DIETARY CONSUMPTION OF FAMILIES IN AHUATOPEC, MORELOS, MEXICO SUBJECT TO A DEVELOPMENT PROJECT

by

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INTRODUCTION

Malnutrition is a global nutrition problem (1). It has been identified as the world's number-one health problem (2). Latham (3) describes the causes of global malnutrition as an insufficient supply of necessary foods, an uneven distribution of the food that is available, and ignorance. In the developing countries the problems of food supply and nutrition have serious effects on health and well-being (4).

Food consumption, in many countries, is limited by the capacity to produce foodstuffs and by low purchasing power (5). The malnutrition problem has received much attention in recent years. However, interest in nutrition, in terms of relative priority, has not been reflected in development plans of most countries in the developing world (6).

Mexico is in a unique position when considering social and economic development. It has the problems of developing and affluent countries (7, 9). Thus, Mexico has been labelled as a developing and a developed country (7). The nutrition problem in Mexico is one of education and distribution of food rather than a need for increased production, according to May and McLellan (10).

Latham (11) indicates the need for careful planning of social development programs, i.e. applied nutrition programs, to provide measurement of their effectiveness. The chances of detecting that a particular change almost certainly resulted from a development program are enhanced by the collection of baseline data (12). This study was designed to provide some baseline data for development projects now being conducted by IMESA (The Morelos Institute of Higher Studies and Agricultural Science).

REVIEW OF LITERATURE

Mexico

The United States of Mexico is a unique example of development for developing countries throughout the world. Kiefer (13) stated that Mexico has demonstrated the advantages of political and economic stability. However, the country is not without problems that have great importance for development and for the state of nutrition (14). Mexico's situation is characterized by old and new problems (7) that are mainly influenced by the country's diverse geography, history, and people (16-18).

Geography

Land morphology has been most influential on Mexico's development in terms of its isolationary effect on the people. The many separate valleys and the varied resources have kept the people in separate communities until within the last 100 years. A gradual breakdown of the isolation has been occurring due to improvement in communication and education (14, 15).

The land is characterized by a plateau region that lies between two coastal ranges, the Sierra Madre Occidental and the Sierra Madre Oriental. The region extends northward to the United States of America border and southward to beyond Mexico City (15). The plateau region is divided into a Northern Mesa with varying degrees of aridity, and a Southern Mesa with tropical, subtropical and temperate areas (16). These regions form a varied pattern of food resources, agricultural practices, ways of life, and diets (20). The altitude rises from 1,200 meters in the north to almost 3,000 meters in the south. The southern part of the Southern Mesa is called the Central Mesa (16).

The Central Mesa, a major concern in this study, has high population densities, urban concentrations, and political influence (16). This heartland of Mexico, due to altitude, rainfall, and relief, constitutes the most favorable region in Mexico (19). Since the time of the Aztecs, the heartland has been the center of Mexican agriculture, industry, wealth, education and culture. Mexico City, the capitol of Mexico, is located on this plateau (16). The central plateau is a cropping region composed of both subsistence farming on small holdings, that produce mostly corn, potatoes, and beans, and flourishing dairy-farms and truck-gardens.

While only 12.1 percent of the total land area is suitable for crops (16), the country is self-sufficient and even an exporter of food. However, production is not evenly distributed. Large portions of the population are underfed and malnourished. Poverty, in city slums and rural areas, includes 40 to 50 percent of Mexico's population (21). This situation puts a drain on the economy because these millions of people offer an enormous potential for economic growth, if they could be drawn into the nation's economy. The rural areas are crowded with more than half of Mexico's work force. These areas cannot absorb the 500,000 new job seekers that population growth provides each year due to an extreme shortage of agricultural land (10, 14). On examining the farm situation, May and McLellan (20) indicate that "dangerous trends are becoming evident, such as the proliferation of uneconomic farmsteads and increased mechanization in an expanding economy."

History

The present problems in Mexico can partially be explained by the influence of Mexico's history, as Gruening (8) states: ". . . Mexico's history and present are of one piece." His statement is enhanced when one learns

that Mexico's past problems often emerge into the present. However, there are in essence many stages of human progress in Mexico. Although some problems, such as illiteracy, exist much as they did a hundred years ago, other problems, such as "the conflict between a culture of small farms operated by hand and one of large enterprises operated by machines" (7), are a culmination of an entire past (8).

The Mexican history and culture go back several centuries. Influence has come from three heritages: Indian, Spanish, and Anglo-American. The existence of these heritages exemplifies one of the important characteristics of this country's diversity. However, similarities have resulted from widespread contacts of Indian people among themselves before the Spanish Conquest, and the common influence of Spanish colonial institutions since the Conquest. Mexico has had a long and complex history of mingling of peoples and cultures (18).

Three major periods can summarize this "mingling": a) the Spanish rule from the conquest in 1521 to independence in 1821; b) the Pronunciamento (or insurrection) period which lasted from 1821 to 1934; and c) the period of stability from 1934 to the present. A paternalistic domination of the indigenous population by the combined authorities of the colonial power and the church characterized the first period. A social structure of two classes was formed. One class has little or no access to private ownership of the means of production, and the other class owned everything (17).

In February, 1821, the second period started with principles of independence and self-government established by the Plan of Iguala. Following independence, daily life worsened as the population decreased by one-sixth, the national income fell by 95 percent, and the output of the mines declined

by 75-80 percent (17). Economic paralysis resulted from the destructiveness of the wars that established independence and from the prolonged period of political instability of about 50 years which accompanied independence (22). The Pronunciamento period was influenced by large acreage haciendas. Owners of the large estates (or haciendas) were among the groups who battled to grab the power which Spain had lost. The Indian masses labored and starved on these haciendas, which covered as much as 500,000 hectares (17, 23). After February, 1857, a constitution was adopted which created the federal system that exists today. The condition of the rural population remained poor, while a civil war between warlords arose and haciendas decreased in size (17).

During the early part of the dictatorship of Porfirio Diaz (1877-1911), haciendas increasingly dominated the rural economy. In addition, a regime policy allowed massive foreign ownership of land and encouraged foreign investment in transportation and industry. The trends of the Diaz regime culminated in one of the most thoroughgoing revolutions of the twentieth century, the Mexican revolution of 1910 (17, 23). Miller (23) describes the trends as follows:

> . . . the growing encroachment on peasant, especially Indian, lands by the great estates fueled the discontent of the dispossessed, and industrialization began to create a new middle class of managers, professionals, and technicians, who came to resent foreign ownership and dictorial repression.

However, the precedents of Mexico's modern economic growth were set by the flood of foreign investment and the emergence of indigenous entrepreneurship during the Diaz dictatorship, as well as the impact of the 1910 revolution on Mexican social structure and patterns of social and economic mobility (22).

This modern economic progress originated with the 1917 constitution principles of education and property. The third period starts in 1934 at the time when the principles, in the form of the agrarian reform program, became solidly established. The program, a policy of reallocating oversized haciendas to provide more equitable ownership of agricultural production and income, parceled out the land to either individual owners or through ejidal (communal) ownership (17, 22). In 1960, the communal land recipients shared 50 percent of the combined crop and pastureland. The ejidos (parceled plots) are often too small to be worked effectively. The policy provides for the encouragement and protection of small holdings. Thus, the policy of redistribution pits the subsistence economy against modern agricultural development (14, 17, 20). The Revolution has changed Mexico in some ways, but the gap between the rich and the poor remains. The majority of the people in Mexico still experience the problems of poverty (23).

People

Mexico's problems, in turn, are influenced by its people. Two important characteristics of the people that play a significant role in Mexico's development and state of nutrition are illiteracy and population dynamics (14, 15).

The level of literacy in 1967 in the rural population was about 48 percent and in the overall population was about 78 percent (14). Costa Rica is the only Latin American country which spends a higher proportion of its national budget on schools. Mexico has built thousands of rural schools since the Revolution, but traditional evils still survive. The population explosion has outpaced the education development (15, 23).

The population growth rate of 3.5 percent per annum, one of the highest in the world, is one of three factors of population dynamics, which has great importance for development and nutrition. The other two factors are: a cityward trend and a young population, one-half of which is under 16 years of age (14). May and McLellan (14) recognize the possibility of a critical situation because:

a) The food resources should increase in proportion to the needs, but it is by no means certain that they have or will. The arable and pasture lands are nearly saturated. Increased production can come only from increased yields which require technological advances for which the country may not be ready.

b) The concentration of a majority of people in the money economy of the cities requires a boost in their purchasing power in order to pay the higher prices the farmer must get if parity is to be achieved.

c) Such a rise in income is contingent upon the availability of jobs in the industrial sections of the cities, since the rural areas no longer attract or absorb the younger generation. Increased opportunity for development is, in turn, contingent upon increased production at a time when capital, skills, and new markets are not readily available. Moreover, increased population creates pollution problems for which no solution is in sight.

Future strategies as solutions to Mexico's various problems are suggested by many (7, 9, 26). Miller (26) suggests that new sources of employment are needed in the countryside to prevent massive migration to urban areas. May and McLellan (7) suggest consolidation of small agrarian holdings into economically sound ones to redistribute the excess population into nonagricultural activities. At the same time the population must be kept away from the large cities as much as possible. Using more specific suggestions, Marret (9) provides a strategy similar to those of Miller (26), and May and McLellan (7):

> The remedy can only lie in the promotion of local schemes for irrigation and other such improvements to the land, livestock developments, and the provision of credit and technical assistance for the farmer. In the wider context the need is for education (both general and technical) and the opening up of communications in order to bring the Indian peasants living in the remote areas into touch with the world.

These future strategies accent the thoughts of Ruiz (15) who indicates that education alone is of little use for development unless major social and economic reforms are undertaken simultaneously in Mexico. With this concept in mind, May and McLellan (10) say that the problem of nutrition in Mexico is one of education and distribution of food rather than one of increased production.

Nutrition in Mexico

The health, well-being, and progress of Mexico's whole population is affected by serious nutritional problems. Ecological, economic, sociologic, cultural, sanitary, and psychologic factors together with rapid demographic increase and insufficient production, conservation, distribution and consumption of foods and nutritients result in chronic malnutrition of population groups. The problems are characterized by: a) lack of environmental adaptation, b) low resistance to illnesses, c) decreased efficiency or incapacity for work among adults, d) lack of school-oriented attitudes in children of school age, resulting in absenteeism and desertion, and e) decreased growth and development in early stages of infancy (27).

Garcia (27) states that 33 percent of the whole population is poorly nourished. An estimated 55 percent of total Mexican population is said to be suffering in some degree from malnutrition (28). In 1968 the population was divisible into three large groups, according to nutrition adequacy, as

follows: a) A marginal group comprised of some 12 million people from rural areas. This group had the lowest minimum income and highest infant mortality. The diet contained practically no food of animal origin. Corn provided more than half of the 2000 kcal intake per person per day. b) A group of about 20 million people from both rural and urban areas who enjoyed better social and economic conditions. The diet of this group was also inadequate. Corn was still the staple food but other foods including a low proportion from animal origin were eaten. c) A group of some 8 million people, mainly in urban areas, whose diet was often excessive.

Garcia (28) states that although the diet is often deficient, the adult population appears to be in good health. The ability of males to undertake much physical activity and of females to have a normal capacity for reproduction and lactation is the result of an extended process of nutritional adaptation. May and McLellan (29) and others (27, 30) indicate that the problem of malnutrition in Mexico concerns mainly children of all ages. According to Berg and Muscat (6), one-third of the children in rural areas are below 75 percent of the body weight-per-age standard.

Anderson et al. (31) have stated that the dietary pattern is fundamentally sound. The pattern is based on tortillas, beans, and chili peppers, and depending on socio-economic level it is supplemented to a greater or lesser extent by other foods which are locally cultivated, gathered wild, or purchased in stores and market places (29, 31, 32, 34, 35). The present-day diets are similar to those of the Indian population 1000 years ago. Three hundred years of Spanish influence and more recent United States technological influence has had only slight effect on diets, considering the whole population. The diets of the urban well-to-do

population, who comprise an estimated 20 percent of the total population, are sharply influenced by foreign cultures. Fifty percent of the population, who are working families in rural areas where most of the dietary resources are produced, consume a mixed diet, with corn, bread, pasta, rice, some meat, milk and eggs being eaten. The remaining 30 percent of the Mexicans eat as their Indian ancestors did, with 60-80 percent of the calories coming from corn and beans (29). Millan (34) discussed the lack of variety in the daily diet, the time consuming methods of cooking [although changes have been noted (35)] with food that is often poorly prepared from a nutritional viewpoint, and sanitary conditions of slaughter-houses, markets, dairies, transportation and preparation or manufacture of certain foods. In addition, Lewis (33) has noted that few families in the village of Tepotzlan maintain a uniformly good diet from day to day even by local standards. The months preceding harvest; fiestas, where money is saved for the fiesta activities by eating less in order to sell corn, beans, eggs and chickens for cash; and seasonal availability of fruits and vegetables are some contributing factors to the variation in the actual consumption of food.

Three meals a day are generally eaten. Corn and beans are found at nearly every meal (34, 36). The main meal of the day is usually eaten in the early or middle afternoon. The meal is based on tortillas preceded by a soup in which some meat may be present, and followed by beans (29, 31). Cravioto (37) approximated the per capita consumption of corn, of which essentially all is eaten as tortillas, at 280 grams daily, however individuals of low economic status may consume 700 grams daily. The quantities of tortillas eaten are important sources of protein, carbohydrate, fat, thiamin, niacin, calcium, phosphorus and iron, as well as 70-80 percent of

the daily energy supply (29, 37). The use of a lime solution for preparing most tortillas adds large quantities of calcium to the diet (31, 37). According to May and McLellan (29) legumes, especially beans, are the second most basic item of the Mexican diet.

Corn and beans are the main sources of protein in the diet. Garcia (28) indicates that the dietary protein is of low biological value. Protein of animal origin is only 20-25 percent of the daily per capita average of 50 grams of protein (31, 32). However, corn and beans complement each other with respect to certain amino acids, and a ratio of about two and one-half corn to one of bean can provide a complete amino-acid balance (38, 39).

The fruits of Mexico are varied, palatable and nutritious, but they are not a regular part of the diet. Children often eat them between meals. Vegetables are common but are not really considered food. However, larger amounts are being consumed now, than 20 years ago. Chillies, onions, and tomatoes are used abundantly as seasonings, especially as a daily sauce. These and other condiments of vegetable origin provide small amounts of vitamins and minerals (29).

According to Zubiran and Chavez (32) the diet in rural areas is deficient in calories, protein, riboflavin, ascorbic acid, and vitamin A. In some areas deficiencies of calcium and niacin also exist. Protein intake is inadequate even in better-provided urban areas. Deficiency disorders among the population, especially among children, arise from protein inadequate in quantity and quality and insufficient amounts of riboflavin, niacin or ascorbic acid (29, 32).

Iron consumption, however, is nearly always in excess. The prevalence of anemia is, therefore, remarkable. Low and/or lack of absorption may be

occurring (28, 29). Garcia (28) indicates the need for further study before conclusions can be made.

About 100 nutrition surveys were conducted between 1960 and 1970 in Mexico. Values for energy, protein and animal protein intakes for individuals in 58 of those surveys were lowest in the Yucatan geographical region. Lowest values for school children were found in southern Mexico and for pre-school children in Yucatan. Seventy percent of the pre-school children in the north were undernourished, while 90 percent of those in Yucatan were found to be undernourished. Breast-fed infants got about half of recommended intakes of protein and energy because of poor milk production by mothers and lack of supplements. Normal motherhood was not possible even though lactating and pregnant women consumed about 20 percent more protein and energy than other women (40).

Broad programs of nutrition are essential at national, regional, and local levels to improve the quantity and quality of the average Mexican diet (30-32, 34). A national policy of food for betterment of nutrition should consider following procedures such as: increasing milk and cattle production; aviculture and fishery development; improved methods of cultivation of individual or communal lands by teaching crop rotation and cultivation of new crops; teaching simple methods of preserving and processing foods; improve hygienics; increase financial income to raise peasant living standards; and intensive nutrition education campaigns (30, 34). The lack of public education has probably contributed to inadequate preservation, storage, refrigeration and distribution for animal protein products and thus to the lack of animal protein in the diet. May and McLellan (29) state that riboflavin, niacin, and protein deficiency problems probably result from

poverty, while malnutrition in suburban areas of major cities and in certain areas of subsistence agriculture results from traditional dietary patterns and localized shortages of the right foods. Anderson et al. (31) warn that attempts at modification should recognize the fact that there is much nutritive value in the food usually consumed. Imposing another food pattern may lower rather than improve the nutritional status of the Mexican.

Nutrition and Health

Working Efficiency

A close relationship exists between economics, social progress, and health (41). Good nutrition is important for health and working efficiency (42). Betterment of nutrition is recognized as a precondition for increasing economic productivity, especially in developing countries (43). Increases in work output have been associated with improved diets (44). Correa et al. (45) estimated the effects of increased calorie consumption on the productive capacity of the labor force in 18 countries. The increased calorie consumption in nine Latin American countries accounted for almost five percent of the growth of national product, a contribution almost as large as that attributed by education.

Reduced capacity to perform work is recognized as one of the long-range unfavorable effects of malnutrition. Low working efficiency is part of the vicious cycle of: lack of food--undernutrition and malnutrition--low working efficiency--low production of food (42, 46). A worker's efficiency is reduced by a) decreased resistance to disease, b) increased absenteeism, c) lethargy, lack of initiative and drive, and d) increased accident rates (42).

Job productivity is restricted by low levels of calorie consumption, as well as non-energy producting nutrients (45). The most important factor affecting work output, in terms of nutrition, is calorie intake (42, 44). Berg (44) says man is subject to the laws of thermodynamics; namely that energy must be absorbed in order that energy may be produced. Thus, metabolized reserves of the body must be replaced regularly by food (42).

Factors Affecting Food Consumption

Socio-economic factors. Malnutrition is predominantly a consequence of poverty; poverty is a consequence of restricted power (economic and political); and restricted power tends to produce life styles that perpetuate restrictions and debilitations on life chances, according to Waisanen and Fonseca (47). Gifft et al. (48) state that a prolonged poverty existence inevitably leads to life style adjustments that demonstrate acceptance of the realities of inadequate income.

The amount and type of food consumed, as well as attitudes about food, are greatly influenced by economic factors in the poverty situation (42, 48). The lack of money demands reconciliation of the relative importance of food compared to other needs (47, 48). Constraints on purchasing power of individuals in developing countries for foods of good nutritive value, such as meat, fish, and eggs, are due to low wages and income and underemployment or unemployment and lead to an unbalanced diet (41, 49, 50). Wheeler (4) states that where maldistribution of incomes exists, maldistribution of food also exists and that socio-economically deprived children are also deprived nutritionally.

Cravioto (51) reported on a long term study being undertaken in a Mexican community where malnutrition of some degree is prevalent among

pre-school children. The study is indicating that "third-degree" malnutrition is strongly associated with lack of social, emotional, and cognitive stimulation within the home, while there is no significant association between the annual per capita income of families in the study and the presence or absence of severely malnourished children.

In some cases, foods of good nutritive value may not be available. The situation, not uncommon in developing countries, necessitates programs for the provision of more varied foods, either through local production or by import (42). Popkin and Latham (49) indicate that programs place excess emphasis on commercially processed foods. These foods are not socially or economically appropriate for the poor and may contribute to a deterioration rather than an improvement in nutritional status. No product that relies on regular retail distribution is reaching the needy groups, because most food needs of the subsistence farmers, slum dwellers, and squatters are not filled by the formalized market system. In addition, the products have a high cost relative to the incomes of the poor.

Socio-cultural factors. Inadequate diet and poor nutritional status are problems often based on prevailing social and cultural customs which may prevent consumption of valuable foods, even when they are available (42). Wellin (52) states that cultural factors intrude on the consumption aspects of nutrition because "culture acts as a screen of values and perceptions through which a person views food, his own body, and the world."

A culture guides and protects, but it also limits perspectives and actions to provide for coping with the needs of individuals comprising a society, according to Grifft et al. (53). The hierarchy of needs, according to the Maslow theory of human maturation, goes from physical needs for

survival, to social needs for security, belongingness, prestige or status, to self actualization needs. Minimum satisfaction of each need is necessary before an individual can move to the next stage. Thus, an individual who is trying to get enough food to live cannot be interested in security for the future (54). Food needs are balanced against other needs, unless severe hunger is present. A deliberate choice to spend money on things associated with higher living standards rather than food may be justifiably wise. Better nutrition may be sacrificed for radios, furniture or automobiles (42, 48).

The socio-cultural significance of certain foods may be quite independent of its nutritional value. This significance has been described by food classifications or categories (42, 54, 55). Edible materials can be classified as a) inedible, b) edible by animals, c) edible by human beings but not by own kind of human being, d) edible by human beings such as self, and e) edible by self (57). Jelliffe (56) described an international system of classification that affects both developing and industrialized regions. The parallel food classifications which show how food consumption is affected world-wide are a) cultural superfoods, b) prestige foods, c) body-image foods, d) sympathetic magic foods, and e) physiologic group foods. The "cultural blocks" of limiting or restricting food intake are a frequent characteristic of these parallel classifications and are often the dietary cause of protein-calorie malnutrition in the vulnerable, mother and young children groups.

Nutritional Adaptation

The human body's responses to food deprivation is typical of the body's ability to adapt to changes in external environment (58, 59). Nutritional

adaptations occur on a continuum that ranges from well-nourished to starvation (60). A state of adaptation allows individuals living on inadequate diets to subsist (42).

Physical and metabolic adaptations can result from short-term to long-term dietary changes. Strenuous efforts are avoided as much as possible and tend to offset mild to moderate dietary limitations. Metabolic adaptations help to maintain a balance between dietary intake and the breakdown of body substances. Alternative metabolic pathways and adaptable endocrine regulatory systems and enzyme systems provide for the body's needs, if necessary materials that the body cannot synthesize are available (42, 45, 58, 61).

Energy demands for an individual greatly determine the effect of a given reduction in the diet. Keys (61) indicates that the conditions causing a food shortage often necessitate a high rate of physical work. According to Fabry (58), reduction of the total energy output is the final effect of adaption. After 6 months of caloric undernutrition, experimental subjects have shown a 20.7 percent caloric saving per day for decreased metabolizing tissue mass, a 11.2 percent caloric saving per day for lower tissue metabolism, a 34.9 percent caloric saving per day for reduced physical activity, and a 23.2 percent caloric saving per day for expenditure for work due to reduced body weight.

Young and Scrimshaw (59) note that children, particularly very young children do not have the ability to survive prolonged starvation as do adults. Growth stops almost immediately in a child deprived of food, due to high energy needs. Marasmus and kwashiorkor develop from deficiencies of calories and protein respectively. Small body size in impoverished countries is attributed to undernourishment which occurs at an early age for an

appreciable length of time. According to Read (62) severe malnutrition affects development of the brain and central nervous system.

Disease

A self-reinforcing cause-effect cycle is characteristic of the paramount world health problems of nutrition and infectious disease and their interrelationships. Resistance to infectious disease is lowered by malnutrition. Individuals with borderline nutrient inadequacies may in fact be subject to classical nutritional deficiencies that are precipitated by an acute infection (63, 64).

Pollack and Sheldon (64) indicate that host metabolism is accelerated and productivity is lost when infectious diseases and parasites are present. As a topic for study the resultant loss of caloric energy was calculated with respect to the costs of providing an equivalent amount of work for populations subject to dysentery, malaria, and tuberculosis. The findings indicate that nutritional losses are neither trivial nor overwhelming in given African and Latin American countries, which complicates the job of planning by developing nations.

Infants and young children are age groups extremely vulnerable to an environment which doesn't provide safe water, sanitary sewage disposal, and adequate shelter (63). Inadequate hygiene and poor dietary conditions favor bacterial and parasitic infections. Interferences in the process of digestion and absorption result in the many deaths from diarrheal diseases or from respiratory infections (63, 65). Malnutrition contributes to a very high mortality among one to four years of age. The malnourished child tends to be more heavily infested with intestinal parasites. In tropical and subtropical countries roundworms, which deplete the child's small

nutrient supply, are especially prominent. Constant loss of blood with increasing anemia is characteristic of hookworm infestation. A diet improved in quantity and quality provides a larger amount of nutrients to be shared between the child and its parasites. In addition, the disease burden is lessened even in the presence of parasites.

Development, International Nutrition, and Change

Nutrition is one of the many interrelated factors affecting human performance which need improvement in the developing countries. Berg and Muscat (6) indicate that the relative importance of nutrition and its relationship to many other factors may not be receiving adequate attention in the development plans of most countries in the developing world. Tiglao (66) states that to carry out a change in social systems, such as a nutrition program, requires involvement of various systems, such as agriculture, commerce and industry, education, health, public highways, and research. Social policy, that is recognition of the importance of developing human resources, plus economic policy must account for the interdependence of the various elements contributing to development efforts (67, 68).

According to Ward (68) a new order of priorities and urgency is emerging into a strategy for overcoming the interdependent obstacles to development. The strategy, a systems approach, has the following elements: a) priorities of money and manpower for the agricultural sector, b) credit, extension services, and basic inputs such as fertilizer, water, and improved seeds for enhancing farming, including small farms, c) slowing movement to large cities by providing peasant farmers with access to the regional and national economy through provision of power, water and roads and by building

intermediate market towns and regional cities, d) establishing market, cooperative, and financial services, and agri-industries in the intermediate centers for providing for consumer needs and for agriculture and farm processing, e) providing employment through labor-intensive farming, absorbing unskilled labor into large-scale building projects, and developing "intermediate technology" and service-type industries in the new urban centers, f) centering schools, technical colleges, hospitals, family health clinics and mobile health units in the new communities, and g) efforts are planned and developed with maximum regional and popular participation in decision-making and in capital formation processes.

Ward (68) indicates that this strategy has shifted development attentions away from "high abstractions" and "generalities of 'economic growth'" toward the urgent human needs. Meyer (69) states that development projects invariably result in serious changes in the whole structure of a traditional society. However, disruption of traditional cultural patterns may have its positive effect on economic growth. More emphasis on behavioral and educational change is needed for development programs rather than just on legal, political, and economic aspects.

Cooperative action has been called a powerful contributor to community development (67). Cleary (70) indicates that cooperatives provide opportunities for educating and training underprivileged people to assume new social and economic responsibilities. A cooperative is a society of persons who voluntarily join together to found and control it democratically. The members join together to promote economic interests according to definite principles accepted by each of them. Cooperative principles as specified by the International Cooperative Alliance are very human in doctrine. Six basic principles have been recognized (70):

a) open and voluntary membership
b) democratic control
c) limited interest, if any, on capital
d) the surplus belongs to the members
e) provision should be made for education
f) cooperation among cooperatives.

The different types of cooperatives are: a) a credit union, b) an agricultural cooperative, and c) a consumer cooperative.

Planning for change, using nutrition as an impetus for development, requires a perspective of nutrition relative to population, productivity and economic development, and society and government (71). Improved nutrition can lead to decreased population growth rates and even near stability due to an accompanying decline in mortality which has been shown to be followed by a decline in fertility. At the same time per capita incomes have risen to high levels. When confidence in the survival chances of first born children increases, parental need for additional children decreases. In addition, family planning programs may be enhanced by nutrition programs through measures for increasing child well-being associated with contraception (6).

Improved nutrition can facilitate productivity and economic development by reducing the encroachment of malnutrition on these factors. Malnutrition reduces life expectancy, especially in terms of child mortality, which reduces expected productive years (6, 45, 71). In Latin America 52 percent of all death of one to four year-olds are associated to some extent with malnutrition (6). Malnutrition also reduces labor productivity and increases associated costs due to decreased mental and physical growth. In addition, malnutrition interferes with the ability to learn, and thus reduces mental performance, regardless of malnutrition's ultimate effect on brain growth (71).

Improved nutrition may decrease the losses to a society that are beyond standardly recognized economic benefits. The benefits to society of leadership, equality, and human well-being need to be emphasized for development planning (6, 71). Potentially outstanding leaders of society may be lost or repressed because of malnutrition. The opportunity to lead that is not reached, limits the country's leadership elite and in turn inhibits the country's chances for economic development. Likewise, equality may be lost due to restricted social mobility. Adequate mental development, and thus adequate nutrition, is probably a prerequisite to programs for mobility developed through social policy. Human well-being may also be depressed in a society where an improved diet, both quantitatively and qualitatively, is not provided (6). Although developing economies may be constrained by the low purchasing power of portions of their populations, public policy can provide much of a population with the capability to enjoy available sources of consumption, whether measurable or not (6, 49, 72). Berg and Muscat (6) describe non-economic consumption as man's appreciation of nature, of love, of friends, of good talk, and of the joy of children, which include some of the major sources of satisfaction in life. Berg (71) suggests that indicators reflecting the quality of life, in addition to the traditional account of increased national wealth, should be used for setting priorities for development planning.

Planning for change, using nutrition as an impetus for development, also requires a diagnosis of a community's food situation and the nutritional status of its population. According to a technical group of the Pan American Health Organization (73) three specific indicators of the situation may be utilized: the net availability of foodstuffs for human consumption, the

actual consumption of foods in the various socioeconomic strata, and the nutritional status of the population. These indicators [or baseline data (11)] may provide cost, time, and impact information suggesting the emphasis for a nutrition intervention program. A more plausible decision is made regarding the emphasis of reliance on nutrition education, of increased food production, of reorientation of agricultural research, of change in government pricing policy, of new distribution and marketing mechanisms, of fortification, of large-scale child feeding programs, of new foods, etc. (71, 73). Nutrition intervention policy decisions based on the three indicators are an important feature of the total effort for social and economic progress (73, 74).

Gordon and Scrimshaw (74) note that program evaluation has become indispensable for public health action programs, such as nutrition intervention. An applied nutrition programs evaluation involves careful appraisal of functioning, accomplishments in terms of stated objectives, and cost in time, money and material for producing results (11). The worth of an intervention program if documented through good evaluation may ensure continuation of the program (74, 75).

Hammonds and Wunderle (76) indicate that nutrition and marketing are equally important to the success of any nutrition intervention program. From that point of view they suggest a specific procedural flow chart, with an accompanying systems analysis, for designing and monitoring an intervention program in a developing country. The chart or model is intended for use in a short-term intervention program. The short-term program is presumed to be the needed immediate action of providing the necessities to people in a country pursuing a long-term economic development which may be slow to

provide necessities. The three basic research projects needed for initiating the intervention program are: a) a nutrition survey for identifying the target group, b) an investigation of food habits and purchase patterns, and c) a study of the adequacy of the existing market mechanism for handling alternative intervention programs.

Neumann et al. (75) discuss a design for planning and evaluation of small-scale nutrition programs. The program design begins with a formulation of goals which is described as being an essential first step in evaluation. The formulation of goals is followed by a formulation of objectives, delineation of measurable criteria, identification of a target group, or groups, and a control group, test procedures, and work plan, including timetable. This approach to evaluation is simple and within the capabilities of the average nutrition program staff.

In a comprehensive applied nutrition program manual, Latham (7) discusses four consecutive stages suggested for any applied nutrition program. The stages are: a) a feasibility survey and preliminary planning, b) baseline data collection and detailed planning, c) pilot programs, and d) expansion (77).

In considering applied nutrition programs, Gordon and Scrimshaw distinguish five broad classifications for program evaluations: a) a program with the simple objective of food supplementation, b) a service program underway, for which no provision for evaluation was made, c) a comprehensive nutrition program that has incorporated related health disciplines, agricultural practices, food distribution and marketing, and social and economic features of community development, d) a local area chosen for a field trial or action program in application of a novel food

to wide-scale use, and e) any action program gives an opportunity for operational research for improved evaluation methods.

Nutritional adequacy is a major determinant of quality of human existence. That quality of human existence, in turn, is assumed to be the ultimate measure of development, because man is assumed to be the key to development (78). Devadas and Chandrasekhar (79) state that any nutritional improvement program can originate through nutritional education. Fugelsang (80) contends that the ultimate objective of nutrition implementation programs is eradication of malnutrition, a behavioral change. In addition, the behavioral change concerning food production and consumption is a definable social change.

To bring about social change, knowledge of community structure and systems and the interrelationships of the systems is needed, according to Tiglao (66). Lowenberg (54) acknowledges that change, in terms of food patterns, will have an effect on the total structure of the community. The process of changing food habits is an essential aspect of nutrition intervention. According to Chavez (8) a well-conducted program can be highly effective in improving the diets of communities. Latham (82) states that changes in beliefs, attitudes and knowledge about foods, nutrition and other related matters may be useful points for assessment. In evaluating an applied nutrition program such changes might indicate changes in dietary behavior and in ultimate nutrition improvement.

Because food patterns are an integral part of culture anyone working for change in any part of the cultural food pattern must study the entire cultural pattern carefully (54). Sensitivity to the cultural lag that creates a gap between folk beliefs and practices regarding food and modern

scientific concepts of nutrition is needed for nutrition education to be effective (83). Chavez (81) states that minor changes in food habits demand priority in applied programs. Such changes are feasible and do not necessitate change in socio-economic level. Minor improvements in family nutrition can be beneficial even though low income individuals may not be able to have certain foods regularly, if at all, or even to have a well-balanced diet. Recognition that betterment of children's nutrition is achieved relatively easily is important because one of the most important food practice changes needed is encouragement of breast feeding (78, 81).

Improved dietary diversification and increased consumption of valuable foods can be achieved through nutrition education. According to Devadas and Chandrasekhar (79), any effective education program must meet the needs of the people, with their active cooperation. Tiglao (66) agrees that community involvement and participation is essential for change to occur. Interest and receptivity can be created by mass media, but the local worker is still a major change agent (78). Effective nutrition education relies on teaching nutrition (79). Nutrition teaching methods may be grouped as: a) individual contacts like home visits, b) group contacts like general meetings, demonstrations, and discussions, and c) mass contacts such as campaigns, exhibitions, tours, and excursions; distribution of literature, leaflets, folders, film shows, and radio programs.

Survey Methodologies

Dietary Studies

Nutrition surveys, as epidemiologic tools, are designed to identify the extent and distribution of malnutrition (84). The complex interrelationships

between environmental and social factors and the individuals in a community are recognized as the origin for nutrition problems. On this recognition, the epidemiological approach to nutritional assessment has been founded (85). According to Fugelsang (80) assessments with high levels of precision are expensive and irrelevant for implementation. In developing countries there is need for simple methods, because such methods allow for survey repetition (86).

The food frequency interview is a simple method of providing useful information on food consumption. It is an interview technique which classifies individuals according to the predominant dietary pattern by determining the frequency of food item intake, rather than according to the amounts of specific nutrients in their diet. In some populations, this interview method is less expensive, is capable of covering larger samples, and can utilize less highly trained personnel than the classical food consumption surveys (86, 87). An inability to provide data on individual nutrients is the main limitation of the food frequency (87). Thus, nutritional status of an individual is not assessed (88). However, an association between diet and a health state can be demonstrated. Changes in food habits or differences in dietary practices qualitatively measured by the food frequency interview technique can be useful to applied nutrition (86, 88).

Getting both accuracy and a picture of usual eating patterns of the past from quantitative (classical) studies may be difficult (84, 86). "The value of dietary studies of the individual's actual current intakes for short periods--one day, one week, or even one month--is questionable for most epidemiological purposes, unless there is good indication that the short-term studies reflect usual eating patterns of the past" (7). The four

most common methods of assessing individual dietary adequacy are: estimation by recall or the questionnaires, food or dietary record, weighed intake, and dietary history (84, 90).

The questionnaire or estimation by recall is usually used for a given 24-hour period. Thus, it is generally called the 24-hour recall and estimates of quantity for the period are asked for. The 24-hour recall provides a satisfactory qualitative indication of the current mean intakes of groups, but validity is low for measures of the usual diet of individuals (84, 89).

The food or dietary record is most often used in nutritional status studies. The individual keeps a record of food eaten for a 1-day, 3-day, or 7-day period. His ability to estimate quantities of food when it is not measured and his diligence and integrity result in variations between individuals. Estimation of food consumption with this method is fairly accurate over a specific period of time (84, 90).

The weighed intake method is most often used in research studies. The method provides an accurate record of food consumption during a period of time. A trained interviewer or the individual may weigh the food consumed. Individuals may alter their usual eating patterns due to the tediousness of the procedure (84, 90).

The dietary history is a good indication of an individual's usual dietary pattern over a relatively long period of time. An interview is usually used. The method is limited by the need for highly skilled interviewers (84, 90).

A qualitative estimate of frequency of food consumption, as a modification of the dietary history, is applicable to epidemiological studies with

thousands of subjects (84, 88). Stefanik and Trulson (88) found that a qualitative diet form, that used food frequencies, gave generally equivalent estimates of the qualitative consumption of foods upon comparisons of diet habits. The interview method would be less time consuming and more economical than classical methods. The method validity was obtained by comparing the data of the techniques to the frequency code system.

An indicated daily nutrient intake based on weekly consumption of food can be found when used with the food frequency (91, 92). Amounts of food usually consumed correlates well with the frequency with which the foods were eaten (86). Clarke (92) showed that one-third of 197 individuals living in nursing home and non-nursing home situations had nutrient intakes dangerously low for adequate tissue maintenance when compared to RDAs.

The method of frequency rating used by Chassey et al. (86) evaluated the diet according to consumption within food groups. They studied the food pattern change of village families in Ciudad Sahagun (Hidalgo, Mexico) as it is related to the process of industrialization and urbanization. The findings supported the hypothesis that "in the process of industrialization or urbanization, food habits or food patterns change progressively, becoming increasingly more complex and varied, and that such changes are related to other similar changes in the social milieu."

All methods of dietary study have limitations. According to Young and Trulson (89) the greatest limitation is human error. In considering those methods using an interview technique, Wakefield (93) indicates that bias, on the part of the interviewer and the interviewee, plays a major role in obtaining accurate information.

Dietary Data Evaluation

Evaluation of dietary adequacy and balance is performed by comparing dietary study data with either a food grouping system or a dietary standard (94-96). Classification of foods into basic food groups, which are based on similarity of nutrient content or some other criteria, is common in many countries although systems vary considerably (94). National as well as international dietary standards are also available (95, 97).

The simplest analysis of dietary consumption uses a food grouping system (96). Foods are grouped according to their a) nutrient content, b) availability, and c) food patterns and habits. The systems are primarily designed for elementary nutrition education purposes, however. It should be noted that at present Mexico doesn't have a food grouping system (94).

Dietary standards such as those of the Food and Agriculture Organization/World Health Organization (FAO/WHO), the Canadian Dietary Standard, or the Recommended Dietary Allowances of the United States aim to insure the maintenance of health for the major portion of the populations concerned, from a nutritional standpoint (95, 97). The recommended uses for dietary standards are exemplified by those stated for the FAO/WHO standard, i.e. "to evaluate the (food) intakes of population groups, to plan diets and food supplies and to serve as a guide for public health nutrition programmes." There are differences between the national and international recommendations (97), some of which are compared in Appendix 1. Differences are related largely to the amount of ignorance in relating minimum requirements to recommended levels for optimal health (95). The "safe level of intake," a term used by the FAO/WHO to explain the provision of a wide margin in stated values, is an allowance of up to two standard deviations which attempts to

encompass 97.5 percent of the world population. Similar provisions are made for nations (95, 97). Thus values that do not meet particular standards do not necessarily indicate potential malnutrition (96, 99).

Calculated dietary nutrient values are usually compared with dietary standards. Calculations, in terms of specific nutrients, are made by using food composition data (96) from sources such as the United States Department of Agriculture, Handbook Number 8 (100), the United States Department of Agriculture Home and Gardens Bulletin Number 72 (101), the Food Composition Table for Use in Latin America (102), the Food Composition Table for Use in East Asia (103), and others (104). The use of food composition tables together with dietary standards is more precise than the use of food group systems (96).

Statement of the Problem

The study was conducted to provide some baseline data in the form of recommendations concerning the food consumption of families in Ahuatopec, Morelos, Mexico, a village of approximately 375 families. It was undertaken during the summer (rainy season) months of June, July, and August, 1973. The sample consists of 11 families, nine of whom were members of a rabbit cooperative and/or a hog cooperative. The rabbit cooperative was in its beginning stage. Cooperatives are part of the total development program being conducted by the Morelos Institute of Higher Studies and Agricultural Science (IMESA), which is addressed at Monasterio Benedictino, Nuestra Senora de los Angeles, Apartado Postal 911, Cuernavaca, Morelos, Mexico which is located on the edge of Ahuatopec. The data is to be utilized by IMESA for present and future evaluation and implementation of programs.

EXPERIMENTAL METHODS AND PROCEDURES

Permission to work in a voluntary capacity as a staff member at IMESA established the opportunity to conduct the study. Involvement with the hog and rabbit cooperatives provided the rapport necessary for interviewing about half of the member families at their respective homes.

The interview, approximately one hour in length, was conducted at a time convenient to the interviewee, who represented the family. In all but two interviews, the mother-figure was the interviewee. The two exceptions were a teenage girl and a male aided by his wife. In all but three interviews, an unskilled interviewer, familiar with the people and the language, assisted with the interviewing. The teenage girl, the male, and one mother-figure were the exceptions. The assistant was not used in these three interviews because the language was not a total barrier. However, for the other eight families, interviewing by myself would have posed a problem in terms of interpreting interviewee's answers and thus in obtaining accurate information. The assistant facilitated much of the social intercourse upon entry into the home. Due to the length of the interview, pauses occurred during which additional conversation occurred. The interviewee was thanked for his or her cooperation upon completion of the interview.

A food frequency questionnaire was utilized to record the frequency and amount of individual foods assumed to have been consumed by the family during a 7-day period prior to the interview. The list of foods (Appendix 2) was developed before leaving the U.S., with the help of a person familiar with the native diet.

Nutrient data for individual foods in the food list were obtained primarily from the Food Composition Table for Use in Latin America (102).

However, the values for mushroom, soft drinks, mole (chili sauce), and sugar were obtained from the United States Department of Agriculture, Handbook Number 8 (100). The nutrient totals for the foods eaten by each family were then summed and the daily average calculated.

The age range and sex for each individual of the families are described in table 1. This description was utilized to determine the nutrient requirements of each individual. The standard for an individual's requirements was that of the Food and Agriculture Organization/World Health Organization (FAO/WHO). The daily requirements of all the individuals composing a particular family were summed. These composite nutrient requirement values were then compared with the total nutrient consumed values to obtain a percent adequacy of nutrient intake for each family (table 2).

RESULTS AND DISCUSSION

By examining the food lists for the 11 families, the diets of the families generally appeared to contain large amounts of tortillas and beans. These foods contributed a large proportion of the energy, calcium and protein (incomplete) in the diet. Foods of animal origin were consumed in small amounts relative to incomplete protein sources. Thus the complete protein contributed by foods of animal origin appeared to be minimal in the diet. A wide variety of fruits and vegetables were consumed by most families, however the amounts of those foods consumed differed between families. These foods contributed a large proportion of the vitamins, especially vitamin A and ascorbic acid, supplied by the diets. Low income and home grown foods appeared, to the author, to contribute greatly to the pattern of the diets and thus to the nutrients consumed.

Food consumption, as estimated by approximate nutrient intake, was indicated to be above adequate for five of the eleven families when compared with FAO/WHO standards for adequacy (table 2). Riboflavin was below the recommended FAO/WHO standard in the remaining six families; this finding supports the literature (29, 32) citing riboflavin as one of the most common nutrients to be low in the diet. The energy values for two families, Family 7 and Family 8, were shown to be low. Family 8 was low in not only energy, but also calcium, riboflavin, and niacin. Family 9 was low in thiamin as well as riboflavin.

Family 8 had below adequate consumption of four nutrients, while no other family has more than two nutrient inadequacies. Personal observation of the family and of the food list for this family leads the author to believe that the consumption of all foodstuffs was low. The individuals in Family 8 were observed to be underweight, which suggested insufficient food consumption before viewing the food list. The amounts of foods consumed by the family of 11 individuals appeared low when the food list was viewed. An increase in food consumption would certainly increase the availability of all nutrients in the diet and thus would increase the amounts of those nutrients shown to be low. However, the increase in consumption of all foodstuffs may not completely alleviate inadequacies. Should energy and calcium be increased to a sufficiency comparable to other families, riboflavin and niacin may still be low, as in other families low in riboflavin and possibly one other nutrient but adequate in energy.

Family size may have some relationship to low nutrient intake levels. Families 6, 7, 8, 9 and 10 have 8, 8, 11, 12, and 11 members respectively (table 1). These families all had one or more nutrient adequacies.

However, Family 1 with four members also had inadequate riboflavin, while Family 11 with nine members had no low nutrient intake levels.

Several factors may alter the nutritional status of the individuals composing the families. Further study would be necessary to provide more specific nutritional status information.

One of the factors is the seasonal variations of food availability and food intake. The availability of foodstuffs, especially fruits and vegetables either purchased in markets or grown in home yards, may be different between the summer months and other times of the year. Thus the intake of such foods would increase and decrease from season to season.

Another factor is the condition of the people. The presence of infection, infestation, pregnancy, and lactation would effect nutritional status. Infections and/or infestations would decrease the supply of nutrients available for absorption even though adequate amounts are consumed. The semi-tropical climate and the often unsanitary living conditions enhance the possiblity for these problems. Children are especially susceptible to malnutrition due to infection and/or infestation. Pregnancy and/or lactation would increase the requirements for some nutrients. The supply actually consumed may appear less adequate if one of these maternal conditions exist.

A third factor that may alter nutritional status is the possibility of unequal distribution of food among family members. While the composite nutrient intake of a family may appear adequate, a given individual may not be fed adequately. One person may be consuming more than his share proportionally, leaving another inadequately fed quantitatively and qualitatively.

TABLE 1

Family composition, according to age range, sex, and number, and family membership in cooperatives

	Family number										
	1	2	3	4	5	6	7	8	9	10	11
Composition:											
Age and sex											
< 1											
M	1					1					1
F									1		
1-3											
M					1				1	1	
F			2			2				1	1
4-6											
M	1		1			1	1		1	1	1
F								1			
7-9											
M				1		1		2	1	1	1
F	1					1	1		1	1	1
10-12											
M				1	1		1			1	
F	1							1	1		
13-19											
M		1	1	1			3	1	1	1	1
F		1		1				2	1	2	1
Adult											
M	1	1	1	1	1	1	1	2	2	1	1
F	1	2	1	1	1	1	1	2	2	1	1
Total	6	5	6	6	4	8	8	11	12	11	9
Membership:											
Rabbit	✓	✓			✓					✓	✓
Hog	✓	✓			✓	✓	✓	✓	✓	✓	✓

TABLE 2

Average intake of nutrients and their adequacy per family per day

Nutrients		Family																					
		1		2		3		4		5		6		7		8		9		10		11	
		Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %	Consumed g	Adequacy %
Energy	Kcal	14137	145	17484	137	30850	242	30163	196	14909	163	16173	108	19521	94[a]	22346	83[a]	40230	152	29874	122	34154	180
Protein	g	467	220	570	254	1412	647	828	307	419	266	515	203	709	196	688	148	888	193	846	199	761	232
Fat	g	549	-	533	-	411	-	828	-	407	-	328	-	516	-	565	-	675	-	906	-	605	-
Carbohydrate	g	1855	-	2747	-	5984	-	4271	-	2410	-	2687	-	3450	-	3842	-	5774	-	5477	-	5986	-
Calcium	mg	5394	180	9945	375	13899	479	6886	209	8193	410	6629	179	9595	218	8586	88[a]	15318	251	16332	284	16430	361
Iron	mg	164	225	188	190	493	609	209	220	146	275	179	192	194	166	209	122	255	152	308	194	463	371
Vitamin A	mcg	10328	336	11961	319	6854	225	21289	536	5529	238	20822	607	26040	518	15364	222	9065	135	17615	297	10216	220
Thiamine	mg	13	245	13	232	35	643	17	273	11	287	11	184	13	157	14	129	11	97[a]	21	213	32	408
Riboflavin	mg	7	97[a]	11	148	15	197	11	124	7	123	8	88[a]	10	83[a]	10	61[a]	13	81[a]	12	85[a]	15	137
Niacin	mg	120	142	130	145	179	204	176	168	103	165	102	101	240	169	122	67[a]	257	141	183	111	212	164
Ascorbic acid	mg	1008	720	1094	729	530	353	1587	992	912	912	929	516	1349	642	1262	115	1575	525	1655	613	1336	608

[a]Below FAO/WHO standards for accuracy.

RECOMMENDATIONS

This study agrees with Anderson et al. (31) who contend that the general food consumption pattern of the Mexican is fundamentally sound. The main exception is riboflavin intake which was low for some families even though energy and other nutrient levels were above adequate. Niacin and thiamin were low occasionally. Increased consumption of foods of animal origin, especially milk and meat, would be wise to make additional riboflavin, niacin, and thiamin available. However, such a change would not take place quickly. Some of the factors which may contribute to retarding the change would be lack of availability of the animal foodstuffs, lack of storage facilities, and present habits of food consumption, such as the use of milk mostly for young children and a high consumption of corn and beans. Because of the probable slowness of such a change a more immediate means of ensuring an adequate supply of riboflavin, as well as thiamin and niacin, would be to fortify the tortillas produced at the tortilleria (small, local factories). The main problem in implementing this change would be to persuade the operator of a tortilleria to add the supplement to the masa (ground corn).

SUMMARY

Eleven villagers in Ahuatopec, Morelos, Mexico were interviewed to determine the dietary consumption of the families they represented. The study was undertaken to provide some baseline data in the form of recommendations for development projects conducted by the Morelos Institute of Higher Studies and Agricultural Science. The nutrient intakes in five of the 11 families were found to be above the FAO/WHO standards for adequacy.

Six of the families were low in riboflavin, two of which were low in energy. One of the two families low in energy was also low in calcium and niacin. Another family (one of the six) was also low in thiamin. Family size appears related to certain inadequacies in the diets. The largest families, except for one, have the low intakes. Further study would be necessary to provide more specific nutritional status information. The seasonal variations of food availability and intake, the condition of the people in terms of infection, infestation, pregnancy, and lactation, and the possibility of unequal distribution of food among family members would alter nutritional status. Thus, considering the apparent adequacy of most nutrients for most of the families the study indicates an inherently sound diet. The main exception of riboflavin, plus occasional low niacin and thiamin levels, may indicate the necessity of either or both of the following: a) a long term process of dietary change involving increased use of animal sources of nutrients (especially milk and meat); b) a more immediate means of ensuring an adequate supply of these nutrients by fortification of tortillas.

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APPENDIX

ILLEGIBLE DOCUMENT

THE FOLLOWING DOCUMENT(S) IS OF POOR LEGIBILITY IN THE ORIGINAL

THIS IS THE BEST COPY AVAILABLE

Appendix 1

Comparative dietary standards of selected countries and UN agencies[a]

Country	Sex	Age (years)	Weight (kg)	Activity	Energy (Kcal)	Protein (g)	Calcium (g)	Iron (mg)	Vitamin A activity (IU)	Thiamin (mg)	Riboflavin (mg)	Niacin equiv. (mg_e)	Vitamin C (mg)
U.S.A.	M	22	70	a	2800	65	0.8	10	5000	1.4	1.7	18	60
	F	22	58	a	2000	55	0.8	18	5000	1.0	1.5	13	55
FAO	M	25	65	a	3200	46	0.4-0.5		a	1.3	1.8	21.1	
	F	25	65	a	2300	39	0.4-0.5		a	0.9	1.3	15.2	
Australia	M	25	70	a	2900	70	0.4-0.8	10	2500	1.2	1.5	1e	30
	F	25	58	a	2100	58	0.4-0.8	10	2500	0.8	1.1	14	30
Canada	M	25	72	a	2850	50	0.5	6	5700	0.9	1.4	9	30
	F	25	57	a	2400	39	0.5	10	3700	0.7	1.2	7	30
C.A. and Panama	M	25	55[a]	Moderate	2700	65	0.45	10	a	1.1	1.6	17.8	60
	F	25	50	activity	2000	60	0.45	10	a	0.8	1.2	13.2	50
Colombia	M	20-29	65	Moderate	2850	68	0.5	10	5000	1.1	1.7	15.8	50
	F	20-29	55	activity	1900	60	0.5	15	5000	0.8	1.1	12.5	50
France	M		65	Moderate	3000	90							
	F		55	activity	2400	75							
India	M	25.4	55	Moderate	2800	55							
	F	21.5	45	activity	2300	45							
Japan	M	26-29	56	Moderate	3000	70	0.6	10	2000	1.5	1.5	15	65
	F	26-29	49	activity	2400	60	0.6	10	2000	1.2	1.2	12	60
Netherlands	M	20-29	70	Light	3000	70	1.0	10	5500	1.2	1.8	12	50
	F	20-29	60	activity	2400	60	1.0	12	5500	1.0	1.5	10	50
Norway	M	25	70	None	3400	70	0.8	12	2500	1.7	1.8	17	30
	F	25	60	given	2500	60	0.8	12	2500	1.3	1.5	13	30
Philippines	M	None	53	Moderate	2400	53	0.5	a	5000	1.2	1.2	a	70
	F	specified	46	activity	1800	46	0.5	a	5000	0.9	0.9	a	70
S. Africa	M	None	73	Moderate	3000	65	0.7	9	4000	1.0	1.6	15	40
	F	specified	60	activity	2300	55	0.6	12	4000	0.8	1.4	12	40
U.K.	M	20 up	65	Medium	3000	87	0.8	12	5000	1.2	1.6	12	30
	F	20 up	56	activity	2500	73	0.8	12	5000	1.0	1.5	10	30
U.S.S.R.	M			Moderate					5000	2.0	2.5	15	70
	F			activity					5000	2.0	2.5	15	70
E. Germany	M	18-35		Light	2700	85	0.8	10	5000	1.6	1.5	18	70
	F	18-35		work	2300	75	0.8	15	5000	1.4	1.3	15	70
W. Germany	M	25	72	Sedentary	2550	72	0.8	10	5000	1.7	1.8	18	75
	F	25	60	activity	2200	60	0.8	12	5000	1.5	1.8	14	75

[a]For all footnotes, see original table in Food and Nutrition Board: Recommended Dietary Allowances. Publ. 1964. 7th Ed. Washington, D.C., National Academy of Sciences, 1968, pp. 69-71.

Appendix 2

FOOD ACCEPTANCE QUESTIONNAIRE

(CUESTIONARIO)

Name of family
(Apellido familiar) _____ Date (Fecha) _____

Members of the family (Miembros de la familia)

Age (Edad)	Males (Varones)	Females (Hembras)
0-1		
1-2		
2-3		
3-4		
4-5		
5-6		
6-8		
8-10		
10-12		
12-21		
Adults (Adultos)		
Total (Total):		

Listed below are foods or groups of foods. Indicate which ones the family usually eats. Indicate also the frequency with which the family ate the food during the last week.

(A seguidas tenemos una lista de comidas o grupos de comidas. Indique Ud. cuales comidas acostumbra comer su familia. Indique tambien la frecuencia con que su familia come cada tipo de comida durante el semana último.)

Food Item (Comida Item)	Eaten daily (Le come diaria-mente)	Eaten almost daily (Le come casi diaria-mente	Eaten at least once per week (Le come por lo menor íma vez a la semana)	Almost never eaten (Casi nunca se come)	Amount (Cantidad) (i.e., cups, 1/2 cup, etc.)
PANES y CEREALES (Bread & Cereals)					
Tortillas					
Pan (Breads)					
Hominey					
Sopas (Macaroni, etc.)					
Maíz (Corn)					
Pasta (Pastry)					
Atole (Drink made of flour)					
Arróz (Rice)					
Trigo (Wheat)					
Avena (Oats)					
Maízena (Cornmeal)					
Galletas (Crackers)					

Food Item	Eaten daily	Eaten almost daily	Eaten at least once per week	Almost never eaten	Amount
FRUTAS y VERDURAS (Fruits & Vegetables)					
Citrus fruits					
Naranjas (oranges)					
Toronjas (grapefruit)					
Limones (lemons)					
Other fruits					
Papaya					
Platanos (banana)					
Mangós (mango)					
Piña (pineapple)					
Manzanas (apples)					
Melones (melons)					
Sandias (watermelon)					
Jimcama					
Guayabas					
Aguacates (avocados)					
Granada (pomegranate)					
Alcachofa (artichoke, globe)					
Tuna (prickly pear fruit, with seeds)					
Pera (pear)					
Yellow vegetables					
Zanahoria (carrots)					
Calabaza (squash, etc.)					
Green vegetables					
Jalapeños- Ajíes- (chili)					
Brecol (broccoli)					
Chicharos (fresh peas)					
Ejotes (green beans)					
Espinaca (spinach)					
Lechuga (lettuce)					
Pepino (cucumber)					

Food Item	Eaten daily	Eaten almost daily	Eaten at least once per week	Almost never eaten	Amount
Esparrago (asparagus)					
Remolacha (beet)					
Apio (celery)					
Quelite (goosefoot, lambsquarter)					
Nopal, tallos (prickly pear, stems)					
Haba (lima bean)					
Other vegetables					
Cebolla (onion)					
Ajo (garlic)					
Perejil (parsley)					
Rabanito (radish)					
Papa (potatoe)					
Col (cabbage)					
Jitomate (tomato)					
Salsa (tomato or chili)					
Hongo (mushroom)					
CARNE (Meat)					
Carne de vaca o Rez (beef)					
Veal (cordero)					
Pescao Pescado (fish)					
Pollo- (chicken)					
Pavo- (turkey)					
Pato- (duck)					
Cerdo-"Puerco" (pork)					
Carnero (lamb)					
Huevos- Blanquillo- (eggs)					
Conejo (rabbit)					
Frijoles (beans)					
Garbanzos (garbanzo)					

Food Item	Eaten daily	Eaten almost daily	Eaten at least once per week	Almost never eaten	Amount
Chicharos (dry peas)					
Gandures o Gandules (pigeon peas)					
Cacauates o Cacahuates (peanuts)					
Nueces (nuts)					
Lentecas (lentiles)					
LECHE (Milk)					
Leche fresca (milk)					
Queso (cheese)					
Leche evaporada "en polvo" (dry skim milk)					
Requesón (cottage cheese)					
Crema					
Helado (ice cream)					
OTRO (Other)					
Pulque Tequila (alcoholic beverages)					
Cerveza (beer)					
Café (coffee)					
Refrescos (soft drinks)					
Te (tea)					
Dulces (candy, usually chocolate)					
Cajeta (type of vegetable candy)					
Chicharones (pork rind)					
Mole (chili sauce)					
Manteca (lard)					
Aceite de vegetables (vegetable oil)					
Mantequilla (butter)					
Azúcar (sugar)					

DIETARY CONSUMPTION OF FAMILIES IN AHUATOPEC, MORELOS, MEXICO SUBJECT TO A DEVELOPMENT PROJECT

by

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B. S., South Dakota State University, 1972

AN ABSTRACT OF A MASTER'S REPORT

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requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1974

Eleven villagers in Ahuatopec, Morelos, Mexico were interviewed to determine the dietary consumption of the families they represented. The study was undertaken to provide some baseline data in the form of recommendations for development projects conducted by the Morelos Institute of Higher Studies and Agricultural Science. The nutrient intakes in five of the 11 families were found to be above the FAO/WHO standards for adequacy. Six of the families were low in riboflavin, two of which were low in energy. One of the two families low in energy was also low in calcium and niacin. Another family (one of the six) was also low in thiamin. Family size appears related to certain inadequacies in the diets. The largest families, except for one, have the low intakes. Further study would be necessary to provide more specific nutritional status information. The seasonal variations of food availability and intake, the condition of the people in terms of infection, infestation, pregnancy, and lactation, and the possibility of unequal distribution of food among family members would alter nutritional status. Thus, considering the apparent adequacy of most nutrients for most of the families the study indicates an inherently sound diet. The main exception of riboflavin, plus occasional low niacin and thiamin levels, may indicate the necessity of either or both of the following: a) a long term process of dietary change involving increased use of animal sources of nutrients (especially milk and meat); b) a more immediate means of ensuring an adequate supply of these nutrients by fortification of tortillas.