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**A NUTRITION STRATEGY FOR USAID-GUATEMALA**

March 1987



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**A NUTRITION STRATEGY FOR USAID-GUATEMALA**

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## Introduction

This report presents recommendations for the development of a strategy by which USAID/Guatemala may contribute to improving the nutritional health of the population of Guatemala. The recommendations are based on analyses of the Mission portfolio as it relates to the development of a nutrition strategy. The analyses have been undertaken within the overall framework of the "A.I.D. Policy Paper on Nutrition" (AID, 1982) which views nutrition as both a cause and a consequence of successful developmental programs and policies. The focus of the strategy is to seek ways of enhancing the positive nutritional impact of existing developmental activities and to identify those programs and policy areas which may be subject to modification in the light of nutritional considerations. This strategy was developed based on an analysis of available documentation and interviews with USAID/Guatemala and ROCAP personnel, during early March, 1987.

## The Nutritional Situation of Guatemala

Guatemala has a longstanding problem of chronic malnutrition, and large segments of its population are currently severely underweight. Evidence of this is given by the fact that in 1978, approximately 60 percent of the children living in the rural areas fell below 2 standard deviations from the median height for their respective ages to cause them to be classified as chronically malnourished. The most recent data from USIPE/INCAP (1986) (Table 1) indicate that seven highland departments have at least ten percent of the population that attends school (six to ten years of age) with severe retardation in height for age. These same seven departments have from 28 to 49 percent of their pre-school aged (five years old and younger) children classified as severely underweight for their ages (MSPAS/INCAP, 1986). The USIPE/INCAP height census of the primary schools may understate the prevalence of chronic malnutrition in the school aged population, because more than 60 percent of the school aged population does not attend school. The weight for age data from the Ministry of Health's "Centros Centinelas" may, perhaps, reveal a selectivity bias in that it represents preschool aged children being served by the health centers. If both sets of data are correct, they jointly suggest a very serious problem and possibly indicate that in the last five years the nutritional situation has worsened from that of the previous five years.

The prevalence rates of severe malnutrition imply that nearly one quarter of a million children in these departments were suffering the effects of deprivation in food and health. Other departments exhibit prevalence rates below these high levels, but only five (Guatemala, Escuintla, Izabal, Zacapa and

Table 1. Distribution of Nutritional Status By Departments for Guatemala

DEPARTMENT	Severe Chronic Malnutrition (percent) (a)	Moderate Chronic Malnutrition (percent) (a)	Risk Category  (a)	Severely Under- Weight (percent) (b)
Guatemala (Dept.)	4.1	20.4		
Guatemala Urban	2.8	17.5	LOW	
Guatemala Rural	5.5	23.3	MODERATE	
El Progreso	4.6	21.8	MODERATE	34.8
Sacatepequez	8.5	32.6	HIGH	28.0
Chimaltenango	13.2	38.8	VERY HIGH	32.9
Escuintla	4.3	21.4	LOW	34.8
Santa Rosa	5.1	22.4	MODERATE	29.0
Solola	20.4	44.2	VERY HIGH	44.4
Totonicapan	17.4	43.5	VERY HIGH	37.5
Quetzaltenango	9.9	34.7	HIGH	39.6
Suchitepequez	10.5	31.0	HIGH	28.5
Retalhuleu	6.3	28.4	MODERATE	28.2
San Marcos	10.5	35.2	HIGH	49.3
Huehuetenango	13.3	38.5	VERY HIGH	40.4
El Quiche	14.4	38.5	VERY HIGH	48.6
Baja Verapaz	9.1	29.2	HIGH	40.6
Alta Verapaz	7.7	30.5	HIGH	32.6
El Peten	5.1	24.6	MODERATE	23.3
Izabal	4.1	21.1	LOW	19.0
Zacapa	5.1	19.0	LOW	16.0
Chiquimula	7.4	26.1	MODERATE	33.3
Jalapa	9.1	28.4	HIGH	
Jutiapa	4.4	20.4	LOW	24.4
Country Totals	8.4	29.0		

a) Primer Censo Nacional de Talla. USIPE/INCAP, 1986

b) MSPAS/INCAP, Encuesta de Centros Centinelas, 1986.

Jutiapa) are rated by the authors of the USIPE/INCAP height census as representing a low risk of malnutrition among their children. The problem is almost exclusively a rural problem; Guatemala City was reported to have only a 2.8 percent prevalence of severely chronic malnutrition among its school aged population (see Table 1 ). In terms of relative risk, the risk of finding a severely stunted child in the school-aged population in the rural departments ranges from a low of twice for the rural part of Guatemala department to 7.2 times for Solola with respect to Guatemala City.

Poor health and inadequate sanitary conditions further aggravate the problem of poor nutrition. PAHO (1985) reported that the coverage of vaccinations was low (less than 50 percent for measles), that the prevalence of low weights at birth was ten percent, and that less than half of the population had access to safe water and adequate sanitation services. Table 2 which is derived from the 1980 census indicates that in three highland departments and in one lowland department (Zacapa) over 80 percent of the population does not have adequate sanitation. It is not surprising then, that 29.6 percent of all deaths are from parasitic diseases; Guatemala is only second to Peru in this regard among the Americas. The country is also low relative to the Western Hemisphere regarding expenditures on health as a share of GDP and on a per capita basis ( PAHO,1985).

Infant and childhood mortality indicators reveal indirect information about malnutrition and are valuable indicators of general well-being. Malnourished children are at higher risk of death from diseases of infancy and childhood than are well nourished children and the conditions that lead to increased mortality are also conditions that cause nutrient wastage in children. Therefore higher infant and childhood mortality rates are strong indicators that children, mothers, families and communities are at nutritional risk and living under generally poor conditions. In the past twenty years, Guatemala has experienced a 40 percent decline in infant mortality from 109 deaths per 1000 live births in 1965 to 66 deaths per 1000 live births in 1985 (World Bank, 1986). This rate is comparable to the other Central American countries with the exception of Costa Rica, which has the lowest infant mortality rate for Central America (20 deaths per 1000 live births). As seen in figure 1, Guatemala experienced an 80 percent decline in child mortality between 1960 and the mid 1980's and a 10 percent decline in general mortality.

### The Food Situation in Guatemala

In general, food availability and domestic production in Guatemala lagged the growth of incomes during the seventies, but

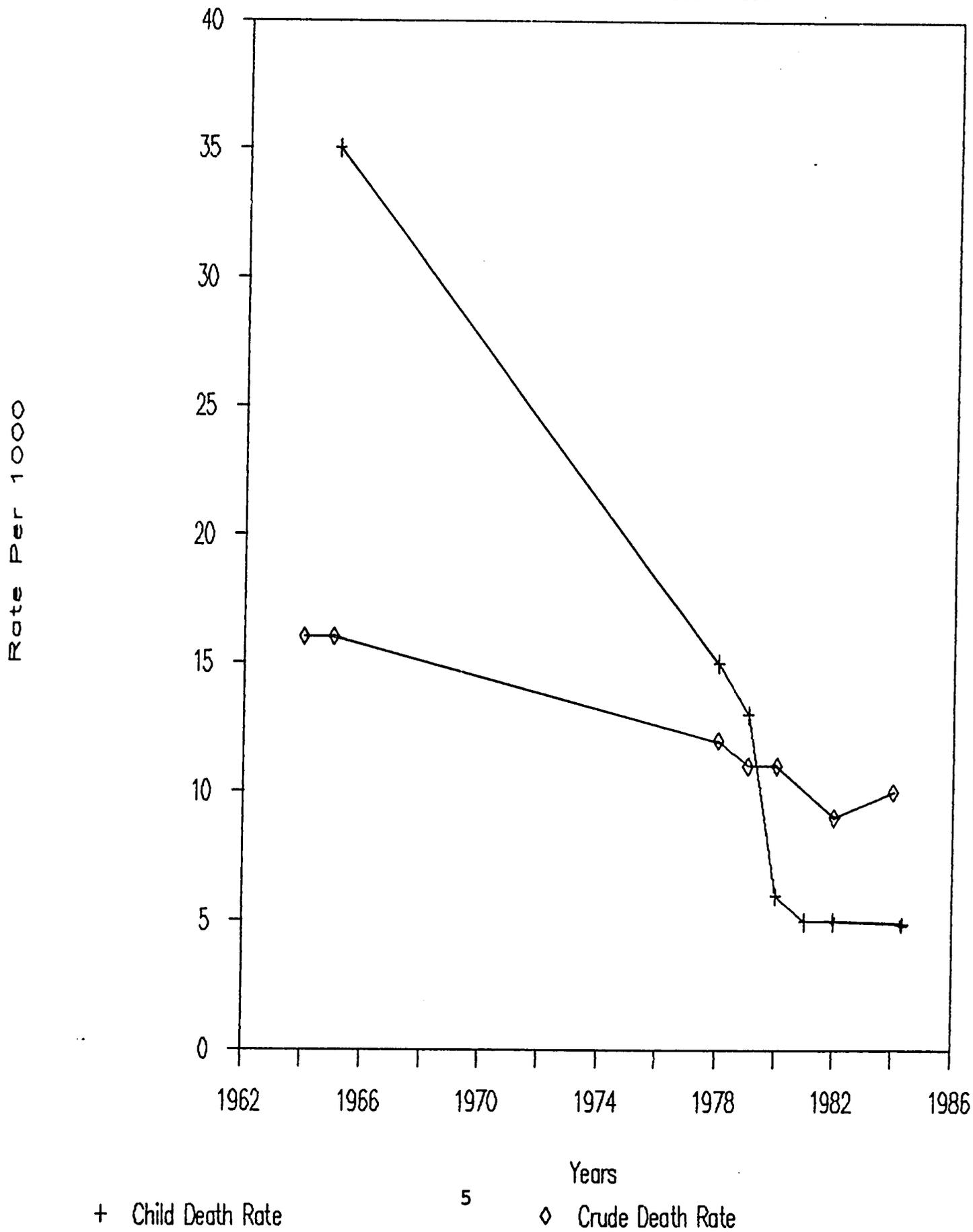
Table 2. Distribution of Basic Services by Departments, 1980.

DEPARTMENT	Number of Households	Percent with Safe Water	Percent with adequate Sanitation	Percent with Electricity
Guatemala (Dept.)	258442	64.6	47.2	74.8
Guatemala City	152523	75.2	52.8	85.2
Guatemala x City	105919	49.3	24.6	59.8
El Progreso	16362	35.8	4.9	35.0
Sacatepequez	23568	41.1	17.1	48.0
Chimaltenango	45466	29.0	9.6	20.0
Escuintla	65751	33.8	16.3	29.7
Santa Rosa	36490	29.2	6.1	25.9
Solola	28796	35.1	2.9	17.9
Totonicapan	37792	24.5	3.9	17.2
Quetzaltenango	67279	32.8	14.5	28.6
Suchitepequez	46431	28.4	15.0	22.6
Retalhuleu	28413	22.2	13.3	25.2
San Marcos	83384	27.3	6.0	13.6
Huehuetenango	75947	24.3	6.4	9.6
El Quiche	57901	23.9	5.2	6.4
Baja Verapaz	22871	24.1	3.6	10.5
Alta Verapaz	62623	11.4	4.2	7.6
El Peten	24851	18.9	0.6	15.8
Izabal	39402	31.0	8.7	23.6
Zacapa	23246	44.6	9.5	43.9
Chiquimula	33458	28.3	8.7	22.1
Jalapa	25822	18.4	8.6	17.9
Jutiapa	47577	27.1	9.8	22.6
Country Totals	1151872	35.7%	17.3%	32.3%

Data from the 1980 Census.

FIGURE 1. Child Mortality and Crude Death Rates

Trends for Guatemala 1960-1985.



declined appreciably with per capita incomes during the recent eighties. Figure 2 presents the plot of per capita incomes, per capita food production and per capita food availability on an annual basis since 1960. Between 1960 and 1980 aggregate food supplies averaged 80 to 85 percent of the FAO recommendation of 2400 calories per capita per day. The most recent estimate by INE(1986) for 1985 indicates that per capita calorie availability was 87 percent of the recommendation.

One basic limitation of these data is that the distribution of the food over households, persons and time(seasons within years) is unknown. The income distribution is sufficiently skewed that Reutlinger and Alderman (1980) estimated that in the 1970's 69 percent of the population had diets that were deficient in food energy. Since per capita incomes have declined by more than 15 percent in the 80's, the prevalence of deficient diets has undoubtedly increased.

Again, as in the case of the anthropometric indicators of malnutrition, the problem of inadequate diets is primarily a rural problem. Table 3 presents some basic data from the 1980 census of population, from the 1979 agricultural census and data derived from production estimates for basic grains in 1985 (INDECA,1985). These data were used to compare the production of basic grains in each department against the average daily diet for Guatemala as given by the food balance sheet for 1985 (INE, 1986). The numbers indicate that five departments in the Western Highlands(Solola, Totonicapan, Quetzaltenango, San Marcos, and El Quiche) would be judged as food deficit in terms of the per capita availability of basic grains if basic grains were to provide one half of the calories in the diet for the rural population alone. This deficit situation is based on the assumption that grain markets and the distribution of effective demand is such that these departments do not "import" grains for their rural population from other regions. It is not likely that these "deficit" departments could have competed with other regions and the urban areas for their share of the available grains. This view is further corroborated by the maldistribution of household incomes.

#### Aspects of the Distribution of Incomes and Poverty

Table 4 presents sectoral employment and household income data from the 1981 Income and Expenditure Survey undertaken by the Ministry of Economics. On a sector-by-sector basis rural households had incomes that were one-tenth to one-half those of the corresponding households in the Guatemala City urban area. Incomes of households dependent on agricultural activities in the rural area were one third those of households dependent on services,commerce or transport for employment in Guatemala City;these latter would usually be considered the urban poor. In

FIGURE 2. Income, Food Production and Availability

Trends in Guatemala 1960-1985

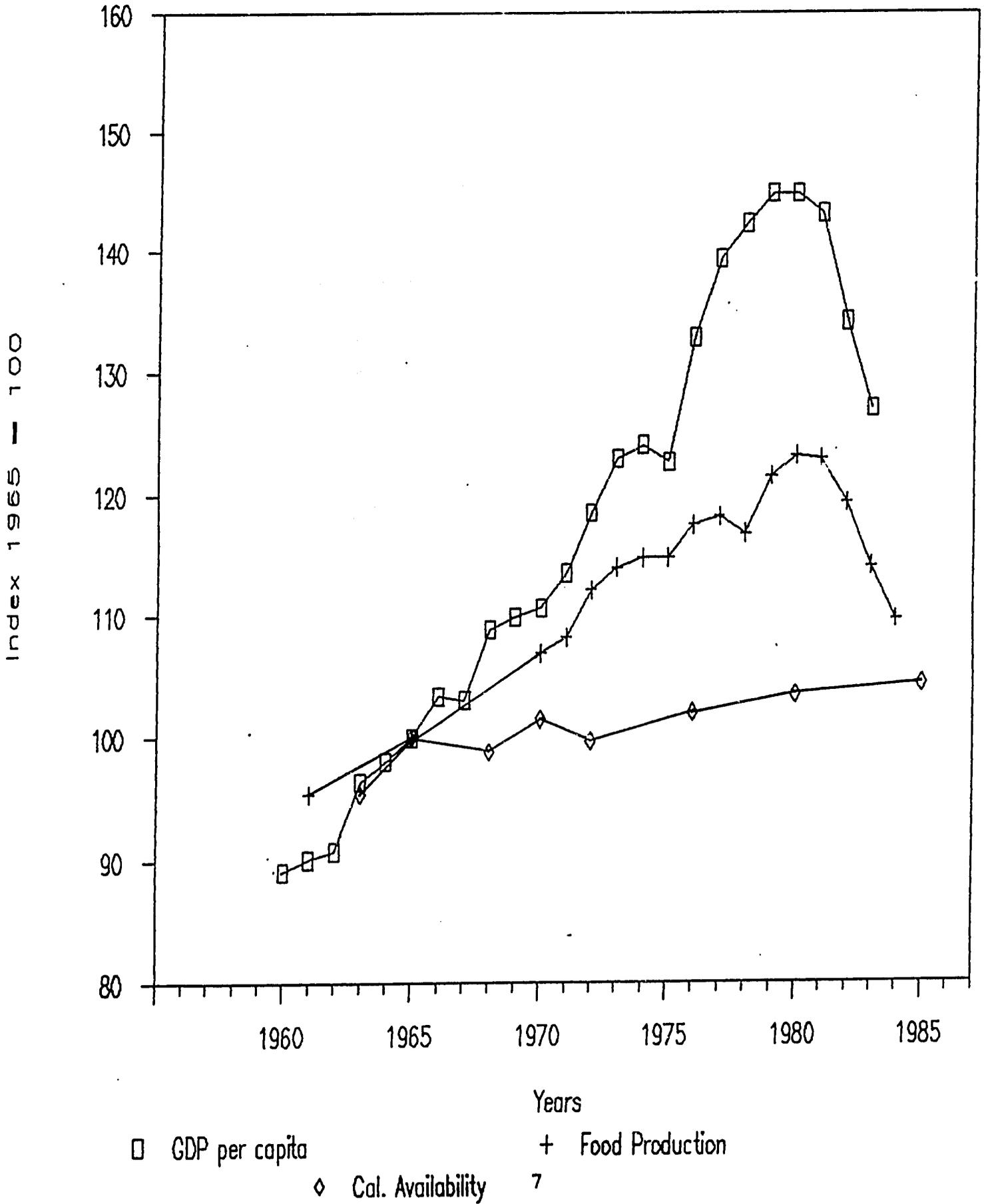


Table 3. Agricultural Production Estimates For Basic Grains,  
Agricultural Year 1985.

DEPARTMENT	Maize Plantings Manzanas	Maize Production Quintales	Bean Plantings Manzanas	Bean Production Quintales	Rice Production Quintales	Sorghum Production Quintales	Regional Food Balance for Grains for Rural Pop. (QQ/Rural Person per Yr.) (a)
Guatemala (Dept.)	21731	438966	8041	981000		25398	0.01
El Progreso	13603	261178	2401	23530		5769	0.53
Sacatepequez	10071	185306	2691	39558		1079	2.84
Chimaltenango	33307	842667	12610	137449		5064	2.83
Escuintla	64835	2256258	851	11403	128229	450030	8.27
Santa Rosa	35903	1016055	10113	104164	15419	299556	5.51
Solola	12077	237917	5111	26066			-1.84
Totonicapan	13610	293976	4033	25408			-2.79
Quezaltenango	22607	798027	7066	69953	54284	1137	-0.23
Suchitepequez	35013	1267471	469	5769	96019	3111	3.87
Retalhuleu	44827	1618255	261	3419	61955	21390	11.56
San Marcos	54351	1212027	13007	114462	18928	3510	-1.19
Huehuetenango	86363	2124530	24402	183015	1190	1455	1.89
E. Quiche	48104	918786	45068	157738	4163	8070	-0.54
Baja Verapaz	28222	555973	4682	45884		98057	3.11
Alta Verapaz	119454	2174063	16575	143652	99610	32686	4.86
El Peten	80701	1799632	16801	283937	23107		18.53
Izabal	39278	942672	7106	100194	196211	29429	4.78
Zacapa	21003	550279	2508	43388	7085	15543	3.19
Chiquimula	30912	868627	14324	237778	12599	204553	7.01
Jalapa	44634	1173874	13910	223951	2736	59914	11.96
Jutiapa	81706	2124356	31137	376758	113734	934544	14.64

INDECA Production estimates for 1985.

- a) The per person requirements in maize equivalents to fulfill one-half the recommended calorie intake were estimated at 4.67 qq. per person per year. This is based national food balance sheet data that indicates that half of the calories are provided by basic grains, primarily maize.

Table 4. Household Income by Selected Sectors of Employment for the Rural Areas and Guatemala City.

	Agri - culture	Manufac - turing	Transport - tation and Communi - cations	Finance and Insurance	Personal and Social Services
<b>RURAL AREAS</b>					
Income strata					
1200	233849	16116	1384	0	7084
2400	273259	23734	6052	365	15885
4800	82448	13068	6296	439	17791
7200	9036	1986	1023	0	2566
12000	4306	1243	877	231	1701
18000	231	0	0	0	0
36000	0	439	0	0	0
60000	0	0	0	0	0
120000	0	0	0	0	0
Average Household Income	1704.46	2388.18	3131.19	4304.35	2856.43
Total Households	603129	56586	15632	1035	45027
<b>CENTRAL URBAN AREAS (Guatemala City)</b>					
Income strata					
1200	113	1485	230	0	2458
2400	686	7906	2949	413	7577
4800	1265	13893	5004	1610	18261
7200	318	6807	3043	1895	9908
12000	654	4612	1861	2670	8643
18000	431	2681	475	2200	3740
36000	765	1610	340	935	1925
60000	225	297	79	274	273
120000	220	206	18	79	245
Average Household Income	16754.97	6909.76	5846.22	12348.00	7049.84
Total Households	4677	39497	13999	10076	53030

Ministry of Economics, 1981 Income and Expenditure Survey, 1981.

terms of income levels, in 1981 there were 303,943 rural households with incomes below Q 1200 per year, and of these 233,849 were in the agricultural sector as farmers and wage workers. In contrast, in Guatemala City, there were only 8651 households at this low level of income. In fact, in all of the urban areas of Guatemala, there were less than fifty thousand households at the lowest income level reported in the survey. The relative risk of being extremely poor is at least 3.5 times greater in the rural areas than in the urban areas. The relative risk of being extremely poor is 8.5 times greater in the rural areas than in Guatemala City; the relative risk of finding severe chronic malnutrition among school children in rural departments ranges from a low of twice for rural Guatemala department to 7.2 for Solola in relation to Guatemala City. Similar distributional imbalances between rural and urban incomes are obvious in the wages paid to affiliates of the IGSS (see data in the tables in Appendix A.)

In the rural areas, 79 percent of the labor force is engaged in agricultural activities, another six percent is employed in commercial efforts (probably agriculturally related), and 41 percent of rural incomes are derived from wage work. The rural labor force in Guatemala is primarily engaged in wage work and not farming (subsistence or commercial), because the imputed value of consumption of household produced foods amounts to 18 percent of the income of the rural sector as a whole, and only 29 percent of rural aggregate household income is derived from self employment as commercially oriented farmers. Efforts to improve rural incomes must emphasize labor productivity as well as land productivity, and there must be explicit recognition of the rural dwellers roles as agricultural laborers and as traders of goods.

The data from the census of population, the agricultural census of 1979, and the 1981 household income and expenditure survey (Table 5) imply that in 1987 approximately 650 thousand households are dependent on rural off-farm employment for their livelihood. One fourth of these are in the grain deficit departments that also exhibit high prevalences of severe malnutrition in children (Solola, Totonicapan, Quetzaltenango, San Marcos and Quiche). In the first four of these, 40 to 75 percent of the farms are smaller than 0.7 hectares (one manzana), and in the Western highlands about 25 percent of the rural households are landless. The landless rural households are not exclusively located in the Western highlands, for example, Jutiapa, Chiquimula, Zacapa, Izabal, El Progreso and Guatemala departments all have more than twenty-five percent of their rural households without land.

Table 5. 1979 Agricultural Census Data

DEPARTMENT	Total Number of Farms	Number of Farms less Than 1 Manzana	Percentage of Farms less than 1 Manzana	Percentage of Rural Landless	Average Size of Commercial Farms in Manzanas	Rural Jobs Needed (1987)
				(a)	(b)	(c)
Guatemala (Dept.)	17702	9418	53.2	79.6	19.9	135662
El Progreso	6693	2196	32.8	43.7	21.7	9505
Sacatepequez	9871	4301	43.6		5.9	4938
Chimaltenango	27784	10579	38.1	2.5	8.8	13253
Escuintla	29088	18399	63.3	35.2	63.5	47710
Santa Rosa	21364	7463	34.9	23.9	24.5	19269
Solola	18301	11027	60.3	1.6	5.2	13103
Totonicapan	27682	20440	73.8	16.3	4.2	32449
Quetzaltenango	30403	19705	64.8	27.5	17.1	42685
Suchitepequez	15437	12152	78.7	53.6	84.1	43196
Retalhuleu	12708	7506	59.1	37.6	35.3	20614
San Marcos	52781	21875	41.4	28.1	8.7	57768
Huehuetenango	58496	18525	31.7	10.7	7.8	33320
El Quiche	52227	15493	29.7		9.1	17787
Baja Verapaz	15201	4676	30.8	18.3	17.2	10389
Alta Verapaz	45949	12791	27.8	14.4	18.9	27299
El Peten	15036	4006	26.6	20.3	72.7	11193
Izabal	14953	5102	34.1	53.4	36.3	31125
Zacapa	8430	3123	37.0	49.5	32.5	15653
Chiquimula	18158	11194	61.6	28.6	15.9	24439
Jalapa	15731	3062	19.5	14.9	11.5	7899
Jutiapa	28567	7575	26.5	25.4	12.8	22873
Country Totals	531623	230608	43.4		19.1	642127

1979 Agricultural Census - Guatemala

Population data are from the 1980 census

- a) Estimated as a proportion of the labor force that is landless or has a farm smaller than 1 manzana.
- b) Commercial Farms > 1 Mz.
- c) The number of rural jobs needed was computed by subtracting the the number of commercial farms from the rural labor force as reported in the 1980 census and expanding by the rural rate of population growth .

## Education and Literacy

In Guatemala as a whole, the literacy rate is low (less than half); in some departments the adult literacy rate is less than one-third while in Guatemala City the literacy rate is almost ninety percent. The long term prospects for the rural areas remain gloomy, because only 35 percent of the primary school aged population attends school, and another 16 percent of the children are in the labor force; the remainder are probably engaged in non-remunerated work in their households. This massive retardation of human capital formation will impede any efforts to increase household and national income, regardless of the nature of such efforts.

## Nutrition within the Economic Policy Framework

"Everybody knows" that Guatemala has had a chronic problem with chronic malnutrition, and that the basic cause is chronic and extreme rural poverty. The root causes are the lack of the essentials for human capital formation -- lack of educational opportunities, lack of safe water, lack of adequate sanitation, and very low returns to the human agent in the rural sector. Economic and trade policies that have directly and indirectly taxed agricultural activities have aggravated the situation in the last five years. The picture may be even more bleak from an income point of view. The direct effects of price controls on food and taxes on agricultural exports, coupled with the indirect effects of trade and exchange rate policies that permit the terms of trade to be stacked against agricultural and rural activities, punish the producers of agricultural products and agricultural wage workers. Agricultural labor is punished relatively more, because with the structure of incentives already biased against agriculture, within agriculture the overvaluation of the exchange rate implies that imported factors of production (inputs) are relatively less costly than they would be under more neutral incentives.

The recent efforts to correct the overvaluation of the exchange rate and at removing price controls on agricultural commodities are steps in the right direction towards improving the nutritional situation of the rural poor. Collaterally there would seem to be no justification for distorting economic incentives for the sake of the urban poor; they too are likely to benefit from the current attempts at economic reform. The urban middle and upper income populations will complain if their artificially cheap food and services become more expensive relative to their labor earnings. Employment, output and profits will undoubtedly decline in those activities that have benefitted from access to the formerly cheap foreign exchange. But these sectors represent low growth potential and households that have enjoyed privileges at the expense of the majority.

The low income urban population has already experienced a substantial shock in that food prices rose by more than 60 percent during 1986 to represent 92 percent of the increase in the cost of living index computed by USAID/Guatemala. To the extent that service incomes are not likely to keep pace with such increases, perhaps this warrants consideration of a food assistance program which would be highly targetted to the very poor in urban areas.

While agricultural production costs will rise in absolute terms as a result of paying for imported inputs at higher Quetzal to Dollar rates, agricultural product prices will rise relatively more as a result of exchange rate reform if international prices are permitted to reflect themselves in domestic prices, as they apparently have. Historically, the import dependence of the costs of production for agricultural exports has been less than 20 percent (IDB,1986) so that the beneficial effects working through product prices of exchange rate reform should overwhelm any deleterious direct effects on producers as a result of higher input costs.

The exchange rate reform measures and future efforts to maintain a real exchange rate throughout the economy will probably depress some manufacturing activities. The temptation to compensate them through fiscal and financial measures should be strongly resisted. The economic effects of any ensuing unemployment would be minor relative to the long-term damage to the efforts to partially remove the bias against agriculture. In fact, one of the missing ingredients in the present government's economic program is a strong commitment towards trade liberalization. As stated in the 1986 IDB report on the economy, "it is unrealistic to expect manufacturing to have significant growth in output and labor demand since most of their output is for domestic consumption and for sale to the CACM". Since an important source of urban employment is related to tourism, it should be expected that the exchange rate reforms should reflect themselves positively in terms of service sector incomes.

#### Recommendations towards a Nutrition Strategy

The elements of the Nutrition Strategy coincide with USAID's efforts to support and improve the economic program of the government, as well as with the overall development assistance efforts in agriculture, health, population and education. In each of these areas the short-term strategy is to mobilize resources towards increased labor productivity as a means for improving total economic performance. The longer term strategy must be directed at improving the stock of human capital and improving the opportunities for its productive use. Economic program

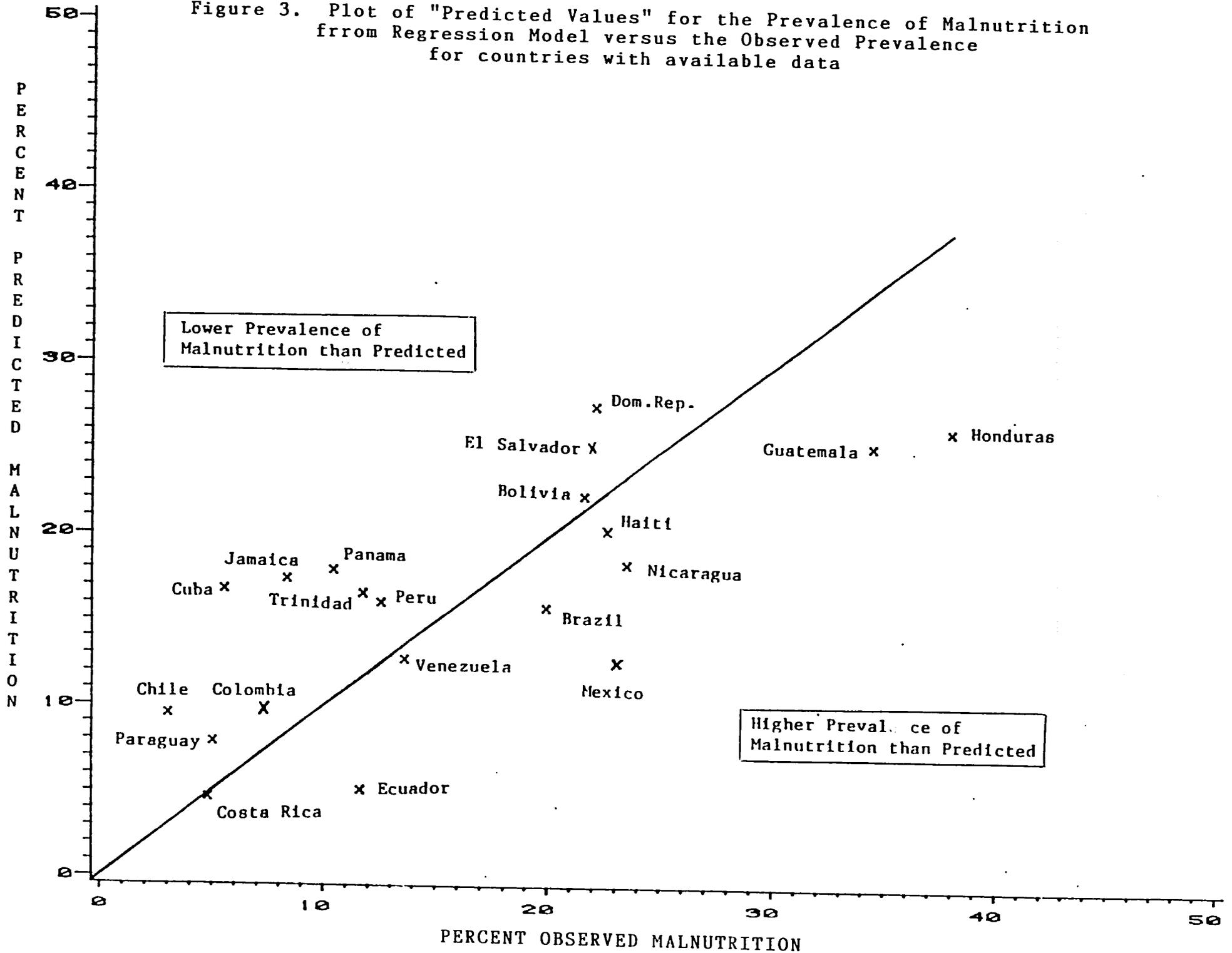
assistance can help create the policy leverage for further policy reform towards improved rural incomes and improved access to social and productive services for the rural population. In the short run local currency generations should be used to enhance the public and private sector's capabilities to absorb development assistance efforts of USAID and other donors.

The USAID health, education, population and agricultural portfolios are mutually reinforcing in the long and short run. Efforts in the health sector can in the short-run contribute towards releasing human resources for productive and investment activities; in the longer run these can be coupled to the education and population activities to help produce a more productive stock of human capital. An improved stock of human capital is required for the long term success of an agricultural assistance strategy that seeks to increase productivity in traditional and new commodities. Diversification of agricultural production towards commodities with higher value in domestic and international markets will require a higher skilled work force in the production and marketing systems of the agricultural sector.

Policy dialogue considerations and the food price effects of the reforms may warrant a small and highly targetted effort towards providing food assistance to the very poor in urban areas. USAID should lobby forcefully against price controls and food subsidies for the benefit of the general urban population. Such efforts would be regressive and could also be destabilizing to the longer term macroeconomic program.

Additionally humanitarian reasons and the Agency's Child Survival Initiative also require a strengthened effort towards improving the nutritional health of the poor in Guatemala. Even if the efforts to improve economic and fiscal performance were to be successful in a relative short run, Guatemala's historical experience suggests that the benefits of income growth and increased expenditure on health do not filter to the very poor. Figure 3, resulting from econometric analyses of the causes of malnutrition in the Latin America and Caribbean region as described in Appendix B, indicates that the nutritional problem in Guatemala is greater than that expected according to the country's level of economic development and the coverage of basic services. Perhaps such an anomaly relative to its hemispheric neighbors is due to the skewness in the distribution of income, food and basic services. The results of the regression model also suggested that improvements in income and food availability were insufficient to improve the nutritional health of the population without concomitant improvements in public and private health services. Accordingly, it is strongly recommended that USAID focus its health, education and rural income generation efforts in the five departments with the highest prevalence of malnutrition and that also appear to be in a food deficit situation. It is also recommended that certain specific nutrition

Figure 3. Plot of "Predicted Values" for the Prevalence of Malnutrition from Regression Model versus the Observed Prevalence for countries with available data



oriented activities be emphasized within the existing portfolio as targetted to the five departments. This report concludes with some suggestions for such activities to be directed towards the following five departments:

Solola,  
Totonicapan,  
Quetzaltenango,  
San Marcos, and  
El Quiche.

### Agricultural Program

The Mission's agricultural program appears to have a strong focus on rural income generation through approaches to improve the productive resource base and diversification towards higher value commodities, particularly in the departments suggested above for priority targetting of the nutrition strategy. Past USAID/ROCAP investments in developing and strengthening the agricultural service institutions have apparently led to significant improvements in resource productivity; on a national average yields of the basic grains have increased and the resource saving innovations (terracing and small-scale irrigation techniques) are being adopted. These efforts should be continued and strengthened, particularly in the targetted areas.

The search for and promotion of yield increasing technologies should continue and be complemented with efforts to increase labor productivity, e.g. labor saving crop protection. These efforts should be directed at the food commodities that are produced primarily for subsistence by the households of the Western highlands as well as the newly introduced higher value crops. As greater output is achieved for a given mix of land and labor effort in the production of the household's food, more resources will be available to respond to other profitable opportunities. The increases in resource productivity (human and physical) in the higher value commodities should lead to greater returns to labor whether provided by the farm family or hired from the neighbors.

An area that perhaps warrants greater emphasis within the agricultural portfolio is the area of marketing systems in the broadest sense. The need is two-fold; marketing services are an important source of off-farm employment, and institutional support is needed to insure that the crops promoted through the diversification efforts respond to effective domestic and international demands in quantity and quality. Furthermore, as the diversification efforts succeed it would probably be profitable for there to be specialization away from the basic food commodities. This might not occur or if it occurs, it might be nutritionally deleterious unless the marketing systems evolve

to provide reliable supplies of low cost food from those areas with comparative advantage in producing basic grains.

### Health, Population and Education Program

By now it has been clearly established that certain Latin American countries have been successful at substantially reducing childhood malnutrition and mortality. The efforts that have worked are those that have improved access to clean water and safe sanitation as well as community based approaches towards preventing the diseases that waste nutrients and synergistically increase the risk of death among malnourished children. These efforts are being intensified worldwide as part of the Agency's Child Survival Initiative; the Mission's efforts should be intensified in the child survival activities, particularly in the targetted areas. Given absorptive capacity limitations of the public sector institutions and the problems with fiscal revenue generations which are likely to worsen in the near term, the Mission should consider using private sector intermediaries for these activities. Consideration should be given to monetization of PL 480 commodities, via such intermediaries if necessary, to fund the local currency costs of such targetted activities.

Within the targetted departments emphasis should be given to maternal health, growth monitoring, at home management of diarrheal disease and extending the coverage and currency of vaccinations for childhood diseases. Water and sanitation efforts can have strong effects in the prevention of diseases and mortality. Community based and well funded water and sanitation projects could be an important source of off-season employment until the small-scale-cum-diversification efforts take hold.

Finally, regarding education, something must be done to keep a much larger proportion of the children in school. Consideration should be given towards monetizing PL 480 Title II high value commodities directly through the schools to compensate rural teachers and to compensate families for the foregone value of the children's labor effort. At-school feeding programs are inadequate in this regard-- it is the children's time in school that must be bought from their families. Perhaps allowing families to trade PL 480 resources such as oil in significant quantities (e.g. value equal to half a daily wage per child per day in school) would compensate them enough to improve the stock of human capital for the next generation of rural workers.

## Bibliography

- AID. A.I.D. Nutrition, AID Policy Paper Bureau for Program and Policy Coordination. Washington, D.C. May, 1982.
- INDECA. Basic grains data for 1985 Guatemala City, Guatemala.
- INE. Instituto Nacional de Estadística, Food Balance Sheet, 1986.
- IDB. International Development Bank, Social and Economic Mission Report for Guatemala. 1986
- Ministry of Economics. Encuesta de Ingresos Y Gastos 1981
- MSPAS/INCAP. Ministerio de Salud, Encuesta de Centros Centinelas, 1986.
- PAHO. Pan American Health Organization, Annual Report of the Director, Washington D.C., July 1985
- Reutingler S. and H. Alderman. "The Prevalence of Calorie Deficient Diets in Developing Countries". World Bank Staff Working Paper No. 374. The World Bank. Washington, D.C. March, 1980.
- USIPE/INCAP. Primer Censo Nacional de Talla, 1986.
- World Bank. World Development Report, Oxford Press, July, 1986.

## Appendix A

### Data Development

Table A1. Income Data from Social Security System

1985 DATA 1985

DEPARTMENT	NUM_EMP TOTAL	PRIVATE SECTOR	TOTAL SALARIES	PRIV_SECT SALARIES	PUB_SECT REMUN Q/P	PRIV_SECT Q\$/PERS	NO_AGRICULTURE WORKERS	TOT SAL'S AG_WORKERS	ANN SALS AG_WORKERS	COMM'L NUMB	SECT TOT SALS	WORKERS ANN SALS
GUATEMALA DEPT	278587	223848	802292560	694067888	1977.10	3100.62	12261	21110942	1721.80	50425	202351052	4012.91
EL PROGRESO	3898	2449	8820970	6509960	1594.90	2658.21	629	625153	993.88	148	260398	1759.45
SACATEPEQUEZ	10694	9114	14315169	11666505	1676.37	1280.06	5511	5746600	1042.75	220	455697	2071.35
CHIMALTENANGO	11004	8770	13216836	9655360	1594.21	1100.95	6275	5602334	892.80	173	216998	1254.32
ESCUINTLA	97175	92714	116929792	109413328	1684.93	1180.12	73597	76436999	1038.59	1520	2864379	1884.46
SANTA ROSA	33487	31486	31314561	27733707	1789.53	880.83	28557	23250890	814.19	186	303798	1633.32
SOLOLA	4498	2626	6282476	3413006	1532.84	1299.70	1507	2019726	1340.23	35	43400	1240.00
TOTONICAPAN	2202	604	3581599	981727	1626.95	1625.38	27	48089	1781.07	32	43500	1359.38
QUETZALTENANGO	29263	24067	40199254	32042434	1569.83	1331.38	13968	11276802	807.33	1475	4122970	2795.23
SUCHITEPEQUEZ	35884	33654	36500911	32289504	1888.52	959.46	28597	24621418	860.98	788	1258591	1597.20
RETALHULEU	19002	16433	23276953	19734509	1378.92	1200.91	11925	12935862	1084.77	561	998193	1779.31
SAN MARCOS	25961	22344	30380235	24045491	1751.38	1076.15	19976	18658418	934.04	390	412297	1057.17
HUEHUETENANGO	8103	4340	11149702	5119188	1602.58	1179.54	2348	1995681	849.95	150	260398	1735.99
EL QUICHE	4189	1603	6148115	1916954	1636.18	1195.85	538	336621	625.69	48	86799	1808.31
BAJA VERAPAZ	4148	2471	4812270	2330429	1479.93	943.11	996	504931	506.96	420	520796	1239.99
ALTA VERAPAZ	23891	19673	22449905	16542930	1400.42	840.90	14833	7261395	489.54	688	933093	1356.24
EL PETEN	3803	1776	6533881	3004155	1741.35	1691.53	290	288532	994.44	117	173599	1483.75
IZABAL	18543	15909	43314031	39306300	1521.54	2470.70	9601	25919813	2699.70	559	846294	1513.94
ZACAPA	5998	3662	8967706	5609186	1437.72	1531.73	1290	1033907	801.48	152	303798	1998.67
CHIQUMULA	4211	1521	7087794	3004192	1518.07	1975.14	111	240443	2166.15	129	195299	1513.95
JALAPA	2304	770	3705526	1102742	1696.73	1432.13	143	72133	504.43	44	65100	1479.55
JUITIAPA	4809	1531	7026613	1859571	1576.28	1214.61	592	456843	771.69	133	282098	2121.04

Table A<sup>2</sup>. Household Income by Sector of Employment

INCOME RANGE	AGRICULT	MINING	MANUFACTR	ELCT,GAS	CONSTR	COMMERCE	TRANSP+	FINANCE	PERS+SOC	OTHER	NOT IN EC
				WATER SRV		REST+HOTL	COMMUNIC	INS+RE	SERVICES		ACT POPN
TOTAL REPUBLIC	672993	2234	141575	10298	68319	126137	49001	13819	142192	4003	104325
1200	250060		21762	595	6548	19991	2773		14056	537	35206
2400	304451	1195	48104	4032	28102	43843	14575	1116	33467	1230	32005
4800	97352	435	44058	3610	24295	33744	19885	3464	53586	1177	20613
7200	11813	205	13706	1191	4298	14068	6309	2444	19994	462	8665
12000	6782	344	8305	530	3870	8726	4264	3240	13660	275	4990
18000	1189		2982	134	603	3204	687	2267	4986	79	1995
36000	901	55	2155	206	437	1874	411	935	1925	152	735
60000	225		297		91	382	79	274	273	73	36
120000	220		206		75	305	18	79	245	18	79
AVG. HH INCOME	1877.97	4357.39	3970.39	3924.70	3500.14	4234.78	4196.39	10285.06	4796.00	5780.26	3008.02
RURAL AREA	603129	741	56586	4179	27179	48938	15632	1035	45027	370	52956
1200	233849		16116	400	3394	13902	1384		7084		27814
2400	273259	596	23734	2879	14518	24297	6052	365	15885	370	18135
4800	82448	145	13068	900	7432	8730	6296	439	17791		6203
7200	9036		1986		809	1778	1023		2566		365
12000	4306		1243		1035	231	877	231	1701		439
18000	231										
36000			439								
60000											
120000											
AVG. HH INCOME	1704.46	2152.23	2388.18	2072.79	2565.00	1969.62	3131.19	4304.35	2856.43	1800.00	1474.18
CENTRAL URB(GUA)	4677	285	39497	1860	18227	36030	13999	10076	53030	3053	23774
1200	113		1485	56	1198	1546	230		2458	295	1270
2400	686	113	7906	56	5786	5727	2949	413	7577	638	3959
4800	1265	117	13893	600	6811	11650	5004	1610	18261	1061	7293
7200	318		6807	614	2175	6528	3043	1895	9908	462	5263
12000	654		4612	194	1051	5578	1861	2670	8643	275	3795
18000	431		2681	134	603	2546	475	2200	3740	79	1344
36000	765	55	1610	206	437	1738	340	935	1925	152	735
60000	225		297		91	382	79	274	273	73	36
120000	220		206		75	305	18	79	245	18	79
AVG. HH INCOME	16754.97	7402.11	6909.76	8286.45	5102.58	7936.30	5846.22	12348.00	7049.84	7045.53	6451.00
REST URBAN	65187	1208	45492	4259	22913	41169	19370	2708	44135	580	27595
1200	16098	0	4161	139	1956	4543	1159	0	4514	242	6122
2400	30506	486	16464	1097	7798	13819	5574	338	10005	222	9911
4800	13639	173	17097	2110	10052	13364	8585	1415	17534	116	7117
7200	2459	205	4913	577	1314	5762	2243	549	7520	0	3037
12000	1822	344	2450	336	1784	2917	1526	339	3316	0	756
18000	527	0	301	0	0	658	212	67	1246	0	651
36000	136	0	106	0	0	136	71	0	0	0	0
60000	0	0	0	0	0	0	0	0	0	0	0
120000	0	0	0	0	0	0	0	0	0	0	0
AVG. HH INCOME	2416.01	4991.72	3386.44	3836.96	3334.68	3687.91	3863.67	4895.05	4066.69	1659.31	

Table A3. Basic Population Data from 1980 Census

BASIC CENSUS DATA 1980

DEPARTMENT	AVG. HH SIZE (pers)	NUMBER of HOUSEHOLDS	TOTAL POPULATION	OF WHICH RURAL	IN LABOR FORCE
GUATEMALA CITY	4.9	152523	754243	0	276309
GUATEMALA xCITY	5.3	105919	556949	455456	167140
GUATEMALA DEPT	5.1	258442	1311192	455456	443449
EL PROGRESO	5.0	16362	81188	59019	19136
SACATEPEQUEZ	5.1	23568	121127	33752	36210
CHIMALTENANGO	5.1	45466	230059	144182	61750
ESCUINTLA	5.1	65751	334666	228549	96284
SANTA ROSA	5.3	36490	194168	149336	50759
SOLOLA	5.4	28796	154249	99584	38326
TOTONICAPAN	5.4	37792	204419	178882	54874
QUETZALTENANGO	5.5	67279	366949	228566	102200
SUCHITEPEQUEZ	5.1	46431	237554	170104	66407
RETALHULEU	5.3	28413	150923	108240	38711
SAN MARCOS	5.7	83384	472326	415571	115222
HUEHUETENANGO	5.7	75947	431343	371972	113934
EL QUICHE	5.7	57901	328175	290927	80670
BAJA VERAPAZ	5.1	22871	115602	94036	29388
ALTA VERAPAZ	5.1	62623	322008	275990	89075
EL PETEN	5.3	24851	131927	100180	37221
IZABAL	4.9	39402	194618	158334	50704
ZACAPA	5.0	23246	115712	83047	29603
CHIQUIMULA	5.0	33458	168863	128442	46317
JALAPA	5.3	25822	136091	97383	35899
JUITIAPA	5.3	47577	251068	202142	60325

Table A4. Literacy and Employment Data from 1980 Census

**BASIC CENSUS DATA**

DEPARTMENT	NUMBER of		OF WHICH		LITERATE	IN LABOR		PERCENT INDIAN	DEPENDENCY RATIO
	HOUSEHOLD	TOTAL POPULATION	RURAL	INDIAN		FORCE	INDIAN		
GUATEMALA CITY	152523	754243	0	50833	546053	276309	6.7	1.73	
GUATEMALA xCITY	105919	556949	455456	108939	319879	167140	19.6	2.33	
GUATEMALA DEPT	258442	1311192	455456	159772	865932	443449	12.2	1.96	
EL PROGRESO	16362	81188	59019	550	39035	19136	0.7	3.24	
SACATEPEQUEZ	23568	121127	33752	56694	67431	36210	46.8	2.35	
CHIMALTENANGO	45466	230059	144182	183718	89846	61750	79.9	2.73	
ESCUINTLA	65751	334666	228549	32964	156947	96284	9.8	2.48	
SANTA ROSA	36490	194168	149336	5794	88592	50759	3.0	2.83	
SOLOLA	28796	154249	99584	145316	41235	38326	94.2	3.02	
TOTONICAPAN	37792	204419	178882	198589	67352	54874	97.1	2.73	
QUETZALTENANGO	67279	366949	228566	222266	164037	102200	60.6	2.59	
SUCHITEPEQUEZ	46431	237554	170104	133883	92788	66407	56.4	2.58	
RETALHULEU	28413	150923	108240	47020	68111	38711	31.2	2.90	
SAN MARCOS	83384	472326	415571	228910	176612	115222	48.5	3.10	
HUEHUETENANGO	75947	431343	371972	284344	119635	113934	65.9	2.79	
EL QUICHE	57901	328175	290927	279689	67663	80670	85.2	3.07	
BAJA VERAPAZ	22871	115602	94036	66274	35065	29388	57.3	2.93	
ALTA VERAPAZ	62623	322008	275990	287987	63917	89075	89.4	2.62	
EL PETEN	24851	131927	100180	29776	53284	37221	22.6	2.54	
IZABAL	39402	194618	158334	44173	81404	50704	22.7	2.84	
ZACAPA	23246	115712	83047	3022	53723	29603	2.6	2.91	
CHIQUMULA	33458	168863	128442	59877	59185	46317	35.5	2.65	
JALAPA	25822	136091	97383	45547	49198	35899	33.5	2.79	
JUITIAPA	47577	251068	202142	20359	106429	60325	8.1	3.16	

Table A5. Distribution of Age of the Population according to the 1980 Census

Basic Census Data 1980.

DEPARTMENT	TOTAL POPULATION	OF WHICH			IN LABOR FORCE	UNEMPLD	AGE GROUP		
		RURAL	INDIAN	LITERATE			0-4	'5-9	OLDER
Guatemala Dept	1311192	455456	159772	865932	443449	10281	191507	164629	955056
Guatemala City	754243	0	50833	546053	276309	6482	102059	85925	566259
Guatemala Xcity	556949	455456	108939	319879	167140	3799	89448	78704	388797
El Progreso	81188	59019	550	39035	19136	716	13710	12656	54822
Sacatepequez	121127	33752	56694	67431	36210	559	20271	16929	83927
Chimaltenango	230059	144182	183718	89846	61750	931	41955	34320	153784
Escuintla	334666	228549	32964	156947	96284	1811	57981	49894	226791
Santa Rosa	194168	149336	5794	88592	50759	33069	30349	30349	133470
Solola	154249	99584	145316	41235	38326	343	28328	24231	101690
Totonicapan	204419	178882	198589	67352	54874	369	36447	31187	136785
Quetzaltenango	366949	228566	222266	164037	102200	1911	64831	54411	247707
Suchitepequez	237554	170104	133883	92788	66407	2169	42178	35494	159882
Retalhuleu	150923	108240	47020	68111	38711	981	27228	23262	100433
San Marcos	472326	415571	228910	176612	115222	1823	91336	74537	306453
Huehuetenango	431343	371972	284344	119635	113934	818	83158	68939	279246
El Quiche	328175	290927	279689	67663	80670	662	61468	53924	212783
Baja Verapaz	115602	94036	66274	35065	29388	2347	20667	18543	76392
Alta Verapaz	322008	275990	287987	63917	89075	918	63644	50570	207794
El Peten	131927	100180	29776	53284	37221	459	26376	21638	83913
Izabal	194618	158334	44173	81404	50704	1178	35743	31559	127316
Zacapa	115712	83047	3022	53723	29603	644	19191	17252	79269
Chiquimula	168863	128442	59877	59185	46317	538	29066	24828	114969
Jalapa	136091	97383	45547	49198	35899	238	25069	21634	89388
Jutiapa	251068	202142	20359	106429	60325	621	44307	40758	166003
Country Totals	4743035	3618238	2376752	1741489	1253015	53105	863303	736915	3142817

Table A.6. Population Data and Percentage of School-Aged Children who were chronically malnourished

DEPARTMENT	PERCENT LITERACY	PERCENT INDIAN	SEVERELY CHRONIC	DEPENDENCY RATIO
Guatemala (Dept.)	83.5	12.2	4.1	1.96
Guatemala City	89.6	6.7	2.8	1.73
Guatemala X City	74.7	19.6	5.5	2.33
El Progreso	63.8	0.7	4.6	3.24
Sacatepequez	73.0	46.8	8.5	2.35
Chimaltenango	52.6	79.9	13.2	2.73
Escuintla	62.3	9.8	4.3	2.48
Santa Rosa	59.6	3.0	5.1	2.83
Solola	36.2	94.2	20.4	3.02
Totonicapan	44.2	97.1	17.4	2.73
Quetzaltenango	59.7	60.6	9.9	2.59
Suchitepequez	52.2	56.4	10.5	2.58
Retalhuleu	60.8	31.2	6.3	2.90
San Marcos	51.4	48.5	10.5	3.10
Huehuetenango	38.1	65.9	13.3	2.79
El Quiche	28.2	85.2	14.4	3.07
Baja Verapaz	40.9	57.3	9.1	2.93
Alta Verapaz	27.4	89.4	7.7	2.62
El Peten	56.2	22.6	5.1	2.54
Izabal	56.9	22.7	4.1	2.84
Zacapa	61.1	2.6	5.1	2.91
Chiquimula	46.5	35.5	7.4	2.65
Jalapa	49.1	33.5	9.1	2.79
Jutiapa	57.1	8.1	4.4	3.16
Country Totals	36.7	50.1		

Table A7. Number of Households with Basic Services according to the 1980 Census

DEPARTMENT	NUMBER of HOUSEHOLD	OF WHICH NUMBER HAVE		
		WATER	SEWERAGE	ELECTRIC
Guatemala (Dept.)	258442	166867	121919	193217
Guatemala City	152523	114676	95845	129906
Guatemala Xcity	105919	52191	26074	63311
El Progreso	16362	5854	807	5732
Sacatepequez	23568	7672	4024	11324
Chimaltenango	45466	13197	4357	9093
Escuintla	65751	22237	10709	19516
Santa Rosa	36490	10652	2242	9453
Solola	28796	10100	842	5156
Totonicapan	37792	9259	1489	6483
Quetzaltenango	67279	22069	9771	19245
Suchitepequez	46431	13203	6950	10479
Retalhuleu	28413	6305	3768	7174
San Marcos	83384	22725	4977	11339
Huehuetenango	75947	18463	4898	7267
El Quiche	57901	13844	3037	3700
Baja Verapaz	22871	5512	819	2405
Alta Verapaz	62623	7147	2608	4771
El Peten	24851	4706	152	3925
Izabal	39402	12214	3419	9306
Zacapa	23246	10373	2197	10212
Chiquimula	33458	9454	2910	7401
Jalapa	25822	4753	2224	4612
Jutiapa	47577	12884	4685	10733
Country Totals	1151872	411510	198804	372543

Table A8. Maternal and Child Health Data

DEPARTMENT	PERCENT									
	PCT ILLITERATE MALE	PCT ILLITERATE FEMALE	PCT WITH ELECTRIC WATER	PCT GOOD WATER SEWERAGE	PCT W/O BREAST FEEDING	PCT. W/O BREAST FEEDING	NO FAMILY PLANNING	CHILDRN W VAC	CHILDRN W CARD	W CHILDRN W GRWT-MNTG
GUATEMALA CITY										
GUATEMALA xCITY										
GUATEMALA DEPT										
EL PROGRESO	43.2	54.4	41.7	40.9	55.6	36.2	95.3	78.3	58.4	48.1
SACATEPEQUEZ	24.2	42.7	66.3	53.6	10.7	25.1	95.5	88.9	60.7	48.1
CHIMALTENANGO	61.2	82.4	19.6	11.3	56.4	36.8	97.9	96	37.2	29.4
ESCUINTLA	42.6	54.6	33.1	52.3	32.8	36.4	90.4	81.4	55.6	23
SANTA ROSA	34.3	54.4	42.9	23.1	58.6	56	94.7	78.9	44.8	13.3
SOLOLA	61.9	82.4	34.3	51.6	51.2	66.7	96.3	97.2	48.3	48.9
TOTONICAPAN	45.8	85	12.2	39.3	52.4	73.1	98.5	99.3	34.9	15.4
QUETZALTENANGO	40.6	75.6	40.3	31.3	36.5	61.4	95.5	94.2	39.3	34.5
SUCHITEPEQUEZ	48.2	74.5	2.5	0	77.3	42	88.9	96	44	27.1
RETALHULEU	32.7	51.6	28.7	27.6	55.9	52	90.2	83.8	35.1	14.6
SAN MARCOS	43.7	69.8	6.4	19.4	30.5	54.7	98.3	94.6	28.9	30.4
HUEHUETENANGO	63.9	86.8	5.9	20.1	74.8	65.5	98.1	96.4		15.2
EL QUICHE	77.1	92.8	2.6	23.4	81.6	61.8	99.1	98.8	40.4	5.4
BAJA VERAPAZ	59.7	78	13.1	7.5	39.6	49.2	97.6	97.1	53.6	30.6
ALTA VERAPAZ	76.6	93.5	0.2	0	71.1	64.6	98.7	97.6	28.4	10.6
EL PETEN	42	56.1	0	22.8	48.9	40.1	94.5	89.3	40.4	34.1
IZABAL	33.2	46	61.1	68.5	25.5	37.5	89.1	74.2	48.4	21.9
ZACAPA	27.8	32.4	80.2	78.1	19.3	28.4	92	55.8	55.5	59.5
CHIQUMULA	55.7	66.1	30.6	17.9	77.2	39.4	98	89	52.5	34.5
JALAPA	59.2	82.1	0.1	0	93.1	46.3	95.1	99.6	22.1	7.4
JUJUTIAPA	46.9	45.3	55.6	58.1	67.6	40	93.3	82.9	69.6	22.6
TOTAL COUNTRY	48.2	65.2	32	31.2	50	47	95.1	89.8	43.9	27.4

a)SOURCE: Primer Censo Nacional de Talla. USIPE/INCAP,1986

b)SOURCE:Encuesta Nacional Simplificada de Salud y Nutricion Materno Infantil

**Appendix B**

**A Model for the Estimation of Malnutrition  
in Latin America and the Caribbean**

Country level data for Latin America and the Caribbean were analyzed using correlation and regression analyses in order to measure gross relationships between indicators of nutritional well-being and its correlates and determinants at the country aggregate level. Tables B1 through B3 present the aggregate data available for countries in the region.

Table B4 presents the bivariate relationships estimated by conventional correlation coefficients for the Latin America and Caribbean countries included in Tables B1 to B3 and for the subset of countries receiving AID assistance. The stronger correlations, overall, are given by the health system factors, although higher aggregate calorie availability is significantly associated with lower prevalences of malnutrition for all countries and for the AID-assisted countries. Broad based factors such as health system coverage (population per physician), health expenditures, and sanitation would appear significantly associated with improved nutritional status for all the countries. Additionally for the AID assisted countries, higher per capita incomes and higher levels of aggregate food availability would also seem to be significantly associated with lower levels of malnutrition.

If only this information were available, it could be interpreted to suggest that the nutrition problems in the higher income countries of the region would be addressed primarily through health sector initiatives, e.g. extension of coverage of health, water and sanitation services. For the AID assisted countries, these efforts would also yield significant improvements, but there would still be much to be gained from improved incomes and increased food availability. These results would also suggest that improvements in income and food availability are insufficient without concomitant improvements in public and private health services.

The prevalence of malnutrition was used as a dependent variable in multiple regression analyses with the health and socio-economic factors as predictors. The percentage of malnourished children was regressed on per capita incomes, population per physician, calorie availability, and coverage of potable water for all the countries with available data. The results of the regression analyses indicated that two-thirds of the variance across countries was explained by these factors, and of the variance explained, broad health coverage as measured by the population per physician was the most important factor; calorie availability was also a significant factor. Aggregate income was significant only when entered first in the model. Potable water exhibited no significant independent contribution in the aggregate data.

Analyses of the residuals from this model (Figure 3) suggested that there were important differences between countries which were not captured by the variables studied. In particular, Guatemala, Ecuador, and Honduras seem to have other specific problems beyond those reflected in the aggregate data. These countries have higher prevalences of malnutrition than those predicted by the regression model. On the other hand, Jamaica, Panama, Cuba and Chile have lower levels than those predicted by the model. Perhaps this suggests that specific nutrition oriented policies of these countries have had significant impact at the national level. These analyses indicate that health, food and income variables determine to a large extent the prevalence of nutrition related problems in the Latin America and Caribbean region.

Table B1. Trends in Welfare Indicators for Selected Countries  
within Latin America and the Caribbean  
between 1965 and 1984

	Population (millions) Mid-1983	GNP per cap. \$	Av.ann. growth rate	Av.ann.rate of inflation		Life expectancy at birth (years)		Population per Physician		Daily calorie supply per cap. (%) of reqmt.		Infant Mortality rate		Child death rate (1-4 years)	
				1983	1965-83	1965-73	1973-83	1965	1983	1965	1980	1982	1982	1965	1983
<b>A. LOW INCOME ECONOMIES</b>															
*Haiti	5.3	300	1.1	4.0	7.8	46	54	12,580	8,200	1,903	84	160	107	37	15
<b>B. MIDDLE-INCOME ECONOMIES</b>															
<b>1. LOWER</b>															
*Bolivia	6.0	510	0.6	7.5	36.2	44	51	3,310	-	2,158	90	161	123	37	21
*Honduras	4.1	670	0.6	2.9	8.6	49	60	5,450	3,120	2,156	95	131	81	24	8
*El Salvador	5.2	710	-0.2	1.6	11.7	54	64	4,630	3,220	2,060	90	120	70	20	6
Nicaragua	3.0	880	-1.8	3.4	16.5	50	58	2,490	1,800	2,268	101	129	84	24	9
*Grenada <sup>a</sup>	0.1	880	-	-	-	-	-	-	-	2,166	96	-	21	-	-
*St. Vincent <sup>a</sup>	0.1	900	-	-	-	-	-	-	-	2,234	99	-	40	-	-
*Costa Rica	2.4	1020	2.1	4.7	23.2	64	74	2,040	1,460	2,635	118	74	20	8	1
*Peru	17.9	1040	0.1	10.1	52.3	50	58	1,620	1,390	1,114	90	131	98	24	12
*Dominica <sup>a</sup>	0.1	1080	-	-	-	-	-	-	-	2,018	90	-	13	-	-
*Guatemala	7.9	1120	2.1	1.9	9.9	50	60	3,830	8,610	2,115	97	109	67	16	5
*St. Lucia <sup>a</sup>	0.1	1130	-	-	-	-	-	-	-	2,390	102	-	27	-	-
*Belize <sup>a</sup>	0.2	1150	-	-	-	-	-	-	-	2,714	-	-	20	-	-
*Jamaica	2.3	1300	-0.5	5.9	16.9	65	70	1,930	2,830	2,489	111	51	28	4	2
*Dominican Rep.	6.0	1370	3.9	2.7	8.5	54	63	1,720	2,410	2,179	96	103	63	14	5
*St. Kitts/Nevis <sup>a</sup>	-	1390	-	-	-	-	-	-	-	2,038	91	-	46	-	-
*Paraguay	3.2	1410	4.5	4.3	12.6	58	65	1,840	1,310	2,820	122	74	45	7	3
*Ecuador	8.2	1420	4.6	6.2	16.6	53	63	3,020	760	2,072	91	124	76	22	7
*Colombia	27.5	1430	3.2	10.8	24.0	56	64	2,530	1,710	2,551	110	80	53	8	3
Cuba	9.8	-	-	-	-	67	75	1,550	720	2,997	130	54	20	4	1

Table B1. Trends in Welfare Indicators for Selected Countries  
(cont.) within Latin America and the Caribbean  
between 1960 and 1984

	Population (millions) Mid-1983	GNP per cap. \$	Av. ann. growth rate			Life expectancy at birth (years)		Population per Physician		Daily calorie supply per cap. (% of reqmt.)		Infant Mortality rate		Child death rate (1-4 years)		
			1983	1965-83	1965-73	1973-83	1965	1983	1965	1980	Total	1982	1965	1983	1965	1983
			2. UPPER													
*Antigua and Barbuda <sup>a</sup>	0.1	1840	-	-	-	-	-	-	-	1,979	88	-	11	-	4	
Chile	11.7	1870	-0.1	50.3	66.2	59	70	2,060	1,930	2,669	109	103	40 <sup>b</sup>	14	2	
*Brazil	129.7	1880	5.0	23.2	63.9	57	63	2,180	-	2,623	110	104	40	14	6	
Argentina	29.6	2070	0.5	24.1	167.8	66	69	640	430	3,363	127	59	36	4	1	
*Panama	2.0	2120	2.9	2.4	7.1	63	71	2,170	980	2,498	108	59	26	4	1	
*Mexico	75.0	2240	3.2	4.8	28.2	59	66	2,060	-	2,976	128	82	52	9	3	
*Montserrat <sup>a</sup>	-	2440	-	-	-	-	-	-	-	2,118	94	-	-	-	-	
*Uruguay	3.0	2490	2.0	51.7	51.0	69	73	870	540	2,754	103	47	38	3	2	
*Venezuela	17.3	3840	1.5	3.3	11.7	60	68	1,270	990	2,557	104	71	38	6	2	
*Barbados	0.3	4340	-	-	-	-	-	-	-	3,020	134	-	24	-	-	
Trinidad & Tobago	1.1	6850	3.4	5.7	15.6	65	68	3,820	1,360	3,083	127	47	28	3	1	

\*AID assisted countries.

Source: World Bank, 1985.

<sup>a</sup>Sources: AID Bureau for Latin America and the Caribbean, Division of Health and Nutrition, 1985.  
Caribbean Food and Nutrition Institute (CFNI), 1984.

<sup>b</sup>Castaneda (1985) reports Infant Mortality Rate for Chile in 1983 equal to 21 deaths per 1000 live births.

Table B2. Health Indicators for Selected Countries in Latin America  
and the Caribbean in the 1980's

	% newborn wt.-2,500 g.	% deaths <sup>1</sup>	Immunization		% Pop. Potable water	% Pop. Sanitary waste disp.	Consult. inhab./ year	Health Expend. per cap.\$	Total health expend. <sup>2</sup>	% Nat'l budget health
			DPT3	Measles						
A. LOW INCOME ECONOMIES*										
*Haiti	17.0	19.4	8.7	-	32.0	19.0	20.0	9.0	3.0	10.0
B. MIDDLE-INCOME ECONOMIES										
1. LOWER										
*Bolivia	10.0	16.6	16.6	62.0	36.0	18.0	-	2.0	6.0	18.3
*Honduras	9.2	27.4	70.0	66.0	69.0	44.0	100.0	43.0	7.0	13.0
*El Salvador	8.7	11.0	45.0	41.3	58.8	50.8	1.1	14.0	-	8.7
Nicaragua	15.0	-	23.9	23.0	43.8	19.6	210.0	-	-	-
*Grenada <sup>a</sup>	-	-	76.0	31.0	85.0	26.0	-	-	-	-
*St. Vincent <sup>a</sup>	8.0	-	86.0	92.0	95.0	95.2	-	-	-	-
*Costa Rica	9.6	4.4	77.9	79.2	92.8	94.8	2.6	71.3	5.7	28.0
*Peru	9.9	45.9	27.8	34.7	49.0	36.0	60.0	15.0	4.5	4.1
*Dominica <sup>a</sup>	10.0	-	-	-	91.1	50.0	-	-	-	-
*Guatemala	10.0	29.6	55.0	38.0	49.8	33.6	40.0	21.8	3.7	13.5
*St. Lucia <sup>a</sup>	-	-	83.0	60.0	70.0	62.0	-	-	-	-
*Pelize <sup>a</sup>	-	-	54.0	44.0	63.2	91.8	-	-	-	-
*Jamaica	-	-	54.0	47.0	90.0	94.5	1.6	46.0	3.6	8.9
*Dominican Rep.	-	10.9	24.4	23.4	65.0	27.5	0.9	7.0	3.7	11.8
*St. Kitts/Nevis <sup>a</sup>	10.5	-	97.0	85.0	95.0	88.3	-	-	-	-
*Paraguay	6.5	12.5	67.0	62.0	25.0	87.8	70.0	12.0	4.9	5.2
*Ecuador	-	17.4	31.5	35.1	38.2	42.9	80.0	34.0	6.0	6.9
*Colombia	3.4	16.3	60.0	52.0	64.6	47.7	50.0	50.0	5.4	7.7
Cuba	8.5	2.0	86.1	72.0	61.2	31.0	5.2	-	-	21.0

Table B2. Health Indicators for Selected Countries in Latin America  
(cont.) and the Caribbean in the 1980's

	% newborn wt.-2,500 g.	% deaths <sup>1</sup>	Immunization		% Pop. Potable water	% Pop. Sanitary waste disp.	Consult. inhab./ year	Health Expend. per cap.\$	Total health <sup>2</sup> expend.	% Nat'l budget health
			DPT3	Measles						
2. UPPER										
*Antigua and Barbuda <sup>a</sup>	3.8	-	94.0	73.0	100.0	90.0	-	-	-	-
Chile	6.8	3.6	92.3	90.8	99.0	80.0	125.0	95.0	6.0	12.4
*Brazil	-	14.8	65.0	87.5	93.7	60.4	1.5	-	-	-
Argentina	8.2	2.0	100.0	-	95.0	100.0	-	184.0	6.2	11.8
*Panama	8.2	6.7	56.0	57.0	90.0	80.8	150.0	98.0	10.1	14.1
*Mexico	15.0	20.3	-	-	71.0	50.7	140.0	5.0	5.7	0.7
*Montserrat <sup>a</sup>	12.4	-	-	-	100.0	-	-	-	-	1.1
*Uruguay	8.3	2.6	55.0	90.0	75.0	40.0	350.0	-	-	7.8
Venezuela	9.1	8.2	71.8	45.0	90.3	78.2	180.0	130.0	3.0	9.1
*Barbados <sup>a</sup>	10.2	-	83.0	84.0	100.0	-	-	-	-	-
Trinidad & Tobago	10.2	4.7	60.0	60.0	71.5	53.7	-	245.0	1.6	-

\*AID assisted countries.

Source: Pan American Health Organization, 1985.

<sup>a</sup>Sources: AID, Bureau for Latin America and the Caribbean, Division of Health and Nutrition, 1985.  
Caribbean Food and Nutrition Institute (CFNI), 1984.  
(for these countries, vaccination coverage is for children under 1 year of age.)

<sup>1</sup>Percentage of deaths due to infections of parasitic diseases.

<sup>2</sup>Total health expenditure as a percentage of the GDR.

Table B3. Percentage of Preschool Children by degree of Malnutrition  
According to the Gomez Classification for Selected Countries  
Within the LAC Region, 1970's to 1985

Country	Year	Number in Sample	<u>Gomez criterion of malnutrition</u>			
			<u>Mild</u> First Degree	<u>Moderate</u> Second Degree	<u>Severe</u> Third Degree	Second and Third Degree
Antigua	1970 <sup>a</sup>	322	27.6	2.1	0.3	2.4
	1975 <sup>a</sup>	535	35.5	6.8	0.8	7.6
	1981 <sup>j</sup>	-	9.0	-	-	-
Argentina	1970 <sup>b</sup>	-	-	-	-	9.3
Bahamas	1974 <sup>a</sup>	321	14.6	0.6	0.9	1.5
Barbados	1969 <sup>c</sup>	248	-	15.3	1.2	16.5
	1975 <sup>a</sup>	3650	36.1	3.1	0.3	3.4
	1981 <sup>j</sup>	-	8.8	-	3.4	-
Belize	1973 <sup>a</sup>	3546	40.0	18.0	1.2	19.2
	1979 <sup>j</sup>	-	20.7	5.5	0.7	6.2
Bolivia	1966-69 <sup>a</sup>	968	29.0	10.2	0.7	10.9
	1981 <sup>d</sup>	-	-	-	-	21.6
Brazil	1968 <sup>a</sup>	569	48.4	17.2	2.7	19.9
Cayman Is.	1970 <sup>c</sup>	-	-	-	-	19.9
	1975 <sup>c</sup>	537	14.1	2.0	-	-
	1979 <sup>j</sup>	-	2.3	-	-	-
Chile	Curico					
	1966 <sup>c</sup>	1540	-	-	-	34.6
	1974 <sup>a</sup>	547709	11.5	3.1	0.8	3.9
	Santiago					
1971 <sup>c</sup>	50839	-	13.2	0.2	13.4	
1977 <sup>a</sup>	1070767	11.9	2.5	0.5	3.0	
Colombia	1965-68	-	-	-	-	15.7
	1968 <sup>b</sup>	3378	-	19.3	1.7	21.0
	1977 <sup>b</sup>	-	-	-	-	19.5
	1979	-	-	-	-	8.3
Costa Rica	1967 <sup>c</sup>	738	-	12.2	1.5	13.7
	1977 <sup>a</sup>	-	-	-	-	12.3
	1982 <sup>e</sup>	-	-	-	-	4.8
Cuba	-	-	-	5.0	0.5	5.5

Table B3. Percentage of Preschool Children by degree of Malnutrition  
(cont.) According to the Gomez Classification  
for Selected Countries Within the LAC Region,  
1970's to 1985

Country	Year	Number in Sample	<u>Gomez criterion of malnutrition</u>			
			<u>Mild</u> First Degree	<u>Moderate</u> Second Degree	<u>Severe</u> Third Degree	Second and Third Degree
Jamaica	1970 <sup>a</sup>	490	39.0	9.0	1.4	10.4
	1970 <sup>c</sup>	489	-	18.0	1.4	19.4
	1970 urban <sup>c</sup>	168	-	13.6	0.5	14.1
	1970 rural <sup>c</sup>	322	-	20.1	1.8	21.9
	1970 rural <sup>c</sup>	576	-	8.0	1.0	9.0
	1978 <sup>j</sup>	-	31.1	7.0	0.9	7.9
Montserrat	1971 <sup>a</sup>	372	28.0	3.5	0.0	3.5
	1975 <sup>a</sup>	1258	19.8	2.3	0.2	2.5
	1976 <sup>j</sup>	-	25.9	2.5	0.4	2.9
Mexico	1958-68					
	rural <sup>c</sup>	5576	-	27.5	3.4	30.9
	urban <sup>c</sup>	-	-	14.8	1.3	16.1
	1970 <sup>b</sup>	-	-	-	-	23.5
Nicaragua	1967 <sup>c</sup>	708	-	13.2	1.8	15.0
	1975 <sup>a</sup>	-	-	-	-	22.6
Panama	1967 <sup>c</sup>	624	-	10.8	1.1	11.9
	1980 <sup>h</sup>	3316	37.7	-	-	11.6
Paraguay	1973 <sup>a</sup>	41750	4.9	2.2	0.7	2.9
	1977 <sup>d</sup>	-	-	-	-	5.0
Peru	1965-71 <sup>a</sup>	83165	32.8	10.9	0.8	11.7
	Puno 1966 <sup>c</sup>	3313	-	4.4	0.5	4.5
	1972	11000	31.0	11.0	2.0	12.0
	1978 urban	-	19.5	5.7	2.4	8.1
	1978 rural	-	23.3	26.7	15.1	41.8
	Puno 1983 <sup>i</sup>	-	40.0	33.0	0.0	33.0
St. Kitts/ Nevis	1974 <sup>a</sup>	1209	33.3	5.4	0.1	5.5
	1980 <sup>j</sup>	-	34.2	7.8	0.4	8.2
St. Lucia	1974 <sup>a</sup>	363	33.0	9.0	1.9	10.9
	1980 <sup>j</sup>	-	19.7	3.1	0.3	3.4
St. Vincent	1983 <sup>j</sup>	-	32.1	5.1	0.9	6.0

Table B3. Percentage of Preschool Children by degree of Malnutrition  
(cont.) According to the Gomez Classification  
for Selected Countries Within the LAC Region,  
1970's to 1985

Country	Year	Number in Sample	Gomez criterion of malnutrition			
			Mild First Degree	Moderate Second Degree	Severe Third Degree	Second and Third Degree
Dominica	1970 <sup>a</sup>	117	19.7	5.1	3.4	8.5
	1976 <sup>a</sup>	396	38.6	10.3	1.8	12.1
Dominican Republic	1970 <sup>c</sup>	1100	-	23.0	4.0	27.0
	1977 <sup>b</sup>	-	-	-	-	24.0
Ecuador	1965-69 <sup>a</sup>	9000	28.9	9.6	1.2	10.8
	Guayaquil urban <sup>c</sup>	426	-	-	-	11.7
	1968-69	-	-	-	-	27.5
	Guayaquil suburban <sup>c</sup>	-	-	25.7	2.9	28.6
	1965 rural	578	45.8	18.7	2.1	20.8
	1985 <sup>f</sup>	-	-	-	-	13.3
El Salvador	1967 <sup>e</sup>	574	-	22.9	3.1	26.0
	1976 rural <sup>e</sup>	782	51.9	18.4	3.6	22.0
	1977 <sup>e</sup>	-	-	-	-	22.1
	1978 rural <sup>e</sup>	1108	42.8	10.0	0.5	10.5
Grenada	1972 <sup>a</sup>	-	44.0	10.0	0.0	10.0
	1975 <sup>a</sup>	1102	29.1	9.0	1.6	10.6
	1979 <sup>j</sup>	-	19.2	4.4	1.3	5.7
Guatemala	1967 <sup>c</sup>	763	-	26.5	5.9	32.4
	1975 <sup>a</sup>	-	47.5	29.5	5.4	34.9
	1976 rural <sup>e</sup>	571	45.7	31.9	4.9	36.8
	1978 rural <sup>e</sup>	649	47.8	26.0	3.2	29.2
Guyana	1971 <sup>a</sup>	964	43.0	16.0	1.7	17.7
	1971 urban <sup>c</sup>	262	-	19.5	0.4	19.9
	1971 rural <sup>c</sup>	702	-	35.0	1.7	36.7
	1983 <sup>j</sup>	-	44.8	9.6	1.1	10.7
Haiti	1961-65 <sup>a</sup>	-	43.0	27.2	7.0	34.2
	1975 <sup>a</sup>	1542	28.9	35.6	17.4	53.0
	1978 <sup>g</sup>	5353	46.0	24.1	3.2	27.3
Honduras	1967 <sup>c</sup>	633	-	27.2	2.3	29.5
	1977 <sup>e</sup>	-	-	-	-	38.0

Table B4. Correlation Coefficients of Economic and Health Indicators with the Prevalence of Moderate and Severe Malnutrition in Latin America and the Caribbean

Indicator*	All LAC Countries	Current AID Assisted Countries <sup>1</sup>
Population per Physician	+ .66	+ .82
Health Expenditures per Capita	- .54	- .29
DPT Immunization	- .48	- .08
Sanitation	- .48	- .49
Calorie Availability	- .36	- .50
Percentage National Budget Spent of Health	- .34	+ .20
Per Capita Income	- .24	- .56
Good Water	- .20	- .28
Measles Immunization	+ .11	- .08

Absolute values above 0.35 are significant at  $p=.1$

\*As defined in Tables 1 and 2 and presented here in order of the absolute magnitude of the correlation coefficients of the given indicator with the prevalence of malnutrition when data for all the LAC countries were included in the analysis.

<sup>1</sup> defined in Table 1.