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By

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ABSTRACT

NON-LOCALLY PRODUCED FOODS IN THE DIET OF PACOBAMBA, PERU RESIDENTS

By

Grace Suzanne Marquis

Three non-locally produced foods, noodles, bottled oil, and iodized salt, were studied to determine their usage and potential effect on the diet of Pacobamba, Peru residents. Thirty families with three participants per family were interviewed. Data on socioeconomic levels and food buying practices, twenty-four hour dietary recalls, and height, weight, and skinfold measurements were collected. The number of kilos of noodles purchased per week had a moderate negative correlation ($r=-.52$; $p \leq .01$) and the quantity of oil purchased showed no relationship with the met percentage of FAO recommended calorie intake for the child. Quantities of iodized salt reported in the adult dietary recalls supplied the WHO recommended intake level for iodine. The girls' anthropometric measurements were significantly higher than the boys' in weight-for-age ($\chi^2=5.6$; $p \leq .05$), weight-for-height ($\chi^2=5.7$; $p \leq .05$), and triceps skinfold ($\chi^2=7.5$; $p \leq .01$). The results suggested that the replacement of local foods with non-locally produced foods could be detrimental to the diet if higher nutrient dense products were displaced, and beneficial if needed calories and nutrients were added.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The nutritional status of individuals in the agrarian rural community has been described by many factors, including the diet, the health and the economic status of the residents (Buck et al., 1968; Escudero, 1978; Joint FAO/UNICEF/FAO Expert Committee, 1976; and Solimano and Chapin, 1981). The quantity and quality of the diet is limited partly by the availability of food, government agricultural policies, access to a market, family incomes, personal preferences, and cultural expectations. The available sanitation, the nutritional status of the individuals, and the availability of medical services all influence the health of the rural population. Lastly, the economic status of Andean residents is restricted by the family's land and animal holdings, access to a market-place, the health and educational level of the family members, social stratification, and governmental social policies (Joint FAO/UNICEF/WHO Expert Committee, 1976; and Solimano and Chapin, 1981). A multidisciplinary approach to research is necessary to understand the nutritional status of individuals in an Andean rural community.

The expansion of roads and other communication linkages in the Andes in recent years has decreased

the isolation of individual communities and has linked them to the national government and market. Regions which were mainly self-sufficient now buy and sell agricultural products through the markets and commercial middlemen. The communities' involvement in the national and regional markets has changed the resources that are available to the rural residents. Prior to the use of a cash economy, foodstuffs were limited to those that could be grown, or obtained through the system of *trueque*, the exchanges of products within the community or among neighboring communities (Bourque and Warren, 1981; and Mayer, 1974). Currently, use of the national monetary currency for exchange has partially replaced the system of trade in the rural areas. The existence of cash obtained through income generating activities has allowed the Andean residents to have a greater access to non-locally produced (NLP) foods that are only sold. Through the two systems of exchange - cash and *trueque* -, and through local harvests, food is acquired in the Andean communities. It is expected but not been studied that there may be an effect on nutritional status of residents because of these changes.

The use and effect of non-locally produced foods incorporated in the rural diet is the focus of this research. Understanding the market's impact on the nutritional adequacy of the rural community's diet can be

an aid to the understanding of food behavior and the formulation of nutrition programs for a region. If an improved, varied diet results, then encouragement of the existing market practices and income earning strategies may be an appropriate means to improve nutritional status of residents. If dietary deficiencies result because of the replacement of local foods, the need to account for lost calories or nutrients should be considered. In either case, or if no change in the diet is yet seen, surveillance of the situation is a needed step in health maintenance (Joint FAO/UNICEF/WHO Expert Committee, 1976).

REVIEW OF THE LITERATURE

Incidence of malnutrition, as shown through clinical, biological, and anthropometric testing, and dietary adequacy have been researched for various regions of the Peruvian Andes. Poverty levels, limited food supplies, and the infant mortality rates, which have been over twice the mortality rates of the coastal cities, have been enveloped in the health and nutrition studies (Instituto Nacional de Estadística, 1978). The role that non-locally produced foods have in the general and weaning diets has been briefly mentioned by several researchers but only studied in some detail in other countries.

Food Balance Sheets

The daily individual energy intake of Peruvians was estimated to be 2275 calories in the food balance sheets developed by the Ministry of Food and Agriculture (Ministerio de Agricultura y Alimentación, 1975). The researchers did not take into account any inequalities in the distribution of the food among the population. As will be seen in the section on dietary surveys in Peru, the typical rural diets have not been found to be as high

in calories as the quoted national average.

Mortality and Morbidity

Nationally, malnutrition has been identified as the principal cause of 3.5 percent of all recorded deaths in 1972; 62 percent of the reported deaths due to malnutrition were in children under five years of age (Escudero, 1978).

The infant mortality rate in 1975-1976 was highest for the Andean regions of Peru, 157.5 per 1000 individuals (Instituto Nacional de Estadística, 1978). The Instituto Nacional de Estadística (INE) demographic survey documented the following as characteristics of departments with the highest mortality rate: more than 70 percent of the people were agriculturalists; over 50 percent of those people five years of age or older were illiterate; the community was rural with less than 500 people; and more than 60 percent of the women were monolingual. The infant mortality rate for the southern mountain department of Apurímac, which was the site for this research, for 1972 was 108 per 1000 live births (Ministerio de Salud, 1974).

Scarce community health services throughout the Andes might have been a contributing factor to the high infant mortality, twice that of Lima (Escudero, 1978; and Solimano and Chapin, 1981). Table 1 shows the difference between the urban and rural areas of Peru in three basic community services in the 1972 census.

Table 1. Community services in rural and urban Peru.

Type of Service	Urban	Rural
Physicians per 10,000 inhabitants[a]	15.5	1.5
Piped water supply (% served)[b]	72.0	10.0
Sewage system (% served)[b]	50.0	less than 1.0

[a]Data from 1973-1976 study, Escudero, 1978.

[b]Data from 1969 study, Solimano and Chapin, 1981.

Low birth weights and retarded growth seen in high altitude Andean communities, where hypoxia (deficiency of oxygen) is an environmental feature, may have been factors in the high mortality rate (Haas, 1976). A study of four cases, rural and urban high altitude communities, and rural and urban low altitude communities, suggested hypoxia had a negative effect on growth (Baker, 1975).

Nutritional Status Studies

Gursky (1969) suggested that the rural highland diet might not have been adequate for the periods of rapid growth in childhood. The at-risk population included those children in large families, of latter birth order, and those children of weaning age (Jelliffe and Jelliffe, 1972).

Research had shown that while national birth weights were comparable to those in developed countries, an

inadequate growth rate of Peruvian infants placed them far below the Western standards by the age of three years (Graham, et al., 1980). In two sample groups of 1693 rural and 123 urban children, the decline in growth rate of girls was seen within the first few months of life; for boys it appeared around six months of age. A period of catch-up growth was noted in children starting by the age of three years. By the end of puberty, the weight of the children had reached Western standards but the height had not reached its comparable standard. Graham and co-workers (1980) suggested that early malnutrition and improper diets throughout childhood might have been the causes of the stunting.

Several other studies throughout Peru confirmed the need for concern about the health of growing children. A group of 714 Moqueguan pre-schoolers was studied in 1972 to determine the degree of malnutrition in the capital district of this southern department (Lira, 1973). Using Ramos Galván[1] height-weight classifications, 36 percent of the children were classified as malnourished (30 percent were grade I, 5 percent were grade II, and 1 percent was grade III). Food feeding attitudes of adults might have

[1] Ramos Galván standards used the following cut-off points to identify malnutrition: grade I: 10-25 percent below the ideal; grade II: 25-50 percent below the ideal; and grade III: over 50 percent below the ideal. The reference population was the Boston data. (Amat y León and Curonisy, 1981).

been defined for the sexes, since nutritional status varied between male and female children. Equal numbers of female and male children were studied in Moquegua; however, 43 percent of the girls and 29 percent of the boys were affected by malnutrition. Agriculturalists had the highest percentage of malnourished children (51 percent of the total agriculturalists' children), even higher than the children that had unemployed parents.

A researcher in Trujillo found that 28 percent of 454 children less than five years of age, 64 percent of them from the lower class, showed some sign of malnutrition, according to Gomez[2] standards (Ramos, 1974). The malnutrition was complicated by the parasites present in 60 percent of the children.

The Ministry of Health studied nutrition in the southern region of Peru (in the departments of Apurímac, Cuzco, and Madre de Dios) and reported 2.6 percent of the morbidity to be due to avitaminosis, anemia, or other nutritional diseases (Ministerio de Salud, 1974). In one rural region of Cuzco, 71 percent of the 164 children under 6 years of age were diagnosed malnourished by Ramos Galván standards (48 percent were grade I, 19 percent were grade II, and 4 percent were grade III). That region was compared to

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[2]Gomez standards used the following cut-off points: grade I: 11-25 percent loss of ideal weight; grade II: 26-40 percent of ideal weight; and grade III; a loss greater than 40 percent of ideal weight. The reference population was the Boston data. (Griffiths, 1981; and Ramos, 1974).

an urban population of 547 children less than six years of age, where the malnutrition rate was 63 percent (42 percent were grade I, 20 percent were grade II, and 1 percent was grade III).

The nutritional status of preschoolers on an urban neighborhood in Huancayo was measured with the Ramos Galván standards (Ministerio de Agricultura y Alimentación, 1977). Fifty-two percent of the participants were suffering from grade I malnutrition, 12 percent were with grade II, and 2 percent were with grade III malnutrition.

Dietary Surveys in the Peruvian Andes

Numerous dietary surveys have been conducted by anthropologists and nutritionists in the Peruvian Andes since the 1950's. In two of the sites that will be discussed below, Vicos and Nuñoa, the nutritional survey was part of a larger, multidisciplinary research effort. The data collected by the researchers offered a broad picture of the communities and the factors affecting the nutritional status of their residents. None of the surveys to be cited accounted for the use of coca leaves and alcohol (as *aguardiente*, a sugar cane alcohol; grain alcohol; or *chicha de jora*, a fermented beverage made from corn). The alcohol beverages may add to the caloric, protein, vitamin and mineral content of the diet, depending upon the processing procedures and the consistency of the

slurry consumed. Coca leaves and the alkali *llipta* with which it was chewed to quell hunger and give endurance, had been noted to be a rich source of calcium (Duke et al., 1975; and Baker and Mazess, 1963).

Vicos

One of the earliest Peruvian national surveys included Vicos, an Andean hacienda community in northern Peru. In 1951, the hacienda was rented to Cornell University for a research project on the "acculturation of the Indian" (Collazos, et al., 1954). Over a period of five years, social, educational, and agricultural reforms were implemented by Cornell University staff and the Peruvian government personnel to raise the community's standard of living (Vazquez, 1965). Between 1952 and 1956, the community was surveyed three times by a team of government investigators. The surveys showed the effect of the reforms on the nutritional status of the residents. The status had improved because of an increased amount of food available, and the improvement of the health and income of the general population.

As is typical of rural Andean communities, the diet in Vicos was partially defined by the altitude of planted fields (*chacras*) that the individual owned or rented. The data collected through the dietary surveys in July 1952, February 1953, and May 1956 showed the typical Vicos diet

to include barley, corn, wheat, broad beans, *oca*, cabbage, potatoes, onions, herbs, sugar, and lard (Collazos, et al., 1954; and May and McLellan, 1974). The Vicos lands ranged from 2700 to 6000 meters (Collazos, et al., 1954). The steep incline of the mountainside required terraced agriculture; the altitude of each parcel allowed only specific crops to be grown. Table 2 lists the crops which are possible to cultivate at the different altitudes in the Andes. The meters are approximations which differ somewhat throughout the country.

Table 2. Crops that can be cultivated at specified Andean altitudes.

Altitude (meters)	Plants cultivated
800-1500	sugar cane, coffee and cash crops
1500-1900	wheat and maize in non-drought years
1900-2450	wheat and maize
2450-3100	lower: wheat, maize and barley upper: potato and pea
3100-3500	potato, *oca*, and other tubers
3500-4450	pasture, *cañihua* and *quinua* (both indigenous grains) and potatoes

From: Brush, 1977; and Thomas, 1976.

The 1952 and 1953 Vicos Surveys

The adequacy of the diet noted in the 1952 and 1953 dietary surveys was first evaluated by Collazos and co-workers (1954) in terms of calories, protein, vitamins and minerals using INCAP recommended allowances. In these first two studies, deficiencies were seen in calories, calcium, vitamin A and riboflavin. The findings of the surveys were supported by medical examinations showing clinical signs of modifications of the tongue and lips, xerosis of the skin, unusual eye pigmentation, poor muscular development and abnormal subcutaneous fat tissue (Alers, 1965; Collazos, et al., 1954; and Collazos, et al., 1960).

The 1956 Vicos Study

An improvement was seen in the diet after the introduction of new technology, such as seeds and fertilizers (Alers, 1965). The new agricultural inputs increased the quantity of the foods available for local consumption. The production and sale of surplus potatoes provided cash for the peasants. The diet in 1956, as compared with the diet in the previous two surveys of 1952 and 1953, was higher in the use of purchased meat and packaged food (types not detailed in the report), and in locally produced crops. The per capita consumption of calories, vitamins A and C, and niacin were found to have increased since 1953.

The improvement was not attributed to purchased items but to the increase in the consumption of locally grown foods (Alers, 1965).

Paucarolla

The average diet in Paucarolla, a farming community located in southern Peru at approximately 3800 meters, was a mixture of locally and non-locally produced foods (May and McLellan, 1974). In a 1955 survey, Paucarolla residents' basic diet included mutton, fresh potatoes, *chuño* (freeze-dried potatoes), rice, bread, barley, *quinua*, and white sugar. The small artisan industry and the surplus crops and animals provided the currency to purchase or exchange for the white sugar, bread and rice. In the evaluation of the diet, the calories, calcium, vitamin A and riboflavin were low in comparison to the World Health Organization (WHO) recommendations (World Health Organization, 1974).

Nuñoa

Two nutritional surveys in 1962 and 1967 were conducted during a long-term multidisciplinary study of high altitude adaptation in Nuñoa (Mazess and Baker, 1964; and Gursky, 1969). The research site was located in the highlands zone of southern Peru and included the town of Nuñoa and the surrounding villages and haciendas. The comparison of data from the studies showed that different factors

affected the Nuñoa diet in each year's study.

The 1962 Survey of Nunoa

In 1962, all foods that were to be consumed by the participants of the study were weighed for one day (Mazess and Baker, 1964). In addition, a 24-hour dietary recall was taken. The foods included: *chuño*, potatoes, other tubers, wheat, barley, maize, *quinua*, *cañihua*, meat, lard, onions, sugar, peppers, and milk. The last four items were consumed only in small quantities. Using the Interdepartmental Committee on Nutrition for National Defense standards for dietary intake, the fresh potatoes provided approximately 75 percent of the recommended vitamin C and 30 percent of the recommended vitamin B complex (Mazess and Baker, 1964; and Mitchell, 1979). *Chuño* provided about 50 percent of the total calcium intake and 25 percent of both the total thiamin and riboflavin intake. Only the *chuño*, potatoes, barley, *quinua*, *cañihua*, and meat products would have been locally produced. Other foods were purchased or part of a trade. In 1962, the non-locally produced foods comprised only 2.5 percent of the total bulk of foods consumed (Picón-Reategui, 1976). The diet appeared to be defined principally by the domestic animals and the crops that could be grown at the given season and high altitude. The national and regional food markets had little interaction with the community.

The 1967 Nuñoa Survey

By 1967, the situation had changed in Nuñoa. A poor harvest of potatoes decreased the availability of the tubers, both fresh and freeze-dried. By July, only one month past the end of the harvesting season, only 9 percent of the diet was made up of potatoes and *chuño*; in contrast to 78 percent of the diet in 1962. The lack of potatoes required the Nuñoa residents to incorporate into their diet other local products and non-locally grown foods. The diet in the 1967 four-day food weighing survey was principally made up of wheat, maize, meat, *quinua*, barley, and some *chuño*. The differences in consumption of products in 1962 and 1967 can be noted in Table 3. The use of meat, wheat, *quinua* and corn increased considerably in 1967.

The analysis of the 1967 Nuñoa diet suggested that it was inferior to the 1962 diet in calories, protein, vitamin C, niacin, riboflavin, calcium and iron (see Table 4). However, several points should be remembered: 1) different researchers collected the two sets of data; and 2) different methods of data collections were used.

The ability to have ready cash or exchangable items, such as animals, became important in Nuñoa, as reliance on the regional and national markets for food increased. Access to the markets and products also influenced the availability of food. In 1967, it was reported that trucks

Table 3. Percent of total bulk of selected foods in the Nuñoa diet, 1962 and 1967.

Food	Baker and Mazess Study Nuñoa (1962) %	Gursky Study Nuñoa (1967) %
ANIMAL:		
cebo (fat)	0.3	0.7
meat	6.0	12.3
cheese	--	2.5
GRAINS AND VEGETABLES:		
cañihua	2.9	2.2
wheat	0.9	21.6
barley	3.4	7.4
rice	--	0.7
quinua	3.0	11.9
maize	1.6	22.0
potatoes	47.9	1.9
chuño	30.4	7.4

From: Picón-Reategui, 1976.

Table 4. Nutrient intakes in Nuñoa, Peru.

	1962	1967
Calories	3110	1784
Protein (gm)	69.0	53.4
Thiamin (mg)	1.8	1.8
Niacin (mg)	41.0	18.0
Riboflavin (mg)	2.1	1.0
Vitamin C (mg)	114.0	8.0
Vitamin A (IU)	102	5542±5962
Calcium (mg)	441	334
Iron (mg)	22.0	18.0

From: Gursky, 1969; and Mazess and Baker, 1964.

from Puno entered regularly to supply residents with liquor, molasses, peppers, maize and fish; Nuñoa stores stocked products such as flour, maize, sugar and rice (Gursky, 1969). The purchasing power of the residents limited the amount of products that could be bought. The purchased foods were primarily wheat and maize in the 1967 diet. A lack of sufficient cash probably prohibited the purchase of the quantity of products needed to meet daily dietary requirements.

Lima

Graham and coworkers (1981) compared varied food expenditures on nutrient sources. As has been seen elsewhere, milk, meats, and fats were consumed more by the higher spending group. In addition, bread was found to be a substitute for noodles when increased money was available. The percentage of the diet that was made up of rice and legumes was constant no matter what the food expenditures were.

Southern Peru

Figueroa (1981) studied food usage in eight communities in southern Peru (in the departments of Huancavelica, Apurímac, Cuzco, and Puno). He found 50 percent of the food consumed to be home grown. Purchases of food included: noodles, rice, canned products, edible oils, beers, and soft drinks. Trading without cash accounted

for only five or less percent of the total production of foodstuffs for the community. Contrary to what other researchers had found, Figueroa thought that there was a trend toward an increased use of local products and a decreased use of the non-locally produced foods. He sighted the example of the increased use of lard instead of vegetable oils. Previous research and the present research do not contribute to this concept of a move away from the market system. On the contrary, all indications point to an increased use of the marketed products.

Non-local Foods Used in Diets Around the World

In each of the Peruvian dietary surveys that were cited, the diet was a mixture of locally and non-locally produced foods. The nutritional adequacy of the diet was affected by the quantity and the nutrient quality of the foods. Studies on the use of non-locally produced foods have been conducted elsewhere, such as in Finland and American Samoa.

Finland Study

In Finland, it was found that as an isolated community became more immersed in a cash economy, the variety of commercially marketed foods increased (Pelto, et al., 1981). As the new products were accepted there was a corresponding loss of the use of locally produced foods.

American Samoa Study

Dietary changes similar to those found in Finland were noted in research conducted on the American Samoan islands (Bindon, 1982). The traditional foods such as breadfruit, banana, yam and shellfish were lost with the development of the islands. When diets were compared between different island sectors varying in the degree of modernization, definite changes were noted. In the most modern sectors, the traditional foods had been replaced by marketed foods such as canned corned beef, canned fish, fresh beef, rice and bread. The more isolated communities maintained the use of the traditional foods.

Breast Milk Volume Studies

Researchers studied the nutrient intake of young children have investigated the production and consumption of breast milk. Quantifying breast milk is necessary before a breast fed infant's diet can be evaluated for calories and nutrients. Where as other foods can be easily weighed and measured before consumption, the mechanism of delivery of breast milk, breast directly to infant, causes difficulty in quantifying the milk. Two methods have been developed to measure the milk produced: 1) "test weighing", where the infant is weighed before and after each feeding and the difference between the weighings is considered the quantity of milk ingested;

and 2) expression of milk from both breasts by mechanical or manual means, after which the milk is measured (Picciano, 1981; and Brown, 1982). Both methods have problems. The yields from expressing the milk may be lower than normal because the natural let-down reflex was interrupted. The "test weighing" method is less disruptive to the normal feeding periods. A cycle can begin with the "test weighings" where the child is awaken during the second weighing, must be breast fed again, and therefore reweighed.

Table 5 shows results from various studies on breastmilk volume. Scottish infants in two studies were weighed before and after breast milk feedings. The mean daily milk consumption at day 5 was 400 and 500 ml, and 700 to over 900 ml between 50 and 200 days (McClelland, 1978). Illinois infants showed lower intake levels in their test weighing (Picciano and Deering, 1977). They consumed from a mean of 606 ml at 28 days to 626 ml at 90 days. Swedish infants consumed a mean of 538 ml at per day at 14 days and 756 ml per day between 3.5 and 6.5 months of age (Lonnerdal, et al., 1976).

"Test weighing" was used in the Gambia to estimate breast milk intakes (Rowland and Paul, 1981). Seasonal changes were noted in the breast milk quantities, which dropped during the rains. The mean 24 hour production of milk (in grams) for infants from 3 to 18 months of age is

Table 5. Breast milk production figures.

Country	Age Groups			
	1 to 6 months ml	6 to 12 months ml	12 to 24 months ml	24+ months ml
USA[a]	606-626			
Sweden[b]	538-756			
Scotland[c]	500-900			
	400-700			
Gambia[d]	730-790	670-730	610	
Mexico (1961)[e]	590	510	380-510	380
Mexico (1971)[e]	450-650	400-500	350	

From: Picciano and Deering, 1977[a]; Lonnerdal, et al., 1976[b]; McClelland, et al., 1978[c]; Rowland and Paul, 1981[c]; and Chavez, et al., 1975[e].

listed in Table 5.

Research completed by Martinez and coworkers (1971 and n.d.) in Mexico and Chavez and coworkers (1975) found breast milk volumes to vary according to the age of the child. A sharp increase in volume was noted during the first 8 weeks after birth, from 450 to 600 ml. That volume declined over the next two months to about 500 ml and stayed at that level for 8 months. During the second year of lactation, milk consumption levels dropped to a mean of 350 ml.

Jelliffe and Jelliffe (1978) gathered breast milk volume studies and developed age groupings that would be used for mean calculations of milk production. The age groups were: 1 to 6 months; 6 to 12 months; 12 to 24 months; and 24 months and over. The means for the groups

were based on studies completed in 13 underdeveloped countries.

Recommendations to estimate the milk intake of the infant varied. The World Health Organization suggested using 850 ml per day as a mean for all periods of lactation (World Health Organization, 1965). Jelliffe and Jelliffe (1978) recommended a lower value for estimating breast milk volumes at varying ages: 500 to 700 ml per day for 1 to 6 months old; 400 to 600 ml per day for 6 to 12 months old; 300 to 500 ml per day for 12 to 24 months old; and 230 to 488 ml per day for 24 months old or over.

Weaning Age Child

Breast milk serves adequately as the sole food for normal infants with healthy mothers, up to a maximum of six months of age (Food and Agriculture Organization, 1974; and Michigan Department of Public Health, 1981). In cases where the mother or infant is not in normal health, a decrease in the growth rate before six months of age may be seen if only breast milk is consumed.

Once breast milk is no longer sufficient to maintain proper growth rates, the infant must receive weaning foods that supply the necessary caloric and nutrient levels for growth. Difficulty arises in underdeveloped areas where the food might not be calorically dense (such as a thin gruel) or might be contaminated and lead to

infectious diseases. Illness is detrimental to the growth rate of the infant as it can cause anorexia, vomiting, and diarrhea, all of which can lead to loss in weight.

In The Gambia each year, the rainy season was accompanied by a food shortage, increased agricultural work, and an increase in infectious disease (Rowland and Paul, 1981). All three factors caused a decrease in energy intake and an increased energy output in women, and a corresponding loss in weight and breast milk output. The response of the mothers to the deleterious situation that could interrupt the normal growth pattern of the infant, was to introduce weaning foods early, between three and five months of age. The stress of inadequate calories was relieved by the weaning foods, however the increased risk of infection through contaminated food, was then a prominent concern for health workers.

Enrichment of weaning foods to improve child nutritional status has been the focus of nutrition education projects in several countries. A mass media project in the Phillippines utilizing radio messages as the primary source of nutrition information, attempted to change mothers' preparation of a weaning food so as to include fish, green vegetables and cooking oil (Manoff International, Inc., 1977). Enrichment of the weaning food with fish and green vegetables was significantly increased in the families exposed to nutrition messages. The

Indonesian Nutrition Improvement Program set similar weaning food goals as the Philippine project: enrichment of porridge, with green vegetables, rice, *tahu* or *tempe*, and coconut milk (Manoff International, Inc., n.d.). The primary source of nutrition information was volunteer community nutrition workers, with radio as the secondary source. Preliminary results showed a significant difference between control and experimental groups for nutrition knowledge, use of green vegetables and coconut milk in porridge, and growth rates as shown on weight-for-age charts.

Dietary Limitations

Cayón (1971) researched the food beliefs of Quechua speakers in two communities in the Andahuaylas province. He found that residents placed various restrictions on the weaning age child's diet, including: no eggs (to avoid an individual's later having children that looked like chickens); no large potatoes or fresh corn-on-the-cob (that were believed to cause the child when older to fall off a cliff); and no chicken heads (that might cause the child to move his or her head like a chicken). Eating chicken necks was believed to cause a child to sing well.

A pregnant woman was allowed any food that she desired; a denial of a food was believed to cause the fetus's death. After giving birth, the mother recuperated

with a diet high in meat.

Twenty-four Hour Dietary Recalls

Rasanen (1979) tested the use of twenty-four hour dietary recalls on Finnish rural children. He found that repeated recalls showed high reproducibility for group consumption. That is, the individual variability between repeated recalls might have been large, but the child's place among the participant group remained unchanged. The reproducibility made the twenty-four hour dietary recall preferable to the food history for dietary documentation.

Beaton and coworkers (1979) looked at sources of variance in the twenty-four hour dietary recall data. Using past participants of the National Heart, Lung, and Blood Institute study, they found a significant effect of the day of the week on the absolute nutrient intakes of women. Working United States women ate more food on Sunday than on other days of the week. Such an effect was not seen with men. It was suggested that the total amount of food ingested (energy intake) rather than the particular combination of food (nutrient concentration per 1000 calories) was the main variance. Nutrient concentrations but not absolute intakes therefore could be pooled across sex and the day of the week without major concern about potential bias.

Gersovitz and coworkers (1978) reported one problem of the twenty-four hour dietary recalls to be the "flat slope syndrome". He suggested that although the mean was accurately recalled, fewer subjects would have very low intakes or high intakes. The flattening effect made it harder to note the effect of a nutrition program because it failed to detect actual differences in participants. Grouping dietary data for the entire sample as a whole might have lessened some of the problems of poor memories, atypical diets and the above mentioned problems.

Data Base

Nutrient content of foods had been analyzed in 100 gram edible portions and common portion sizes. The United States Department of Agriculture (1975) and Pennington and Church (1980) both developed food composition tables for American foods, using common portion sizes to report the nutrient composition. The Ministry of Health (Ministerio de Salud, 1975) in Peru developed food composition tables for Peruvian foods, using portion sizes of 100 grams.

FAO Recommended Intakes of Nutrients

The Food and Agriculture Organization (FAO) in joint effort with the WHO developed a handbook on recommended intakes of nutrients, based on human nutritional requirements (Food and Agriculture Organization, 1974). The

recommendations were meant to serve as guidelines for government planners, institutions involved in food preparation, and as comparison figures for nutrition surveys. The recommendations were written as the minimum requirements for the specified age group. A comparison of actual reported intake to FAO recommended intake could not be used to indicate malnutrition, without further clinical and biochemical evidence.

Anthropometric Measurements

Anthropometric measurements have been used to estimate individuals' nutritional status (Jelliffe, 1966). Length- or height-for-age is used as an indicator of past nutritional problems (Griffith, 1981). Low values in this category could signify stunting from long-term malnutrition. Weight-for-age is sensitive to small changes in nutrition status and reflected chronic and acute malnutrition. The sensitivity of the weight-for-age measurement made it useful for monitoring nutrition programs. Weight-for-height indicator is used to identify children that might be short for their age but are well proportioned for their height. Triceps skinfolds are a method to measure skinfold thickness as an indicator of subcutaneous fat (energy) stores (Jelliffe, 1966).

Reference Population

WHO recommended the use of United States National Center for Health Statistics (NCHS) growth charts for reference values for height and weight (World Health Organization, 1978, and Waterlow et al., 1977). The NCHS values were chosen for the following reasons: 1) the data were recent; 2) the sample size was large and varied according to ethnic background, socioeconomic strata, and place of residence; 3) a trained staff collected the data; 4) the data were cross-sectional; and 5) the data were available for analysis. Triceps skinfolds were analyzed in the 10-State Nutrition Survey for black and white Americans. The 10-State Nutrition Survey was a survey of those states thought to have large pockets of poverty and hunger. Although it was not representative of the entire United States, it did offer a large reference population, to be used until the NCHS recently collected triceps skinfold data are available.

Summary

Researchers have suggested that the population segments at greatest nutritional risk are weaning age children and others in periods of rapid physical growth. The Vicos and Paucarolla studies showed deficiencies in diets of residents in calories, vitamin A, riboflavin, and calcium. The Nuñoa researchers found deficiencies in vitamin A,

calories, riboflavin and vitamin C. Malnutrition has been documented in the nutritional status surveys as ranging from 28 to 71 percent of the young children sampled.

With increased market participation, a growing portion of the diet of each of these villages and other communities around the world was made up of non-locally produced foods. These products had the possibility of supplementing or replacing the foods that were traditionally grown and eaten. In the case of Vicos, the new foods appeared to add little to the diet. In the case of Nuñoa and American Samoa, the traditional, local foods were replaced by purchased foods. Concern about replacing the local foods arose because of the limited purchasing power of rural people. The cash available to the rural residents might not have been sufficient to buy the quantity of foods imported from outside the region which were necessary to meet the residents' daily dietary needs.

The changes which occurred in the food habits of rural communities can be watched throughout the process of development. In the Andes of Peru, isolated villages are slowly coming into contact with the national and regional markets. This contact may induce positive, negative, or no effects on the rural diet. A supplementation of the diet would be positive for the groups that have been identified as high nutritional risks. However,

these same groups may become more at risk should a highly nutritious food be replaced by one that is purchased but is nutritionally inferior.

No researchers have studied the use of non-locally produced foods in the Peruvian diet. Therefore, this study was designed to examine the use of the locally and non-locally produced foods in the rural community of Pacobamba, Peru. Like other research sites previously mentioned, Pacobamba is a farming community in the Andes, whose residents obtain food through private agricultural production, trading without cash, and purchasing with cash. Marketing practices that brought non-locally produced foods into the community were studied along with the reasons why people chose to use these marketed foods. By evaluating the nutritional value of the foods themselves and their usage, estimates on the impact that these foods might have had on the rural diet can be made.

METHODS

Three non-locally produced foods were studied to document their prevalence and usage in the Pacobamba residents' diet and estimate their effect on health status of residents. Methods used in the research included: literature review, participant observation, socio-economic and food buying interviews, store inventory interviews, twenty-four hour dietary recalls, and collecting anthropometric measurements.

The literature review provided socioeconomic background for the study and defined past nutritional problems in the southern Peruvian Andes. It also helped to define the age groups of the participants. Participant observation helped to define the child age group, the three non-locally produced foods to be used, and characterized the community. A socioeconomic interview schedule was used to define the community of Pacobamba. Food buying questions identified the prevalence of the non-locally produced foods. A store interview was utilized to identify non-locally produced foods available to the community residents, the foods' place of origin, and to help the researcher choose the three non-locally produced

foods to be studied. The twenty-four hour dietary recalls gave an estimate of the dietary intake, and a frequency of non-locally produced foods in the diet could be elaborated from this data. The anthropometric measurements of height, weight, and triceps skinfold were used to estimate the nutritional status of the participants. Both the dietary intake and anthropometric measurements taken were used to see if any effect of the non-locally produced foods could be noted in nutrients or nutritional status of participants using varying levels of these foods.

Fieldwork was conducted from August to December 1983, during which the researcher lived in the village of Pacobamba. The interview schedule to collect socio-economic and food buying data was developed in English, translated to Spanish at Michigan State University, and pretested in Peru. A randomly selected sample of families were interviewed on three occasions to obtain data on the family's socioeconomic status and food buying habits, a twenty-four hour dietary intake, and height, weight, and triceps skinfolds.

Preliminary Research

A literature review was conducted at Michigan State University and the following Institutions in Lima: Centro de Investigación en Nutrición y Control de Alimentos

(CINCA); Instituto de Investigación Nutricional (IIN); Instituto Nacional de Estadística; Ministerio de Salud; and Ministerio de Agricultura y Alimentación.

Publications on previous nutrition research conducted in the Andes were reviewed for information on specific nutritional problems in Peru and culturally important customs related to food and agriculture. Data were collected on agricultural production in the district of Pacobamba through the annual agricultural production reports from the Agriculture and Food Ministry and the 1972 Agricultural Census (Oficina Nacional de Estadística y Censos, 1975; and Ministerio de Agricultura y Alimentación, 1974). Socioeconomic descriptions of the district and the town of Pacobamba were found in data from the 1972 population census (as of this writing, the 1982 census for the department of Apurímac was not available) (Instituto Nacional de Estadística, 1978).

Researchers at CINCA and IIN were informally interviewed to help define the age group of the children to be sampled. Through the discussions, the weaning age group was chosen to be the sample.

Health ministry officials in Abancay were also interviewed and nutritional data on the department of Apurímac were requested by the researcher. Although growth monitoring was conducted in many medical outposts around the Apurímac department, no centralization nor

compilation of the reports were completed.

Permission to Conduct Research in the Province of Andahuaylas

As the province of Andahuaylas was under military rule, written permission was obtained from the area security chief of the Armed Forces in order to conduct research in Pacobamba (See Appendix A). Once permission was granted, the researcher met with no interference from the military or civilian police.

Participant Observation

This researcher's first two months in Pacobamba were spent on participant observation. Informal conversations with residents in their homes and fields, and more structured conversations with store owners and political leaders provided information on three areas: community characteristics, community cash flow, and entrance of non-locally produced foods to Pacobamba (Agar, 1980; and Burgess and Burgess, 1975). Figure 1 specifies examples of the information gathered on each issue. All observations were recorded in a field notebook, which was updated daily to serve as one resource for the Research Site chapter (Bass and Kolasa, 1974; Bass, et al., 1979; and Pelto and Pelto, 1978).

General Topic	Specific Information Gathered
Community characteristics	Geographic attributes (water source, mountains) Community services (political, medical, religious) Residents' community obligations (taxes, work) Economic and communication linkages to other cities Ethnicity and language Social activities (festivals, food preparation customs) Food taboos and beliefs Agricultural practices Sex and age roles in food production, preparation, and consumption Prevalent medical concerns
Cash flow	Present cottage industries and cash cropping Animal production and sale Trade Labor practices Marketing practices
Entrance of non-local foods	Time of entrance of non-locally produced foods Origin of foods Seasonality of non-locally produced foods Plans for future importation

Figure 1. Recorded topics from participant observation.

Before starting the interviews, the specific age group of the child was defined and three non-locally produced foods were chosen in order to focus the food buying questions. Both these issues are discussed in the following two subheadings.

Sample

A family consisting of at least a child less than 3 years of age who was also eating foods along with breast milk, an adult male, and an adult female, was the sample unit. The determination of the age of the child to be sample was finalized during the participant observation period. Women from the community were asked for the oldest age they had ever heard of a child being breast-fed. This age, thirty-six months, was used as the upper limit for the child selection. The lower limit of the age group was defined as the age at which the child was eating food in addition to milk. In studies conducted in the Andes and presently in Lima, the weaning age child has been identified as at the highest nutritional risk (Brown, 1983; Mazess and Baker, 1964; and Gursky, 1969). Non-locally produced food presently and in the future may play an important role in the weaning diet and therefore in the nutritional status of the young child.

In Pacobamba, children generally ate from the family pot. In the interviews, only one family mentioned a food

item other than bottles of formula or milk, that was made only for the child to consume. The child's diet therefore was representative of the food available to other family members. The adult female and male of the family were included in this study since their diet represented the family pot of food. They also contributed additional information on the use of non-locally produced foods. The mother was typically the food purchaser and was exposed to the non-local foods more than other family members. She might on occasion purchase foods for herself and others that might not reach the family pot, as they are consumed at the place of purchase. Similarly, the male might buy items that would not be consumed by everyone in the house, such as alcohol. Each participant's recall therefore, represented the general diet of the family and the foods that might be specific to that member's age, sex, or role.

Non-locally Produced Foods

During the participant observation period, the non-locally produced foods available in Pacobamba and Huancarama were noted by the researcher. Three NLP foods were chosen to be the focus of this study, based on three points: 1) the foods replaced a traditionally used product, 2) the nutritional significance of the food, and 3) the overall prevalence of the use of the food. The foods

chosen were: iodized salt, noodles, and vegetable oil. A few questions were also asked about the quantity of sugar, canned fish, and rice used by the family per week.

Sampling

Aided by several residents, this researcher drew a map of Pacobamba (See Figure 2). All houses that lay within the town's boundaries were included along with the major irrigation canals, rivers, roads, school, city hall, church, and stores. The houses were numbered so that the map could serve in the sample selection process.

Using a random number table, eighty house numbers were arranged for screening and sampling. Sampling from the map was used to insure that all present residents were included in the selection process. Sampling from birth records would have eliminated from the potential sample, recent migrants to Pacobamba and children who were born elsewhere.

Each household, corresponding to the house number, was then screened to see if it met the following criteria: 1) child under three years of age and consuming foods other than just breast milk, 2) adult male, and 3) adult female. The screening was completed by: the researcher's knowledge of the family; home visits to establish the age and foods fed the child; and town birth records. All but six birth dates were available and could be confirmed

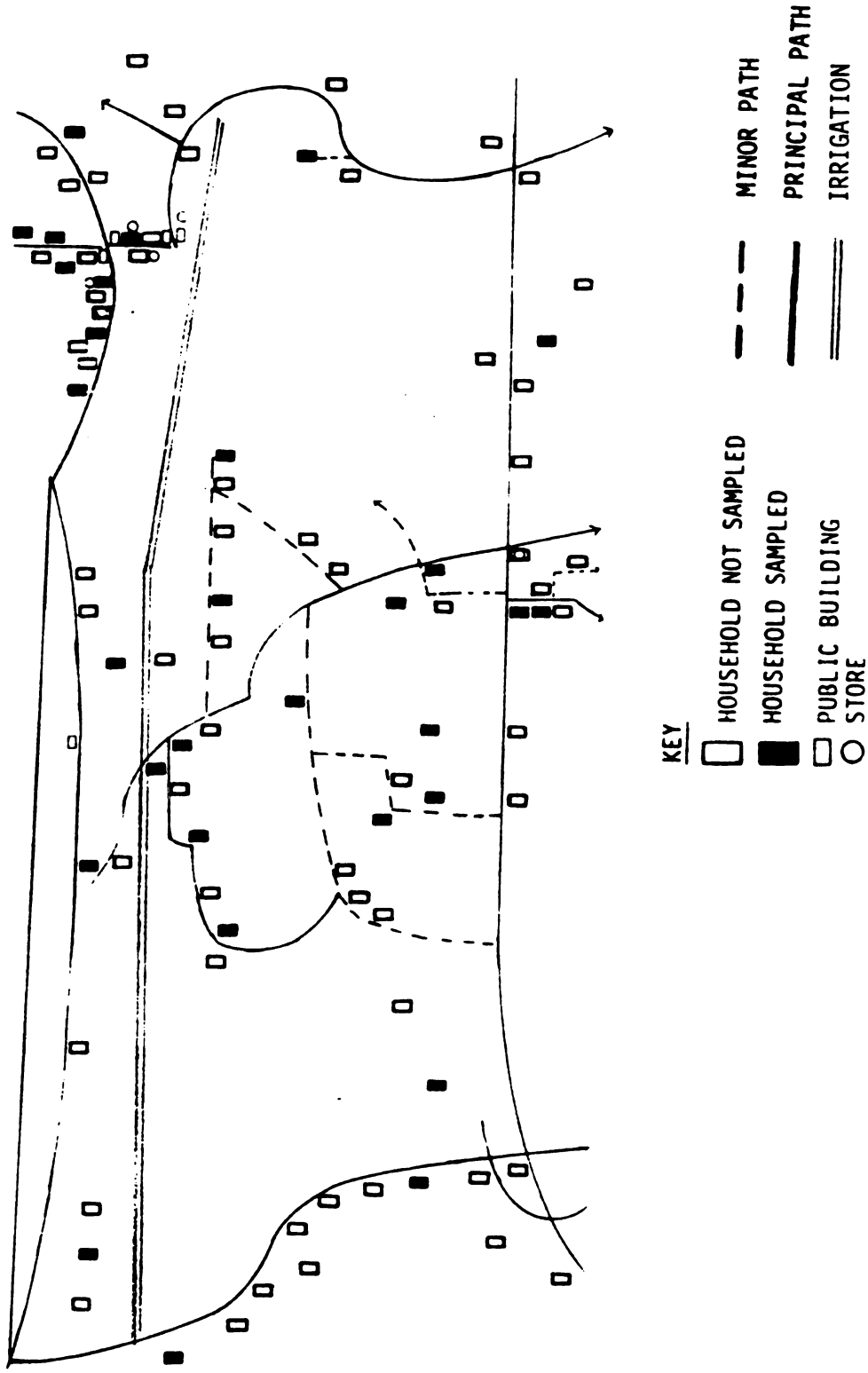

Figure 2. Map of Pacobamba.

by town records. In cases where the child's age as stated by the mother did not correspond to the town's birth records, the records were used as they remain more reliable than mothers' memories (Puffer and Serrano, 1973). In Peru, the registration of births is mandated by law.

A household was not included in the sample if: 1) members did not wish to participate, or 2) an adult family member was not located at the house in four consecutive visits by this researcher. Thirty-three households were identified as meeting all three criteria. Three households refused participation or could not be located, leaving a sample of thirty households.

In cases where two family members met the criteria for participation, the following priorities were used to choose the participant: 1) the mother and father of the child were preferred to other nuclear family members; 2) if one or both parents were not available, other nuclear family members were invited to participate; 3) if two or more children were under two years of age, the nuclear child was used; and 4) if two or more children less than three years of age were both nuclear family members, the mother was asked to decide which child would cooperate best with the three anthropometric measurements. Only one child was included so that each sample unit (the family) would be equally represented.

Use of Translator

Pacobamba residents were monolingual (Quechua speakers) and bilingual (Quechua and Spanish speakers). This researcher conducted the interviews alone in homes where the female participant was bilingual. In homes where the female participant was monolingual, this researcher only asked the uncomplicated questions in Quechua. All elaborate responses and explanations of questions and initial introductions to the study were conducted in Quechua by the translator.

Selection of Translator

A female translator was preferred so that she would easily participate in conversations with the women participants on subjects that were socially considered sex-limited: breast-feeding, cooking techniques, child rearing practices, and food purchasing habits. A resident of Pacobamba who maintained a working relationship with other residents from Pacobamba was preferred for two reasons: 1) her presence would not be an additional obtrusion on the family as she would be familiar to the participants; and 2) she would be close enough to contact on a moment's notice, should an opportunity to interview someone arise, and could conduct interviews early in the morning and late in the evening when people were in their homes.

Training of Translator

The translator was trained prior to beginning the interviews. The study was thoroughly explained to the translator and the type of information to be gathered was outlined. The subjects' rights were emphasized so that she would be able to explain them in Quechua to the monolinguists and aid the researcher in collecting the data.

Data Collection Tools

The data collection was completed on four originally developed forms: a store interview form, socioeconomic and food buying interview schedule, anthropometric measurement sheet, and a twenty-four hour dietary recall sheet (See Appendix B). All but the store interview form were administered during three interviews with each family. All forms were developed at Michigan State University and translated into Spanish. Quechua translations of key parts of the interview schedule were completed in the field.

Store Interview

Over the four month research period, the researcher collected inventory data on all six regularly functioning stores in Pacobamba and five stores in Huancarama that represented different areas of the town. A list was prepared by the researcher at each store to itemize the locally and non-locally produced foods, the foods' place

of origin, and the price of each item (Ministerio de Salud Pública, n.d.). Store owners were interviewed in their store, to determine the food inventory, during a quiet time with few customer interruptions.

Interview Schedule

The socioeconomic and food buying interview schedule was used with each family. It included questions on: 1) home living conditions; 2) family composition; 3) educational levels of family members; 4) travel experiences of family members; 5) land ownership; 6) agricultural and livestock practices; 7) cottage industries; 8) off-farm employment; and 9) food purchasing habits. The data were designed to describe the sample population and relate family characteristics to NLP food buying habits.

The schedule used both open and closed ended questions in a formal interview setting (Bass, et al., 1979). This format was chosen because of the language barrier with monolingual participants and the need for a translator.

The entire socioeconomic and food buying interview schedule was to be completed by either the adult female or male participant during the first visit to the family. The female participant was preferred as she was normally the food purchaser and could therefore more accurately give food buying information. When the woman was hesitant, or the male participant decided that he was the

spokesperson for the family, he was used.

Anthropometric Measurements

Weight, height, and triceps skinfold measurements were taken for the child, female, and male participants of each family using standard technique (Griffiths, 1981; Jelliffe, 1966; and Kanawati, 1976). All measurements were conducted in the participants' homes. Weight was measured with a spring scale "romana" model for children, and with a floor bathroom Detecto scale model for adults. The weight was recorded to the nearest 0.25 kilograms for children and 0.5 pounds for adults. Height was measured to 0.1 centimeters. A recumbent measuring board with a fixed tape measurer was made by the researcher and carried to each home. Triceps skinfolds were measured to 0.5 millimeters with a Lange Caliper.

Twenty-four Hour Dietary Recall

The dietary recall data were collected for all three participants on three components: 1) the type of food eaten; 2) the quantity eaten; and 3) the preparation of the food eaten. The dietary recall for one participant was obtained during the first visit, and the other two recalls were subsequently collected during the second and third visits. Twenty-four hour dietary recalls were completed by asking the participant what first food or drink was consumed the previous day starting at the same

time as the on-going interview. The researcher then worked forward in time to identify all foods eaten in the previous twenty-four hours.

The female participant was expected to provide the information for the child's diet recall.

The researchers attempted to represent all days of the week for the twenty-four hour dietary recalls (Karvetti and Knuts, 1981).

Human Subjects Consent Form

The proposal and interview schedules were submitted to the Michigan State University Committee on Research Involving Human Subjects. At the initial visit to each family, the study and the subject's rights were explained to the family members. A copy of the results of the study was offered to all families.

Pretesting

The data collection tools were pretested in Pacobamba with the first three families and the first two stores sampled. Minor wording changes were made on the interview schedule. No changes were necessary on either the anthropometric or twenty-four hour dietary recall sheets. The store interview form was found to be difficult to use while conducting an inventory of the store. The inventory data were therefore noted in a separate notebook

at the time of the interview and later were transferred to the store form for easy coding.

Data Collection

Data were collected by the researcher and the translator in Pacobamba during the period September to November, 1983. Each cooperating family was visited three times to collect all the data for the socioeconomic and food buying interview schedule, twenty-four hour dietary recalls, and take anthropometric measurements.

Payment to the Participants

Participants that completed the study by cooperating with the interview and three dietary recalls and anthropometric measurements were offered a gift in the form of a photograph of their family.

Analysis

Store Data

The data collected on the food store inventories were described qualitatively and the frequency of stores carrying specified food items was calculated.

Interview Schedule

Data from the interview schedule were used to describe the sample population. Frequencies of the living

conditions, families socioeconomic status, agricultural and livestock production, and money making projects were calculated.

Food buying habits were described qualitatively and frequencies were tallied. The extent of purchasing non-locally produced foods was tested with Pearson's Product Moment Correlation Coefficient to see if travel or education caused significant differences in buying habits levels.

Twenty-four Hour Dietary Recall

The dietary recalls were analyzed for calories, protein, calcium, vitamin A, thiamin, riboflavin, niacin, and ascorbic acid that were computed from the following food composition tables: Food Values of Common American Foods (Unites States Department of Agriculture, 1975), Food Values of Portions Commonly Used (Pennington and Church, 1980), and La Composición de los Alimentos Peruanos (Ministerio de Salud, 1975). Common recipes calculated when ingredients of a meal were not known, were developed by the researcher, who averaged the number of known recipes for a given product.

The nutrient intake of each individual was then compared with the recommended nutrient intakes of the Food and Agriculture Organization and the World Health Organization (Food and Agriculture Organization, 1974).

FAO values used for the percent of recommended calcium intake, corresponded to the lowest value in the given FAO range, so as to reflect the minimum requirement of the nutrient. Diets were considered inadequate if 100 percent of the FAO recommendations were not met.

The frequency of foods mentioned during the twenty-four hour recall was determined and associated with the level of dietary adequacy and the NCHS percentiles for childrens' values on height and weight with Pearson's Product Moment Correlation Coefficient (Nie, et al., 1975; Fitz-Gibbon and Morris, 1978).

Anthropometry

The anthropometric measurements of height, weight, and skinfolds were compared with various United States reference populations, as Peruvian standards do not exist. Children's height and weight values were compared to the NCHS standards as suggested by the World Health Organization (World Health Organization, 1978). The female and male adult height and weight values were compared with the HANES I (1971 to 1974) data (United States Department of Health, Education, and Welfare, 1979). Triceps skinfolds for all participants were compared with the Ten-State Nutrition Survey using values for black US residents so as to diminish economic disparities between sample and reference populations (Michigan Department of

Public Health, 1980). All anthropometric data were plotted against the reference populations to determine the percentiles of the sample population. Pearson's Product Moment Correlation was used to test for any significant differences in the percentage of nutrient recommendations met and the percentile reached on the NCHS growth charts.

THE RESEARCH SITE

Pacobamba, Peru is a peasant community located in the southern department of Apurímac, within the province of Andahuaylas and the district of Pacobamba (See Figure 3). A dirt road connected Pacobamba with the town of Huancarama (approximately seven kilometers in distance); the latter maintained a daily truck route with the department capital of Abancay. The description of the region that follows is based on Peruvian census data from 1972 (the 1982 census has not yet been released), annual agricultural reports from 1970 to 1979, local historians' published works, notes from the researcher's observations, discussions with informants, and data from the interview schedule.

Historical Note

Pacobamba became the district capital in 1944 when the district of Huancarama was subdivided in order to isolate a then-populated lepers' colony located close to Pacobamba (O'Sullivan, 1983; and Vivianco, 1972). Until the period of agrarian reform began in 1968, the community had individual private landholdings, community lands, and

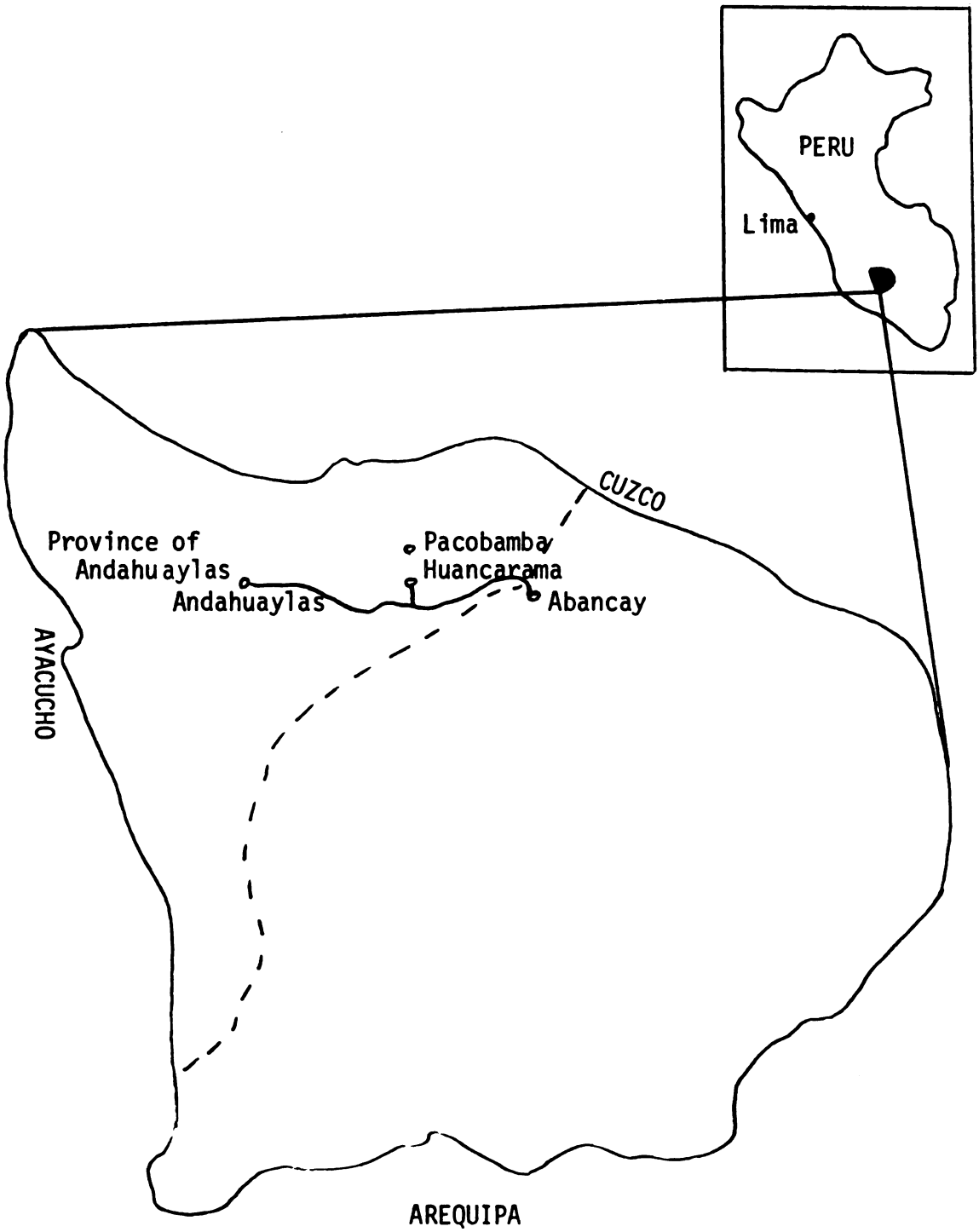

Figure 3. Department of Apurímac.

grazing lands that were owned by the hacienda Santa Rosa. In return for the use of the grazing lands, the local peasants were required to work on the hacienda without pay. When expropriation of the hacienda was imminent in the early 1970's, the owner gave a small portion of his land to past workers with the hope that the workers would be satisfied and not request that the authorities expropriate all the land. Total expropriations were affecting almost all haciendas during the early 1970's (Caballero, 1980 and 1981). To this date, the community of Pacobamba has made no legal claim on the hacienda Santa Rosa and the title remains in the hands of the old owner. The land which is fertile lowland, is unused.

Present Day Status

The village of Pacobamba has the legal status of a "peasant community". This suggests that the residents maintain communal lands and resources, such as water. The status allows the community residents to be eligible for low interest (about 46 percent) Agrarian Bank loans for cash cropping.

According to the "Poverty map of 1981", designed by the Banco Central de Reserva, Apurímac fell into the category representing the poorest regions of Peru (El Comercio, 1983). The map was based on living conditions, education, health, income, and demographic characteristics

of the department.

Population

In the 1972 census, the total population of the urban area of Pacobamba was 120, with 38 houses (Oficina Nacional de Estadísticas y Censos, 1974). However, the census definition of Pacobamba did not correspond with the residents' definition of their village. The residents define Pacobamba by geographical outlines, as seen in Figure 4. The southern limit is defined by a road and mountain edge, the northern limit is a river, the eastern edge is a river and the curve of a mountain, and the western edge is a road and a mountain edge. That description included two of the annexes mentioned in the 1972 census (Uchubamba and Comunpampa). The researcher, for the purpose of the study, used the residents' definition of their village. The total population was 378 individuals with 95 houses, if the two annexes were included from the 1972 census (See Figure 4).

The ratio of males to females in the district of Pacobamba (total populated was 4458) in 1972 varied with the age group considered (See Figure 5). For children under one year of age, 57 percent of the populace was female; from one to three years of age 57 percent of the group was male; and once the age of 15 years or over was reached, the percentages changed again to 57 percent

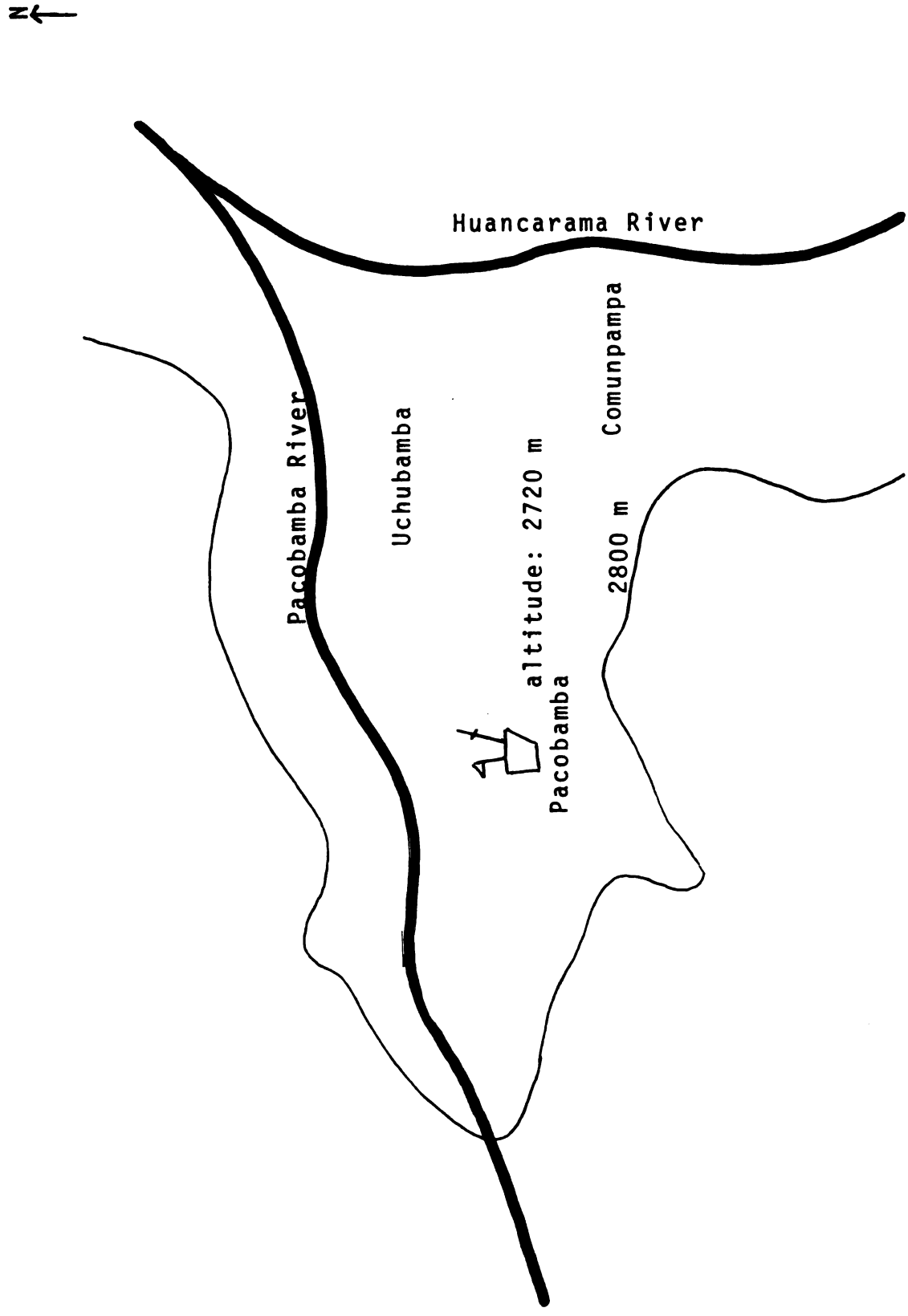

Figure 4. Topographic outline of Pacobamba.

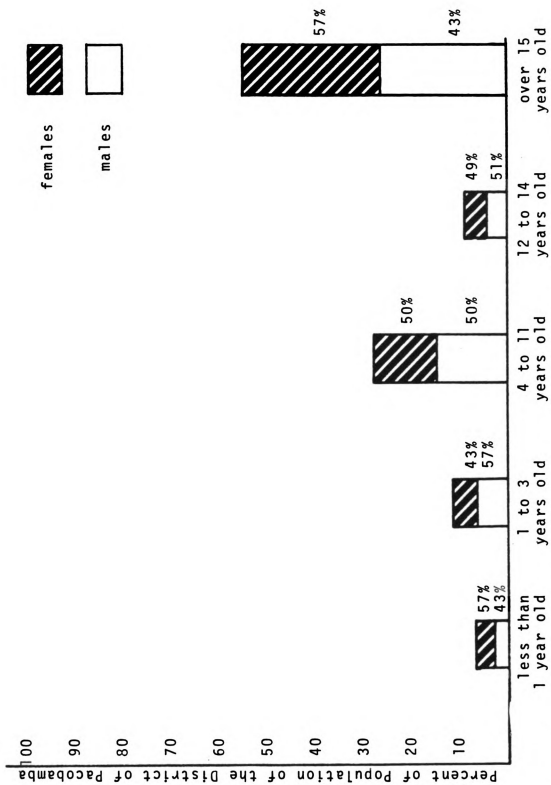

Figure 5. Age and sex distribution of population in the district of Pacobamba, 1972.

females. The decrease in percentage of males in the older age group could be explained by the out-migration of males looking for work from the communities. The change in percentages from "less than one" to "one to three" groups was not easily explained but could be the result of fluctuations due to small population size. This researcher did not note any prevalent care practices of differentiating between male and female children that would explain these percentages.

The 1972 Pacobamba district statistics showed that 49 percent of the population was under 15 years of age. The marital status of the over 12 years of age group included 51 percent married couples, 26 percent unmarried, 9 percent widow(er)s, and 12 percent *convivientes* (living together but not married legally). There was one case of divorce. Fifty-six percent of the households were nuclear, 22 percent were extended, and the remaining were either one person or composite households.

Ethnic Identification

Ethnic identification of the residents included mestizo and Indian. The actual percentages of the population were not known, but pure Indian residents are expected to be rare due to the fact that the Spanish presence and intermarriage has occurred for several centuries.

Housing

Houses were made of mud-and-straw sun-baked bricks. A few of the homes were of cane and mud. Roofs were made of Spanish tiles, straw, eternite (compresed wood chips and plaster), or metal. Spanish tiles were locally produced and imported from Cuzco; the best quality tiles were from Cuzco and were the most expensive form of roofing. The less expensive metal roofs were not desirable because of the noise produced during a rain. In 1972, for the entire province of Andahuaylas, 93.1 percent of the homes were adobe and 55.2 percent of the roofs were Spanish tiles. Residents often commented on the increased number in Spanish tile roofs in Pacobamba since potato cash cropping had begun. All homes in Pacobamba had dirt floors inside the house. A few houses had cement bases on the outside walls.

Community Services

Water

Pacobamba's water was obtained from two rivers. One river above the town supplied the houses in the area of the plaza and to the north; the other river, coming from the direction of Huancarama, supplied the rest of the village. Water was communally owned, therefore the maintenance of the irrigation canals was completed through

community work projects (*faenas*).

Water usage for crop irrigation was controlled by an elected community member. Tickets were sold for a minimal cost by this member for the day that a resident wanted to use the water. The cost of the ticket paid for the ticket itself and a small compensation to the controller. Three tickets were sold for each day. Problems arose often over the water irrigating system for some of the following reasons: 1) often people could not get water for the days when their crops needed the water, and therefore would have to irrigate throughout the night when water was not controlled; 2) if a farmer had plots in more than one region of the community, more than one day had to be requested, thereby decreasing the availability of days for other residents; 3) large plots could require more than one day to irrigate; and 4) the irrigation process cut off water for those homes below the site of irrigation; families could go days without having water flow by the house. Water usage was one of the principal sources of strife in the community since water was such a limited and valued commodity.

The water used for consumption was obtained directly from the irrigation ditches, from a gathering hole (a deposit for irrigation ditch water), or from a natural spring. The last case was the least common as the springs were typically in the lower part of Pacobamba, well past

the last houses.

Sanitation

Sanitation facilities were limited in Pacobamba. This researcher found that three out of thirty families interviewed, mentioned having a specific area for human excretions. Only one actually had an outhouse. The only other outhouse known to the researcher was that of the school. The majority of the villagers used their fields as the communal waste disposal area.

Communication

In late 1983, Pacobamba had a telegraph service which worked two days a week. Telephone service was to be installed soon. Previously existing telephone lines were stolen, thereby interrupting the service. Telephone users now travel to Huancarama to make a call.

Security

The entire province of Andahuaylas was under military rule due to the state of emergency declared by President Belaúnde after terrorist attacks in the region in early 1983. Headquarters for the military were in Andahuaylas. The military and civilian police posts for Pacobamba were in Huancarama. Any official visits to Pacobamba occurred only upon complaints from a resident and a request for the authorities' assistance.

Education

Pacobamba had an elementary school for grades kindergarten to sixth. The school was staffed by six teachers: one had only a secondary education, two had a secondary education and were taking courses to become licensed teachers, two had finished the university, and one (the director) had graduated from the Peruvian equivalent of a teacher's college.

According to the school's director, there was an approximate 70 percent enrollment of the children that were of school age in Pacobamba. Thirty percent of the children that started school finished the sixth grade. Principal reasons for not finishing their primary education included: 1) parents forced them to work on the land; and 2) lack of interest in school on the part of the parents and the children. Approximately 6 percent of the children that started primary school, went on to the high school in Huancarama or elsewhere.

In the 1972 census for the province of Andahuaylas, 29.5 percent of the population over 5 years of age was literate. The average rate for men was 43 percent, for women it was 14 percent. In the sample population 20 percent of the women and 27 percent of the men finished sixth grade or higher. Fifty percent of the women and 33 percent of the men never attended school.

The government maintained a nutrition program (Plan de Alimentación Escolar) in the schools. United States Food for Peace commodities were combined with local donations of potatoes to prepare the children's lunches. For 150 enrolled children in Pacobamba, for March to December, 1983, the following foods were provided: 90 kilos of dry milk powder, 112.5 kilos of Corn-Soy-Milk mixture, 112.5 kilos of bulgar wheat, 90 kilos of oats, 80 kilos of rice, and 7 gallons of vegetable oil.

Medical

A medical outpost in Pacobamba was under construction. No date for its completion or staffing had been set. Therefore residents had to travel one hour to Huancarama to visit the medical outpost and to Abancay, four hours in truck, for the hospital. The outpost in Huancarama was staffed by a primary health worker (*sanitario*), a German nurse, and two auxiliary workers. The facilities included: examination, minor surgery, and growth monitoring rooms; facilities for overnight stays, pharmacy stocked with basic medicines price-controlled by the government, laboratory, and living quarters for the health worker.

A "Mothers' Club" was held at the outpost for participants of the growth monitoring program. In the past, the government had provided dry milk powder for the program's children diagnosed as malnourished. More recently, the milk was only provided by CARITAS (Peruvian non-profit

aid agency) and quantities were not reliable. The amount that came would be divided among the number of participants, and often would be less than one kilo per month.

According to the health worker, respiratory infections were the main illness in children during the dry season. During the rainy season, gastrointestinal infections and diarrhea became severe. An estimated four children from Pacobamba died during the 1983 wet season from dehydration due to diarrhea. The infant mortality rate for the department of Apurímac for 1972 was 108 per 1000 (Ministerio de Salud, 1974).

Religion

The majority of the population in Pacobamba was Catholic. A few families had converted to Evangelism. The Catholics frowned upon the Evangelists as the latter group would go up into the mountains from sundown Friday to sundown Saturday to worship. The Evangelists in return would denounce the Catholics because of their alcohol drinking. Many of the social customs were based on drinking rituals, and the resident evangelists were socially ostracized from community gatherings. Several residents last year left the community and went to the jungle with other evangelists to a described "paradise" to live.

Spiritual Illness

Pacobamba residents identified four distinct spiritual illnesses that were commonly believed to manifest themselves in biological symptoms. These illnesses included *susto*, *mal viento*, *pagapa* and envy.

Susto

Susto, or fright, was the most common explanation for illness of a child. Its symptoms ranged from diarrhea to vomiting to stupor to subtle changes in the eyes. Only a healer, a person trained in identifying and curing *susto*, could identify the etiology of the illness. During the prayer sessions of one healer, the ill individual's head and hands were rubbed as the healer repeated the Catholic's Creed, in Spanish. The healer explained the illness as follows: when a child fell or was startled, the child could suffer from *susto*. The child's spirit would leave the body and the child would become sick. Therefore the healer had to call back the spirit and ask it to return to the child's body so that the child would become well.

Mal viento

Finally, *mal viento* or bad wind, was a common explanation for a wide variety of illnesses, from spontaneous abortions to the flu. It could be associated with one area of Pacobamba that was thought to be dangerous because

of its wind, or to sudden changes of temperature that one might experience going from the warm house to the cool night air.

Pagapa

Pagapa occurred at the time of birth. When a child was born with the mother in a squatting position, the child could be accidentally dropped on the dirt floor. If this occurred, the earth received the child's spirit at the site of the fall. Without his or her spirit, the child became sick. To cure the illness, an exchange of a wide variety of foods for the spirit was made. The foods were buried in the spot where the child fell and the earth would only then release the child's spirit. This illness required a trained healer to identify the problem and the cure.

Envy

Illness could also be brought on by an envious person who placed a curse on the envied individual. A fortune card reader was necessary to identify the curse placed on the sick individual. A series of rituals were performed during the night to break the curse by daylight. Interestingly, one could only rid oneself of such a curse by passing it on to someone else. The healer placed the curse on a toad and the toad at daybreak was taken to the farthest crossroad from the village and released. Once

released, the person that first crossed the toad would be inflicted with the curse.

For all these spiritual diseases, Pacobamba residents considered Western medicine useless. People concluded that the source of their illness was spiritual before seeing the health worker or after receiving a treatment that did not work. In any case, these explanations of disease were dangerous for infants when they kept the child away from treatment for diarrhea or other diseases.

Employment

Community Work Projects

Community projects, or *faenas*, were an important means of maintaining communal property. Irrigation ditches and roads were upgraded; schools, churches, and the city hall were built. Each community member was responsible for providing a male adult to work on all projects approved by the mayor. Those that did not or could not send a male family member had to pay the cost of a laborer's day wages, approximately U.S. $1.00.

Off-farm Labor

Before the agrarian reform affected most of the haciendas in the early 1970's, it was common for the male residents (and their wives if they were still without children) to travel to haciendas and work for an established

period of time. The system of obtaining work hands for an hacienda was managed by an "*enganchador*" (the person who "hooks" another). The *enganchador* would arrange loans for villagers at a time of need, in return for a promise to work at an hacienda for usually 90 to 120 days. The *enganchador* would pick up the workers and return them home after their debt was paid. It was not uncommon that a worker would become further indebted at the hacienda through drinking or purchases at the store, and would have to continue working to pay off the new debt as well as the old one. Most residents from Pacobamba mentioned haciendas in the departments of Cuzco, Ayacucho, and Huancavelica as common work spots.

After the agrarian reform disrupted the system of haciendas, the off-farm work sharply declined. A few residents still travel to the coffee, tea, coca, and cocoa cooperatives in Cuzco. With the introduction of cash cropping, the necessity of traveling off the farm to find income was lessened. In 1983, only 46.7 percent of this sample population claimed to work off their own land and 64 percent of those worked as farm laborers for other Pacobamba residents. In November, 1983, a male and female farm laborers' wages were 2000 and 1500 soles respectively (about U.S. $1.00 and $0.75.

A few residents obtained cash by working in Abancay. A basket weaving factory job could offer a skilled worker

an average of 75,000 soles (U.S. $32.00) per month. Finally, a few residents were skilled laborers, such as house builders and carpenters. These people worked as agriculturalists and supplemented their income with work requiring their skills.

Cottage Industries

According to the 1972 census, 99.3 percent of the Pacobamba district population had no cottage industry (Oficina de Estadística y Censos, 1974). This differed from this researcher's own findings, and daily experiences. Of the sample population, 36.6 percent participated in some type of money making work (selling cheese or eggs, or spinning thread to sell). Other residents that were not part of the study were known to weave for community members.

In the higher altitude communities, it was common to sell cheese on Thursday to a buyer from Pacobamba who would then resell the products on Sunday in Huancarama for a profit. Most cheese bought in Huancarama on Sundays was for the Abancay market. The development of the Abancay cheese market has greatly affected the availability of cheese in Pacobamba. Whereas three years ago cheese was plentiful and could be readily bought, this year it was unavailable to the local residents. Local explanations were the following: local buyers obtained

advances from Abancay merchants, and in turn advanced the money to the cheese makers so as to have cheese ready for a certain date. The cheesemaker might receive 400 to 600 soles (about U.S. $.25) per cheese, which was resold for 650 to 800 soles. Once in the capital of Abancay, the cheese was worth 1000 soles. The local cheese maker often did not want to sell to a local resident out of fear that the local resident might ask for a discount. To avoid the uncomfortable and undesirable situation, the cheesemaker usually found it easiest to say, "*manan kanchu*" (there is none). The cheese was left to be sold on a purely business level where one could acceptably defend one's financial interests.

Climate

Pacobamba residents' houses lay between 2589 meters and slightly above 2720 meters (Instituto Geográfico Militar, 1971). The region is affected by two seasons: dry season started around May and continued through November; the rainy season began in December or January and continued through April. It was normal to have an occasional rain during the dry season. Many villages became totally isolated during the rainy season as mud roads became impassible. The southern mountain region suffered from a drought in 1983 which only mildly affected the precipitation in the province of Andahuaylas. The

lack of sporadic rain during the dry season in 1983 has negatively affected pastures and caused for concern that the rains in early 1984 will not be sufficient. In response to this concern, the government has included the Andahuaylas province in the state of emergency for the drought, to allow special funding to enter the region for relief work.

Agriculture

The yearly importance of a crop was determined by the family's needs and the national market. Beans, for example, reportedly did not receive a high market value in 1982 and therefore were not grown in 1983. Potatoes, however, had been increasing in importance in the last five years. Potatoes had been traditionally grown in small quantities for home consumption as Pacobamba was not considered appropriate potato growing land. The oldest potato cash cropper started alone in 1975. The family then moved to Lima at the end of the 1970's, interrupting their cash cropping. Other families soon followed the cash cropping idea when the national agrarian university La Molina developed better potato seed that was appropriate for a moderate climate and altitude found in Pacobamba.

The principal food crops in Pacobamba were potatoes, corn, wheat, and peas. Alfalfa was grown for animals.

Potatoes were planted after the rainy season and harvested four to six months later (called the *Maway* or medium harvest). One resident this year was experimenting with a parcel of land to see if potatoes could grow during the rainy season. Although nutrient depletion was acknowledged, only increased use of fertilizers were implemented to combat it. Reported potato yields in 1983 were ranging from 51 *arrobas* (586.5 kilos) to 150 *arrobas* (1725 kilos) per *tarea* (one-eighth of a hectare). Residents explained the yield differences by seed quality. Wheat was grown with irrigation during the dry season, in the lower areas of Pacobamba. During the rainy season, wheat was placed in the semi-terraced areas above the village.

Starting in October through November, the corn was sown with the reported earliest harvest being ready in January. Corn and potatoes were the basis of the diet and corn was also used for animal feed. Seed for corn was obtained from last year's crop, through the exchange of a product such as potatoes for seed, or an exchange of varieties of corn seed.

According to residents, potato seed should be changed each harvest to protect the crop from pests. Many residents give their seed to residents of higher altitudes, who plant and harvest during opposite seasons as their lowland counterparts. Once the high altitude residents had harvested their potatoes, they returned an

equal amount of seed from other towns such as Andahuaylas, where reportedly high yields were obtained.

Mean total area per family in the Pacobamba district, according to the 1972 census, was 5.16 hectares, divided into an average of 3.37 parcels (Oficina Nacional de Estadística y Censos, 1975). The census found that of the total land surface, 30.4 percent was worked land, 40.7 percent was natural pastures, and the remaining was forests, permanent cultivation, or other types.

Garden

Garden plots ranged from non-existent to five *tareas* (five-eighths of a hectare). Water appeared to be the limiting factor for garden size. Those families living above the irrigation ditches had no or very limited gardens. Typical products grown were cooking herbs (coriander, parsley, *huacatay*, *paico*), onions, cabbage, garlic, and fruits such as lemons, avocados, and medlar. A few families grew cabbage and cauliflower as a cash crop to sell to residents and to Abancay merchants in Huancarama. One family that did not cash crop in potatoes claimed to make a better living by cash cropping a variety of garden products.

Festivals and Special Days

Special days in Pacobamba included community-wide and family celebrations. The Christmas-New Year's festival was the highlight of the year. Everyone also gathered for the school's fair. Private celebrations for San Juan and All Saints' Day were mentioned by residents.

Christmas

The Christmas festival actually began one year in advance. After the previous festival ends, a new sponsor must volunteer for the following year. "Volunteering" could mean just that or that the Christ child figure was brought to someone's house and that family was asked to accept the sponsorship.

The new sponsors arranged in September an "*ipalla*", a party for the entire community to gather and make donations for the Christmas festival. The *ipalla* was meant to show the generosity of the sponsors and their faith that the other residents would be equally generous. Elaborate meals were prepared in 1983 with two courses including meat, and unlimited alcohol in the form of a corn drink (*chicha*) and unrefined alcohol from grapes (*trago*). A main table was set up for the prestigious members of the community. Offense was taken when those families formally invited with a written invitation did not attend. People not invited were welcome as long as they contributed to

the Christmas festival. During the evening, the sponsors went from guest to guest and asked what each would offer for Christ. The godfather of the festival noted the promised contributions (which ranged from a chicken to a cow, money to costumes for dancers). Each promise was met with a drink of alcohol. At the completion of the list, all contributions were read aloud for the approval of the guests. Contributions were delivered to the sponsors sometime in November or December.

The actual festival could take place over Christmas or New Year's; because of the expense, both were not celebrated separately. Several days included dancing, preparations of food, music, and performances. An "embassador" riding the lead horse announced the dancers to perform, explained each action and read the list of contributions to the festival (Vivianco, 1972). Dancers, with their faces painted black, represented the kings that had come from afar bringing gifts for Christ. Mass was held by one of the prists from Huancarama.

A successful Christmas festival was considered to be a reflection of faith in Christ; more faith corresponded to a better festival. The sponsor had honored Christ child by holding a festival and therefore, it was thought, good luck should come to the sponsor. It also enhanced the prestige of the sponsor in the community by showing excessive generosity in the festival.

School Fair

Another community-wide celebration was the two-day school fair. This was a money-making activity for the school, which every year met with severe criticism from the residents, who felt that the money never went to improve the school but instead went directly to the teachers' pockets. Criticism did not stop the residents from participating in the fair. Soccer competition games were held all day long in the plaza, a bull fight was held in the make-shift ring in the school yard, and stands were set up with favorite dishes: sheep meat stew, chicken soup, potatoes with cheese sauce, baked guinea pig with peas, roasted pig, *chicha*, and beer.

San Juan

On the 24th of June, San Juan was celebrated. This holiday was a mixture of Catholic and ancient religious beliefs. One resident explained the day as the celebration to ask the *aputayta* (the most powerful mountain spirit) to protect the families' animals. *Chicha* was blown toward the mountain over the animals' body as a gift to the spirit. Bright ribbons were strung through the protected animals' ears as ornaments. The tails of the animals were cut off and braided together. The braid was wrapped around a pot of *chicha* and alcohol and buried in the ground. The braid would keep the animals from ever

straying from each other; the pot of *chicha*, should it not dry up over the year, would signify that there would not be a lack of water.

Diet

The Pacobamba diet was based on three meals a day, with no in-between meal eating. Breakfast was generally soup. For families that herded animals far from the house, this meal was their main meal of the day. Soups might include whole wheat kernels, corn, pumpkin (*zapallo*), and squash (*calabaza*), rice, or noodles. Potatoes always complemented the main ingredient. A few families had adopted more urban customs and consumed eggs and bread for breakfast. *Hurpada*, a hot gruel of a variety of grains and legumes, was served no matter what the economic level of the family.

Lunch was served around noon. For traveling family members, this might only have been corn. But for most people, it was a large meal. It usually included soup and often a second course of potatoes, peas, or wheat. Eggs were used when available, either fried or scrambled into the fried potatoes. Chicken and guinea pig were saved for guests or special days such as a birthday. Beef consumption was common only when an accident occurred, such as a cow falling off a cliff. Pork consumption was determined by the family pig's age, and the need for lard. The

slaughter would be planned around a special day.

Dinner was often soup, but might have included the second course from lunch should some be left over. It was not common for one soup to be prepared for the entire day. Fresh soup was made for each meal. With every meal, either *mote* (boiled corn kernels) or *cancha* (toasted corn kernels) were served.

Fluids were not served during a meal. Once the food had been consumed, hot teas were served. A tea might have been made of lemon tree or celery leaves, cinammon sticks, fennel leaves, or other assorted wild herbs. Actual black tea or coffee was rare.

Restriction on Diet

Few restrictions on the diet were mentioned to the researcher. Women, just after giving birth, were given about a week of a high animal protein diet to regain their strength. Infants, however, were thought to be able to eat any food an adult could eat after four to six months of age. The restriction on their weaning diet was a policy of moderation; foods should be introduced slowly so as not to upset their system. Other researchers in nearby communities have reported much more elaborate restrictions, as mentioned in the review of the literature. The diet of the post-partum woman was the only diet that was the same in both the present research and that of

Cayoń (1971).

RESULTS AND DISCUSSION

The use and dietary effect of three non-locally produced foods were studied through various data collected. The data from the socioeconomic family interview schedule were described qualitatively and quantitatively as frequencies. Food buying practices, with special emphasis on noodles, iodized salt, and bottled composite oil, were tabulated. Significant correlations between food buying habits and the socioeconomic data were described.

Store inventory data were compiled to identify foods available through the market system. The percentage of stores carrying each product and the origin of the product was noted.

Twenty-four hour dietary recalls were analyzed for nutrients and compared with FAO recommended intakes. Height, weight, and triceps skinfold measurements were compared with the United States reference populations. Results from the recalls and the anthropometric values were correlated with the frequency of non-locally produced foods in the diet. These results and discussion follow.

Family Interviews

Twenty-four of the thirty families sampled completed the entire study (including the socioeconomic and food buying interview schedule, three twenty-four hour dietary recalls, and three sets of anthropometric measurements). Reasons for incompleted sets of interviews are shown in Table 6.

Table 6. Reasons for incompleted interviews. (n=6)

Reason for incompletion	Number of families
Three or more visits were denied or postponed indefinitely	1
Participant did not return to Pacobamba within researcher's stay (working elsewhere)	3
Participant refused cooperation	2

Socioeconomic Status of Families

Almost all (93%) of the interview schedules were answered by women, the other two families were represented by the father.

Housing

Table 7 has the housing characteristics of the sample population. Most (63%) of the families sampled had their house located below a functioning irrigation canal. The rest of the families were in the plaza with water piped

Table 7. Housing characteristics. (n=30)

Characteristic	Families affected %
Wall Material:	
Adobe	87
Adobe and cane	10
Cane	3
Roof Material:	
Spanish tiles	70
Straw	13
Eternite	13
Metal	4
Door Material:	
Wood	77
Cane	3
Sticks	3
No door	17
Number of Tables:	
None	43
One	37
More than one	20
Number of Chairs:	
None	37
One	37
More than one	26
Number of Beds:	
None	10
One	40
More than one	50
Radio:	
None	7
One	80
More than one	13
Luxury items (has at least one):	
Sewing machine	17
Stove (kerosene)	7
Record player	3
Oven	30

Table 7 (cont'd.)

Lighting[a]:	
Kerosene lamp	97
Flashlight or lantern	13
Outhouse Facilities:	
Available	13
Not available	87
Source of Water:	
Irrigation ditch	40
Gathering hole (from ditch)	43
Faucet	13
No personal source, uses neighbor's	4

[a]Total does not equal 100% as some respondents had both categories.

to the above (13%) or above an irrigation canal (24%). The position of the house in relation to the canal affected the length of time spent each day carrying drinking water to the house, the feasibility of having a garden, and the crops that could be grown. The most limiting situation was that of living above the canal, where farmers had only the rain to irrigate their fields. The quality of housing, as defined by the types of walls, roof, door, and water supply differed significantly ($p \leq .05$) according to the house's location with the highest quality housing in the plaza and the poorest housing in areas above the irrigation ditches.

Generally, houses were made of mud and straw sun-baked adobe bricks, Spanish tiled roofs, and had wooden doors. The houses averaged 3 rooms. More than half of the respondents had at least one table and chair. Ninety percent or more of the families had one or more beds and a radio. Only a few families had an oven for baking or luxury items such as a sewing machine. All families cooked with firewood; all but one lit their homes with kerosene lamps. Water was normally obtained from the irrigation ditch, and few families had any outhouse facilities.

Family Composition

The family size ranged from 3 to 15, with a mean of 7, for the sample population (See Table 8). Seventeen percent of the families were extended. The most common extended members living in the house were grandchildren less than one year of age. Other relations in homes included grandmother, grandchildren one to three years of age, teenage nephew, daughter-in-law, and son-in-law. One family had a non-kin living with them, working as an employee.

Education

Half of the female participants never had attended school (See Table 9). Of those girls that did have the opportunity to go to school, only 13 percent finished primary school, and none finished high school. Less than half (47%) of the women could communicate in Spanish. The educational level of the male participants was higher than the female participants. Many (67%) of the men had attended school and some of them (20%) had finished primary school. One man had also finished high school. Most of the men (70%) spoke Spanish, in addition to the native Quechua.

The sample population's educational level was slightly higher than that reported for the Andahuaylas province in the 1972 census. The low level of educational

Table 8. Family composition. (n=12)

Relationship of extended family member to house owner[a]	Households affected of total sample population, %
Grandchild less than 1 year old	10
Grandchild 1 to 3 years old	7
Teenage nephew	3
Daughters-in-law, 10 to 17 years old	7
Daughters-in-law, over 17 years old	3
Son-in-law, over 17 years old	3
Grandmother	3
Non-kin member of household	3

[a]17 percent of the total families had one or more extended family members.

Table 9. Educational level of participants. (n=30)

Level of Education Reached Years of Schooling	Adult Participants[a] %
Female:	
None	50
Primary:	
first	7
second	7
third	17
fourth	0
fifth	10
sixth	7
Secondary:	
first	3
Male:	
None	33
Primary:	
first	10
second	13
third	17
fourth	3
fifth	10
sixth	7
Secondary:	
first	0
second	3
third	3

[a]Totals may not equal 100% because of rounding.

achievements for the entire province was probably due to the isolation of some communities and their distance from the schools in the rural areas such as Pacobamba. The number of schools in the region and an increased emphasis in education in the last 10 years might also be factors in the noted increase in the educational level.

Travel Experience

Most (69%) male participants had lived in places other than Pacobamba during some period of their life. In a few cases the travel came while serving the Armed Forces; others left Pacobamba to look for work. The average amount of time spent living in another place was two years, with a range from zero to sixteen years. The most frequently mentioned area (32%) that was visited was the "*montaña*", the semi-jungle region that previously had haciendas (See Table 10). Other areas visited included the coastal towns (24%), Lima (17%), Abancay and other mountain cities (7%), and other villages (3%).

Seventy percent of the female participants lived in other areas of Peru. The women, however, had a longer average stay, of 2.4 years, with a similar range of zero to fifteen years. The most frequently mentioned area of stay was the "*montaña*" region (33%). Other places mentioned included Lima (23%), coastal towns (17%), Abancay and other mountain towns (13%), and other mountain

Table 10. Travel by participants. (n=30)

Area Visited	Families %	Range of Visits Years
Female:		
Mountain village	7	4-15
Abancay or other mountain city	13	0.1-4
Montaña (semi-jungle)	30	0.1-4
Coastal towns	17	0.6-4
Lima	23	0.3-8
Male:		
Mountain village	3	4
Abancay or other mountain city	7	2-3
Montaña	32	0.3-4
Coastal towns	24	0.3-16
Lima	17	0.1-6
Other family members:		
Abancay or other mountain city	7	1-14

villages (7%). In comparison with the male participants, the women had a slightly higher visiting rate to Lima and large mountain cities such as Abancay. The men tended to go to the coastal towns more than women. This difference in visiting areas might reflect the typical jobs found for men and women. Men commonly looked for agricultural positions found on haciendas along the "*montaña*" or coast. Women might have been more likely to look for domestic servants positions in the large cities, such as Lima and Abancay.

Money Making Projects

Many (63%) of the families had some means of obtaining cash, other than selling agricultural products or livestock (See Table 11). Thirteen percent of the

Table 11. Means to obtain cash (n=30)

Task	Families Involved in Activity %
Sell cheese or eggs	10
Spin thread	3
Rent land or animals	20
Resell agricultural products	3
Own store	7
More than one of the above	20
None of the above	37
	100
Father is local farm laborer	30
Father is farm laborer on hacienda	7
Father is factory worker in Abancay	7
Father is skilled worker in Pacobamba	3
Father does not work off own land	53
	100

families had cottage industries (making or selling cheese or yarn); 20 percent rented their land for potato harvest, or bulls for plowing; two families had a store; one family bought and resold agricultural products from the district; and 20 percent of the families did more than one of these options to make money.

All of the above mentioned tasks except the cottage industries could be completed by the man or the woman of

the family. Whereas men were often weavers, only women spun yarn or made cheese. Both men and women could work as farm laborers, though it was more common for the man to work in the field and the woman to take care of the animals, the children, and the house. Less than half (47%) of the fathers in the sample worked off their own farm. The majority of the men (64%) that gained day wages were local farm laborers, earning about U.S. $1.00 per day. Other reported jobs included basket weaving in Abancay (14%), working as a farm laborer on cooperatives in Cuzco (14%), and working as a skilled laborer in Pacobamba (7%). The average number of days worked off the farm was 102 per year.

Available Food Products

Agriculture

Most families (77%) owned their parcels of farmland. A few (10%) owned some land and rented additional parcels for potato cash-cropping. Only 13 percent of the families rented all the land they farmed. All of those last families were young couples that had not yet been able to buy their own land.

The most commonly grown crops in Pacobamba were corn (93%), potatoes (87%), and wheat (57%) (See Table 12). A few families (33% or less) also grew peas, broad beans, *calabaza*, *zapallo*, beans, and barley. The majority of

Table 12. Agriculture and livestock production. (n=30)

Agricultural Product or Livestock	Families with Product or Livestock %
Agricultural Product:	
Corn	93
Potato	87
Wheat	57
Onion	53
Cabbage	37
Peaches	37
Peas	33
Avocado	30
Garlic	30
Lettuce	20
Lemon	17
Tomato	17
Cauliflower	17
Chilie peppers	17
Medlar	13
Carrots	13
Sugar cane	13
Other fruits	13
Broad beans	10
Sweet potatoes	7
Squash (*Calabaza*)	7
Pumpkin (*Zapallo*)	7
Caguia	7
Apple	3
Beet	3
Beans	3
Barley	3
Livestock:	
Chickens/roosters/chicks	100
Pigs	97
Bulls	90
Guinea pig	87
Nonmilking cows	77
Horses	63
Sheep	50
Milking cow	27
Duck	23
Rabbit	7
Turkey	3
Goat	3

the families growing corn and wheat (77% and 94% respectively) did not sell any of the harvest. On the other hand, potatoes were primarily a cash crop and 85% of the growers sold part of their harvest.

More than half (57%) of the families had a garden. The most common items in the gardens were onions (53%), cabbage (37%), peaches (37%), peas and herbs (33% each), and avocados and garlic (30% each). Some garden items seemed to be related to the economic level of the family, as shown by the level of housing conditions. Herbs, which were the most traditional item of a garden, were predominantly grown by the poorest families (60%). Fifty-five percent of those families that grew cabbage, a fairly new product for Pacobamba gardens, were in the highest category of the housing index.

Like potatoes, many of the garden products were sold for cash. Over half (60%) of the families growing cauliflower and carrots sold the products for cash. Lettuce, cabbage, and onions were also sold by at least 25 percent of the families growing the products.

Livestock

Every family had chickens. The number of chickens ranged from two to fifteen, with a mean of six. In addition, families had a mean of five chicks, and two roosters. Pigs were nearly as common as chickens, only

one family reported not owning a pig. The mean number of pigs was two per family with a range of zero to nine pigs.

The other important livestock raised by Pacobamba families included bulls (90%), guinea pigs (87%), and non-milking cows (77%). Table 12 lists all other livestock that were reported by the families and the percentage of families raising each type of animal.

Food Store Inventory

Half (54%) of the stores surveyed were located in Pacobamba, the remaining stores were in Huancarama (46%). Participants mentioned shopping in both villages. Huancarama shops were not visited daily because of the distance from Pacobamba (approximately seven kilometers). Many items were more expensive or not available in Pacobamba.

Table 13 lists the foods sold in the stores that were surveyed, and whether or not the food was locally or non-locally produced. The most common store food items (sold by over half the stores surveyed) were: sugar, iodized salt, noniodized salt, candies, soft drinks, bulk noodles, rice, sardines, and spices. One-quarter to one-half the stores sold prepared wheat flour, corn, bread, cookies, tuna in oil, alcohol, wine, and evaporated milk. Few stores sold the remaining food items, such as

Table 13. Foods available in local stores. (n=11)

Food Item	Stores with Item %	Locally Produced (LP) Non-locally Produced (NLP)
Sugar	73	NLP
Iodized salt	73	NLP
Non-iodized salt	73	NLP
Soft drinks	73	NLP[a]
Candies	73	NLP[b]
Rice	64	NLP
Noodles (bulk)	64	NLP
Sardines in tomato sauce	55	NLP[b]
Spices	55	NLP
Evaporated milk	46	NLP
Cookies	46	NLP
Tuna in oil	36	NLP
Prepared wheat flour	27	NLP
Corn	27	LP
Bread	27	LP
Alcohol (*trago*)	27	NLP
Bottled oil	27	NLP
Bulgar wheat	18	NLP
Chilie peppers	18	LP
Cabbage	18	LP
Carrots	18	LP
Potatoes	18	LP
Greens (herbs)	18	LP and NLP
Onions	18	LP
Tuna in tomato sauce	18	NLP
Bulk oil	18	NLP
Margarine	18	NLP
Coffee/tea	18	NLP
Processed bread product	9	NLP
Broad beans	9	LP
Tomatoes	9	NLP
Pumpkin (*Zapallo*)	9	LP
Oca	9	LP
Cassava	9	NLP
Garlic	9	LP
Banana	9	NLP
Beef	9	LP
Boxed noodles	9	NLP
Beer	9	NLP
Pudding/packaged sweet *chicha*	9	NLP

Table 13. (cont'd).

Chocolate	9	NLP
Fresh milk	9	LP
Eggs	9	LP

[a]one type of soft drink is made in the city of Andahuaylas, the others are national products.

[b]some of these products were contraband from Argentina and Bolivia.

fresh vegetables, processed bread, tuna in tomato sauce, packaged noodles, beer, oil, drinks, and milk and egg products.

Store owners said that the highest quantity of goods sold was in sugar, salts, rice, and noodles. Oil purchases varied with the season, high when lard was scarce and decreasing when lard was available. One store owner mentioned that canned fish in the past had been a big seller, but due to the rapid increases in prices, it was almost prohibitive for most peasants (about U.S. $1.00 for a can, or a day's wages). Soft drinks were present in most stores, but were a luxury item for most people. Candies seemed to be purchased mostly by school-age children.

Study's Focus on Non-locally Produced Foods

Three non-locally produced foods were chosen to be the focus of this study based on the following criteria: 1) the food acted as a replacement to a previously used, or traditional, food item; 2) the food was available through the local stores; and 3) based on participant observation, the food appeared to be an important addition to the diet. Below is a brief description of each food chosen, iodized salt, noodles, and bottled oil, and the contribution each could make to the diet.

Iodized Salt

In communities that are located in goitrous regions such as the Andes, where the iodine content of the environment is low and rich dietary sources of iodine are not available, iodized salt represents an important source of the mineral. The researcher could only report two cases of goiterous-like masses resembling grade three in the classification system by Perez, Scrimshaw, and Munoz (Jelliffe, 1966). Health statistics from 1960 showed Apurímac to have the third highest incidence of endemic goiters, with 9.88 percent of the population affected (Kelly and Snedden, 1960). Cretinism, myxedema, and goiters were most prevalent between 1000 to 3000 meters above sea level, within which was the research site of Pacobamba. No recent health statistics on goiters were available at Abancay's Health Ministry.

The United States National Research Council and the WHO recommended allowances for iodine for adults is 150 µg per day (National Research Council, 1980; and World Health Organization, 1974). The WHO suggested 300 to 400 µg per day for regions where goitrogens were present. The 150 µg could be provided by two grams of iodized salt, if there is a 1:10,000 iodine level in the table salt. The most serious health risk of low iodide intake is cretinism, hypothyroidism in infants. Children of parents with endemic goiters could be inflicted with

cretinism, which untreated causes retardation in mental, physical, and sexual development.

The mean salt used, as measured by the adult twenty-four hour dietary recalls divided by the mean number of family members, was 0.5 tablespoons of salt or about 6 grams. With the salt iodized at a rate of one part of iodine in 10,000 parts of salt, this would have provided 461 µg of iodine.

Noodles

The nutrient content of noodles is seen in Table 14. It is compared with other local foodstuffs that noodles commonly partially replaced when they were used in soup (See Table 14). Potatoes were included in the list. However, potatoes normally complemented another foodstuff rather than being the primary component of the soup, so a soup with noodles and a soup with wheat would both have potatoes as a secondary ingredient. Rice was not included as it was not a local food.

The principal foods listed by families as being commonly substituted by noodles in soup included wheat (72%), yellow corn (69%), white corn (*chochoca*) (34%), and potatoes (30%). Items mentioned by less than 25 percent of the families were pumpkin (*zapallo*), squash (*calabaza*), peas, barley, rice, *quinua*, broad beans, and dried potatoes (*moraya*).

Table 14. Nutrient content in 100 grams of selected foods used in soup.

Foodstuff	Calories	Protein (gm)	Calcium (mg)	Iron (mg)	Vit. A (µg)	Thiamin (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
NOODLES	360	9.4	24	1.1	--	0.13	0.13	1.50	--
Potato									
yellow	103	2.0	6	0.4	--	0.07	0.06	1.85	9.0
white	97	2.1	9	0.5		0.09	0.09	1.67	14.0
Peeled whole wheat kernel	358	8.4	51	4.6	--	0.22	0.15	3.85	--
Yellow corn	321	8.4	6	1.7	3.3	0.30	0.16	3.25	0.7
Squash	21	0.5	11	0.6	3.3	0.03	0.04	0.28	10.0
Pumpkin[a]	26	0.7	26	0.6	166.7	0.03	0.04	0.40	3.7

[a]Pumpkin was included as it has been seen by the researcher to be commonly consumed in Pacobamba. Due to reported changes in a nearby cooperative that specialized in pumpkin, the vegetable was not readily available in 1983. As it was not mentioned in any of the recalls, it was not included in Tables15 and 16.

From: Ministerio de Salud, 1975.

The products mentioned in Table 14 were not typically used in equal quantities for a given amount soup. Therefore, to consider their nutrient contribution to the diet, Table 15 lists them in the quantities that were usually present in a twenty-seven cup pot. The quantities were from the average recipes used in nutrient composition calculation by the researcher (for further explanation see "Twenty-four hour dietary recall", page 44).

Table 16 is a listing of the percentage of nutrients of five foods that noodles commonly replace in soup, as compared with the nutrient composition of noodles. Noodles is considered to be equal to 100 percent and the other soups are compared to the noodle soup for nutrient density. White and yellow potatoes are superior to noodles in everything but protein. They particularly are high in the B vitamins and ascorbic acid, the latter which noodles do not have. Wheat kernels are superior to noodles in every category, with the highest contributions to the diet being made in calcium, iron, thiamin, and niacin. Yellow corn is only superior to noodles, for the quantity used in a soup, in thiamin and niacin. Noodles provide 50 percent more calories and protein than yellow corn, and 74 percent more calcium. The squash is superior to noodles in calcium, iron, vitamin A, ascorbic acid, and the B vitamins. Noodles, however, do provide over 50 percent more calories and protein than squash.

Table 15. Nutrient content of selected foods based on reported quantities used in soup.

Foodstuff	Weight (gm)	Calories	Protein (gm)	Calcium (mg)	Iron (mg)	Vit.A (µg)	Thiamin (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
NOODLES	(360)	1294	34	86	4	--	0.5	0.5	5.4	--
Potato/yellow	(2000)	2060	40	120	8	--	1.4	1.2	37.0	180
Potato/white	(2000)	1940	42	180	10	0.4	1.8	1.8	33.4	280
Peeled whole wheat kernel	(500)	1790	42	255	23	--	1.1	0.7	19.2	--
Yellow corn	(188)	803	16	11	3	6.6	0.6	0.3	6.1	1
Squash	(4000)	840	20	440	24	133.0	1.2	1.6	11.2	400

From: Ministerio de Salud, 1975.

Table 16. Percentage of nutrients of selected foods, based on nutrient content of noodles.

Foodstuff	Calories	Protein	Calcium	Iron	Vit.A	Thiamin	Ribo-flavin	Niacin	Ascorbic Acid
	%	%	%	%	µg[a]	%	%	%	mg[a]
Potatoes/yellow	114	85	100	133	--	200	171	493	180
Potatoes/white	108	89	150	166	0.4	257	257	445	280
Wheat	149	134	319	575	--	243	157	385	36
Yellow corn	50	51	26	80	9.4	120	71	121	2
Squash	47	43	367	400	133.0	171	229	149	400

[a]As noodles do not provide vitamin A or ascorbic acid, the quantities listed under these headings are the actual µg and mg provided by the corresponding foodstuff.

In this study, as has been seen in other studies in the Andes, the typical diet appeared to be low in calories, calcium, vitamin A, and riboflavin. The use of noodle soup instead of wheat soup, for instance, would have a negative effect on the calorie, calcium, and riboflavin intakes of the day. On the other hand, noodle soup would improve the dietary intake of all three of these nutrients if it were replacing corn soup. Squash soup would offer a small amount of vitamin A, but more importantly, would increase the calcium and riboflavin content over a noodle soup, but at the expense of calories. A combined diet of the noodles, grains, and vegetables would be best to maximize the nutrient content of the diet.

Oil

The sierran diet is typically low in fats, partially due to the high cost of oil or lard, and the family limitations on pig production. With increasing incomes due to cash cropping, the opportunity to purchase fats in the form of lard or oil, increases. Small increases in calories could be important for the weaning age children that are insufficient in their caloric intake.

For families with limited cash incomes, a diet might be almost void of fat as the quantity of lard (from the family pig) is used up. For families that use oil differently than lard, the oil would replace at times the lard, thereby making the lard last longer. Residents in Pacobamba

reported killing one to two pigs per year. With a limited cash income, oil would be an infrequent source of fat, because of its high cost. The price of vegetable or composite oil in November 1983 was about 3000 soles (around U.S. $1.50) per liter, or one and a half days of a farm laborer's wages. Cash cropping, cottage industries, and the limited off-farm work would provide the income to supplement the diet with oil. Using the mean reported oil use, the oil would provide 189 calories per family member per day. For the infant less than one year of age, that quantity is 23 percent of the FAO recommended calorie intake; for children 1 to 3 years of age, that is 14 percent of their recommended daily calorie intake. This may be a high estimate since it assumes an equal distribution of the oil for each member.

Food Buying Habits of Families

Table 17 shows the foods mentioned by families that could be purchased, and those that could be obtained through trade (*trueque*). The answers were spontaneous; additional responses might have been obtained had probes been used. Three of the most often mentioned purchased items (over 90 percent of the families) were noodles, salt, and oil. These items were the focus of this study, to see if variation in the quantity of these foods made a significant difference on the diet's nutritional adequacy. Other NLP foods in

Table 17. Foods purchased or obtained through trade by Pacobamba residents. (n=30)

Foodstuff	Percent of Families Mentioning Food	
	Purchased (%)	Exchanged (%)
Noodles	100	10
Rice	100	30
Sugar	97	50
Oil or lard	97	--
Iodized or noniodized salt	90	17
Tuna or sardines	73	--
Evaporated milk	23	--
Spices	20	--
Oats	10	--
Vegetable (non-specified)	10	--
Broad beans	--	23
Oca	--	13
Potatoes	--	13
Candies	10	--
Bread or flour	10	7
Alcohol	3	13
Meat	3	--
Guinea pig	--	7
Cheese	3	23
Eggs	3	20
Fruit	3	3
Coffee	3	--
Corn	--	26
Quinua	--	3

high demand were sugar and rice. Items that were obtained through trade (by over 20 percent of the families) were sugar, rice, corn, cheese, broad beans, and eggs. Certain products common to the high altitude communities, such as cheese, *oca*, and broad beans, were less likely to be obtainable with cash. Residents from the lower altitudes would take to the high altitude dwellers products that were not readily available in the remote areas, such as sugar, salt, or fresh garden vegetables, and exchange them for the high altitude products. This was shown in Table 17 where for instance, 23 percent of the families mentioned that cheese could be obtained by trade but only 3 percent mentioned that it was obtainable with cash.

Below is a discussion of the specific buying habits and use of iodized salt, noodles, and oil. In addition, the mean purchases of sugar, canned tuna and sardines, and rice is considered along with their nutrient contribution to the average diet.

Salt

Stores in Huancarama and Pacobamba sold both industrial non-iodized rock salt and iodized fine grain salt. In November 1983 the rock salt was approximately 250 soles per kilogram whereas the iodized salt was 400 soles. Frequently the women complained of the poor quality and uncleanliness of the bulk granular salt. Iodized salt came

pre-packaged, clean, and already ground, thereby making it more appealing to the women residents. The rock salt however, was generally thought to be more potent than pre-packaged salt and therefore more economical. It could be ground down to a powder or used in the chunk form for soup. Some women limited their use of iodized salt, by claiming that the iodized salt did not produce as firm a cheese as noniodized salt did. As there is no technical explanation for this reasoning it may be only a justification for choosing the more economical salt.

Iodized salt is an important non-locally produced food for a community that potentially has a high risk of goiters and cretinism. Iodized salt is still not used by 100 percent of the population. One out of the thirty women interviewed stated that she had never bought iodized salt. An additional seven women said they had used the salt in the past but no longer used it. In total 27 percent of the sample population had made the decision to not use iodized salt and thereby created a potential health risk for their families.

The most frequent reason (62%) given for using iodized salt was convenience (See Table 18). Other reasons offered by the families in order of importance were: health considerations (14%), dislike of granular salt (10%), economic considerations (5%), and personal preferences (5%). The families reported using a mean of about one kilo of

iodized salt per week, with a range of 0 to 3.5 kilos. The mean might have been exaggerated as 48 percent of the families did not purchase salt last week. Dietary recalls did not suggest such high levels of salt intake.

Only three of the thirty families (19%) had always used iodized salt. For the other families, non-iodized salt in the chunk (granular) (76%) or rock (7%) form was used in the past; the remaining participants did not specify previous use. Many (29%) of the past granular salt users still cooked with both non-iodized and iodized salt for all foods. An equal number of non-iodized salt users limited the non-iodized salt to only cheese and soup making.

Noodles

Noodles have been present in Pacobamba for decades, however in the past they were consumed on only special occasions. Today many families use them on a regular basis. Noodles are available as non-enriched, enriched, and with egg added. Egg noodles are approximately 5 times as expensive as the other noodles.

All families reported using noodles, with a mean consumption of 2 kilos dry weight per week (See Table 17). One family reported daily consumption of noodles. The range of reported consumption of noodles was 0.4 to 7 kilos per week.

The reasons given for using noodles were, in decreasing importance: change of a monotonous diet (47%), taste was pleasant (30%), satisfied a whim (7%), and lack of other food choices (3%).

Table 18 lists the foods that noodles replace when used in a soup. As previously mentioned, the principal foodstuffs were wheat, corn, and potatoes. Other items mentioned by less than one-third the families were rice, squash, peas, pumpkin, *quinua*, broad beans, barley, and dried potatoes.

Oil

All but one family (97%) interviewed had bought bottled oil in the past. The families claimed to average 1.1 liters of oil per week, however the mean purchase of oil the week prior to the interview was only 0.7 liters (See Table 17).

Most families (69%) used oil only when they did not have lard. Other reasons given for the use of oil were health (14%), enjoyable flavor (10%) and disliked the lard (7%). A few families (21%) used oil for specific foods, such as rice, noodles, and salads; the rest of the families used oil as they would use lard. Most families (69%) still preferred to use lard if it were available.

Table 18. Characteristics on the use of three non-locally produced foods.

Characteristic	Mean±S.D. kilos	Range kilos	Population following Belief or Practice %
IODIZED SALT			
Amount used per week	1.0±.9	0-3.5	
Percent of population presently using product			73
Reasons for using product:			
-convenience			62
-health			14
-dislike granular			10
-economical			5
-preference			5
Limitations on use of product			
-use for all foods			71
-not used for some foods			29
NOODLES			
Amount used per week	2.0±1.4	0.4-7	
Percent of population presently using product			100
Reasons for using product:			
-change of diet			47
-taste			30
-whim			7
-lack of choices			3
-more than one reason			13
Replaced in the diet:			
-wheat			72
-yellow corn			69
-white corn			34
-potatoes			31
-rice			21
-*calabaza*			14
-peas			10
-*zapallo*			7
-*quinua*			7
-broad beans			7
-barley			3
-dried potatoes (*moraya*)			3

Table 18. (cont'd.)

OIL			
Amount used per week	1.1±.8	0-3 liters	
Percent of population presently using product			97
Reasons for using product:			
-lack of lard			69
-health			14
-taste			10
-disliked lard			7
Limitations on use of product			
-used for all foods			79
-used for specific foods			21

Other Non-locally Produced Foods

Families were also asked about their use of sugar, canned fish products, and rice. Typically, sugar was purchased by residents on a weekly basis. Most (67%) families had bought sugar in the week prior to the interview, and a median purchase was 2.9 kilos. The mean was not reported here as each of five families had purchased that week a 50-kilo bag of sugar for several month's use, thereby distorting the statistic. A mean monthly use of sugar was 12.6 kilos. The mean number of cans of tuna or sardines purchased in the previous week was 1.4, with a range of 0 to 6 cans. Many (37%) of the families reported no purchasing sardines in the last week. The mean for rice purchases was 1.7 kilos, ranging from 0 to 5 kilos. A few (17%) Of the families had not purchased rice in the previous week.

Sugar, fish, and rice were used more to supplement the diet, rather than replace a food that was traditionally eaten in the recent past. If a family had no cash to buy sugar, no hot drink was served that day. Reported sugar use would supplement the diet with a mean of 230 calories per day per person, assuming equal distribution of calories per family member.

Canned tuna or sardines was a luxury item for residents. The mean amount of fish reported to be consumed (1.4 cans) per week would provide 117.2 calories and 14 grams of

protein per average family member. Sardines also provided 261 mg of calcium and 0.1 mg of riboflavin, whereas tuna provided .8 mg and 0.07 mg respectively. Tuna was higher than sardines in niacin with 7.2 mg but not vitamin A with 7.22 I.U., whereas sardines had 3.1 mg niacin and 15.4 I.U. of vitamin A.

Rice was infrequently used because of its cost. Between August and December of 1983 the price rose from 650 to 1000 soles (about U.S. $.30 to .50) per kilo. During the same time the selling price of potatoes fell from 7500 to around 5500 soles (U.S. $3.75 to 2.75) per 11.5 kilos, making it less likely that luxury items would be purchased. The mean rice purchase per week would provide 2.3 grams of protein, 8 mg of calcium, 0.3 mg of iron, 0.02 mg of thiamin, less than 0.01 mg of riboflavin, and 0.6 mg of niacin.

Sugar is probably the most important supplementary non-locally produced food, because of its continual usage in homes of Pacobamba residents.

Factors Related to the Use of Non-locally Produced Foods

The housing index was designed to categorize the level of housing and to use these categories to estimate economic levels of the residents. The index was based on the type of walls, roof, doors, and source of water. Ranking of each item was determined by participant observation and

conversations with residents. For instance, residents said that the most desirably type of roof was Spanish tiles, it was also the most expensive.

The housing index was used to determine the relationship between housing quality (which here estimated economic level) and use of the three chosen non-locally produced foods: iodized salt, noodles, and oil. As is shown in Table 19, the housing quality showed no significant correlation with the quantity of the three NLP foods consumed.

Exposure to food habits in other places, measured by the amount of time spent living in other towns was thought to affect the quantity of non-locally produced foods. The relationship between the number of years the female adult spent in other communities and the number of non-locally produced foods mentioned being bought, was studied. Also the numbers of years of visits was related to the number of kilos of noodles purchased per week. The woman's visits were used because she was the food buyer and preparer and would be the most influential person in terms of the family's non-locally produced food usage. The relationships did not show any significant correlation (See Table 19).

The educational level of the woman had no significant correlation with the amount of NLP foods mentioned in the twenty-four hour dietary recall or the number of kilos of noodles used per week.

Table 19. Correlation coefficients for factors related to use of non-locally produced foods. (n=30)

	Housing Index (Pearson's r)	Woman's Visiting Time (Pearson's r)	Woman's Educational Level (Pearson's r)
Kilos of salt used	.24		
Kilos of noodles used	.29	-.05	-.11
Liters of oil used	.10		
Number of NLP foods mentioned in the adults' dietary recalls	.27	-.12	-.05

Twenty-four Hour Dietary Recalls

The female adult was used to obtain a twenty-four hour dietary recall for herself and the child participant. In one case, the father provided the recall for the child. Any questions on the preparation of the food from the male participant was addressed to the food preparer. In cases where the food preparer was not available, and the man did not know the recipe of the food, a common recipe was used.

Although the researcher attempted to equally represent all days of the week, economic constraints limited the fieldwork, and a repeated problem of finding residents at home for scheduled appointments forced the researcher to accept recalls when the participants could be found. No

Peruvian research has suggested differences in the diet for varying days of the week. North American researcher Gersovitz and coworkers (1978), found women to eat more food on Sundays. If a similar situation is true in Peru and since Sunday was over represented in this study, any error due to unequal representation of the days may show an overestimation of nutrient intake.

In two cases, the twenty-four hour dietary recall was not conducted for the same child that was measured. In these two cases, the anthropometrics cannot be compared directly to the diet, but they can be used to make generalizations about the family's nutritional well-being and use of non-locally produced foods.

FAO Recommended Intake

The results from the twenty-four hour dietary recalls are listed in Table 20. The mean calorie intake for all family members was low, ranging from 75 percent of the FAO recommended intake level for the female adult to 85 percent of the child.

Protein percentages were over one hundred percent of the FAO recommended intakes for all family members. The protein was usually from a mixture of grains and vegetables. Almost one-third of the families had no meat products (beef, chicken, guinea pig, blood or canned fish) during the three days members were interviewed for the dietary

Table 20. Mean percent and standard deviation of the FAO recommended intake of calories and nutrients.

	Calories	Protein	Calcium	Vit. A	Thiamin	Riboflavin	Niacin	Ascorbic Acid
	%	%	%	%	%	%	%	%
Child (n=29)	85±45	164±123	76±64	124±60	136±145	121±127	85±62	309±396
Female adult (n=27)	75±30	125±59	66±51	25±29	112±46	72±35	115±59	301±219
Male adult (n=25)	83±35	146±73	81±55	33±45	115±52	75±37	121±63	362±229

recalls. Milk products were consumed in the families on at least one out of the three days of the dietary recalls, by 43 percent of the families.

Calcium was low for all family members interviewed, ranging in mean intakes from 66 to 81 percent of the FAO recommended intakes. Milk and milk products in the household were low partially due to the lack of pasture for the animals. The decrease in pasture was due to the 1983 drought.

Vitamin A recommendations were only met by the children who were breast fed. Adult mean values were low, between 25 and 33 percent of the FAO recommended intakes. Pumpkin (*Zapallo*) a rich source of vitamin A, had not been available in 1983, reportedly because of problems in a local cooperative. Another potential rich source of vitamin A, medlar, was not in season during the months that the twenty-four hour dietary recalls were taken. For most of the dietary recalls, the main source of vitamin A was the greens and herbs used in soups.

Thiamin recommended intakes were met by all family members, as were the niacin values for all but the child. Riboflavin intake was low for the adult male and female, with a mean of 72 and 75 percent of the recommended intake levels. The children's mean intake met the FAO recommended intake level. All family members met the ascorbic acid recommendations. The primary source of ascorbic acid for

residents was potatoes.

Relationship Between NLP Foods and Dietary Adequacy

The relationship between the number of non-locally produced foods reported in the twenty-four hour dietary recalls and the adequacy of the child's diet was measured. The percentage of the FAO recommended caloric intake for the child was related to the number of NLP food reported in the diet of the child and the number of NLP foods reported in the diet of the mother and father. The correlation coefficients are given in Table 21. The number of non-locally produced foods reported in the diet of the child and in the diets of the mother and father had no significant correlation with the calculated percentage of the FAO recommended caloric intake of the child.

Table 21. Pearson's correlation coefficients for the relationship of FAO recommended caloric intake for child and non-locally produced foods.

	Percent of FAO Recommended Caloric Intake for Child Participant
Number of NLP foods in child's diet (n=29)	.04
Number of NLP foods in both adults' diet (n=24)	.28
Number of kilos of noodles reported used per week (n=30)	-.52*
Number of liters of oil reported used per week (n=30)	-.37

*$p \leq .01$

The number of kilos of noodles reported to be used per week and the percent of FAO recommended caloric intake for the child participant had a moderate negative correlation ($r=-.52; p \leq .01$); that is, as the reported usage of noodles increased, a decrease was seen in the calorie intake. This might occur if the diets low in noodles were high in the calorie-concentrated items, such as wheat.

The number of liters of oil reported to be used per week had no significant correlation with the percent of FAO recommended caloric intake for the child participant. The lack of a significant correlation of the number of non-locally produced foods in the diets of the child's and adults' and the amount of oil used per week to the percent of FAO calorie recommendation met by the child's diet, may be due to several factors. The diets were a general reflection of the family pot, from which the child ate. The low variation may be explained by the group being homogeneous in their non-locally produced food usage, or that the data collection method was insufficient to pick up such variations.

No correlation was evident between the amount of oil used in the diet and the caloric intake of the child. This might have been due to the following reasons: 1) there was not enough variation in the amount of oil used by the families to cause significant variations in the percent of the FAO standards for calories; and 2) the dietary recall

method used was not sensitive enough to pick up significant variations in the percentage of FAO standards met by the child's diet.

Anthropometric Data

Children

Plotted data on height-for-age, weight-for-age, and weight-for-height, for the children are seen in Figures 6 through 11. For weight-for-age, most (75%) of the male children were under the 5th percentile, and all but one male child were under the 50th percentile. The female group had only about one-third (31%) of the children below the 5th percentile and had one child over the 75th percentile. The male children equally showed low height-for-age readings, with 75 percent of the group under the 5th percentile and no child above the 50th percentile. The female children had over half (54%) of their group under the 5th percentile and also did not have anyone above the 50th percentile. When weight-for-height was plotted, no female and only 19 percent of the male children fell below the 5th percentile. Two female children were within the 90th to the 95th percentile. Using Chi Square, there was a significant difference between male and female children and the percentage of the corresponding group under and above the 5th percentile for weight-for-age ($\chi^2=5.6$; $p\leq.05$), and for weight-for-height ($\chi^2=5.7$; $p\leq.05$). No significant

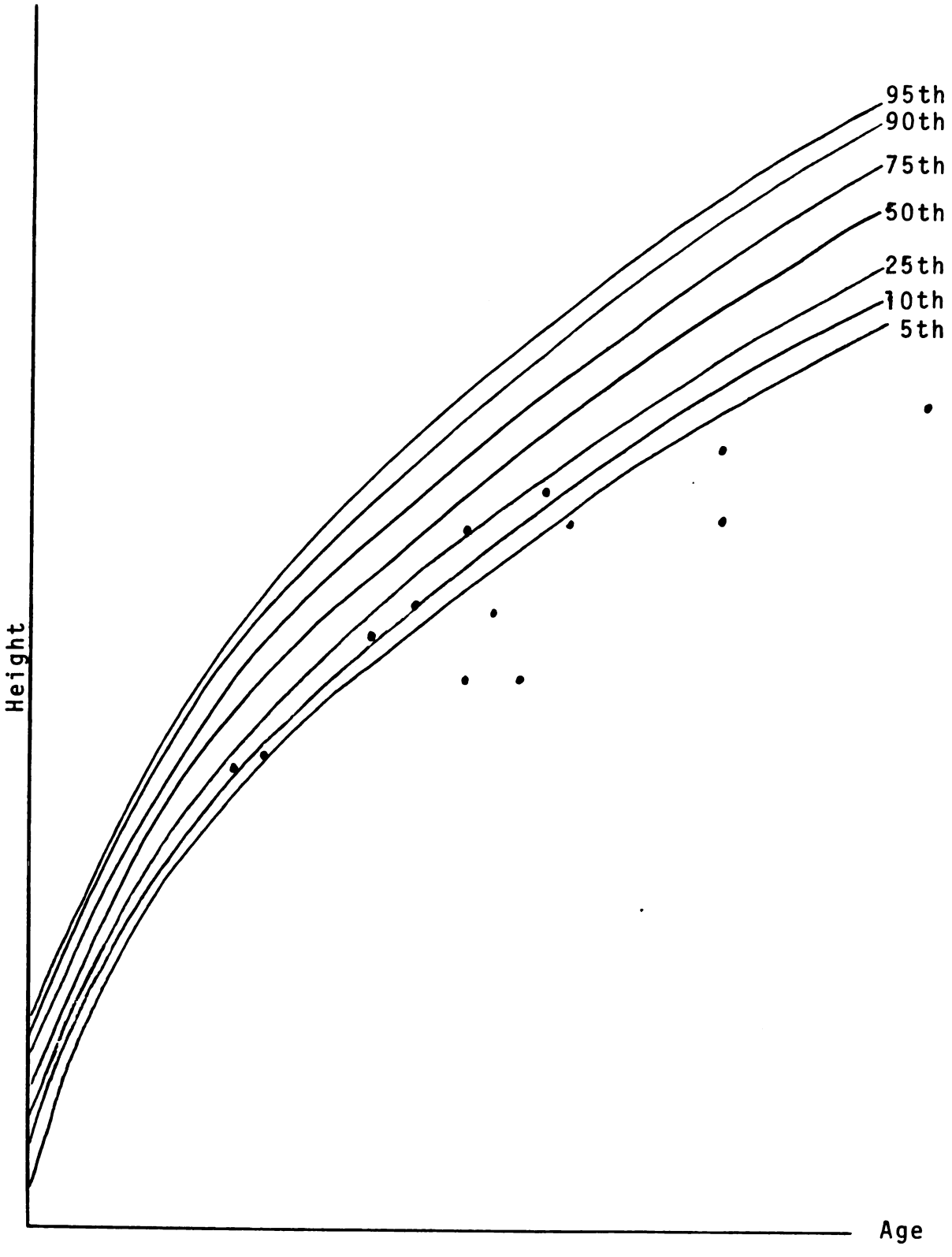

Figure 6. Height-for-age for girls.

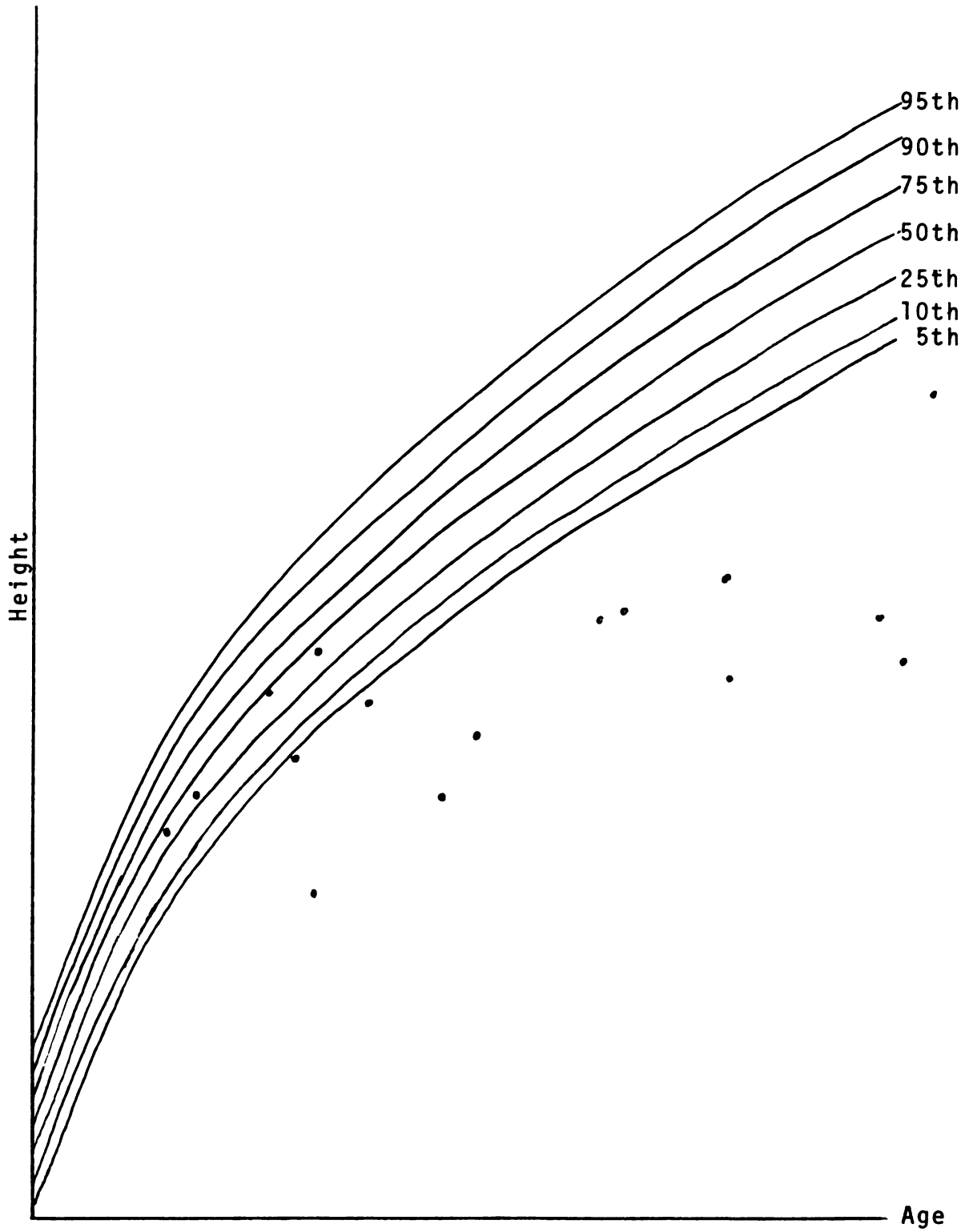

Figure 7. Height-for-age for boys.

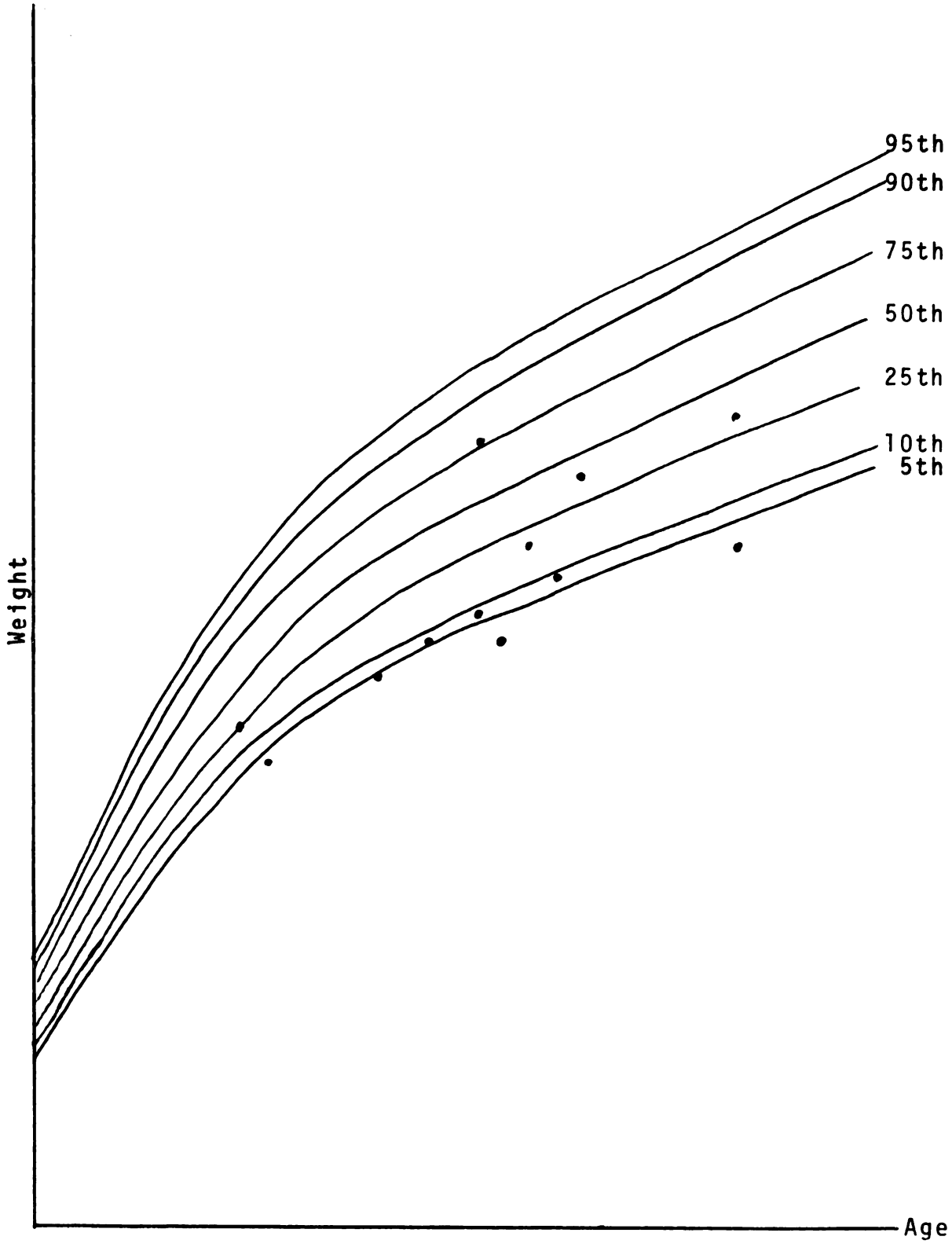

Figure 8. Weight-for-age for girls.

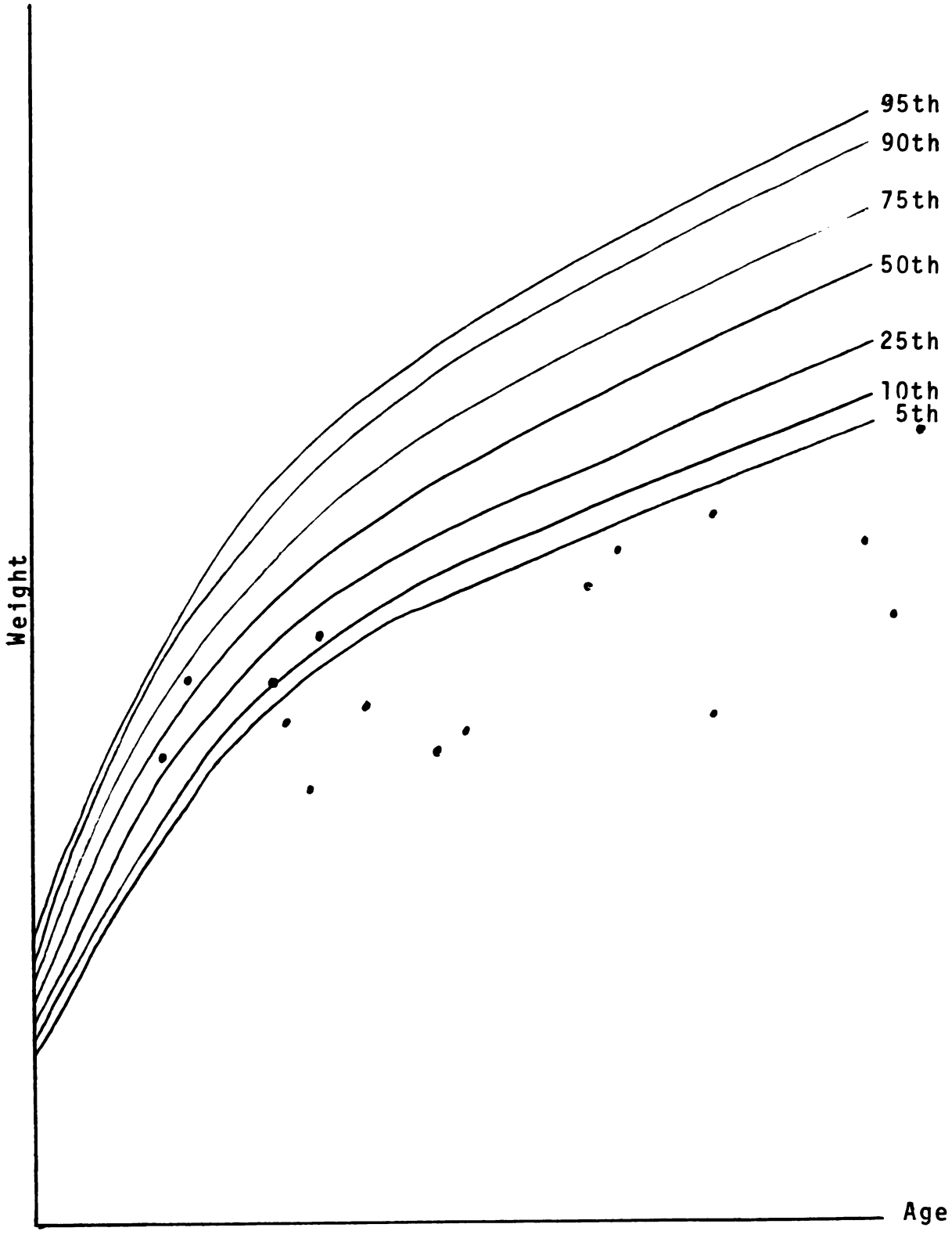

Figure 9. Weight-for-age for boys.

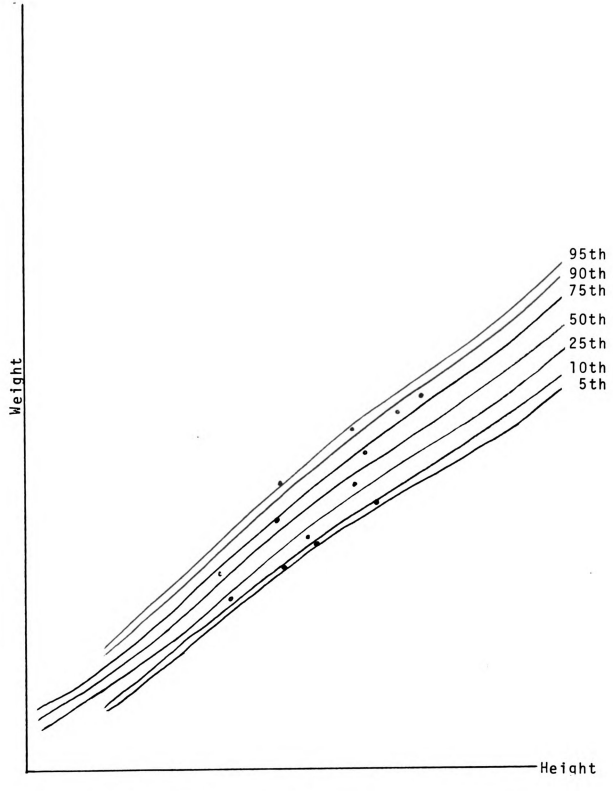

Figure 10. Weight-for-height for girls.

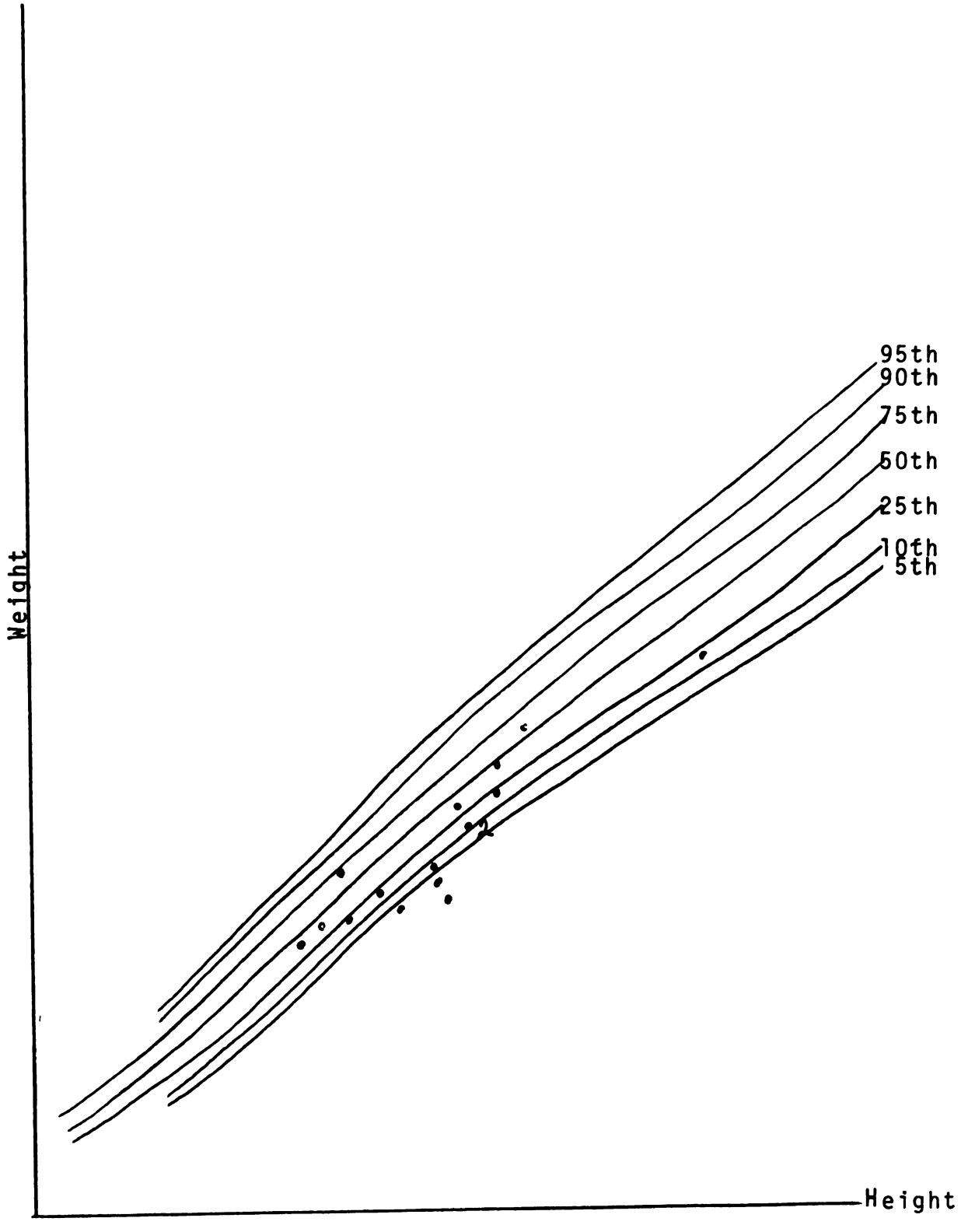

Figure 11. Weight-for-height for boys.

difference was found between the sex of the child and the height-for-age percentiles.

The triceps skinfold data shown in Table 22 also shows significant difference (χ^2=7.5; p≤.01) in the nutritional status of males and females. While all the female children were at least at the 15th percentile or above for the triceps skinfold, the male children had 43 percent of their group under the 15th percentile. No male children had a triceps skinfold reading above the 85th percentile, whereas eight percent of the female children were between 85th and 95th percentile.

The results seen in Figures 6 through 11 and Table 22 are different than results from other researchers. Other studies have found the male children to have higher percentiles on growth charts than their female counterparts. Graham and coworkers (1980) found the growth rate of female children to fall off around three months prior to the decline in male children's growth rate. Lira (1973) similarly found a difference in the nutritional status of the two sexes, where almost fifty percent more girls than boys were defined as malnourished. The difference in nutritional status could suggest different food behaviors on the part of the parents for boys and for girls.

The present research does not support Graham and Lira's results. Here, girls' height and weight nutritional status indicators show a better nutritional status. Significant

Table 22. Height, weight, and skinfold measurements.

Measurement/Participant	n	Percent of Participants with Stated Percentiles						
		<5	5-10	10-25	25-50	50-75	75-90	90-95
Weight/age								
Female child	13	31	23	23	15	--	8	--
Male child	16	75	0	13	6	6	--	--
Height/age								
Female child	13	54	8	30	8	--	--	--
Male child	16	75	--	--	25	--	--	--
Weight/height								
Female child	13	--	23	15	8	23	15	15
Male child	16	19	6	31	31	13	--	--
Female adult	27	--	--	26	30	22	4[a]	
Male adult	25	8	16	32	20	--	--	

Triceps Skinfolds		<5	5-15	15-50	50-85	85-95
Female child	13	--	--	54	38	8
Male child	16	12	31	38	19	--
Female adult	27	--	46	54[b]		
Male adult	25	--	12	88[b]		

[a] category is for 75 to 95th percentile.

[b] category is for 15 to 85th percentile.

differences between sex and age seen in the 1972 census on the district of Pacobamba supported the present data. In the census there was a significant drop (χ^2=3.9; p≤.05) in the percentage of male children after 12 months of age, suggesting that some factor, biological, environmental or social is negatively affecting the survival rates of the male children more than the female children. Various theories exist to try to explain differences of growth rates and health status of children, including social definitions for appropriate behavior toward the male and female children, the result of which could be detrimental to one of the sexes; and differing biological reactions to environmental stresses (Cassidy, 1980; Scrimshaw, 1978; Stini, 1972; and Haas, 1976). The researcher did not note any child feeding behaviors that were sex-specific, and therefore cannot support either theory or explain why the female children were superior in weight and height measurements to the male children. This finding would suggest that sex-defined feeding behaviors should be more closely studied.

Adults

The weight-for-height and triceps skinfold measurements for the adult male and females are listed in Table 22. All female participants were above the 10th percentile; only eight percent of the male participants

were under the 5th percentile. All triceps skinfold measurements were above the 5th percentile.

Relationship Between NLP Foods and Anthropometric Measurements

The number of non-locally produced foods reported in the twenty-four hour dietary recall of the child participant was related with the percentiles reached on the weight-for-age and height-for-age NCHS charts, using the Pearson's Product Moment Correlation Coefficient. Pearson's correlation coefficient was used here for rank order data because of the multiple tied ranks (Runyon and Haber, 1980). The number of NLP foods in the child's diet and the number of kilos reported used per week had no significant correlation with the plotted percentiles for the child's weight-for-age or height-for-age (See Table 23). A relationship might have been seen with measurements that were more precise than these 3 anthropometric measurements, or repeated dietary recalls that would have picked up larger variations between families usage of non-locally produced foods.

Table 23. Pearson's correlation coefficients for the relationship between anthropometric measurements to non-locally produced foods.

	NCHS Percentile for Weight-for-age	NCHS Percentile for Height-for-age
Number of NLP foods in child's diet (n=29)	.22	.12
Number of kilos of noodles reported used per week (n=30)	.04	-.23

Conclusions

Pacobamba residents obtained their foodstuffs by three different means: family agricultural and livestock activities, trading without cash, and purchasing with cash. Each means of food acquisition provided a fairly limited range of foods. Agricultural and livestock production provided mainly corn, potatoes, wheat, and meat products. Trading alone provided high altitude grown products, such as broad beans, the legume *tarhui*, and cheese. Cash purchases most often involved iodized and noniodized salt, noodles, oil, sugar, and rice. A maintenance of these three food procurement methods could be important to keeping a varied diet. If, for instance, the tradition of trading foods further was replaced with cash purchasing of foods, then the ability to buy legumes or cheese would depend on the peasants' cash reserves.

The price of their own labor and the market value of the foods they produced would decide if the once-traded products could be purchased. Unstable market values of agricultural products might then have a detrimental effect on the ability to purchase foods and therefore vary the diet.

Over 90 percent of the residents interviewed bought iodized salt, noodles, and oil on a weekly basis. The quantity of each product purchased varied according to need, personal preferences, and economic capabilities. The iodized salt was used to replace noniodized bulk industrial salt by most (73%) residents, although a few families mentioned using only noniodized salt for specific tasks, such as cheese and soup making. The iodized salt was a potentially important non-locally produced food because of its role in the prevention of goiters and cretinism.

All participants used noodles in their diet, and the normal preparation technique was in soup. Noodles replaced in part a wide variety of foods and could be beneficial or harmful to the caloric and nutrient content of the diet depending on the food that was replaced. The moderately negative significant correlation ($r=-.52$; $p \leq .01$) between the number of kilos of noodles purchased per week by the family and the percentage of the FAO recommended caloric intake for the child showed that in general, as the number

of noodles purchased increased in the diet, there was a corresponding decrease in the dietary adequacy in calories. The negative relationship found between the number of kilos of noodles used and the caloric intake of the child in this research should be considered carefully, as they were based on only one twenty-four hour dietary recall. Should the results accurately reflect the dietary intake and the dietary recalls were not significantly affected by the "flat slope syndrome" then for a weaning age child, the results could be important to his or her well-being. The mean caloric intake of the child was 85 percent of the FAO recommendation. If the present diet was further substituted with noodles, a corresponding decline in the calorie intake would be expected. On the other hand, if noodles were presently consumed, a decrease in their use by changing to a product of higher caloric density such as wheat kernels, should show a corresponding increase in caloric intake.

Oil was an important non-locally produced food because it was the most concentrated form of calories available. Although no significance between use of oil and calorie intake was found, more sensitive data collection measurements might have been able to give a significant correlation. Bottled oil was an additional source of fat and over time, the small quantities of calories provided by the oil could add to the caloric intake of a young child's

diet.

Other non-locally produced foods were added to the Pacobamba diet. Sugar provided extra calories and was commonly used. Rice and sardines (both expensive but well liked items) were used on special occasions and provided extra calories, protein, vitamins, and minerals. Tuna in oil was especially high in calories, due to the oil in which it was packed.

Non-locally produced foods were an important part of the Pacobamba diet. People used them to vary and supplement their own limited diet. The quantity used was primarily limited by the family's economic means, which was determined by their ability to cash crop, have cottage industries, and work off the farm.

Some products undoubtedly had a positive effect on the nutritional adequacy of the diet, such as iodized salt. The effect of noodles had to be considered on an individual food basis, because they could replace nutritionally inferior or superior products.

Data from medical outposts on goiters, cretinism, and myxedema should be compiled by the Ministry of Health in Abancay, to update the statistics on the incidence of these conditions in Apurímac. With such information in hand, further research could consider the regional usage of iodized salt and educational approaches (such as emphasizing convenience along with health) should they

be deemed necessary, to increase iodized salt consumption. The costs and benefits of regional price supports for iodized salt in high goitrous areas could be discussed in future research.

Further research with more sensitive dietary data collection methods should be conducted to continue to monitor the use of noodles and note their role as a replacement food in the residents' diets. Additional exploration into what is considered to be the role of noodles in weaning foods will broaden the understanding of the effect noodles potentially have on the diet of Pacobamba residents. Other NLP foods could be explored to note their effect on the diet.

Oil consumption should be researched with more sensitive data collection tools to note its effect on the caloric adequacy of the weaning diet. Further investigations could consider whether or not bottled oil is the best choice for caloric improvement of the diet, or if another readily available food would provide the calories and additional nutrients.

Finally, additional research is needed on the significant differences found between the sexes in weight-for-age and weight-for-height, to determine the factors involved.

SUMMARY

Thirty randomly selected families with a weaning age child were interviewed to determine the families' food buying habits and their use of three non-locally produced foods in their diet. The three NLP foods, iodized salt, noodles, and oil, were chosen because they were replacing a previously used food, were widely available in Pacobamba, and could be important nutritionally to the diet.

The families in the sample population were described from the data on the socioeconomic questions answered during the first interview. Most of the families were located downhill from an irrigation ditch, and therefore had easy access to water. The houses were generally made of mud and straw sun-baked bricks, with Spanish tiled roofs, and wooden doors. The mean family size was seven, and the majority of the families were nuclear. Half of the female and one-third the male participants did not have any formal type of school education. Almost half of the women and about one-third of the men spoke only Quechua. The majority of the male and female adults had traveled out of Pacobamba and lived elsewhere. The female participants had a slightly higher mean length of stay outside of Pacobamba than their male counterparts. The

males reported traveling to agricultural communities more than the females, which might reflect the types of jobs that each sex searched out. The males would be more able to find work on farms where the females might have looked for domestic servant jobs.

Cash was obtained through three methods: cash cropping, cottage industries, and off-farm wage labor. Families generally cash cropped potatoes, a practice which had just recently begun and was involving more land each year. Some families cash cropped vegetables, to be sold in Pacobamba and Huancarama. Women often made cheese or spun thread to be sold. Other tasks included renting land or animals, buying and reselling agricultural products, or having a store. Men and women worked as farm laborers; all but two participants worked in Pacobamba. The two exceptions were working in the *montaña* (semi-jungle). More profitable jobs included factory work in Abancay and skilled labor work (such as house building) in Pacobamba.

The food that was consumed was obtained through family agricultural production, a trade, or a purchase with cash. Almost all families owned their own land and grew corn, potatoes, and wheat. A few families had a wider variety of products including peas, broad beans, squash, pumpkin, beans, and barley. More than half the families had a garden. Commonly grown garden products included onions,

cabbage, peaches, peas, herbs, avocados, and garlic.

Livestock owned by families was varied in types of animals but not numerous. All families had chickens. Pigs were owned by all but one family, and served as an important source of fat in the form of lard. Guinea pigs were the most important source of meat of residents as they were fairly common on special holidays. Only about one-quarter of the families had milking cows, which demonstrated the residents diets' lack of milk and contributed to the low calcium intake in the diet.

In the eleven stores surveyed, the most commonly purchased foods were sugar, iodized and noniodized salt, rice and noodles. Oil was commonly purchased during the periods of the year that lard was scarce.

Iodized salt was important to the diet because of the protection it gave against goiters, myxedema, and cretinism. The Andean region was one of the goiter belts of the world and a lack of iodine in the region was a health risk. Noodles had been present in the diet for years, but because of the cash cropping and increased income, residents were reporting that their consumption of noodles had increased. The nutritional significance of noodles depended on the food that they replaced. Wheat kernels, a common item in soup, were found to be superior to noodles when considered in the quantity that each were normally used in soup. However, the noodles were found to be higher

in calories and other nutrients except niacin and thiamin, than yellow corn. Noodles did have a moderately negative correlation ($r=-.52$; $p \leq .01$) with the percentage of FAO standard for calories for the child. Oil could have been an important addition to the diet as it was a concentrated form of calories. In some families it replaced lard, in others it was used to extend the lard.

Over ninety percent of the families mentioned purchasing with cash noodles, salt, oil or lard, sugar, and rice. Iodized salt was generally purchased because it was convenient to use, that is it did not require any grinding or cleaning. Other reasons mentioned for using iodized salt were health considerations, a dislike of granular non-iodized salt, economic reasons, and a personal preference for the iodized salt. Some families still used both iodized and noniodized salt for all foods; others used noniodized salt for only specific foods such as cheese and soup. The mean reported purchase per week of iodized salt was one kilo, but the mean usage as shown by the adult twenty-four hour dietary recalls was 315 grams per week.

Noodles were purchased to vary the diet of the residents. Other reasons for purchasing noodles included enjoying the taste, satisfying a whim, and having a lack of other choices. Noodles most commonly replaced wheat, yellow corn, white corn, and potatoes in the soup. Other foods included rice, squash, peas, pumpkin, *quinua*,

broad beans, barley and dried potatoes. An average mean purchase of noodles per family per week was two kilos.

The mean purchase of oil per week was 0.7 kilos. It was primarily used when there was a lack of lard, but some families bought it because of health reasons, they liked the oil or they disliked lard.

Other non-locally produced foods that were present in the diet of Pacobamba residents were sugar, canned fish products, and rice. Each of these provided extra calories, and the latter two items added to the protein and vitamin and mineral content of the diet. Sugar was the most prevalent food, with a mean purchase of 2.9 kilos per family per week.

The housing index, which estimated the economic status of the resident, the amount of time the female adult spent away from Pacobamba, and the female adult's educational level did not have a significant correlation with the number of non-locally produced foods mentioned as being purchased.

The twenty-four hour dietary recalls showed a low mean percentage of the FAO recommended intakes for calories and calcium for all three family members. The female and male adults' diet were also low in vitamin A and riboflavin. The caloric intake of the child, as measured by the percentage of FAO calorie intake standard met by the diet, had a significant negative correlation ($r=-.52$; $p \leq .01$) with the

number of kilos of noodles reported used per week.

The anthropometric data suggested a possible difference in feeding behaviors for male and female children. The height, weight, and skinfold measurements suggested that the female children were in better nutritional status than the male children. Height-for-age and weight-for-age measurements were significantly different ($\chi^2=3.92$; $p\leq.05$) for males and females. The data did not support past nutrition research and merits further attention. No significant correlation was found between the number of non-locally produced foods in the child's diet and the NCHS percentile reached for weight-for-age and height-for-age.

The diet of Pacobamba residents was comprised of approximately 20 percent of non-locally produced foods. Future research should continue to consider the impact of these foods on the residents' diets to insure adequate nutritional and health status of the Pacobamba residents.

APPENDICES

A U T O R I Z A C I O N

Este Comando autoriza a los Srs WALTER MELENDEZ VILCAS y GRACE SUZANNE MARQUIS , para que realicen estudios sobre la Estructura Agraria - Producción de Aguardiente y Nutrición Humana en la Provincia de Andahuaylas, respectivamente, ambos estudios encuadrados dentro de los alcances de las Ciencias Sociales.

El presente documento deja constancia sobre el carácter específico de las investigaciones por realizar, que en ningún caso deberá desviarse, así como de la responsabilidad de los interesados sobre su propia seguridad.

Andahuaylas, 3 de Agosto de 1,983

P.d

APPENDIX B

Data Collection Tools

APPENDIX B1

Socioeconomic and Food Buying Interview Schedule

Family Code _____

1. Respondent's Name: _____ 2. age ____ 3. sex ____

Questions for the chosen foods ("X" is the food)

"X" _____

4. What food items do you typically buy with cash?

   Can any of these foods be obtained through trade (i.e., no cash)?

   ___ yes, there are: _____
   ___ no

5. Have you ever bought "X"?

   ___ yes
   ___ no If no, why not? _____
   (Go to question 13)

6. Can you remember the first time you bought "X"? Please describe the circumstances for me.

   _____

7. How often do you buy "X" now?

   ___ everyday
   ___ several times a week
   ___ seldom
   ___ I don't buy it now because _____
   (Go to question 13)

8. Why do you buy "X" now?

   ___ it is convenient
   ___ it is cheap
   ___ I like the taste
   ___ my family likes the taste
   ___ other, please specify: _____

9. How much did you buy of "X" last week? _____

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Family Code _____

10. How do you use "X"?

_____

11. What food(s) did you use before you had "X"?

_____

12. Do you still use the food you mentioned in the previous question?

___ yes, I use it for _____
___ no

Type of home and surroundings (complete via observation, if possible)

13. Type of material for the house:

___ mud and straw bricks
___ other, please specify: _____

14. Type of roof:

___ sheet metal
___ thatch
___ other, please specify: _____

15. Type of doors on house:

___ wooden
___ cloth
___ none
___ other, please specify: _____

16. Number of rooms in the house: _____
List the general purpose of each:

17. Furniture and appliances in the house (include number of items):

___ table ( )
___ chairs ( )
___ couch ( )
___ bed ( )
___ small tables ( )
___ curtains ( )
___ rugs ( )
___ sewing machine ( )
___ cabinets ( )
___ lanterns ( )
___ radio ( )
___ stove ( ); type:
___ refrigerator ( ); type:
___ other, please specify:

Family Code _____

18. Type of stove/cooking appliance

___ built-in mud-straw brick stove
___ open pit fire area
___ other, please specify:

19. Source of drinking water:

___ irrigation ditches
___ river
___ lagoon
___ other, please specify: _____

20. Where are human wastes deposited:

___ latrine
___ field
___ no specified area
___ other, please specify: _____

21. How long do you travel to obtain water? _____ minutes

22. Respondent's relationship to family _____

23. How many people live in this house? _____
Please list their name, age, sex, and relationship to you.

Name	Age	Sex	Nuclear	Extended	Not related
a.					
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					

(List others on the back of this sheet)

24. Have you (or the mother, if the respondent is not the mother) attended formal schooling?

___ yes
___ no
If yes, where? _____
for how many years? _____

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GSM/83

Family Code: _____

25. Can you (or the mother, if the respondent is not the mother) read and speak Spanish?

___ yes
___ no
___ she can speak but not read Spanish

26. Has the father (or male participant) attended formal schooling?

___ yes, where? _____ for how many years? _____
___ no

27. Can the father (or male participant) read and speak Spanish?

___ yes
___ no
___ he can speak but not read Spanish
___ he can read but not speak Spanish

28. Does the child go to school?

___ yes, where? _____ for how how many years has he/she attended? _____
___ no

29. Can the child speak and read Spanish?

___ yes
___ no
___ he/she can speak but not read Spanish

Family Code _____

PART II

30. What cities in Peru have you or a member of your family visited?

City	Traveler	Length of Stay	Year Traveled

31. Do you ____ own or ____ rent the land your family cultivates?
If you own, go to question 32.
If rents, who owns the land you rent? _____

32. What crops does your family cultivate in the chacras during the year?

___ maize
___ wheat
___ potatoes
___ squash
___ other, please specify:
___ beans
___ broad beans
___ olluca
___ oca

Which of these crops are sold?

33. Does your family maintain a garden?

___ yes
___ no

34. What plants grow in your garden?

___ garlic
___ onions
___ aji (hot pepper)
___ herbs, please specify: _____

___ other, please specify: _____

35. What domestic animals do you own? (How many of each are there)?

___ roosters ( )
___ chickens ( )
___ guinea pigs ( )
___ milking cows ( )
___ non-milking cows ( )
___ bulls ( )
___ donkeys/mules ( )
___ horses ( )
___ dogs ( )
___ others, please specify:

Which of these animals do you sell? _____

Family Code _____

36. What types of small businesses does your family have?

___ selling cheese/milk/eggs
___ cooking
___ making yarn
___ weaving
___ sewing/knitting
___ renting land/animals
___ other, please specify: _____

37. Does someone in the family work for day wages or goods?

___ yes
___ no
If no, go to question 38
If yes, please tell me the type of work done and the number of days per month worked:

Type of work	Days/month worked

38. Do you ever receive cash as a gift?

___ yes
___ no

39. Are there any other sources of cash that you have which we might have forgotten to mention?

___ yes, there are _____
___ no

CRONOGRAMA DE ENTREVISTAS

1. Código de la familia _____

2. Edad de la participante _____ 3. Sexo de la participante _____

HACER LAS PREGUNTAS 30-62 PRIMERO.

Tipo de casa (por observación)

4. Tipo de material de la casa

___ adobe
___ otro _____

5. Tipo de techo

___ metal
___ de paja
___ otro _____

6. Tipo de puertas de la casa

___ de madera
___ de tela
___ no hay puertas
___ otros _____

7. Número de cuartos en la casa _____
   Poner el propósito general de cada cuarto:

8. Muebles e implementos en la casa (incluyendo el número de cada uno)

___ mesa ( )
___ silla ( )
___ sofa ( )
___ cama ( )
___ mesitas ( )
___ cortinas ( )
___ alfombras ( )
___ máquina de coser ( )
___ estantes ( )
___ laternos ( )
___ radio ( )
___ cocina ( )
___ refrigerador ( )
___ otro _____

9. Tipo de cocina

___ de ladrillos, construido en la cocina
___ fuego al aire libre
___ otro _____

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Código de la familia _____

10. Fuentes de agua para tomar

___ asequias
___ río
___ laguna
___ otro _____

11. Por cuanto tiempo tiene que caminar para conseguir el agua? _____ minutos?

12. Hay letrina?

___ sí
___ no

13. La relación de la participante en la entrevista con relación a la familia es _____

14. Cuántas personas viven en esta casa? _____ Por favor, dígame sus nombres, edades, sexo, y la relación que tienen con Ud.

Nombre	Edad	Sexo	Nuclear	Extendido	No familia
a.					
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					

15. Ha tenido Ud. la oportunidad de ir al colegio?

___ sí, dónde? _____ por cuántos años? _____
___ no

16. Puede Ud. leer y hablar en castellano?

___ sí
___ no
___ puedo hablar pero no leer en castellano

17. El señor de la familia ha tendio la oportunidad de ir al colegio?
___ sí, dónde? _____ por cuántos años? _____
___ no

MSU/FSHN
GSM/83

Código de la familia _____

18. Puede hablar y leer castellano el señor de la familia?

___ sí
___ no
___ puede hablar pero no leer en castellano

19. Va el niño al colegio ahora?

___ sí, dónde? _____ por cuánto tiempo ha asistido? ___
___ no

20. Puede el niño hablar y leer castellano?

___ sí
___ no
___ el/ella puede hablar pero no leer en castellano

SEGUNDA PARTE DE ENTREVISTA

21. Qué ciudades en el Perú ha visitado Ud. y su familia?

Ciudad	Viajero	Duración de la visita	Año del viaje

22. Es Ud. el dueño de la tierra que su familia cultiva o es de alguna otra persona?

___ dueno
___ no dueno, el dueno es _____

23. Que cosas cultiva su familia en las chacras durante el año?

___ maiz
___ trigo
___ papas
___ zapallo
___ frijoles
___ habas
___ olluca
___ oca
___ otros:

Cuáles de estos productos acostumbran vender?

24. Tiene su familia un jardín (chacrita o huerta atrás de la casa)?

___ sí
___ no (pasar a la pregunta 26)

Código de la familia _____

25. Que plantas cultivan en su jardín?

___ ajo
___ cebolla
___ ají
___ hierbas, por ejemplo:

___ otros:

26. Cuáles animales domésticos tienen (y cuanto de cada uno)?

___ gallo ( )
___ gallinas ( )
___ cuyes ( )
___ vacas lecheras ( )
___ vaca no lechera ( )
___ toros ( )
___ caballos ( )
___ perros ( )
___ otros:

Cuáles de las animales su familia vende:

27. Tiene su familia algun pequeno negocio?

___ no tiene
___ vender queso/leche/huevos
___ cocinar
___ hacer hilo
___ tejer
___ cocer
___ aquilar tierra/animales
___ otro:

28. Alguien en la familia ha trabajado alguna vez o trabaja por un sueldo o en especias?

___ sí
___ no (ir a pregunta 29)

Puede hacer el favor de decirme el tipo de trabajo hecho y cuanto dias por mes trabaja.

Tipo de trabajo	Días/mes trabajado	Estación

29. Tiene Ud. alguna otra fuente de ingreso?

___ sí, son: _____
___ no

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Código de la familia _____

Preguntas sobre la comida no producida localmente

30. "X" es ____noodles (fideos)_____

31. Qué comidas generalmente Ud. compra con plata?

32. Se puede conseguir estas comidas por trueque?

___ sí, estas son _____
___ no

33. Ha comprado Ud. "X" alguna vez?

___ sí
___ no. Por qué? _____
(sí no, Ir a pregunta 42)

34. Recuerda Ud. cuando fue la primera vez que compró "X"? Por favor, puede describir esa situación por mi?

_____

_____

35. Cuántas veces Ud. compra "X" ahora?

___ cada dia
___ algunas veces por semana
___ de vez en cuando
___ no compro porque _____
(si no, ir a pregunta 42)

36. Por qué Ud. compra "X" ahora?

___ es conveniente
___ es barato
___ me gusta el sabor
___ a mi familia le gusta el sabor
___ otra razón _____

37. Qué cuantidad de "X" Ud. compró la semana pasada? _____

Código de la familia _____

38. Cómo usa Ud. "X"?

_____

_____

39. Qué tipo de comida ha usado Ud. antes de tener "X"?

_____

40. Todavía usa Ud. esta comida que mencionó en la última pregunta?

___ sí, la uso para _____
___ no, no lo uso porque _____

Preguntas sobre la comida no producida localmente

41. "X" es ____bottled oil (aceite)_____

42. Qué comidas generalmente Ud. compra con plata?

43. Se puede conseguir estas comidas por trueque?

___ sí, estas son _____
___ no

44. Ha comprado Ud. "X" alguna vez?

___ sí
___ no. Por que? _____
(si no, Ir a pregunta 53)

45. Recuerda Ud. cuando fue la primera vez que compró "X"? Por favor, puede describir esa situación por mí?

_____

_____

46. Cuántas veces Ud. compra "X" ahora?

___ cada día
___ algunas veces por semana
___ de vez en cuando
___ no compro porque _____
(si no, ir a pregunta 53)

Código de la familia _____

47. Por qué Ud. compra "X" ahora?

___ es conveniente
___ es barato
___ me gusta el sabor
___ a mi familia le gusta el sabor
___ otra razón _____

48. Qué cuantidad de "X" Ud. compró la semana pasada? _____

49. Cómo usa Ud. "X"?

_____

_____

50. Qué tipo de comida ha usado Ud. antes de tener "X"?

_____

51. Todavía usa Ud. esta comida que mencionó en la última pregunta?

___ sí, la uso para _____
___ no, no lo uso porque _____

Preguntas sobre la comida no producida localmente

52. "X" es iodized salt (sal yodizada)

53. Qué comidas generalmente Ud. compra con plata?

54. Se puede conseguir estas comidas por trueque?

___ sí, estas son _____
___ no

55. Ha comprado Ud. "X" alguna vez?

___ sí
___ no. Por que? _____
(si no, Ir a pregunta 4)

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Código de la familia _____

56. Recuerda Ud. cuando fue la primera vez que compró "X"? Por favor, puede describir esa situación por mí?

_____

_____

57. Cuántas veces Ud. compra "X" ahora?

___ cada día
___ algunas veces por semana
___ de vez en cuando
___ no compro porque _____
(si no, ir a pregunta 4)

58. Por qué Ud. compra "X" ahora?

___ es conveniente
___ es barato
___ me gusta el sabor
___ a mi familia le gusta el sabor
___ otra razon _____

59. Qué cuantidad de "X" Ud. compró la semana pasada? _____

60. Cómo usa Ud. "X"?

_____

_____

61. Qué tipo de comida ha usado Ud. antes de tener "X"?

_____

62. Todavía usa Ud. esta comida que mencionó en la última pregunta?

___ sí, la uso para _____
___ no, no lo uso porque _____

Appendix B2

Anthropometric Data Sheet

Family Code_____

ANTHROPOMETRIC DATA SHEET

Participant's Name _____ Age _____ Sex _____

Weight (kg) _____/_____/_____

Height (cm) _____/_____/_____

Triceps skinfold (mm) _____/_____/_____

Participant's Name _____ Age _____ Sex _____

Weight (kg) _____/_____/_____

Height (cm) _____/_____/_____

Triceps skinfold (mm) _____/_____/_____

Participant's Name _____ Age _____ Sex _____

Weight (kg) _____/_____/_____

Height (cm) _____/_____/_____

Triceps skinfold (mm) _____/_____/_____

MSU/FSHN
GSM/83

Appendix B3

Twenty-four Hour Dietary Recall Sheet

Family Code _____

24-HOUR DIETARY RECALL

Participant's Name _____ Age _____ Sex _____

For the following 24-hour dietary recall, please include the quantity eaten and how each food was prepared. Local measuring utensils should be used if possible.

FOOD	AMOUNT	PREPARATION

MSU/FSHN
GSM/83

APPENDIX B4

Survey of Available Foods
Found in Local Stores/Markets

Store/Market:
Date of Survey:

Food:	LP	NLP	NA	Price/Unit	Stock
GRAINS:					
Choclo (corn-on-the-cob)					
Mote (kernels of corn)					
Cancha (toasted corn)					
Barley					
Wheat					
Quinua (grain)					
Máchica (*cancha* flour)					
Wheat flour					
Corn flour					
Broad bean flour					
Pea flour					
Barley flour					
Cañihua (grain)					
Others:					
LEGUMES:					
Pea					
Broad beans					
Dried beans, specify:					
Others:					
VEGETABLES:					
Hot peppers					
Green beans					
Tomato					
Lettuce					
Spinach					
Pumpkin					
Calabasa					
Onions					
Turnip					

Store/Market:
Date of Survey:

Food:	LP	NLP	NA	Price/Unit	Stock
Cabbage					
Green pepper					
Cucumber					
Carrot					
Oca (tuber)					
Olluca (tuber)					
Potatoes					
Chuño					
Sweet Potatoes					
Others:					
FRUITS:					
Pears					
Apples					
Oranges					
Lemons					
Figs					
Papaya					
Banana					
Chirimoya (custard apple)					
Mango					
Avocado					
Others:					
MEAT, FISH, POULTRY:					
Rabbit					
Guinea pig					
Chicken					
Pork					
Mule meat					
Beef					
Alpaca/llama meat					
Fish					
Others:					
ADDITIONAL PRODUCTS:					
Sugar					
Iodized salt					
Non-iodized salt					
Chancaca (sugar					
Noodles (✓ if enriched)					

Store/Market:
Date of Survey:

Food:	NL	NLP	NA	Price/Unit	Stock
Rice (✓if enriched)					
Quaker oats					
Cookies, baked goods					
Candies					
Coca-cola, other pop					
Aguardiente (cane alcohol)					
Alcohol (grain)					
Beer					
Wine					
Chicha de jora (indigenous grain alcohol)					
Canned Tuna					
Others:					
ANIMAL PRODUCTS:					
Milk					
Eggs					
Cheese					

APPENDIX C

Description of Common Peruvian Foods[a]

Caigua
Cyclanthera pedata Schrad. Tropical vine plant with yellow-white fruit that are 2 to 3 inches long.

Calabaza
Sechium edule Sw. From the genus of herbaceous vines of the family Cucuribitaceae. Similar to squash.

Cañihua
Chenopodium pallidicaule Aellen. Indigenous grain to the Andean high altitude regions.

Chicha
Fermented drink normally made of corn, but can have *quinua*, peanuts, barley, or other grains.

Huacatay
Tagetes minuta L. From the genus of strong scented tropical American herbs.

Medlar (nispero)
Mesopilus germanica. Brown-orange fruit, the size of a small apple. Usually used in compotes, preserves and jellies.

Oca
Oxalis tuberosa. Tubers that are round or kidney-shaped, 2½ to 3½ inches across, that are of reddish skin and white pulp.

Paico
Chenopodium abrosioides L. Tropical American weddy herb used as an herb and for medicinal properties. Known as Mexican tea, Spanish tea, and Worm seed. Therapeutic dose for worms and aemebas approaches lethal dosage.

Quinua
Chenopodium quinoa. Indigenous grain to the Andean high altitude regions.

Zapallo
Cucurbita maxima. From the genus of Cucurbitaceae, with many seeded fleshy fruit and a hard rind. Similar to pumpkin.

[a](Coyle, 1982; and Ministerio de Salud, 1975).

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