

# Protein and calorie malnutrition among preschool Navajo Indian children, a follow-up<sup>1</sup>

Jean Van Duzen,<sup>2</sup> M.D., James P. Carter,<sup>3</sup> M.D., Dr. P.H.,  
and Roger Vander Zwagg,<sup>4</sup> Ph.D.

**ABSTRACT** A follow-up study was conducted on the infant and child-feeding programs to determine the prevalence of protein and calorie malnutrition among preschool Navajo Indian children. These programs were introduced on the reservation in 1968. The numbers of patients admitted to the Public Health Service Indian Hospital in Tuba City, Arizona, with deficits in weight for their chronological ages, marasmus, and kwashiorkor were compared during two 5-year periods, 1963 to 1967 and 1969 to 1973. The results show an 18% reduction in the total number of patients under 5 years of age admitted to the hospital and a 39% reduction in the number of patients admitted with deficits in weight for their chronological ages. Marasmus has practically disappeared, with only two cases described since the end of fiscal 1969. The number of cases of kwashiorkor has also decreased by 50%, mainly in the last 4 years. The height and weight data on 1,462 Head Start children from all over the reservation were measured in September 1973, and these measurements were compared with data obtained in September 1967. While they still show a significant deviation from the Boston growth curves, there is a definite improvement from 1967 to 1973. This improvement was especially noticeable in height. Thirty percent of the girls and 30% of the boys fell below the 3rd percentile for Boston in 1967. In 1973, these figures were 11% and 16%, respectively. In the case of the girls in 1973, the numbers below the 3rd percentile are significantly smaller for younger girls than for the older girls, suggesting that the growth retardation occurred in the first 2 years of life, and that the older children had not received the full benefit of the free infant formula feeding programs. This trend, however, was not present in boys. It is concluded that the infant and child feeding programs have contributed to improved growth among Navajo preschool children. At the same time, concern is expressed that these feeding programs will be replaced by a Food Stamp Program and that the gains made will be reversed. Concern is also expressed for the regressive effects of inflation and rising food prices and the effects they will have on the nutritional status of the Navajo people. *Am. J. Clin. Nutr.* 29: 657-662, 1976.

In 1969, a systematic review was published of all cases of the severe nutritional deficiency syndromes, kwashiorkor and marasmus, admitted to the Public Health Service Indian Hospital in Tuba City, Arizona, during a 5-year period, 1963 to 1967 inclusive (1). In 1967, this hospital served an estimated population of 10,000 people living on the western half of the reservation. The population under 5 years of age was estimated to be slightly over 2,000.

Findings at that time showed that of a total number of 616 children who were admitted to the hospital and diagnosed as having malnutrition, 15 had kwashiorkor, and 29 had marasmus. All of the children admitted to the hospital with malnutrition had weights below the norms for their chronological ages. The

majority of those admitted with kwashiorkor and marasmus were not breast fed. They frequently had associated symptoms of diarrhea and, in many instances, they had respiratory infections as well. The data that was available supported the diagnosis of kwashiorkor in nearly every instance, i.e., weight

<sup>1</sup> From the Division of Nutrition, Vanderbilt University, Nashville, Tennessee, 37203, and the Department of Pediatrics, Public Health Service Indian Hospital, Tuba City, Arizona 86045.

<sup>2</sup> Chief of Pediatrics, Public Health Service Indian Hospital, Tuba City, Arizona 86045. <sup>3</sup> Associate Professor of Nutrition and Pediatrics, Vanderbilt University Medical School, and Director of MCH/FP Center, Meharry Medical College, Nashville, Tennessee 37203. <sup>4</sup> Associate Professor of Biostatistics, Vanderbilt University, Nashville, Tennessee 37203.

below the 3rd percentile and total protein level below 6.0 g/100 ml., and children with weight below the 3rd percentile and serum albumin level below 3.5 g/100 ml. These children also had clinical signs of edema and hair changes as well.

In addition, height and weight data were obtained on 944 Head Start children from all over the reservation and were compared to the Boston norms. An analysis of the data showed that nearly one-third of the children were below the 3rd percentile for height. Nearly one-tenth of the children were below the 3rd percentile for weight. The overall conclusion was that protein and calorie malnutrition constituted a major public health problem on the Navajo reservation and particularly on the western half.

Since 1968 a multiplicity of programs to provide food for infants, preschool children, and their families have been instituted on the reservation. During our previous study from 1963 to 1967, the Navajo reservation was taking part in the United States Department of Agriculture's (USDA's) Surplus Commodity Food Distribution Program, subject to the eligibility standards of the states of New Mexico, Arizona, and Utah. Some surplus foods, for example, cheese and butter, were not distributed because of storage requirements of refrigeration. Increased temperatures during storage of the other foods also caused problems, and reports of inferior quality were rampant. But in most instances, the foods were not suitable for infants and very young children even when they were available. A total of 14 different foods was available, at times, out of the 22 distributed by USDA.

As a result of national publicity and Congressional hearings on malnutrition during 1967 to 1969, a number of efforts were made to provide food to the Navajo people. Some of these efforts were purely voluntary. For example, as a result of the CBS documentary, "Hunger in America," which was aired on national television in 1968, many private donations were received by the Department of Pediatrics of the Public Health Service Indian Hospital in Tuba City, Arizona. These donations sometimes came only with instructions to "do something." This voluntary response was very gratifying. The money was put into a

patient benefit fund and used to buy infant formula for malnourished infants outside the hospital setting. This free formula program was later expanded to include infants who were not malnourished but believed to be at nutritional risk. We were impressed with the short-term results but were unable to demonstrate significant statistical changes in a small group of infants over a short period of time.

In 1969, the USDA Supplemental Food Program for Infants, Preschool Children, Pregnant and Lactating Mothers was instituted on the reservation. In Tuba City, 400 families were initially involved in this program. The program was discontinued, however, in early 1972 when the "Donated Foods Program" came into being. This latter program incorporated the Supplemental Food Program and the Surplus Commodity Food Distribution Program and was controlled and managed by the Navajo tribe rather than the states of Arizona, New Mexico, and Utah. The tribe significantly modified the eligibility requirements and improved the delivery systems which resulted in increased participation in the new Donated Foods Program.

In 1970, still another program, Emergency Food and Medical Services, was started through the Office of Navajo Economic Opportunity of the Navajo tribe. They started a special program of formula distribution for "prematures." This program was also eventually expanded to include other infants determined to be at "high risk." Also as a part of the Donated Foods Program early in 1972, all infants under 1 year of age who were not being breast fed automatically became eligible for infant formula. This program was a cooperative effort of the Navajo Tribe, USDA, and the Indian Health Service. The Office of Navajo Economic Opportunity also began to provide special formulas for those infants unable to tolerate standard milk formulas, as in cases of milk allergy and malabsorption syndromes.

However, during the entire period of time, insufficient efforts to encourage and promote breast feeding were made, and the early weaning trend which was described in our previous publication has not been reversed. Also, since 1968, short-term assistance has been provided by various charities, such as a 3-month supply of formula from SHARE,



Inc., and by the private food industry through food donations.

**Methods and materials**

Although there have been multiplicity of food sources, changes in eligibility requirement, the replacement of one food program by another, all resulting in various quantities and types of foods available at different times, the situation has been reassessed with regard to protein and calorie malnutrition among Navajo preschool children by: 1) reviewing the number of patients admitted to Tuba City Hospital with malnutrition, marasmus, and kwashiorkor during the years 1969 to 1973 inclusive and by comparing them with patients admitted during the previous 5-year period, 1963 to 1967 inclusive; and 2) plotting the heights and weights of Navajo Head Start children recorded from all over the reservation in September 1973 and comparing them with those collected previously.

The height and weight data on Navajo Head Start children were recorded by their teachers in September 1973. The children were classified by sex, utilizing first and last names. A preliminary screening of the data revealed five schools for which average age-adjusted heights or weights deviated grossly from those of the others. The average for each of these five specific schools deviated by four or more standard deviations from the mean of the distribution of all the other school averages, either for age-adjusted height or age-adjusted weight. Within these five schools, the variation among students was not unusual and hence it was concluded that systematic error of measurement or recording was responsible for these results, and data from these schools were excluded from the rest of the analysis. This left data from 84 schools. It was also decided to restrict the analysis to children aged 36 to 71 months old since the number of children outside this age range was relatively small. The 1,462 children from the 84 schools aged 36 to 71 months of age for whom sex, height, and weight were known were divided into age groups. The number of the children by age and sex in each of the age groups are presented in Table 1.

As in our previous publication, we determined the height and weight percentiles of the Boston growth curve to which each child belonged. Also, an estimate of the prevalence of protein and calorie malnutrition within each age group was made by determining the number of children falling below the 3rd percentile.

Table 2 provides information regarding admissions to the Public Health Service Indian Hospital in Tuba City,

**TABLE 2**  
Comparison of admissions to Public Health Service Indian Hospital, Tuba City, Arizona, 1963 to 1967, 1969 to 1973

	Total 1963-1967	Aver- age/yr	Total 1969-1973	Aver- age/yr
Total pa- tients ad- mitted 5 yr and under	4,355.0	871.0	3,590.0	718.0
Patients with malnutrition	616.0	123.0	377.0	75.4
Marasmus	29.0	5.8	9.0	1.8
Kwashiorkor	15.0	3.0	8.0	1.6

Arizona. The 5-year periods, 1963 to 1967 and 1969-1973 are compared and 1968 appears to be a pivotal year. As indicated above, a multiplicity of food programs was being introduced at that time. The total number of admissions under 5 years of age dropped 18%. The number of children with a diagnosis of malnutrition, i.e., their weights were below the norms for their chronological ages, dropped from a yearly average of 123 to 75.4. Marasmus has practically disappeared. Seven of the nine cases of marasmus in the past 5 years occurred during fiscal year 1969. This clinical diagnosis has only been made twice in the past 4 years. Kwashiorkor has also been reduced by 50%, going from a yearly average of 3 to 1.6. The most dramatic drop, however, in the incidence of kwashiorkor has been in the last 4 years. Those cases which continued to occur also appeared to be milder in degree (J. Van Duzen, unpublished observations).

The height and weight data from 1967 and 1973 are plotted in Figure 1. They demonstrate that malnutrition is less prevalent among Navajo preschool children examined in 1973 than among those examined in 1967. All height and weight results were taken from findings of Head Start teachers. Especially noticeable are the improvements in height. In 1967, 30% of the girls and 30% of the boys fell below the 3rd percentile of the Boston growth curve. In 1973, these figures were 11 and 16%, respectively. However, in spite of the relative improvement of the 1973 group, their deviation from the Boston growth curve is still statistically significant. In 1967, 8% of the girls and 9% of the boys were below the 3rd percentile for weight. In 1973, these figures were both 6%.

Because of the recognition of the problem of malnutrition and the resultant improvements in food distribution that have occurred relatively recently, it is possible that the older children still show the results of early protein and calorie deficiencies. Also, from the 1967 data, we believed that the widespread growth retardation detected occurred sometime during the first 2 years of life. To investigate these hypotheses, the percentage of children in each 1 year group classified below the 3rd percentile was examined. These data are presented in Figure 2.

For girls, a significant trend emerges. The percentage of girls below the 3rd percentile is significantly smaller ( $P < 0.05$ ) for 3-year-old girls than that for the 5-year-old girls in 1973. For boys, however, this trend is not present.

**TABLE 1**  
Age and sex of Navajo children involved in 1973 study<sup>a</sup>

	36-47 months	48-59 months	60-71 months	Total
Boys	174	380	136	690
Girls	214	409	149	772
Total	388	789	285	1,462

<sup>a</sup> Nineteen children were less than 36 months of age; children older than 71 months of age were also excluded.

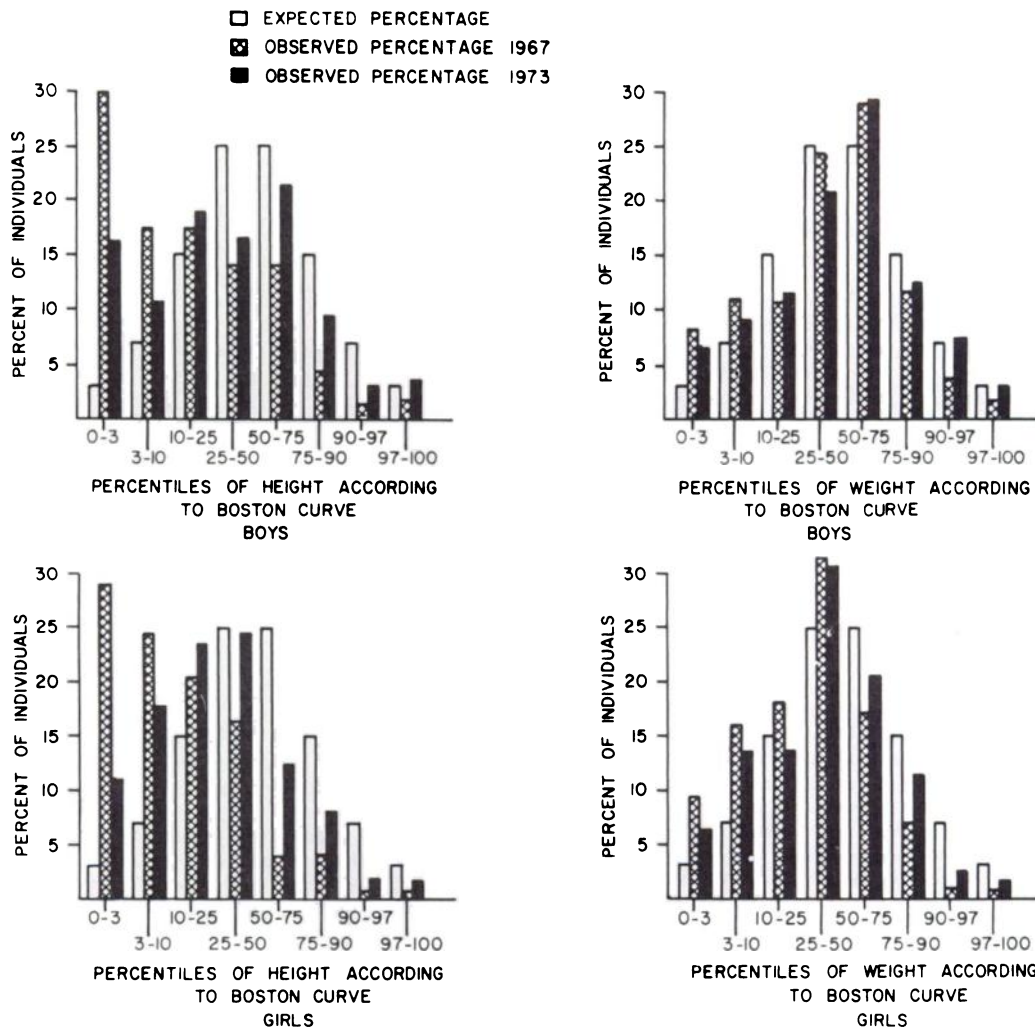


FIG. 1. Expected and observed numbers of Navajo children in various percentiles of the Boston height and weight curves 1967. Expected and observed numbers of Navajo children in various percentiles of the Boston height and weight curves 1973.

## Discussion

There were eight cases of kwashiorkor during the period of 1969 to 1973. Four of these families had working parents and two of them were extremely large families. The fact that the parents worked made them ineligible for financial assistance. In two other families, the parents worked only periodically which also made them ineligible for relief. These families were also very mobile and on and off the reservation frequently, again complicating their eligibility for financial and/or food assistance. The child of one welfare family

was the fourteenth pregnancy, one of ten living children, and was either premature or small for gestational age. In two of the cases of kwashiorkor, history could not be obtained that would explain why they were receiving inadequate amounts of foods.

The cases of marasmus have decreased despite the trend away from breast feeding and toward early weaning. This is because infant formula has been made available to all Navajo infants under one year of age. The mothers need only request it at the nearest United States Public Health Service hospital or clinic, or mission hospital or clinic. At





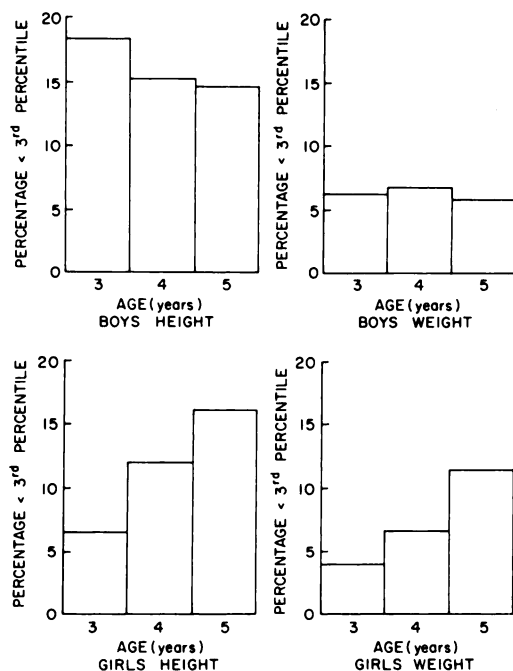


FIG. 2. Percentages of children below the 3rd percentile by age in 1973.

times, temporary transportation problems might interfere with procurement, but on the whole a supply of powdered infant formula for 3 months at a time has been available to all infants.

Other factors could play a role in bringing about these improvements in the nutritional status of preschool Navajo children. Diarrhea and pneumonia appear to be less common in the so-called Well Baby Clinics. This may be the result of environmental improvements, such as better housing and sanitation. These improvements have occurred for 247 families in the Tuba City Service Unit since 1962 under Public Law 86-121 projects (2). The number of families with some of these improvements is small, because the projects require clusters of families around a sufficient water supply. Most of the Navajo people live in scattered camps. Also, the organizational, financial, and energy inputs required of the community in order to be eligible for one of these projects are quite substantial. Nevertheless, these improvements could have resulted in a reduction, especially in gastrointestinal disease, and as a consequence, an improvement in nutritional status.

On the other hand, certain changes are taking place on the reservation which forebode an overall deterioration in the nutritional status of the Navajo people. In the Tuba City Service Unit, the population for 1967 was estimated to be 10,000. In 1973, it increased to 13,000. However, the population under 5 years of age was estimated to be slightly over 2,000 in both years. The Bureau of Indian Affairs reports that within the western Navajo area, which includes the Tuba City Hospital Service Unit, the total population in 1973 was 24,945, with an available work force of 8,023. Of this work force, only 2,576 were permanently employed; 2,920 were temporarily employed; 2,627 were unemployed, of whom 2,025 were actively seeking employment. This represents a true unemployment rate of over 25% and indicates an economically insufficient area. In the same area, 2,000 were on General Assistance, receiving an average of \$200 a month. This assistance, plus the benefits of the food programs, permits the people to live at a subsistence level. Much of the existing employment is dependent upon such programs as the Office of Navajo Economic Opportunity and is subject to annual renewal of grants.


The effects of inflation have been felt even more severely on the reservation. A basket of food products frequently bought by Navajo families in a small reservation trading post increased 41% in 5 years. The same basket at a cash market in Tuba City increased 32.5% and at a supermarket off the reservation increased 27.4% (J. Van Duzen, unpublished observations).<sup>5</sup> Baby food, which was available in 1968 in the trading posts, has become so expensive that it is no longer stocked by some posts. In addition, there are those who must confine their purchases to the reservation because of transportation problems and cultural practices. These people are also subjected to the abuses of the trading post system. (This was recently disclosed by a staff report to the Federal Trade Commission (3)).

Thus, we have the interesting paradox of

<sup>5</sup> A list of the same fourteen supplemental foods was bought in September 1968 and in September 1973 at three stores: Flagstaff Supermarket, Tuba City Supermarket, and the Shonto Trading Post. The percentage increase in price was then computed.

improved growth among preschool children, primarily in the first 2 years of life, because of an active infant feeding program and an overall deterioration in the economic circumstances of the Navajo people. It should be noted, however, that the regressive effects of inflation did not actually set in until 1973 to 1974, at the very end of our second 5-year study period.

In any case, the above-mentioned intervention food programs are not permanent. At this time, it is doubtful that any of them will continue much longer in their present form. When Food Stamps are introduced on the reservation, they should not be considered as a replacement for existing food programs. The improvements in growth among preschool children can be wiped out by replacing the existing programs with a Food Stamp Program. Furthermore, a Food Stamp Program meets many obstacles when one consid-

ers the problems of determining eligibility and certification, the long lines and inconvenient office hours, transportation problems on the reservation, and little or no purchasing power on the part of the recipients. Decisions of change, therefore, must consider possible loss of present gains. 

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### References

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