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9. ABSTRACT

The nutritional and health characteristics of the semi-rural community of Candelaria, Colombia are analyzed using systematic observations of over 80% of all the children under six years old and their families. During the seven years of operation the program serviced 1840 different families. After a 6 month training period girls between 16 and 21, (Promotoras), assumed the task of visiting all participating families every two months. These ten volunteers provided education on nutrition, hygiene and utilization of health services gathered data including child height and weight, and referred sick children to a Health Service Unit staffed by four public health nurse aides. The overall management of the Health Center was directed by a general practitioner and a Public Health nurse. The major purpose of the program was to prevent disease as well as to reach children before any illnesses had progressed to a point requiring extensive and costly medical treatment.

This analysis indicates that the program was successful for the following reasons: (1) In spite of an erosion in purchase power the malnourishment rate in the child population dropped 25%. (2) The program reduced the incidence of diarrhea 20% to 50% depending upon the age of the child and the duration of time the family was in the program. (3) Girl malnourishment dropped 31% and boy malnourishment dropped 12%. (4) The education level of the parent, expenditures on food, and monthly income all affected the level of child malnourishment. (5) There was a decrease in real expenditures on food of 8.7%. (6) Consumption of food dropped and a shift occurred from animal to vegetable protein. (7) The use of birth control increased from 18.7% to 43.6%. These seven factors are discussed in detail and illustrated with tables and graphs.

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THE PROMOTORA PROGRAM IN CANDELARIA:
A COLOMBIAN ATTEMPT TO CONTROL MALNUTRITION
AND DISEASE, 1968-74

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THE PROMOTORA PROGRAM IN CANDELARIA:
A COLOMBIAN ATTEMPT TO CONTROL MALNUTRITION
AND DISEASE, 1968-74

SUMMARY AND CONCLUSIONS

In 1968 a new health program was initiated in Candelaria, Colombia. This program centered around health volunteer workers (Promotoras), girls between 16 and 21 years of age with at least five years of primary school. Following a six-month training period, they assumed the task of visiting all families with children less than six years of age every two months. The ten volunteers provided education on nutrition, hygiene and utilization of health services; gathered data including child height and weight; and referred sick children to a Health Service Unit. The latter was staffed by four Public Health Nurse Aides and provided initial treatment of the most common illnesses. Pregnant and lactating mothers were also instructed in pre- and post-natal care.

The overall management of the Health Center was directed by a general practitioner (sixth year medical student) and a Public Health nurse. The major purpose of the program was to prevent disease as well as to reach children before any illnesses had progressed to a point requiring extensive and costly medical treatment.

By utilizing the volunteers to identify those children requiring further treatment, the time of the highly skilled health care personnel could be reserved for tasks appropriate to their skills. The direct participation of community members in the program increased its acceptability.

Detailed records were obtained on 80% of the entire child population and associated families, including health and nutritional status and a rich collection of family socio-economic information (see Bibliography and Appendix A). This data set representing over one half million variable observations in 9800 child and 1800 family records was converted to machine readable form and analyzed during 1975 and 1976.

The conclusions stemming from this analysis are that the Promotora program as carried out in Candelaria was successful in reducing child malnourishment for a variety of reasons as summarized below.

Although the child population was well off relative to other semi-rural Colombian villages at the start of the program, the malnourishment rate dropped in the entire child population from roughly 29% in 1968 to 21% in 1974; a 25% reduction. This occurred in spite of an erosion of purchasing power and a large turnover in families participating in the program. (Figure 3)

When children that entered the program during their first year are compared with those entering in their second or later year the reduction in malnourishment is even greater; a 30% to 40% improvement. (Figure 11)

A strong relationship between the presence of diarrhea and malnourishment is shown both graphically (Figure 4) and statistically (Page 20). More important is the finding that the Promotora program reduced incidence of diarrhea significantly; 20% to 50% depending upon the age of the child and the duration of time the family was in the program. (Figure 8)

A particularly surprising result was that the nutritional status of girls improved far more than boys during the seven-year period. Based on the Gomez standard which was used during the period of the program, malnourishment in girls decreased from 36.1% to 24.8% while the rate for boys went from 19.7% to 17.3%. That is, girl malnourishment dropped 31% and boy malnourishment dropped only 12%. Although the utilization of a sex differentiated standard would change the relative position of boys to girls there would be no change in the finding that girls improved far more than boys. (Figure 12)

The education level of the parent, expenditures on food, and monthly income all affected the level of child malnourishment.

During the seven-year period, 1968-1974, there was a significant erosion in family purchasing power for the entire community. Although the average family income increased from 683 pesos to 1251 pesos, when adjusted for inflation, real income dropped to 566 pesos in constant terms. This resulted in a decrease in real expenditures on food of 8.7% over the seven-year period. (Figure 20)

A function describing the relationship between infectious disease and food consumption was formulated. (Figure 21) This relationship is important because it could lead to helping define what the best mixture of community level interventions should be.

Consumption of food also dropped which increased the gap between need and consumption from 22.7% to 33% for proteins and 19.7% to 29.7% for calories. In addition, shifts occurred from animal proteins to lower priced vegetable proteins. Whereas the mixture was 47% animal and 53% vegetable in 1968 it was 37% animal and 63% vegetable by 1974. (Table 7)

- The use of birth control more than doubled during the Promotora program. Families using some form increased from 18.7% in 1968 to 43.6% in 1974 with the largest change in use being the IUD. (Figure 14) Birth order was shown to affect sibling malnourishment rate in Candelaria. It is therefore reasonable to presume that as family planning increases there will be further positive effects upon the child malnourishment rate.

STATEMENT OF PURPOSE

This report analyzes the nutritional and health characteristics of a semi-rural Colombian community. It utilizes a set of data almost unique in the developing world. The data consist of systematic observations of over 80% of all children under six years old and their families during the "Promotora" program in Candelaria, a town of 8,000. Promotora's intervention during 1968 to 1974 appears to have successfully reduced child malnourishment. Equally important, it promises to achieve similar results if applied elsewhere.

Additionally, this report discusses important methodological issues related to evaluating community health systems and charting a course of inquiry into the better understanding of extremely complex interrelationships underlying malnutrition at the family and community levels.

THE SETTING - CANDELARIA, COLOMBIA

Candelaria (population approximately 8,000) is located in the Cauca River Valley 30 kilometers from Cali. The major crop produced by the surrounding rich agricultural lands is sugar cane. Most of the men work in sugar cane fields or mills. Average monthly income is \$30.00 U.S. Although there is some home production of vegetables and other foodstuffs, the people depend on cash incomes for survival.

Recently the population has been growing at an annual rate of approximately 10%, due to the high natural birthrate and the immigration of families from subsistence farms in search of employment. The family migration rate is approximately 18% per year since many of the immigrants remain in Candelaria for only a year or two before moving on to Cali or other cities. Thus, Candelaria is in constant transition -- typical of communities in the area.

DESCRIPTION OF THE PROMOTORA PROGRAM

The Promotora program centers around health volunteer workers (Promotoras), between 16 and 21 years of age with at least five years of primary school. Following a six month training period they assumed the task of visiting all families with children less than six years of age every two months. The

ten volunteers provided education on nutrition, hygiene and utilization of health services; gathered data including child height and weight; and referred sick children to a Health Service Unit. The latter was staffed by four Public Health Nurse Aides and provided initial treatment of the most common illnesses. Pregnant and lactating mothers were also instructed in pre- and post-natal care.

The overall management of the Health Center was directed by a general practitioner (sixth-year medical student) and a Public Health nurse. The major purpose of the program was to prevent disease as well as to reach children before any illnesses had progressed to a point requiring extensive and costly medical treatment.

By utilizing the volunteers to identify those children requiring further treatment, the time of the highly skilled health care personnel could be reserved for tasks appropriate to their skills. The direct participation of community members in the program increased its acceptability.

As shown in Table 1, the Promotora program serviced an average of 921 families per year (except the first year, when 737 families were involved), including 1392 children (first year - 694) less than six years old. Based upon a census conducted in 1963, 506 families inhabited the town including 1094 children less than six years old, with 2.16 children less than six years old per family.

However, the 1973 census indicated 1260 dwellings with 1952 families, for a total of 8773 inhabitants. Presently, no data concerning the total number of children less than six years old exist for Candelaria, but it is reasonable to believe that between 20 and 25% of the population belong in this age group. Based on these criteria, we can conclude that over 80% of the children in the population participated in the Promotora program.

During the seven years of the program's operation, 1840 different families participated, including 9051 children less than six years old. The operation

of the program was fairly stable. The first year, 40% of the attending families registered, of which 240 families (13%) permanently enrolled in the program for the six years of its duration. Abandonment by the enrolled families primarily due to outmigration during their first year in the program was on the average 17%. (Table 2) Thus, except for the initial year, each of the 10 health volunteers served approximately 139 children in 92 families with roughly 17% of the participants changing each year as migration to and from Candelaria occurred.

A health card, Figure 1, was kept by the mother for every child under six years of age. Data was recorded on this card during each visit so that the mother could observe the progress of her child relative to a standard. The Gomez standard was used for this purpose and no distinction was made between male and female children.

Two types of data were generated by the Promotora program: 1) family demographic and general health information, and 2) individual child health data. Family level information includes number of years in the Promotora program, family size and composition, age of family members, educational level of parents, occupation, income of principal wage earner, weekly expenditures of food and the number of children in the family classified by degree of malnourishment. Individual child health data contains age and weight of child, order of birth in the family, nutritional status, extent of diarrhea sickness, hospitalization and clinic visitation, and whether or not DPT and polio immunization was given during the preceding period. A detailed description of these data is shown as Appendix A.

Candelaria has had health-related interventions since 1958, when the Board of the Faculty of Medicine at the Universidad del Valle in Cali decided to establish a rural health center there for teaching purposes. Consequently, the analysis of the Promotora program (1968-1974) must be placed in the context of these previous interventions. Before delving into the effects of the Promotora program it is therefore necessary to describe these previous interventions, a more complete description of which is contained

in "Comparative Effects of Three Types of Nutritional Assistance Programs,"
by Alfredo Aguirre, Universidad del Valle, Cali, Colombia, 1971.¹

In 1958 the Department of Preventative Medicine and Public Health of the Universidad del Valle established a rural health center. Services in preventative and curative medicine were rendered by residents and medical students exposed by their work to community problems. The point was utilization of available resources rather than development of a "University Hospital" in rural surroundings. Students and residents learned to resolve problems they might face in other communities with no university assistance.

The Nutritional Recuperation Center, started in August, 1962, provided care for children with second and third degree malnourishment after release from the hospital. Children remained at the center during the week and were sent home on weekends. Besides furnishing children with adequate food, the center was to educate the mother about the importance of balanced diets. It became evident, however, that the educational efforts were not reaching the rest of the community; often the siblings of the children under treatment were malnourished. Even some of the "recuperated" children became malnourished upon return home. The costs of the program per recuperated child were high and the scarce facilities limited the number who could be treated. The emphasis was on curative rather than preventative medicine.

In January, 1964, the Nutritional Recuperation Center was disbanded and all children showing any sign of malnourishment were treated as outpatients. Weekly food supplements were distributed for each person of vulnerable age (pre-school children, pregnant or nursing mothers). Mothers in groups of 25-30 took part in seven educational presentations. The educational efforts of this project appeared to have reached the rest of the community. The weight for age malnourishment rate decreased from 40.8% to 31.8% in the first six months of the program and was proportionately greater in the severely malnourished groups. While the project was considered successful, the costs were high in relation to the economic resources of the health center.

-- As a result of municipal water and sewage programs, 67.7% of the homes had sanitary waste facilities and 90.9% had piped water by 1964. The impact of this on the malnourished rate cannot be accurately determined, but a 1963 survey conducted prior to the supplementation program indicated a rate of 40.8% compared to the 55.6% shown in the 1965 national survey.

Consequently, by the time Promotora was initiated, the children of Candelaria were already comparatively healthy. The most recent nation-wide survey of Colombia (1966) found that 55.7% of the children less than six years of age were malnourished in communities comparable to Candelaria.² In 1968, however, when the Promotora program was initiated, malnourishment in Candelaria was roughly 30%, the collective results of the interventions conducted during the previous decade. Figure 2 summarizes the prevalence of malnourishment and diarrhea in Candelaria children between 1963 and 1974 and Table 3 indicates the nutritional status of Colombian children between 1960 and 1974 in different regions.

It is clear that Candelaria is not typical of rural communities in Colombia. Although many of its families reside there only temporarily, the community as a whole is accustomed to projects being conducted by outsiders. This was a strong influence on the acceptance of the Promotora program. Beyond that, water and sewage treatment systems made the task of reducing the infection rate through education somewhat easier. It is therefore difficult to predict precisely what the impact of a Promotora program would be in a community with minimal sanitation facilities and a malnourishment rate of 50-60%. Despite these problems, the Promotora program in Candelaria is the only program that can be evaluated and, when the limitations of some of the data are recognized, significant conclusions may still be drawn regarding both the Promotora program and some community/family infrastructure characteristics.

Time limited the analysis. In many cases underlying relationships have been only touched upon. Questions raised have vastly exceeded answers.

The information in this report is offered to enable others to tackle problems of malnutrition more effectively. We reluctantly call this a final report, for much more information can and will be derived from this data source. The results of the Promotora program are described in the following section.

THE EVALUATION OF THE PROMOTORA PROGRAM

It would be methodologically convenient if we could merely report changes in the health and nutritional status of children exposed to the Promotora program over the seven-year period 1968-1974 and then assess whether these changes warranted the expenditures necessary for their attainment. But such is not the case. Time and again as we have examined the relationships between the intervention and the resultant improvement in child health, we have found it necessary to delve into many aspects of the environment that are not directly related to the Promotora program. While this has made the task more difficult it has also produced a rich collection of exogenous factors which at times have even overwhelmed the effects of the program under direct analysis. We shall treat each major finding both in terms of the Promotora program and where possible in the larger Colombian setting.

As we evaluate the Promotora program it is also important to clarify the nature of what we call malnourishment and the methodology employed to measure changes produced by the program. If we review the natural history of child malnourishment - whether it is caused by infection or a nutrient deficient or both - we see that children born in a healthy nutritional state often suffer a period of sharp but short-term malnutrition during weaning. When malnourishment occurs over a short period it is characterized by a weight loss in relation to height and is called acute malnutrition. If the diseased condition continues, growth in height is retarded. Prolonged illness produces a permanent deficit in height for a given age. This deficit we call chronic or stunting malnutrition. Recovery from malnutrition results in a weight gain proportional to the child's height and some gain in the child's height proportionate to his age. Consequently, recordings of weight for a given age represent the sum of damages produced by long-term chronic malnutrition and short-term acute malnutrition.

The data set used in this analysis contained weight for age information for all observations but only a sample of height for age information. As a result, most of the analysis utilizes the weight for age measurements. Under these conditions then, any short-term changes in the weight for age

measurements represent a rather dramatic change in the actual nutritional status of the child population.

A child was considered undernourished if it was 15% below the expected weight for its age. The Gomez standard was used, which measures slightly below the 25th percentile of the Boston standard for children. It should be noted that the standard for the population of Colombia runs slightly above the 25th percentile of the Boston standard for children and undernourishment is defined as a weight loss of 10% with regard to that standard. Thus some children considered normal in Candelaria would be considered undernourished if defined by the standard of undernourishment accepted in Colombia. Given that during the entire period of the program the same standards and definitions were used, it is possible to draw conclusions from the variations in the malnutrition rate.

It is necessary to note the different interpretations of the variations in the malnutrition rate and their implications. The most current is to express the measurement of undernourishment as a function of its variations by calendar years (malnutrition vs. calendar year). One of the factors that can most affect this type of analysis is internal and external migration. In Candelaria, the phenomenon of migration is notable; it has been calculated that each year a migration of 15-25% occurs. Variations in the income of the population serviced are also important.

Another means of expressing the variations in the malnutrition rate consists of examining its relationship to the amount of time spent in the program by the participants (% malnutrition vs. years in the program); the greatest inconvenience with an analysis of this type lies in the possibility of deducing the effect of the program with the accompanying effect of an increase in the age of the population served.

Finally, it is possible to examine the percentage of children that are malnourished for different cohorts of children defined in terms of their length of participation in the program. This obviates the problems described previously but recognizing the fact that the number of children

in the older ages is generally low, making the data seem less conclusive.

Changes In Child Malnourishment 1968-1974

At the program's inception in 1968 the malnutrition rate of all grades was 28.6%. By 1971 it had dropped to 19%. Between 1972 and 1974 this rate remained stable at around 21%. (Figure 3 and Table 4)

It is important to consider if, for the population of Candelaria, we should expect a major reduction in the malnutrition rate independently of whether such a reduction is due to the intervention; or if the stabilization of the malnutrition rate is due to the point at which the normal distribution of weight/age does not easily permit a further reduction. Comparing what is considered the normal weight distribution for the population of Bogota with the population of Candelaria, we see that the lower weight limit for each group considered normal in Candelaria coincides with the 20th percentile of the weight distribution for Bogota children. Thus if the normal populations are comparable, the definition of undernourishment would classify 20% of the normal children of both populations as undernourished. In other words, the maximum sensitivity of the instruments used to measure undernourishment is roughly 20%.

We can conclude then that for a combination of reasons, malnutrition dropped in Candelaria during the Promotora program to a level below which it would be difficult to attain under most conditions.

Child Malnourishment and Infection

One of the most useful methods of assessing the impact of a community health services program is to examine changes in the rate of infection. However, isolating malnutrition and infection is virtually impossible. Their synergistic relationship precludes separation. A change in the infection rate will affect the amount of nutrients available to the child, which in turn influences malnourishment. By the same token, a change in nutrient intake will affect by some degree the incidence and severity of infections.

Trends in the rate of malnourishment and infection over program and calendar year will be discussed separately and then compared in order to identify some of their interrelationships within Candelaria, Colombia. The analysis uses diarrhea as the expression of infection because of its high prevalence in early childhood and its statistical correlation with malnourishment. Our measure of malnutrition is the weight for age classification using the Gomez standard.

The diarrhea rate is the average frequency of diarrhea as recalled by the mother for the month preceding the Promotora visit. The quantification of the incidence of this infection is thus subject to a lack of recall, mothers not seeing the child's stool, and acceptance of what would clinically be diagnosed as diarrhea as the norm. Despite these methodological limitations, the diarrhea rate by age may be observed accurately. There is a low incidence in infancy when many children are nursing and then a sharp rise from six months to 30 months, the post-weaning period. At this time, children are being introduced to new foods, usually low in protein, and are also mobile, enabling them to crawl around and pick up infections. In Candelaria, this period is followed by a steady decline. (Figure 4)

It is important to recognize the "natural change" in rate of malnourishment and infection as the child ages. This is independent from any health program. Similarly, differing environmental conditions will influence what is "natural." For instance, the national Colombian survey of 1966 showed the malnourishment rate for children less than 1 year was 32.9%. It peaked in the 3rd year at 66.8% and then dropped to 55.9% by the 5th year.⁵ Therefore it is misleading to base an analysis of the effects of the program strictly by charting children over time because as they age, change in their malnourishment rate will occur regardless of intervention.

The evaluation of any observable trends in diarrhea over time is complicated by this "aging effect." The average age of the children in Candelaria increases the longer they are in the program. (Figure 5) There also appears to be an increase in the average age of the population of children through the calendar years as well. (Figure 6) Thus a change in the diarrhea is not necessarily

indicative of success or failure -- the observable trend may be related to the aging process. Therefore it is difficult to assess the impact of the program based strictly on the graph of the rate of diarrhea as the time enrolled in the program increases. (Figure 7)

Figure 8 indicates that the Promotora program is successful with respect to reducing diarrhea rates. In essentially all age groups the rate decreases through the third year of the program. In other words, a two-year-old in the program the second year will have a lower diarrhea rate than a two-year-old during its first year in the program.

We had planned to examine both the incidence and severity of diarrhea. The longer the duration of a particular case, the greater the impact on a child's nutritional status. If a child suffers five consecutive days of diarrhea, it will be more damaging than five bouts of one day's duration separated by a few days of relative health. The data from the Promotora program on the duration of diarrhea, however, showed little promise for further analysis. It is probably easier for a mother to remember the number of times the child had diarrhea rather than the duration of each illness. Thus our attempts to correlate severity of diarrhea with malnourishment have not yet been successful.

For the reasons described earlier in this section, malnourishment is clearly tied to infection rates. The graph of malnourishment rate versus time spent in the program reveals a modest decline after the second year. (Figure 9) During this semester the average age of children enrolled in the program is 32.4 months which corresponds with the age in which children suffer the highest incidence of malnourishment. The rate of malnourishment does not fall as low as the rate for diarrhea because beyond early childhood it is no longer a dominating factor in the etiology of malnutrition. When children can walk, they are less liable to become infected with germs from human feces and other contaminants that abound on the floors and ground of poverty-ridden communities. Furthermore, by the time they pass early childhood, they have developed some resistance to diarrhea. At this point, the controlling factors in determining nutritional status are probably a

lack of food and metabolic stresses caused by low grade infections from a variety of sources.

The plot of malnourishment against age and number of years in the program shows decreasing malnourishment among children three and under. (Figure 10)

Malnourishment does not decrease as consistently for the older age groups however. This could be the result of different factors. The malnourished four and five-year old who is enrolled in the first year of the program may be chronically undernourished and hence more difficult to treat. An analysis of the two youngest groups as they move through the program indicates a continual decrease in the malnourishment rate. (Figure 11) The graph of malnourishment by age for the first program year is a reflection of the expected rate of malnourishment for each age group without any intervention and in that sense can act as a control. Figure 11 also graphically illustrates the importance of reaching the children when they are very young. If a child is enrolled as an infant, the probability of it being malnourished at age three, four, or five will be lower than if the child is two years of age at entry.

Malnourishment and Sex of Child

One of the most interesting results to come from the analysis of the Candelaria Promotora data concerns the effect of sex on both the absolute amount and the relative change in malnourishment rate. Nationally, the Colombian rates differ: 47.5% for boys; 64.6% for girls. The same differential existed for children in Candelaria in 1968; 19.7% for boys and 36.1% for girls. However by 1974 the values had changes to 17.3% for boys and 24.8% for girls. (Figure 13)

In other words, most of the drop in malnourishment for all children between 1968 and 1974 was attributable to a dramatic decrease in female malnourishment (31%) and a modest 12% reduction in male malnourishment.

Several theories can be offered to explain this observation. Applying one standard to both males and females could cause a higher female malnourishment rate than if separate standards were used. However, this would not explain the narrowing of the differential over the period of the program.

We suspect that increased awareness of dietary practices and an explicit observable record of the status of each child regardless of sex no longer allowed the mother to "favor" male children due to her cultural upbringing. The entire family had visible assessment showing their daughters seeming to need more attention relative to their sons. This permitted other natural paternal instincts towards the well-being of their family to come into play.

Further analysis will be undertaken on this variable by applying a sex differential, height-for-weight standard to confirm this sex effect. However, regardless of which standard is used, the change in malnourishment rate will continue to be greater for girls than for boys.

Malnourishment and Family Planning

Another aspect of the Promotora program included instruction in family planning. It is well known that the number of children and their spacing affect the malnourishment of all siblings in the family. Therefore, one measure of effectiveness of the program may be usage of birth control as related to the number of years each family participates in the program. Figure 13 and Table 8 indicate that birth control usage increased from 19.9% in the first year a family was enrolled to 51.8% in the seventh year. While all methods except rhythm increased substantially, the IUD increased most (6.8% to 19.8%). (When usage is measured over calendar years there is an increase from 18.7% in 1968 to 43.6% in 1974, as shown in Figure 14 and Table 8.)

The relationship between malnourishment rate and child birth order is shown in Figure 15. The malnourishment rate for children was 15.5% for first children rising unevenly to 32.6% for ninth children. Although there is no direct evidence of the relationship between family planning usage and number of children in the family, it is reasonable to assume that

the Promotora program is helping to decrease average family size and consequently is having a positive effect upon child malnourishment.

ANALYSIS OF FACTORS EXTERNAL TO THE PROGRAM

Figure 16 describes the major factors which determine the nutritional status of a child. The quantity and quality of food together with the degree of biological utilization determines nutritional status. In turn, these two major variables are driven by numerous other factors. Some of these are not related to the Promotora program but must be considered when evaluating the results of the experiment.

Malnourishment and Inflation

For the most part, the families in Candelaria depend on cash income for survival. These families are very susceptible to inflation because their incomes are so low that 85% of their earnings are spent on food. The graph of the consumer price index reflects the increase in cost of living in Colombia over the seven-year period of the Promotora program. (Figure 17) The graph of percent change in the consumer price index is more readily understandable, for it shows the inflation rate by year. (Figure 18) If wages and per capita food expenditures do not increase annually by a corresponding rate, less or lower quality food will be purchased and malnourishment will increase. Applying the consumer price index to the monthly income, it can be seen that the real income of families in the Promotora program decreased from 1968 to 1974 by 7.1%. (Figure 19)

There is a comparable decrease in per capita weekly food expenditures- however, the decrease is 8.7% which is more than that of monthly income. (Figure 20) Since requirements are rather inelastic at low levels of income, we expected that the percentage decrease in per capita food expenditures would be less than the decrease in income because the people would increase the proportion of their income spent on food. It appears, however, that the percent of the income not spent on food is as inelastic if not more so than food expenditures. The explanation for this relative lack of inelasticity is probably the very high percentage of total monthly income devoted already

to food. The remaining disposable income is so small that only essentials are being purchased even in good times.

Effects of inflation upon malnourishment are further dramatized by observing the manner in which overall child malnourishment rates for the entire community track expenditures on food in price adjusted pesos. (Figure 20) At almost the same time that real family expenditures in food starts to decrease (1971), the child malnourishment rate ceases to decrease and begins to slowly climb. On the other hand if families are divided into groups of relatively constant expenditures in food (adjusted to 1968 pesos) the malnourishment rate drops over the life of the program both in terms of year in the program and calendar year. Thus, not only is the Promotora program effective in improving the nutritional status of the children, but it is partially helpful in alleviating and overcoming the potentially detrimental effects of inflation.

Malnourishment and Food Consumption

Tables 5, 6, and 7 illustrate how during the years of the Promotora program, the gap between requirement and consumption increased from 22.7% in 1968 to 33% in 1974 for proteins and from 19.7% to 29.7% for calories, reflecting our previous conclusions on food expenditures.

In terms of the quality of food consumed, the prediction that inflation would lead people to buy food of lower quality is also fulfilled, as evidenced by the fact that the percentage of animal proteins therein diminishes from 47% in 1968 to 37% in 1974. (Table 7)

Here again we can expect the effect of the Promotora program to reduce the malnutrition rate in spite of not having provoked an increase in the consumption and quality of food.

A function describing the relationship between infectious diseases and food consumption was formulated. The measure for decrease was incidence of diarrhea and the variable measuring food consumption was weekly food

expenditures per capita in constant pesos. It can be seen from Figure 21 that in order to attain the same level of nourishment a diarrhetic child must consume considerably more nutrients. Conversely, for a given consumption a child's level of nourishment will change by as much as 15%. A 15% drop in weight is sufficient to advance the child by at least one degree of malnourishment. Although the measures available from the data in the Promotora program are not ideal for defining this function, we believe these initial findings merit further investigation. A more precisely defined function could lead to helping predict what the best mixture of community level interventions should be.

Malnutrition and Parental Education

Our analysis indicates that parental education affects child malnutrition to a significant degree. Figures 22 and 23 show, literate parents (either mothers or fathers) having a lower average child malnourishment throughout the entire seven years of the Promotora program. It was hypothesized that the malnourishment rates for literate and illiterate mothers would converge as the length of time in the program increased but we found no such convergence.

Figures 24 and 25 illustrate the tendency for children of a literate father or mother who remain in the program longer than other children to have a lower malnutrition rate. For the baby sons of an illiterate father or mother this tendency is not as evident, although for all ages the malnutrition rate is less following a year of participation in the program than the malnutrition rate for children unexposed to the program.

Finally, Figure 26 shows that food expenditures are greater in families whose fathers are literate than they are in families whose fathers are illiterate, both by program year and calendar year.

Thus, the Promotora program is as effective in the reduction of the malnutrition rate among literate families as it is among illiterate families.

FURTHER ANALYSIS OF PROGRAM EFFECTS

The analysis described in previous sections used weight for age as the measure of child malnutrition. As mentioned previously, this measure confounds both chronic and acute malnourishment. Consequently, further analysis was performed on the subset of observations having both height and weight recordings. This allowed us to observe acute malnourishment for years 1969 through 1974 on approximately 40% of the individual child observations.

A regression equation was formed using the soon-to-be published National Academy of Science weight for height standard as the dependent variable.* Many different independent variables were tried with the following variables being statistically significant.

<u>Variable Definition</u>	<u>Relationships that are Statistically Significant</u>
1. Number of days sick with diarrhea	Negative correlation with nutritional percentile
2. Whether or not the mother nursed	Positive correlation with nutritional percentile for the first 24 months
3. Educational level of mother	Positive correlation with nutritional percentile
4. Sex of child	Positive correlation
5. Number of children in family	Negative correlation
6. Age of mother	Negative correlation
7. Per capita food expenditures	Positive correlation with nutritional percentile for 2-12 months and 24-48 month intervals but no significance for the 12-24 month interval.
8. Amount of time spent in Promotora program	Positive correlation with nutritional percentile

* Heller, P.S., Drake, W.D., et.al., Working Draft, June, 1976.

These results appear to be consistent with the weight for age findings and show promise of shedding additional light upon the program if pursued further.

CONCLUSIONS

The Promotora program as carried out in Candelaria was quite successful in reducing child malnourishment for a variety of reasons.

- Although the child population was well off relative to other semi-rural Colombian villages at the start of the program, the malnourishment rate dropped in the entire child population from roughly 29% in 1968 to 21% in 1974; a 25% reduction. This occurred in spite of an erosion of purchasing power and a large turnover in families participating in the program. (Figure 3)
- When children that entered the program during their first year are compared with those entering in their second or later year the reduction in malnourishment is even greater; a 30% to 40% improvement (Figure 11)
- A strong relationship between the presence of diarrhea and malnourishment is shown both graphically (Figure 4) and statistically (Page 20) More important is the finding that the Promotora program reduced incidence of diarrhea significantly; 20% to 50% depending upon the age of the child and the duration of time the family was in the program. (Figure 8)
- A particularly surprising result was that the nutritional status of girls improved far more than boys during the seven-year period. Based on the Gomez standard which was used during the period of the program, malnourishment in girls decreased from 36.1% to 24.8%, while the rate for boys went from 19.7% to 17.3%. That is, girl malnourishment dropped 31% and boy malnourishment dropped only 12%. Although the utilization of a sex differentiated standard would change the relative position of boys to girls there would be no change in the finding that girls improved far more than boys. (Figure 12)

The education level of the parent, expenditures on food and monthly income all affected the level of child malnourishment.

During the seven-year period 1968-1974 there was a significant erosion in family purchasing power for the entire community. Although the average family income increased from 683 pesos to 1251 pesos, when adjusted for inflation, real income dropped to 566 pesos in constant terms. This resulted in a decrease in real expenditures on food of 8.7% over the same seven-year period. (Figure 20)

A function describing the relationship between infectious disease and food consumption was formulated. (Figure 21) This relationship is important because it could lead to helping define what the best mixture of community level interventions should be.

Consumption of food also dropped which increased the gap between need and consumption from 22.7% to 33% for proteins and 19.7% to 29.7% for calories. In addition, shifts occurred from animal proteins to lower priced vegetable proteins. Whereas the mixture was 47% animal and 53% vegetable in 1968 it was 37% animal and 63% vegetable by 1974. (Table 7)

The use of birth control more than doubled during the Promotora program. Families using some form increased from 18.7% in 1968 to 43.6% in 1974 with the largest change in use being the IUD. (Figure 14) Birth order was shown to affect sibling malnourishment rate in Candelaria. It is therefore reasonable to presume that as family planning increases there will be further positive effects upon the child malnourishment rate.

FIGURES

FIGURE 2

CHILD MALNOURISHMENT AND DIARRHEA RATE

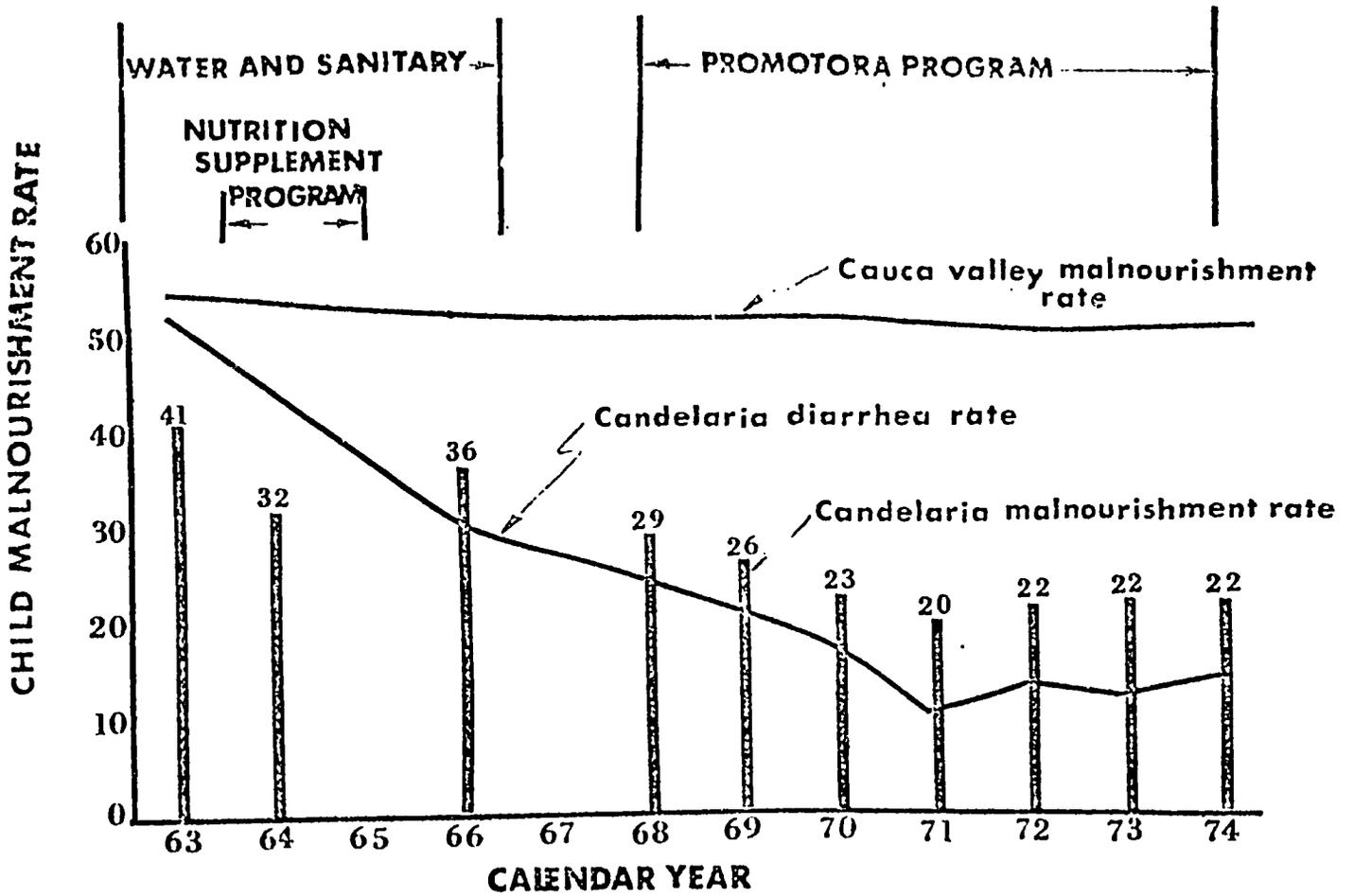


FIGURE 3

PERCENT MALNOURISHMENT FOR CHILDREN OF ALL AGES

IN CANDELARIA, COLOMBIA 1968 TO 1974

(BASED ON 9800 INDIVIDUAL CHILD RECORDS)

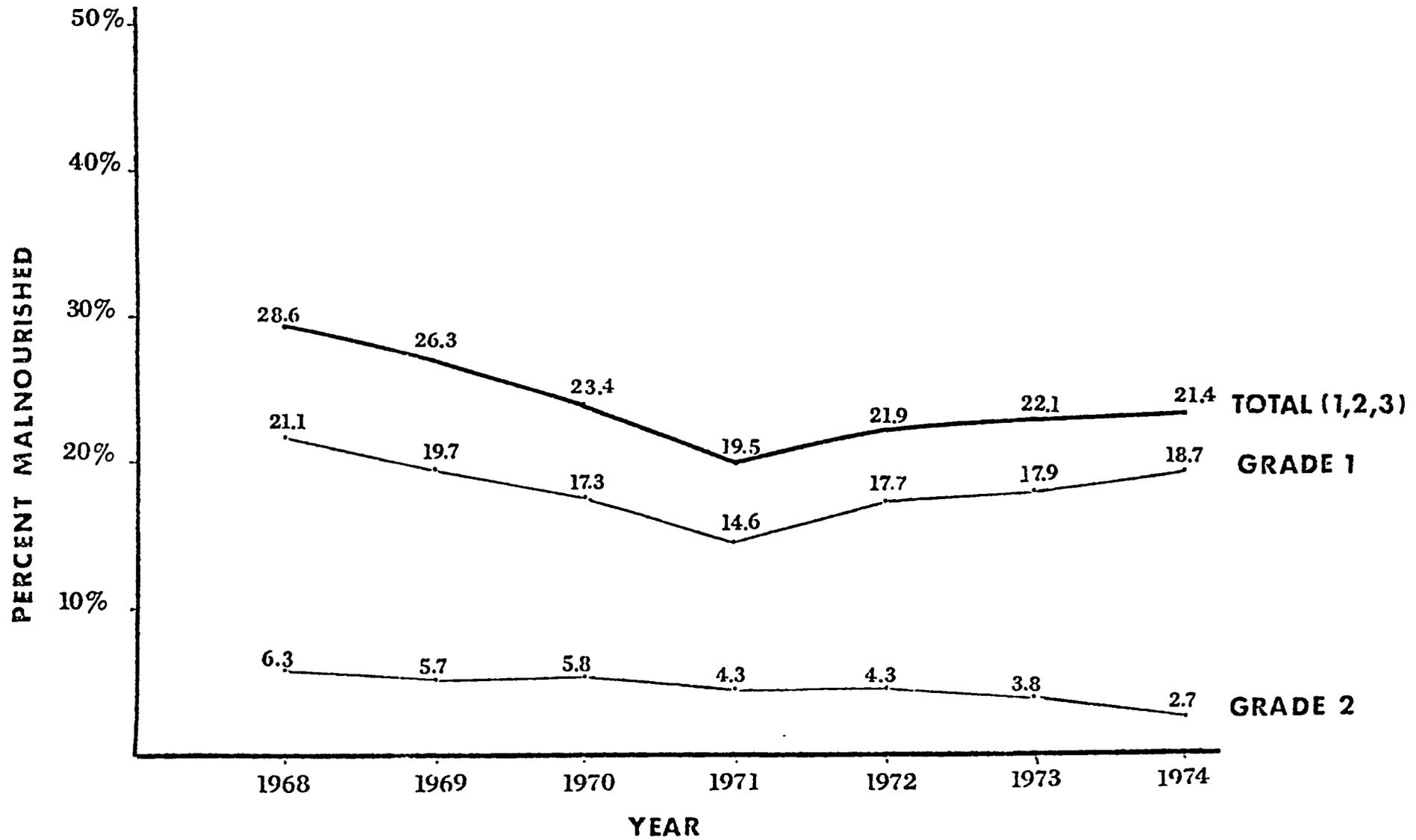


FIGURE 4

PERCENT MALNOURISHMENT AND DIARRHEA VS. AGE OF CHILD
(CANDELARIA, COLOMBIA)

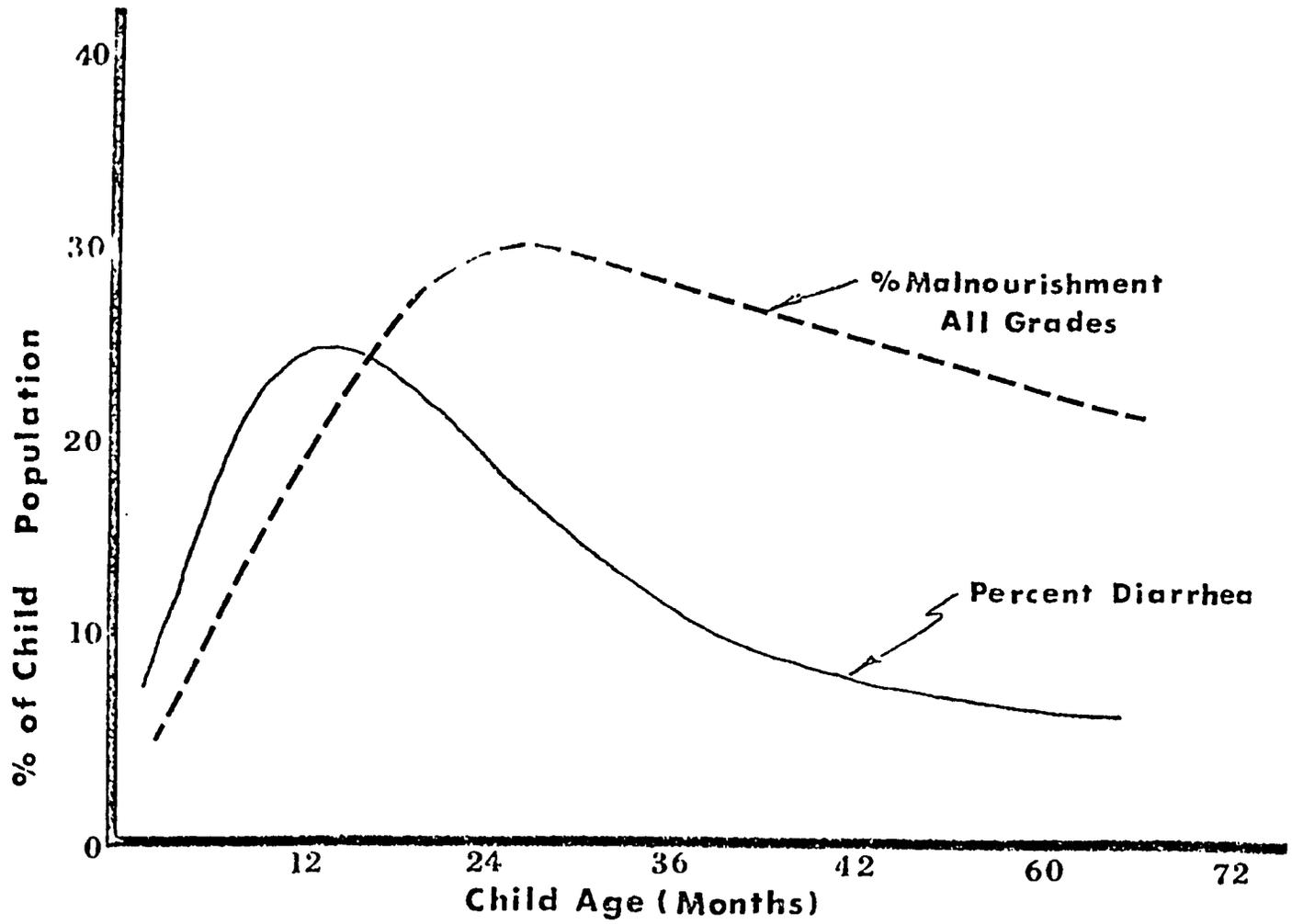


FIGURE 5

AVERAGE AGE OF CHILD IN MONTHS BY YEAR IN PROGRAM

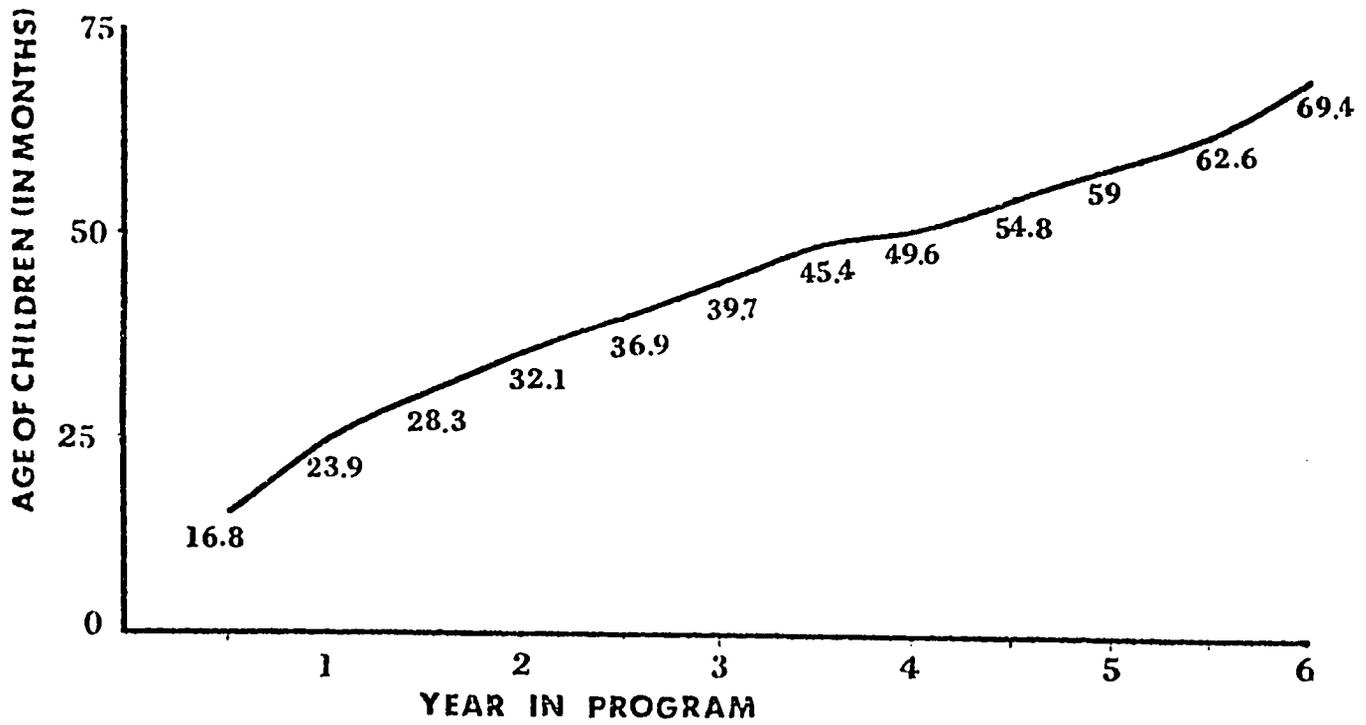


FIGURE 6

AVERAGE CHILD AGE BY CALENDAR YEAR
(CANDELARIA, COLOMBIA)

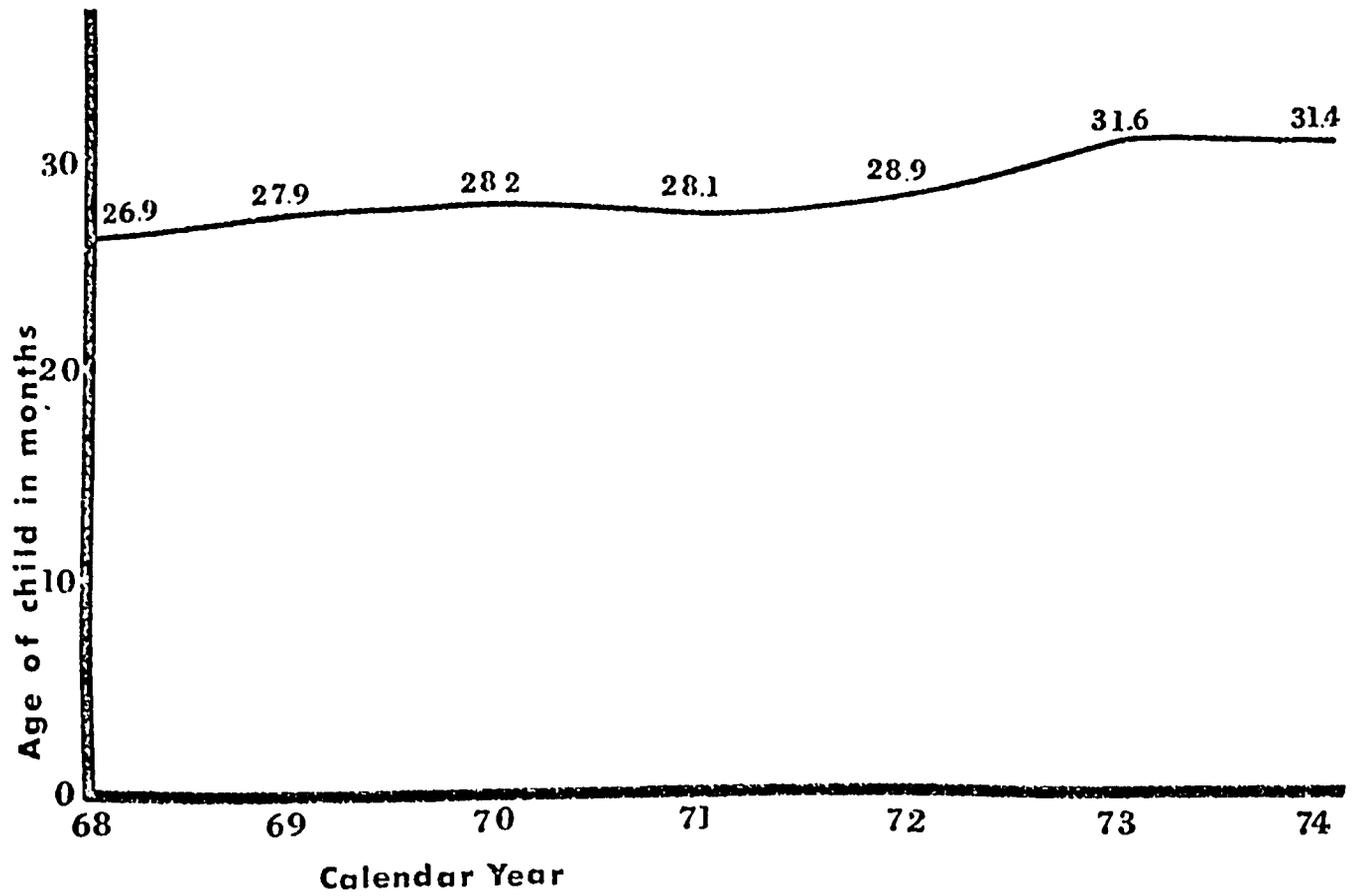


FIGURE 7

CHILD DIARRHEA RATE BY YEARS IN PROGRAM

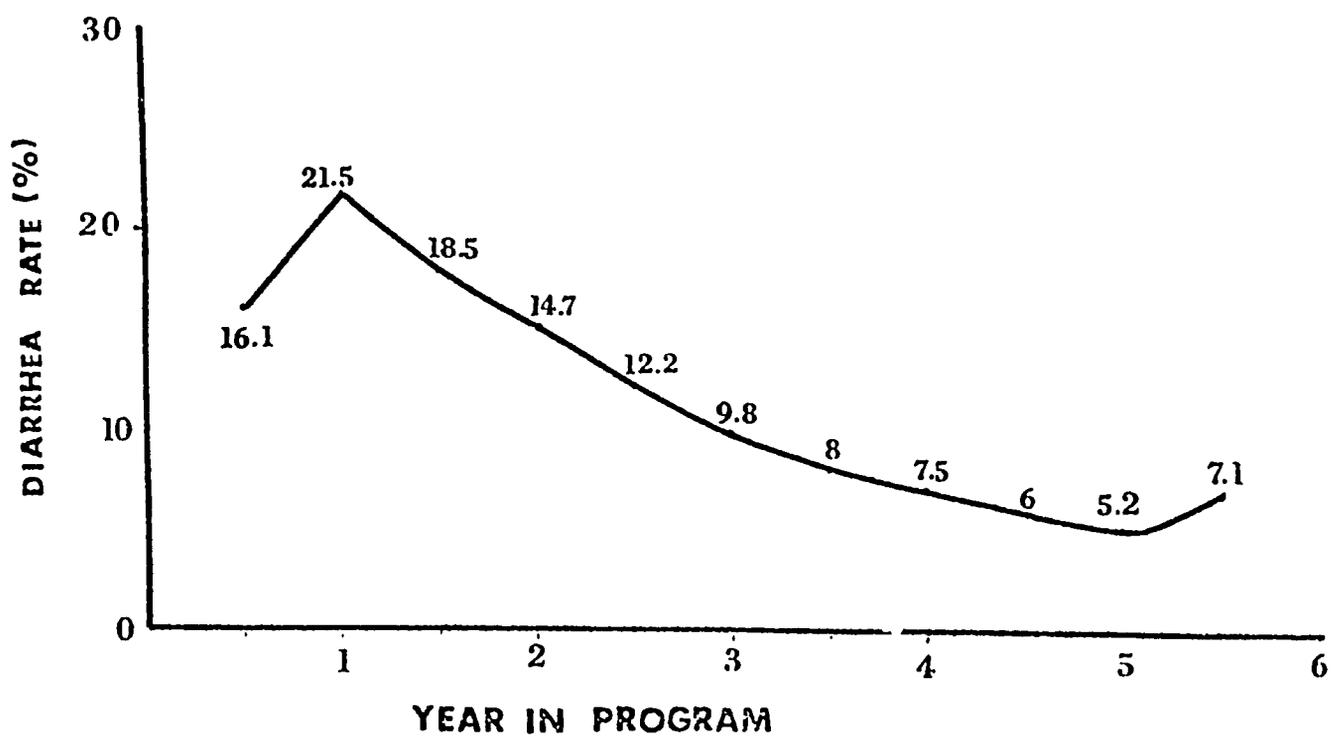


FIGURE 8

DIARRHEA RATE BY YEAR IN PROGRAM AND CHILD AGE
(CANDELARIA, COLOMBIA)

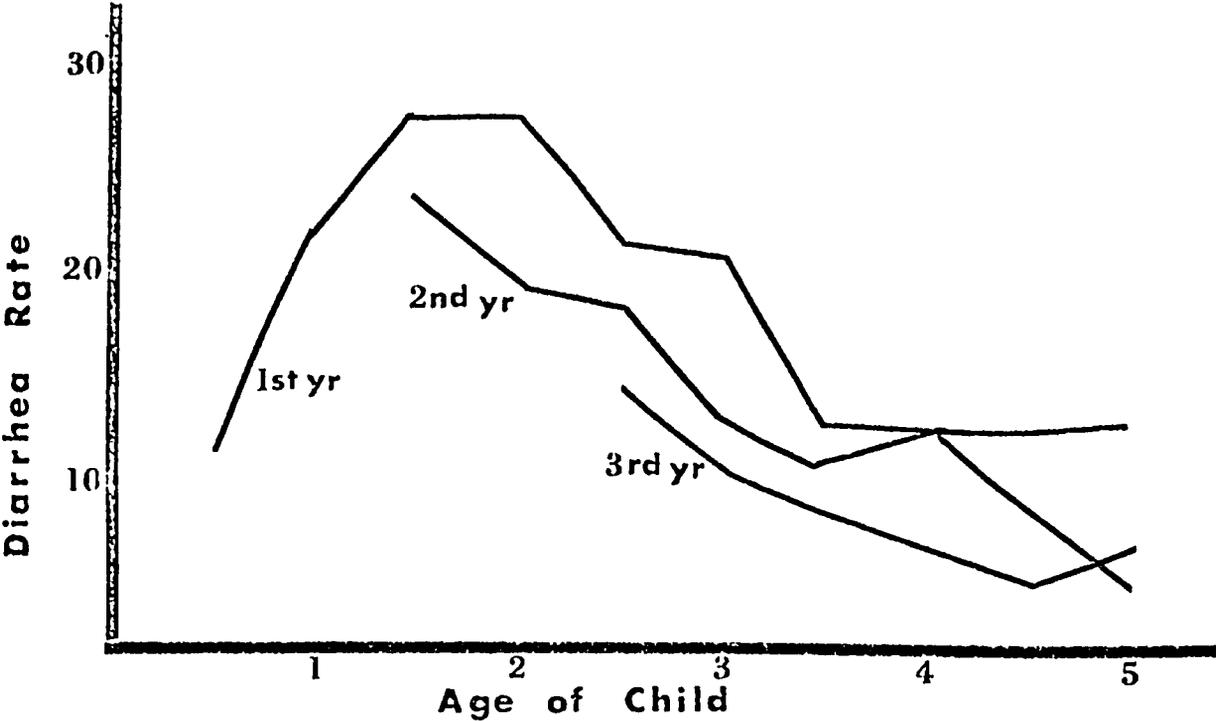


FIGURE 9

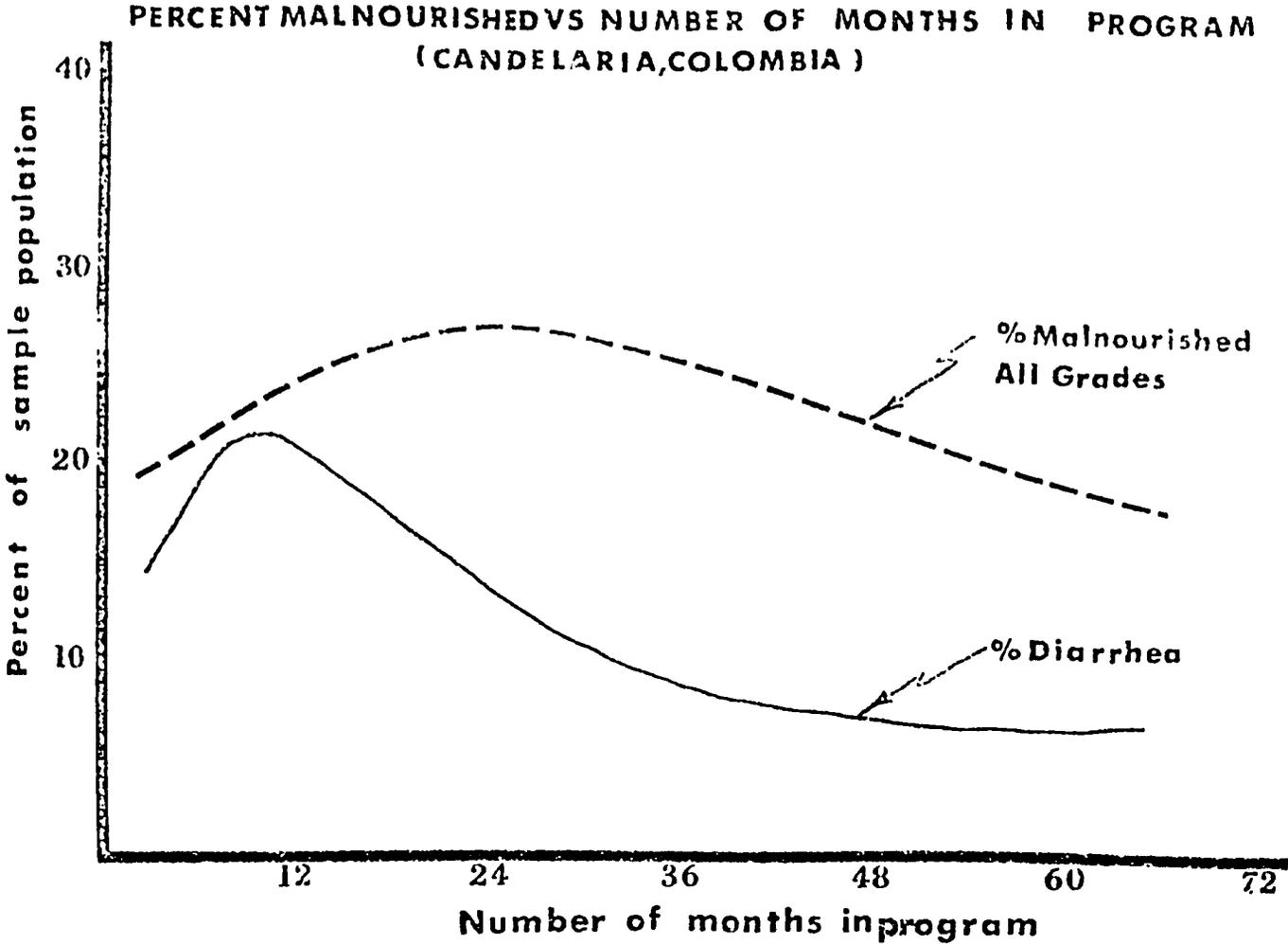


FIGURE 10

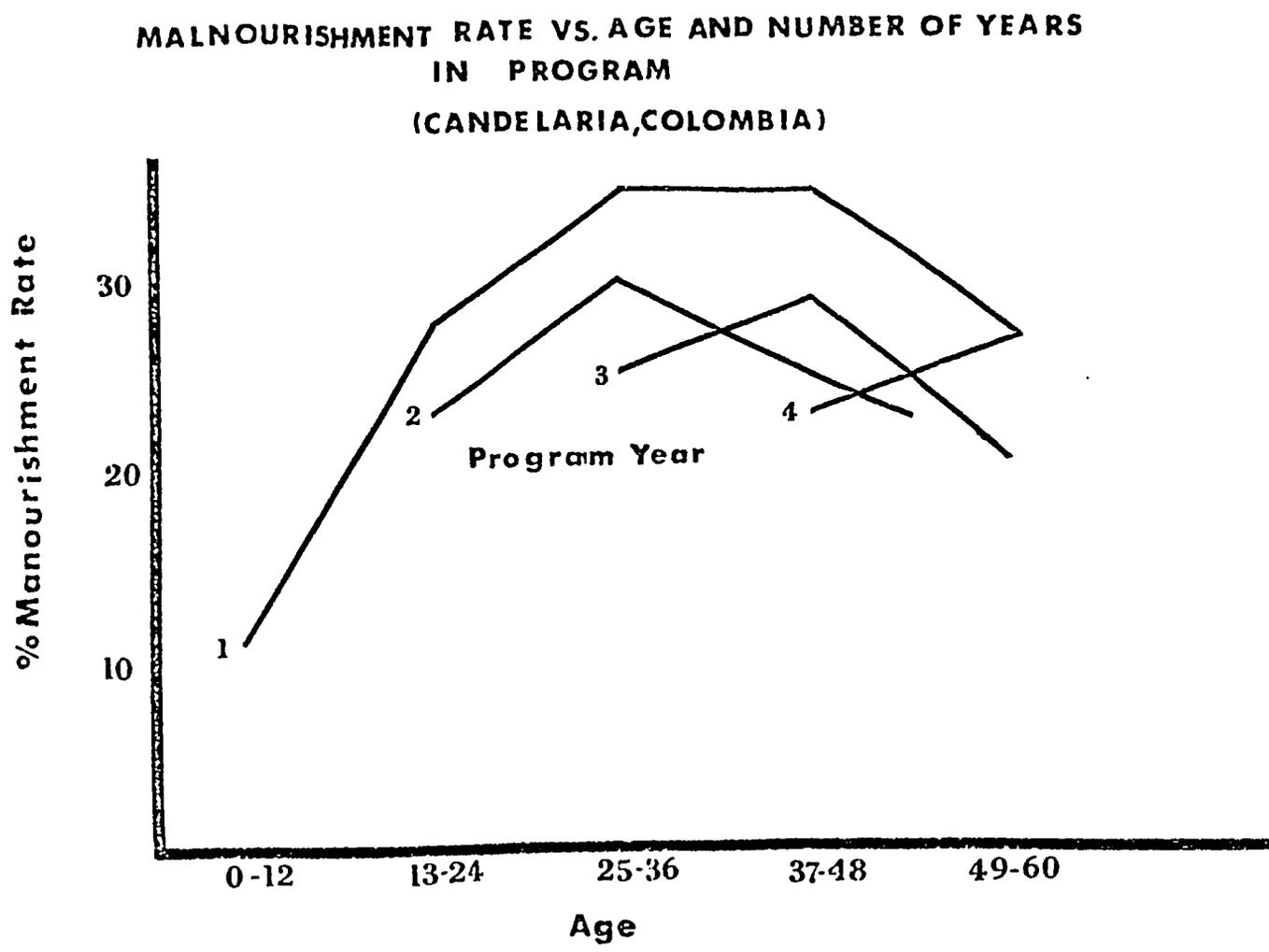


FIGURE 11

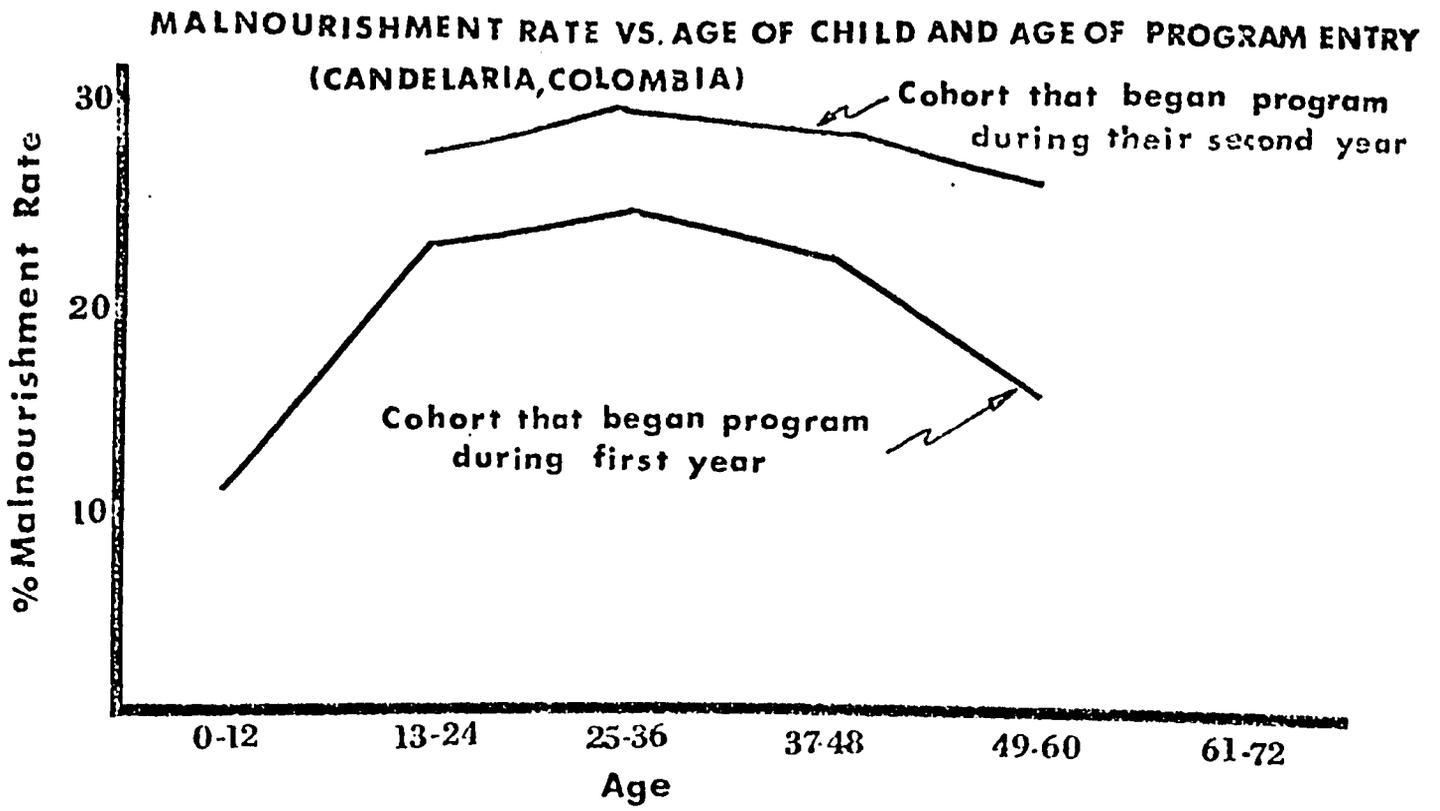
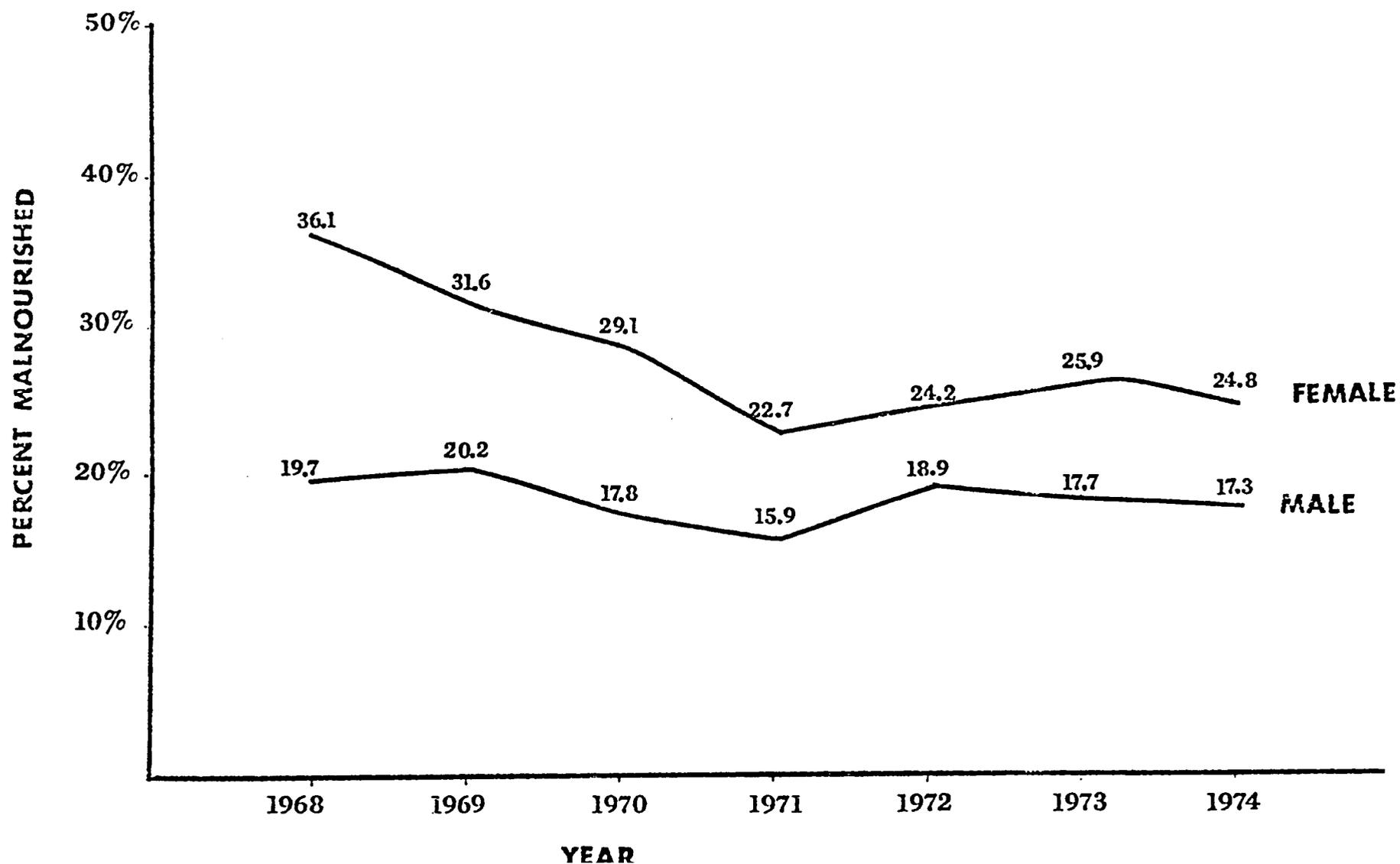


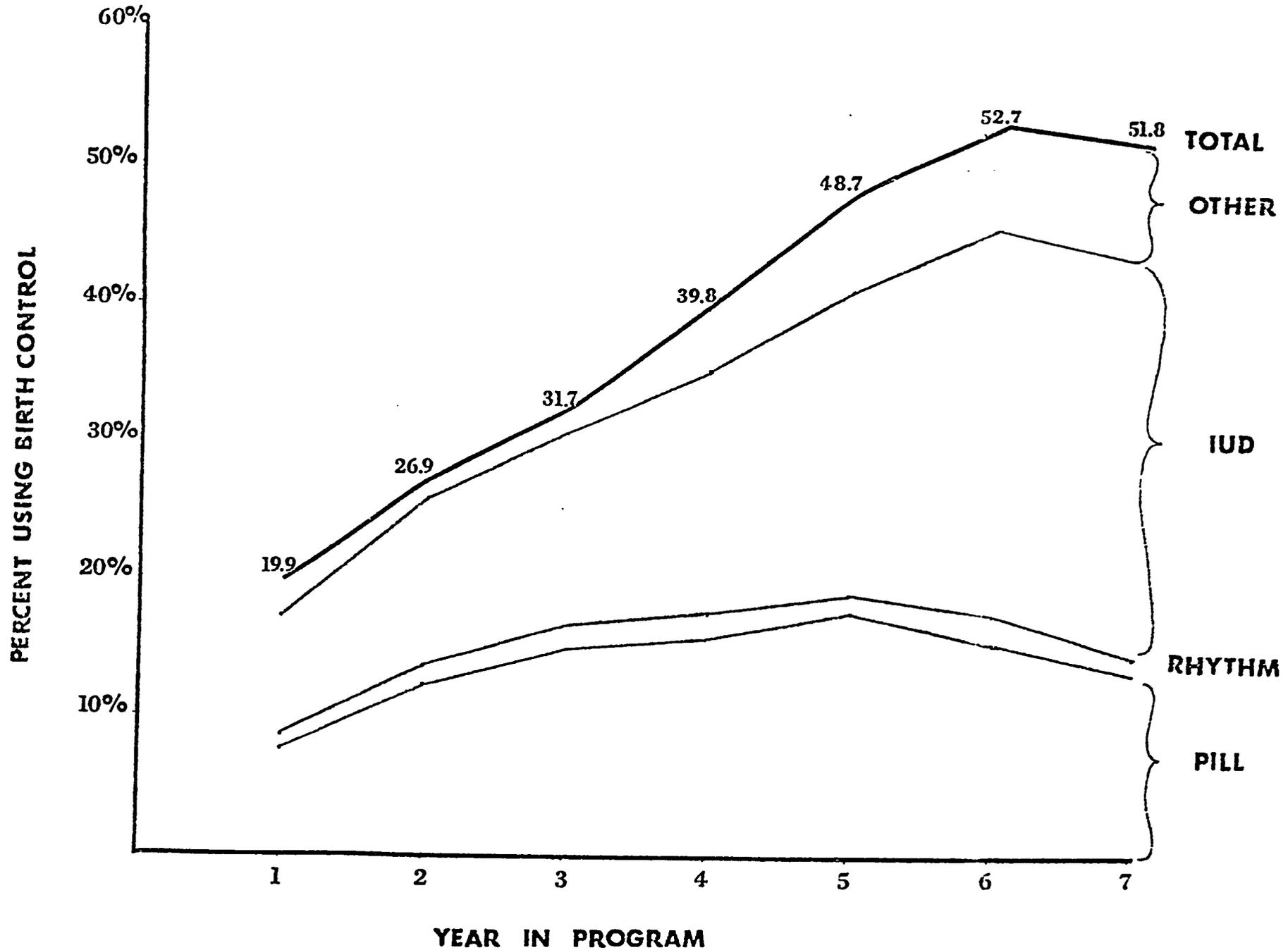
FIGURE 12

**PERCENT MALNOURISHMENT BY SEX
IN CANDELARIA COLOMBIA 1968 TO 1974
(BASED ON 9800 INDIVIDUAL CHILD RECORDS)**



**PERCENTAGE OF WOMEN USING BIRTH CONTROL
BY PROGRAM YEAR, AND METHOD
CANDELARIA, COLOMBIA (1840 FAMILIES)**

FIGURE 13



**PERCENTAGE OF WOMEN USING BIRTH CONTROL
BY YEAR AND METHOD
IN CANDELARIA, COLOMBIA (1840 FAMILIES)**

FIGURE 14

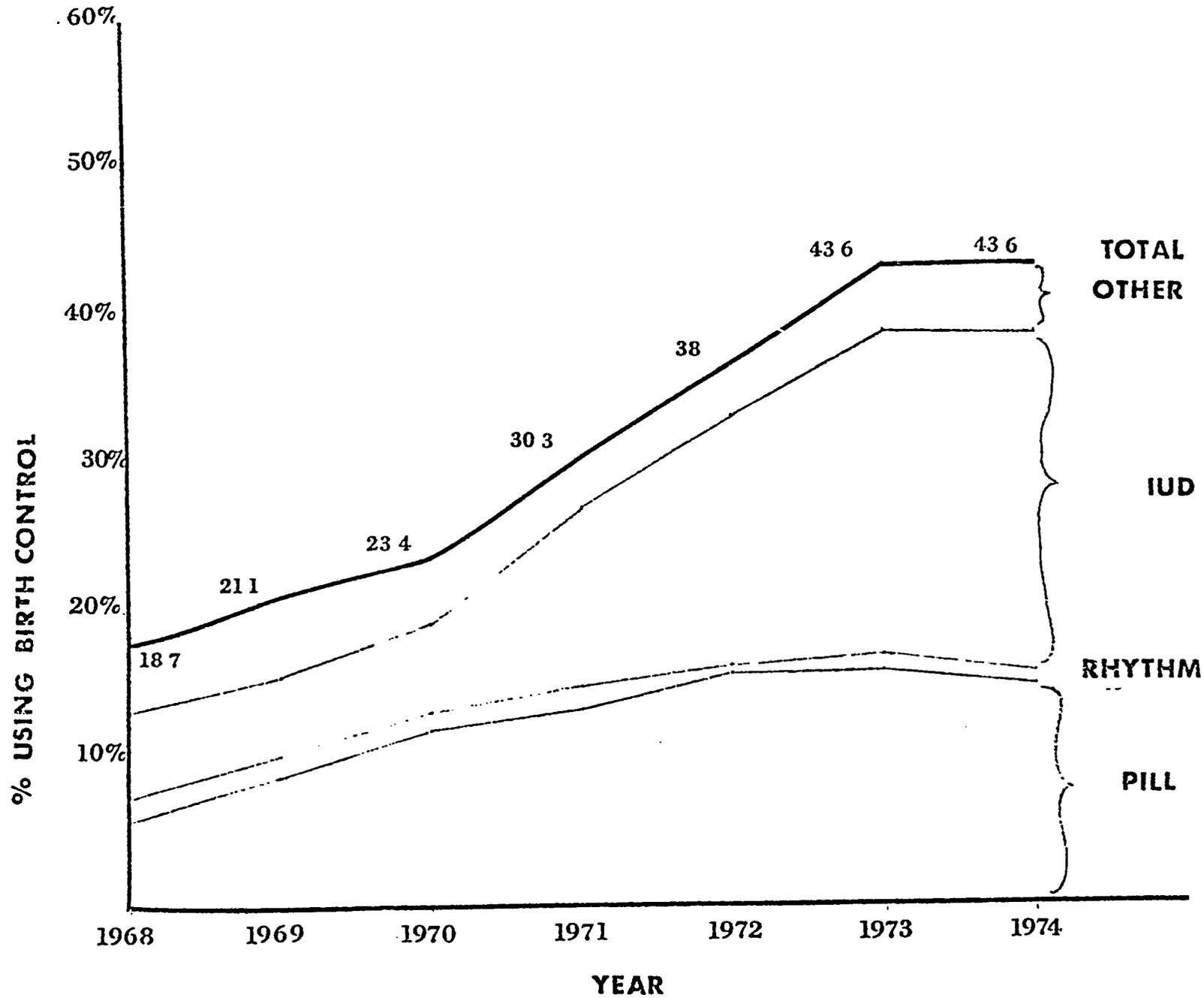


FIGURE 15

**MALNOURISHMENT RATE VS. BIRTH ORDER
(CANDELARIA, COLOMBIA)**

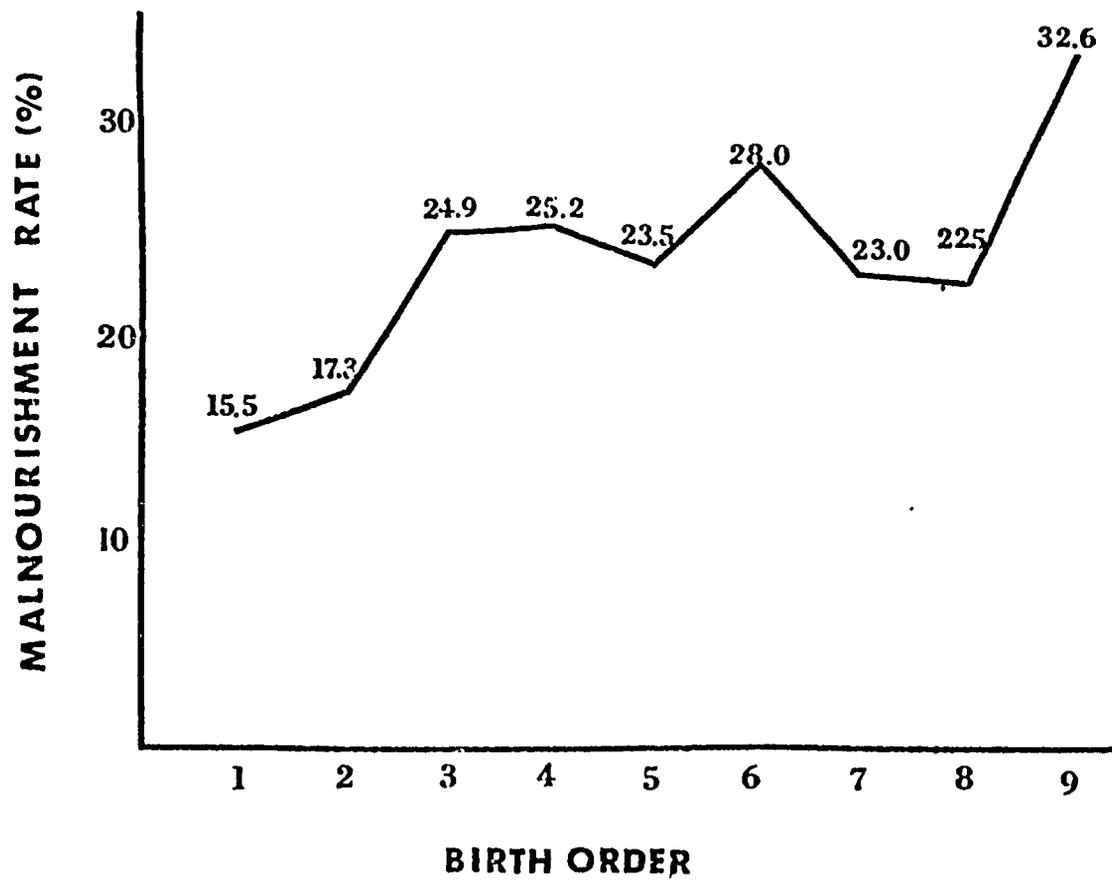


FIGURE 17

CONSUMER PRICE INDEX IN COLOMBIA 1968 TO 1974

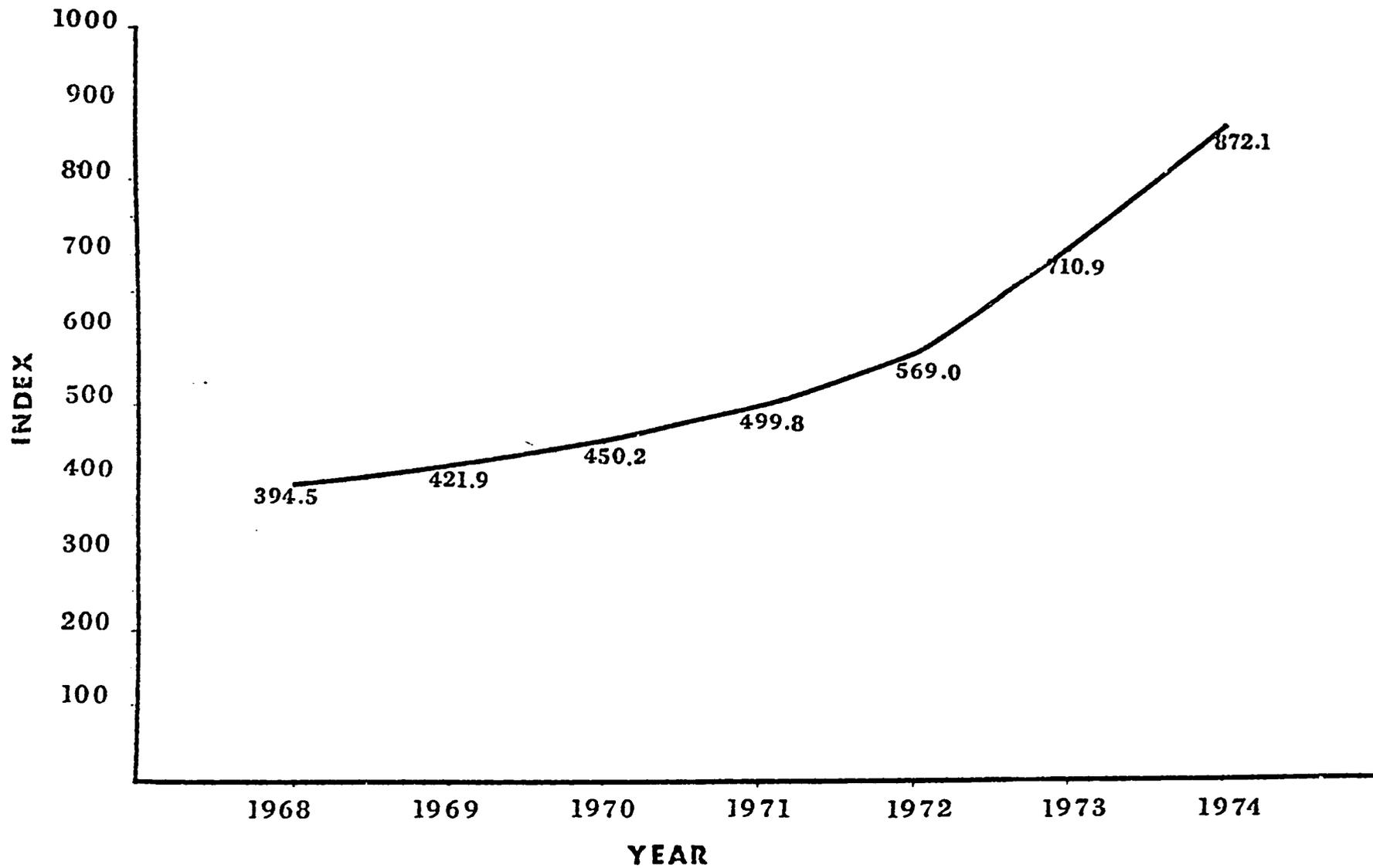


FIGURE 18

PERCENT CHANGE IN CONSUMER PRICE INDEX IN COLOMBIA
1968 TO 1974

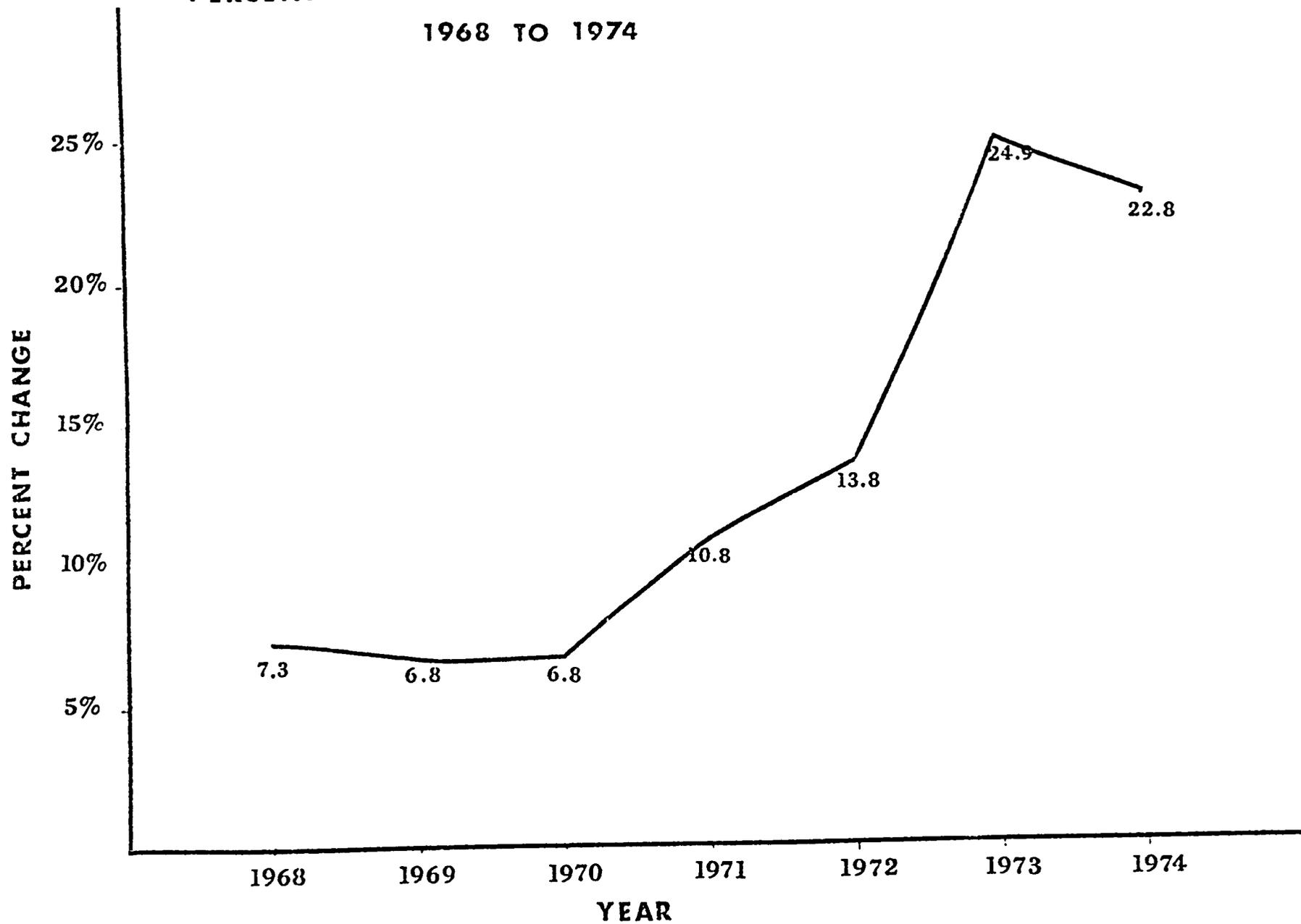
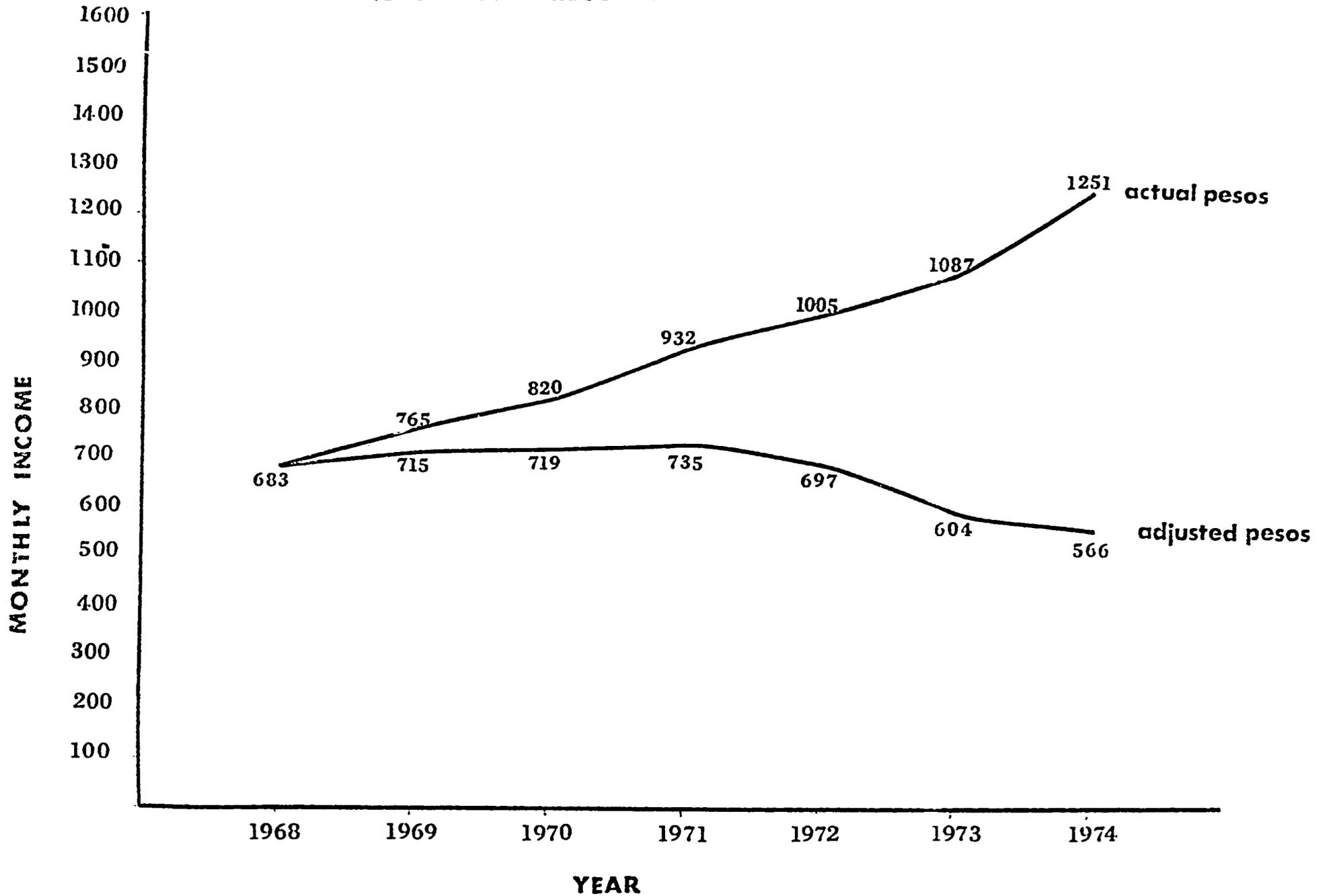


FIGURE 19

MONTHLY INCOME IN PESOS
IN CANDELARIA, COLOMBIA BETWEEN 1968 AND 1974
(BASED ON 1840 FAMILY RECORDS)



**EXPENDITURES ON FOOD IN PESOS
IN CANDELARIA, COLOMBIA 1968 TO 1974
(BASED ON 1840 FAMILY RECORDS)**

FIGURE 20

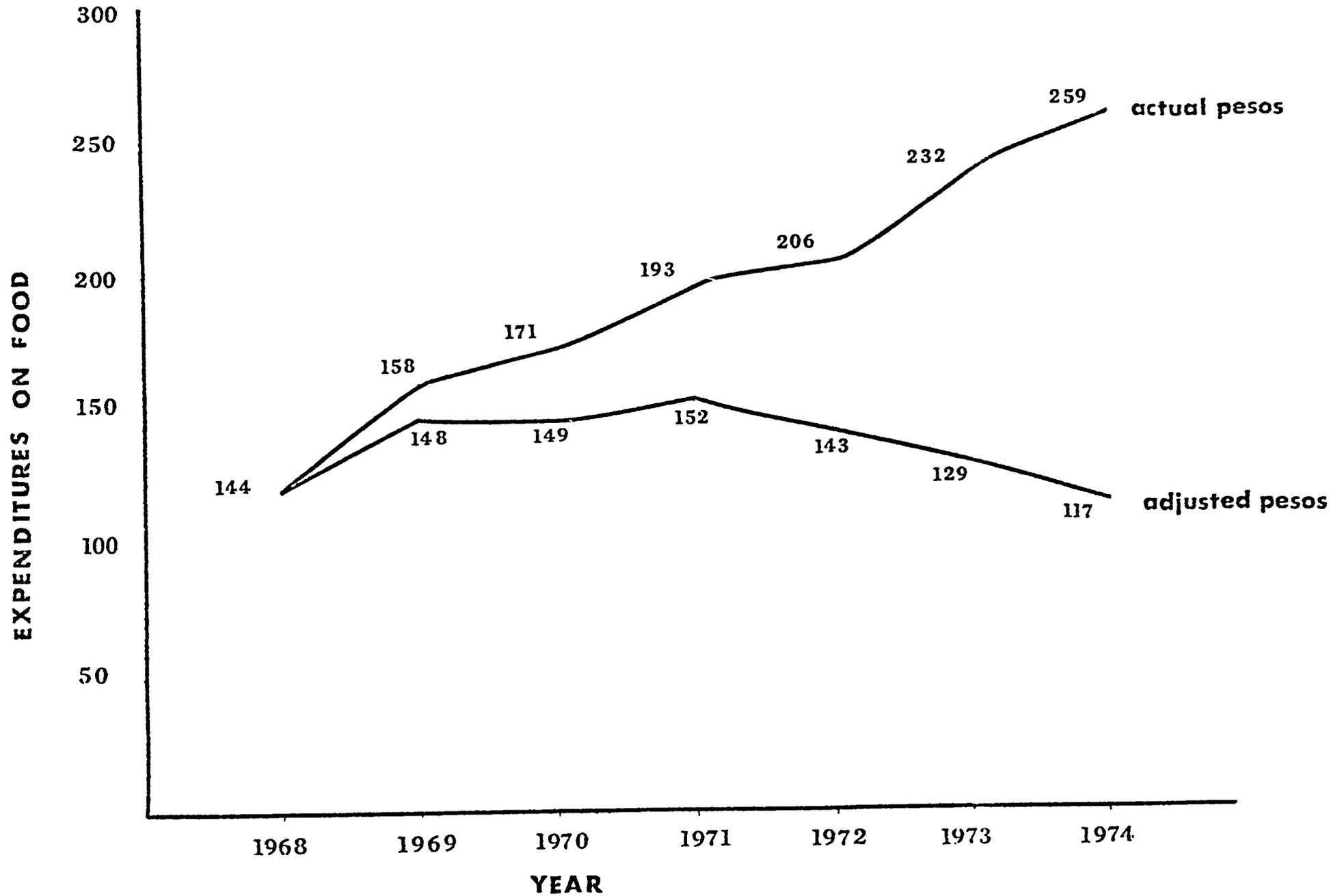


FIGURE 21

**WEEKLY EXPENDITURES ON FOOD PER CHILD VS. NOURISHMENT LEVEL
(CANDELARIA, COLOMBIA)**

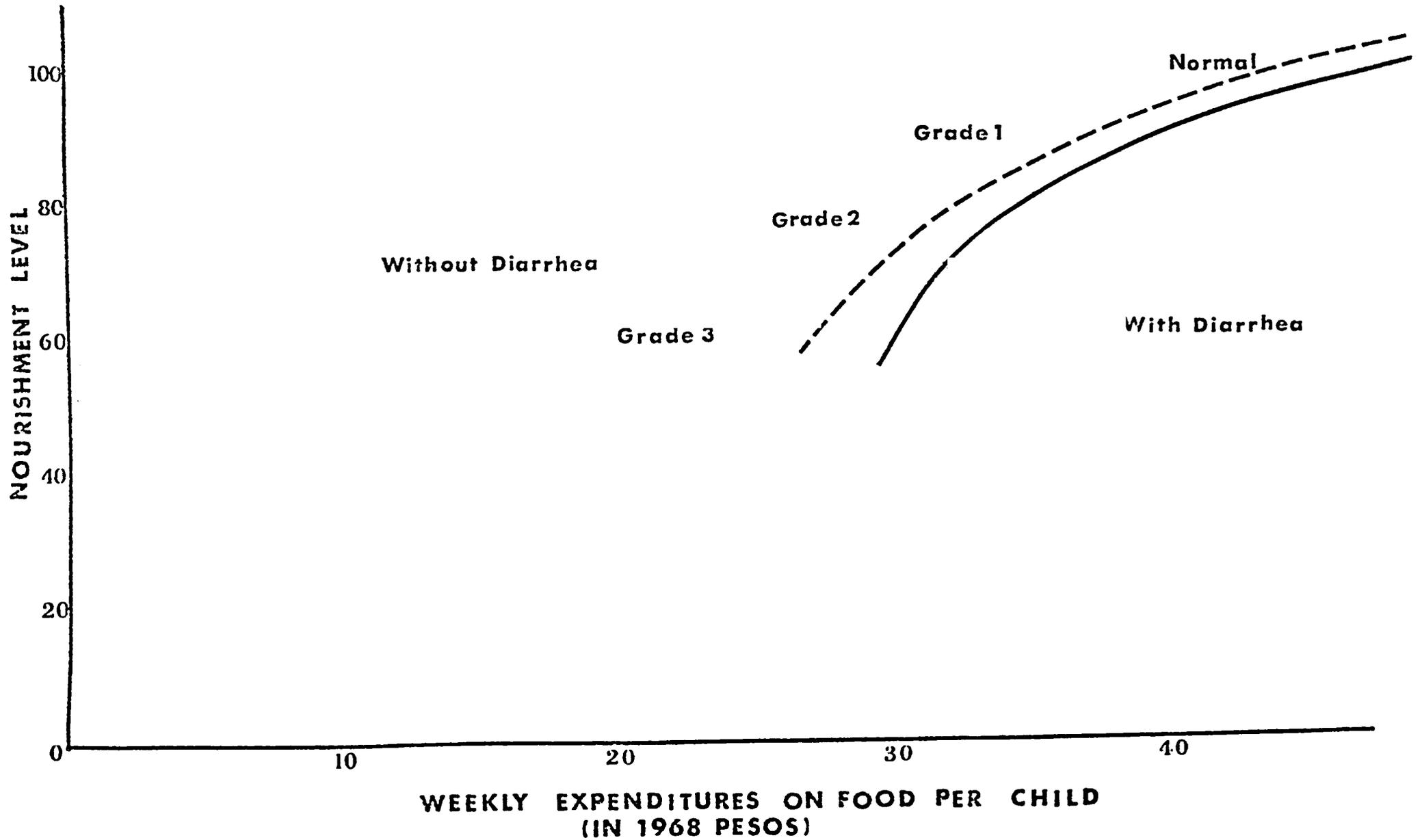


FIGURE 22

PATERNAL LITERACY VS. MALNOURISHMENT RATE BY CALENDAR YEAR
(CANDELARIA, COLOMBIA)

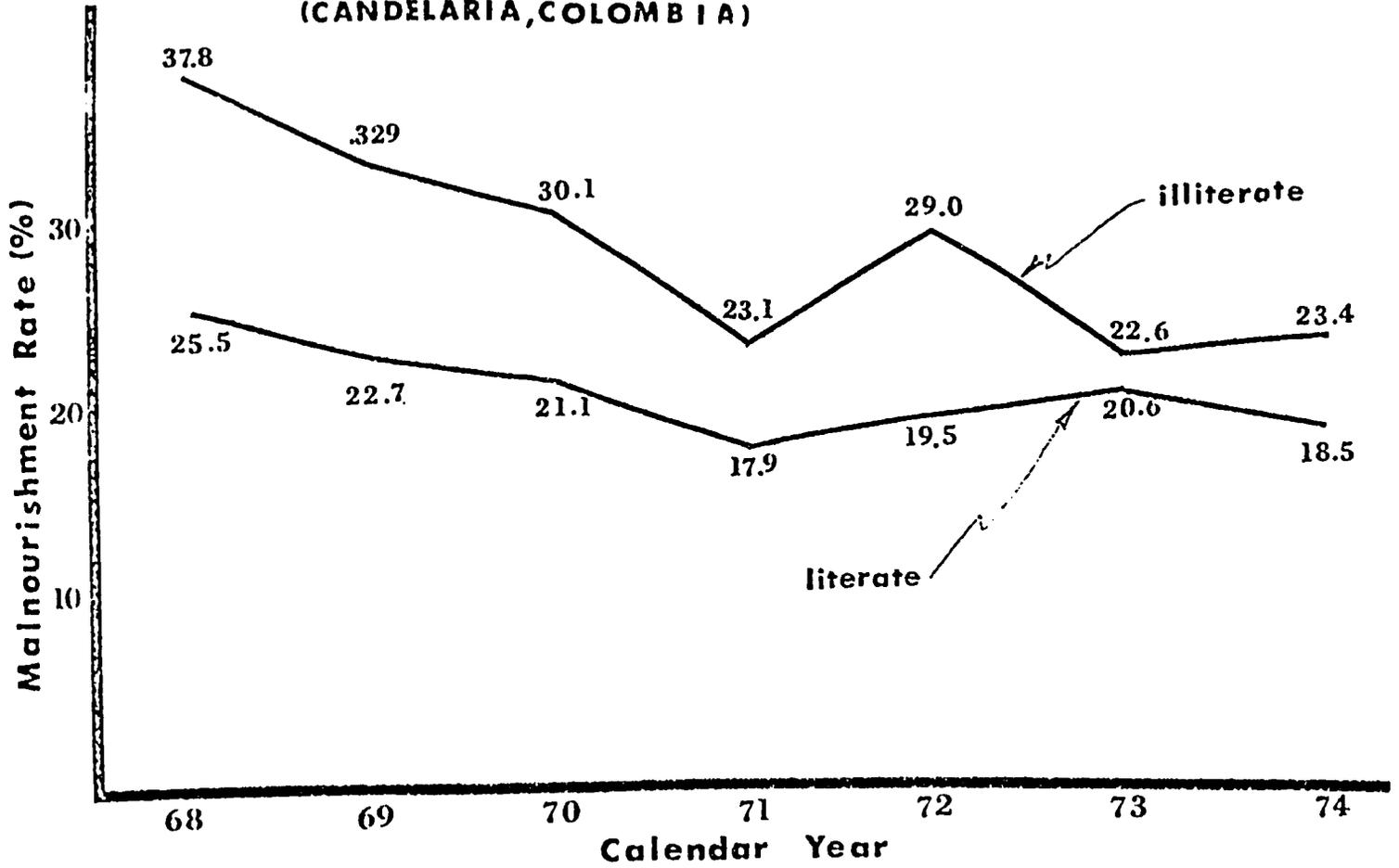
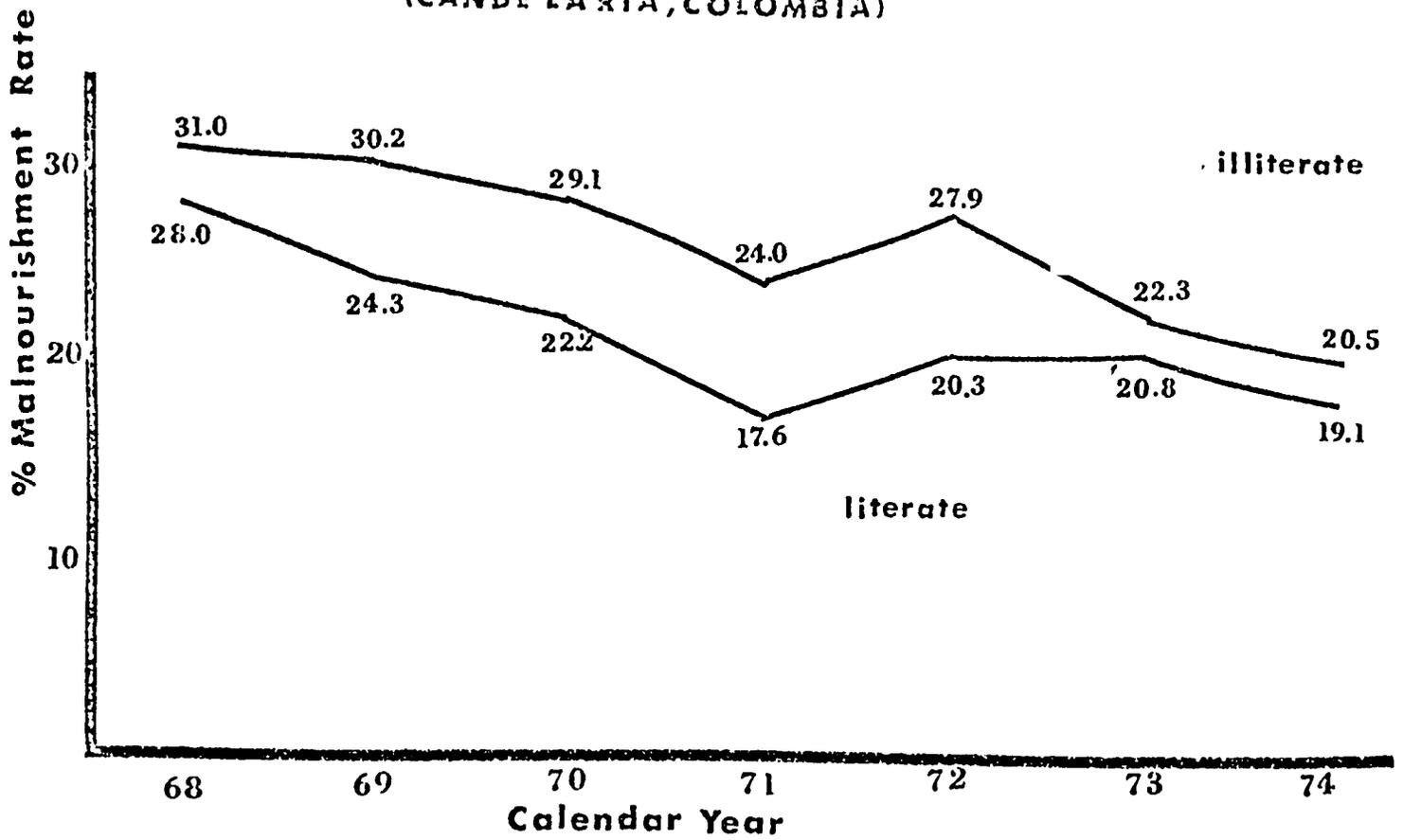
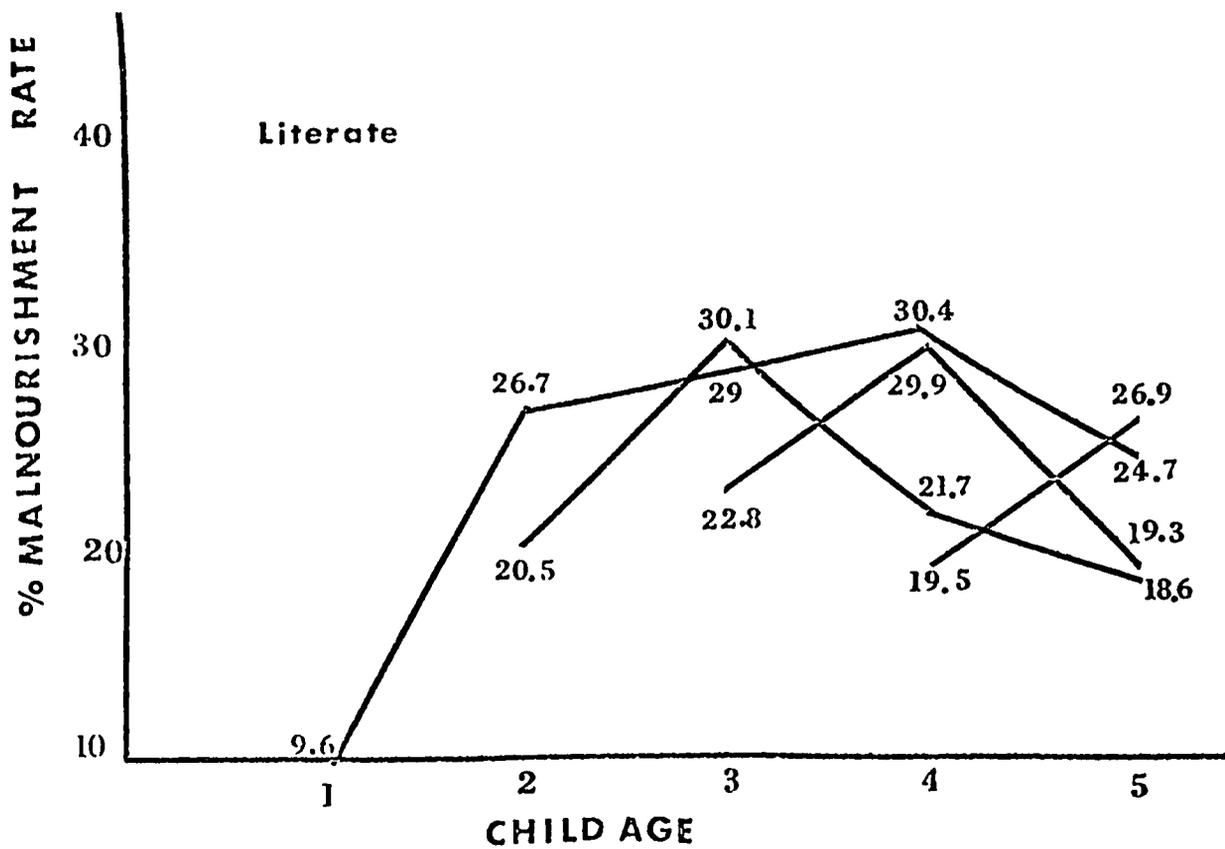
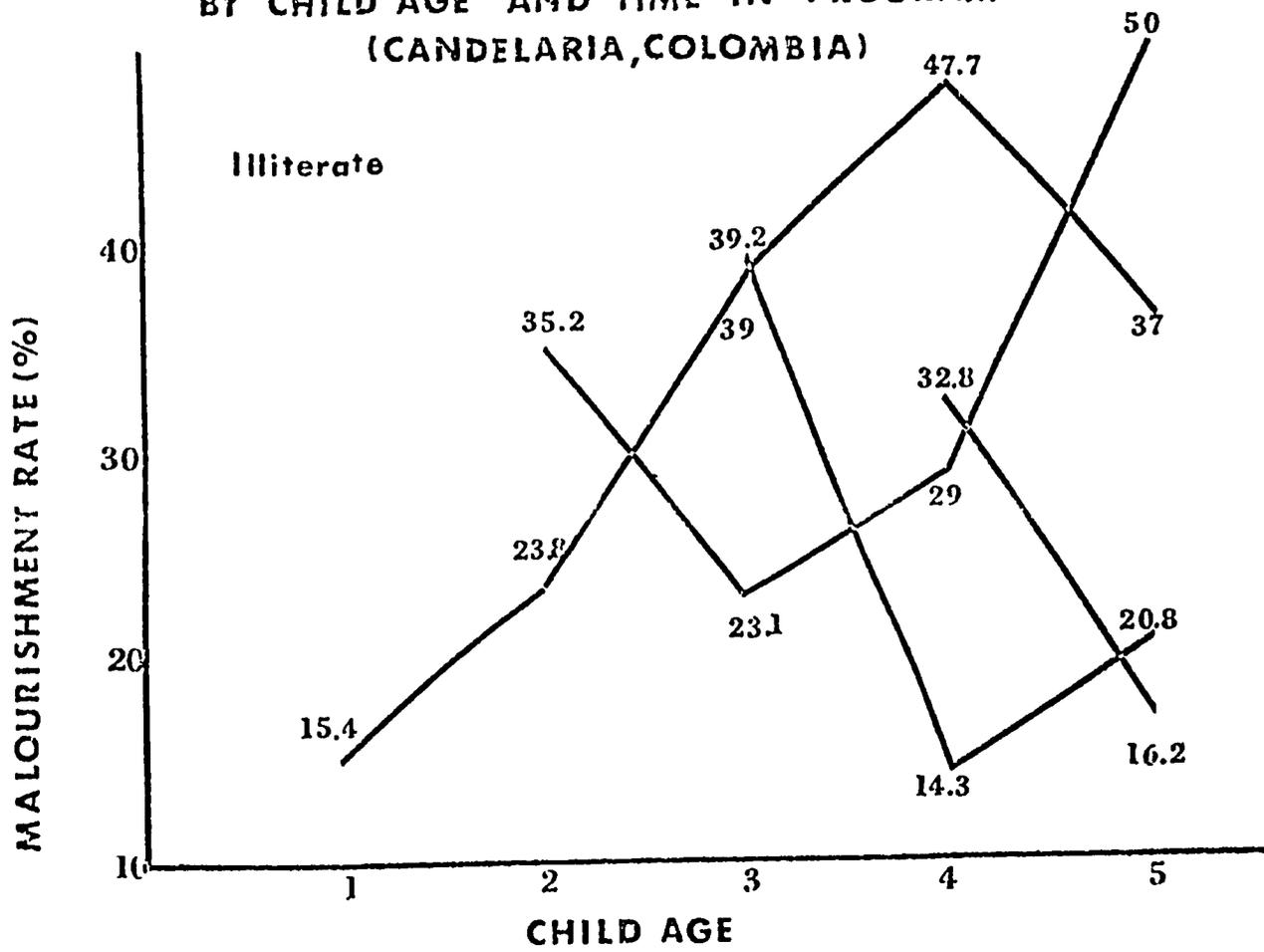


FIGURE 23

**MATERNAL LITERACY VS. MALNOURISHMENT RATE BY CALENDAR YEAR
(CANDELA RIA, COLOMBIA)**



PATERNAL LITERACY VS PERCENT MALNOURISHMENT
BY CHILD AGE AND TIME IN PROGRAM
(CANDELARIA, COLOMBIA)



**MATERNAL LITERACY VS PERCENT MALNOURISHMENT
BY AGE AND TIME IN PROGRAM
(CANDELARIA, COLOMBIA)**

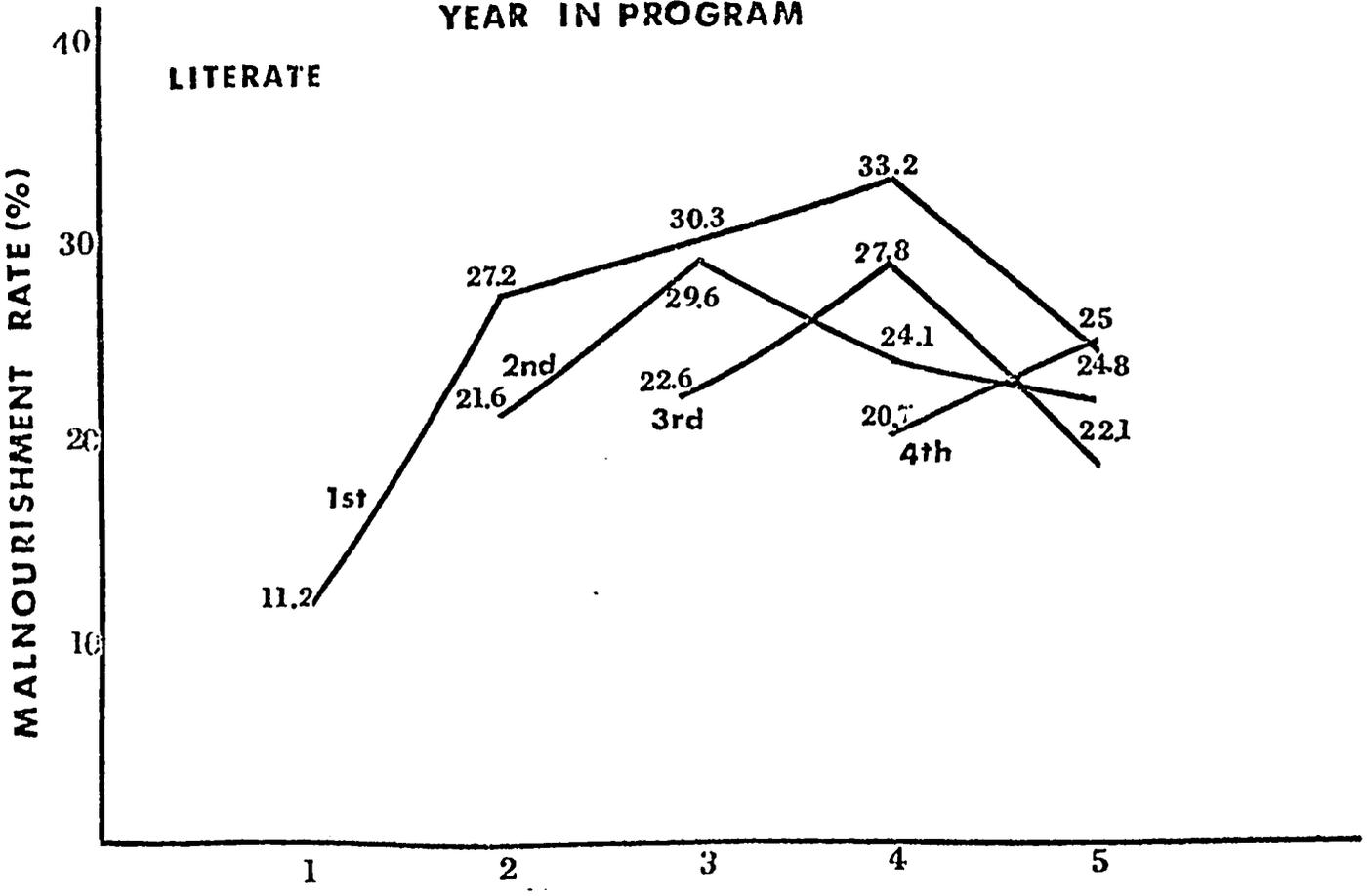
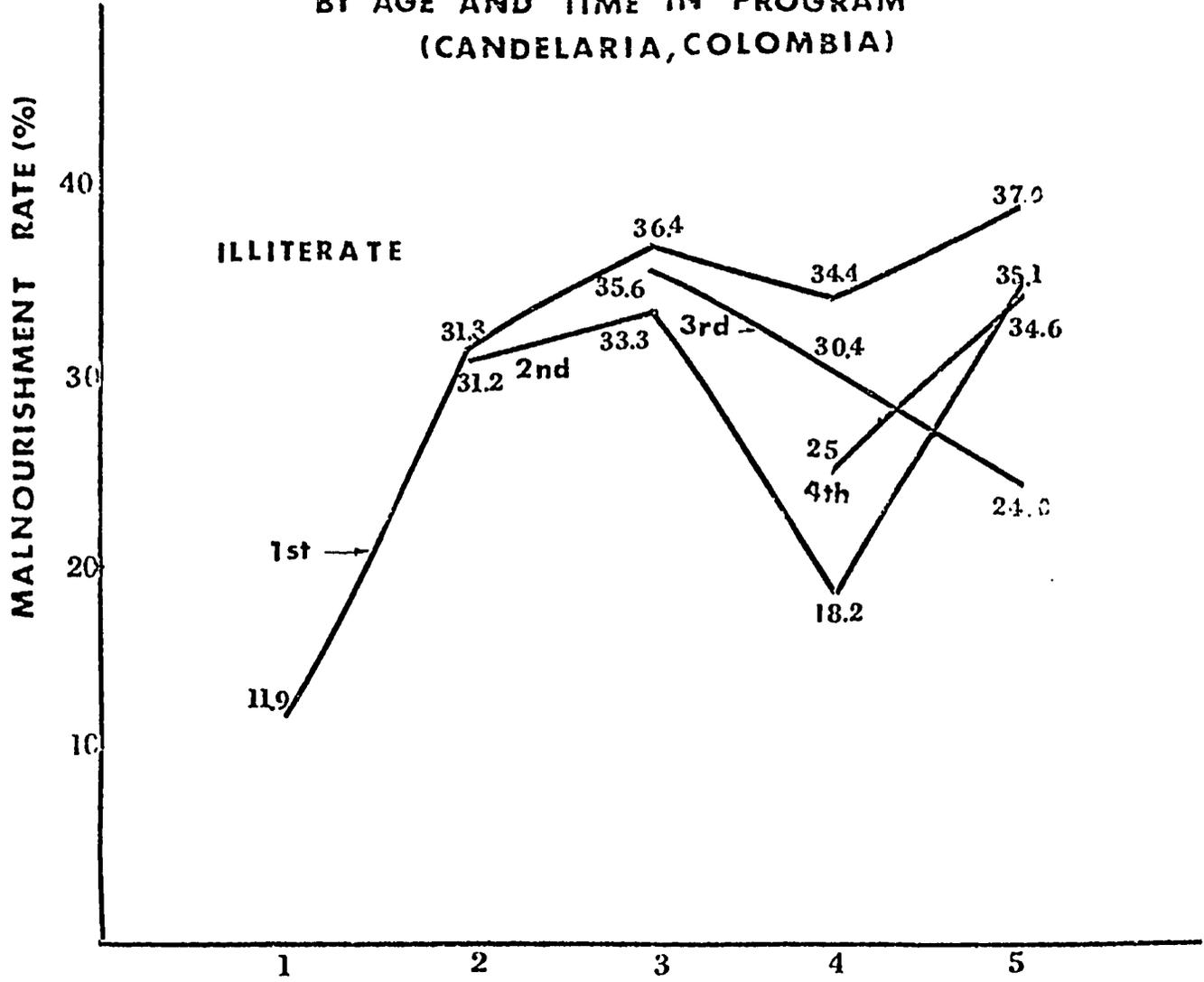
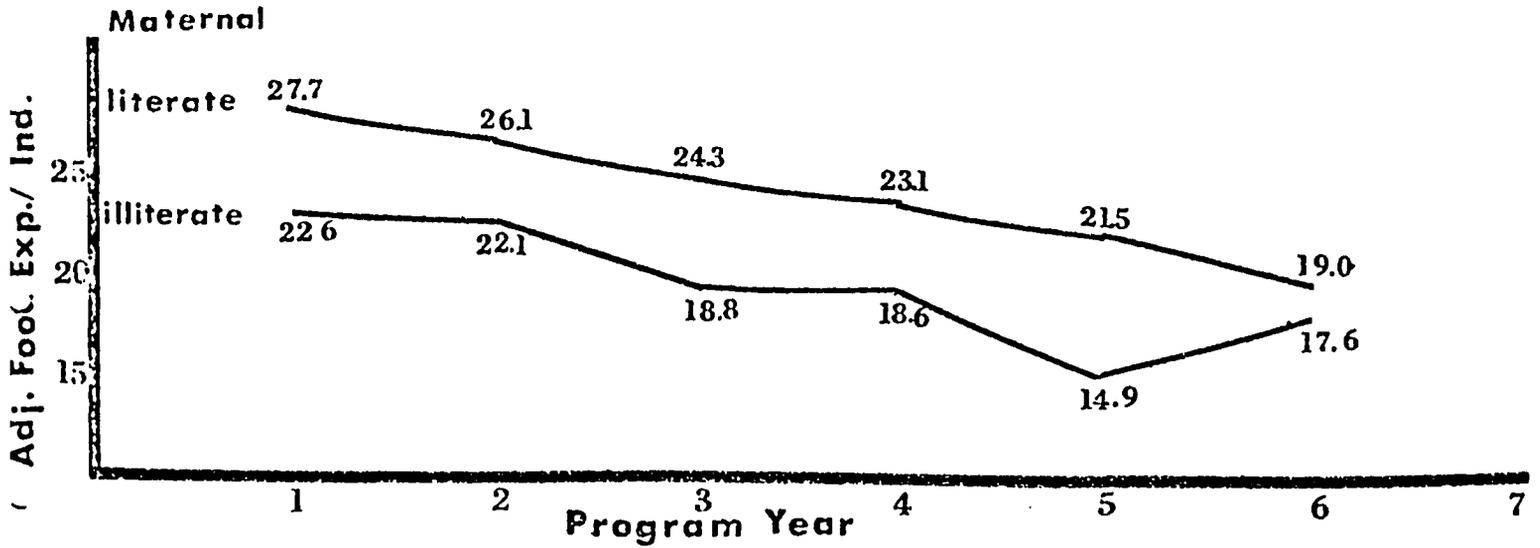
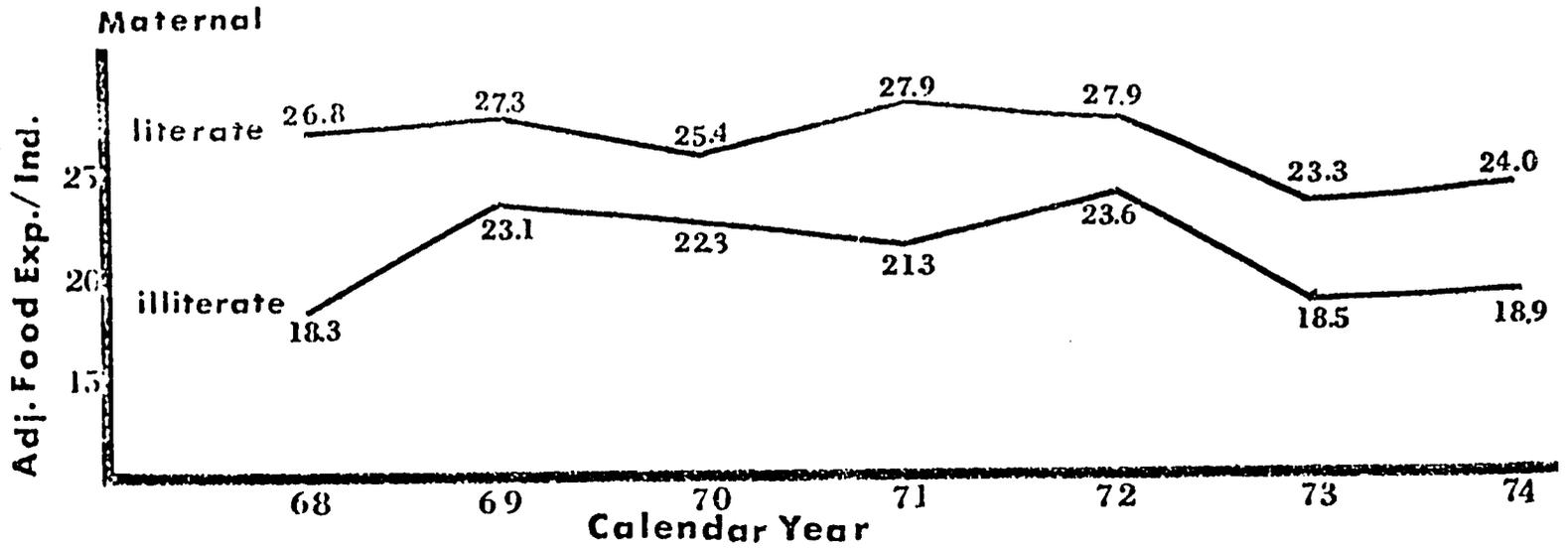


FIGURE 26

ADJUSTED FOOD EXPENDITURE PER INDIVIDUAL VS. LITERACY
(CANDELARIA, COLOMBIA)



TABLES

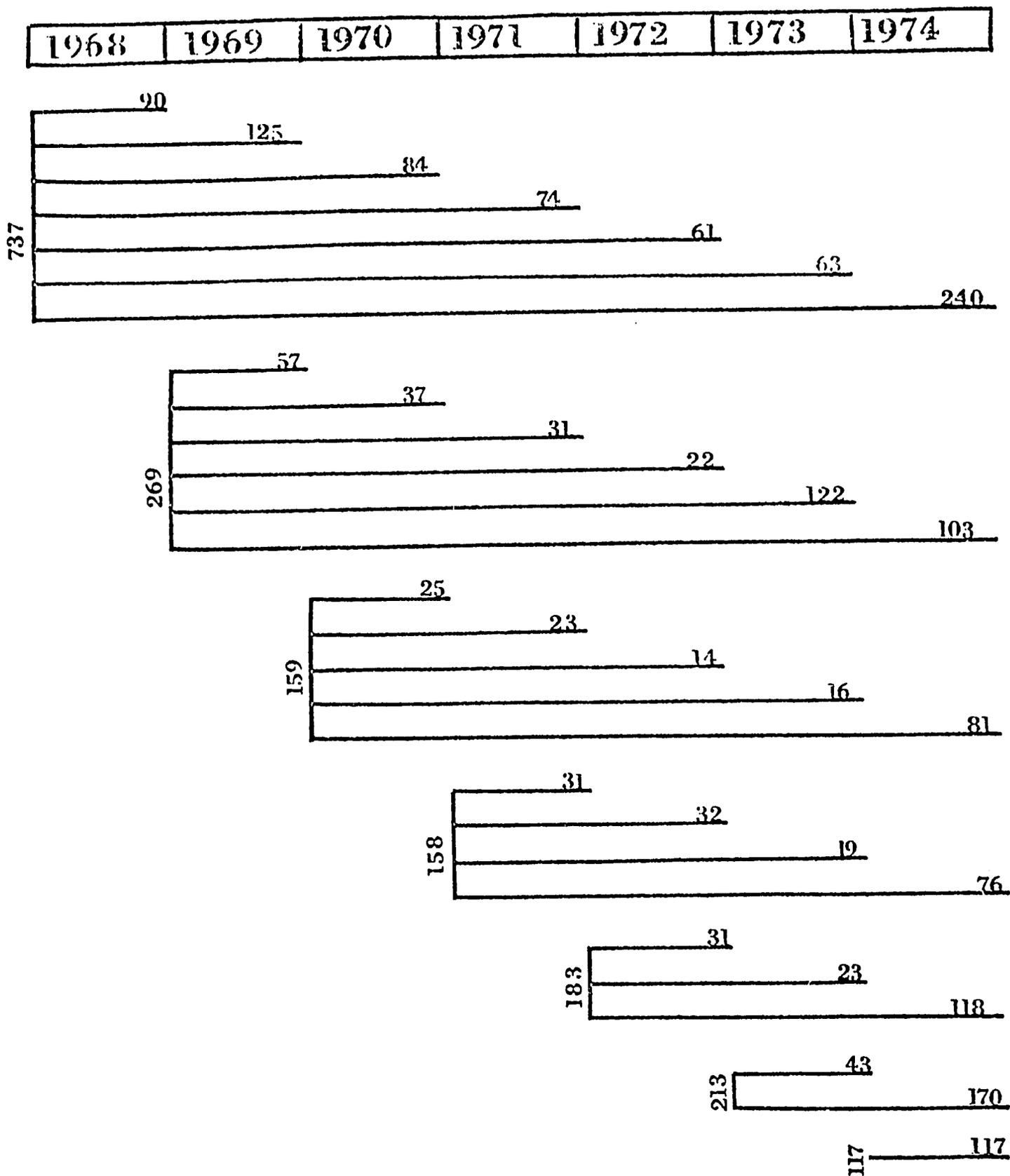
TABLE

CHARACTERISTICS OF THE PROMOTORA PROGRAM IN CANDELARIA 1968 - 1974

Year:	1968	1969	1970	1971	1972	1973	1974
Participating Families	737	916	893	905	929	982	905
Participating Children	694	1,309	1,350	1,438	1,430	1,638	1,192
Children per family (< 6 years)	0.94	1.43	1.53	1.53	1.54	1.62	1.32
Average Age of Attending Children (months)	26.9	27.9	28.2	28.1	28.9	31.6	31.4

NUMBER OF FAMILIES PARTICIPATING
 IN PROMOTORA PROGRAM BY YEAR
 (BASED ON 1840 FAMILY RECORDS)

TABLE 2



TOTAL COUNT BY YEAR

737	916	893	905	929	982	905
-----	-----	-----	-----	-----	-----	-----

TABLE 3

NUTRITIONAL STATUS OF COLOMBIAN CHILDREN 1960 - 1974

CHILDREN	AREA	AGE (Months)	YEAR OF SURVEY	% N	I	II	III
477	Huila (Tolima) Templado (U)	0-15 (a)	1960	47.8	27	28	6
314	Nariño. Alti-Plano (U)	0-12	1960	52.5	23	11	9
1094	Valle (S.R.)	0-6	1963	59.2	26	13	1.3
640	Colombia (S.R.)	0-3	1963	58.4	25.8	13.8	2
970	Rural. Haliconia (Ant.)	0-13	1968	+	+	+	+
964	S.R. San Jacinto (Bolívar)	3-72	1968	33	49.2	15.8	1.1
452	San Andrés	0-6 (a)	1974	62	27.6	9.5	0.7
3378	Colombia (9 localidades)	0-6 (a)	1953--68	33.4	45.6	19.3	1.7
2000	Colombia	0-18	1964	44	40	14	2
400	Bogotá. Medio hospitalario	0-6	1962--63	29	47	20	4
9725	AVERAGES			48%	33%	14%	2.9%

TABLE 4

PERCENT MALNOURISHMENT FOR ALL CHILDREN 0-72 MONTHS
 CANDELARIA COLOMBIA 1968-74
 (Based on Individual Child Data)

NUTRITIONAL STATUS	PERCENT MALNOURISHMENT						
	1968	1969	1970	1971	1972	1973	1974
Grade I	21.1	19.7	17.3	14.6	17.0	17.9	18.7
Grade II	6.3	5.7	5.8	4.3	4.3	3.8	2.2
Grade III	1.2	.8	.4	.6	.5	.4	.5
Total	28.6	26.3	25.4	19.5	21.9	22.1	21.4
Normal	71.4	73.7	76.6	80.5	78.1	77.9	78.6
Count	694	1309	1350	1438	1430	1638	1192
Nursing	18.5	21.6	19.6	20.0	17.6	13.1	13.4
Count	694	1309	1350	1438	1430	1638	1192

TABLE 5
 CONSUMPTION OF NUTRIENTS IN CANDELARIA
 1968 - 1974

	1968	1969	1972	1973	1974
Calorie Deficit	19.17	33.50	39.6	31.7	29.7
Protein Deficit	22.7	29.33	42.6	34.5	33
Calcium Deficit	61.83	58.83	79.6	75.6	74.8
Iron Deficit	25.0	27.4	54.2	30.2	30.2
Animal Protein Consumed (%)	47.0		43.0	36.0	37.0
Vegetable Protein Consumed (%)	53.0		57.0	64.0	63.0

TABLE 6

PERCENTAGE OF REQUIRED CALORIES CONSUMED IN CANDELARIA 1964 - 1968

Calendar Year \ Age Groups	Breast Fed Children	Preschool	School Age	Adolescent Boys	Adolescent Girls	Male Adults	Female Adults
1964	64	77	51	72	92	89	132
1969	53	62	42	60	76	73	109
1972	48	57	38	54	66	66	99
1973	54	65	43	61	78	75	112
1974	56	67	44	63	80	77	115

TABLE 7

PERCENTAGE OF REQUIRED PROTEINS CONSUMED IN CANDELARIA 1964 - 1974

Calendar Year \ Age Groups	Breast Fed Children	Preschool	School Age	Adolescent Boys	Adolescent Girls	Male Adults	Female Adults
1964	53	89	65	90	90	81	81
1969	51	79	58	84	84	76	76
1972	41	64	47	68	68	62	62
1973	47	73	53	78	78	71	71
1974	48	74	54	80	80	72	72

TABLE 8

BIRTH CONTROL USAGE BY PROGRAM AND CALENDAR YEAR
(Candelaria Colombia 1968-74)

PRESENT BIRTH CONTROL BY CALENDAR YEAR

	1968	1969	1970	1971	1972	1973	1974
Pill	5.9	9.2	11.8	13.3	15.7	15.8	14.9
Rhythm	1.7	1.5	1.3	1.5	.6	1.0	.7
IUD	5.1	5.5	6.3	12.0	16.0	21.7	22.5
Other	6.0	4.9	4.1	3.5	5.7	4.9	5.5
None	81.3	78.9	76.6	69.7	62.0	56.6	56.4
Count	712.0	889.0	862.0	880.0	892.0	941.0	854.0

PRESENT BIRTH CONTROL BY PROGRAM YEAR

	1	2	3	4	5	6	7
Pill	8.4	12.1	14.4	15.7	18.2	15.4	13.2
Rhythm	.8	1.0	1.3	1.9	.7	1.8	.9
IUD	6.8	9.5	11.4	17.2	22.3	28.2	29.8
Other	3.8	4.4	4.6	5.0	7.4	7.3	7.9
None	80.1	73.1	68.3	60.2	51.3	47.3	48.2
Count	1800.0	1399.0	982.0	722.0	538.0	383.0	228.0

APPENDIX A

CANDELARIA INDIVIDUAL CHILD DATA SET: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description
ID	1	1-4		Family identification code number. Unique to each family and identical to records in family data set.
FAMORD	2	5-6		Order of person in family (adults first, children next with oldest first and non-nuclear members last).
AGE	3	7-8		Age of child in months at time of visit.
BIRTHORD	5	10		Order of birth in family (1 = first born).
INTERVAL	6	11-12		Interval between this child and last born in months. 0 = no following children.
WEIGHT	7	13-17		Actual weight in gms. of child at time of visit.
BOSWT	8	18-22		Weight of Boston child at same age in months ÷ by 10. 50th percentile value of Boston standard. Cal.18 should always be zero.
COLWT	9	23-27		Weight of Colombian child at same age in months ÷ 10. 50th percentile value of Bogota standard.
NU STAT	10	28		Nutritional status of child based upon Candelaria standard. 1 = grade I; 2 = grade II; 3 = grade III; 4 = normal.
BOSTAND	11	29-30		Percentile of Boston Standard (based upon a chart look-up for the child's height and age).
CANSTAND	12	31-32		Percentile of Candelaria Standard (based upon a chart look-up for the child's height and age).

CANDELARIA INDIVIDUAL CHILD DATA SET: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description
		33-35		Alpha punch of CAI identifying that this is an individual child record.
HEIGHT	13	36-38		Height of child at time of visit in centimeters (blank = no data).
BOSHGHT	14	39-41		Ideal height for child at given age based upon the 50th percentile of the Boston Standard. This table look-up was: (if value is greater than 99.9 cm. decimal point is moved one place to the left).
COLHGHT	15	42-44		Ideal height for child at given age based upon the 50th percentile of the Colombian Standard. (if value is greater than 99.9 cm. decimal point is moved one place to the left).
NURSING	16(c)	45	1	Breast feeding at time of visit.
			2	No breast feeding at time of visit.
DIARRREA	17(c)	46	1	Child has had diarrhea during month preceeding visit. definition of diarrhea is more than three loose stools per day. Since the mother is the observer this may also indicate a significant deviation from the norm in her option, the bimodal frequency distribution indicated in the data may be the result of differences in definition.
			2	No diarrhea during last month.
DIA #	18	47-48		Number of episodes of diarrhea during month preceeding visit (an episode is defined as a continued period of diarrhea followed by a period of normalcy).

CANDELARIA INDIVIDUAL CHILD DATA SET: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description
DIADAYS	19	49-50		Number of days sick with diarrhea during the proceeding month.
DPT	20(c)	51	1	DPT given during preceeding month.
			2	No
POLIO	21(c)	52	1	Oral polio vaccine given during preceeding visit.
			2	No
OUTPAT	22(c)	53	1	Child visited outpatient clinic during preceeding month. Children only go to outpatient when sick and usually upon recommendations of Promotora.
			2	No visit
HOSP	23(c)	54	1	Child hospitalized during preceeding month.
			2	No hospitalization
SICK	24(c)	55	1	Child sick at any time since last visit of Promotora.
			2	No sickness
DAYSICK	25	56-57		Number of days sick since last visit - with or without diarrhea.
MONTHS	26	58-59		The number of months the child has been in the Promotora program and consequently receiving its benefits;

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description	
JUNE 30	27	60	1	Visit of Promotora before June 30th of year; e.g., in first semester.	
			2	Visit of Promotora after June 30th of year; e.g., in second semester.	
YEAR	28	61-62		Calendar year of Promotora visit.	
WEIGHT*	29	63-67		Weight of child in grams on the first visit child was in the program.	
BOSWT*	30	68-72		Ideal weight for the age of the child at the time of the first visit in the program. (Based upon the 50th percentile of the Boston Standard - in grams ÷ 10.	
COLWT*	31	73-77		Ideal weight for the age of the child at the time of the first visit in the program based upon the 50th percentile value of the Colombian Standard. (grams ÷ 10)	
CHANGE*	32(c)	78	1	Improved	Change in grade of nutritional status since the child first entered into the program. Standard is the Candelaria classification of nutrition.
			2	Worsened	
			3	No change	
CHANGE	33	79	1	Improvement	Change in grade of nutritional status since the last Promotora visit. Standard is the Candelaria classification of nutrition.
			2	Worsening	
			3	No change	

CANDELARIA FAMILY DATA SET: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description	
ID	1	1-4		Family identification code number. Unique to each family and identical to individual child records in individual data set.	
TIME	2	5		The number of years the family has been in the program since the beginning of 1968.	
IN.PROG	3(c)	6	1	Actually in the program as of October 1974	
			2	Left the program due to outmigration from Candelaria prior to October, 1974	
			3	Left the program due to all children in family becoming more than 72 months before October, 1974.	
			4	Left program because of dislike prior to October, 1974	
			5	Left program for other reasons or don't know (probably migration).	
HOUSING	4(c)	7	1	Owned own home when entered program.	
			2	Rented when entered program.	
			3	Living with some other family and not paying rent when entered program.	
FAMS/HS	5	8		Number of families living in the same structure.	
RENT*	6	9-12		Rent per month in pesos when entered the program (blank if owned or if living with someone else).	
TYPE HEAD	7(c)	13	1	Man-husband	type of head of household upon entering the program
			2	Woman-wife or unmarried	

CANDELARIA FAMILY DATA SET: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description	
TYPE HEAD	7(c)	13	3	Other	
AGE.HEAD	8	14-15		Age of head of household upon entering the program.	
FAM.SIZE	9	16-17		Number of persons in family upon entering program.	
CH*0-6	10	18		Number of children in family who are less than 72 months old upon entering the program.	
MALES	11	19-20		Number of males in family upon entering the program.	
FEMALES	12	21-22		Number of females in family upon entering the program.	
AGE.DAD	13	23-24		Age of father upon entering the program. (Blank if there is no father).	
AGE.MOM	14	25-26		Age of mother upon entering the program. (Blank if there is no mother).	
SCHOOL.D	15	27-28		Number of years of schooling for father.	
SCHOOL.M	16	29-30		Number of years of schooling for mother.	
ED.LVL.D	17(c)	31	1	Illiterate	Level of educational attainment of the father at the time of entry into program.
			2	Read and write only	
			3	Primary(Grades 1-5)	
			4	Secondary (Grades 6-11)	
			5	Technical(Comparable to Secondary)	

CANDELARIA FAMILY DATA SET: 1969-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description	
ED.LVL.D	17(c)	31	6	University attendance	
			7	Other or don't know	
ED.LVL.M	18(c)	32	1	Illiterate	Level of educational attainment of the mother at the time of entry into program.
			2	Read and write only	
			3	Primary (Grades 1-5)	
			4	Secondary (Grades 6-11)	
			5	Technical (Comparable to Secondary)	
			6	University attendance	
			7	Other or don't know	
MRTL.D	19(c)	33	1	Married	Marital status of the father upon entry into the program/
			2	Living in free union	
			3	Married but separated	
			4	Free union but separated	
			5	Spouse deceased	
			6	Single	
MRTL.M	20(c)	34	1	Married	(see next page)
			2	Living in free union	
			3	Married but separated	

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description	
MRTL.M	20(c)	34	4	Free union but separated	Marital status of the mother upon entry into the program.
			5	Spouse deceased	
			6	Single	
OCCUP.HH	21(c)	35	1	Worker - manual labor	Occupational classification of the head of household.
			2	Employee - clerical, office, etc.	
			3	Small merchant	
			4	Other	
INC*	22	36-39		Family income per month in pesos at time of entry into program.	
LST.BORN	23	40-41		Number of months since the last child was born regardless of whether the child lived.	
BIRTH.AID	24(c)	42	1	Physician or intern	Type of person who attended last birth.
			2	Midwife	
			3	Neighbor	
			4	Other	
BIRTH.CK	25(c)	43	1	Some pre-natal attention by a physician.	
			2	None	
PREG?*	26(c)	44	1	Pregnant at time of entry into program - yes.	

CANDELARIA FAMILY DATA SIT: 1968-1974

Variable Name	Variable Number (C=categorical)	Card Column	Numeric Value	Description
PREG?*	26(c)	44	2	No
		45		Bad data
FAM.PL	27(c)	46	1	Enrolled in family planning program
			2	Was enrolled but not now
			3	Not enrolled?
KNOW?FP	28(c)	47	1	Mother has heard of family planning program
			2	Not heard
UNIONS	29	48		Number of different unions mother has had which led to pregnancy. (unions can be marriages, free or casual)
PREGS*	30	49-50		Number of pregnancies mother has had by time of entry into program.
BIRTHS*	31	51-52		Number of live births by time of entry into program.
ABORTS*	32	53		Number of abortions by time of entry into program.
STILL*	33	54		Number of stillbirths by time of entry into program.
ALIVE*	34	55-56		Number of children living at the time of entry into program.
RENT 74	35	57-59		Rent per month in pesos in October, 1974

CANDELARIA FAMILY DATA SET: 1968-1974

The following variables are the time series data arranged by the number of years in the program. Since the variables differ only by the time during which they were measured, they are described in general and the variable number that corresponds to program year is then listed. Note that the label for each variable for a particular program year differs from those of other years only in its last character. In the list of variables below a # appears where this character occurs in the label. Thus the label for a particular program year would have the program year replace the #.

Variable Name	Variable Number for Program Year (Card columns are in brackets followed by card number.)							Description
	1	2	3	4	5	6	7	
BIRTH#	36 (60,1)	51 (7,2)	66 (27,2)	81 (47,2)	96 (67,2)	111 (16,3)	126 (36,3)	Number of children born live during program year.
ABORT#	37 (61,1)	52 (8,2)	67 (28,2)	82 (48,2)	97 (68,2)	112 (17,3)	127 (37,3)	Number of abortions during program year.
STILL#	38 (62,1)	53 (9,2)	68 (29,2)	83 (49,2)	98 (69,2)	113 (18,3)	128 (38,3)	Number of stillbirths during program year.
DEATHS#	39 (63,1)	54 (10,2)	69 (30,2)	84 (50,2)	99 (70,2)	114 (19,3)	129 (39,3)	Number of child deaths during program year (only children in program).
BC#	40 (64,1)	55 (11,2)	70 (31,2)	85 (51,2)	100 (71,2)	115 (20,3)	130 (40,3)	Method of birth control: 1 = Pill 2 = Rhythm 3 = IUD 4 = Other 5 = None

CANDELARIA FAMILY DATA SET: 1968-1974

Variable Name	Variable Number for Program Year (Card columns are in brackets followed by card number.)							Description
	1	2	3	4	5	6	7	
INC#	41 (65-68,1)	56 (12-15,2)	71 (32-35,2)	85 (52-55,2)	101 (72-75,2)	116 (21-24,3)	131 (41-44,3)	Monthly family income in pesos. Recorded at the end of each year, but representing a rough weighted average.
FOOD#	42 (69-71,1)	57 (16-18,2)	72 (36-38,2)	87 (56-58,2)	102 (5-7,3)	117 (25-27,3)	132 (45-47,3)	Weekly family expenditures on food in pesos. Rough average for year.
PROGYR#	43 (72,1)	58 (19,2)	73 (39,2)	88 (59,2)	103 (8,3)	118 (28,3)	133 (48,3)	Calendar year the data pertains to. Coded as follows: 1=68, 2=69, 3=70, 4=71, 5=72, 6=73, 7=74
CH.TOT#	44 (73,1)	59 (20,2)	74 (40,2)	89 (60,2)	104 (9,3)	119 (29,3)	134 (49,3)	Number of children in family during year (includes children over 72 months)
CH.#.0-6	45 (74,1)	60 (21,1)	75 (41,2)	90 (61,2)	105 (10,3)	120 (30,3)	135 (50,3)	Number of children less than 72 months alive at end of program year.
GI.#	46 (75,1)	61 (22,1)	76 (42,2)	91 (62,2)	106 (11,3)	121 (31,3)	136 (51,3)	Number of children in family less than 72 months, with grade I malnourishment at end of program year.
GII.#	47 (76,1)	62 (23,1)	77 (43,2)	92 (63,2)	107 (12,3)	122 (32,3)	137 (52,3)	Number of children in family less than 72 months, with grade II malnourishment at end of program year.

CANDELARIA FAMILY DATA SET: 1968-1974

Variable Name	Variable Number for Program Year (Card columns are in brackets followed by card number.)							Description
	1	2	3	4	5	6	7	
GIII.#	48 (77,1)	63 (24,1)	78 (44,2)	93 (64,2)	108 (13,3)	123 (33,3)	138 (53,3)	Number of children in family less than 72 months with grade III malnourishment at end of program year.
CH#-	49 (78,1)	64 (25,1)	79 (45,2)	94 (65,2)	109 (14,3)	124 (34,3)	139 (54,3)	Number of children in family less than 72 months who dropped at least one grade during the year.
CH#+	50 (79,1)	65 (26,1)	80 (46,2)	95 (66,2)	110 (15,3)	125 (35,3)	140 (55,3)	Number of children in family less than 72 months who improved at least one grade of malnourishment during year of program.

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