SUMMARY
YEMEN ARAB REPUBLIC NATIONAL NUTRITION SURVEY 1979

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

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SUMMARY

YEMEN ARAB REPUBLIC
NATIONAL NUTRITION SURVEY
1979

conducted by

The Yemen General Grain Corporation
Ministry of Supply

in cooperation with the

Ministry of Health
Yemen Arab Republic

with the assistance of the

U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control

and the

United States Agency for International Development
Department of State
Washington, D.C.

HIGHLIGHTS

In 1979, the Yemen General Grain Corporation (YGGC), Ministry of Supply, with the assistance of the Center for Disease Control, Atlanta, Georgia, U.S.A. and the support of the Agency for International Development, Washington and Sana'a, conducted a national survey of the nutritional status of Yemeni children of preschool age. The survey's primary purpose was to provide data on the prevalence and regional distribution of protein-energy malnutrition and anemia, and some of their principal correlates. Using population proportionate sampling, 117 survey sites were selected in three rural and one urban statistical universe within eight of the ten governorates which comprise the Yemen Arab Republic. These universes included the Northern and Southern Highlands, the Tihama and the Sana'a areas.

The prevalence of retarded linear growth (stunting), consistent with chronic undernutrition, was greatest in the Northern Highlands (70.6 percent) and smallest in the Tihama (51.8 percent). Extrapolating to the total population in the four survey universes, about 730,000 Yemeni children from 6 months to 5 years of age were stunted.

The prevalence of wasting, consistent with acute undernutrition, was greatest in the Tihama (23.9 percent) and smallest in the Northern Highlands (7.0 percent). In the total population, an estimated 120,000 Yemeni children were wasted.

Anemia was extremely common in the children surveyed and is distributed in a regional pattern similar to wasting. The prevalence of anemia was 66 percent in the combined rural areas and 17 percent in urban Sana'a. A similar regional pattern for anemia exists among the mothers of survey children.

The dietary data in the survey illustrate that breast-feeding is nearly universal. The duration of breast-feeding, however, is less among the more affluent and among urban families. Use of proprietary formulae and non-traditional weaning foods is limited primarily to urban Sana'a.

Based on the data obtained in this survey, the following objectives for action should be considered:

- Decrease the prevalence of:
  a. concurrent wasting and stunting among 12 to 24 month old children, particularly in the Tihama,
  b. wasting alone, among the same subgroups,
  c. anemia particularly among children from 3 to 36 months of age in all three rural regions.
- Reduce the prevalence of anemia among women of childbearing age.

METHODS

The Yemen Arab Republic (Yemen) occupies an area of some 200,000 km^2 in the southeastern corner of the Arabian Peninsula. The estimated national population in 1979, based upon extrapolation from the Population and Housing Census of February 1975, is approximately 6.5 million persons. Three quarters of the population are rural, directly engaged in agriculture, and the urban population is centered mainly in the three largest cities: Sana'a, the national capital, Ta'izz in the Southern Highlands, and Al Hudaydah on the Red Sea. Approximately 18 percent of the population is under the age of 5 years. These are subdivided into some 40 Qada (subprovinces) which are further divided into some 170 Nahiya (districts).

Sampling. The survey was conducted in eight of the 10 governorates. These eight governorates were combined into four sampling universes based on geographic or demographic similarities (Figure 1). Approximately 900 children were sampled in each of these universes. A population proportionate, two-stage sampling method was used to select survey children. This sampling method permitted valid statistical comparisons to be made between universes.

In the first sampling stage, 30 sample sites in each region were selected from the total population of that region, as listed in the 1975 census. In the second stage, at each sample site, a list of inhabited houses was compiled and an initial household was randomly selected from that list. A cluster of surrounding households was then visited until a predetermined number of total people were included.

Logistics. A staff of 25 persons, nine women and 16 men, was trained to administer the survey questionnaire, weigh and measure children, and obtain blood specimens for hemoglobin determinations. This staff was divided into six 3-person teams plus three survey supervisors, one laboratory technician, and a reserve team.

The teams measured the length or stature of each survey child to the nearest 0.1 cm with a specially constructed portable measuring board (1). Weight was determined to the nearest 0.1 kg using a Salter hanging scale. The presence or absence of pedal edema was elicited by firm thumb pressure for 3 seconds on the dorsal surface of both feet. Blood specimens, on a 20 percent subsample of children and their mothers, were obtained for hemoglobin determination. A brief clinical examination was conducted, searching for classical signs of vitamin deficiencies in the skin and mucous membranes. Data were also collected on certain socioeconomic characteristics, and on infant feeding and weaning practices.

Anthropometric Indices. Three indices of physical growth are commonly used to describe the nature and extent of malnutrition in children: weight for height, height for age, and weight for age (2,3,4,5). Weight for height, body mass in relation to body length, provides an estimate of current nutritional status, either under- or overnutrition. Height for age is an index of linear growth and reflects past nutritional status. The weight for age index, although commonly used, is a composite index that cannot distinguish between a child who is underweight because of

thinness from one who is underweight because of shortness. Data for all anthropometric indices are presented as standard deviations (S.D.) of the NCHS/CDC reference values. Standard deviations reflect the actual distribution of anthropometric values compared to the reference population. Two standard deviations below the reference median value has been chosen as the cut-off since observed values below this level are considered to be, for all three anthropometric indices, abnormally low.

Children whose weight for height values are more than 2 S.D. below the reference mean are considered acutely undernourished, or wasted. Children whose height for age values are more than 2 S.D. below the reference mean are considered chronically undernourished, or stunted.

Waterlow has suggested a system of cross-classifying height for age and weight for height, permitting a categorization of children who are "normal" in both indices, stunted alone, wasted alone, or concurrently stunted and wasted, a category with greater morbidity and mortality risk (5).

RESULTS

The survey gathered data from 3,245 children. Age and sex distribution is shown in Table 1 for the combined rural and urban Sana'a universe samples.

1. Wasting and Stunting

The cross-tabulation of height for age and weight for height values is a useful means for describing the anthropometric status of groups of children. Table 2 presents the percent prevalence rates of wasting (acute undernutrition), stunting (chronic undernutrition), combined wasting and stunting, and "normal" children in each of the four universes and in the combined three rural universes. Undernutrition was more prevalent in the rural regions than in urban Sana'a.

Among the rural regions, wasting and concurrent wasting and stunting have the greatest rates in the Tihama and the smallest in the Northern Highlands. For stunting alone, the smallest prevalence was found in the Tihama and the greatest was in the Northern Highlands. For each of the three conditions, intermediate prevalence rates were seen in the Southern Highlands.

Figure 2 presents distribution curves of height for age values. Compared with the reference population, Yemeni children were generally shorter.

Figure 3 presents the distribution, in standard deviations (S.D.), of weight for height values of the survey population for the combined rural regions and for urban Sana'a as compared to the reference population. Rural Yemeni children were thinner than Sana'a children, and both rural and urban children were thinner than reference population children.

Figure 4 shows prevalences of wasting only, stunting only, and concurrent wasting and stunting, for sexes combined, for the combined rural regions. The prevalences of concurrent wasting and stunting are greatest in the second year of life, generally the most vulnerable period for severe malnutrition in childhood. It is during this period that most children are being or have already been weaned from the breast and are not provided sufficient quantities of semi-solid foods.

2. Anemia

For children, anemia is defined as a hemoglobin value less than 11.0 grams per 100 ml blood. Table 3 presents prevalence rates of anemia in a 20 percent subsample of survey children, by age, in each of the four survey universes. Among the three rural regions, the Tihama has by far the greatest prevalence of low values (82 percent). The prevalence of low values is much smaller in urban Sana'a (17 percent) than in the other rural regions (53 and 47 percent). For rural children, anemia tended to be most common between the ages of 6 and 24 months. For urban Sana'a children, it was most common between 24 and 36 months.

For women, anemia was defined as a hemoglobin level less than 11.0 grams for pregnant women and less than 12.0 grams for all other women. Table 4 presents anemia prevalence rates for the mothers of children who had hemoglobin determinations, in the four survey regions. Rural women, particularly those in Tihama had a higher prevalence of anemia than urban ones.

3. Breast-Feeding, Weaning, and Dietary Data

Table 5 shows the portion of urban and rural children being breast fed by age. By 6 months of age 17 percent of rural children and 39 percent of urban children are no longer breast-feeding. At 12 to 15 months of age 57 percent of rural children and 23 percent of urban children are still breast-feeding.

Table 6 gives the prevalences of 14 major food groups which were consumed by the survey children and their families in the rural regions and urban Sana'a. For example, grains were consumed by 99 percent of urban families, and legumes by 88 percent. Among rural families grains were consumed by a proportion (97 percent) similar to urban families yet legumes were consumed by a far smaller proportion (26 percent). For children, the consumption of grains was 72 percent and 68 percent in urban and rural regions respectively. Although many foods are consumed both by young children and family members, such nutritious foods as legumes, fish, vegetables and fruits appear to be restricted in the diets of young children

SUMMARY AND CONCLUSIONS

The prevalence of each of the two common forms of protein-energy malnutrition - acute undernutrition (wasting) and chronic undernutrition (stunting) was found to be high among children of preschool age examined in the National Nutrition Survey during the summer and fall of 1979 in the Yemen Arab Republic. Stunting is more prevalent than wasting, and both are more prevalent in the rural universes than in urban Sana'a. Among the three rural universes - the Tihama, the Southern Highlands, and the Northern Highlands - prevalences vary considerably. Stunting is least prevalent in the Tihama and most prevalent in the Northern Highlands, however, wasting is most prevalent in the Tihama and least prevalent in the Northern Highlands. In the Southern Highlands the prevalence of wasting and stunting is intermediate.

The prevalence of stunting tends to increase with increasing age, while the prevalence of wasting increases only slightly during the second year of life and then declines. Wasting is somewhat more common in boys than in girls, particularly during the second year of life.

Concurrent wasting and stunting, a severe form of undernutrition which is associated with risk of greater mortality and morbidity, is common in Yemen, reaching prevalence levels of approximately 15 percent among 18 to 24 month old children in the rural universes. Illness, fever, and diarrhea are more common among these wasted and stunted children.

Anemia was common in the survey children. Its prevalence shows a regional pattern similar to that of wasting: most common in the Tihama (82 percent) and least common in urban Sana'a (17 percent). Anemia shows a similar regional pattern among the mothers of these children - greatest in the Tihama and smallest in urban Sana'a.

Breast-feeding is a common and established practice. There are urban rural and socioeconomic differences. The duration of breast-feeding is longer for the less affluent and rural children than for affluent and urban children.

RECOMMENDATIONS

As a result of data provided by the National Nutrition Survey of the Yemen Arab Republic, the following priorities for action should be considered:

1. Interventions among preschool children to decrease the prevalence of:
   - concurrent wasting and stunting among 12 to 24 month old children, particularly in the Tihama,
   - wasting alone, among the same subgroups, and
   - anemia, particularly among children from 3 to 36 months of age, in all rural regions.

2. Interventions to decrease the prevalence of anemia in rural regions among women of child bearing age.

Based on survey data possible action steps would be:

1. to persuade mothers to breast-feed their children at least for a year or more,

2. to teach practical and acceptable ways of utilizing and preparing indigenous weaning foods. These foods should include those generally available and utilized by the family.

New approaches to nutrition education and to food preparation which are appropriate for Yemen are needed. It should not be presumed that such approaches can be introduced ready-made, on a large scale, or in a short

time. They must be pretested at the grass-roots level, preferably first in one Tihama village and in one rural Highland village. In the field-testing, one or more respected community members, after having received an appropriate short course of special training, should serve as a catalyst in the community, sharing with local mothers and fathers in mutual teaching/learning processes to develop appropriate approaches to better nutrition.

It is essential that each nutrition demonstration program have the means to make estimates of birth and deaths of children under 5, and to take measurements of height, weight, and hemoglobin on these children. These measures are essential to evaluate whether or not improved levels of health, physical growth and hemoglobin do, in fact, occur within the program.

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Figure 1

YEMEN ARAB REPUBLIC
NUTRITION SURVEY "UNIVERSE" BOUNDARIES

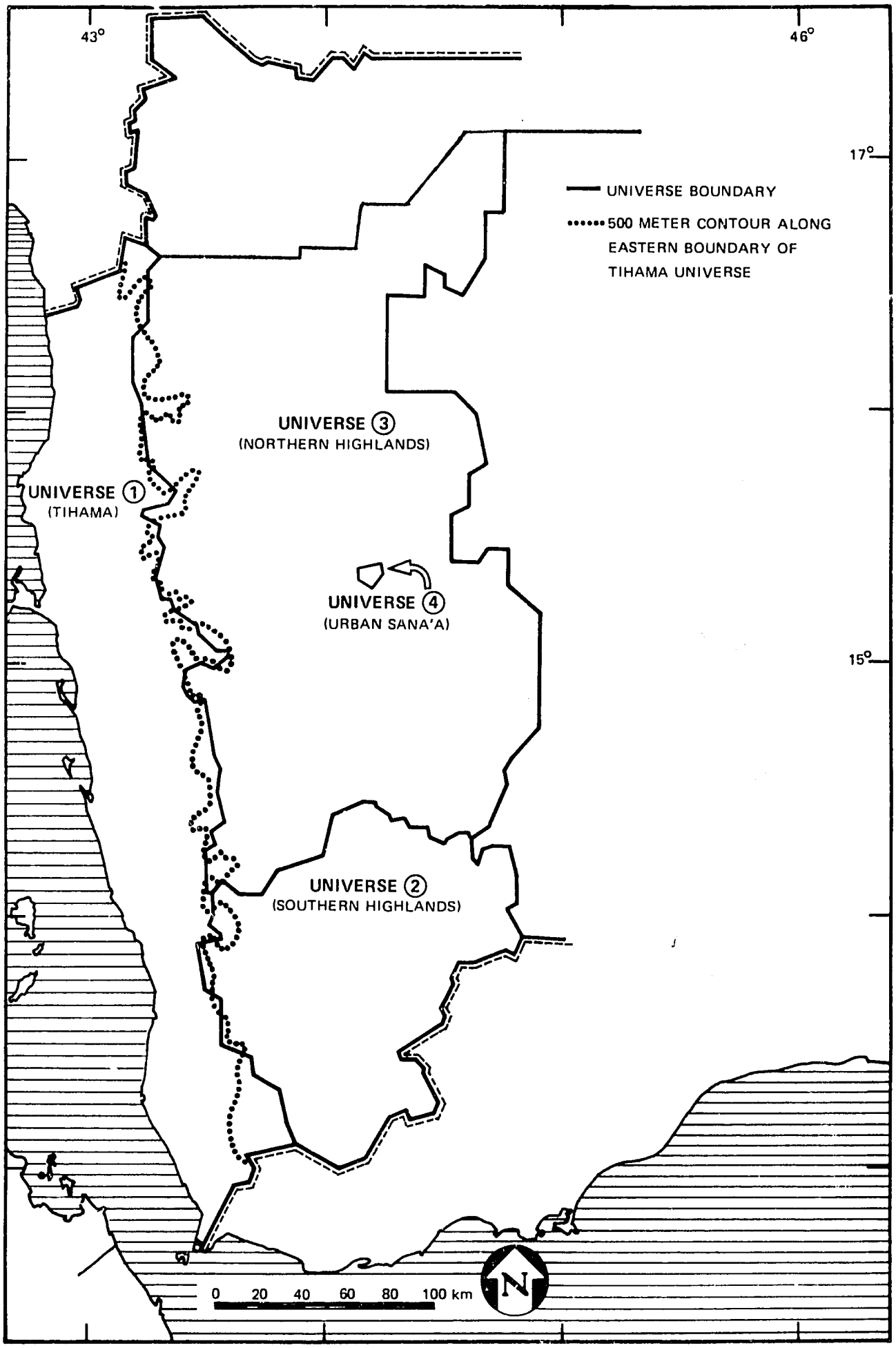

FIGURE 2. DISTRIBUTION OF SURVEY CHILDREN BY HEIGHT FOR AGE STANDARD DEVIATIONS, COMBINED RURAL VS URBAN SANA'A YEMEN 1979 (NCHS/CDC REFERENCE)

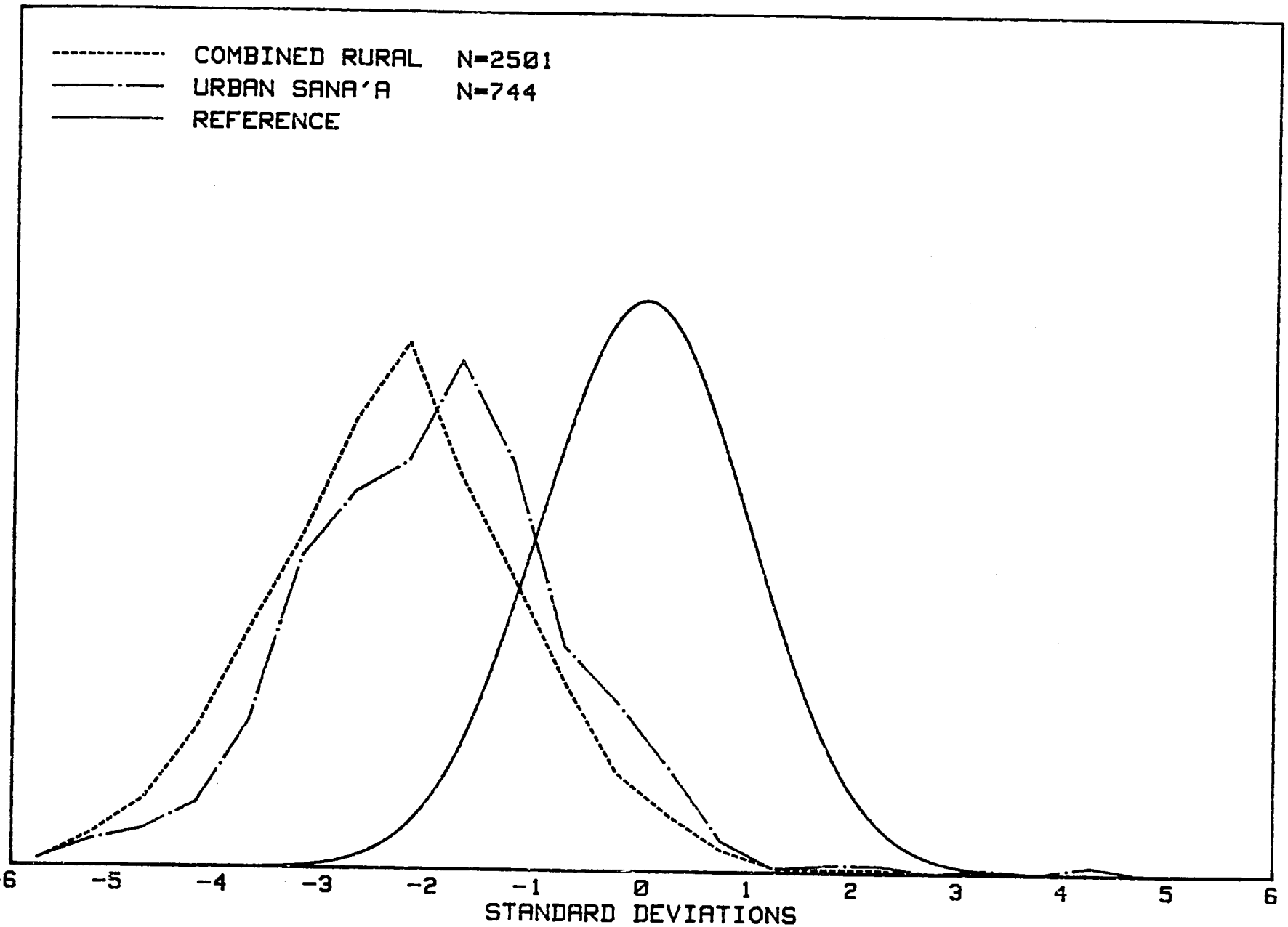

FIGURE 3. DISTRIBUTION OF SURVEY CHILDREN BY WEIGHT FOR HEIGHT STANDARD DEVIATIONS, COMBINED RURAL VS URBAN SANA'A YEMEN 1979 (NCHS/CDC REFERENCE)

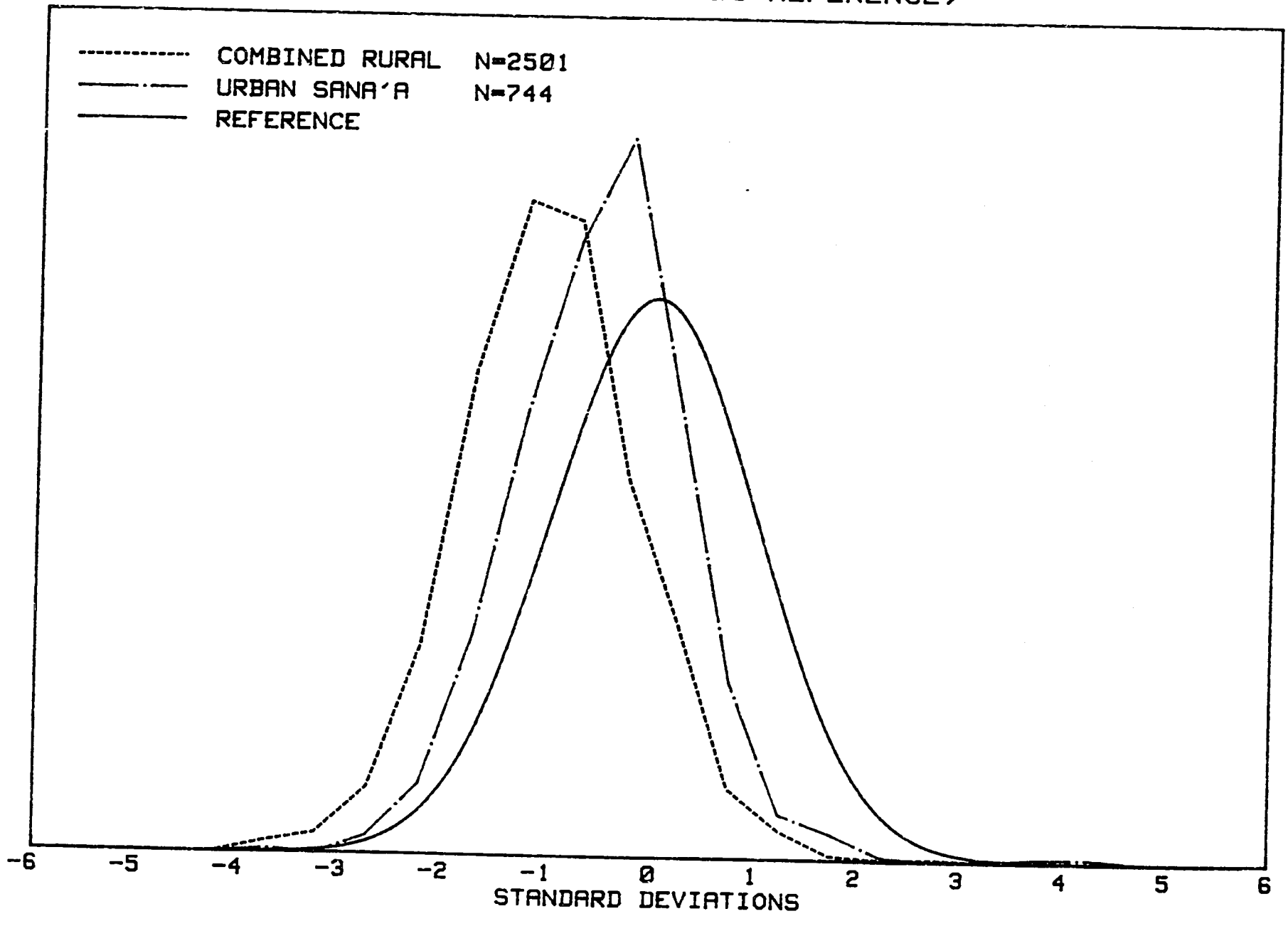

FIGURE 4. PREVALENCE OF WASTING ONLY, STUNTING ONLY, AND CONCURRENT WASTING AND STUNTING, COMBINED RURAL YEMEN 1979 (NCHS/CDC REFERENCE)

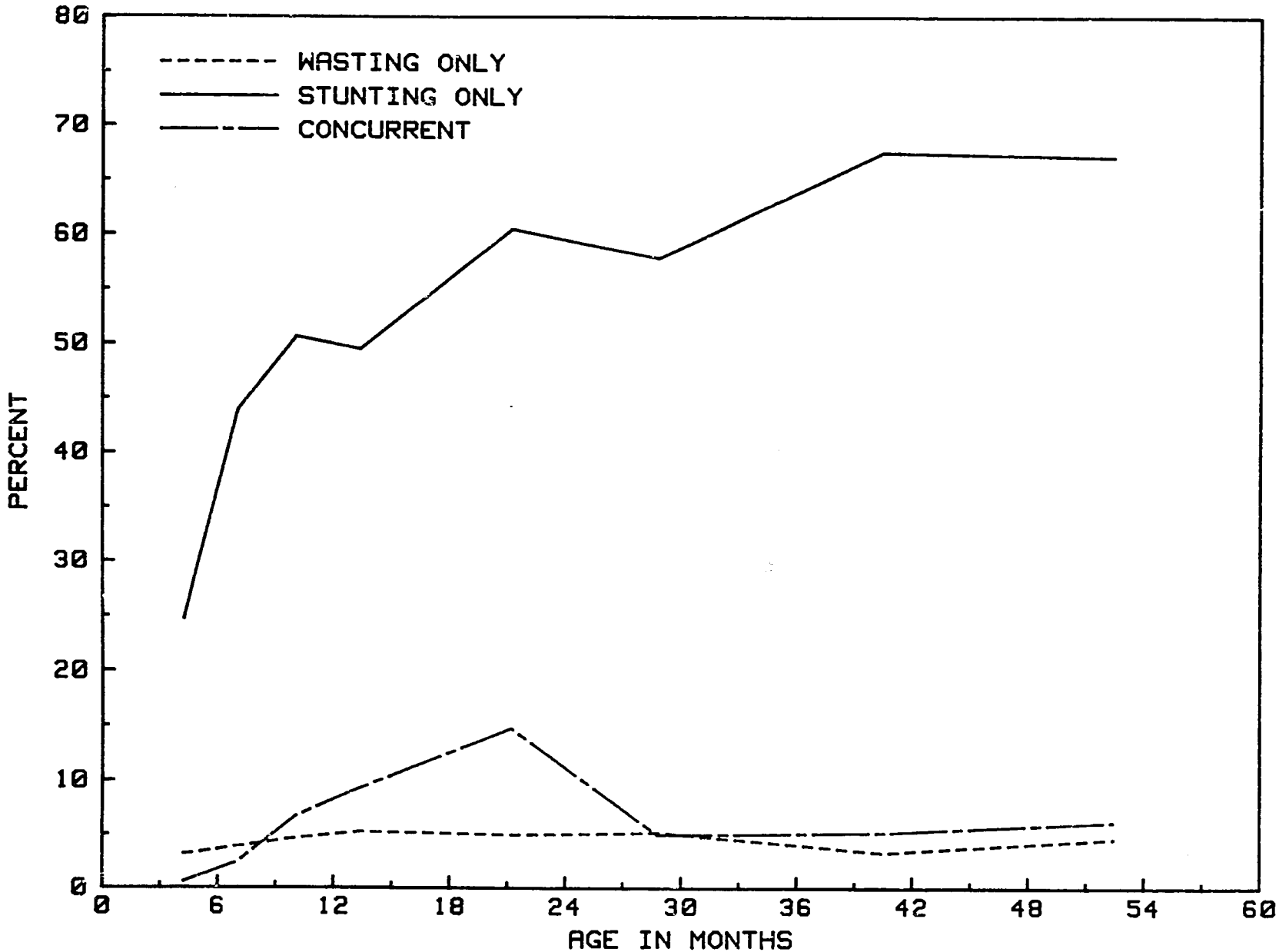

Table 1. Percentage Distribution of Survey Children by Age and Sex: Yemen 1979

COMBINED RURAL

Age in Months	Male	Female	Total[a]
3-5	6.6%	6.6%	6.6% (164)
6-11	14.1%	14.7%	14.4% (368)
12-17	14.6%	14.7%	14.6% (356)
18-23	11.7%	12.4%	12.0% (290)
24-35	21.9%	20.8%	21.4% (552)
36-47	19.5%	18.3%	19.0% (476)
48-59	11.6%	12.5%	12.0% (295)
Total	55.3% (1385)	44.7% (1116)	100.0% (2501)

URBAN SANA'A

Age in Months	Male	Female	Total[a]
3-5	4.8%	6.9%	5.9% (44)
6-11	15.2%	11.1%	13.1% (97)
12-17	13.5%	16.2%	14.9% (111)
18-23	8.1%	9.0%	8.6% (63)
24-35	28.1%	23.8%	25.9% (193)
36-47	19.0%	16.1%	17.5% (130)
48-59	11.3%	16.8%	14.2% (106)
Total	47.9% (357)	52.1% (387)	100.0% (744)

[a] Percentages are weighted based on population proportions. Actual number surveyed given in parentheses.

Table 2. Percentage Distribution of Survey Children by Waterlow Classes by Region: Yemen 1979 (NCHS/CDC Reference)

Region	Waterlow Class[a]				
	Wasting Only	Stunting Only	Wasting and Stunting	Normal	Total[b]
Tihama	11.0%	38.9%	12.9%	37.2%	100.0% (819)
Southern Highlands	3.2%	54.7%	6.0%	36.2%	100.0% (970)
Northern Highlands	2.9%	66.4%	4.2%	26.5%	100.0% (712)
Combined Rural	4.4%	56.2%	6.5%	32.9%	100.0% (2501)
Urban Sana'a	2.1%	47.2%	1.2%	49.5%	100.0% (744)

[a] Wasting only: Weight for Height more than 2 standard deviations below the mean, and Height for Age not more than 2 standard deviations below the mean.
Stunting only: Height for Age more than 2 standard deviations below the mean, and Weight for Height not more than 2 standard deviations below the mean.
Wasting & Stunting: Weight for Height and Height for Age more than 2 standard deviations below the mean.

[b] Actual number surveyed given in parentheses. Percentages are weighted based on population proportions.

Table 3. Percentage Distribution of Survey Children by Hemoglobin Values by Region: Yemen 1979

Hgb Value	Region				
	Southern Tihama	Northern Highlands	Combined Highlands	Urban Rural	Sana'a
<7.0	13%	5%	3%	6%	-
7.0- 7.4	7%	3%	2%	3%	1%
7.5- 7.9	9%	3%	6%	5%	-
<8.0	29%	12%	12%	15%	1%
8.0- 8.4	4%	2%	2%	2%	1%
8.5- 8.9	10%	7%	5%	7%	2%
8.0- 8.9	14%	9%	6%	9%	3%
9.0- 9.4	9%	8%	6%	8%	-
9.5- 9.9	11%	8%	5%	7%	2%
9.0- 9.9	20%	16%	12%	15%	2%
10.0-10.4	10%	10%	7%	9%	4%
10.5-10.9	9%	6%	10%	8%	7%
10.0-10-9	20%	17%	17%	17%	11%
11.0 & greater	18%	47%	53%	44%	83%
11.0-11.4	4%	11%	8%	9%	13%
11.5-11.9	6%	13%	10%	11%	6%
12.0-12.4	4%	11%	10%	10%	18%
12.5-12.9	4%	4%	8%	5%	12%
13.0 & greater	-	7%	18%	9%	33%
Total[a]	100% (135)	100% (174)	100% (117)	100% (426)	100% (135)

a/ Percentages are weighted based on population proportions. Actual number surveyed given in parentheses.

Table 4. Percentage Distribution of Survey Children's Mothers' Hemoglobin Values by Region: Yemen 1979

Hgb Value	Region				
	Tihama	Southern Highlands	Northern Highlands	Combined Rural	Urban Sana'a
<8.0	8%	1%	3%	3%	-
8.0- 8.9	8%	3%	1%	3%	-
9.0- 9.9	10%	4%	4%	5%	1%
10.0-10.9	23%	11%	10%	13%	2%
11.0-11.9	27%	19%	15%	19%	6%
12.0 & greater	24%	62%	68%	58%	91%
Total[a]	100% (127)	100% (162)	100% (108)	100% (397)	100% (128)

[a] Percentages are weighted based on population proportions. Actual number surveyed given in parentheses.

Table 5. Age Distribution of Survey Children by Breast-Feeding Status at the Time of the Survey: Yemen 1979

COMBINED RURAL

Age in Months	Breast-Feeding	Not Breast-Feeding	Total[a/]
3-5	83.1%	16.9%	100.0% (164)
6-8	69.7%	30.3%	100.0% (185)
9-11	64.4%	35.6%	100.0% (182)
12-14	56.1%	43.9%	100.0% (229)
15-17	35.7%	64.3%	100.0% (127)
18-23	24.6%	75.4%	100.0% (288)
24-35	7.4%	92.6%	100.0% (550)
36-47	3.5%	96.5%	100.0% (471)
48-59	1.3%	98.7%	100.0% (294)
Total	27.7% (720)	72.3% (1770)	100.0% (2490)

URBAN SANA'A

Age in Months	Breast-Feeding	Not Breast-Feeding	Total[a/]
3-5	61.2%	38.8%	100.0% (44)
6-8	39.2%	60.8%	100.0% (55)
9-11	26.4%	73.6%	100.0% (42)
12-14	22.4%	77.6%	100.0% (70)
15-17	9.5%	90.5%	100.0% (41)
18-23	6.4%	93.6%	100.0% (63)
24-35	2.1%	97.9%	100.0% (193)
36-47	0.7%	99.3%	100.0% (130)
48-59	-	100.0%	100.0% (105)
Total	11.9% (89)	88.1% (654)	100.0% (743)

[a/]Percentages are weighted based on population proportions; actual number surveyed given in parentheses.

Table 6. Prevalence of Consumption of Major Food Groups by Survey Children 3-30 Months of Age and Their Families, by Region: Yemen, 1979

Food Group	Survey Children				Survey Children's Families			
	Combined Rural		Urban Sana'a		Combined Rural		Urban Sana'a	
	Percent	Number Surveyed	Percent	Number Surveyed	Percent	Number Surveyed	Percent	Number Surveyed
Eggs	6%	(691)	13%	(203)	8%	(690)	14%	(208)
Root Crops	7%	(695)	60%	(208)	8%	(695)	73%	(208)
Grains	68%	(695)	72%	(208)	97%	(695)	99%	(208)
Fruits	8%	(695)	17%	(208)	16%	(695)	27%	(208)
Vegetables	13%	(695)	20%	(208)	84%	(695)	89%	(208)
Milk Products	28%	(694)	13%	(206)	63%	(693)	34%	(208)
Milks	47%	(695)	15%	(208)	39%	(695)	26%	(208)
Other Beverages	71%	(695)	65%	(208)	98%	(691)	97%	(208)
Meats	14%	(695)	29%	(208)	26%	(695)	60%	(208)
Fish	16%	(695)	2%	(208)	35%	(695)	6%	(208)
Poultry	7%	(695)	22%	(208)	12%	(695)	38%	(208)
Legumes	10%	(695)	39%	(208)	26%	(695)	88%	(208)