

NUTRITION AND PUBLIC HEALTH IN THE DOMINICAN REPUBLIC¹

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SUMMARY

A nutrition survey was carried out in a mountainous region southwest of Santiago, Dominican Republic, to determine the extent of malnutrition in the area and to obtain information regarding food beliefs and practices needed to design a viable nutrition program. A stratified cluster sampling technique was used to interview 295 mothers of preschool children and examine 448 of their children under five years of age. The incidence of moderate and severe malnutrition was less than expected. Only 12.3% of the children were $\leq 75\%$ of the National Center for Health Statistics (NCHS) reference standard for weight/age; however, 6.5% were $> 110\%$ of the standard. Children from large, poor families were most vulnerable to growth retardation. Definite meal patterns were identified that included varied sources of cereal

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products and animal and mixed vegetable proteins. Milk and sausage consumption had a significant positive association with all three growth parameters. Suggestions were made for further research and program development.

INTRODUCTION

An integrated rural development project, the Plan Sierra, was created in 1979 by the Government of the Dominican Republic. The project is located in the mountains southwest of Santiago, the second largest city in the country. This area contains the headwaters of the primary rivers that irrigate the Cibao Valley, the country's most fertile agricultural land. Approximately 120,000 people live within the region which has been considered to be one of the most ecologically fragile and economically deprived in the country. The area has been divided into three zones, Janico, San José de las Matas, and Moncion, named for the principal town in each zone. The main objectives of the Plan Sierra are to stop erosion and conserve the natural resources of the region, as well as to improve the standard of living of the people. These objectives will be achieved through programs of land management, agriculture, education, and health. Education programs include further education for the primary school teachers, vocational education for the men, and non-formal education for the women. Primary health care is delivered by the Ministry of Public Health and Social Service (SESPAS) through health promoters in several hundred communities and through five rural clinics. In January 1980 mobile medical teams began rotating through each zone in an effort to provide basic medical services until an improved permanent health system could be planned and implemented. A nutrition survey was conducted by the mobile medical teams during April and May 1980 to determine the extent of malnutrition in the Plan Sierra area, and to obtain information regarding food beliefs and practices needed to design a viable nutrition program.

METHODOLOGY

A stratified cluster technique (1) was used to obtain the sample. Ten mothers of children less than five years of age were interviewed in each of the 10 administrative communities in each of the three zones for a total sample size of 300. The first mother in

each community was randomly selected; additional subjects were obtained through cluster sampling. Women who did not wish to participate were replaced by their closest eligible neighbor. The mother's children under five years of age were included in the sample. All mothers were interviewed in their homes by experienced social workers, and the interview schedule was coded to maintain confidentiality. Children were examined at the mobile medical site by the physician. The interview schedule was developed in cooperation with the staff of the Plan Sierra and the medical teams. Care was taken to ensure that no embarrassing or harmful questions were included. Family food consumption patterns were determined through the use of food frequency lists cross checked with a simplified recall of foods consumed during the previous day. The food frequency list was developed by the staff of the Plan Sierra. No attempt was made to obtain quantitative dietary data.

The child's examination included a history of illnesses and vaccinations, a clinical examination, hemoglobin and hematocrit analyses, and anthropometric measurements of length or height and weight. The medical history and clinical examination were conducted by the physician. Anthropometric measurements and biochemical analyses were obtained by the nurse and medical technician, respectively. Criteria established by the Center for Disease Control (2) were used to determine high and low hemoglobin and hematocrit values. Anthropometric field methods outlined by Zervas (3) were employed. The beam balance scale was checked for accuracy each time it was moved, and weight was read to the 0.1 kilogram. Height, or length, of children below three years of age was read to the nearest 0.5 centimeter. Results were compared to the National Center for Health Statistics (NCHS) standards (4).

The interview schedule, child's health history schedule and anthropometric, clinical, and biochemical protocols were pretested during the monthly field rotation prior to data collection. Both schedules and protocols were slightly revised after the pretest.

Preliminary data analysis was done at the Ministry of Agriculture of the Dominican Republic in cooperation with the Department of Statistical Reporting and Computers. Statistical analysis was completed at the University of Houston. BMDP-79, Biomedical Computer Programs (5) was used in both analyses.

RESULTS

Usable data were obtained from 295 women and 448 children

under five years of age. Differences between the three zones were insignificant except for a few variables which will be noted.

Growth, Morbidity, and Clinical Findings

Mean age of the children in the same sample, formed by 203 boys and 245 girls, was 31.5 months. Only 19.4% were still being breast-fed. The incidence of moderate and severe malnutrition in the region was less than expected, according to the Gómez classification (5). Almost one-half of the children had some degree of malnutrition (Table 1) but only 12.3% were moderately or severely malnourished. This percentage is significantly less than the malnutrition percentage found by Sebrell (6), on a nation-wide scale

TABLE 1

PER CENT DEVIATION FROM NORMAL WEIGHT/AGE OF CHILDREN
IN THE PLAN SIERRA REGION OF THE DOMINICAN REPUBLIC
DURING APRIL-MAY, 1980¹

% NCHS standard	%	(n)
> 110	6.5	(31)
90-110	44.4	(198)
75-89	36.8	(164)
60-74	10.1	(45)
< 60	2.2	(10)
TOTAL	100.0	(448)

1 Compared to National Center for Health Statistics (NCHS) standards.

survey in 1969, or by Caritas Dominicana in the Cibao Valley in 1976 (7). A small number (6.5%) of obese children was also found. Additional evidence of chronic undernutrition in a small segment of the sample was detected in the height/age data (Table 2). When 95% of the reference standard was taken as the cut-off point for mild height retardation, 65.8% of the children were classified as mildly retarded in growth. If, as Neuman (8) believes, long-term, severe undernutrition is represented by attained height

TABLE 2

PER CENT DEVIATION FROM NORMAL HEIGHT/AGE OF CHILDREN
IN THE PLAN SIERRA REGION OF THE DOMINICAN REPUBLIC
DURING APRIL-MAY, 1980¹

% NCHS standard	%	(n)
> 110	0.7	(3)
96-110	33.0	(148)
91-95	27.2	(124)
86-90	23.2	(104)
< 85	15.4	(69)
TOTAL	100.0	(448)

1 Compared to National Center for Health Statistics (NCHS) standards.

less than 85% of the standard, 15.4% of the children suffered chronic severe undernutrition. Weight/height data indicated that overnutrition may be a greater problem than undernutrition. Children who were > 110% of the NCHS standards comprised 25.2% of the sample. When weight/height was classified according to Kanawati (9), 2.2% were severely undernourished, 6.0% moderately undernourished, and 6.2% mildly undernourished.

The number of clinical signs of malnutrition observed by the physicians did not correlate with the incidence of malnutrition as determined by anthropometric measurements. One or more clinical signs of malnutrition were found in 43.3% of the sample. Pale conjunctiva, the most frequently seen clinical sign, was seen in 22.9% of the children. With the exception of pale conjunctiva and angular stomatitis, 84% of all clinical signs were detected in Moncion Janico had significantly more children with pale conjunctiva than the other two regions. Likewise, San José de las Matas had significantly more signs of angular stomatitis. Bilateral scars of angular stomatitis were detected in 11.6% of the total sample, but current signs were found in only 1.7%. Although 10% of the subjects in Sebrell's study (6) were vitamin A deficient and very little consumption of vitamin A rich foods was reported in this study, virtually no clinical signs of vitamin A deficiency were reported. Biochemical results also showed that the

sample was in better nutritional status than anticipated. Only 7.4% had low hemoglobin values for their age although 12.3% had low hematocrit values.

The effectiveness of the Ministry of Public Health immunization program, as carried out by the local health promoters was shown in the number of children who had received at least one immunization. Three-fourths of the children had received one or more injections of DPT and polio vaccine; only 22.2% had received the measles vaccination. BCG vaccinations ranged from 20.2% of the population in Janico to 62.8% in San José de las Matas. Although only 41.4% of the total sample had been vaccinated with BCG, no history of tuberculosis was reported.

Colds were the most frequent cause of childhood illness. Almost every child (93.2%) had had one or more colds. Illness related to an unsanitary environment was also common. At least 41.0% had had impetigo and 39.0%, parasites at least once. At the time of the study 12.5% of the children had diarrhea; slightly over one-third (37.0%) had diarrhea during the previous week. These episodes had lasted for an average of 3-4 days, but 59.7% of the children rarely or never had diarrhea. There was no correlation between having diarrhea or frequency of diarrhea and any of the anthropometric or socioeconomic variables.

Socio-economic Findings

Mean household size was 6.4 ± 3.1 persons. Fathers were present in 94.2% of the households. Approximately 90% of both males and females had attended at least one year of school. Women had attended school slightly longer than men ($\bar{x}_F = 3.5$ vs $\bar{x}_M = 3.2$). Although there was an expected negative association between age and years of school completed by the women, this was not the case for the men. Those under 25 years of age were more likely to have gone to secondary school (31.2%), but also were more likely to have never attended school (25.0%). Only the group of men over 55 years of age had a higher percentage of non-attenders (35.0%), than the 25-year-old men; the majority of them (75.5%) were farmers. The remaining men were about evenly divided between occupations requiring some formal training or education, craftsmen, and semi- or unskilled workers. Although most of the women (74.7%) were housewives, those who listed other occupations were four times as likely to have a skilled occupation as an unskilled one.

All of the respondents had at least one child less than five years of age. Only 9.7% of the women were pregnant at the time of the study, but there was a mean of 5.8 pregnancies per woman. These pregnancies had resulted in 5.1 live births and 4.3 living children. This number corresponds to the number of children listed as living in the household at the time of the survey.

Most of the families (82.9%) owned houses which tended to be small but fairly well constructed. Almost half of the houses (49.1%) had two rooms, although the mean was 2.5 rooms with a range from 1 to 6. Walls were of wood siding (92.8%) with roofs constructed primarily of either metal (52.9%) or thatch (35.8%). Most of the floors were cement (61.0%); the remainder primarily dirt (21.2%) or wood (17.2%). Only 10.4% of the homes had electricity. Although 70.0% obtained their water from a spring or river, one fourth (25.0%) received water from a faucet in their homes. The remaining 5.0% obtained it from a well. Almost half (49.0%) of the families thought their water was safe to drink although no test was made for water potability. Only one respondent had an indoor toilet but 87.3% did use a latrine. A small number used an enclosed trench (1.7%) while the remainder (10.6%) reported they had no toilet or latrine facilities. Fogones were used for cooking by 82.0% of the respondents. The rest used either a gas stove (12.5%) or cooked on the ground (5.2%).

An association between house construction and sanitation was found, with a strong positive correlation between the quality of roof materials and the quality of floor materials of the house. Poorer quality of materials used in roof construction was also associated with fewer rooms. The poorer the quality of the floor, the greater the likelihood of inadequate sanitary facilities. No association was found between type of cooking facilities or land tenure and construction or size of house.

Most of the men (60.0%) were small landholders with less than 100 *tareras*.⁴ Of the landholders, 3.8% leased their land out, 3.2% were renting it from someone else, and the rest were working their own land. The holdings of 80.0% of the farmers averaged 20.3 *tareras* and accounted for only 28.3% of all landholdings. Those farmers with holdings greater than 100 *tareras* had an average of 310.8 *tareras* and controlled 71.7% of the land. Not all of

4 One *tarera* = 0.63 hectáreas.

the available land was cultivated. Twenty *tareras* or less were cultivated by 74.60/o of the farmers, and land under cultivation by these men averaged 9.5 *tareras*. Only 12 of the farmers (6.90/o) were cultivating more than 50 *tareras*. The purpose of cultivation was to provide for the family and to sell in 53.50/o of the cases; only 5.80/o sold their entire crop, while the remainder grew crops only for family consumption. Yuca (*Manihot esculenta*), the most popular crop, was grown by 81.00/o of the respondents. Other crops frequently grown were corn, kidney beans, sweet potatoes, and pigeon peas.

The father's age and the number of times the mother had been pregnant were significantly associated with all three growth parameters. Other socio-economic variables affecting one or more measures of growth were the mother's age and education, father's education, number of living children, walls and floor of the house, cooking method, actual land holdings, and the amount of land cultivated.

Family Food Practices

Almost all respondents said they usually ate three meals a day; this was supported by the dietary recall. Only 2.70/o of the subjects had not eaten breakfast, 2.00/o had not eaten an evening meal and only one person had not eaten a midday meal. Similar food consumption patterns were identified on both the simplified dietary recall and the food frequency lists.

Rice and beans were the most popular foods, with over 920/o of the sample claiming to eat both foods daily. Other foods frequently consumed (at least 2-3 times per week) by three-fourths or more of the families were bread, spaghetti, eggs, yuca, sweet potato, and plantain. Over half of the respondents regularly consumed (2-3 times per week) sausages, milk, pigeon peas, sweet bananas, cheese, and meat. Fruits, other than sweet bananas, were seldom eaten. Tomatoes and guava were frequently eaten by over a third of the respondents, but less than a third ate avocados, papaya, or oranges regularly.

Foods that were reported as frequently consumed were also reported as foods consumed the previous day. The morning and evening meals contained many similar foods (Table 3) which differed from the foods consumed at midday. The morning meal usually consisted of a cereal or grain product plus a staple food such as plantain, yuca, or sweet potato. Dairy products were

TABLE 3

FOOD REPORTED CONSUMED DURING THE PREVIOUS DAY IN THE PLAN SIERRA
REGION DURING APRIL—MAY 1980

Food	Morning		Food	Midday		Food	Evening	
	o/o	(n)		o/o	(n)		o/o	(n)
Milk	36.6	(108)	Rice	83.7	(247)	Plantain	43.4	(128)
Bread	33.2	(98)	Kidney beans	72.9	(215)	Eggs	38.6	(114)
Eggs	29.5	(87)	Meat	34.6	(102)	Spaghetti	34.6	(102)
Plantain	28.8	(85)	Spaghetti	27.8	(82)	Yuca	31.9	(94)
Oats	21.3	(63)	Salad ¹	23.0	(68)	Soup ³	30.5	(90)
Yuca	19.0	(56)	Moro ²	17.6	(52)	Bread	20.3	(60)
Sweet potato	18.3	(54)	Salted cod	10.5	(31)	Sweet potato	16.9	(50)
Spaghetti	10.5	(31)	Soup ³	10.2	(30)	Oats	14.2	(42)
Sausages	9.8	(29)	Pigeon peas	9.5	(28)	Milk	14.2	(42)
						Meat	14.2	(42)
						Tubers	12.2	(36)
						Chocolate	10.2	(30)

¹ Usually contains shredded cabbage or lettuce plus sliced tomatoes.

² Rice and bean mixture.

³ Usually contains plantain, various tubers, or squash plus small amount of meat or sausages.

popular. Milk was drunk by 36.60/o and eggs were eaten by 29.50/o of the sample. Rice and beans were consumed by a majority of the respondents at midday. Over 500/o reported some source of animal protein such as meat, sausages, fish, or eggs. An additional 10.20/o had a soup or stew that usually contained meat and vegetables (primarily tubers). Plantain, spaghetti, yuca, and sweet potato were also popular at the noon meal. Other vegetables were rarely mentioned with the exception of salad, a side dish which usually consisted of shredded cabbage or lettuce, plus sliced tomatoes. The evening meal contained a variety of foods, most frequently plantain, yuca, and/or a tuber. Cereal products such as spaghetti, bread, and oatmeal were popular. Other vegetables were seldom mentioned as part of the evening meal.

Consumption of milk or sausages was significantly associated with all three anthropometric parameters. Although only 8.50/o of families consumed sausages daily, 66.10/o did so at least 2-3 times per week. Milk was drunk daily by 44.70/o and 2-3 times weekly by 28.80/o. Both height/age and weight/height were highly associated with bread and yuca consumption. Frequent corn, pigeon pea, and spaghetti consumption by families also had a positive effect on height/age of the children.

Maternal and Child Food Beliefs

Most of the respondents thought that there were beneficial foods for pregnant or lactating women, and only 330/o - 400/o thought that some foods were harmful at these times. Milk was named as the best food for pregnant women by 37.60/o of the respondents. Meat was thought to be best by 27.50/o. Fruits, eggs, and vegetables were infrequently named as the best food but were frequently mentioned as other good foods to eat during pregnancy. Milk, along with salted codfish, were also most popular as foods for lactating mothers; meat, eggs, soups, and oatmeal were also thought to be important foods during lactation. Soursop was the most frequently named harmful food for pregnant women; no others were named as most harmful by 20/o or more of the sample. There was a lack of agreement about which foods are harmful during lactation, as well as a significant difference of opinion among communities. Over 500/o of the women in San José de las Matas and Moncion thought that some foods are harmful to women while breast-feeding, but only 100/o

in Janico thought so. Avocado was the food most frequently mentioned, although pork, tripe, pigeon peas, fish, and herring were also named. None of the women indicated a belief that food intake should be increased during pregnancy or lactation.

Infant Feeding Practices

A high proportion of bottle feeding was found throughout the region. Although 68.8% of the mothers thought that maternal milk was the best food for children under six months of age, by the age of two months 68.5% of the infants were receiving a bottle in addition to, or instead of the breast. By the age of three months, 79.3% of the children received a bottle. Mothers who owned bottles (77.6%) had an average of 2.1 bottles. Cow's milk (45.8%) or powdered milk (40.0%) were usually given in the bottle an average of four times per day; only 6.8% of the mothers said they never gave milk in a bottle. Mothers in San José de las Matas were more likely to breast-feed than other mothers. The importance of milk in the child's diet diminished greatly after six months (Table 4). Between the ages of six months and one year, only 40.0% of the mothers thought that milk was the best food for their child; this includes 15.9% who favored maternal milk. Between one and three years, only 15.2% of the mothers thought milk was the best food, and no one mentioned it as best for children under three years of age. Supplemental foods, other than milk, were introduced around the age of five months ($\bar{x} = 5.2 \pm 2.8$ months). The most popular supplemental food was *crema de habichuelas* (sweetend purée of kidney beans with milk). Potato purée was also mentioned by over half the respondents. Eggs or egg yolks, meat, and fruit in some form were given to children who were still being breast-fed or receiving bottle milk. Most children were weaned during the latter half of the first year ($\bar{x} = 10.3$ months). By the age of one year family food had replaced milk or weaning foods as the mothers thought it was best for their children.

Mothers definitely believed that a child with diarrhea should receive liquids other than milk; lemonade was preferred by 55.2% of the women but fruit juices, soup, cola beverage, and tea were mentioned frequently. Milk was the food that most women (85.4%) would not give a child with diarrhea. All meals would be withheld by 24.7%, while others said they would not feed them rice (19.0%) or kidney beans (14.9%), the staple

TABLE 4

**FOODS BELIEVED TO BE BEST FOR INFANTS AND YOUNG
CHILDREN IN THE PLAN SIERRA REGION DURING APRIL-MAY,
1980**

Food	o/o	(n)
<i>Best food for an infant 6 months of age</i>		
Maternal milk	68.8	(203)
Powdered milk	4.4	(13)
Cow's milk	2.7	(8)
Don't know	12.2	(36)
<i>Best food for an infant 6 months — 1 year of age</i>		
Cow's milk	18.0	(53)
Crema de habichuelas ¹	18.0	(53)
Maternal milk	15.9	(47)
Eggs or egg yolk	9.2	(27)
Potato purée	8.5	(25)
Powdered milk	6.1	(18)
Family meal	5.4	(16)
Compote	4.7	(14)
Don't know	5.1	(15)
<i>Best food for a child 1-3 years of age</i>		
Family food	41.4	(122)
Meat	10.8	(32)
Egg, egg yolk	11.2	(33)
Cow's milk	9.8	(29)
Powdered milk	5.4	(16)
Don't know	7.5	(22)
<i>Best food for a child 3 years of age</i>		
Family food	45.1	(133)
Meat	21.7	(64)
Vegetables	5.4	(16)
Egg	3.7	(11)
Don't know	20.7	(61)

¹ Sweetened bean purée.

foods for most families at noon. There was less consensus about what food to feed or withhold from a child with fever. Various fruit juices were named by 45.00/o of the respondents but milk, tea, soup, and soft drinks were also mentioned. Continuation of regular meals was thought to be best by 20.00/o; however, 40.00/o of the respondents would discontinue regular meals for a child with fever. Milk, rice, and beans would also be withheld by 20-250/o of their mothers.

CONCLUSIONS

Although the incidence of moderate and severe malnutrition in the Plan Sierra region of the Dominican Republic was lower than expected, some chronic undernutrition does exist. There was evidence that obesity may be a greater nutritional problem than undernutrition and, for this reason, its incidence and magnitude in the region should be further investigated. The children most vulnerable to malnutrition were those from large, poor families; their parents tended to be younger and less well educated than those of well-nourished children. These families had fewer economic resources as reflected in house construction and the amount of land owned or cultivated. With the exception of corn, which was frequently consumed by only about one-third of the sample, the foods significantly associated with growth of the children were consumed regularly by approximately 750/o of the respondents.

A great variety of foods were available and combined into definite food consumption patterns. Morning and evening meals contained similar foods, primarily plantain, tubers, and cereal or grain products. The greatest variety of foods were eaten during the evening meal. The midday meal was most limited in variety with some combination of rice and beans almost universally consumed. Throughout the region egg, meat, and milk consumption was higher than expected; vegetable and fruit consumption was extremely low.

The women may not be applying their beliefs about the best foods for pregnant and lactating women or young children; although the average of pregnancies was 5.8, they only averaged 4.3 living children. The reason needs to be investigated in greater depth. One explanation for early switch to bottle feeding despite the belief that mother's milk is best for an infant, may be that the

mothers are unable to produce sufficient milk. No information is available on mother's weight gain during pregnancy nor on birth-weights of their infants.

Health services in the region are minimal but are reaching a large segment of the population. Although immunizations are usually started, most children do not complete the entire series. The number of moderately and severely malnourished children is sufficient to warrant the development of a nutritional rehabilitation program in the region. The majority of the population, however, would benefit from a health and nutrition education program that would encourage them to make optimum use of available food and other resources.

RESUMEN

NUTRICION Y SALUD PUBLICA EN LA REPUBLICA DOMINICANA

Se llevó a cabo una encuesta nutricional en la región sur-oeste de Santiago, República Dominicana, con el fin de determinar el alcance de la desnutrición en el área, y recabar información respecto a las creencias y prácticas alimentarias prevalentes, para diseñar un programa de nutrición factible. Se utilizó la técnica estratificada de muestreo de conglomerados, entrevistándose a 295 madres de niños preescolares, y se examinó un total de 448 de sus hijos menores de cinco años de edad. La incidencia de desnutrición moderada y severa fue menor que la prevista. Únicamente el 12.3% de los niños estuvieron $\leq 75\%$ por debajo del estándar de referencia del Centro Nacional de Estadísticas de Salud (NCHS) de Estados Unidos de América, establecido para peso/edad; sin embargo, el 6.5% estuvo $> 110\%$ por encima del estándar. Se comprobó que los niños provenientes de familias grandes y pobres eran los más vulnerables al retardo de crecimiento. Se identificaron patrones definidos de alimentación que incluían variadas fuentes de productos a base de cereales, así como proteínas de origen animal y provenientes de mezclas de vegetales. El consumo de leche y salchichas tuvo una asociación positiva significativa con los tres parámetros de crecimiento usados. Se formularon sugerencias para la realización de investigaciones más a fondo, y para el desarrollo de programas.

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