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Malnutrition in Tropical America

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INTRODUCTION

The concepts about the causes of and the solutions to the food and nutrition problems in Third World nations have been substantially modified during the last two decades [Joy and Payne, 1975]. It is now generally accepted that chronic malnutrition in children results from inadequate access to and utilization of health and educational services and/or from the low purchasing power of families. Therefore, if malnutrition is to be effectively dealt with, governments should strengthen those programs oriented to reducing significantly the existing levels of poverty.

This chapter discusses the present nutritional and health conditions in Tropical America (TA) and the changes that have occurred in the principal health indicators over time. TA includes 17 countries that include approximately 16 million km^2 of national territory and 297 million inhabitants. It is subdivided into Continental Middle America (CMA), including Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama, with 93 million people; and Tropical South America (TSA), which comprises Brazil, Bolivia, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, and Venezuela, with 204 million inhabitants [PAHO, 1982a]. TA in general has a hot and humid climate, although temperature and rainfall vary dramatically by altitude. A mixture of indigenous and Spanish-speaking cultures forms the majority of the populations. The remaining, predominantly indigenous populations are found in the highlands or in bordering isolated communities. African-American populations are mostly concentrated on the Atlantic coasts. Approximately 43% of the population of the region is under 15 years of age. The adult literacy rates range from 47% in Guatemala to 90% in Costa Rica and Mexico [PAHO, 1982a]. Poverty affects 71% of the population in Guatemala and 65% in Honduras [MIDEPLAN, 1983]. Less than 40% of house-

holds in eight countries (Bolivia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Paraguay, and Peru) have access to adequate water supply systems [PAHO, 1982b].

MALNUTRITION IN TROPICAL AMERICA

The data available in TA since the 1940s had identified protein-energy malnutrition, anemias associated with iron and folate deficiencies, hypovitaminosis A, and iodine deficiency as the most pressing nutritional problems of the area.

In the following section, the most recent data related to nutritional and health conditions are reviewed. Most data sources consulted are derived from national nutrition surveys that did not provide details about sampling procedures, the validity and reliability of the data, the methods of data collection, the growth standards used, or the procedures for data editing and processing. Thus, in most countries it was not possible to estimate or adjust for the confounding effects imposed by different methodologies. However, for some countries, the changes observed in rates cannot be attributed solely to methodologic differences in the data sets. Despite those difficulties of interpretation it is important to get a general notion of trends in light of the health goals proposed for the year 2000.

National Prevalence and Changes Over Time

Mortality. Mortality and indicators of growth retardation to a large extent reflect prevailing deficiencies of energy and protein. The mortality figures reported in this chapter are derived from national health statistics. While infant and child deaths are underestimated by official statistics, the present trend in most countries is towards improving the reporting system. Thus, if reductions in mortality are observed, these are generally underestimations of the true changes occurring over time. The information on infant mortality (IM) in TA in the 1970s is presented in Table I. The most important annual declines in IM are seen in Paraguay (5.7 deaths of children under 1 year of age per 1,000 live births), Costa Rica (4.2/1,000), Peru (3.8/1,000), and Mexico (3.6/1,000). Belize (2.5/1,000), Ecuador (2.2/1,000), Guatemala (1.9/1,000) and Panama (1.9/1,000) have also shown important reductions in IM during the 1970s. Some countries in Central America report IM that underestimate the true figures. In spite of that, five countries in TA still have IM above 50/1,000, the maximum acceptable figure established in health for all in the year 2000.

The 1- to 4-year mortality figures (1–4 YM) for the year 1970 and the period 1977–1981 in TA are shown in Table II [PAHO, 1982a; OPS, 1981; MS, 1983; Baum and Arriaga, 1981]. Marked annual reductions in this indicator are reflected in all countries, particularly in Guatemala (1.46/1,000) and El Salva-

TABLE I. Infant Mortality in Tropical America in 1970 and 1977–1981

Country	Years		Average annual reductions[a]
	1970	1977–1981	
Paraguay	93.8	48.1	5.7
Costa Rica	61.5	19.0	4.2
Peru	65.1	35.1	3.8
Mexico	68.5	39.7	3.6
Belize	50.7	27.5	2.5
Ecuador	76.6	61.0	2.2
Panama	40.5	21.5	1.9
Guatemala	87.1	70.2	1.9
Venezuela	49.2	32.1	1.7
Colombia	50.5	39.5	1.6
El Salvador	66.7	53.0	1.5
Brazil[b]	92.0	85.2	1.0
Honduras	33.2	24.9	0.9
Guyana	34.7	28.5	0.6
Suriname	36.7	35.1	0.2
Bolivia[b]	151.6	151.0	0.1
Nicaragua	42.8	42.9	0.0

[a]Reference period varies from 6 to 11 years.
[b]From Baum and Arriaga [1982], and based on census and household surveys.

TABLE II. Mortality for Children 1–4 Years of Age in Tropical America in 1970 and 1977–1981

Country	Years		Average annual reductions
	1970	1977–1981	
Guatemala	27.0	12.4	1.46
El Salvador	13.0	4.1	1.11
Mexico	10.6	3.3	0.91
Peru	12.5	5.2	0.91
Ecuador	14.9	8.1	0.85
Nicaragua	9.5	3.6	0.84
Honduras	11.4	4.3	0.79
Panama	7.6	2.1	0.55
Belize	4.3	1.6	0.45
Venezuela	5.2	2.6	0.35
Colombia	6.8	4.5	0.33
Costa Rica	4.4	0.9	0.32
Suriname	4.3	1.4	0.31
Paraguay	6.7	4.1	0.26
Guyana	3.2	1.9	0.08

dor (1.11/1,000), where previous rates were among the highest in the region. The less dramatic annual reductions are seen in countries with previously low levels of 1–4 YM in 1970. With the exception of Colombia, Ecuador, Guyana, and Paraguay, all countries had a drop of at least 50% in the 1–4 YM during the period of analyses.

Incidence of growth retardation. A child with a weight for age below 75% of the median of an internationally accepted reference pattern is defined here as suffering from weight retardation (Gómez II and III) [Gómez et al, 1956]. The latest reports of incidence of growth retardation in children are shown in Table III. The highest rates of second- and third-degree malnutrition in children are found in Guatemala (30.5%) [Valverde et al, 1981], and Honduras (29.5%) [INCAP/CDC, 1972]; while in Colombia and Costa Rica the respective figures are 8.3% and 4.8% [Mora, 1982; Jaramillo, 1983]. The rates of growth retardation, 15% or less, reported from Nicaragua, Panama, El Salvador, and Venezuela [Parillón, 1982; INCAP, 1983; PAHO, 1982c] are also low compared to rates observed in other developing nations.

Comparable data on weight for age are not available for other countries. Nevertheless, the nutrition survey of Bolivia, conducted in 1981 [INAN, 1983], disclosed that 49% of children 6–59 months old had heights below two standard deviations of the reference pattern, as compared to only 22.4% of Colombian children [Mora, 1982]. Other countries, such as Peru and Ecuador, have reported rates of growth retardation based on growth patterns or reference values (25th percentile) that underestimate the true incidence of growth retardation [Amat and Cunurisy, 1981; PAHO, 1982c].

The information on changes in the incidence of weight retardation in TA countries is shown in Table IV. Important improvements occurred in El Salva-

TABLE III. Percentage of Children Under 5 Years of Age Weighing Below 75% of Standard Weight for Age (W/A) in Tropical America

Country	Year	Incidence (%)
Costa Rica	1982	4.8
Colombia	1977-1980	8.3
El Salvador	1978	10.4
Panama	1980	11.6
Venezuela	1974	13.6
Nicaragua	1966	15.0
Belize	1973	19.2
Brazil	1968	19.9
Honduras	1967	29.5
Guatemala	1977	30.5

TABLE IV. Percentage of Children Under 5 Years of Age Weighing Below 75% of Standard Weight for Age in Tropical America, 1965-1968 and 1974-1982

Country	Years		Average annual reductions
	1965-1968	1974-1982	
El Salvador	27.5	10.4	1.32
Venezuela	19.0	13.6	0.68
Colombia	15.7	8.3	0.62
Costa Rica	13.5	4.8	0.54
Guatemala	33.6	30.5	0.28
Panama	11.9	11.6	0.02

dor, Costa Rica, Colombia, and Venezuela. Panama maintained in 1980 [Parillón, 1982] the same low prevalence as that observed in 1967 [INCAP/CDC, 1972]. Guatemala showed a slight decline in the proportion of children with growth retardation, 33.6% in 1965 [INCAP/CDC, 1972] and 30.5% in 1977 [Valverde et al, 1981]. Data from Brazil that compare results from surveys conducted in the 1960s and 1970s also demonstrate a decline from 68.3% to 46% in the percentage of children under 5 years of age who are below 90% of appropriate weight for age [Dutra et al, 1981].

Incidence of vitamin A deficiency. Vitamin A deficiency is defined here as any case with a serum retinol level below 20 μg/dl (low and deficient levels). The latest reports of rates for children and for the total population in TA countries are presented in Table V. In El Salvador 31.3% of children below 60 months of age had low or deficient levels of serum retinol [MSPAS/INCAP, 1977]. Panama reported a vitamin A deficiency incidence in children of 18.4% [INCAP/CDC, 1972]. The more recent figures for children from Costa Rica (1.6%) [Novygrodt, 1983], Guatemala (9.2%) [Arroyave et al, 1979] and Honduras (less than 2.8%) [CID, 1980] indicate that vitamin A deficiency is no longer a public health problem in these three countries.

The proportions of the total population exhibiting vitamin A deficiency in Bolivia and Brazil are extremely high, being 45.1% and 43.0%, respectively [OPS, 1981]. The national nutrition survey conducted in Bolivia in 1981 reported a national incidence of night-blindness of 2.1% in children aged 6 to 59 months, confirming the existence of a severe deficiency of vitamin A in that country [INAN, 1983].

Table VI presents data on changes in vitamin A deficiency in children in the 1960s and from 1976 to 1980 [INCAP/CDC, 1972; MSPAS/INCAP, 1977; Novygrodt, 1983; Arroyave et al, 1979; CID, 1980]. The results show a marked decline in the incidence of vitamin A deficiency in all countries. Fur-

TABLE V. Incidence of Vitamin A Deficiency (20 μg/dl) in Children Under 5 Years of Age and in the Total Population in Tropical America

Country	Year	Incidence (%)
Children		
Costa Rica	1981	1.6
Honduras[a]	1980	2.8
Guatemala	1977	9.2
Panama	1967	18.4
Nicaragua	1966	19.8
El Salvador	1976	33.3
Total population		
Venezuela	–	4.9
Paraguay	–	6.6
Guyana	–	9.5
Colombia	1977-1980	12.4
Brazil	–	43.0
Bolivia	–	45.1

[a]The latest information from Honduras [CID, 1980] reported a percentage of cases below 30 μg/dl of 2.8%. Therefore, no more than 2.8% of cases are below 20 μg/dl.
(–) No information about the year was available [OPS, 1981].

TABLE VI. Incidence of Vitamin A Deficiency (20 μg/dl) in Children Under 5 Years of Age in Tropical American Countries During the 1960s and 1976-1980

Country	Period	Incidence (%)		Average annual reductions
		Previous survey (1960s)	Latest survey (1976-1980)	
Honduras	1967-1980[a]	39.5	2.8	2.82
Costa Rica	1966-1981	32.5	1.6	2.06
El Salvador	1966-1976	50.0	33.3	1.67
Guatemala	1965-1977	26.2	9.2	1.42

[a]For 1967, information from INCAP/CDC [1972]. Regarding figure for 1980, see footnote a, Table V.

thermore, two surveys conducted in children under 5 years of age in six communities of rural Honduras—one in 1978 prior to the initiation of a program designed to fortify sugar with vitamin A and one in 1980 after 2 years of sugar fortification—showed that the proportion of children with serum retinol levels below 30 μg/dl was reduced from 35% to 2.8% [CID, 1980]. In Honduras, Guatemala, and Costa Rica, national programs fortifying sugar with retinol palmitate were implemented in the 1970s.

TABLE VII. Incidence of Endemic Goiter in the Total Population of Tropical America

Country	Year	Incidence (%)
Colombia	1965	2
Costa Rica[a]	1979	4
Panama	1975	6
Mexico	1972	8
Guatemala[a]	1979	10
Venezuela[a]	1966	13
Brazil[a]	1976	14
Peru	1975-1976	15
Honduras	1966	17
Paraguay	1976	18
Nicaragua	1981	20
El Salvador[a]	1973	24
Bolivia	1981	61

[a]School-age children.

Incidence of iodine deficiency. The incidence of iodine deficiency has been evaluated by either the percentage of the total population or of the school-age population with any clinical evidence of goiter.

The latest reports documenting the incidence of endemic goiter in the total population in TA are presented in Table VII. Bolivia, Ecuador, Peru, Paraguay, Brazil, Guyana, Venezuela, El Salvador, Honduras, Guatemala, and Nicaragua have rates above 10% [INCAP/CDC, 1972; OPS, 1981; INCAP, 1982; DeMaeyer et al, 1979; Quezada, 1979]. Colombia and Costa Rica have successfully eliminated clinical cases of iodine deficiency, as less than 5% of the populations have goiters. In Suriname, Mexico, and Panama the latest reported figures on incidence of goiter are less than 10% [DeMaeyer et al, 1979; Flores et al, 1981; Parillón, 1979].

The changes in the incidence of endemic goiter have been well documented in TA countries as reflected in Table VIII. With the exception of Paraguay and Brazil, dramatic improvements have been seen in endemic goiter rates in most countries.

Incidence of anemia. No current national statistics on the magnitude of iron- and folate-related anemias are available for TA countries. The data available by the end of the 1960s describing the proportion of pregnant women with hemoglobin levels below the World Health Organization (WHO) norm (less than 11.0 gm/liter) in different regions or cities of TA countries are shown in Table IX [Royston, 1982]. The Pan American Health Organization collaborative study, conducted in the early 1970s in cities of Brazil, Colombia, Guatemala, Mexico, Peru, and Venezuela, showed anemia rates of 28.5% in pregnant women, 17.3% in nonpregnant women, and 3.9% in adult males

TABLE VIII. Incidence of Endemic Goiter in Different Periods in Tropical American Countries

Country	Period	Incidence (%)		Average annual reductions
		First survey	Latest survey	
Nicaragua	1978-1981	33	20	4.3
El Salvador	1967-1973	48	24	4.0
Colombia	1945-1965	45	2	2.2
Panama	1967-1975	16	6	1.2
Costa Rica	1966-1979	18	4	1.1
Guatemala	1954-1979	38	10	1.1
Peru	1967-1976	22	15	0.8
Mexico	1950-1972	20	8	0.5
Brazil	1956-1976	18	14	0.2
Paraguay	1965-1976	18	18	0.0

TABLE IX. Estimates of Percentage of Pregnant Women With Levels of Hemoglobin Below the Norm* in Tropical American Countries

Country	Year	(%)
El Salvador	1969	15
Brazil	1968	20
Colombia	1968	22
Guatemala	1965	34
Peru	1968	35
Mexico	1968	38
Venezuela	1968	54
Guyana	1971	55

*Less than 11 gm/liter.

[Cook et al, 1971; Royston, 1982]. Iron-deficiency anemia was widespread in both high and low socioeconomic groups. Serum folate deficiency was found in 10% of women. Serum B_{12} deficiency was identified but only in pregnant women [Royston, 1982].

Variation in Mortality and Malnutrition Within Countries

The following analyses of variation in mortality and in the nutritional status of children within TA countries are based on data available from Costa Rica, Guatemala, and Panama.

A survey of schoolchildren's height conducted by Costa Rican teachers in 1979 showed dramatic differences among the 80 "cantones" in the numbers of children with attained height below 90% of the expected height for age. Five cantones had a rate of height retardation above 22%, and in another five, the proportion of children with heights below 90% ranged from 4.4 to 6.3% [Valverde et al, 1980b].

A survey of schoolchildren's height was conducted in Panama in 1982 [MS/ME, 1983]. The information was disaggregated for the 514 municipalities into which the country is divided. The percentage of children with a height more than two standard deviations below the median height of the (US) National Center for Health Statistics (NCHS) reference pattern [Hamill et al, 1979] was 21.8%. However, a total of 14 municipalities had rates of height retardation (>2 SD below the NCHS median) above 70%, whereas in 34 municipalities, no children were found whose height was >2 SD below the reference median. Similar data are available from other countries [Mora, 1982; SGCNPE/INCAP, 1980].

Data documenting differentials in the nutritional status of children according to the occupation of the head of household also have been reported. Information available from a national nutrition survey conducted in Guatemala in 1980 showed that in families whose heads of household were farmers with less than 0.7 hectare of land, 57.1% of children were reported with height retardation, as compared to 34.7% in those families where the head of household was a skilled employee [SGCNPE/INCAP, 1980]. Similar findings have been communicated from other TA countries [SIN/MS, 1980; Franklin et al, 1982].

Variation in IM in 1978, at the canton level, in Costa Rica is illustrated in Figure 1. The hatched areas represent cantones with IM above 35/1,000; areas

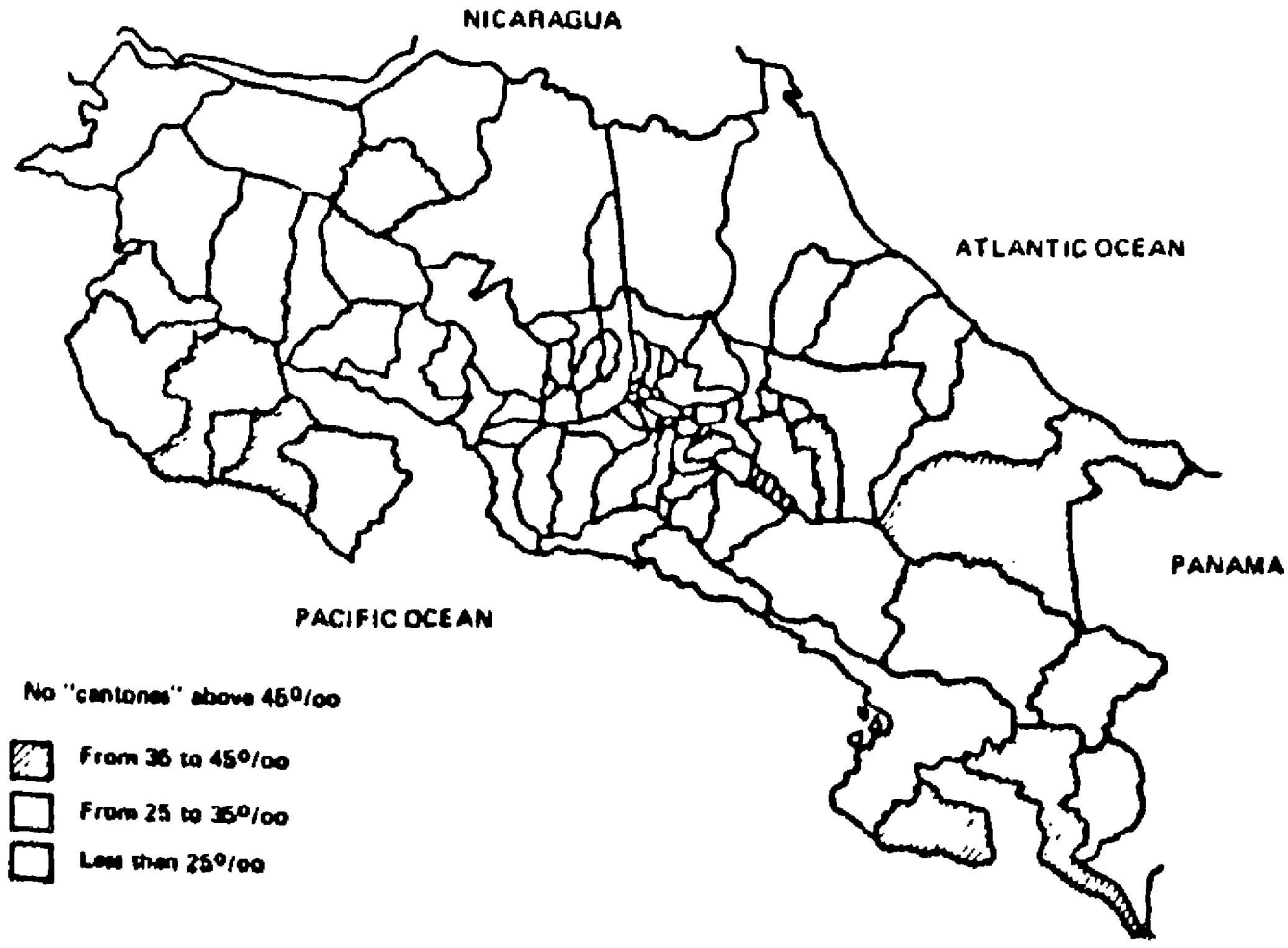

Fig. 1. Infant mortality by canton, Costa Rica, 1978.

in white are cantones exhibiting IM below 25/1,000 [Bermúdez, 1980]. Similar data describing differentials in IM in the 66 districts of Panama for 1982 have been reported [MS, 1983].

The probability of dying during the first 24 months of life has been reported by region in Guatemala [Haines et al, 1981]. The probability ranged from 92/1,000 children in the Central Region to 176/1,000 children in the Southern Region. During the period 1964–1973 the annual decline was observed mostly in nonindigenous populations (4.0/1,000) and to a lesser extent in indigenous groups (1.2/1,000).

Ecology dictates the differentials described. Poverty and malnutrition are concentrated mostly in rural communities. For example, the prevalences of height retardation in different ecological regions of El Salvador have been reported elsewhere [Valverde et al, 1980a]. Half of the children in coffee-growing areas are height-retarded, whereas in the urban slums only 33% are found in the same category. On the other hand, data gathered on schoolchildren in Costa Rica and Panama have shown that the areas inhabited by a higher proportion of Indians exhibit the highest levels of malnutrition [Valverde, 1980a; MS/ME, 1983]. Coincidentally these are also the most deprived regions within countries.

The coastal regions and lowlands are dedicated to banana, cotton, sugar, and other cash crops, which are grown on large plantations employing full-time or part-time laborers. The low-quality land is left for small farmers cultivating staple foods.

The high-quality land on the mountain slopes or the highlands is dedicated to coffee or other cash export crops, which are also grown on large plantations employing permanent and seasonal laborers. The poor land in the highlands also is left to subsistence farmers cultivating staple foods. These populations also form the seasonal labor force employed in the cotton and coffee harvests. Seasonal migration also entails family disruption and greater exposure to diseases.

DISCUSSION

The data show that nutritional deficiencies still exist in several TA countries. Within countries, important variation was identified in mortality and in the nutritional status by geographical location and occupation of the head of household.

Significant improvements in the incidence of protein-energy malnutrition and vitamin A and iodine deficiencies have occurred in several TA countries. These changes may be the result of the extension of health service coverage, improvements in agricultural production and local marketing systems and/or the efficient operation of food fortification programs.

Another contribution to improving the nutritional status of the region has been the decision to conduct periodic diagnoses of food and nutrition conditions and set up permanent nutrition information systems. These efforts have promoted political concern, both internationally and nationally, and facilitated the more rational allocation of existing resources to those families and/or communities in greatest need of social, health, and nutrition services.

The improvements in vitamin A status observed in Costa Rica, Guatemala, and Honduras can be attributed directly to the implementation of national programs adding vitamin A to sugar. However, in Colombia and El Salvador, where fortification of this type has not been implemented, the major contribution to improvements in vitamin A status and other nutritional deficiencies may be the extension of social services to dispersed communities. For example, in El Salvador a nationwide program, operating in 1973 and 1974, distributed vitamin A capsules through the health infrastructure [Sommer, 1976]. In many countries iron supplements are routinely distributed to pregnant women.

The analyses of changes in the nutritional conditions of the population of TA were based on incidence rates. However, population growth occurring during the study period may overshadow the nutritional improvements measured by these rates. In some countries in which national figures report less severe health and nutritional problems than in the past, more individuals are currently suffering from malnutrition in spite of the reductions in overall rates. For planning purposes and action programs the total number of persons at risk is often more useful than incidence.

Some CMA countries are now more exposed to man-made disasters owing to the rapid depletion of natural resources and to regional political conflicts. The latter has caused the displacement of entire communities and greater difficulties of access to basic services. Significant declines in the production of basic foods are also occurring in the same areas. Refugee problems are reported in Mexico, Guatemala, Honduras, and Costa Rica, and to a lesser extent in Panama.

The international crisis has also limited the capacity of governments to extend the coverage of social and nutritional services. Priority has been given again to direct government investments in productive activities, as opposed to the allocation of additional resources to social services. The deterioration of the purchasing power of national currencies has also imposed constraints on the normal operation of programs such as the fortification of salt and sugar, since the potassium iodate and the retinol palmitate are imported.

On the other hand, in almost all countries, governments have made efforts to identify and locate geographically the most deprived families and communities so that action programs can be better targeted. This has led to a more efficient provision of basic health and nutrition services to regions and commu-

nities that were traditionally excluded from these benefits. Still the lack of current valid and reliable health and nutritional data evidence the need for providing more support to the development of permanent food and nutrition information systems. At the same time, the likely impact of economic crises on health and nutrition indicators should not be overestimated. In spite of a severe economic crisis that occurred in Costa Rica from 1980 to 1982, the important improvements in health and nutrition conditions observed during the 1970s were maintained in the 1980–1982 period [Jaramillo, 1983]. The results of the 1977–1980 national survey in Colombia [Mora, 1982] provide similar evidence. Likewise, poor Guatemalan communities have not suffered a deterioration in health and nutritional conditions, in spite of the economic crisis and/or more limited access to social services [Delgado et al, 1983].

What changes in nutritional conditions can be expected from government interventions? This question is discussed in Gwatkin et al [1980], Delgado et al [1983] and Valverde et al [1983]. Undoubtedly, efficient food fortification programs have eradicated iodine and vitamin A deficiencies in many countries [Arroyave et al, 1979; DeMaeyer et al, 1979]. To estimate the expected nutritional effects of social and economic interventions by government, let us examine data from coffee plantations located in Western Guatemala. Families in these plantations were afforded a medical care program, an increase in minimum wages, and the distribution of an improved protein corn, Opaque-2, for 17 months [Valverde et al, 1983]. The overall incidence of weight retardation declined from 32.4% to 22.2% one year after a new wage scale was enacted. In those populations receiving the Opaque-2 corn, a medical care program, and an increase in wages, children's growth was better than in comparison populations with only medical care and improvements in wages.

The provision of medical care alone has been reported to produce declines in IM and 1–4 YM [MOH/INCAP, 1982; Delgado et al, 1983], but the effects are not immediately reflected in children's growth. In spite of dramatic declines in IM and 1–4 YM in Western Guatemala [Delgado et al, 1983] no reductions were seen in the percentage of children weighing less than 75% of standard weight for age after the communities were exposed for 3 years to an effective simplified medical care program [Valverde et al, 1983].

The variety of lifestyles should be a major consideration in designing interventions for deprived groups. For example, an increase in minimum wages will improve the purchasing power of laborers in coffee plantations but will not affect subsistence farmers or other laborers whose salaries are "above" minimum wages. On the other hand, small farmers will be positively affected by programs distributing land and credit, which to a much lesser extent may also affect other poor groups. Subsidies, through low-price shops, will not benefit populations residing in isolated communities, as these services are usually located in cities or in concentrated semiurban areas.

To conclude, mortality, anthropometric, and other data reflecting vitamin A, iodine, iron, and folate deficiencies indicate that nutritional problems still persist in TA countries. These deficiencies are often more dramatic when the data are analyzed by region and family type. Finally, nutritional problems in TA are not going to be eradicated by "a program" but rather by the operation of a set of programs of an economic and social nature under the responsibility of personnel who understand the behavior and the likely responses of communities to the proposed program activities. Furthermore, there is not—and let's not keep looking for—a single technological solution to overcome food and nutritional problems. It has to be accepted that if resources available are not directed efficiently to poor families, and if decisions of policy makers to implement effectively the proposed actions are not taken, malnutrition will continue to affect an important proportion of the population residing in Tropical American countries.

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