Consultant Report

First Round Anthropometric and Food Security Indicators

DSA/UNICEF* Nutrition and Food Security Survey

November 1991 to January 1992

Agricultural Surveys and Policy Analysis Project (ASPAP)

(*Projet des Enquêtes Agricoles et Analyse des Politiques Economiques du Secteur Rural*)

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* In 1991, the Division des Statistiques Agricoles (DSA) of the Ministry of Agriculture contracted to perform a nationwide survey of rural nutrition and food security issues. This report presents to USAID and UNICEF the findings of the collaborating consultant in partial fulfillment of the latter's terms of reference. Sections of the report will be published later in French as part of an official DSA Working Document. This document is a technical report, not an official publication.

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Introduction

Description

The data presented in this report are the results of the first round of a UNICEF-sponsored survey on nutrition and food security in Rwanda conducted by the Division de Statistiques Agricoles (DSA) of the Ministère de l'Agriculture et de l'Elevage (MINAGRI). The report presents information on the anthropometric status of children under 60 months of age and their mothers or other female caretakers, the food consumption habits of the children, and the degree of food insecurity experienced by their households. The questionnaire contains information on a wide range of other topics, including general health status of individuals, proximity to health services, water sources, maternal history, and habitat, which will be presented in later publications.

Objectives

The ongoing survey, which will be repeated twice yearly from December, 1992, has a number of objectives: to identify the prevalence of malnutrition in rural Rwanda; to study the relation between malnutrition, food security, and control of resources; to identify secondary sources of malnutrition; to monitor, over time, the nutritional status of sample households in order to identify seasonal patterns of malnutrition; to aid national decision makers in understanding and responding to the nutritional and food security situation of Rwandan households at the policy level; and to develop a surveillance methodology that can be employed by other countries facing similar constraints. Some of these objectives can be met directly through analysis and use of the information included in the nutrition questionnaires; other information will be gained by joining the nutrition data with the production, income and consumption, and other data routinely collected by DSA on the same households.

Definitions

A household is defined as a group of persons, related or not, who recognize the same head of household, whose resources are held more or less in common, and who usually live under the same roof. A mother is considered to be any woman who cares for small children, whether or not they are her own. As a result, there are a significant number of cases included in the survey in which the adult female interviewed is not the biologic mother of the children, but a grandmother, aunt, step-mother or other person. The sample therefore contains cases where two "mothers" were interviewed in the same household: these are usually situations where an unmarried daughter of the head of household is responsible for the care of a niece or nephew, or sometimes her own child. As a result of these latter cases, the number of

women interviewed and measured for anthropometric data (1316) is slightly greater than the number of households in the survey. The much larger number of children (1939) is obviously due to the brief average interval between births; young households usually have more than one child under the age of 60 months.

The Sample

This first round of data was collected between November, 1991 and January, 1992 on rural households from a nationwide random sample regularly surveyed by DSA for agricultural production data. The entire sample contains 2496 rural households, but because the questionnaire concerns households containing children under the age of 60 months and their mothers, only the 1287 households meeting that criterion were included in the survey. The data were weighted prior to analysis to account for varying population densities across regions.

Methodology

Data collection was carried out by a team of 20 experienced DSA interviewers equipped with motorcycles, each interviewing households that they had already visited in the course of other routine and special studies. The interview process consisted of two parts: first, an oral interview with the principal adult female with children under 5 years of age, followed by measurement of weight, height, and left arm circumference of the mother and each child. A step-on scale was used for the mothers' weight, a portable hanging scale for the children. Height was measured using locally fabricated equipment: For the mothers, a collapsable, free-standing, graduated measure was used; for children a height-measuring board for both standing and recumbent measurement based on a UNICEF model was employed. Arm circumference was measured using locally fabricated, color-coded arm bands marked in centimeters.

I. Anthropometric Indicators for Rural Children 0-60 Months

Tables 1.0 through 1.6 compare the calculated standard indices of malnutrition (weight-for-height, height-for-age, weight-for-age) for rural Rwandan children aged 0-60 months with those of a north American reference population. The standards are published by the United States Public Health Service Health Resources Administration and are referred to as the NCHS Growth Charts (Rockville, Maryland: 1976 HRA 76-1120,25,3).

Studies conducted in numerous countries have shown that anthropometric data taken from samples of middle and upper-class children in developing countries does not differ significantly from that of the north American reference population used for the NCHS tables. Consequently, these standards are considered valid for all populations and deviations from them are accepted as resulting from social and economic, rather than genetic factors.

The NCHS standards are published in two sets, one for children 0 to 36 months, the other for children 2 to 18 years. The study being presented here employs the standards for children 0 to 23 months from the first set of tables, and the standards for children 24 to 60 months from the second set[1].

Tables 1.7 and 1.8 present arm circumference for children 12 to 60 months. Nutrition experts concur[2] that this measure changes little for normal children over that period, hence a single standard can be used for all children within that age range. Table 1.9 compares the results of this study with those of two other recent studies of children's nutritional status in rural Rwanda, the CFNPP/UNICEF study of 1987 and the Enquête National de Budget et Consumption (ENBC) of 1982-83.

Table 1.0 Children's Anthropometric Indices by Age Group

Table 1.0 summarizes three standard anthropometric indicators of the nutritional status for children under 60 months of age for six age groups, weight-for-height, height-for-age, and weight-for-age. These indices are explained in greater detail in the discussions of Tables 1.1 to 1.6 below.

Weight-for-height, which represents near-term nutritional status, is used to indicate the degree of acute malnutrition resulting from either recent illness or insufficient calories. The data presented indicate that there was little acute malnutrition in the study population at the time of the survey, with only 5.2% of children falling more than two standard deviations (-2 z-score) below the international standard mean.

Height-for-age, an indicator of chronic malnutrition, is a measure of stunted growth resulting either from long illness or long-term calorie deficit. Table 1.0 indicates an alarmingly high rate of chronic malnutrition, with over 52% of the children surveyed exhibiting some degree of stunted growth (below -2 standard deviations from the standard mean) and nearly half of those (25%) suffering from severe, chronic calorie insufficiency.

At first glance the height-for-age figures appear to contradict those discussed above for weight-for-height, which show low levels of acute malnutrition. In fact, these apparently contradictory results simply indicate that the children's bodies have adapted to chronically low calorie intake by growing less

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[1] United Nations Department of Technical Co-operation for Development and Statistical Office. 1990. Assessing the Nutritional Status of Young Children. National Household Survey Capability Programme. New York.

[2] Zerfas, A.J. 1986. "Anthropometric Field Methods: General." In Human Growth: A Comprehensive Treatise. Vol.2: Nutrition and Growth. D. Jelliffe and E.F. Jelliffe, eds. New York: Plenum Press.

Table 1.0

Anthropometric Indicators for Children 0-60 Months

Rwanda, November 1991 to January 1992

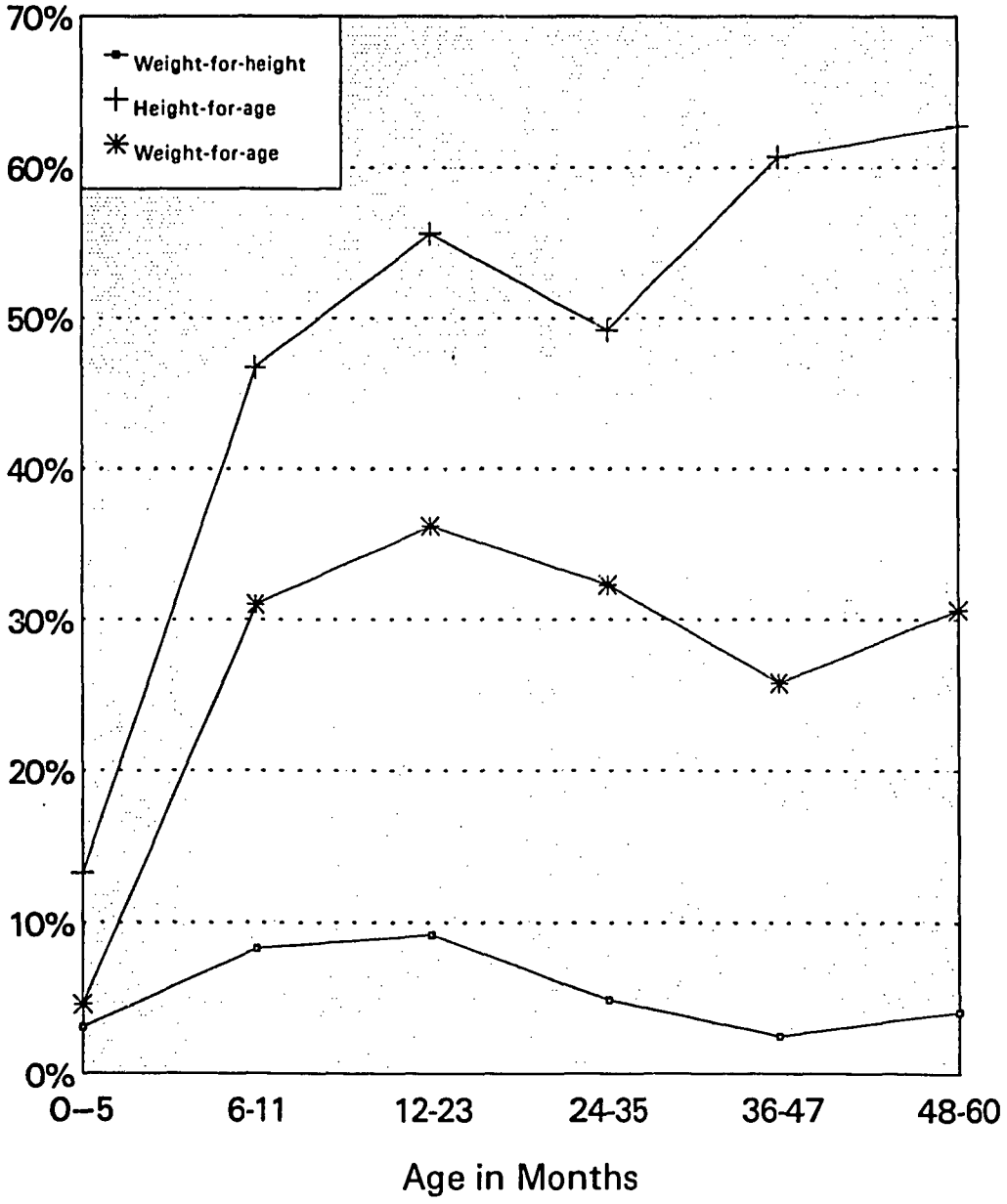
Weight-for-height, Height-for-Age and Weight-for-Age

Age in Months	Number of children	Weight-for-height			Height-for-age			Weight-for-age		
		Mean z-score	% with z-score -2.0	% with z-score -3.0	Mean z-score	% with z-score -2.0	% with z-score -3.0	Mean z-score	% with z-score -2.0	% with z-score -3.0
0-5	179	.89	3.1	.7	-.66	13.3	6.5	.22	4.6	2.7
6-11	190	.10	8.3	2.8	-1.80	46.7	21.0	-1.42	31.0	9.9
12-23	357	-.35	9.2	1.4	-2.11	55.6	27.2	-1.56	36.2	7.9
24-35	380	-.17	4.9	.8	-2.01	49.2	20.6	-1.50	32.3	8.9
36-47	422	.08	2.5	.1	-2.36	60.7	27.5	-1.42	25.8	4.5
48-60	412	-.07	4.1	1.6	-2.35	62.7	34.4	-1.50	30.6	4.1
Total	1939	-.01	5.2%	1.1%	-2.04	52.2%	25.0%	-1.33	28.6%	6.3%

Malnutrition in Rwanda

Comparison with International Anthropometric Standards

Percent < -2 Standard Deviations *



* Weight-for-height: Acute malnutrition
* Height-for-age: Chronic malnutrition

Ministry of Agriculture/DSA, 1992

and therefore ultimately requiring fewer calories.[3] This conclusion is supported by the trends in weight-for-height across age groups: As weaning begins at six months, the percent of children with insufficient weight triples to over 9% between 12 and 23 months, but then gradually declines to pre-weaning levels as stunting adjusts height to calorie availability. Further evidence is given by the trends in height-for-age: the degree of stunting in the study population increases gradually with age, increasing by almost 50% between six and 60 months.

Weight-for-age, intended to indicate insufficient weight, represents a combination of the other two measures, and as such is somewhat difficult to interpret. Statistically it is an average of weight-for-height and height-for-age and is interpreted here as further evidence of insufficient calorie intake by children during and after the weaning process.

The chart following Table 1.0 graphically summarizes the children's nutritional data. The bottom line, representing weight-for-height, shows that acute malnutrition remains low for all age groups, and even declines with increasing age. Chronic malnutrition (height-for-age), however, increases dramatically after the first five months of life and maintains an upward trend through 60 months. Weight-for-age shows a similar sharp increase during the second six months of life, but then stabilizes around 30% until five years of age.

Table 1.1 Weight-for-height: Acute Malnutrition

Table 1.1, weight-for-height, is interpreted as showing the degree of acute malnutrition in the study population. The mean Z-score for any group indicates the degree to which that group diverges, on average, from the reference population for the index in question. In this case, we see that the average weight-for-height z-score for all children in the study (-.01) is approximately zero, meaning that on average rural Rwandan children differ little from their north American counterparts on this measure. However, the percent of Rwandan children below the cutoff points indicating malnutrition is worrisome.

The columns presenting the percent of cases with Z-scores less than -2 and -3 indicate the percent of cases in each sex/age group that are less than two and three standard deviations, respectively, below the standard mean. These categories correspond to "moderate" (-2 SD) and "severe" (-3 SD) malnutrition. Statistically, a "normal" distribution, such as the one for this study population, will contain approximately 95% of its subjects between minus two and plus two standard deviations, or "Z-scores" around the mean. Similarly, approximately 99% of all cases should be located between minus 3

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[3] See Seckler, D., 1980. "Malnutrition: An Intellectual Odyssey." Western Journal of Agricultural Economics. 5(2): 219-226.

Table 1.1

Anthropometric Indicators for Children 0-60 Months

Weight-for-Height

Age in Months	Number of children	Weight-for-height		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Male				
0-5	91	.93	4.4	1.3
6-11	89	.12	9.8	4.7
12-23	175	-.37	10.9	1.4
24-35	183	-.25	6.2	1.6
36-47	200	.17	1.8	0.0
48-60	195	-.14	2.6	.9
Total	933	-.02	5.6	1.3
Female				
0-5	88	.85	1.6	0.0
6-11	100	.09	6.9	1.2
12-23	182	-.34	7.6	1.5
24-35	197	-.09	3.6	0.0
36-47	222	.00	3.2	.1
48-60	217	-.01	5.5	2.2
Total	1006	-.01	4.8	.9
Grand total	1939	-.01	5.2	1.1

Note: Totals are based on gender groups (N=933 and N=1006) not age categories. Grand total is based on entire sample (n=1939).

and plus 3 standard deviations. Since we are interested only in the lower half of the distribution, we would hope to find only 2.5% or less cases below -2 Z-scores and only 0.5% cases below the -3 Z-score. We find instead approximately twice as many cases in each category, indicating a significant number of acutely malnourished children as compared to the reference population. No significant statistical differences by sex were found.

By age group, both sexes show a mean Z-score above the reference mean for the first six months of life with a gradual deterioration through the second year. The highest rates of acute malnutrition are seen among males at 12-23 months, where 10.9% of children had Z-scores less than -2.0.

Table 1.2 Height-for-Age: Chronic Malnutrition

Height-for-age is considered an indicator of longterm, chronic malnutrition and of socioeconomic status. The data presented in Table 1.2 show an extremely high rate of chronic malnutrition, with a mean Z-score of -2 and over 52% of children below that level, rather than the 2.5% one would expect in a normally distributed population. Combined with the information from Table 1.1, this suggests that while there is a low level of acute malnutrition such as one would find under famine conditions, there is a very severe degree of chronic malnutrition. This situation reveals that Rwandan children suffer a continuous series of nutritional insults over a long period of time, most probably due to a combination of repeated morbidity, poor infant feeding habits, poor sanitary conditions and food insecurity at the household level. Furthermore, the 63% of children below -2 Z-score in the oldest age group indicates that this situation has existed for some time.

Table 1.3 Weight-for-age: Insufficient Weight

Weight-for-age is an indicator which is normally used to monitor weight gain in individual children. Since it mixes information used to diagnose chronic (height/age) and acute (weight/height) malnutrition, it is not as useful as it's component indicators for the classification of malnutrition on a population basis. It should be noted, however, that the percent of infants below -2 SD for both sexes during the first six months of life is not much higher than those of the reference population, but then increases precipitously during the second six months. This suggests that enfants grow well during the period of exclusive breastfeeding, but that their weight falls as a result of illness and poor weaning habits.

Similarly, the percent of cases with Z-scores less than -2 and -3 increases dramatically for both sexes after the first six months of life. There is also a dramatic increase after this period in the percent of cases with less than -3 Z-score, gradually leveling off as the population ages.

Table 1.2

Anthropometric Indicators for Children 0-60 Months

Height-for-Age

Age in Months	Number of children	Height-for-age		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Male				
0-5	91	-.52	10.3	4.1
6-11	89	-1.92	54.6	22.6
12-23	175	-2.22	59.6	28.1
24-35	183	-2.02	50.6	21.8
36-47	200	-2.46	65.2	28.6
48-60	195	-2.37	61.3	36.3
Total	933	-2.07	54.1	25.8
Female				
0-5	88	-.80	16.4	9.0
6-11	100	-1.70	39.7	19.6
12-23	182	-2.01	51.8	26.4
24-35	197	-2.01	47.8	19.4
36-47	222	-2.28	56.6	26.4
48-60	217	-2.34	64.0	32.7
Total	1006	-2.00	50.5	24.2
Grand total	1939	-2.04	52.2	25.0

Note: Totals are based on gender groups (N=933 and N=1006), not age categories. Grand total is based on entire sample (n=1939).

Table 1.3

Anthropometric Indicators for Children 0-60 Months

Weight-for-Age

Age in Months	Number of children	Weight-for-age		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Male				
0-5	91	.29	3.2	1.8
6-11	89	-1.43	32.5	9.4
12-23	175	-1.63	40.8	9.8
24-35	183	-1.55	33.2	11.1
36-47	200	-1.37	24.2	3.5
48-60	195	-1.55	32.6	2.9
Total	933	-1.34	29.6	6.4
Female				
0-5	88	.15	6.1	3.7
6-11	100	-1.41	29.6	10.4
12-23	182	-1.49	31.9	6.1
24-35	197	-1.46	31.5	7.0
36-47	222	-1.47	27.4	5.5
48-60	217	-1.46	28.8	5.1
Total	1006	-1.33	27.7	6.1
Grand total	1939	-1.33	28.6	6.3

Note: Totals are based on gender groups (N=933 and N=1006) not age categories. Grand total is based on entire sample (n=1939).

This same pattern was seen in the weight-for-height data (Table 1.1), as breast milk is gradually supplanted by other foods. This is a common pattern seen in many African societies, reflecting the consequences of poor weaning practices: primarily, late introduction of inappropriate weaning foods given infrequently to young children. All children between the ages of 6 and 36 months need appropriate, supplementary foods in addition to breastmilk. Nutritional status improves again in the fourth year (36-47 months) after the transition to solid food has been largely completed. No systematic differences between males and females are apparent.

Table 1.4 Weight-for-height by Prefecture: Acute Malnutrition

Table 1.4 shows some striking differences at the prefectoral level. The data for Ruhengeri, in the north and with a relatively high average altitude, indicate little or no acute malnutrition with a mean Z-score greater than 0 (.66) and no children with a Z-score of less than -2. By contrast Butare, in the south and at a lower altitude, had the lowest mean Z-score (-.52) and shows the greatest degree of acute malnutrition with 10% percent of children at or below the -2 Z-score threshold. Kibungo, a lowland area of relatively recent settlement, follows Butare as the second worst prefecture with 9.4% of children at or below less than -2 Z-scores for weight-for-height.

Table 1.5 Height-for-age by Prefecture: Chronic Malnutrition

As seen previously in Table 1.2, the percentage of children with height-for-age scores below -2 and -3 standard deviations nationwide is 52.2% and 25%, respectively. At the prefecture level, percent of children below -2 Z-score ranges from a low of 40% in rural Kigali to over 58% in Gikongoro and Gitarama. In all but three prefectures at least half of the children measured were at or below the -2 Z-score threshold for height-for-age, indicating widespread chronic malnutrition.

Table 1.6 Weight-for-age by Prefecture: Insufficient Weight

The weight-for-age Z-scores show a pattern similar to that seen in the weight-for-height table (Table 1.4 above): Butare has the highest number of cases below the -2 Z-score level with 46.7%, and Ruhengeri has the fewest with approximately 17%. Since weight-for-age is a composite of the other two indicators, this supports the conclusion that among all prefectures in Rwanda, children in Butare show the highest degree of wasting resulting from acute malnutrition, and children in Ruhengeri the least. It is also interesting to note that the prefecture with the next greatest percent of cases below -2 Z-scores, Gikongoro, has only 34%, more than 12 percentage points less than the percentage for Butare.

Table 1.4

Weight-for-Height by Prefecture

Prefecture	Number of children	Weight-for-height		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Butare	198	-.52	10.0	2.0
Byumba	213	-.03	6.1	1.9
Cyangugu	148	-.01	.8	0.0
Gikongoro	127	.12	8.1	1.8
Gisenyi	212	.10	2.9	.3
Gitarama	230	-.03	5.5	1.9
Kibungo	165	-.38	9.4	2.6
Kibuye	141	.09	2.8	.6
Kigali	275	-.16	6.7	.5
Ruhengeri	229	.66	0.0	0.0
Rwanda	1939	-.02	5.2	1.1

Table 1.5

Height-for-Age By Prefecture

Prefecture	Number of children	Height-for-age		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Butare	198	-2.08	56.3	29.3
Byumba	213	-2.22	57.3	23.6
Cyangugu	148	-2.10	56.2	29.7
Gikongoro	127	-2.37	58.7	33.1
Gisenyi	212	-1.95	50.4	19.3
Gitarama	230	-2.24	58.5	30.8
Kibungo	165	-1.73	46.9	24.5
Kibuye	141	-1.86	47.6	21.1
Kigali	275	-1.67	39.7	19.5
Ruhengeri	229	-2.24	54.9	24.1
Rwanda	1939	-2.07	52.2	25.0

Table 1.6

Weight-for-Age By Prefecture

Prefecture	Number of children	Weight-for-age		
		Mean z-score	% with z-score -2.0	% with z-score -3.0
Butare	198	-1.68	46.7	13.7
Byumba	213	-1.44	32.1	8.8
Cyangugu	148	-1.32	28.1	2.1
Gikongoro	127	-1.57	34.2	9.0
Gisenyi	212	-1.20	21.0	4.5
Gitarama	230	-1.45	27.7	5.4
Kibungo	165	-1.40	31.8	8.2
Kibuye	141	-1.17	24.6	2.9
Kigali	275	-1.19	27.4	5.2
Ruhengeri	229	-1.01	17.1	3.0
Rwanda	1939	-1.34	28.6	6.3

Tables 1.7 and 1.8 Left Arm Circumference by Prefecture and Sex

In most settings, left arm circumference can be employed as an indicator of "thinness", that is, body fat and muscle mass. As stated above, this measure changes little for normal children between the ages of 12 and 60 months, hence a single standard can be used.

According to accepted standards, children with arm circumference above 13.5 centimeters are considered to be of good nutritional status, children with circumference between 12.5 and 13.5 cm are somewhat malnourished, and children under 12.5 cm are severely malnourished.

Table 1.7 presents the percentage of children in each prefecture falling into the different categories of nutritional status according to arm circumference. Butare has the largest percentage of moderately and severely malnourished children, and Ruhengeri has the lowest percentage malnourished, with no cases in the severely malnourished category and only 5.4% in the moderately malnourished category. All other prefectures fall somewhere between these two extremes, but all show relatively small percentages of malnourished when compared to Butare.

Table 1.8 lists the mean, standard deviation and valid number of cases for males and females by prefecture. As seen repeatedly in the previous tables, Butare shows the worst results, with a mean circumference of 13.6 cm (stddev 1.4) for males and 13.3 cm (stddev 1.7) for females, suggesting widespread malnutrition in that prefecture. Ruhengeri, in contrast, has a mean arm circumference of 15.0 for both sexes (stddev 1.2 for males and 1.4 for females), indicating good nutritional status for most children. The means for both sexes in all other prefectures are 14.0 cm or bove, indicating acceptable nutritional status in these areas. Differences by sex are not statistically significant.

Table 1.7

Nutritional Status According to Arm Circumference, by Prefecture

	Left Arm Circumference		
Prefecture	% < 12.5 cm	% 12.5-13.5 cm	% > 13.5 cm
Butare	18.9%	26.1%	55.0%
Byumba	1.5%	10.3%	88.2%
Cyangugu	3.0%	14.2%	82.7%
Gikongoro	3.9%	8.7%	87.4%
Gisenyi	2.1%	9.4%	88.5%
Gitarama	2.1%	15.0%	82.9%
Kibungo	3.9%	11.9%	84.2%
Kibuye	1.6%	11.7%	86.7%
Kigali	5.2%	15.0%	79.7%
Ruhengeri	0.0%	5.4%	94.6%
Rwanda	4.3%	13.0%	82.8%

Table 1.8

Mean Arm Circumference, Children 12 to 60 Months

by Sex and Prefecture

Prefecture	Mean	Standard Deviation	Valid N
Male			
Butare	13.8	1.2	81
Byumba	14.7	1.2	81
Cyangugu	14.4	1.0	55
Gikongoro	14.7	1.2	50
Gisenyi	14.8	1.2	82
Gitarama	14.6	1.1	84
Kibungo	14.7	1.1	64
Kibuye	15.0	1.1	54
Kigali	15.0	1.5	112
Ruhengeri	15.2	1.1	88
Total	14.7	1.2	753
Female			
Butare	13.6	1.6	84
Byumba	14.8	1.1	91
Cyangugu	14.4	1.2	65
Gikongoro	14.4	1.1	56
Gisenyi	14.8	1.1	83
Gitarama	14.3	1.0	100
Kibungo	14.6	1.3	62
Kibuye	14.6	1.1	58
Kigali	14.8	1.5	116
Ruhengeri	15.3	1.1	100
Total	14.6	1.3	815
Rwanda	14.6	1.3	1568

Table 1.9 Comparison with Previous Anthropometric Surveys

Over the past decade a number of surveys of children's nutritional status have been conducted in both rural and urban Rwanda. Table 1.9 compares the results of two of those surveys, the Enquête National de Budget et Consumption (ENBC) and a collaborative study conducted by the Cornell Food and Nutrition Policy Program (CFNPP) and UNICEF/Kigali, with the results of the survey conducted by DSA and presented in this document (the DSA data are divided to facilitate comparison). The ENBC data were collected in 1982-83 from a sample of 276 rural children under the age of six years; the CFNPP data represent findings on 1,847 children between the ages of 6 and 36 months in 7 of Rwanda's 10 prefectures, collect in August and September of 1987.[4]

Examination of the two columns of DSA data, the first for the sub-group of children aged 6-36 months, the second for all children aged 0 to 60 months (including the sub-group), suggests that children during the weaning period (6 to 36 months) are slightly more more likely to malnourished than those in other age groups. For the first three indicators, weight-for-height, height-for-age and weight-for-age, the differences are small, and in the case of height-for-age the cummulative percent malnourished are not significantly different (51.5% versus 52.2%); arm circumference, however, shows a very significant difference between the weaning group and the inclusive group (26.5% versus 17.3% cummulative percent malnourished). Overall, the data show a trend toward a greater degree of malnourishment in the weaning group, supporting the assertion that the weaning period is the most nutritionally vulnerable.

Comparison of the DSA subgroup with the CFNPP data (columns 1 and 3) for weight-for-height and arm circumference support the conclusions of Schnepf (1991) for the weaning period agegroup and suggest a worsening situation since 1987 when the CFNPP data were collected. All percentages of malnourished are higher for 1991-92 data, and the mean z-score for weight-for-age is lower for the more recent data.

Comparison of the entire DSA sample (column 2; ages 0 to 60 months) with the ENBC data (column 4; ages 0 to 72 months) shows somewhat contradictory results. Percentages moderately and severely malnourished according to weight-for-height suggest a slightly worsening situation over the ten years since the ENBC study, but the lower mean z-score for the ENBC study contradicts this conclusion. Similarly, the height-for-age data record a much higher percentage of cases of moderate stunting ten years ago (33.7% for ENBC versus 27.2% for 1991-92), but the more recent DSA data show a much greater percentage for severe stunting and a 38% increase in the cummulative percentage of cases exhibiting stunting (from 37.7% in 1982-82 to 52.2% in

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[4] See p.26 in: Schnepf, R.D. 1991. Understanding the Health and Nutritional Status of the Children of Rwanda. Monograph 13. Ithaca, N.Y.: CFNPP.

Table 1.9

Comparison of Anthropometric Data for Rural Rwanda

Study	DSA (1992)	DSA (1992)	CFNPP (1987)	ENBC (1982-83)
Age range	6-36 Months	0-60 Months	6-36 Months	0-72 Months
Sample size	N=968	N=1939	N=1328	N=276
Weight-for-height				
Moderate	5.8%	4.1%	-	2.8%
Severe	1.4%	1.1%	-	0.2%
Cummulative	7.2%	5.2%	-	3.0%
Mean z-score	- 0.18	-0.01	-	-0.19
Height-for-age				
Moderate	28.4%	27.2%	-	33.7%
Severe	23.1%	25.0%	-	4.0%
Cummulative	51.5%	52.2%	-	37.7%
Mean z-score	-2.02	-2.04	-	-1.87
Weight-for-age				
Moderate	24.8%	22.3%	20.3%	29.4%
Severe	8.6%	6.3%	3.6%	4.0%
Cummulative	33.4%	28.6%	23.9%	33.4%
Mean z-score	-1.50	-1.33	-0.96	-1.33
Arm circumference (MUAC)	(13-36 months)	(12-60 months)	(13-36 months)	
% < 12.5 cm	6.4%	4.3%	6.5%	-
% 12.5 - 13.5 cm	20.5%	13.0%	14.8%	-
Cummulative	26.5%	17.3%	21.3%	-

1991-92). The weight-for-age data follow the pattern of the height-for-age data: lower percentages of underweight in the "moderate" and "cummulative" categories of the more recent data, but a higher percentage of severe underweight for the latter. Also, the mean z-scores for the two studies are identical at -1.33%. No arm circumference data are available for the ENBC survey.

Superficially, the results of the three studies appear to be contradictory: comparison of the DSA results from 1991-92 with those of the CFNPP survey of 1987 show a worsening nutritional situation for children, but the comparision of the former study with the ENBC of 1982-83 are ambiguous, suggesting in some respects a worsening situation, in others an unchanged or even improved situation. However, several factors lead to the ultimate conclusion that the DSA survey is reliable and correct in presenting a worsening nutritional situation for children in Rwanda: a much smaller sample size for the ENBC survey (276 cases versus 1939 for DSA and 1328 for CFNPP) reduces its reliablity; only one indicator (weight-for-age) suggests an "improved" situation today when compared to ten years ago, and this conclusion is undermined by the theidentical mean z-scores for this indicator; and the consistency with which the comparison of the DSA and CFNPP data show a worsening situation.

I. Anthropometric Indicators for Rural Mothers

Tables 2.1, 2.2 and 2.3 present basic anthropometric data for women in the sample who were already mothers and under 50 years of age at the time of the interview, non-pregnant and pregnant, by prefecture. As indicated by its title, Table 2.3 provides the same data for an important subset of the pregnant mothers, those in their second or third trimester of pregnancy. The indices used are body mass index (BMI), weight (kg), height (cm), and left arm circumference.

At the national level, there is no significant difference between pregnant and non-pregnant women for the arm circumference measure, and very little difference in weight. In industrialized countries a weight gain of between 5.5 and 8.0 kg during pregnancy is recommended[5], but pregnant mothers in Rwanda are on average only 2 kg heavier than their non-pregnant counter-parts, and even women in the second and third trimesters are only 3 kg heavier. This extremely low maternal weight gain greatly increases the likelihood of maternal mortality and of low infant birth-weight.

At the prefecture level, a pattern similar to that seen among the children is found: non-pregnant mothers in the northern

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[5] Institute of Medicine, National Academy of Sciences (US). Nutrition During Pregnancy. National Academy Press, Washington, D.C., 1990.

prefectures of Gisenyi (57.3 kg) and Ruhengeri (56.2 kg) are significantly above average in weight, whereas women in the south are generally below average with Cyangugu (51.4 kg) in the last position. Arm circumference for this group also shows women in Gisenyi (25.9 cm) and Ruhengeri (25.6 cm) in the most favorable position, and another southern prefecture, Butare (23.9 cm), in the last position.

Among all pregnant women (Table 2.2), Ruhengeri leads again with a mean weight of 64.6 kg[6] for its' 15 cases, approximately eight kilos above the national average for all pregant women followed by Kibuye (58.5 kg) and Gisenyi (57.1 kg). Kibungo, in the lowland southeast, takes the last position with 51.8 kg, and actually shows a decline of 2 kg from the mean non-pregnant weight. The standard deviation for the Kibungo average is the lowest of all the prefectures (3.87), implying that this anomalous weight loss is related to seasonal or environmental factors specific to the area rather than to interviewer error. Overall the weight results are corroborated by the arm circumference data.

Body mass index (BMI)[7] is a nutritional status indicator for adults analogous to weight-for-height for children, with a value of less than 18.5 for a non-pregnant female indicating chronic energy deficiency. Table 2.1 shows that the mean BMI for non-pregnant mothers in Rwanda (22.4) is well above that threshold point, suggesting that few Rwandan women experience chronic energy deficiency. This figure also compares favorably with those of other African countries: mean BMI values for similar women in Burkina Faso (20.5), Kenya (21.3), and Senegal (21.1)

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[6] Since the same scale was used to weigh both pregant and non-pregnant women, it is unlikely that equipment error is the cause of this high average. Comparison of the weight and height data for Ruhengeri revealed two cases with both above average height and weight, but neither case was so extreme that the data could be unequivacably considered in error. However, calculation of the prefectoral average for weight of pregnant women without these two cases (n=12) gives a mean weight of 62.5 kg suggesting that the high average weight is in large measure an artifact of the small number of cases under consideration (n=15 after weighting), with the possibility of some error in data collection. Analysis of subsequent data collections will, over time, provide more reliable information on all indices. Regardless of the possibility of error in the Ruhengeri data for this variable, the conclusion that women in the northern region of Rwanda have, on average, a higher weight gain during pregancy than their southern neighbors is unchanged.

[7] weight/height^2 (kg/m^2)

Table 2.1

Anthropometric Data for Mothers Under 50 Years

Non-pregnant Mothers, by Prefecture and Nationwide

Prefecture	Body Mass Index		Weight (Kg)		Height (Cm)		Left arm circumference		Cases
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Valid N
Butare	21.67	2.25	53.21	7.09	156.54	5.97	23.9	2.6	126
Byumba	22.89	2.96	54.31	7.81	154.09	7.66	25.4	2.2	111
Cyangugu	21.64	3.41	51.38	7.69	154.09	5.90	24.4	2.2	62
Gikongoro	23.37	2.74	53.16	6.52	150.92	6.66	24.2	2.1	70
Gisenyi	23.47	2.84	57.32	8.02	156.23	6.46	25.9	2.6	101
Gitarama	21.83	2.79	52.33	6.65	154.95	6.41	24.7	2.1	134
Kibungo	21.79	2.76	53.90	8.06	157.17	6.68	24.7	2.4	83
Kibuye	22.33	2.66	54.95	7.23	157.34	5.97	25.2	2.3	59
Kigali	22.31	2.74	54.74	7.94	156.55	5.86	25.5	2.7	147
Ruhengeri	23.15	2.54	56.16	7.11	155.69	5.85	25.6	2.4	127
Rwanda	22.44	2.81	54.26	7.57	155.49	6.53	25.0	2.5	1021

Table 2.2

Anthropometric Data for Mothers Under 50 Years

All Pregnant Mothers, by Prefecture and Nationwide

Prefecture	Body Mass Index		Weight (Kg)		Height (Cm)		Left arm circumference		Cases
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Valid N
Butare	22.56	2.26	54.61	5.79	155.65	5.83	24.0	1.5	15
Byumba	22.98	1.81	54.93	6.37	154.49	6.70	24.1	1.2	11
Cyangugu	22.58	2.59	54.39	7.54	155.03	3.70	24.3	1.7	16
Gikongoro	23.96	2.65	52.74	4.97	148.60	5.76	23.9	1.8	15
Gisenyi	23.30	2.73	57.10	9.03	156.28	6.31	24.9	2.3	31
Gitarama	22.76	3.19	55.35	5.65	156.39	7.14	24.1	2.1	18
Kibungo	21.31	1.91	51.81	3.87	156.04	3.41	23.3	1.5	15
Kibuye	23.71	2.04	58.48	6.72	156.96	6.51	25.0	1.6	20
Kigali	23.61	3.35	56.66	10.17	154.61	5.73	24.9	2.9	21
Ruhengeri	25.45	2.28	64.62	9.65	159.01	8.32	26.3	2.4	15
Rwanda	23.25	2.71	56.25	8.00	155.44	6.43	24.6	2.1	178

Table 2.3

Anthropometric Data for Mothers Under 50 Years

Second and Third Trimester Pregnant Mothers, by Prefecture and Nationwide

Prefecture	Body Mass Index		Weight (Kg)		Height (Cm)		Left arm circumference		Cases
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Valid N
Butare	23.32	1.74	57.58	5.09	157.17	5.39	24.0	1.6	7
Byumba	23.86	1.44	58.28	5.76	156.21	7.16	23.7	1.3	7
Cyangugu	22.73	2.85	55.32	8.29	155.81	3.96	24.5	1.5	9
Gikongoro	24.28	2.20	53.74	4.20	148.97	6.14	24.2	2.0	9
Gisenyi	23.19	2.40	57.22	9.55	156.64	6.69	24.5	1.8	15
Gitarama	23.26	3.32	55.89	5.75	155.49	7.16	24.0	2.2	14
Kibungo	21.02	1.72	50.95	3.76	155.78	3.15	22.8	1.4	11
Kibuye	23.95	2.19	59.70	6.47	157.84	5.60	24.7	2.0	12
Kigali	23.22	3.05	56.26	7.80	155.64	4.20	24.3	2.0	14
Ruhengeri	26.01	2.05	66.90	8.78	160.19	8.63	26.8	2.4	12
Rwanda	23.48	2.66	57.29	7.90	156.13	6.36	24.4	2.1	109

are at least one kilo lower.[8] As would be expected, mean BMI for all pregnant women (23.25) is above that for non-pregnant women (22.44), but the BMI for women in the second and third trimesters of pregnancy, when weight gain should be greatest, is only slightly higher at 23.48. These results indicate that on average, food intake during pregnancy does not increase to levels sufficient to safeguard the health of either the pregnant mother or the fetus

III. Feeding Patterns

Child nutrition and health experts generally agree that with few exceptions, exclusive breastfeeding is the most desirable feeding regimen for all infants during the first six months of life: Breast milk is by nature perfectly adapted to the nutritional needs of the child, and since it requires no preparation, the likelihood of bacterial contamination is slight.

The exclusivity of breastfeeding is a key aspect of this regimen: Not only does it reduce the likelihood of illness from water or food born bacteria, it also maximizes the nutritional efficiency of the childs' diet. Because breastmilk is the best adapted and most complete nutrient for a child during this early period, the addition of other liquids or foods, even water, to the feeding regimen reduces the space available for breastmilk and thereby reduces the overall nutritional efficiency of the child's diet. Provided sufficient access to the mother, an exclusively breastfed infant therefore receives a nutritionally well-balanced diet, with sufficient calories, and with a low incidence of illness.

Tables 3.1 and 3.2 summarize data collected on infant and child feeding habits in this study. Although the 91% of Rwandan children are reportedly breastfed up to the age of two years (Table 3.2), the percentage of infants exclusively breastfed during the first six months of life is considerably lower at 74 percent. This average for the 0-5 month age group is somewhat misleading; closer examination of the data reveal that at five months only two-thirds (64%) of infants are exclusively breastfed, and that the average drops precipitously to 34 percent by the end of the seventh month.

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[8]K. Krasovec and M.A. Anderson. Maternal Nutrition and Pregnancy Outcomes: Anthropometric Assessment. Scienfific Publication No. 529, Pan American Health Organization, 1991.

Table 3.1

Percent of Children Exclusively Breastfed, by Age Group

N=1939

Age in Months	Number of children	Excludively breastfed
0-5	179	73.9%
6-11	190	16.8
12-23	357	3.1
24-35	380	.6
36-47	422	.7
48-60	412	0.0

Table 3.2

Percent of Children Consuming Each Food Yesterday, by Age Group

N=1939

Age in Months	Number of children	Breastmilk	Other Liquids	Water given by mother	Semi-solids	Solids
0-5	179	99.5%	9.9%	6.9%	12.4%	4.3%
6-11	190	97.0	28.7	19.0	42.6	57.0
12-23	357	90.8	37.3	51.6	41.5	90.4
24-35	380	53.5	43.4	65.5	36.7	96.3
36-47	422	25.7	41.9	76.7	36.1	98.6
48-60	412	6.3	38.0	76.4	34.6	97.9

IV. Food Security Indicators

Food security is here defined as 'physical and financial access to food in sufficient quantity and in an acceptable form at the household level for all members of a household during all seasons of the year.' The information contained in the following tables indicates that this was not the case for the approximately 40% of rural Rwandan households that reported having at least one month of insufficient food resources during the 12 months preceeding December 1991 and January 1992. Tables 4.1 through 4.4 list food security indicators by household, month and prefecture.

Table 4.1 Number of Months of Food Insecurity Reported

Among the 1287 households in the sample, 521 (40.5%) reported at least one month of food insecurity, with the modal number of months being two to three.

Table 4.1

Number of Months of Food Insecurity Reported

by Household

Number of Months	Frequency	Percent
None	766	59.5%
1 month	60	4.7%
2 months	132	10.3%
3 months	126	9.8%
4 months	79	6.2%
5 to 8 months	81	6.3%
9 months or more	43	3.3%
Number of households	1287	100.0%

Table 4.2

Frequency of Citation, Months of Food Insecurity

(N=1287)

Month	Frequency	Percent of Households
January	61	4.7%
February	77	6.0%
March	108	8.4%
April	178	13.9%
May	150	11.7%
June	100	7.8%
July	89	6.9%
August	95	7.3%
September	152	11.8%
October	207	16.1%
November	212	16.4%
December	83	6.4%

Table 4.2 Frequency by Month

The most frequently cited months of household food shortage occur in two groups, September through November and April through May, and each period immediately preceeds a major bean harvest. The Season A harvest tends to begin sometime in December and continues into February, while the Season B harvest usually begins in June, continues through July and overlaps with the annual sorghum harvest in July and August. As Table 4.2 indicates, the most difficult months for most households are October and November, which are each cited by approximately 16% of all households.

Tables 4.3 and 4.4 Household Responses to Food Insecurity

Table 4.3 lists, in order of importance, the ways in which households which reported some food insecurity tend to respond to their periods of food shortage. Note that the responses are not mutually exclusive.

Table 4.3

Household Responses to Food Insecurity

(N=521)

Reponse	Frequency	Percent
1) Early harvest	392	75.1%
2) Fewer meals	374	71.7%
3) Look for off-farm employment	287	55.1%
4) Consume seed reserves	233	44.8%
5) Sell household or personal goods	165	31.6%
6) Borrow food from neighgors	140	26.8%
7) Seek food aid from Commune	46	8.9%
8) Send children to grandparents	43	8.2%
9) Sell land	38	7.3%
10) Seek food aid from church	37	7.0%
11) Withdraw children from school	29	5.6%
12) Some adults leave household	28	5.5%
13) Seek food aid from other sources	22	4.2%

By far the most important responses for all households nationwide are early harvest and eating fewer meals, cited by 75% and 72% of all food-insecure households, respectively. Next in importance are off-farm employment (55%) and the consumption of seed reserves (45%), followed by sale of personal or household goods other than land (32%) and borrowing food from neighbors (27%). All other responses were cited by less than 9% of concerned households nationwide.

Table 4.4 compares these responses by prefecture. In all prefectures, the most frequent response is either early

Table 4.4

Household Responses to Food Insecurity by Prefecture

(N=521)

Reponse / Prefecture	Rwanda	Butare	Byumba	Cyangugu	Gikongoro	Gisenyi	Gitarama	Kibungo	Kibuye	Kigali	Ruhengeri
1) Early harvest	75.1%	73.6%	83.1%	88.8%	78.7%	69.8%	80.7%	93.3%	60.2%	67.6%	74.4%
2) Fewer meals	71.7	90.8	58.8	95.0	32.6	73.0	62.9	66.1	86.4	72.0	86.5
3) Off-farm employ.	55.1	57.6	69.7	44.5	70.4	53.8	49.3	13.5	50.6	38.8	59.7
4) Eat seed reserve	44.8	17.6	62.4	17.9	49.8	38.4	77.6	20.5	5.5	49.5	55.4
5) Sell hh goods	31.6	38.2	34.0	31.4	19.4	33.2	40.2	38.9	40.2	17.5	23.9
6) Food-neighbors	26.8	23.0	35.9	48.3	12.7	39.9	35.5	0.0	28.5	6.8	23.9
7) Food-commune	8.9	15.5	4.0	11.2	24.4	1.1	16.4	0.0	0.0	0.0	4.0
8) Chldrn->grndprnt	8.2	0.0	12.2	13.4	1.6	6.9	8.7	0.0	23.0	2.3	12.9
9) Sell land	7.3	6.3	17.3	5.8	7.7	6.9	1.3	0.0	8.4	9.7	5.3
10) Food-church	7.0	4.1	0.0	5.5	30.8	0.0	8.9	0.0	13.1	2.5	1.0
11) W/d school	5.6	3.3	13.7	0.0	5.8	3.0	4.2	0.0	12.0	6.2	1.3
12) Adults leave	5.5	6.4	10.7	0.0	4.1	1.3	3.5	0.0	11.6	2.5	6.7
13) Seek other aid	4.2	2.1	3.2	5.8	3.9	0.0	15.0	0.0	5.0	0.0	0.0
Number of Households	521	76	62	22	53	51	84	7	49	56	62

harvest or fewer meals, although which response is most frequent varies across prefectures. This may be related to the type of crop predominant in a region or farm-size stratum: because sweet potatoes and manioc are harvested year round and can be stored in the ground, "early harvest" may not be a valid response for some households.

Examination of the data within prefectures shows significant variation in the predominance of different responses and emphasizes the degree to which the availability of options varies by region and influences their selection by food-insecure households. Households in Butare, for example, are almost as likely to choose option (7) "seek food from the Commune" (16%) as they are to select (4) "eat seed reserves" (18%), whereas at the national level consumption of seed reserves is a far more important response (45%). This suggests the existence of communal administrations that are perhaps more oriented toward the distribution of food aid than are the administrations of other prefectures.

Similarly, food-insecure households in Byumba show a higher than average propensity to sell land in order to cover food shortages, probably reflecting that prefecture's larger average farm size.

Gitarama shows a much higher than average propensity to consume seed reserves (78% of households versus 45% at the national level), and to seek aid from the Commune or other sources.Kibuye households show the lowest tendency to consume seed reserves (5.5%), but a very strong tendency to send children to their grandparents when food shortages occur (23%). These households also have a much greater liklihood of seeking food aid from churches (13%), withdrawing children from school (12%), and having extra adults leave the household (12%) when food is short.

Most notable in Ruhengeri is a higher than average tendency to send children to live with their grandparents during periods of food shortage.

IV. Summary

There appears to be little acute malnutrition in Rwanda, but the children's anthropometric data indicates very high levels of chronic malnutrition, manifested as stunted growth, and a significant degree of insufficient weight at the national level. Although all regions show high levels of chronic malnutrition, the northern region shows lower levels of malnutrition in general for both children and mothers.

The anthropometric data for Rwandan women compares favorably with that for women in other African countries, but the indices for pregnant women as a group are unfavorable. The data indicate that maternal weight gain is extremely low,

greatly increasing the likelihood of maternal mortality and of low infant birth-weight.

Although approximately 91% of Rwandan children are breastfed up to the age of two years, the percent who are exclusively breastfed between 0 and 5 months is only 74% on average, with only 64% exclusively breastfed by the sixth month. Since the fifth and sixth months can be considered an acceptable period for the beginning of weaning, this information is not in itself troubling. The problem lies with the rapid introduction of solids as the predominant weaning food after the sixth month.

Fully 40 percent of all rural households experience one month or more of food insecurity, usually during the pre-harvest periods of October-November and April-May. Although household responses to this situation vary, the most frequently cited were early harvesting of crops and reduction in the number of meals or quantity of food consumed on a daily basis.