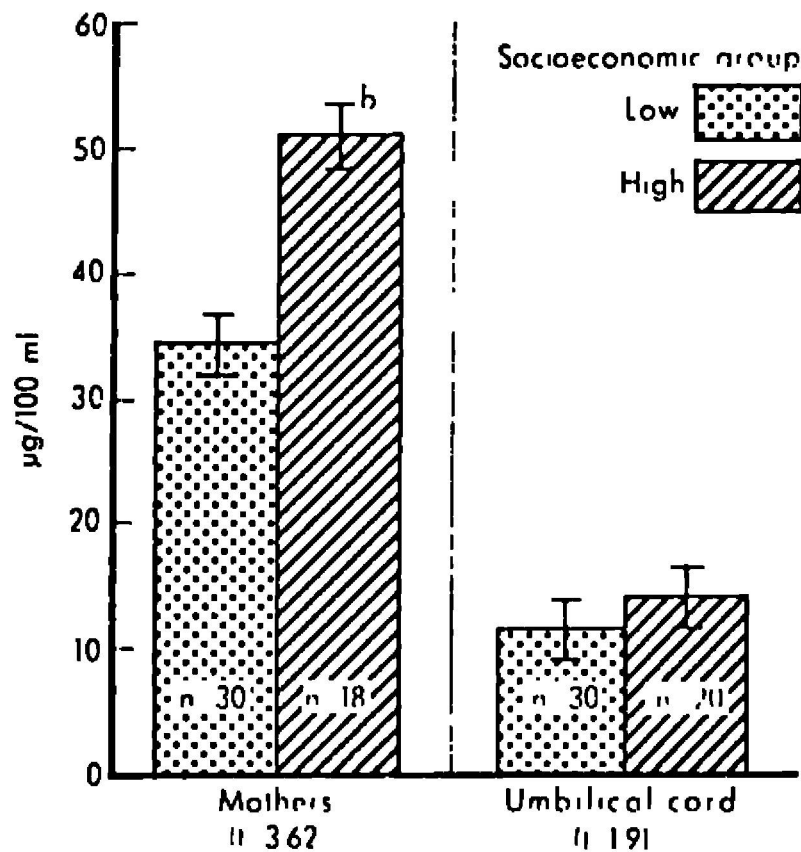
^b $p < 0.01$

essential amino acids in plasma from pregnant women and newborns in groups with low socioeconomic status (23).

Serum levels of vitamin A follow a similar pattern. As Figure 2 shows, these levels tend to be low in mothers and newborns from groups with low socioeconomic status. The magnitude of the differences, however, is less in umbilical cord samples from the newborn than in samples from the mothers. This fact suggests that, at least in the case of vitamin A, a placental mechanism exists that tends to protect the fetus (24).

Information about proportion of women with deficient (less than 15 per cent) transferrin saturation has defined the magnitude of the iron deficiency problem in Central America and Panama. The data presented in Figure 3 clearly show that at least 50 per cent of the women sampled were deficient (5).

Figure 2. Serum vitamin A levels found in pregnant women^a and in blood from the umbilical cord.



Source: INCAP.

^a Serum sample obtained at delivery

^b $p < 0.01$

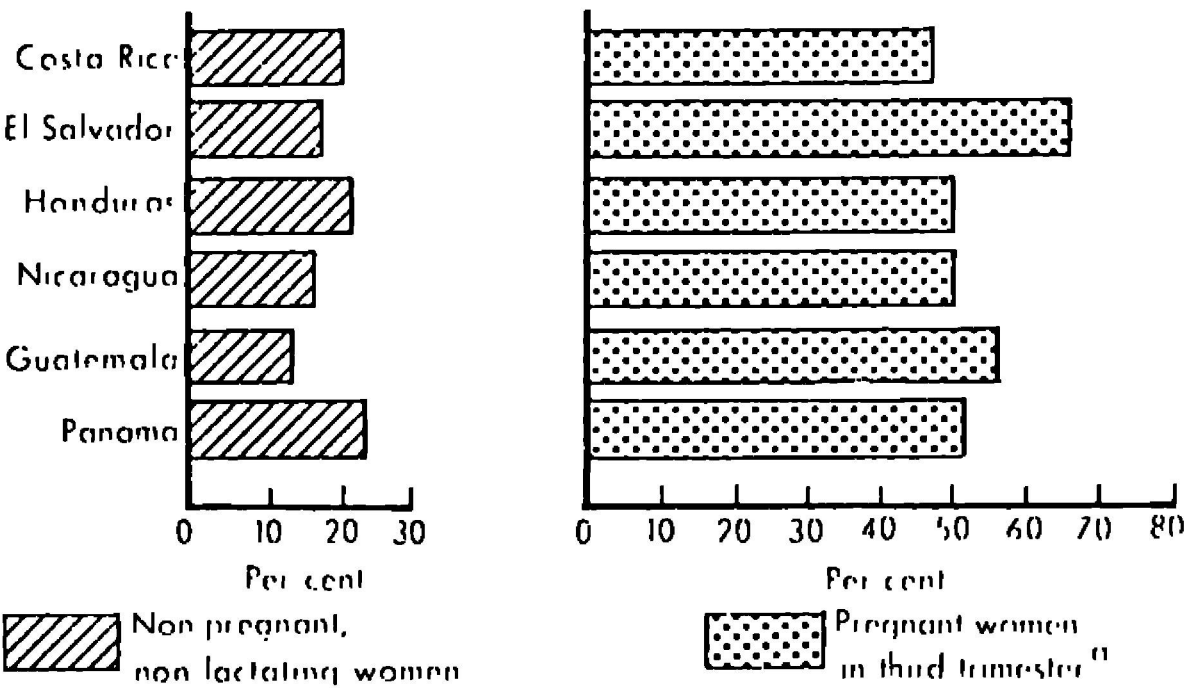
The fact that folate deficiency also exists becomes more evident when iron is administered to pregnant women. It has been found, for example, that sera from 58 per cent of a sample of pregnant women with low socioeconomic status had low or deficient folate levels (25, 26). This point merits special attention because of increasing evidence that folate deficiency during pregnancy adversely affects fetal growth (27).

At the present time the most limiting nutrients for pregnant women in Latin America are energy, protein, vitamin A, riboflavin, iron, and folates. Iodine should be added to this list in areas where endemic goiter is highly prevalent.

It should also be noted that in many poor areas where malnutrition is prevalent, pregnant women suffer from nutrient deficits that are qualitatively similar but quantitatively greater than those observed in the general population.

Still more important, the available evidence indicates that in many ways the nu-

Figure 3. Percentages of non-pregnant and pregnant women tested from Central America and Panama with deficient (< 15%) transferrin saturation, 1965-1966.



Source: INCAP

^a The Panamanian women were tested in the second trimester

tritional status of a fetus reflects deficiencies experienced by its mother. Thus, maternal nutrition has great public health significance, because it affects not only mothers but also their unborn children. In addition, pregnancy brings with it increased need for nutrients, a fact that should be kept in mind when planning public health programs.

In planning action programs one of the difficulties in analyzing current nutritional situations is that, in general, nutrition surveys fail to provide a clear understanding of the significance and magnitude of the problem, the population segments at highest risk of malnutrition, or the most important conditioning factors involved. Moreover, they usually present their data in the form of national averages. This can lead to serious error of interpretation, since the intakes of the more needed segments of the population tend to differ greatly from average figures.

For planning and action purposes, the essential thing is to establish what is happening in the different situations and socioeconomic categories within each country. This information is what provides the policy and decision maker with the knowledge needed to understand the nature and magnitude of the nutrition problems, to identify the large disparities that exist between social groups in different geo-economic contexts, to point out the importance of certain basic foods to satisfy the requirements of the low socioeconomic groups, and to make the most appropriate decisions in each circumstance. In addition, it is essential to develop simple high risk indicators and to use them in the continuous surveillance of each country's nutrition and health status.

Definition of Objectives

Besides considering nutritional matters, this phase of work must define the coverage the program will provide, the implementation time required, and restrictions on ex-

tension of services. Within this context, it is also essential to define the technical and administrative standards the program is to maintain.

The program objectives should be formulated taking into account the recommended dietary allowances for the specific country and population groups involved. These estimated dietary allowances are needed to plan food supplies and consumption goals for the population; to interpret food intake records when assessing the nutritional status; to formulate nutrition policies; and to guide nutrition education programs, orient food technology, and regulate the nutritional quality of foods. Therefore, it is important to define, as clearly as possible, what the recommended dietary allowances are for pregnant and lactating women and the way to satisfy their nutritional requirements.

As an illustration, Table 1 presents the recommended dietary allowances during pregnancy and lactation for women in the United States, Central America, and the Caribbean. Comparable data for nonpregnant adult women are also included. There are some striking differences (e.g., differences in recommended iron intake arising from different assumptions about absorption rates). Some other differences can be ascribed to differences in the standard body size estimated for each population. However, there are other differences—such as the tendency to recommend lower energy and higher protein intakes in the United States—that can only be partially explained by different patterns of physical activity. For example, some differences in the recommended protein intakes (54 g vs. 76 g) are large enough to have major implications for planning food supplies or for interpreting consumption records when assessing a population group's nutritional risk.

Another important question in defining objectives for a nutrition program is the feasibility of those objectives. Very often, the recommendation has been to reach

Table 1. Recommended dietary allowances for non pregnant, pregnant, and lactating women in the United States,^a Central America,^b and the Caribbean.^c These allowances are intended to provide sufficient amounts of nutrients to maintain health in nearly all population groups.

Item	Not pregnant			Pregnant			Lactating		
	U.S.A.	Central America	Carib-bean	U.S.A.	Central America	Carib-bean	U.S.A.	Central America	Carib-bean
Energy (kCal) ^d	2,000	2,050	2,200	2,300	2,400	2,485	2,500	2,600	2,750
Protein (g) ^e	46	45	41	76	60	54	66	68	65
Fat-soluble vitamins:									
Vitamin A (retinol equivalents, µg) ^f	800	750	750	1,000	900	800	1,200	1,100	1,200
Vitamin D (µg) ^g	0	h	2.5	10	h	5	10	h	5
Vitamin E (I.U.) ⁱ	12	h	12	15	h	15	15	h	15
Water-soluble vitamins:									
Thiamine (mg)	1.0	0.8	0.9	1.3	1.0	1.0	1.3	1.0	1.1
Riboflavin (mg)	1.2	1.1	1.2	1.5	1.3	1.4	1.5	1.4	1.5
Niacin equivalents (mg) ^j	13.0	13.5	15.0	15.0	15.8	17.0	17.0	17.2	19.0
Pyridoxine (mg)	2.0	h	1.5	2.5	h	2.0	2.5	h	2.1
Ascorbic acid (mg)	45	30	30	60	50	50	80	50	50
Folacin (µg) ^k	400	200	200	800	400	400	600	300	300
Vitamin B ₁₂ (µg)	3.0	2.0	2.0	4.0	3.0	3.0	4.0	2.5	2.5
Calcium (mg)	800	450	500	1,200	1,100	1,000	1,200	1,100	1,000
Magnesium (mg)	300	h	250	450	h	300	450	h	350
Iron (mg) ^l	18	28 ^m	19	18 ⁿ	28 ^m	19	18	28 ^m	19
Iodine (µg)	100	h	h	125	h	h	150	h	h

^aSource: U. S. National Academy of Sciences, *Recommended Dietary Allowances* (8th edition), 1974.
^bSource: INCAP, *Recomendaciones dietéticas diarias para Centro América y Panamá*, 1973.
^cSource: Caribbean Food and Nutrition Institute, *Recommended Dietary Allowances for the Caribbean*, 1976.
^dBased on moderate activity for adults; adjustments should be made for greater or lesser activity.
^eAdjusted to Net Protein Utilization (NPU) = 70 for average Caribbean diet (except for infants 0-1 year of age), which is reference protein.
^f1 µg retinol equivalent = 1 µg retinol = 6 µg beta carotene.
^g1 µg vitamin D = 40 I.U.
^h = no published information available.
ⁱ1 mg dl-cc tocopheryl acetate = 1 I.U.; 1 mg dl-cc-tocopherol = 1.1 I.U.; 1 mg d-cc-tocopheryl acetate = 1.36 I.U.; and 1 mg d-cc-tocopherol = 1.49 I.U.
^j1 mg niacin equivalent = 1 mg niacin = 60 mg tryptophan.
^kExpressed as free folacin activity.
^lBased on 15 per cent absorption for people obtaining 14-20 per cent of their energy intake from animal foods.
^mBased on 10 per cent absorption for people obtaining 8-13 per cent of their energy intake from animal foods.
ⁿThe use of supplemental iron is recommended.

established dietary allowances with daily intakes of milk, eggs, meats, cheeses, whole or enriched grains, legumes, fruits, vegetables, and butter or margarine. However, a diet of this pattern is beyond the reach of most poor segments of the population. Therefore, besides stressing the need to increase purchasing power and food availability, emphasis should be placed on formulating recommendations that include

practical and feasible food ration models for specific target populations—models enabling the requisite nutrients to be obtained in ways best-suited to conditions prevailing in a particular country.

The data presented in Table 2 show how women in rural Guatemala could satisfy their need for additional nutrients during pregnancy by using food products available in the community. If these foods are used,

Table 2. Daily dietary "cost" of pregnancy in an indigenous rural community of the Guatemalan highlands, 1978, based on recommended increases in the intake of local products.

Nutrient values and cost of local products	Nightshade ^a 1-2 bunch (21 g)	Beans (4 tablespoons, cooked)	Tortillas (yellow, 2 units)	Cheese (15 g)	Tomatoes (1-2 unit)	Cabbage (1 leaf)	Total	Recommended increase during pregnancy ^b
Energy (kCal)	10	108	186	65	5	6	380	350
Protein (g)	1.1	7	5	4	0.2	0.4	17.7	15.0
Calcium (mg)	48	28	142	341	1	10	570	650
Iron (mg)	2.7	2.1	2.2	0.2	0.1	0.2	7.8	0
Thiamine (mg)	0.04	0.2	0.1	0.05	0.01	0.01	0.41	0.20
Riboflavin (mg)	0.06	0.06	0.01	0.01	0.01	0.01	0.19	0.20
Niacin (mg)	0.1	0.6	1.0	0	0.1	0.1	1.9	2.30
Retinol (vitamin A, µg)	115	0	14	29	13	2	173	150
Cost (US cents)	1	2.2	2.0	3.0	0.5	0.3	9.0	

^aIt may be replaced by: chard, watercress, goosefoot, crotalaria, spinach, lettuce, carrots, ripe mango or 1 g of cow liver.
^bINCAP, *Recomendaciones dietéticas diarias para Centro América y Panamá*, 1973.

the additional investment required during pregnancy is about 9 cents per day—as compared to about one dollar per day for the foods traditionally cited in nutrition education schemes of developed countries (28).

The data in Table 2 also indicate that although vitamin A can be obtained in sufficient quantity from these locally available foods, other strategies—such as vitamin A supplementation, or fortification of a suitable food—would be needed to ensure adequate vitamin A intake for pregnant women in this population (29).

The nutrient content of a food supplement should be designed to correct or compensate for the main limiting nutrients in the home diet. Thus, a high-protein supplement may not be appropriate for populations—like many of those in the Third World—where the main limiting nutrients are sources of energy rather than protein. On the other hand, in populations where the staple food has a low content of protein (e.g., cassava), a high-protein supplement would be appropriate. It is advisable that the protein-calorie ratio of the supplement should not be lower than that of the home diet.

Two other public health considerations—dose-response and time-response relationships—also merit consideration. Data from

different sources suggest that the dose-response may range from 25 to 84 grams of increased weight at birth per 10,000 supplemented calories during pregnancy. Thus, the effect a food supplement will have on the proportion of low birth-weight babies could be roughly predicted from the expected increase in average birth-weight and the distribution of infant birth-weights in the population before the intervention began (30).

Regarding time-response, the data available suggest that the more nearly the food supplementation coincides with pregnancy, the greater will be its effect on birth-weight. However, during pregnancy the effects of supplementation (per supplemented calorie) will tend to be similar, regardless of the trimester in which it is provided (16). Thus it is reasonable to expect that food supplementation provided during the third trimester of pregnancy will have a significant effect on both fetal growth and the mother's nutritional status.

The type of food supplement to be provided should be selected so as to maximize acceptability and local self-reliance, and to minimize cultural or economic dependence on imports. To the extent possible, locally available foods should be utilized. For example, in Central America a food supple-

ment combination of corn, beans, and vegetable oil may be the most appropriate—not only nutritionally, but culturally and economically as well. Of course, the availability of key limiting vitamins and minerals is an additional matter that needs to be considered when selecting types of food supplements.

Decisions about the amount of food to be provided should depend mainly on the estimated average nutrient deficits in the home intake, the expected rates of replacement of home intake by the supplement, the expected dose-response relationship, and the cost of the supplement.

Let us assume, for example, that energy intake needs to be supplemented because the energy intake deficit is about 30 per cent (720 calories daily); that 25 per cent of the supplement will merely replace other food in the diet (i.e., the replacement rate is 25 per cent); and that the expected dose response is 33 g of birth-weight gain per 100 daily net supplemented calories during the last trimester of pregnancy. Also, the proportion of low birth-weight babies (under 2,500 g) delivered before supplementation in the hypothetical community was 20 per cent, the proportion weighing less than 2,400 g was 8 per cent, and the proportion weighing less than 2,300 g was 6 per cent.

Under these circumstances, a daily supplement of 400 calories during the last trimester of pregnancy would be expected to decrease the proportion of low birth-weight babies from 20 per cent to 8 per cent. That is, there would be an effective average supplement (after replacement) of 300 calories per day, a total expected birth-weight gain of 100 g (3×33 g), and a consequent elevation of all but 8 per cent of infant birth-weights to at least 2,500 g. Similarly, a daily supplement of 800 calories during the last trimester would be expected to diminish the proportion of low birth-weight babies from 20 per cent to 6 per cent.

If each supplemented calorie cost .02 cents, the cost of providing 400 calories

daily would be 8 cents per day, while the cost of providing 800 calories would be 16 cents per day. Therefore, in this case a decision to provide 400 calories of supplement per day might be appropriate.

There are some advantages to distributing the food supplements at central locations within the village—as compared to having them prepared at individual households. These are, principally, that this procedure minimizes replacement of items in the home diet if the supplement is provided between regular mealtimes; it avoids the need to supplement the diets of all family members; and it may facilitate nutritional education. However, if population groups are very dispersed, or if not even minimum local facilities are available, such central distribution may not be feasible.

It should be noted that although a family ration may be the most appropriate procedure to avoid dilution of the food supplement among all the family members, it is roughly five to seven times as expensive as maternal single supplementation. It also increases the probability of home diet replacement and of the family becoming economically dependent on the supplement. Such potential disadvantages may totally cancel out the advantages of the family approach.

Also, sometimes the lack of specific kitchen equipment for preparing certain supplements (such as oil-fried foods) may prevent the mother from using them, or may sharply reduce their effectiveness and acceptability.

Identification of Required Resources

This step implies a comprehensive assessment of the existing health infrastructure. Not only must this analysis take account of the human and material resources but also the organizational and administrative setting for operating the health program. Particular attention should be given to defining specific nutrition activities and tasks

to be performed by the available personnel at all levels of the health system (31).

Table 3 provides an example of the types of personnel involved and the services rendered by an integrated primary health care and nutrition program serving three rural communities in Guatemala. Table 4 breaks down program activity into tasks aimed at improving the nutritional status of pregnant and lactating women. In defining these tasks, nutrition services must be integrated with other health actions, and must never be depicted as a separate, vertical activity. It should also be recognized that Table 4 is presented merely as an example, not as any sort of rigid model to be closely followed.

The functions of program personnel should revolve about their assigned tasks-- execution, teaching, supervising, making referrals, and participating in other community activities. Each of the tasks should be carefully described in the program's operations manual to ensure proper service delivery.

One key task, identification of pregnant women with high nutritional risk, can be done using very simple risk indicators.

These indicators do not necessarily require that the mother be weighed, and their predictive value is independent of the gestational age of the fetus (32). The data in Figure 4, collected at four rural Guatemalan villages, help to bring out relationships between the proportion of low birth-weight babies delivered by different groups of mothers, food supplementation received, and levels of nutritional risk defined by maternal height and socioeconomic status. It is clear that both height and socioeconomic status were associated with the risk of delivering a low birth-weight infant. It is also evident that food supplementation had a dramatic effect on the proportion of low birth-weight babies delivered by the group of short mothers with low socioeconomic status- who were the mothers at greatest risk of malnutrition. In contrast, the food supplement appeared to have no measurable impact on the proportion of low birth-weight infants born to mothers at low nutritional risk (tall mothers with high socioeconomic status). These data therefore indicate that: (1) the food supplement will have its greatest impact upon women at high nutritional risk; and (2) whether or

Table 3. Specific tasks of health personnel in an integrated primary health care and nutritional program serving three rural Guatemalan communities.

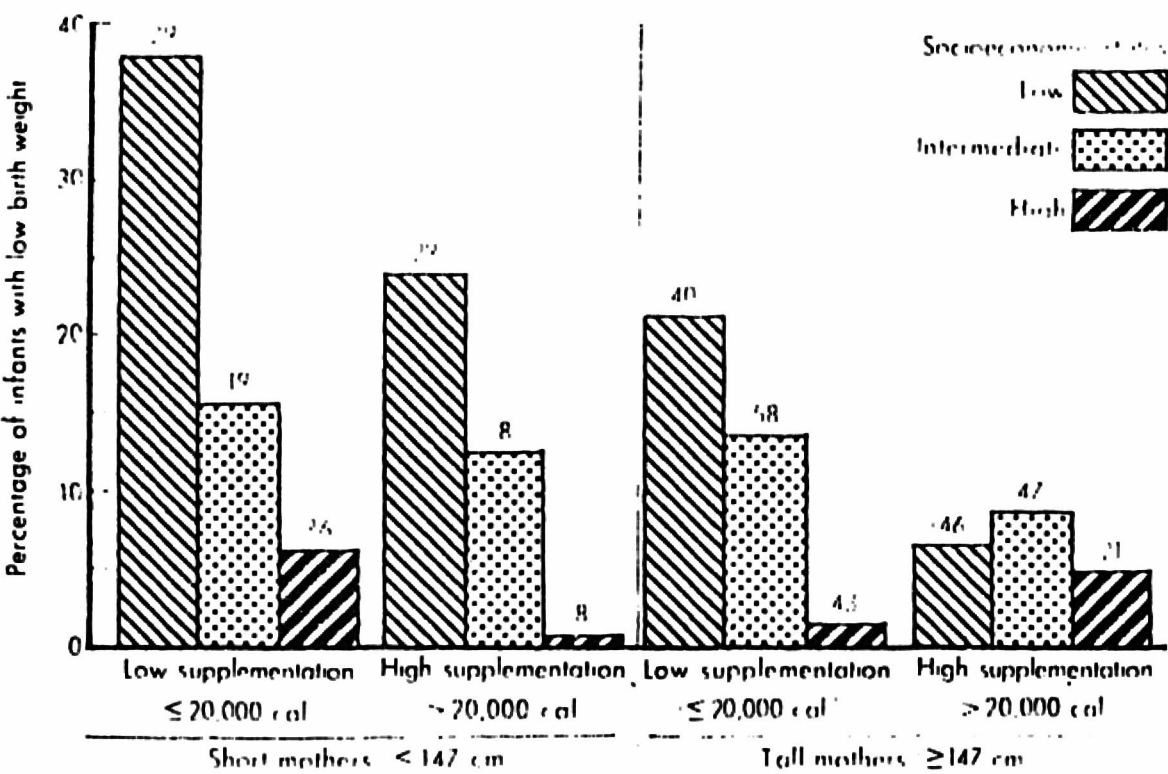
Level of care	Personnel involved	Tasks performed
Home	<ul style="list-style-type: none">• Family• Midwife• Health promoter• Rural health technician	<ul style="list-style-type: none">• Health, nutrition and family planning (educational and promotional activities)• Simplified maternal and child health care preventive measures and treatment of minor morbidity• Early detection of high risk individuals• First-aid referrals
	<ul style="list-style-type: none">• Auxiliary nurse• Nurse• Dentist• Physician	<ul style="list-style-type: none">• Health, nutrition and family planning (educational and promotional activities)• Maternal and child health care• Preventive measures• Medical care• Dental health, nutrition, and family planning services• Referrals

Table 4. An example of program activity (food supplementation) broken down into specific tasks, frequency, personnel, and functions.

			Personnel and functions (E = execution, P = participation, R = referral, S = supervision, T = teaching)				
Activity	Tasks	Frequency	Mid-wife	Rural health promoter	Rural health technician	Auxiliary nurse	Nurse ^a Physician
Food supplementation for pregnant women at high nutritional risk	1) Detect pregnancies	Bimonthly home visits	P	E/R	T/S	T/S	T/S
	2) Conduct census of pregnant women	Update bimonthly	P	E	T/S	T/S	S
	3) Identify pregnant women at high nutritional risk	Promotional campaign every two months	P	P	E/R	T/S	T/S
	4) Distribute food supplement to pregnant women at high nutritional risk	Every two weeks, beginning at detection of high nutritional risk pregnancy	P	E	T/S	P	S
	5) Provide nutrition orientation associated with food distribution	Simultaneous with food distribution and bimonthly home visit	P	E	T/S	P	T/S S
	6) Follow up pregnancies at high nutritional risk	Once during last trimester	P	E/R	T/S	P	T/S E T/S

^a The goals of the program were to detect all pregnancies before the third trimester; to identify all pregnant women at high nutritional risk before the third trimester; and to reduce the incidence of low birth-weight babies from 20 to 10 per cent

Figure 4. Proportions of low birth-weight babies in different maternal groups defined by socioeconomic status, supplementation received during pregnancy, and maternal height.



Source: INCAP
No. of mothers studied appears in parentheses at the top of each column
p < 0.05

not they receive the supplement, women at slight nutritional risk will deliver a relatively small percentage of low birth-weight babies.

Some maternal characteristics that could be used to design simple scales for estimating nutritional risk during pregnancy are: arm circumference, height, head circumference, house characteristics, proportion of family children alive, and usual pre-pregnant woman weight (33). Also, as Figure 5 indicates, when gestational age can be assessed reasonably accurately, weight gain during pregnancy becomes one of the best indicators of nutritional risk (34).

Program Execution

It is worthwhile emphasizing that adequate supervision and quality control have tremendous influence upon the services rendered. Supervision should be the key

instrument used by the administration to control the program, give guidance, and provide on-the-job training—so that the different categories of personnel can monitor and improve their own performances as health team members.

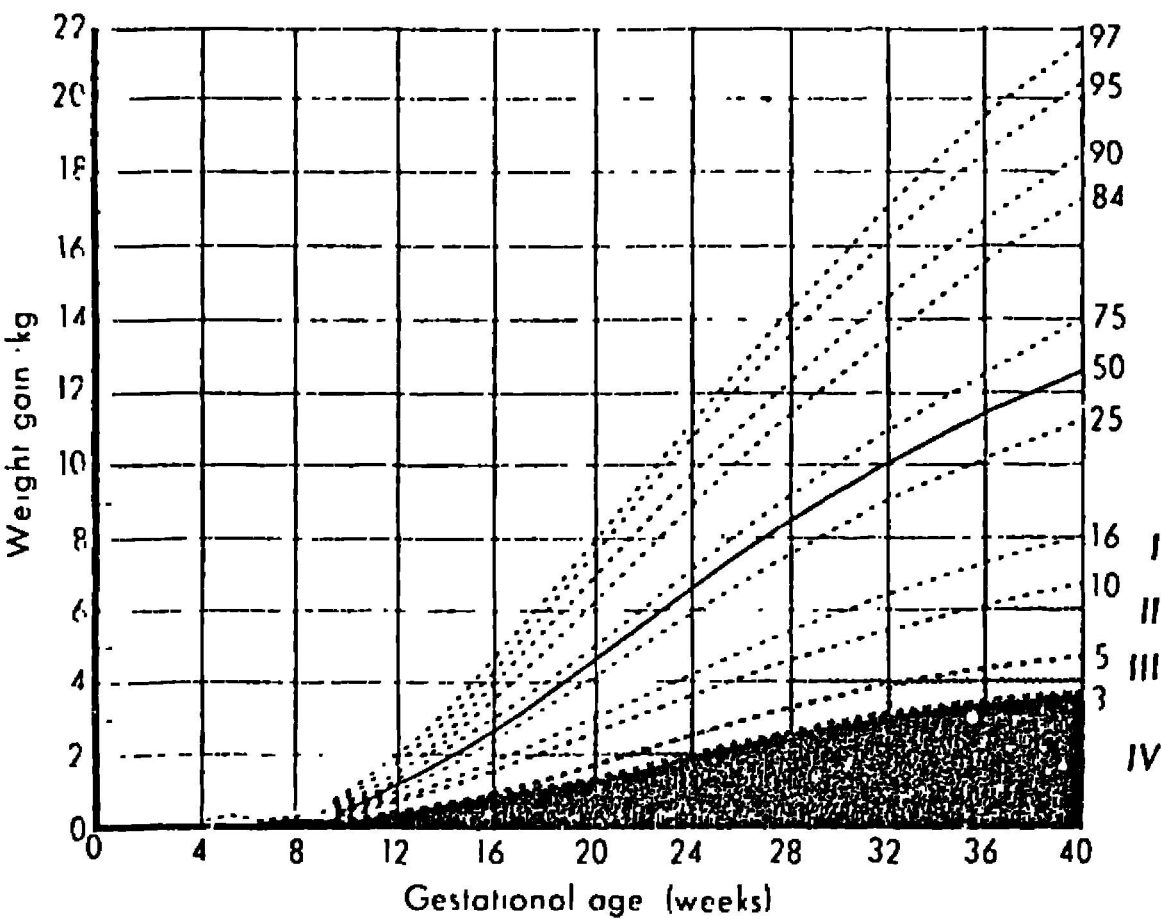
Community participation can also help to optimize the program's effectiveness, efficiency, and appropriateness.

Many other important activities, such as control of food commodities or other supplements, can be monitored effectively by means of simple forms. Periodic review of these forms by the person responsible should provide key information about how supplies arrive, who receives them, how they are stored, and who is assigned to distribute and control them.

Program Evaluation

Evaluation activities should be planned and defined in detail *before* program im-

Figure 5. Risk of delivering a low birth-weight baby, as indicated by maternal weight gain during pregnancy. The numbers at the end of each line are percentiles. Shading indicates areas (I-IV) of progressively higher risk.



plementation, so as to ensure that adequate data on recipient and control groups can be collected. The main items to be evaluated are as follows:

- The program's appropriateness for existing cultural patterns, the nation's social development strategies, and the prevailing health system.
- The program's impact (effectiveness) measured in terms of its general and specific goals.
- The program operations including all the program's technical and administrative structures.

- The detected positive results or negative side-effects.
- Overall program efficiency, as measured by cost-effectiveness estimates if possible.

Evaluation—and resulting control measures as needed—constitute the essential basis for readjusting or modifying the program in the light of local circumstances. As this implies, it is necessary that program operations remain flexible enough to leave room for continual improvement of this kind.

SUMMARY

The purpose of this article is to present some basic guidelines for programs seeking to improve the nutritional status of pregnant and lactating women in Latin America.

A review of major nutrition problems in the Americas recently concluded that on the whole the people of Latin America have a diet notably deficient in energy, protein, vitamin A, riboflavin, and iron. These deficiencies, especially pronounced among the poor, are likely to have a negative impact on maternal and child health wherever they are found.

In seeking to analyze the problems of specific countries, the essential thing is to learn what is happening in the various social, geographic, and economic population categories involved. Many national nutrition surveys can contribute but little to this process. What is necessary is implementation of very simple high risk indicators for routine nutrition and health use surveillance of the various population groups.

Targets for any given nutrition program should be based upon recommended dietary intake levels for the specific populations involved, and also upon consideration of how feasible it will be to attain those levels.

The tasks of program personnel teaching, supervising, making referrals, and participating

in other activities—should be carefully described in the program's regular operations manual to ensure standardized execution.

In general, the type of food supplement provided should be selected so as to maximize acceptability and local self-reliance, and to minimize dependence on imports. Decisions about the amount of food to be provided should depend mainly upon the estimated average nutrient deficits in the home intake, the rate at which the supplement is expected to replace ordinary home intake instead of adding to it, the expected response of the fetus, and the cost of the supplement.

With regard to program execution, adequate supervision and quality control have tremendous influence upon the services rendered. Community participation can also help optimize the program's effectiveness, efficiency, and appropriateness.

Finally, evaluation—and resulting control measures as needed—provide the basis for modifying the program in response to local circumstances. Program operations thus need to remain flexible enough to leave room for continual improvement through modifications of this kind.

REFERENCES

(1) Pan American Health Organization. *Guide for the Organization of Health Services in Rural Areas and the Utilization of Auxiliary Personnel*. PAHO Scientific Publication 290. Washington, D.C., 1975.

(2) Lechtig, A., and G. Arroyave. The nutrition problem in Latin America: Definition, causes, and remedial actions. *Bull Pan Am Health Organ* 11(4):319-331, 1977.

(3) Flores, M., M. T. Menchú, and G. Arro-

yave. Ingesta de micronutrientes en las áreas rurales de Centro América y Panamá. *Arch Latinoam Nutr* 19:265-278, 1969.

(4) Institute of Nutrition of Central America and Panama (INCAP) and Nutrition Program, U.S. Center for Disease Control. *Nutritional Evaluation of the Population of Central America and Panama: Regional Summary*. DHEW Publication No. HSM-72-8120. U.S. Department of Health, Education, and Welfare, Washington, D.C., 1972.

(5) Instituto de Nutrición de Centro América y Panamá (INCAP); Oficina de Investigaciones Internacionales de los Institutos Nacionales de Salud (E.U.A.); ministerios de salud de los seis países miembros. *Evaluación nutricional de la población de Centro América y Panamá: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua y Panamá* (6 volumes). INCAP, Guatemala City, 1969.

(6) Interdepartmental Committee on Nutrition for National Defense. *Bolivia: Nutrition Survey*. U.S. Government Printing Office, Washington, D.C., 1964.

(7) Interdepartmental Committee on Nutrition for National Defense. *Chile: Nutrition Survey, March-June 1960*. U.S. Government Printing Office, Washington, D.C., 1961.

(8) Interdepartmental Committee on Nutrition for National Defense. *Colombia: Nutrition Survey, May-August 1960*. U.S. Government Printing Office, Washington, D.C., 1961.

(9) Interdepartmental Committee on Nutrition for National Defense. *Ecuador: Nutrition Survey, July-September 1959*. U.S. Government Printing Office, Washington, D.C., 1960.

(10) Interdepartmental Committee on Nutrition for National Defense. *Peru: Nutrition Survey of the Armed Forces, February-May 1959*. U.S. Government Printing Office, Washington, D.C., 1960.

(11) Interdepartmental Committee on Nutrition for National Defense. *The West Indies: Trinidad and Tobago, St. Lucia, St. Kitts, Nevis, and Anguilla: Nutrition Survey, August-September 1961*. U.S. Government Printing Office, Washington, D.C., 1962.

(12) Interdepartmental Committee on Nutrition for National Defense. *Venezuela: Nutrition Survey, May-June 1963*. U.S. Government Printing Office, Washington, D.C., 1964.

(13) Pan American Health Organization. *The National Food and Nutrition Survey of Guyana*. PAHO Scientific Publication 323. Washington, D.C., 1976.

(14) Arroyave, G. Nutrition in pregnancy: Studies in Central America and Panama. *Arch Latinoam Nutr* 26:129-157, 1976.

(15) Arroyave, G., A. Méndez, and W. Ascoli. Relación entre algunos índices bioquímicos del estado nutricional y nivel socio-cultural de las familias en el área rural de Centro América. *Arch Latinoam Nutr* 20:195-216, 1970.

(16) Lechtig, A., H. Delgado, R. E. Lasky, R. E. Klein, P. L. Engle, C. Yarbrough, and J.-P. Habicht. Maternal nutrition and fetal growth in developing societies: Socioeconomic factors. *Am J Dis Child* 129:434-437, 1975.

(17) Lechtig, A., H. Delgado, R. Martorell, C. Yarbrough, and R. E. Klein. Relación entre aspectos socioeconómicos y peso al nacer. In O. Althabe, and S. Schwarcz (eds.), *Aspectos perinatales del parto prematuro*. Editorial "El Ateneo," Buenos Aires, Argentina, pp. 190-198.

(18) Arroyave, G., W. H. Hicks, D. L. King, M. A. Guzmán, M. Flores, and N.S. Scrimshaw. Comparación de algunos datos bioquímico-nutricionales obtenidos de mujeres embarazadas procedentes de dos niveles socio-económicos de Guatemala. *Rev Col Med (Guatemala)* 11:80-87, 1960.

(19) Beteta, C. E. Embarazo y nutrición: Estudio longitudinal en mujeres embarazadas pertenecientes al grupo rural de bajo nivel socio-económico de Guatemala. Graduate thesis in medicine and surgery. School of Medical Sciences, San Carlos University, Guatemala City, 1963.

(20) Lechtig, A., J.-P. Habicht, E. de León, G. Guzmán, and M. Flores. Influencia de la nutrición materna sobre el crecimiento fetal en poblaciones rurales de Guatemala: I. Aspectos dietéticos. *Arch Latinoam Nutr* 22:101-115, 1972.

(21) Arroyave, G., S. Valenzuela, and A. Faillace. Investigación de deficiencia de riboflavina en mujeres embarazadas de la ciudad de Guatemala. *Rev Col Med (Guatemala)* 9:7-13, 1958.

(22) Beaton, G. H., G. Arroyave, and M. Flores. Alterations in serum proteins during pregnancy and lactation in urban and rural populations in Guatemala. *Am J Clin Nutr* 14:269-279, 1964.

(23) Arroyave, G. Nutrition in pregnancy in Central America and Panama. *Am J Dis Child* 129:427-430, 1975.

(24) Arroyave, G., Y. M. de Moscoso, and A. Lechtig. Vitamina A en sangre de embarazadas y sus recién nacidos de dos grupos socioeconómicos. *Arch Latinoam Nutr* 25:283-290, 1975.

(25) Viteri, F. E., V. de Tuna, and M. A. Guzmán. Normal haematological values in the Central American population. *Br J Haematol* 23:189-204, 1972.

(26) Viteri, F. E., and M. A. Guzmán. Haematological status of the Central American population: Prevalence of individuals with

haemoglobin levels below "normal." *Br J Haematol* 23:725-735, 1972.

(27) Iyengar, L., and K. Rajalakshmi. Effect of folic acid supplement on birth weights of infants. *Am J Obstet Gynecol* 122:332-336, 1975.

(28) Worthington, B. S., J. Vermeersch, and S. R. Williams. *Nutrition in Pregnancy and Lactation*. C.V. Mosby, St. Louis, 1977.

(29) Arroyave, G., and A. Lechtig. Nutrición materna en una sociedad de bajo nivel socio-económico. In O. Althabe, and S. Schwarcz (eds.), *Aspectos perinatales del parto prematuro*. Editorial "El Ateneo," Buenos Aires, Argentina, 1978, pp. 104-112.

(30) Lechtig, A., C. Yarbrough, H. Delgado, J.-P. Habicht, R. Martorell, and R. E. Klein. Influence of maternal nutrition on birth weight. *Am J Clin Nutr* 28:1223-1233, 1975.

(31) Daza, C. H. Las unidades técnicas de nutrición de los ministerios de salud y la extensión de los servicios primarios de salud. *Bol Of Sanit Panam* 82(3):197-205, 1977.

(32) Lechtig, A., H. Delgado, C. Yarbrough, J.-P. Habicht, R. Martorell, and R. E. Klein. A simple assessment of the risk of low birth weight to select women for nutritional intervention. *Am J Obstet Gynecol* 125:25-34, 1976.

(33) Lechtig, A., and R. E. Klein. Riesgo nutricional materno fetal. *Arch Latinoam Nutr* 30:1980 (Carta al Editor). In press.

(34) Lechtig, A., H. Delgado, C. Yarbrough, J. Belizán, R. Martorell, V. Valverde, and R. E. Klein. Guía para interpretar la ganancia de peso durante el embarazo como indicador de riesgo de bajo peso al nacer. *Bol Of Sanit Panam* (in press).

POLIOMYELITIS SURVEILLANCE*

In 1979, the United States experienced the first epidemic of poliomyelitis since 1972. Through 21 September there were 15 epidemic-associated cases (13 paralytic; two nonparalytic) in the United States. All paralytic cases occurred in unvaccinated Amish persons.

In addition, there were eight reported endemic cases—i.e., non-epidemic-associated cases that were indigenous to the United States. All eight were paralytic and were epidemiologically classified as vaccine associated. Five occurred in recent recipients of trivalent oral poliovirus vaccine and three in contacts of such recipients.

From 1 January 1969 through 21 September 1979, there were a total of 185 cases of paralytic poliomyelitis reported to the Center for Disease Control through the National Poliomyelitis Surveillance System. Of these, 43 were epidemic associated; 73 endemic, vaccine associated (23 in recipients; 50 in contacts); 39 endemic, nonvaccine associated; 19 imported; and 11 in immunodeficient persons. The number of paralytic cases per year from 1969 through 1978 ranged from five to 32. There were 21 paralytic cases reported from 1 January to 21 September 1979.

*Source: *Weekly Epidemiological Record*, 15 February 1980. Geneva, World Health Organization.