AFRICA NUTRITION

Nutrition and Health Status Of Young Children in Niger

Findings from the 1992 Niger Demographic and Health Survey

U.S. Agency for International Development
AFR/ARTS and R&D/N

Macro International Inc.

Food Security and Nutrition Monitoring Project

Nutrition and Health Status of Infants and Young Children in Niger

Findings from the 1992 Niger Demographic and Health Survey

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August 1993

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ACRONYMS

CDC	Centers for Disease Control
CDD	Control of Diarrheal Disease
EA	Enumeration Areas
FAO	Food and Agriculture Organization of the United Nations
GNP	Gross National Product
MAG/EL	Ministère de l'Agriculture et de l'Elevage (Ministry of Agriculture and Livestock)
NCHS	National Center for Health Statistics
NDHS	Niger Demographic and Health Survey
OAU	Organization of African Unity
OPVN	Office des Produits Vivriers du Niger (Niger Board of Food Crops and Buffer Stocks)
ORT	Oral Rehydration Therapy
ORS	Oral Rehydration Solution
OSEM	Office et Sociétes d'Economie Mixte (Multi-Economic Company's Board)
PMI	Protection Maternelle et Infantile (Maternal and Child Health)
RHF	Recommended Home Fluid
RINI	Office du Riz du Niger (Niger Rice Board)
SD	Standard Deviation
TDCI	Troubles Dûs à la Carence en Iode (Iodine Deficiency Disorders)
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children Fund
USAID	United States Agency for International Development
USDA/ERS	United States Department of Agriculture/Economic Research Service
WHO	World Health Organization

ACKNOWLEDGMENTS

The completion of this report was made possible with the assistance of a number of people. Special thanks is due to Monique Barrère for the translation. Thanks are also due to Aylene Kovensky and Kaye Mitchell for producing the report.

SUMMARY

The 1992 Niger Demographic and Health Survey (NDHS), a nationally representative survey, provides information on the nutrition status of Nigerien children between the ages of 1 and 59 months at the national, regional, and urban/rural levels. Overall, 33 percent of children are stunted, 37 percent are underweight, and 16 percent are wasted. Both chronic and acute undernutrition are significantly higher in Maradi than in Dosso, Tahoua/Agadez, Tillabéri, and Zinder/Diffa. Chronic undernutrition is also higher in rural areas and other urban areas than in Niamey.

Infant and child feeding practices are far from optimal and result in increased levels of undernutrition soon after birth. The prevalence of stunting increases dramatically through 24 months of age where it peaks at over 50 percent. Thereafter it remains at over 45 percent through the age of 4 years. Wasting also rises rapidly in infancy and remains at over 30 percent among children age 12 to 24 months before declining to around 10 percent. These results show that growth in both height and weight is noticeably retarded up to the age of 24 months and that further deterioration in nutritional status does not occur after this age. Indeed, there is an improvement in acute, but not chronic, nutritional status among the older children.

Breastfeeding is begun very late in Niger: only 30 percent of infants are put to the breast within 24 hours of birth. Mothers in Maradi, Zinder/Diffa and, to a lesser extent, Tahoua/Agadez, are the most likely to delay the initiation of breastfeeding beyond 24 hours.

A high proportion of infants are fed complementary liquids and solids within the first two months of life. Less than 1 percent of infants are exclusively breastfed for the first 4 months of life, which is the optimal infant feeding practice recommended by the World Health Organization (WHO).

Although almost all infants receive water and other liquids too early, a sizeable proportion of infants are also given complementary solid foods too late. The WHO recommends that breastfed infants should begin receiving complementary solid foods between 4 and 6 months of age. In Niger, however, about 3 percent of infants age 6 to 9 months are already fully weaned and nearly 20 percent of the breastfed infants in this age group are not receiving complementary solid foods.

Only 3 percent of infants in Niger under 12 months of age are fed using a bottle.

About one in three children under the age of 5 years has a recent history of diarrhea, nearly one in two had fever recently, and nearly one in four had a cough. Morbidity levels are very high soon after birth with patterns closely following those for undernutrition. The prevalence of diarrhea, fever, and cough increases with age and remains high through age 24 months. There are no urban/rural differences in the age-specific prevalence of diarrhea but children in Maradi and Zinder/Diffa and in Dosso and Tahoua/Agadez are more likely to have diarrhea than children in Tillabéri (over 40 percent and between 25 and 33 percent, respectively).

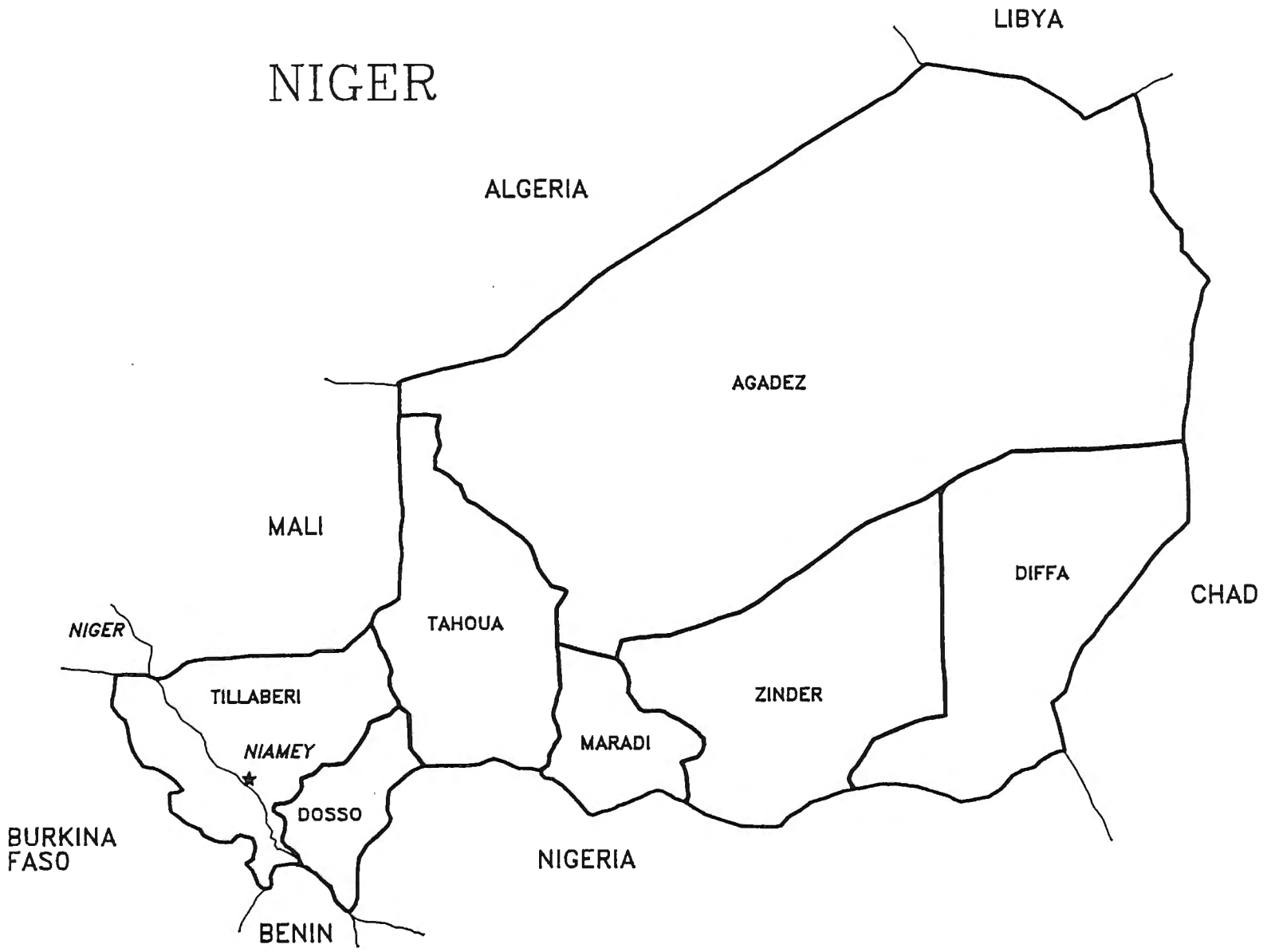
The overall prevalence of nightblindness among children age 24 to 59 months is 2.6 percent, which is almost three times the level deemed by the WHO as being of public health significance. Multivariate analyses showed that the risk of nightblindness is highest in Dosso and lowest in Tahoua/Agadez.

Multivariate analyses also show that undernutrition is largely determined by the child's age, size of the child at birth, exposure to diarrheal disease, and factors generally associated with poverty.

In comparison with data from the 1985 national nutrition survey, the 1992 NDHS data indicate that although stunting has declined by 5 percent, underweight by 18 percent, and wasting by 26 percent, the levels of undernutrition remain unacceptably high. Stunting declined very slightly in rural areas, but increased in urban areas. Underweight fell in rural areas, but increased in urban areas. Wasting, on the other hand, fell in both urban and rural areas during the 7-year period. It is pertinent to point out that the 1985 survey was conducted during a severe drought when the levels of the weight-related indicators would be expected to be higher than in a non-famine situation. The fact that chronic nutritional status in urban areas appears to have deteriorated suggests that the economic situation in urban areas is declining and is manifested in poor child growth.

Efforts to alleviate undernutrition in Niger need to focus on the first three years of life, when undernutrition has its greatest effect on Nigerien infants and children and mortality rates are highest. In particular, public health efforts need to work towards:

- Promoting the initiation of breastfeeding immediately after birth.
- Increasing the duration of exclusive breastfeeding through 4 to 6 months of age.
- Increasing the number of infants receiving complementary solid foods at the appropriate time.
- Informing mothers about proper regimens for children.
- Improving both personal and food hygiene so as to reduce the risk of pathogen contamination from food.
- Educating parents about the importance of good intra-household food distribution.


NIGER
LIBYA
ALGERIA
AGADEZ
MALI
TAHOUA
DIFFA
CHAD
NIGER
TILLABERI
ZINDER
NIAMEY
MARADI
DOSSO
BURKINA FASO
NIGERIA
BENIN

Chapter 1

INTRODUCTION

1.1 GEOGRAPHY AND POPULATION

The Republic of Niger, a landlocked state on the southern edge of the Sahara in West Africa, comprises seven "departments" (regions) and covers 1,267 million square kilometers (see map of Niger, page xvi). The country is a vast peneplain dominated by three highland ranges: the Termit Massif in the East and the Aïr and Djado Massifs in the North. The highest point (2022 m) is Mount Greboun, which is part of the Aïr Massif. Niger has one permanent source of water, namely the Niger River, which extends for 550 km in the southwest. Lake Chad, common to Niger, Tchad, Cameroon, and Nigeria, lies in the South East of the country.

According to the 1988 census (Ministère de l'Economie et des Finances, 1992c), the current population is estimated to be 8 million people and growing at the rate of 3.3 percent per year; 5 percent in urban and 3 percent in rural areas. Eighty-five percent of the population is rural, of which less than 4 percent are nomads. Most of the nomads reside in Tillabéri, Tahoua, and Zinder where they account for a small proportion of the total population. Twenty-one percent of the population, or 1.54 million, are children under age 5. Overall, the population density of 5.7 people per square kilometer is low; the least dense areas are the desert regions of Agadez and Diffa, where there are fewer than 1.5 people per square kilometer, and the most dense areas are the agricultural areas of Maradi and Dosso with 30 to 33 people per square kilometer. Rural-urban migration is increasing, particularly in Agadez, Diffa, and Tillabéri largely because people can no longer survive in the inhospitable Sahara desert.

The majority of the Nigerien population resides in the South of the country, along the Niger Nigeria border, and along the Niger River. There are eight ethnic groups. The most numerous are the Hausa (53 percent) and the Djerma (21 percent) followed by the nomadic Touareg and Peulh (20 percent each). Smaller ethnic groups include the Kanouri/Manga (5 percent), who live in the South East, and the Toubou, Arabe, Gourmatche, and Mossi (collectively 1 percent). Nearly all Nigeriens are Muslims.

1.2 CLIMATE AND ECONOMY

The climate is tropical, and the year is divided into a short rainy season (June to October) and a dry period (November to May). Although the range of temperatures is greatest in the northeast, most parts of the country experience high temperatures, about 40 degrees Centigrade, in the hot season (February to May) and low temperatures, between 12 and 15 degrees Centigrade, during the coldest months (December and January). Precipitation varies according to latitude: the northern desert receives almost no rain, whereas enough rain falls in the area south of Goure (400 mm) and in North Tahoua to support herding: In the south, rainfall is adequate (560 mm) for settled agriculture. Further west, along the Niger River and south of the Sahel, open savannah with scattered trees predominates.

The economy is based on subsistence agriculture, animal husbandry, and exploitation of minerals (notably uranium). World Bank (1991) estimates show that agriculture and livestock contributed 36 percent, industry and manufacturing 21 percent, and services 51 percent to the Gross National Product (GNP) in 1989. Maradi is the economic center of the country, because of the importance of the agricultural sector. Production of peanuts, formerly the most important agricultural export, has declined. During the mid-1970s cotton cultivation was introduced in order to reduce dependence on a single agricultural export. The nomadic

peoples in north and central Niger practice animal husbandry, but their livelihood was adversely affected by drought in 1968-74 and again in 1984-85 and by the closing of the border with Nigeria, the chief market for Niger's beef, from 1984 to 1986. Hence the high rural-urban migration in Agadez.

Niger possesses important mineral resources, of which the most valuable is uranium. The uranium reserves in the northwestern district of Arlit (in Agadez) are among the largest in the world. Some cassiterite, gypsum, phosphate, salt, iron, tin, tungsten, and coal reserves also exist. In the late 1970s petroleum was discovered. Extraction of minerals for export is the leading industry. Manufacturing is limited to primary products - peanut oil and other processed foods, beer, cotton textiles, and cement.

Niger has a large foreign debt (US$ 248 million in 1988; UNDP, 1990). Furthermore, its heavy dependence on foreign aid is equivalent to 15 percent of the GNP. Thirty-five percent of the rural population lives below the poverty level. Indeed, per capita income was estimated to be US$ 310 in 1990, but the average annual GNP per capita growth rate fell by 4.5 percent between 1980 and 1990 (OAU/UNICEF, 1992). Less than one percent of the GNP is spent on health care, and only 4 percent is spent on education (UNDP, 1990).

1.3 FOOD PRODUCTION

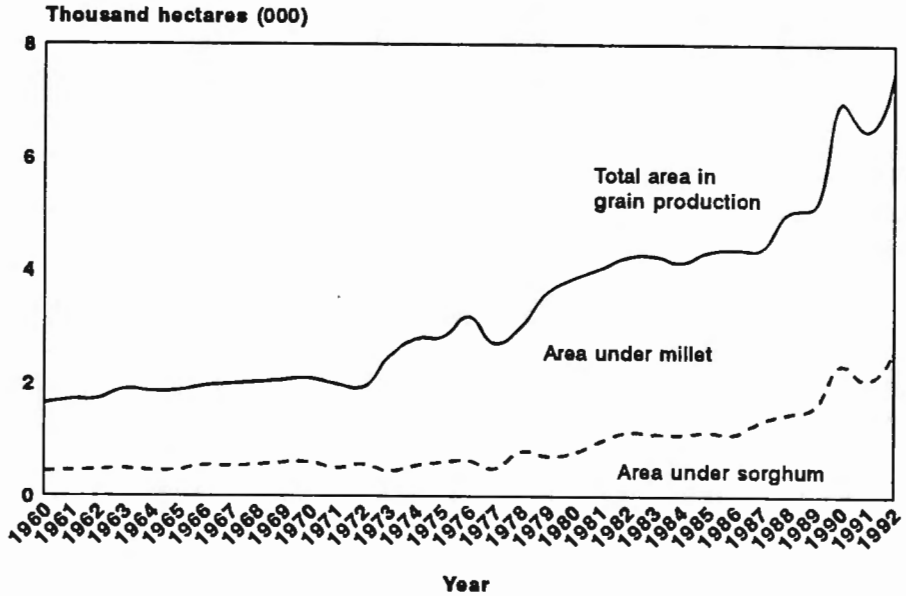
Although only about 3 percent of the total land area is cultivated with crops, nearly 90 percent of the labor force is engaged in agriculture. Overall, Maradi produces just under one-quarter of the country's millet and sorghum, Zinder and Tillabéri each produce one-fifth, and Dosso and Tahoua produce just under one-fifth. Diffa and Agadez, which are mostly desert, contribute less than two percent of the total cereal production.

Production of millet and sorghum, which are the major subsistence crops, has increased over the last 20 years (Figure 1.1), largely through extending the area under cultivation rather than increased yields. Apart from the drought years, there has been no noticeable increase in cereal imports[1] over the last 20 years and most of the cereal available for consumption is produced in the country (Figure 1.2). The 1991 average per capita consumption of cereals was estimated to be 227 kg per year, but there are large annual fluctuations (Figure 1.3). Deficits in cereal availability are partially compensated through food aid, the volume of which varies from year to year. For example, food aid imports in 1985 (a drought year) were 256.6 thousand metric tons but were only 27.9 thousand metric tons in 1988 (a relatively good year) (OPVN, 1991).

The only data available on food consumption are those for 1984-1986 (FAO, 1991). During this time, estimated average per capita availability of cereals was 237 kg per year, of which 70 percent (165 kg) was millet, 20 percent (47 kg) sorghum, 6 percent (14 kg) rice, 3 percent wheat (7 kg), and 1 percent maize (3 kg). Starchy roots (primarily cassava) and pulses also contribute to the diet but their availability (31 and 26 kg per year, respectively) and consumption are considerably lower than that of cereals. The availability of vegetables and fruits, important sources of vitamins, is limited at 23 and 20 kg per person per year, respectively. In contrast, the availability of milk is much higher, 44 kg per person per year.

[1] Officially, most of the imported rice, sorghum, and millet comes from Benin whereas wheat is imported mainly from Togo (Ministère du Transport et du Tourisme, 1993). There is, however, extensive informal trading in food commodities between Nigeria and Niger that are not included in the official statistics.

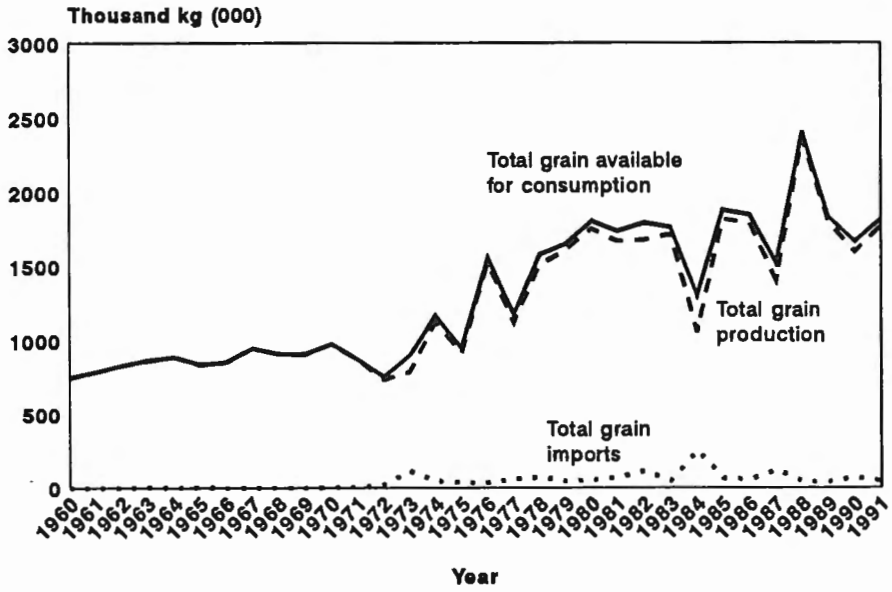
Figure 1.1
Area under sorghum and millet, Niger 1960-1992



USDA/ERS 1993; MAG/EL 1993

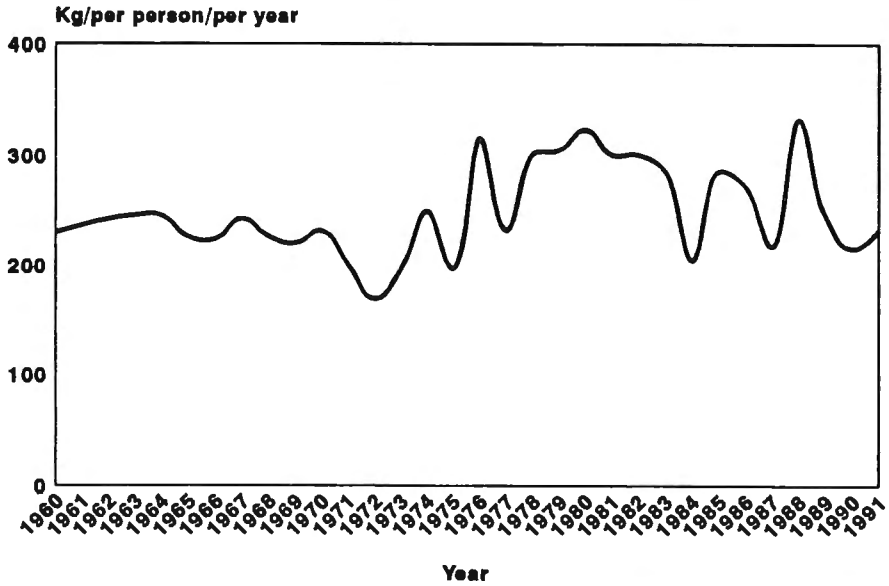
FAO (1991) estimates for 1984-1986 indicate that, on a per capita basis, the Nigerien diet meets 100 percent of energy requirements. However, there is evidence of large social and economic disparities (Sizaret and Paci, 1985). Average energy supply is estimated to be 2330 calories per person per day; 11 percent from protein, 14 percent from fat, and 75 percent from carbohydrate (FAO, 1991). Cereals and tubers contribute about 70 percent to total energy intake, pulses and nuts 12 percent, livestock and fish 6 percent, oils and fats 4 percent, sugar 3 percent, and vegetables and fruits less than 1 percent each. Diets are monotonous and nutritionally poor, as evidenced by the low fat component.

Figure 1.2
Total grain production and imports, and quantity available for consumption, Niger 1960-1991



USDA/ERS 1993

Figure 1.3
Annual per capita grain available for consumption, Niger 1960-1991



Ministère du Plan 1991; USDA/ERS 1993

1.4 FOOD MARKETS

There are three marketing networks for cereal and livestock products, namely:

- The informal sector, which is difficult to regulate.
- A semi-modern commercial sector dominated by Mahgrebians, Asians, and a handful of Nigeriens.
- A modern commercial sector dominated by multinationals and a number of members of OSEM (Multi-economic Offices and Companies), which include the Nigerien board of food crop products and buffer stocks (OPVN), the Nigerien rice board (RINI), the Sahel flour mills, the COPRO-NIGER, the livestock resource board (SONERAN), and a number of smaller private companies.

Throughout the country, markets for traditional crops are operated by the private sector. In theory the government fixes wholesale and retail prices for agricultural products once a year but price controls are not enforced. Thus, cereal markets are effectively not regulated and markets operate freely. However, the State intervenes in the market once a year when it sells, and replaces, one third of the OPVN buffer food stocks.

Niger's food economy is regionally integrated with that of its neighboring countries, namely Mali, Burkina Faso, Benin, and especially Nigeria. Because of the dependence on regional trade, it is difficult to implement agricultural price policies in Niger.

1.5 FOOD HABITS

The staple foods are millet and sorghum which are used to make a solid porridge, known as *tuwo*, or a gruel known as *fura*. Pulses and/or nuts are used in the sauces that accompany the staple. Consumption of fruits and vegetables is seasonal. Meat is rarely eaten in rural areas; consumption is higher in urban areas. Fish is only eaten along the banks of the Niger River and around Lake Tchad. Milk and sugar consumption varies by lifestyle and income level. Oil is used mainly in urban households.

Food consumption patterns in rural areas are largely determined by cropping patterns and the diet is based on subsistence production. Food intake varies considerably and is dependent on ecological and climatic conditions, both of which determine production levels. During the pre-harvest season, people voluntarily reduce their food intake anticipating that the rains may be late or even fail. Some areas, notably Agadez, are food-deficit areas. Indeed, Agadez produces only 10 percent of its requirements. Thus, people are dependent both on what is available in the market and on their income level.

Milk and millet are the staple foods for the nomadic Touareg and Peulh. Milk is the staple during the winter months and at the beginning of the dry season, whereas millet becomes a more important food during the dry season when milk becomes less available. As a result of the droughts of the last 20 years, many nomads have settled in rural areas and subsequently adopted rural food habits.

There has been a noticeable change in eating habits in urban areas, particularly in Niamey, over the last 20 years. Rice is now eaten at mid-day in about 90 percent of households in Niamey, but millet is still eaten at the evening meal (Gamatchié, 1989). In addition, mid-day meals are increasingly being eaten outside the home. Rice consumption in urban areas is estimated to be 77 kg per person per year (over one-third of the annual cereal intake), compared with only 7 kg per person per year in rural areas. Pulses, meat, and oils also figure more prominently in the urban diet. Because of differing dietary patterns, agricultural products contribute 82 percent to total energy intake in urban areas and 93 percent in rural areas. The active promotion of seasonal foods has also resulted in changes in the dietary patterns in urban areas with foods such as cauliflower, carrots, eggplant, and lettuce now more visible in the diet. There is, however, a need to sensitize rural people to use these seasonal foods.

1.6 NATIONAL FOOD AND NUTRITION POLICY

Niger is in the process of developing its national food and nutrition policy. Indeed, the document will soon be submitted to the Government for ratification. Once approved, an action-plan to implement the policies will be formulated by the Inter-ministerial Nutrition Committee based on the recommendations of the International Nutrition Conference[2] (FAO/WHO, 1992).

The major nutrition problems in Niger include protein-energy malnutrition, which is widespread; vitamin A deficiency, which is known to be a public health problem in Tahoua, Maradi, and Zinder; nutritional anemias, which affect between one-third and one-half of adult women; and iodine deficiency, which is found in specific areas along the River Niger, in Dosso, and along the Niger Nigeria border although the extent and magnitude of the problem remains unknown.

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[2] Held in Rome, Italy, between December 5th and 11th 1992.

A number of programs to eradicate nutritional deficiencies are currently being implemented. Among these, growth monitoring of children under 5 years and nutritional rehabilitation have been on-going for a long time in health centers. More recently, growth monitoring for children under 3 years has been implemented at the village level. Vitamin A programs, notably capsule distribution, promoting the production and consumption of vitamin A-rich foods and education on vitamin A, are being implemented in a number of districts in Tahoua and Maradi. Action plans to eliminate nutritional anemias and iodine deficiency are currently being prepared.

1.7 DATA SOURCE AND TYPE OF INFORMATION COLLECTED

The data sample for this report was drawn from the Niger Demographic and Health Survey (NDHS) conducted by the Direction de la Statistique et des Comptes Nationaux between March and June 1992.[3] The NDHS was a national sample survey designed to provide information on fertility and family planning among women of child-bearing ages as well as on the health and nutritional status of their children (0-59 months). A total of 6,503 women between the ages of 15 and 49 years from 5,242 households were interviewed. The NDHS sampling frame is described in Appendix A.

Full details of the NDHS sample and data collection procedures are given elsewhere (Alichina *et al.*, 1993). Briefly, information was collected on household characteristics such as type of housing; water supply; type of toilet facilities; the availability of electricity; type of transport owned; and ownership of a radio, television, etc. Information was also collected on the composition of the household, including the age, sex, and educational level of all household members. Characteristics of the NDHS sample used in this report are presented in Appendix B.

Detailed information was collected on reproductive behavior and intentions; knowledge and use of contraceptives; employment; marital status; husband's education and occupation; maternal health and use of health care facilities for individual women. Information was also collected on breastfeeding and infant feeding practices, child health, and vaccination status for children born in the previous five years. Standard anthropometric techniques (WHO, 1988), were used to measure the heights and weights of these children.

The survey was funded by the Nigerien government and the U.S. Agency for International Development with technical support from MACRO International Inc., Columbia, Maryland, U.S.A.

[3] Unless otherwise noted, all data presented in this report are from the sample of all living children under five years of age drawn from the 1992 Niger Demographic and Health Survey.

Chapter 2

BASIC INDICATORS OF NUTRITIONAL STATUS

Measures of weight and height in combination with age are used to determine nutritional status; three different indicators of nutritional status are commonly used. Stunting,[1] a failure to grow adequately in height in relation to age, reflects past or chronic undernutrition; it results from an inadequate intake of food over a lengthy period of time and is also affected by chronic illness. Wasting,[2] a failure to gain weight in relation to height, reflects recent or acute undernutrition; it results from a recent failure to receive adequate nutrition and is affected by both seasonal changes in food intake and acute illness, in particular diarrhea. Underweight,[3] or a low weight in relation to age, can be due to either chronic or acute undernutrition. The quality of NDHS nutrition data and anthropometric measurements are discussed in Appendix C.

In this chapter, the association between nutritional status and a number of nonbiological (geographic, social and economic) and biological (health and age-related) factors are examined.

2.1 LEVELS OF UNDERNUTRITION

The NDHS data show that 33 percent of all Nigerien children under five years[4] are stunted, 37 percent are underweight, and 16 percent are wasted (Figure 2.1). This means that one in three children is short and one in six is thin, which are fourteen and seven times, respectively, the levels expected in a healthy, well-nourished population.[5] Compared with the 1985 National Nutrition Survey for children age 6 to 59 months (Ministère de la Santé Publique et des Affaires Sociales, 1985), acute undernutrition has improved but there has been little improvement in the level of chronic undernutrition (Appendix D). Indeed, stunting has declined slightly from 38 to 36 percent, underweight has declined by 18 percent (from 49 to 40 percent), and wasting by 26 percent (from 23 to 17 percent). The improvement in the weight-related indices between 1985 and 1992 probably reflects the post-famine improvement in nutritional status.

The NDHS data show that nearly one-half of the stunted children are severely stunted. In addition, one-third of the underweight children are severely underweight and close to one-fifth of the wasted children are severely wasted (Table 2.1). In a healthy, well-nourished population only one in one thousand children is expected to be severely undernourished. The data for Niger indicate that the levels of severe stunting, severe underweight, and severe wasting are extremely high, 153, 123 and 31 times, respectively, that expected in a healthy well-nourished population. It is possible that the very high levels for severe undernutrition are

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[1] Stunted children are those whose height-for-age Z-score is more than 2 standard deviations below the median of the NCHS/CDC/WHO reference population.

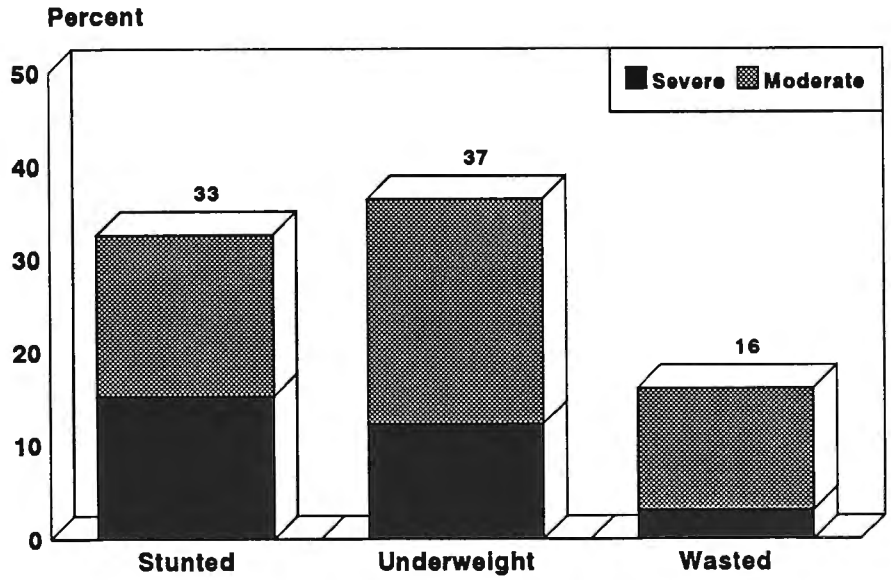
[2] Wasted children are those whose weight-for-height Z-score is more than 2 standard deviations below the median of the NCHS/CDC/WHO reference population.

[3] Underweight children are those whose weight-for-age Z-score is more than 2 standard deviations below the median of the NCHS/CDC/WHO reference population.

[4] Children born in the month of interview are excluded.

[5] In a healthy well-nourished population 2.2 percent of children are expected to be moderately undernourished and 0.1 percent severely so.

Figure 2.1
Undernutrition among children age 1 to 59 months, Niger



NDHS 1992

Table 2.1 Moderate and severe stunting, underweight, and wasting by region and residence

Among children age 1 to 59 months, the percentage moderately undernourished and the percent severely undernourished, by region and residence, Niger 1992

Region and residence	Stunted			Underweight			Wasted		
	Moderate[1]	Severe[2]	Number	Moderate[1]	Severe[2]	Number	Moderate[1]	Severe[2]	Number
Region									
Dosso	15.1	10.0	613	22.4	8.2	613	11.3	1.6	651
Maradi	21.9	21.5	658	29.2	19.2	658	15.7	4.4	835
Tahoua/Agadez	19.1	16.4	872	26.9	10.0	872	11.1	3.3	978
Tillabéri	14.2	8.8	933	21.0	9.0	933	13.4	2.2	1132
Zinder/Diffa	17.5	21.0	736	22.2	15.6	736	13.3	4.0	911
	p<0.001			p<0.001			p<0.001		
Residence									
Niamey	14.4	4.9	255	19.5	4.8	255	10.5	1.6	277
Other urban	19.1	10.1	483	26.2	5.9	483	9.6	2.3	523
Rural	17.4	17.0	3073	24.3	13.9	3073	13.6	3.4	3708
	p<0.001			p<0.001			p<0.02		
Overall	17.4	15.3	3812	24.2	12.3	3812	13.0	3.14	507

Note: Level of significance determined using Chi-square test.
[1]Between -2 and -3 standard deviations of the median of the NCHS/WHO/CDC reference population.
[2]Below -3 standard deviations of the median of the NCHS/WHO/CDC reference population.

exacerbated by age overstatement. The age-specific trend for severe undernutrition, however, follows that for moderate undernutrition and there is no reason to believe age misstatement is biased towards overestimating age.

Table 2.2 shows the nutritional status of Nigerien children based on the Waterlow Classification[6] (Waterlow, 1972). Six percent of children under age 5 are both wasted and stunted, which is 11 times the level expected in a healthy, well-nourished population. A further 27 percent of the children are stunted only and 10 percent are wasted only; together these are 15 times the level expected in a healthy, well-nourished population. Only 57 percent of the children are neither stunted nor wasted, which is 40 percent lower than the expected value.

Table 2.2 Waterlow classification[1] of nutritional status by region and residence

Among children age 1 to 59 months, the percentage both stunted and wasted, stunted only, wasted only, and neither stunted nor wasted, by region and residence, Niger 1992

Region and residence	Stunted and wasted	Stunted only	Wasted only	Neither stunted nor wasted	Number
Region					
Dosso	3.8	21.2	8.9	66.1	615
Maradi	8.0	35.1	9.8	47.2	664
Tahoua/Agadez	4.7	30.5	9.0	55.8	878
Tillabéri	4.0	18.7	13.3	63.9	942
Zinder/Diffa	7.3	30.6	10.1	52.0	748
		p<0.001			
Residence					
Niamey	2.5	16.7	9.3	71.5	257
Other urban	3.4	25.6	8.7	62.4	487
Rural	6.1	28.0	10.7	55.2	3103
		p<0.001			
Ensemble	5.5	26.9	10.4	57.2	3848

Note: Level of significance determined using Chi-square test.
[1]Below -2 standard deviations of the median of the NCHS/WHO/CDC reference population for height-for-age (stunting) and weight-for height (wasting).

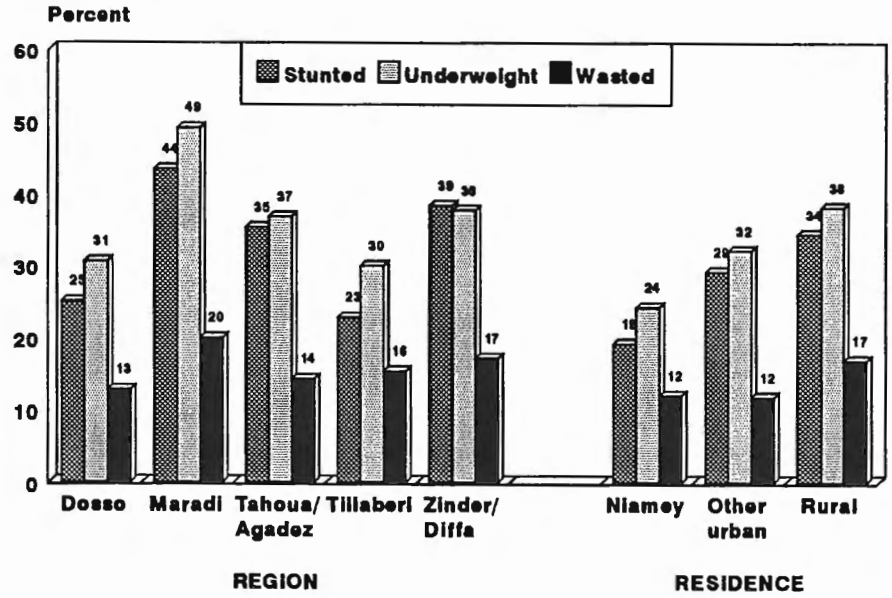
2.2 NONBIOLOGICAL FACTORS

Geographic Characteristics

There are noticeable regional differences in nutritional status (Figure 2.2). Undernutrition is highest in the Maradi region where about 45 percent of the children are stunted, 50 percent are underweight, and 20 percent are wasted.

[6] In a healthy, well-nourished population, it is expected that 97.5 percent of the children are neither stunted nor wasted, 2.5 percent are wasted or stunted, and 0.5 percent are both wasted and stunted.

Figure 2.2
Undernutrition among children age 1 to 59 months, by region and residence, Niger



NDHS 1992

Undernutrition is also associated with type of area of residence,[7] that is, whether children live in Niamey, other urban areas, or rural areas. Rural areas have the greatest proportion of stunted children and underweight children; Niamey the lowest (Figure 2.2). Levels of wasting are also higher in rural areas than in either Niamey or other urban areas.

There are an equal proportion of severely stunted children in Maradi and in rural areas, but more severely than moderately stunted children in Zinder/Diffa (Table 2.1). Severe underweight, severe wasting and the most severe form of undernutrition, i.e., being both stunted and wasted (Table 2.2), are also higher in these three areas than elsewhere. Severely undernourished children are at much greater risk of morbidity and subsequently death. Indeed, mortality rates are higher in Maradi, Zinder/Diffa, and rural areas than elsewhere; this is discussed in Chapter 4.

Compared with the data from 1985, residential pattems in nutritional status of children age 6 to 59 months have changed. Appendix D shows that, while the level of stunting has remained constant in rural areas, it has increased over 25 percent in urban areas. Underweight has declined by 20 percent in rural areas, but increased by nearly the same percentage in urban areas, and wasting has declined by 25 percent in rural areas but less than 15 percent in urban areas. These data suggest that acute but not chronic undernutrition has improved in rural areas during the last 7 years. In contrast, the level of acute undernutrition appears not to have changed in urban areas but the level of chronic undernutrition has increased.

[7] Area refers to the usual place of residence for visitors included in the survey.

Social and Economic Characteristics

Social and economic data collected by the NDHS and associated with undernutrition are presented in Tables 2.3.1 and 2.3.2. Children are less likely to be chronically undernourished if their parents have moved from their original place of residence. Maternal education and working in the informal sector are associated with lower levels of both chronic and acute undernutrition, indicating that income from women's work has a positive impact on a child's growth. The education and occupation of the mother's husband, however, only influence chronic undernutrition, suggesting a wealth effect.

A child of a young mother is more likely to be stunted than a child of an older mother. This probably indicates that younger mothers are less experienced in child care. Children from households where the mother is in a polygamous union are more likely to be chronically undernourished than those whose mothers are in a monogamous union. Children of the latter are also more likely to be undernourished than those whose mothers are not currently married. Husband's place of residence is also associated with chronic nutrition status; children from households where the husband resides with the mother tend to be more chronically undernourished than children from households where the husband is absent or the mother is currently not married. This may, in part, reflect that remittances that absent husbands, who are working elsewhere, send home have a positive impact on nutritional status.

Other indicators that reflect higher social and economic status are also associated with better nutrition. These include possession of appliances (possession score), ownership of a motor bike or car, piped water/private well or a toilet in the house, non-earth floors, an improved roof, and having a servant who can look after the child (Table 2.3.2). Many of these social and economic factors, however, not only interact with each other but also with region and residence; they are discussed further in Chapter 5.

Table 2.3.1 Stunting, underweight, and wasting by nonbiological factors

Percentage of children age 1 to 59 months who are stunted, underweight, and wasted, by nonbiological factors, Niger 1992

Nonbiological factor	Stunted	Underweight	Wasted
Length of residence			
<5 years	27.3	32.8	15.5
5 to 9	32.3	33.8	15.5
10 or more	29.7	35.5	16.0
Always	36.1	39.1	16.6
	p<0.001	p<0.02	NS
Mother's education			
None	33.6	37.1	16.7
Primary +	25.0	31.3	11.0
	p<0.001	p<0.05	p<0.002
Mother's occupation			
Petty trade	31.3	32.0	12.6
Cottage industry	25.9	32.8	19.0
Farmer	34.5	43.0	19.7
Housewife	33.7	36.9	15.6
	p<0.02	p<0.001	p<0.001
Husband's education			
None	33.6	37.8	16.4
Primary +	24.3	26.5	13.2
	p<0.001	p<0.001	NS
Husband's occupation			
Petty trade	25.5	31.9	15.3
Cottage industry	31.4	32.6	13.7
Farmer	34.5	38.2	16.7
	p<0.001	p<0.005	NS
Mother's age			
15 to 19	24.2	29.8	13.4
20 to 24	31.2	35.7	16.8
25 to 29	33.2	36.5	16.3
30 to 34	34.6	38.5	15.6
35 to 39	36.6	39.4	17.1
40 to 49	32.9	35.8	15.1
	p<0.01	NS	NS
In a polygamous union			
Yes	35.0	40.7	16.5
No	31.7	34.8	16.0
Mother not married	27.0	23.9	12.8
	p<0.05	p<0.001	NS
Husband lives at home			
Mother not married	27.0	23.9	12.8
Yes	33.7	37.1	16.0
No	21.9	34.6	19.4
	p<0.001	p<0.01	NS
Overall	32.7	36.5	16.1
Number	3812	3812	4507

Note: Level of significance determined using Chi-square test.
NS = Not significant.

Table 2.3.2 Stunting, underweight, and wasting by nonbiological factors

Percentage of children age 1 to 59 months who are stunted, underweight, and wasted, by nonbiological factors, Niger 1992

Nonbiological factor	Stunted	Underweight	Wasted
Possession score[1]			
0	33.8	38.1	17.4
1	33.9	36.4	14.8
2+	17.8	23.9	11.3
	p<0.001	p<0.001	p<0.001
Transport owned			
Motor bike/car	21.8	27.2	12.1
Bicycle/cart	28.9	36.3	15.8
None	33.7	37.2	16.3
	p<0.001	p<0.01	NS
Source of drinking water			
Private pipe/well	24.2	26.6	11.6
Public pipe	31.6	35.3	13.9
Public well	33.9	37.8	16.7
River/stream	27.4	33.5	15.2
	p<0.01	p<0.005	NS
Toilet at home			
Yes	26.1	29.7	13.5
No	34.3	38.2	16.6
	p<0.001	p<0.001	p<0.05
Type of floor material			
Cement/other	26.4	28.2	11.0
Earth/sand	34.1	38.3	17.0
	p<0.001	p<0.001	p<0.001
Type of roof material			
Corrugated iron/other	23.1	27.5	13.3
Mud	32.5	35.3	14.7
Straw	35.0	40.4	18.4
	p<0.001	p<0.001	p<0.005
Usual child caretaker			
Older siblings/husband	39.5	44.2	18.2
Relative/neighbor	32.0	40.5	17.2
Servant/other	14.0	27.2	10.7
Mother takes to work	30.5	34.2	16.6
Mother does not work	33.8	36.9	15.6
	p<0.005	p<0.05	NS
Overall	32.7	36.5	16.1
Number	3812	3812	4507

Note: Level of significance determined using Chi-square test.
NS = Not significant.
[1]Score of one for availability/ownership of electricity, radio, television or refrigerator.

2.3 BIOLOGICAL FACTORS

Health Characteristics

The sex of a child is not associated with undernutrition. However, children reportedly born small or very small at birth are at greater risk of being chronically undernourished and acutely undernourished than those born of an average or large size (Table 2.4). In addition, children who were weaned because they were considered to be at the appropriate age are more likely to be stunted than those weaned because of maternal factors (primarily pregnancy) or factors intrinsic to the child (for example, the child was sick or refused to suckle).

Children who had diarrhea in the preceding two weeks are more likely to be acutely undernourished. Fever and cough are also associated with a higher level of acute undernutrition. Overall, among children 9 months[8] and older, being immunized against measles is protective against acute undernutrition. This may reflect, in part, better maternal care and/or access to health services.

Undernutrition is also associated with the number of deceased children a mother has. Children with two or more dead siblings are more likely to be chronically undernourished than those with fewer than two dead siblings. The deceased children may also have been undernourished. These results reflect the importance of the home environment to nutritional status.

Table 2.4 Stunting, underweight, and wasting by biological factors

Percentage of children age 1 to 59 months who are stunted, underweight, and wasted, by biological factors, Niger 1992

Biological factor	Stunted	Underweight	Wasted
Birth size			
Average+	30.9	33.6	14.5
Small	35.7	40.4	17.1
Very small	36.7	44.7	22.3
	p<0.005	p<0.001	p<0.001
Reason for stopping breastfeeding			
Maternal factors	36.8	35.9	12.2
Child factors	34.7	36.0	8.4
Age to wean	44.8	40.6	10.8
	p<0.005	NS	NS
Diarrhea (2 weeks)			
Yes	34.4	44.3	23.0
No	31.9	33.2	13.4
	NS	p<0.001	p<0.001
Fever (2 weeks)			
Yes	32.2	40.5	20.3
No	33.1	33.0	12.5
	NS	p<0.001	p<0.001
Cough (2 weeks)			
Yes	30.2	36.4	20.1
No	33.5	36.5	14.9
	NS	NS	p<0.001
Measles immunization[1]			
Yes	39.0	40.7	14.4
No	38.0	43.7	18.5
	NS	NS	p<0.002
No. dead children			
0	30.3	34.6	15.9
1	32.0	35.1	15.3
2	37.7	42.4	16.8
3+	35.1	37.7	17.1
	p<0.005	p<0.001	NS
Overall	32.7	36.5	16.1
Number	3812	3812	4507

Note: Level of significance determined using Chi-square test.
NS = Not significant.
[1]Children 9 months and older only.

Birth-weight and Birth Size

Just under twenty percent of children in the NDHS were weighed at birth—more in Tillabéri and Tahoua/Agadez and in Niamey and other urban areas than in the other areas (Table 2.5). However, birth weights are reported for only 15 percent of the sample and there is no information on whether the data were obtained from birth records or mother's recall. Therefore, caution should be exercised in using the data. There are regional and gender differences in *mean* birth weight, with newborn infants in Tahoua/Agadez and newborn girls being lighter

[8] Nine months is the age by which a child should be immunized with measles vaccine.

than other newborn babies. This result, which indicates that girls are lighter than boys, is consistent with results of other studies in Africa (Defo and Partin, 1993; Dole *et al.*, 1990; Sprundel *et al.*, 1988).

Among children for whom birth-weight data are reported, 8 percent had a low birth weight (<2.5 kg), which is considerably lower than the 20 percent national estimate for 1983-85 (WHO, 1991). The higher WHO estimate may be partially influenced by the fact that the data cover the severe famine of 1984-1985. The NDHS provides no evidence of regional or residential differences in the *prevalence* of low birth-weight babies but low birth-weights are apparently more evident in girls than in boys (Table 2.5).

Overall, 36 percent of mothers perceived their children to be small or very small at birth (Table 2.5), and there are regional, residential, and gender differences in reported birth size. More mothers in Zinder/Diffa and, to a lesser extent, in Maradi than in other regions reported their children were small or very small at birth. Rural infants and newborn girls are reportedly smaller at birth than other infants.

There appears to be an association ($p<0.001$) between mean birth weight and birth size. Overall, children classified as very small at birth weighed 2.6 ± 0.6 kg, those who were small weighed 2.8 ± 0.4 kg, and those who were average or above weighed 3.2 ± 0.5 kg. Despite the limitations of the data, they suggest that there is a tendency for newborn infants in Zinder/Diffa, Maradi, and rural areas, and for newborn girls to be smaller (and thus more likely to be classified as undernourished) than other newborn infants.

Table 2.5 Birth weight and size at birth

Among children under 5 years, the percentage weighed at birth, mean birth weight, the percentage of low birth weight (LBW) births, and the percentage of births that were average+, small, and very small, by region, residence, and sex of child, Niger 1992

Region, residence, and sex of child	Weighed at birth	Mean weight (kg) and (SD)	LBW births[1]	Size at birth: Average+	Small	Very small	Number
Region							
Dosso	12.5	3.07 (0.56)	8.9	74.5	14.0	11.4	818
Maradi	17.4	3.06 (0.50)	5.5	57.8	25.3	17.0	1071
Tahoua/Agadez	20.5	2.98 (0.49)	11.8	68.0	20.1	11.9	1232
Tillabéri	25.5	3.13 (0.55)	8.7	70.3	15.8	13.9	1356
Zinder/Diffa	13.9	3.09 (0.46)	4.0	49.9	32.8	17.3	1179
	p<0.001	p<0.05	NS		p<0.001		
Residence							
Niamey	84.4	3.12 (0.53)	8.9	72.7	18.5	8.8	323
Other urban	77.0	3.05 (0.51)	8.3	73.6	18.0	8.5	628
Rural	6.3	3.06 (0.50)	6.8	61.9	22.6	15.6	4705
	p<0.001	NS	NS		p<0.001		
Sex of child							
Male	18.4	3.14 (0.53)	6.0	67.1	19.8	13.1	2995
Female	18.8	3.00 (0.50)	10.4	60.1	24.1	15.8	2661
	NS	p<0.001	p<0.02		p<0.001		
Overall	18.5	3.08 (0.52)	8.1	63.8	21.8	14.4	5655
Number	5705	832	832				

Note: Level of significance determined using Chi-square test or ANOVA.
NS = Not significant.
[1]Low birth weight (<2.5 kg).

Age-Specific Patterns of Undernutrition

The NDHS shows that there are clear age-specific patterns in the prevalence of undernutrition. Among infants age 1 to 5 months, the prevalence of stunting, underweight, and wasting are 2, 3, and 6 percent, respectively (Figure 2.3 and Appendix Table E.1). After 6 months of age, these prevalences increase rapidly up to 24 months of age. Between 18 and 23 months of age, close to one-half of all children are stunted, over one-half are underweight, and 35 percent are wasted. Figure 2.4 shows the same trends for severe stunting, underweight, and wasting. An important finding is that between the age of 12 and 24 months wasting is highest when stunting increases most rapidly, indicating that this age group is the most vulnerable to being both wasted and stunted, thus incurring morbidity and, ultimately, death. Inasmuch as deficits in height are not readily made up, the prevalence of stunting remains high (around 40 percent) even among older children. However, the prevalence of underweight and wasting does diminish and level out among older children.

Although chronic undernutrition is the greater nutritional problem in Niger, the prevalence of acute undernutrition is extremely high, exceeding 30 percent among infants and young children age 12 months to 24 months. Inappropriate infant and child feeding practices, which are discussed in Chapter 3, are strongly associated with the high levels of undernutrition seen in this age group.

The age-specific pattern of undernutrition is similar in all five regions and urban/rural areas (Appendix Tables E.1 and E.2) despite the significant differences in the prevalence of undernutrition between regions and residence. This indicates that the critical period of nutritional vulnerability for children throughout Niger is during the first 24 months of life. In some regions, for example Maradi, children under 5 years old do not recover from the nutritional insult inflicted on them early in life to the same extent as children in the other regions.

Figure 2.3
Undernutrition among children age 1 to 59 months by age, Niger

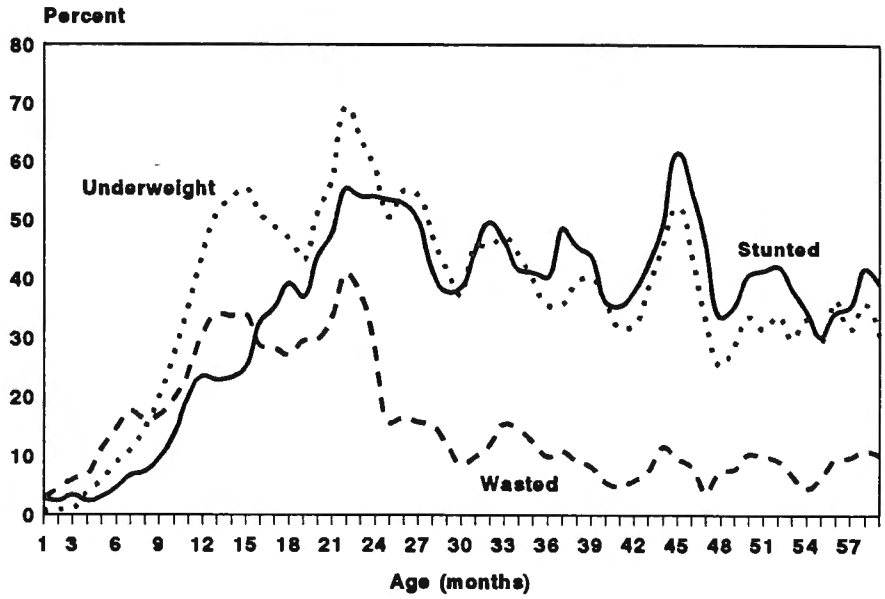


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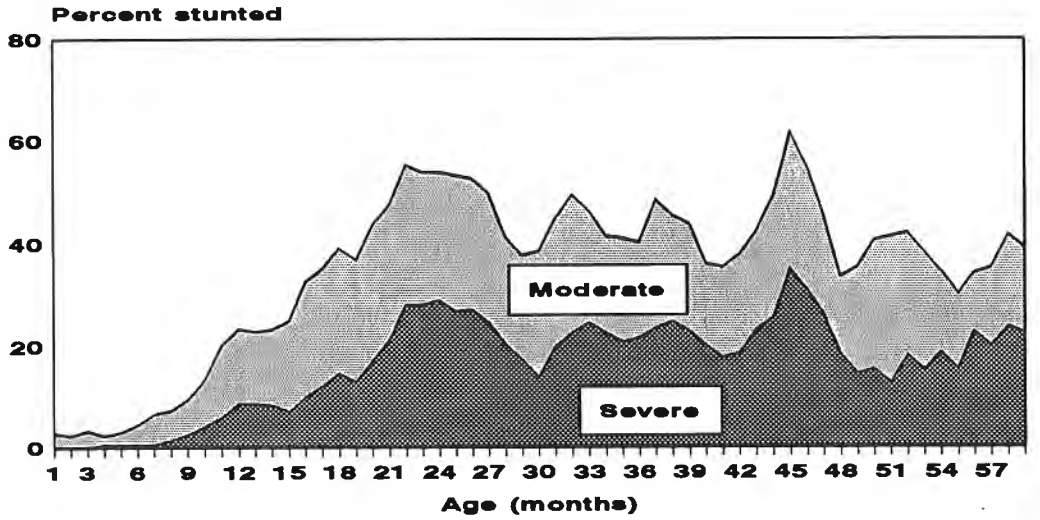
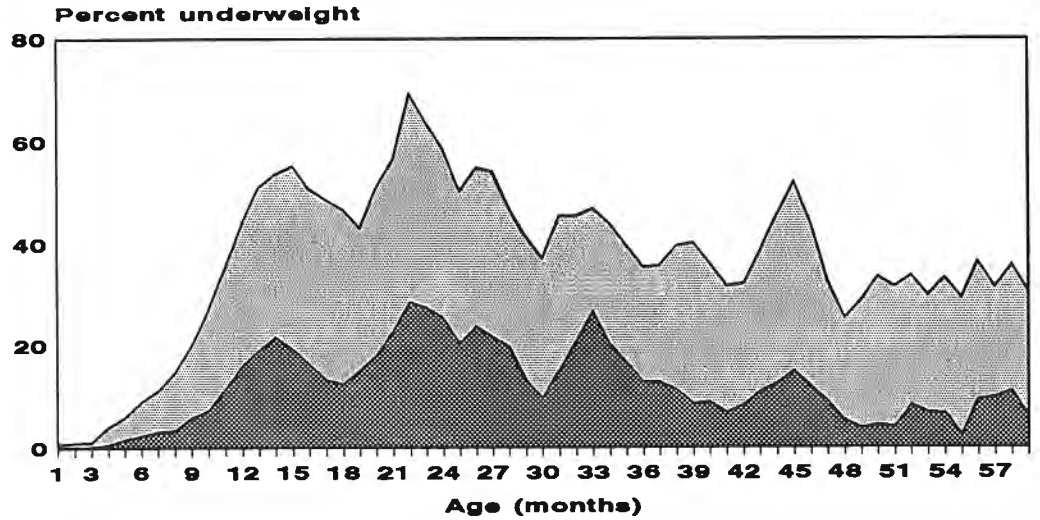
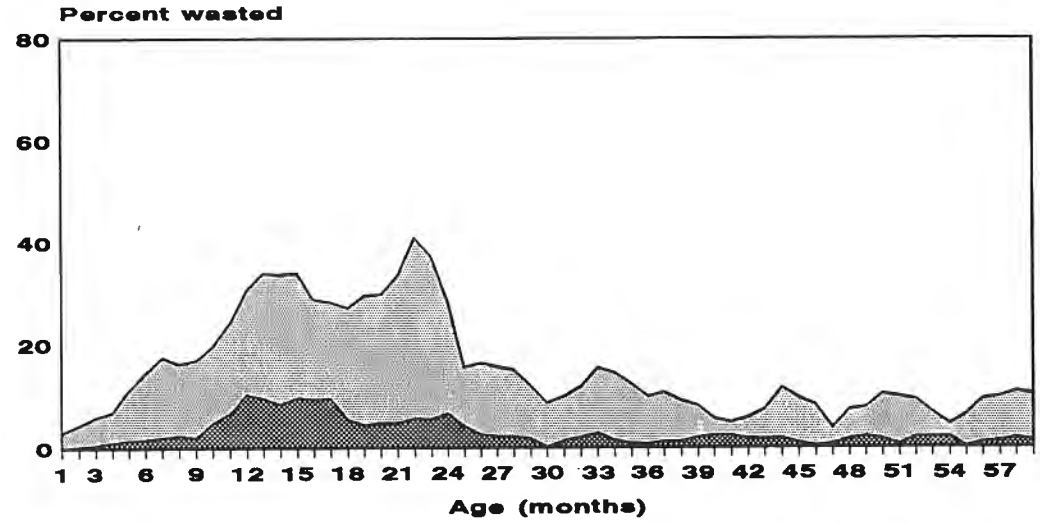
Figure 2.4

Stunting, underweight, and wasting among children age 1 to 59 months, Niger







NDHS 1992

Chapter 3

INFANT AND CHILD FEEDING PRACTICES

3.1 INITIATION OF BREASTFEEDING

The initiation of breastfeeding in Niger is nearly universal and does not differ by sex of the infant; region; residence; maternal age, education, or occupation; source of antenatal care; attendant at delivery; or place of delivery (Table 3.1).

Although nearly all women breastfeed their infants, initial breastfeeding practices are far from optimal. Only one out of five newborn infants is put to the breast immediately, indicating that only these infants receive colostrum, whereas about 70 percent are not put to the breast within the first day of life (Table 3.1). Mothers in Niamey, and thus Tillabéri, are more likely to start breastfeeding immediately. Mothers who live in Maradi, in Zinder/Diffa, in other urban areas, in rural areas, who are under 25 years, who have no formal education, who work as farmers, who do not go for antenatal care, who are attended at delivery by a traditional birth attendant, and who deliver at home, are more likely to postpone breastfeeding. There is, however, considerable overlap in all these characteristics; mothers who live in Maradi or in Zinder/Diffa are also more likely to reside in rural areas, be young, have no education as well as no antenatal care, be attended by a traditional birth attendant when giving birth, and deliver at home.

The NDHS results indicate the timing of the first breastfeeding is most likely related to cultural practices that discourage the giving of colostrum. The Hausa, for example, often delay initiating breastfeeding for up to 3 to 4 days because they fear that the first milk will kill the child (Keith, 1990). Among the Hausa, colostrum is believed to be bad milk and it is not used. Indeed, mothers are given traditional medicines to remove the bad properties in early milk and they begin breastfeeding only when they are sure the colostrum has passed, i.e., the milk changes from being yellow and thick to white. Until then the newborn infant is fed water, sugared water, animal milk, or herbal teas. Frequently these infants are given "holy" water, made from the ink used for writing Koranic verses. "Holy" water is believed to protect and prepare the infant to receive its mother's milk, once the latter has been deemed free of its bad properties.

The use and type of prelacteal food have important implications for the health and welfare of newborn infants. The introduction of any liquid or food exposes an infant to pathogens and thus increases the risk of morbidity, in particular diarrheal disease. In addition, the protein content of animal milk is much higher than that of human milk and, aside from the risk of introducing pathogens, infants are less able to digest the protein. Unless animal milk is properly diluted, infants are further predisposed to diarrhea. Given that 80 percent of women fail to give their infants the immunological and nutritional benefits of colostrum, there is an urgent need to educate both health professionals and mothers of its importance.

3.2 EXCLUSIVE BREASTFEEDING

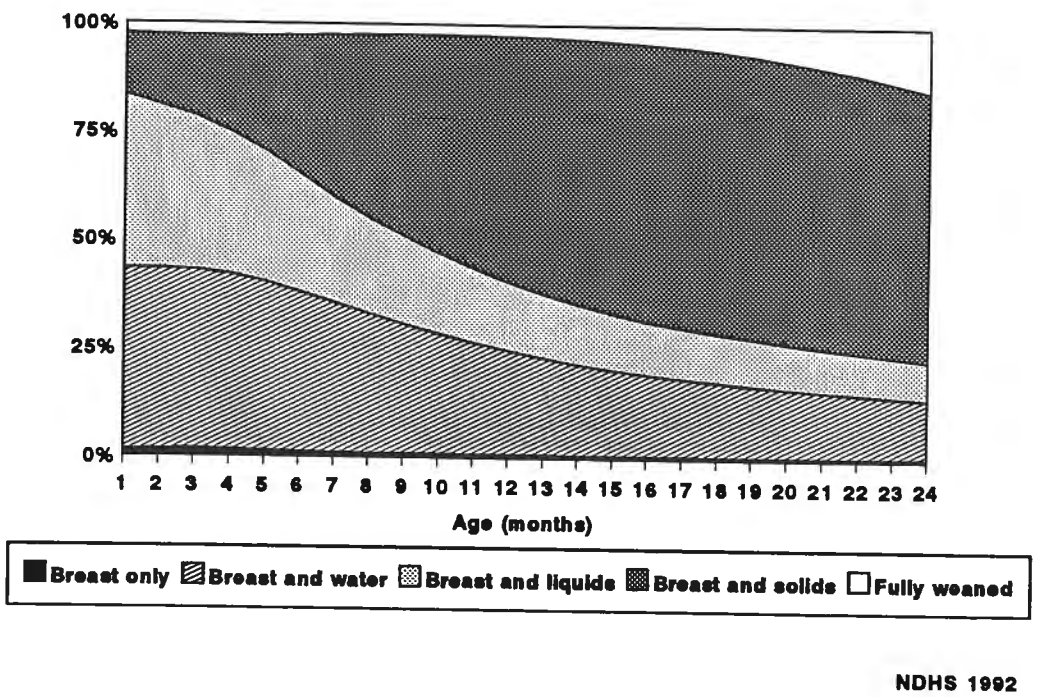
The WHO recommends that infants be exclusively breastfed for the first 4 to 6 months of life. However, exclusive breastfeeding is rarely practiced in Niger. Forty percent of last-born infants were given plain water in addition to breast milk within the first two months of life (Figure 3.1 and Appendix F). Although the giving of plain water in tropical climates has long been recognized as an accepted medical practice, as well as a cultural pattern, recent research has conclusively established that healthy, exclusively breastfed infants do not need additional water (Sachdev *et al.*, 1992). The prevalence of exclusive breastfeeding among infants less than 4 months of age is negligible in all regions. Furthermore, exclusive

Table 3.1 Initial breastfeeding

Percentage of children under 5 years who were ever breastfed and the percentage who started breastfeeding immediately, within 24 hours, and after 24 hours or more, by background factors, Niger 1992

Background factor	Ever breastfed	Started breastfeeding: Immediately	<24 h.	24 h.+	Number
Region					
Dosso	99.8	25.9	14.2	59.9	531
Maradi	99.6	7.5	4.2	88.3	703
Tahoua/Agadez	99.4	20.2	8.8	71.0	808
Tillabéri	99.9	37.7	18.4	43.9	888
Zinder/Diffa	99.8	10.8	4.8	84.4	792
	a		p<0.001		
Residence					
Niamey	99.4	52.6	18.2	29.2	214
Other urban	99.7	21.6	13.0	65.4	394
Rural	99.7	18.5	9.3	72.2	3114
	a		p<0.001		
Mother's age					
15 to 19	99.3	11.0	7.4	81.6	371
20 to 24	99.7	18.6	11.8	69.6	875
25 to 29	99.7	22.3	10.7	67.0	1017
30 to 34	99.6	22.5	10.4	67.2	707
35 to 39	99.8	22.7	10.1	67.2	440
40 to 49	100.0	27.2	6.8	66.0	312
	a		p<0.001		
Mother's education					
None	99.7	20.1	9.6	70.4	3366
Primary+	99.7	27.6	15.9	56.5	357
	a		p<0.001		
Mother's occupation					
Petty trade	99.9	20.1	9.5	70.3	635
Cottage industry	99.9	29.3	13.1	57.5	363
Farmer	99.8	14.1	11.1	74.8	574
Housewife	99.5	21.4	9.6	69.0	2143
	a		p<0.001		
Source of antenatal care					
No one/other	99.6	15.8	6.9	77.3	2506
Nurse/midwife/doctor	99.8	31.0	16.9	52.1	1215
	NS		p<0.001		
Attendant at delivery					
Nurse/midwife/doctor	99.7	35.4	18.1	46.4	601
Trained TBA (1)	99.6	17.1	8.4	74.6	693
TBA	99.7	9.4	5.0	85.6	961
Relative/friend	99.7	20.3	6.4	73.3	833
No one	99.7	28.9	17.4	53.7	633
	a		p<0.001		
Place of birth					
At home	99.7	18.0	8.6	73.4	3074
Health facility	99.7	34.0	17.5	48.6	647
	a		p<0.001		
Overall	99.7	20.8	10.2	69.0	3723
Number	5705				

Note: Level of significance determined using Chi-square test.
NS = Not significant.
a = n too small for valid Chi-square test.
[1]Traditional birth attendant



and full (breast milk and water only) breastfeeding does not exceed 55 percent in any regions or urban/rural areas and is particularly low in Zinder/Diffa (Figure 3.2).

The use of breast milk substitutes (fresh milk, herbal teas, koko,[1] fura,[2] PMI bouillies,[3] and tuwo[4]) is prevalent in Niger. During the first 2 months of life, over one-half of all infants are given breast milk substitutes (Figure 3.1 and Appendix F). Hung and Diallo (1992) found that over 40 percent of mothers in Zinder believe complementary solid foods should be given in the first three months of life and one-half of the children in this age group were already receiving foods. There are three major causes for concern in the too early introduction of plain water, other liquids, and complementary solid foods to breastfed infants under the age of 4 months. First, the liquids and solids offered are nutritionally inferior to breast milk. Second, the intake of other liquids and food results in lower breast milk intake which, in turn, reduces the mother's supply of milk, since breast milk production is determined, in part, by both the frequency and intensity of suckling.

---

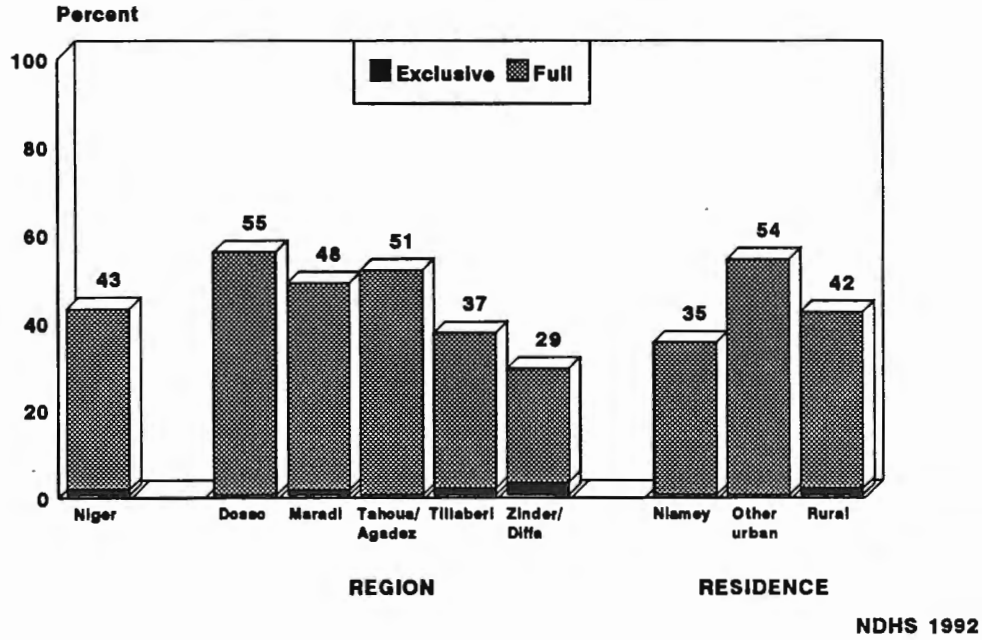
[1] A fermented liquid gruel of hot millet and water prepared for children.

[2] A cold, sour skimmed milk cooked liquid gruel that is the most common household food.

[3] Baby cereal porridge recommended by the Centres de Santé Maternelle et Infantile (PMI), Ministry of Health.

[4] A solid millet porridge served with a sauce, which is a staple food and eaten by everyone. Poorer households make the sauce from leaves whereas the better off use dried vegetables, spices, cowpeas, oil, or even a little meat.

Figure 3.2
Exclusive and full breastfeeding among infants under 4 months by region and residence, Niger



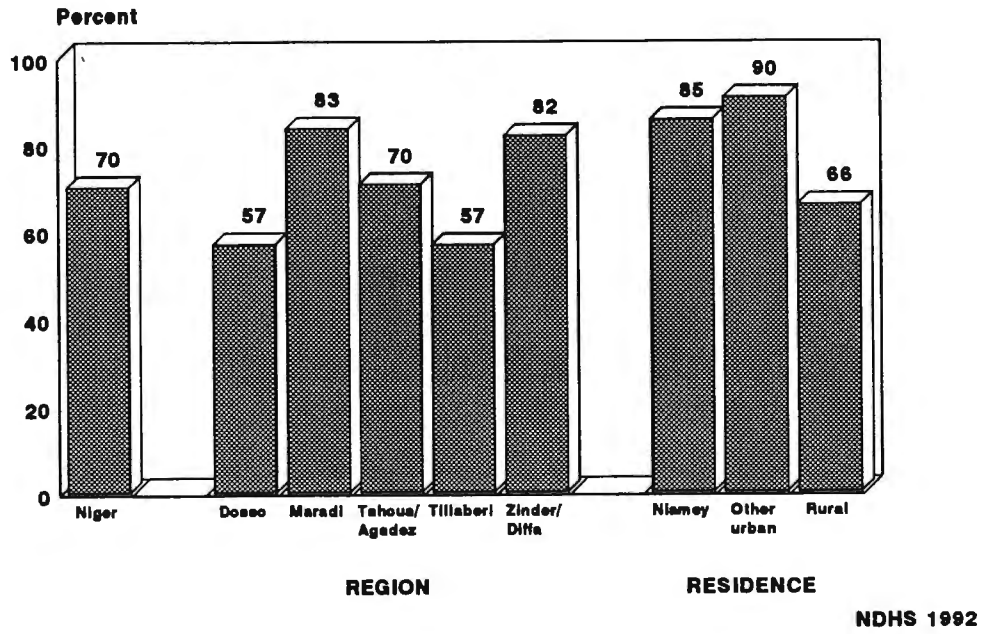
Third, feeding young infants other liquids and food increases their exposure to pathogens and consequently puts them at higher risk of diarrheal disease.

3.3 INTRODUCTION OF COMPLEMENTARY SOLID FOODS

The NDHS data show that at 6 months of age 97 percent of infants are still breastfed (Figure 3.1 and Appendix F), which is higher than the value (30 percent) cited in UNICEF (1992). Nevertheless, a delay in introducing complementary solid foods to older breastfed infants is a problem equally as important as the inappropriate feeding practices for infants under 4 months of age. The WHO recommends that complementary solid foods be introduced to infants between 4 and 6 months of age. In Niger, about 2 percent of infants age 6 to 9 months are already completely weaned and, at the same time, more than one in four is still not receiving complementary solid foods (Figure 3.1 and Appendix F). This is particularly a problem in Dosso and in Tillabéri (despite relatively high levels of complementary solid food use in Niamey), where more than forty percent of all infants are not given complementary solid foods (Figure 3.3).

Among the Hausa, once a child is able to sit up and grasp things he/she sits with other household members at meal times. Mothers usually put a small amount of food into a separate bowl, which is placed between the child's legs, so that the child has food even if he/she eats slower than the rest of the household. Hausa mothers believe that children know when they are hungry and when they are full; thus children are left to regulate their own food intake (Keith, 1990).

Figure 3.3
Breastfeeding with complementary food among infants age 6 to 9 months by region and residence, Niger



3.4 BOTTLE USE

Bottles are not often used in Niger. Among infants 12 months and younger, 3 percent are fed using a bottle. Bottle use is higher in Tillabéri than in the other regions (6 percent versus 2 percent) largely because 19 percent of infants in Niamey are fed using a bottle versus 11 percent in the other urban areas and only 1 percent in rural areas. These data show that the Ministry of Health's policy to discourage bottle use, to promote breastfeeding, and to use a cup and spoon if breastfeeding is not possible, is being successfully implemented.

3.5 FULL WEANING

The duration of breastfeeding is long; over 95 percent of all infants are breastfed throughout their first year of life and over three-quarters are breastfed well into their second year (Figure 3.1 and Appendix F). The NDHS data on breastfeeding at one year are considerably higher than the 15 percent cited by UNDP (1990). The median duration of breastfeeding is 21 months (Alichina *et al.*, 1993). Residence in Zinder/Diffa, Tahoua/Agadez, and other urban areas; having no formal education; and having given birth with the assistance of a medically trained person at delivery are associated with a shorter duration of breastfeeding (Table 3.2). Thus the data indicate that health professionals fail to advise mothers to breastfeed for as long as possible.

Table 3.2 Median duration of breastfeeding

Median duration of breastfeeding among children under 3 years, by selected background factors, Niger 1992

Nonbiological factors	Median duration of breastfeeding (months)	Number
Region		
Dosso	23.3	598
Maradi	21.3	816
Tahoua/Agadez	20.6	933
Tillabéri	21.4	791
Zinder/Diffa	19.5	943
Residence		
Niamey	20.7	220
Other urban	18.9	451
Rural	21.2	3628
Sex of child		
Male	21.0	2263
Female	20.9	2036
Mother's education		
None	21.1	3896
Primary+	19.9	404
Assistance at delivery		
Medically trained	19.6	644
Traditional birth attendant	20.8	1886
Other or none	21.8	1766
Overall	20.9	4300

Note: Medians are based on current status. Full breastfeeding includes exclusively breastfed children and those who received water in addition to breastfeeding. Medians for exclusive breastfeeding are not shown due to very few children being exclusively breastfed.
Source: Alichina et al., 1993

Seventy-five percent of mothers stopped breastfeeding their last child because they considered the child old enough to be weaned (Table 3.3). Keith (1990) indicates this means that the child is able to eat independently, has a certain amount of emotional independence, and will soon "forget the breast." Just over 20 percent of mothers stopped breastfeeding because of maternal factors, of which pregnancy is the main cause, and 4 percent cited intrinsic child factors. Mothers are less likely to cite "time to wean" as a reason for weaning if they are from Dosso or from Tillabéri, live in Niamey, are under 19 years old, have a cottage industry, belong to wealthier households, and if their child is not currently stunted. To a certain extent, these factors are interrelated.

Table 3.3 Reason for fully weaning last-born child

Among last-born children under 5 years, the percent distribution fully weaned because of maternal factors, because of child factors, and because mother considered it time to wean, by selected background factors, Niger 1992

Background factor	Maternal factors[1]	Child factors[2]	Time to wean	Number
Region				
Dosso	47.9	5.4	46.7	424
Maradi	6.7	2.1	91.2	585
Tahoua/Agadez	17.1	4.0	78.9	696
Tillabéri	38.5	4.4	57.0	733
Zinder/Diffa	4.2	3.9	91.9	706
		p<0.001		
Residence				
Niamey	23.8	5.1	71.1	197
Other urban	15.9	4.7	79.4	391
Rural	22.1	3.7	74.2	2556
		p<0.05		
Mother's age				
15 to 19	35.3	3.0	61.7	138
20 to 24	19.6	4.9	75.5	724
25 to 29	25.1	3.5	71.4	959
30 to 34	21.1	4.1	74.8	671
35 to 39	17.2	4.8	78.0	385
40 to 49	13.0	1.6	85.4	267
		p<0.001		
Mother's occupation				
Petty trade	16.4	3.5	80.1	584
Cottage industry	30.0	4.3	65.7	319
Farmer	24.8	1.6	73.6	449
Housewife	20.8	4.6	74.6	1785
		p<0.001		
Possession score[3]				
0	17.5	3.1	79.4	1824
1	28.2	4.8	67.0	1105
2+	20.2	6.4	73.4	216
		p<0.001		
Stunted (<-2SD ht/age)				
Yes	19.1	3.2	77.7	866
No	24.4	4.4	71.2	1164
		p<0.005		
Overall	21.4	3.9	74.7	3144

Note: Level of significance determined using Chi-square test.
[1]Ill, nipple/breast problem, working, became pregnant.
[2]Ill, refused, no milk.
[3]Score of one for availability/ownership of electricity, radio, television or refrigerator.

About 20 percent of children age 12 to 23 months are fully weaned, thus losing the benefits of breast milk (Table 3.4). Early weaning is more evident in Zinder/Diffa, in Tahoua/Agadez, and in urban areas than elsewhere. Five percent of children age 24 to 59 months are not fully weaned. Delayed full weaning is more evident in Dosso, in Tillabéri, in rural areas, and among boys.

Overall, one-half of the households in the NDHS ate three or more meals on the previous day, 42 percent ate only two meals, and 8 percent only one meal. More households in Tillabéri and to a lesser extent in Tahoua/Agadez and Niamey than in the other areas apparently ate only one meal on the previous day. Households in Maradi and in rural areas were more likely to have eaten two meals whereas those in Dosso, Zinder/Diffa, and urban areas were more likely to have eaten 3 meals. Nutritional status is not associated with the number of meals eaten by the household on the previous day, even after controlling for child age. This is probably because the question was asked about the number of household meals rather than the number of times the child was fed.

Efforts to improve the nutritional status of infants and children in Niger need to focus on:

- Ensuring that breastfeeding is initiated immediately.
- Extending the duration of exclusive breastfeeding.
- Recommending appropriate alternatives for infants who cannot be exclusively breastfed (because their mothers are working).
- Advising on the appropriate time to introduce complementary solid foods.
- Improving the nutrient content of the foods offered to infants and young children.
- Discouraging bottle use in urban areas.

Table 3.4 Feeding patterns for children age 12 to 59 months

Feeding patterns among children age 12 to 23 months and 24 to 59 months, by region, residence, and sex of child, Niger 1992

Background factor	12 to 23 months			24 to 59 months		
	Breastfed and solids	Fully weaned	Number	Breastfed and solids	Fully weaned	Number
Region						
Dosso	91.1	8.9	144	10.6	89.4	476
Maradi	85.2	14.8	193	3.0	97.0	594
Tahoua/Agadez	76.0	24.0	241	4.5	95.5	687
Tillabéri	80.8	19.2	296	8.5	91.5	761
Zinder/Diffa	75.0	25.0	212	1.5	98.5	675
	p<0.001			p<0.001		
Residence						
Niamey	71.9	28.1	66	4.0	96.0	193
Other urban	67.3	32.7	126	1.4	98.6	362
Rural	83.3	16.7	895	6.1	93.9	2638
	p<0.001			p<0.001		
Sex of child						
Male	81.5	18.5	599	6.3	93.7	1698
Female	79.8	20.2	487	4.5	95.5	1494
	NS			p<0.001		
Overall	80.8	19.2	1087	5.4	94.6	3193

Note: Level of significance determined using Chi-square test.
NS = Not significant.

Chapter 4

MORTALITY AND HEALTH

4.1 INFANT AND UNDER-FIVE MORTALITY

Infant and under-five mortality rates in Niger are extremely high; 13 out of 100 infants die before reaching their first birthday and 33 out of 100 children die before reaching their fifth birthday (Table 4.1) (Alichina *et al.*, 1993). Comparing data from the 1988 National census, where the infant and under-five mortality rates were 170 and 290 per 1000 for 1980, respectively, with the NDHS data, it appears that child survival has not improved between 1980 and 1992. Nevertheless, the World Food Council (1992) indicates that Niger has reduced under-five mortality by less than 2 percent a year from 1980 to 1990. In order to reach the target under-five mortality rate set by the 1990 World Summit for Children (below 70 per 1,000 live births by the year 2000), the under-five mortality rate in Niger will have to fall by at least 75 percent between 1990 and 2000. This is equivalent to reducing the under-five mortality rate by 15.5 deaths per 1000 births each year, which is higher than the figure cited by the World Food Council and UNICEF (1993) (11.5 and 12.6 per 1000 births, respectively) and is unachievable.

Table 4.1 Infant and under-five mortality rates

Infant and under-five mortality rates for the ten-year period preceding the survey, by selected background factors, Niger 1992

Background factor	Mortality rates (per 1000) Infant	Under-five
Region		
Niamey	63.8	156.6
Dosso	116.8	284.6
Maradi	160.8	390.9
Tahoua/Agadez	141.0	335.5
Tillabéri	124.6	283.1
Zinder/Diffa	139.3	356.1
Residence		
Niamey	63.8	156.6
Other urban	101.7	237.6
Rural	142.6	346.8
Mother's age at birth		
15 to 19	156.2	343.9
20 to 29	125.3	318.3
30 to 39	134.0	323.4
40 to 49	117.0	353.2
Mother's education		
None	137.0	334.0
Primary+	101.9	207.9
Birth order		
1	164.9	337.9
2 to 3	120.6	318.3
4 to 6	127.4	317.3
7 or more	142.5	345.3
Previous birth interval		
Less than 2 years	158.6	346.0
2 to 3 years	118.5	326.8
4 or more years	73.8	219.4
Sex of child		
Male	135.8	318.6
Female	133.0	333.9
Overall	134.5	326.1

Note: *Infant mortality rate:* the probability of dying before the first birthday; *under-five mortality rate:* the probability of dying before the fifth birthday.
Source: Alichina et al., 1993.

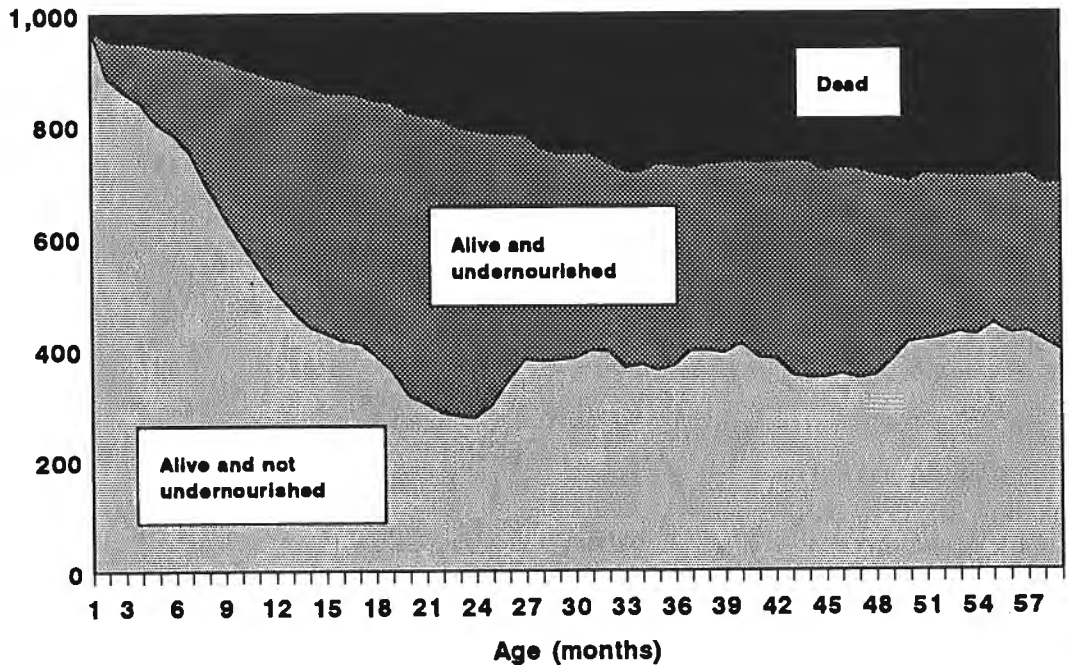
Although the infant mortality rate for girls is similar to that for boys, the under-five mortality rate is 5 percent higher. It is possible that girls age 1 to 4 years are "fostered out" or given away more than boys. The result would underestimate the female population, but would overestimate female mortality rates.

Both infant and under-five mortality rates differ by residence and region. Mortality rates are highest in Maradi followed by Zinder/Diffa and Tahoua/Agadez where between 14 and 16 of one-hundred infants do not live to see their first birthday and between 34 and 39 of one-hundred children under 5 years do not live to see their fifth birthday. Under-five mortality in rural areas is about 45 percent greater than in other urban areas and more than double that in Niamey. Similarly, the infant mortality rate in rural areas is 40 percent greater than in other urban areas and more than twice the level in Niamey. Both infant and under-five mortality rates differ by mother's age and education, birth order, and previous birth interval. Infants and children of adolescent mothers and mothers with no formal education are

at greater risk of dying, as are first-born infants and children with birth order seven or higher, or a preceding birth interval of less than two years. These findings are consistent with other studies that show that young maternal age, high parity, and birth intervals of less than 2 years are associated with greatest risk of infant and child mortality.

Figure 4.1 shows that there is an association between undernutrition and mortality among children under 5 years. Under-five mortality increases through age 36 months. At the same time, the level of undernutrition[1] increases dramatically through 24 months after which it declines slightly[2] and stabilizes by the age of 27 months. In other words the majority of children under-five years old who die do so by the age of 3 years by which age levels of undernutrition have peaked.

Figure 4.1
Undernutrition and mortality among children age 1 to 59 months by age, Niger



NDHS 1992

[1] Children stunted and/or wasted.

[2] The apparent improvement in nutritional status after 24 months may be partly due to the fact that the reference population for children over 24 months is different from that for children under 24 months and the growth curves for both data sets do not meet exactly.

4.2 MORBIDITY[3] AND USE OF HEALTH FACILITIES

Overall, 29 percent of the children reportedly had diarrhea in the two weeks preceding the survey, 47 percent had fever, and 23 percent had cough (Table 4.2). Morbidity varies, however, both by region and residence. Diarrhea is more prevalent in the Maradi, Zinder/Diffa, and Dosso regions; fever is more prevalent in the Dosso and Tillabéri regions; and cough is less prevalent in the Tahoua/Agadez region. The prevalence of diarrhea, fever, and cough is higher in rural areas than in urban areas. The 1985 National Morbidity and Mortality Survey (Ministère de la Sante Publique et des Affaires Sociales, 1985), showed levels of diarrhea, fever, and cough lower than in the NDHS (25, 31, and 14 percent, respectively) and a similar urban/rural pattern. Children are estimated to have, on average, 6.9 episodes of diarrhea each year (PRITECH, 1989).

Table 4.2 Prevalence of diarrhea, fever, and cough

Percentage of children age 1 to 59 months with diarrhea, fever, and cough in the two weeks preceding the survey, by region and residence, Niger 1992

Region and residence	Percentage of children with:			Number
	Diarrhea	Fever	Cough	
Region				
Dosso	31.0	52.0	23.6	799
Maradi	32.5	42.6	20.2	1028
Tahoua/Agadez	27.0	46.0	16.0	1193
Tillabéri	23.3	51.9	28.3	1300
Zinder/Diffa	32.2	40.6	28.1	1128
	p<0.001	p<0.001	p<0.001	
Residence				
Niamey	17.9	29.7	20.3	310
Other urban	22.2	27.1	16.6	611
Rural	30.5	50.3	24.5	4527
	p<0.001	p<0.001	p<0.001	
Overall	28.8	46.5	23.4	5448

Note: Level of significance determined using Chi-square test

Different ethnic groups differentiate different types of diarrhea, and this may have resulted in under-reporting of diarrhea. The Hausa, for example, differentiate teething diarrhea from diarrhea caused by heat, by cold, by the mother fasting (during Ramadan), by milk from a pregnant woman, by unaccustomed foods, by swelling of the glottis, and from Allah's will. The treatment is specific to the cause. For example, diarrhea caused by heat requires drinking foods considered to be "cooling," and the opposite is true for diarrhea caused by cold. There is no treatment for teething diarrhea (Keith, 1990).

The mothers of three-quarters of the children with a recent history of diarrhea did not seek advice for their child's illness nor did three-quarters of the mothers of children with fever/cough (Table 4.3). There are both regional and residential differences in seeking advice for fever/cough but only residential differences in seeking advice for diarrhea. Children with fever/cough in Tillabéri are more likely to be taken for treatment than those living in the other regions, whereas those in Dosso are less likely to be taken for treatment. More children with diarrhea or fever/cough in urban areas are taken for treatment than in rural areas.

The mothers of only 12 percent of children with a fever or cough and 10 percent of children with diarrhea sought treatment for them from a health facility, and mothers of only 14 percent of children with either fever or cough, or with diarrhea sought treatment from relatives or neighbors. These findings probably reflect access to health facilities, mothers' concern about the illness, and time available to seek treatment for a sick child, as well as cultural factors that determine the norm in terms of a child's health status. Forty-one percent of the population apparently have access[4] to health services, 99 percent in the urban areas and 30

[3] The discussion on morbidity focusses on diarrhea, fever, and cough. Diarrhea is defined as three or more watery stools per day. No definitions were given for fever or cough as it was assumed that mothers are familiar with the terms. Fever may be associated with malaria, diarrhea, infections, etc.

[4] Access is defined as the ability to reach a health facility within one hour using the usual means of transport.

percent in the rural ones (UNICEF, 1993). Given this, the NDHS results suggest that health facilities are underutilized by sick children.

Table 4.3 Source of treatment for fever/cough and diarrhea

Percentage of children age 1 to 59 months sick with fever/cough and percentage of children sick with diarrhea whose mothers sought treatment/advice from different sources, by region and residence, Niger 1992

Region and residence	Treatment sought for fever/cough: Health facility	Relative/ neighbor	None	Number	Treatment sought for diarrhea: Health facility	Relative/ neighbor	None	Number
Region								
Dosso	10.2	9.5	80.3	448	9.1	9.9	81.0	247
Maradi	10.3	16.8	72.9	495	10.3	15.2	74.5	341
Tahoua/Agadez	10.4	13.3	76.3	581	10.9	15.6	73.5	322
Tillabéri	15.2	14.8	70.0	747	11.1	15.5	73.3	303
Zinder/Diffa	10.3	13.9	75.8	535	9.6	12.1	78.3	364
		p<0.002				NS		
Residence								
Niamey	41.2	5.3	53.5	116	31.4	11.6	57.0	56
Other urban	36.6	8.3	55.1	203	34.6	12.2	53.2	135
Rural	8.2	14.7	77.2	2486	7.0	14.1	78.9	1387
		p<0.001				p<0.001		
Overall	11.6	13.8	74.6	2805	10.2	13.8	76.0	1577

Note: Level of significance determined using Chi-square test.
NS = Not significant.

Only 17 percent of mothers whose children had diarrhea in the preceding two weeks gave oral rehydration therapy (ORT) of any kind. Ten percent used oral rehydration salts (ORS) in solution, 10 percent gave recommended home fluids (RHF), and 3 percent gave both ORS and RHF (Table 4.4). The proportion of mothers using ORT is one-third the level (54 percent) indicated by the OAU/UNICEF (1992). There are regional differences in both ORS and RHF use and thus ORT use: ORS use is greater in Tillabéri and Tahoua/Agadez whereas RHF use is lower in Zinder/Diffa than elsewhere. ORT use is also higher in urban areas than in rural areas. It is important to note that because there are no data on the severity of diarrhea it is not necessarily appropriate to relate ORT usage rate to diarrhea levels, since mothers do not systematically use ORT for mild, short-term cases of diarrhea. The latter, however, is unlikely to explain the big difference in the findings for ORT use between the NDHS and the OAU/UNICEF report.

Table 4.4 Use of oral rehydration therapy for treatment of diarrhea

Percentage of children age 1 to 59 months who had diarrhea in the preceding two weeks whose mothers treated them with oral rehydration therapy (ORT): solution prepared from oral rehydration salts (ORS) and/or recommended home fluids (RHF), by region and residence, Niger 1992

Region and residence	Received: ORS[1]	HMF[2]	ORT[3]	Number
Region				
Dosso	8.9	11.7	17.5	248
Maradi	7.6	10.3	15.6	343
Tahoua/Agadez	14.2	10.0	21.7	324
Tillabéri	13.6	11.4	19.9	303
Zinder/Diffa	7.9	5.4	10.2	367
	p<0.01	p<0.05	p<0.001	
Residence				
Niamey	36.6	18.0	45.9	56
Other urban	31.2	20.7	38.7	136
Rural	7.3	8.1	13.4	1393
	p<0.001	p<0.001	p<0.001	
Overall	10.4	9.6	16.7	1584

Note: Level of significance determined using Chi-square test.
NS = Not significant.
[1]Solution prepared from ORS packets (oral rehydration salts).
[2]Recommended home fluid (e.g., sugar/salt/water solution).
[3]Oral rehydration therapy (ORS and/or RHF).

Among breastfed children having diarrhea, about 55 percent of mothers do not change their breastfeeding; only 6 percent increase, but 38 percent decrease the frequency of breastfeeding (Table 4.5). Among all children with diarrhea, less than 10 percent of mothers increase the volume of fluids given during the episode, over 60 percent give the same amount, and 30 percent reduce the volume of fluids. Eighty-three percent of diarrheic children receive the same number of meals, 3 percent receive more meals, and 13 percent get fewer meals than usual during the diarrheal episode. These findings suggest that mothers either do not have knowledge about how to care for a child with diarrhea and/or they are not using this knowledge; of particular concern is that fluids are withheld from one-third of children with diarrhea. Keith (1990) points out that among the Hausa, sick children, like healthy children, are believed to know when they are hungry or full: if they refuse food, or show no interest in food, they are not compelled to eat. Perrier (1991) found that Djerma and Hausa mothers say they do not change feeding patterns during diarrhea or sickness but they are aware that sick children lose their appetite and even weight. Mothers react in different ways such as forcing the child to eat, feeding small amounts frequently, changing the type of food offered, or using traditional medicines. Many mothers indicated that they would force-feed a diarrheic child, but they also recognize that sometimes this can not be done after diarrhea because the child needs to adjust to eating food again. Mothers also indicated that they withhold sugar, in particular, and also peanuts from diarrhoeic children. In general, no special foods are prepared for sick children.

Table 4.5 Changes in feeding practices among children with diarrhea

Among children age 1 to 59 months with diarrhea, the percentage of those breastfeeding who receive the same, increased, or decreased feeds; the percentage of those who received the same, more, or less fluids; and the percentage of those who received the same, more, or less solids, by region and residence, Niger 1992

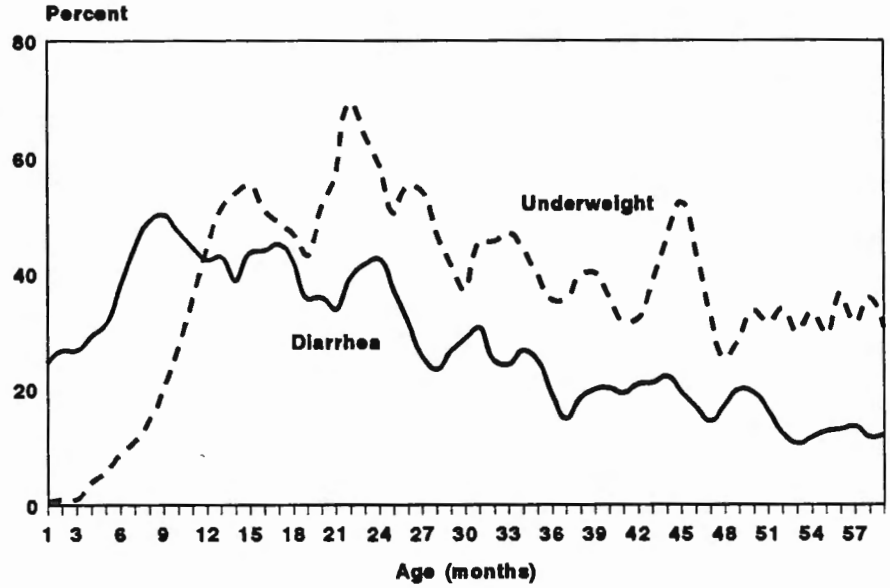
Region and residence	Frequency of breastfeeding				Amount of other fluids given				Number of meals			
	Same	In-creased	De-creased	Number	Same	In-creased	De-creased	Number	Same	In-creased	De-creased	Number
Region												
Dosso	59.3	10.4	30.3	247	65.7	12.8	21.5	248	94.1	0.0	5.9	137
Maradi	55.2	2.0	42.8	334	59.0	13.0	28.0	340	77.5	7.7	14.8	203
Tahoua/Agadez	59.9	7.4	32.7	315	66.2	3.6	30.2	322	85.9	2.9	11.2	183
Tillabéri	51.2	6.1	42.8	299	55.3	8.0	36.7	299	83.6	2.7	13.7	189
Zinder/Diffa	54.9	4.4	40.7	365	59.7	7.1	33.2	364	76.5	1.8	21.7	196
		p<0.002				p<0.001				p<0.001		
Residence												
Niamey	53.2	6.4	40.4	55	54.8	11.9	33.3	54	77.2	4.0	18.8	33
Other urban	57.6	6.5	35.9	134	64.5	14.1	21.4	134	79.4	7.1	13.5	79
Rural	55.9	5.7	38.5	1370	60.9	8.1	31.0	1384	83.3	2.8	13.8	797
		NS				p<0.05				NS		
Overall	55.9	5.8	38.3	1559	61.0	8.7	30.3	1573	82.8	3.2	13.4	909

Note: Level of significance determined using Chi-square test.
NS = Not significant.

4.3 AGE-RELATED PATTERN OF DIARRHEA

It is well established that morbidity, especially diarrheal disease, has a negative influence on nutritional status among children under age 5. In Niger, the age-specific prevalence of diarrhea follows approximately the same trend as that for underweight (Figure 4.2). Among infants age 1 month, the

Figure 4.2
Diarrhea and underweight by age, Niger



NDHS 1992

prevalence of diarrhea is already at 25 percent, and increases dramatically to over 50 percent by the age of 9 months, after which it drops to around 20 percent by age 36 months. Beyond the age of 36 months there is a slight decline in diarrhea prevalence. The high prevalence of diarrhea among very young infants probably is most related to the widespread practice of introducing complementary liquids and foods at too early an age.

Similar age-specific patterns for diarrhea are found in the different regions and residential areas, despite significant differences in absolute prevalence. In addition, the prevalence of diarrhea in all five regions and all three residential areas closely matches that for undernutrition; the prevalence of diarrhea is significantly higher in Maradi, in Zinder/Diffa, and in rural areas.

4.4 BIOLOGICAL AND NONBIOLOGICAL FACTORS ASSOCIATED WITH DIARRHEA

Because children age two and younger are generally recognized as being the most vulnerable to undernutrition and diarrhea, further analyses have been undertaken to determine the nonbiological and biological factors associated with diarrhea. Table 4.6 shows that, aside from region and residence, children whose mothers work in a cottage industry or who farm, who have one or no siblings, and who are normally taken care of by a relative/neighbor or taken to work by the mother are more likely to have diarrhea.[5]

[5] In contrast, mother's education, source of drinking water, availability of toilet, type of floor material, possession score (a wealth indicator), being fed using a bottle, and number of household meals are not associated with diarrhea.

Table 4.6 Prevalence and net relative risk of diarrhea among children age 1 to 24 months

Percentage of children 1-24 months who have diarrhea and the net relative risk of having diarrhea, by selected background factors, Niger 1992

Background factor	Diarrhea	Net relative risk
Region		
Tillabéri	32.7	1.00[a]
Dosso	36.4	1.25[b]
Maradi	43.9	1.47[b]
Tahoua/Agadez	38.3	1.31[b]
Zinder/Diffa	41.1	1.40[b]
	p<0.005	
Residence		
Niamey	27.0	
Other urban	33.9	
Rural	39.7	
	p<0.005	
Mother's occupation		
Petty trade	36.7	
Cottage industry	47.6	
Farmer	43.7	
Housewife	35.9	
	p<0.001	
Total number of children		
1	40.2	
2	43.8	
3	35.1	
4	33.2	
5	38.3	
6+	37.7	
	p<0.05	
Usual child caretaker		
Older siblings/husband	34.6	
Relative/neighbor	44.3	
Other	34.7	
Mother takes to work	42.7	
Mother does not work	35.9	
	p<0.02	
Age of child (months)		
1-10	35.6	
11-18	42.8	
19-24	39.3	
	p<0.01	
Feeding pattern		
Breast (+ water)	28.5	1.00[a]
Breast and liquids	24.6	0.84
Breast and solids	43.6	1.48[b]
Fully weaned	38.3	1.33[b]
	p<0.001	
Fever (2 weeks)		
No	23.2	1.00
Yes	51.5	2.15[b]
	p<0.001	
Cough (2 weeks)		
No	23.2	1.00
Yes	51.5	1.35[b]
	p<0.001	
Nutritional status		
Not stunted, not wasted	26.4	1.00[a]
Wasted only	39.0	1.20[b]
Stunted only	27.5	1.01
Wasted and stunted	46.3	1.50[b]
Unknown	-	1.04
	p<0.001	
Overall	38.4	
Number	2546	2477

Note: Level of significance determined using Chi-square test.
[a]Overall p<0.05.
[b]p<0.05 compared with reference category.

Among the biological variables examined, children who are both breastfed and receiving complementary solid foods are more likely to have diarrhea than other children. In addition, children who have a recent history of fever or cough and children who are both stunted and wasted, or wasted only, are also more likely to have a recent history of diarrhea.

The factors associated with a recent history of diarrhea have been used to develop a logistic regression[6] model to predict diarrhea among children 2 years and younger. Children have been divided into three age groups (1 to 10 months, 11 to 18 months, and 19 to 24 months) during which the prevalence of diarrhea first rises, remains high, and declines (see Figure 4.2).

Regression estimates of relative risk greater than one indicate that the risk of having diarrhea is greater than for the reference category. Thus, children with a recent history of fever are over two times more likely to have diarrhea than children without fever, while those with a recent history of cough are 35 percent more likely to have diarrhea than those without a cough (Table 4.6). In addition, children who are both stunted and wasted are about 50 percent more likely to have diarrhea than those neither wasted nor stunted whereas children who are only wasted are 20 percent more likely to have diarrhea than children neither stunted nor wasted. Children who receive solid foods, be they breastfed or not, are between one-third and one-half more likely to have diarrhea. This suggests that pathogen contamination from food, and thus food hygiene, probably is an important determinant of diarrhea.

The risk of being diarrhoeic for children in Tillabéri is between 25 and 50 percent less than in the other regions.

Maternal occupation, which reflects both the amount of time a mother has for childcare and relative wealth, is closely correlated with feeding pattern. Removing the effect of feeding pattern on diarrhea also removes the effect of mother's occupation. Similarly, the association between total number of children and diarrhea is removed once child age is entered into the model. The usual child caretaker is closely associated with urban/rural residence, which, in turn, is associated with region. Removing the effects of region on diarrhea also removes the effects of both usual child caretaker and residence. Child age is closely associated with nutritional status and after removing the effects of the latter on diarrhea, age of child no longer remains significant.

The results of the logistic regression essentially confirm that weaker children, i.e., those who are ill and undernourished, are more vulnerable to diarrhea. Vulnerable children include those exposed to pathogens from food. In addition, compared with Tillabéri, children in the other regions are more vulnerable to diarrhea, suggesting an association between poorer access to health care and increased risk of diarrheal disease.

4.5 AGE-RELATED PATTERN OF FEVER

Although the prevalence of fever is high among all age groups, particularly children age 9 to 24 months (Figure 4.3), and in all regions, it is significantly lower in the Zinder/Diffa and Maradi regions and in urban areas (Table 4.2). Malaria, the most common cause of fever, is highly prevalent throughout Niger. It is possible that fever is lower in Zinder/Diffa because the absence of water limits mosquito survival. However, it is not clear why the prevalence of fever is lower in Maradi. The residential differences in the prevalence of fever can be partly explained by greater success of the malaria control program in urban areas than in rural areas.

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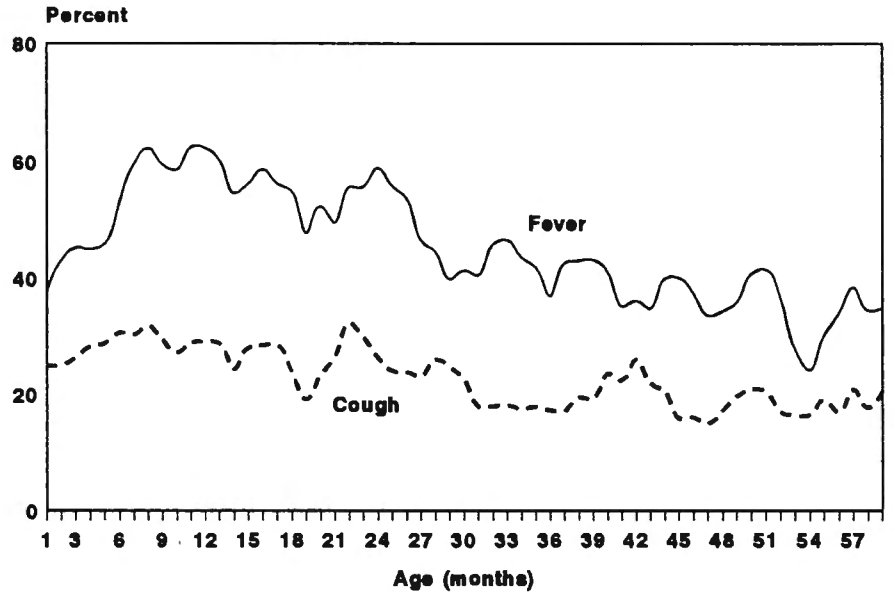
[6] Logistic regression models are explained in Appendix G.

Figure 4.3
Fever and cough by age, Niger



NDHS 1992

4.6 AGE-RELATED PATTERN OF COUGH

The prevalence of cough is high throughout the first 18 months of life after which there is a small decline (Figure 4.3). The prevalence of cough is higher in Tillabéri and Zinder/Diffa than elsewhere. Children living in rural areas are more likely to have had a cough, but urban/rural differences are less marked than those for diarrhea (Table 4.2).

4.7 NIGHTBLINDNESS

Data were collected for all children on the presence of nightblindness, a sign of vitamin A deficiency, known as *dundumi* in Hausa and *dandumi* in Djarma. Because it is difficult to know whether a non-ambulatory child is nightblind, the analyses presented here include only children age 24 to 59 months.

Overall, 2.6 percent of children age 24 to 59 months are nightblind (Table 4.7). This is three times the level WHO (1982) defines as being of public health significance. The prevalence of nightblindness is particularly high in Dosso region compared with the other regions; it is also higher in rural than in urban[7]

[7] The prevalence of nightblindness is the same for Niamey and other urban areas; hence they have been combined as urban areas.

Table 4.7 Prevalence and net relative risk of nightblindness among children age 24 to 59 months

Percentage of children 24-59 months who have night-blindess and the net relative risk of having nightblindness, by selected background factors, Niger 1992

Background factor	Night-blindness	Net relative risk
Region		
Tillabéri	2.4	1.00[a]
Dosso	6.6	2.59[b]
Maradi	2.3	0.94
Tahoua/Agadez	0.7	0.32[b]
Zinder/Diffa	2.1	0.81
	p<0.001	
Residence		
Urban	0.5	1.00
Rural	3.0	5.48[b]
	p<0.001	
Mother's education		
None	2.8	
Primary+	0.7	
	p<0.05	
Mother's occupation		
Petty trade	1.8	
Cottage industry	4.2	
Farmer	3.8	
Housewife	2.2	
	p<0.05	
Toilet at home		
Yes	0.9	
No	2.9	
	p<0.01	
Floor material		
Sand/earth	2.9	
Cement/tiles	0.7	
	p<0.01	
Total no. of children		
1	1.9	
2	3.2	
3	2.5	
4	3.5	
5	3.7	
6+	0.6	
	p<0.02	
Sex of child		
Male	3.1	
Female	2.0	
	p<0.05	
Fever (2 weeks)		
Yes	3.5	
No	2.1	
	p<0.05	
Diarrhea (2 weeks)		
Yes	4.2	
No	2.2	
	p<0.005	
Wasted (<-2SD wt/ht)		
No	2.5	1.00[a]
Yes	0.5	0.18
Unknown	-	1.65[b]
	p<0.05	
Overall	2.6	
Number	2546	2477

Note: Level of significance determined using Chi-square test.
[a]Overall p<0.05.
[b]p<0.05 compared with reference category.

areas. Comparable data are available only for the Maradi, Tahoua, and Zinder regions where 7.3, 3.1, and 3.2 percent, respectively, of children age 2 to 5 years were found to be nightblind in the period immediately after the 1985 drought (Sloan *et al.*, 1986). Overall, 4 percent of children in the 1986 survey were nightblind; none in urban areas and 4.5 percent in rural areas. In addition, boys were more likely to be nightblind than girls (4.2 versus 3.8 percent, respectively). Since the 1986 survey, a vitamin A program has been implemented in the Maradi, Tahoua, and Zinder regions which accounts, in part, for the decline in nightblindness in these three regions.

In the NDHS, nightblindness is associated with a number of social and economic factors;[8] children whose mothers have no formal education or who work in a cottage industry or farm, who come from households with no toilet facilities, and whose homes have an earth/sand floor are more likely to be nightblind. Children who have more than one sibling are also more vulnerable to nightblindness. Among the biological variables investigated, boys, children with a recent history of fever or diarrhea, children who are not underweight, and children who are not wasted are more likely to be nightblind. As with diarrhea, however, many of these factors are interrelated. Indeed, after developing a logistic regression model to predict nightblindness among children age 2 to 5 years, only region and urban/rural residence proved to be good predictors. Although wasting (and underweight) were found to be good predictors of nightblindness the difference was between nightblindness among children who were weighed and those who were not weighed. Children not weighed were two-thirds more likely to be nightblind than those weighed, even after removing the effects of region and residence on nightblindness.[9] Children in Dosso are at least two and one-half times more likely and those in Tahoua/Agadez are one-third less likely to be nightblind than children in Tillabéri. This could, in part, be related to livestock ownership and thus better access to dairy products, which are important sources of vitamin A. Children in rural areas are at five times more risk of being nightblind than those in urban areas, suggesting that their diet is less diverse and more deficient in vitamin A foods.

The results of the logistic regression suggest that where children live determines their vulnerability to nightblindness. This is most probably related to both the access to and use of vitamin A containing foods. Children from households where dairy products are likely to be important components in the diet appear to be better protected against nightblindness than other children.

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[8] Nightblindness is not associated with other wealth indicators such as possession score or transport owned. It is also not associated with whether a child is breastfed or with stunting.

[9] A description of the children who were not weighed can be found in Appendix C.

Chapter 5

NUTRITION AND CARING CAPACITY OF THE FAMILY

The social, economic, health, and child variables identified as important in the bivariate analyses in Chapter 2 have been included in multivariate analyses in order to determine their net effects on nutritional status.

The following variables have been used to develop the best possible model to explain stunting, underweight, and wasting among children under age 5. The categories of each variable are indicated in parentheses with the reference category listed first. Only those variables that are significant are discussed in the sections that follow.

Nonbiological variables:

1. Region (Tillabéri, Dosso, Maradi, Tahoua/Agadez, Zinder/Diffa)
2. Residence (Niamey, other urban, rural)
3. Length of residence (less than 5 years, 5 to 9 years, 10 or more years, always)
4. Mother's age (15 to 19 years, 20 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 years, 40 to 49 years)
5. Mother's education (primary+, none)
6. Mother's occupation (petty trading, cottage industry, farmer, housewife)
7. Husband's education (primary+, none)
8. Husband's occupation (petty trading, cottage industry, farmer)
9. Mother in a polygamous union (not married, no, yes)
10. Husband lives at home (mother not married, no, yes)
11. Possession score (maximum score of 4 based on the availability of electricity, ownership of a TV, radio and/or refrigerator)
12. Transport (bicycle/cart, motor bike/car, none/animals)
13. Source of drinking water (pipe/well at house, public pipe, public well, river/stream)
14. Toilet (yes, no)
15. Floor (cement/other, earth/sand)
16. Roof (corrugated iron/other, mud, straw)

Biological variables:

1. Reason for full weaning (age to wean, maternal factors, child factors, not fully weaned)
2. Birth size (average+, small, very small)
3. Diarrhea (no, yes)
4. Fever (no, yes)
5. Cough (no, yes)
6. Vaccinated against measles (yes, no)
7. Number of dead children mother has (0, 1, 2+)

8. Diet
   a. 0 to 3 months[1] (fully breastfed, partially breastfed, fully weaned)
   b. 4 to 6 months[2] (breastfed, fully weaned)
   c. 7 to 11 months[3] (breastfed with complimentary foods, breastfed only, fully weaned)
   d. 12-23 months[4] (breastfed, fully weaned)
   e. 24-59 months[5] (fully weaned, breastfed)

Analyses were carried out for all children under 5 years old together and in the following age groups: infants 1 to 3 months old, infants 4 to 6 months, infants 7 to 11 months, children 12 to 23 months, and children 24 to 59 months old. Separate analyses were done for these age groups because optimal and appropriate feeding patterns depend on age. Risks of undernutrition were compared with the optimal feeding practice for each age group. The age-specific bivariate analyses between diet and stunting, diet and underweight, and diet and wasting show an association only for children age 24 to 59 months. Diet is also associated with wasting among children age 7 to 11 months. Breastfed children in both the above age groups are more likely to be undernourished, indicating that they do not receive sufficient complementary solid foods. Because the diet variable was not sufficiently specific and thus could not predict nutritional status in each of the different age groups, the models presented here include all children under 5 years.

5.1 STUNTING

The important determinants of stunting among Nigerien children under the age of 5 years are child age group, size of child at birth, reason for full weaning, region, household possession score, husband's occupation, and usual child caretaker (Table 5.1). The risk of stunting increases dramatically and significantly with a child's age. Indeed, children fall into one of three groups: those 6 months and younger; those 6 to 17 months, who are between 3 and 13 times more likely to be stunted than infants under 6 months; and those 18 to 59 months, who are about 25 times more likely to be stunted than infants under 6 months. Because the pernicious effects of poor nutrition take time to manifest themselves in stunting this finding is not unexpected. However, the difference in risk levels is extremely high and reflects the accumulated effect of inappropriate feeding practices, high rates of morbidity, and poverty.

Children whose mothers stated that they were small at birth are 22 percent more likely—and those who were very small at birth 43 percent more likely—to be stunted than children who were of average or large size at birth. Whether this finding is indeed true, and thus an indicator of maternal nutrition, or a reflection of the current size of the child, is unknown. Evidence that children born small or very small may be more stunted than children born average or large comes from the data showing the association between mother's perception of birth size and mean birth weight (see Chapter 2).

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[1] The optimal practice has been taken to be exclusive and full breastfeeding. Full breastfeeding is included because so few infants are exclusively breastfed.

[2] The recommended practice is to introduce infants to solid foods between the ages of 4 and 6 months. Thus, all infants in this age group should still be breastfed.

[3] By the age of 6 months, all infants should be receiving complementary solids in addition to breast milk, so this is used as the reference category.

[4] It is recommended that children be breastfed beyond the age of 12 months even if they are receiving complementary solids.

[5] Beyond the age of two years, breast milk does not contribute significantly to the energy and nutrient requirements for growth. For this reason the reference category is fully weaned,

Table 5.1 Net relative risk of stunting, underweight, and wasting

Net relative risk of stunting, underweight, and wasting for children 1 to 59 months, Niger 1992

Background factor	Stunting	Underweight	Wasting
Age group			
0 to 5	1.00[a]	1.00[a]	1.00[a]
6 to 11	3.81[b]	6.72[b]	3.20[b]
12 to 17	12.62[b]	17.03[b]	5.37[b]
18 to 23	24.40[b]	18.82[b]	5.82[b]
24 to 35	26.51[b]	16.52[b]	2.40[b]
36 to 47	26.69[b]	13.60[b]	1.51
48 to 59	23.93[b]	11.96[b]	1.56
Size at birth			
Average+	1.00[a]	1.00[a]	1.00[a]
Small	1.22[b]	1.34[b]	1.26[b]
Very small	1.43[b]	1.47[b]	1.61[b]
Reason for full weaning			
Age to wean	1.00[a]		
Maternal factors	1.08		
Child factors	0.81		
Currently breastfed	1.39[b]		
Region			
Tillabéri	1.00[a]	1.00[a]	1.00[a]
Dosso	0.98	0.93	0.83
Maradi	1.86[b]	1.67[b]	1.36[b]
Tahoua/Agadez	1.50[b]	1.29[b]	1.01
Zinder/Diffa	1.74[b]	1.22[b]	1.07
Possession index			
2+	1.00[a]	1.00[a]	
1	1.68[b]	1.28[b]	
0	1.45[b]	1.25[b]	
Type of roof			
Corrugated iron/other	1.00[a]	1.00[a]	
Mud	1.21[b]	1.05	
Straw	1.48[b]	1.31[b]	
Husband's occupation			
Petty trade	1.00[a]		
Cottage industry	1.17		
Housewife	1.31[b]		
Mother's occupation			
Petty trade	1.00[a]	1.00[a]	
Cottage industry	1.10	1.48[b]	
Farmer	1.35[b]	1.51[b]	
Housewife	1.15[b]	1.26[b]	
Usual child caretaker			
Servant/other	1.00[a]		
Sibling/husband	2.47[b]		
Relative	1.95[b]		
Mother takes to work	2.12[b]		
Mother does not work	2.35[b]		
Mother's marital union			
Not currently married	1.00[a]		
Monogamous	1.41[b]		
Polygamous	1.68[b]		
Diarrhea (2 weeks)			
No	1.00	1.00	
Yes	1.35[b]	1.31[b]	
Fever (2 weeks)			
No	1.00		
Yes	1.38[b]		
Number	3910	3910	4504

[a]Overall $p<0.05$.
[b]$p<0.05$ compared with reference category.

The reason for fully weaning a child is not associated with chronic undernutrition *per se* but breastfeeding is. Children who are currently breastfed are at nearly 40 percent greater risk of being stunted than fully weaned children, even after controlling for age. This indicates that their energy and nutrient intake is inadequate, because they are not fed sufficient complementary solid foods.

Children in Tahoua/Agadez are at 50 percent greater risk and children in Zinder/Diffa and in Maradi between 75 and 85 percent greater risk of being stunted than those from Tillabéri and Dosso. Because living in a particular region does not by itself cause undernutrition, the region must be acting as a proxy for other factors associated with poor nutrition, such as access to food, feeding practices, childcare practices, and parasitic infestations, which were not measured in the NDHS.

The household possession score, which is used as a proxy for wealth, also predicts stunting. Children from households that have electricity, a radio, a television, and a refrigerator are between 45 and 68 percent less likely to be stunted than children from households that own few or none of these items, even after taking region into account. Irrespective of where they live or the relative wealth of the household, children whose mother's husband's occupation is a farmer are at nearly one-third more risk of being stunted than children from households where the husband has another occupation. In addition, children who are cared for by a servant or at a kindergarten are at one-half the risk of being stunted. This finding probably reflects that these children come from households with a high social and economic status.

Other nonbiological factors that can be taken as proxies for wealth, such as type of transport owned, source of drinking water, availability of a latrine, type of floor or roof, and whether the husband lives at home or is away, are not good predictors of stunting among young children in Niger. The reason is that source of drinking water and availability of a latrine are closely correlated with type of floor material, which along with type of roof, type of transport owned, and husband's education are closely correlated with possession score. Once the effects of possession score on stunting are removed, the above variables are no longer significant. Similarly, the type of marital union of the mother and the number of deceased children a mother has are correlated with mother's education, which is correlated with region, as are husband's place of residence and urban/rural residence. Removing the effect of region on stunting also removes the effect of these variables. Length of residence and mother's occupation are associated with husband's occupation, and child's age is associated with mother's age. Including husband's occupation and child's age in the model eliminates the effect of the other variables on stunting.

5.2 UNDERWEIGHT

A number of the nonbiological and biological factors that predict underweight among children age 1 to 59 months are similar to those that predict stunting, namely, increasing child age, small birth size, residence in Maradi, Tahoua/Agadez, or Zinder/Diffa, and lower possession scores (Table 5.1).

The type of roof a household has, which is also a proxy for wealth and perhaps for environmental sanitation, is a good predictor of underweight: Children from households with a mud roof are over 20 percent more likely to be underweight and those from households with a straw roof are nearly 50 percent more likely to be underweight than other children. In addition, children whose mothers earn money are less likely to be underweight, suggesting that this income contributes to a better quality diet. Children whose mothers are currently not married are around 40 and 70 percent less likely to be underweight than those whose mothers are in a monogamous or a polygamous union, respectively. This suggests that children from households headed by women are perhaps better protected against being underweight than those from households headed by males. This situation can be partially explained by household meal patterns whereby men receive both more food and the best parts. In addition, it is very likely that men and women have different expenditure patterns.

Diarrhea, which has an immediate effect on energy balance, increases the risk of being underweight by 35 percent.

Associations between nonbiological and biological variables resulted in a number of variables being dropped from the model for predicting underweight during its development. For example, including child's age group in the model eliminated the effect of length of residence on underweight; type of floor in the model eliminated the effects of drinking water and availability of a latrine; adding a possession score to the model eliminated the effects of type of floor, father's attendance at school, and type of transport owned; and adding mother's occupation to the model eliminated the effects of fever and mother's education, which, in turn, eliminated the effect of the number of dead children. Urban/rural residence and husband's occupation are not good predictors of underweight once type of roof are entered into the model. Similarly, usual child caretaker and husband's place of residence fall out of the model once type of marital union is entered.

5.3 WASTING

Infants between 6 and 11 months are at three times greater risk, children 12 to 17 months and 18 to 24 months are at over five times greater risk, and those 24 to 35 months at nearly two and one-half times greater risk of being wasted than infants under 6 months. These findings are very probably due to poor dietary practices and high morbidity.

Children who were perceived by their mothers to be small or very small at birth are significantly more likely to be wasted than those considered to be of average size or larger at birth. The presence of diarrhea and the presence of fever in the previous two weeks increases the risk of wasting by over 30 percent because of the anorexia associated with illness and, in the case of diarrhea, the loss of body fluids.

Children in Maradi are nearly forty percent more likely to be wasted than children living elsewhere. Acute undernutrition is also associated with mother's occupation and type of roof. Both of these are likely to reflect a wealth effect on the risk of a child being wasted. Other social and economic variables, which are also proxies for wealth, again fell out of the logistic regression model through their associations with region and type of roof.

In summary, stunting, underweight, and wasting are largely determined by child age, size at birth, exposure to diarrheal disease, and factors generally associated with poverty. Children in Maradi are the most vulnerable to both chronic and acute undernutrition. Because infants and young children are not being fed optimally, undernutrition manifests itself soon after birth. The situation is exacerbated by very high levels of diarrhea at a very young age. The prevalence of undernutrition increases dramatically up to 24 months. Between 12 and 24 months of age the prevalence of wasting is over 30 percent, and between 18 and 48 months of age the prevalence of stunting is over 45 percent. After 24 months of age, improvements are seen in measures of underweight and wasting, and morbidity levels fall dramatically, which indicate a decline in nutritional risk for children once they enter the third year of life. This is most likely because, once they are older, children are more able to actively partake in the traditional family diet. Furthermore, the weak children have died.

These results indicate that efforts to improve child nutrition in Niger should focus on the first three years of life when inadequate dietary intake and diarrheal morbidity have their greatest effect on undernutrition, and when mortality rates are highest. The data strongly suggest that the main components of the primary health care system, particularly the Control of Diarrheal Disease (CDD) program and nutrition activities, need to be more vigorously pursued in order to improve the nutritional status of Nigerien children.

Chapter 6

RECOMMENDATIONS

The NDHS is the second survey to provide nationally representative data on the nutritional status of children under five years old, and the findings indicate that there are important challenges ahead.

Niger, in signing the International Conference on Nutrition's World Declaration and Plan of Action (FAO/WHO, 1992), is committed to eradicating malnutrition in all its forms. However, the Nutrition Division in the Ministry of Health, which is responsible for coordinating all the activities arising from the International Conference on Nutrition, lacks the necessary resources. Unless the Nutrition Division is strengthened both technically and financially it is unlikely that the goals laid down at the International Conference on Nutrition, and signed by the Nigerien Government, will be realized.

The associations between the age-specific risk for undernutrition and morbidity coupled with that of infant feeding patterns point to five major areas that need attention if child nutrition in Niger is to be improved.

1. Policy makers, administrators, professionals, and the public at large need to be made more aware of the nutritional problems in Niger.

2. The NDHS data reveal clear regional disparities in health status, nutritional status, and the use of health facilities. This suggests that there also are large regional disparities in the availability of health services, which needs to be addressed.

3. Children under 2 years of age are the most vulnerable to undernutrition and those under 3 years to dying. For this reason nutrition programs need to focus on the first three years of life. Specifically, health professionals, paramedics, and traditional health care workers need to:

   - Be made aware of the importance of feeding colostrum to newborn infants, so that they will advise mothers to initiate breastfeeding immediately. Feeding newborns other liquids, such as water or milk, before beginning to breastfeed must be actively discouraged.

   - Advise mothers to exclusively breastfeed their infants until they are 4 to 6 months old.

   - Advise mothers that by the age of 6 months their infants must receive complementary solid foods made from locally available foods.

   - Advise mothers about the quality and quantity of complementary solid foods that infants and young children need for proper growth. Although the survey provides no information on the composition or quantity of foods provided, it is generally recognized that traditional complementary solid foods have limited nutritional value. Given the high mortality rates, rapid deterioration in nutritional status, and high rates of morbidity starting soon after birth and continuing until 36 months of age, it is imperative that culturally appropriate methods to improve the quality of traditional complementary solid foods that are economically viable be developed and taught to mothers.

4. The rapid and high increase in the prevalence of diarrhea among children under 12 months old suggests that pathogen contamination from food and/or serving utensils is common. Efforts to

improve food hygiene (washing hands, cleaning serving utensils, etc.) will benefit children's nutritional status. It must be borne in mind, however, that once infants begin to crawl and explore their environment, they are exposed to many diarrheal-causing pathogens in addition to those in contaminated foods.

5. The continued high levels of chronic undernutrition among children over 3 years old, indicating that catch-up growth is limited, suggests that there is either insufficient food at the household level or that it is unequally distributed. To increase the food supply, households need to be told about low-cost methods for reducing storage losses and/or low-cost methods of food preservation, including solar drying of fruits and vegetables during the season of surplus. To alter behavior patterns associated with the distribution of food within households, nutrition and health education messages must be addressed to both parents—not just mothers. This will increase the likelihood of education messages having an impact on the welfare of children.

Additional Information Needs

The NDHS data set has identified several areas where further information would be useful. These include:

1. Evaluation of current nutrition programs

   In view of the high rates of undernutrition and poor infant and child feeding practices it is essential that current nutrition programs, particularly those incorporating nutrition education, be evaluated so as to identify the bottlenecks in terms of getting the *appropriate* messages to both health providers and families. Targeting educational messages through different channels, including mosques, need to be further explored.

2. Review of existing literature on nutrition in Niger

   Studies undertaken in Niger on cultural beliefs and practices concerning infant and child feeding, the nutrient density of commonly used complementary solid foods, feeding practices during diarrhea, maternal time constraints, and household economic constraints need to be reviewed and synthesized. This information can be used to develop appropriate nutrition interventions.

3. Information on micronutrient deficiencies

   Micronutrient deficiencies such as iron-deficiency anemia, iodine deficiency, and vitamin A deficiency are becoming increasingly recognized as important nutritional problems in Niger but there are currently no data on their extent or severity. Efforts to improve the quality of traditional complementary solid foods should also ensure that the micronutrient content of these foods meets infant and child requirements.

REFERENCES

Alichina, I., B. Garba, and B. Barrère. 1993. *Enquête démographique et de santé: Niger*. Direction de la Statistique et des Comptes Nationaux, Ministère des Finances et du Plan and Macro International Inc., Columbia, Maryland.

Defo, B.K. and M. Partin. 1993. Determinants of low birth weight: A comparative study. *J. Biosoc. Sci.*, 25: 78-100.

Dole, N., K. Gleiter, D. Savitz, T. Chimbira, and M. Mbizvo. 1990. Birthweight patterns in Harare, Zimbabwe. *Am. J. Epid.*, 19: 98.

FAO. 1991. *Food balance sheets: 1984-1985 average*. Rome.

FAO/WHO. 1992. *International conference on nutrition*: World declaration on nutrition and plan of action. Rome.

Gamatchié, M. 1989. *La consommation du riz dans la ville de Niamey*. Institut Italo-africain, Niamey.

Hung. M-M. and Y. Diallo. 1992. *Zinder intergrated health project: Baseline survey in child survival and family planning knowledge, attitudes and practices*. CARE International, Niger.

Keith, N. 1990. *Infant feeding, weaning, and diarrhea disease management: Hausa practice and beliefs and educational implications. Part I: The ethnographic study*. US AID, Niamey.

Ministère de l'Agriculture et de l'Elevage; Direction de l'Agriculture. 1993. *Annual report*. Niamey.

Ministère de l'Economie et des Finances. 1992a. *Recensement Général de la Population 1988: Analyse des données définitives - Caractéristiques économiques*. Bureau Central du Recensement. Niamey.

Ministère de l'Economie et des Finances. 1992b. *Recensement Général de la Population 1988: Analyse des données définitives - Caractéristiques socio-culturelles des ménages, des chefs de ménage et caractéristiques de l'habitat*. Bureau Central du Recensement. Niamey.

Ministère de l'Economie et des Finances. 1992c. *Recensement Général de la Population 1988: Analyse des donnéees définitives - Rapport de synthèse*. Bureau Central du Recensement. Niamey.

Ministère de la Santé Publique et des Affaires Sociales. 1985. *Enquête Nationale sur la Morbidité et la Mortalité*. Cellule de planification. Rapport No. 1. Niamey.

Ministère du Plan. 1991. *Annual report*. Niamey.

Ministère du Transport et du Tourisme. 1993. *Transports routiers*. Centre National des Utilisateurs des Transports. Niamey.

OPVN. 1991. *Annual report*. Niamey.

OAU/UNICEF. 1992. *Africa's children, Africa's Future: Human investment priorities for the 1990s*. OUA International Conference on Assistance to African Children, Dakar.

Perrier, S. 1991. *Etude des pratiques alimentaires et du comportement des mères dans l'alimentation du jeune enfant: Enquête fura-koko.* Ministère de la Santé Publique, Services des Maladies Diarrhéiques/PRITECH, Niger.

PRITECH. 1989. *Diarrhea illness in the Sahel: Epidemiological findings and early results of the campaign against diarrheal disease.* US AID Dakar.

Sachdev, H.P., J. Krishna, R.K. Puri, L. Satyanarayana, and S. Kumar. 1992. Water supplementation in exclusively breastfed infants during summer in the tropics. *Lancet*, 337: 929-933.

Sizaret, F. and C. Paci. 1985. Nutrition in rural development: Experience from Niger. *Food and Nutrition*, 11(1): 40-45.

Sloan, N.L., A. Paxton, and R.L. Leavell. 1986. *Xerophthalmia and trachoma in Burkina Faso, Chad, Mali, and Niger.* Hellen Keller International Inc., New York.

Sprundel, M., A. Buve, A. Serufilira, J.C. Vander Auwera, A. Mehens and A. de Clercq. 1988. Birthweight and socio-economic status: A study in Kigale, Rwanda. *Int. J. Epid.*, 17:579.

UNDP. 1990. *Human development report 1990.* Oxford University Press, New York.

UNICEF. 1992. *The state of the world's children.* Oxford University Press. New York.

UNICEF. 1993. *The state of the world's children.* Oxford University Press. New York.

USDA/ERS. 1993. Agriculture data base. Washington, D.C.

Waterlow, J.C. 1972. Classification and definition of protein-energy malnutrition. *Brit. Med. J.*, 3: 566-569.

WHO. 1982. *Control of vitamin A deficiency and xerophthalmia.* Technical report series No. 672. Geneva.

WHO. 1988. *Measuring change in nutritional status.* Geneva.

WHO. 1991. *Global health for all monitoring and evaluation reported data.* HFA monitoring and evaluation report, 1-7. Geneva.

World Bank. 1991. *World Development Report.* Oxford University Press.

World Food Council. 1992. The global state of hunger and malnutrition. Eighteenth Ministerial Session, Nairobi.

Appendix A

SAMPLE DESIGN

The 1988 census was used as the basis of the sampling frame for the Niger Demographic and Health Survey (NDHS). For logistical reasons areas where access was difficult were excluded, namely the pastoral areas in the North, where the population density is very low. The NDHS, therefore, covered all the regions in Niger except the district of Bilma and the "restante" of Arlit in the Agadez region. Although the areas excluded represent about one-third of the country's land mass, they contain less than one percent of the total population.

The listing for the 4479 enumeration areas (EAs), created by the Bureau Central de Recensement for the 1988 census, served as the sampling frame. The sample for the NDHS was stratified and selected in two stages. In the first stage, 235 EAs were selected from the census list with probability proportional to size. A complete listing of the households residing in each of the EAs provided the sampling frame for the selection of the households.

The urban/rural stratification used in the sampling frame was based on an administrative classification: the urban area includes all the headquarters of both the départments (regions) and the arrondissements (districts), which may or may not have the socio-economic characteristics usually associated with the urban area. For this reason, it was necessary to consider the urban community of Niamey as a separate domain for analysis. The three study domains retained are Niamey, other urban areas, and rural areas.

A total of 5,819 households, containing 6,750 women between 15 and 49 years, were identified as being eligible and selected to participate in the survey.

Source: Alachina *et al.*, 1993.

Appendix B

BACKGROUND CHARACTERISTICS OF HOUSEHOLD AND RESPONDENT

1.1 Characteristics of the Household Population

The NDHS collected information on all usual residents and visitors who slept in the household the previous night. A household is defined as a person or group of people living together and sharing a common pot of food.

Overall, 91 percent of the households in the NDHS survey are headed by men and the rest are headed by women. There is residential diversity: 8 percent of rural households are headed by women as are 15 percent of urban households (14 percent in Niamey and 16 percent in other urban areas; Alichina *et al.*, 1993). In the 1988 census, 10 percent of households were headed by women: 16 percent in urban areas and 8 percent in rural areas. The higher proportion of women-headed households in urban areas is attributed to the greater number of unmarried (divorced) women in these areas. There are more women-headed households in Maradi, Zinder, and Diffa than in the other regions. Women-headed households have on average 3 fewer people than those headed by men (Ministère de l'Economie et des Finances, 1992b).

Overall average household size in the NDHS is 6.1 people (Alichina *et al.*, 1993). Households are slightly larger in urban areas (6.3 people per household; 6.4 people per household in Niamey and 6.2 people per household in other urban areas) than rural areas (6.1 people per household). These results are similar to those from the 1988 census where overall household size is 6.4 people with households in rural areas being slightly larger (6.4 people per household) than those in urban areas (6.0 people per household) (Ministère de l'Economie et des Finances, 1992c).

1.2 Characteristics of Households with Children Under Five Years of Age

Demographic Factors

A total of 3,683 mothers and 5,717 children under the age of five years are included in the analyses presented in this report. The distribution of children under five years old and their mothers by region (Dosso, Maradi, Tahoua/Agadez, Tillabéri, Zinder/Diffa) and residence (Niamey, other urban, rural) is shown in Table B.1. Eighty-four percent of respondents are from rural areas, which is about the same proportion as in the population.

There are regional differences in the number of children living at home and total number of children a mother has (Table B.2). Mothers in Dosso tend to have both more children and more children living at home than mothers in the other regions while the opposite is true for mothers living in Zinder/Diffa. These findings follow the same trend as the census data for household size (Ministère de l'Economie et des Finances, 1992c). Although there are no residential differences in the number of children living at home, mothers in rural areas tend to have fewer children than those in urban areas, which is contrary to the census findings. Mothers in Maradi have on average 1.4 deceased children, which is higher than that for the other regions. Rural mothers are more likely to have more deceased children, more than twice the level found in Niamey. The number of deceased children in a family is known to be associated with the nutritional risk of surviving siblings.

Table B.1 Nutrition sample from the Niger DHS

Percentage of mothers of children under 5 years in the Niger DHS nutrition sample, and among children the percentage that are male and the percentage that are female, by region and residence, Niger 1992

Region and residence	Mothers		Children		
	Percent	Number	Male	Female	Number
Region					
Dosso	14.2	524	54.7	45.3	820
Maradi	19.1	705	51.3	48.7	1079
Tahoua/Agadez	21.5	793	51.4	48.6	1240
Tillabéri	23.6	870	52.2	47.8	1358
Zinder/Diffa	21.5	790	55.5	44.5	1220
Residence					
Niamey	5.7	208	51.2	48.8	326
Other cities/towns	10.7	393	49.7	50.3	637
Rural	83.7	3082	53.5	46.5	4754
Overall	100.0	3683	52.9	47.1	5717

Table B.2 Mean and standard deviation for living and dead children

Mean and standard deviation for number of children living at home, total number of children per mother, and number of dead children per mother, among children under 5 years, by region and residence, Niger 1992

Region and residence	Number of children at home		Total number of children		Number of dead children		Number
	Mean (SD)		Mean (SD)		Mean (SD)		
Region							
Dosso	3.12	(1.65)	3.49	(1.76)	1.07	(1.1)	524
Maradi	2.84	(1.53)	3.31	(1.68)	1.43	(1.19)	705
Tahoua/Agadez	2.80	(1.62)	3.13	(1.7)	1.12	(1.14)	793
Tillabéri	2.89	(1.72)	3.38	(1.79)	0.88	(1.04)	870
Zinder/Diffa	2.45	(1.47)	3.01	(1.67)	1.14	(1.16)	790
Level of significance	p<0.001		p<0.001		p<0.001		
Residence							
Niamey	2.92	(1.8)	3.46	(1.81)	0.57	(0.9)	208
Other cities/towns	2.96	(1.76)	3.42	(1.82)	0.83	(1.05)	393
Rural	2.77	(1.58)	3.22	(1.71)	1.2	(1.15)	3082
Level of significance	NS		p<0.02		p<0.001		
Overall	2.80	(1.61)	3.25	(1.73)	1.12	(1.14)	3683

Note: Levels of significance determined using ANOVA.
NS = Not significant.

Maternal And Social And Economic Factors

The mean and standard deviation age of mothers with children under the age of five years by region and residence is shown in Table B.3. Mothers in Maradi tend to be older than the other mothers, whereas those in Zinder/Diffa tend to be younger but there are no urban/rural differences in mother's age.

Overall, 91 percent of mothers have never been to school (Table B.4), which is similar to the figure of 87 percent found in the 1988 census (Ministère de l'Economie et des Finances, 1992a). Mothers in Tillabéri and in urban areas are more likely to have been to school than those in other areas. This finding reflects the availability, access to, and use of educational institutions, as well as cultural attitudes attached to the importance of educating daughters.

About two out of five mothers in the NDHS are engaged in employment in addition to being a wife and mother (Table B.5), which is similar to the findings in the census (Ministère de l'Economie et des Finances, 1992a). A higher proportion of the working mothers live in Maradi and Dosso; in Dosso they are primarily en-

Table B.3 Mother's age

Mean and standard deviation for age of mothers of children under 5 years, by region and residence, Niger 1992

Region and residence	Mother's age, in years: Mean (SD)	Number
Region		
Dosso	28.2 (7.0)	524
Maradi	29.1 (7.6)	705
Tahoua/Agadez	27.6 (7.0)	793
Tillabéri	28.2 (7.1)	870
Zinder/Diffa	27.1 (6.9)	790
Level of significance	p<0.001	
Residence		
Niamey	28.7 (6.9)	208
Other cities/towns	27.7 (7.2)	393
Rural	28.0 (7.2)	3082
Level of significance	NS	
Overall	28.0 (7.2)	3683

Note: Levels of significance determined using ANOVA.
NS = Not significant.

Table B.4 Mother's education

Percent distribution of mothers of children under 5 years by level of education, according to region and residence, Niger 1992

Region and residence	Educational level: None	Primary+	Total	Number
Region				
Dosso	93.5	6.5	100.0	524
Maradi	95.1	4.9	100.0	705
Tahoua/Agadez	93.4	6.6	100.0	793
Tillabéri	82.6	17.4	100.0	870
Zinder/Diffa	91.1	8.9	100.0	790
Level of significance	p<0.001			
Residence				
Niamey	62.2	37.8	100.0	208
Other cities/towns	76.2	23.8	100.0	393
Rural	94.5	5.5	100.0	3082
Level of significance	p<0.001			
Overall	90.7	9.3	100.0	3683

Note: Levels of significance determined using Chi-square test.

Table B.5 Mother's occupation

Percent distribution of mothers of children under 5 years by occupation category, according to region and residence, Niger 1992

Region and residence	Mother's occupation					Number
	House-wife	Petty trade	Cottage industry	Farming	Total	
Region						
Dosso	43.9	13.1	20.9	22.1	100.0	524
Maradi	44.6	20.2	3.7	31.5	100.0	705
Tahoua/Agadez	69.1	15.7	10.9	4.3	100.0	791
Tillabéri	60.3	11.2	12.7	15.8	100.0	869
Zinder/Diffa	63.1	25.9	3.4	7.6	100.0	786
Level of significance		p<0.001				
Residence						
Niamey	62.5	29.5	7.8	0.2	100.0	208
Other cities/towns	56.4	34.4	8.8	0.4	100.0	391
Rural	57.2	14.3	10.0	18.5	100.0	3076
Level of significance		p<0.001				
Overall	57.4	17.3	9.8	15.5	100.0	3675

Note: Levels of significance determined using Chi-square test

gaged in farming and cottage industries[1] but in Maradi they are active in farming and petty trade. In urban areas working women are primarily involved in petty trade. Women who work as farmers do so primarily on their husband's land. Traditionally, women in a monogamous union are expected to stay at home and look after their children and the husband is responsible for providing for his family. In contrast, women in a polygamous union are expected to work and their remuneration is used to cover the expenses of their children (Ministère de l'Economie et des Finances, 1992a).

Because women tend to work in the informal sector, they are able to take their children to work with them. Indeed, according to the NDHS results just under three-quarters of the working mothers take their youngest child to work with them. This practice is more common in Dosso and, to a lesser extent, in Tillabéri and Zinder/Diffa than elsewhere (Table B.6). More rural than urban mothers take their youngest child with them to work. Overall, an equal proportion of mothers depend on their older children/husband (12 percent) or other relatives/neighbors (11 percent) to look after the youngest child while they are at work and the rest depend on a servant, kindergarten, and so forth. The latter are more common in Niamey, where people are better able to afford to pay for child care.

[1] Cottage industries includes preparing food for sale whereas petty trading comprises primarily selling either fresh or prepared food.

Table B.6 Usual caretaker of children of working mothers

Percent distribution of child caretakers who are siblings/husband, relative/neighbor, other person, or mother, by region and residence, Niger 1992

Region and residence	Child caretaker: Siblings/ husband	Relatives/ neighbor	Other	Takes child to work	Total	Number
Region						
Dosso	10.5	5.6	0.8	83.1	100.0	294
Maradi	19.1	18.2	2.2	60.5	100.0	382
Tahoua/Agadez	18.1	10.2	2.3	69.3	100.0	242
Tillabéri	5.3	11.7	5.1	78.0	100.0	333
Zinder/Diffa	8.9	8.8	3.6	78.7	100.0	285
Level of significance		p<0.001				
Residence						
Niamey	7.7	18.4	16.7	57.3	100.0	76
Other cities/towns	12.6	20.9	7.7	58.8	100.0	167
Rural	12.7	9.7	1.4	76.2	100.0	1294
Level of significance		p<0.001				
Overall	12.4	11.4	2.8	73.4	100.0	1536

Note: Levels of significance determined using Chi-square test.

Ninety-six percent of the mothers interviewed are currently married and nearly 90 percent have a husband living at home (Table B.7). The husbands of the remaining mothers have migrated elsewhere to work. Mothers in Tillabéri and Dosso are more likely to have their husbands living elsewhere, and mothers in Tillabéri are more likely to be currently unmarried (mostly divorced) than mothers in the other regions.

Table B.7 Residence of mother's husband

Percent distribution of husbands of mothers of children under 5 years by whether husband resides at home or elsewhere, according to region and residence, Niger 1992

Region and residence	Husband's residence: At home	Elsewhere	Mother not married	Total	Number
Region					
Dosso	81.6	16.8	1.6	100.0	524
Maradi	97.3	0.6	2.1	100.0	705
Tahoua/Agadez	91.7	3.8	4.5	100.0	793
Tillabéri	77.6	16.2	6.2	100.0	870
Zinder/Diffa	95.4	1.1	3.6	100.0	790
Level of significance		p<0.001			
Residence					
Niamey	80.2	5.6	14.3	100.0	208
Other cities/towns	85.2	4.7	10.1	100.0	393
Rural	89.8	7.8	2.3	100.0	3082
Level of significance		p<0.001			
Overall	88.8	7.4	3.8	100.0	3683

Note: Levels of significance determined using Chi-square test.

Urban mothers are more likely to be currently unmarried than rural ones, which is consistent with the 1988 census findings. About one-third of mothers are in a polygamous union, which is also similar to the census data (Ministère de l'Economie et des Finances, 1992b). Polygamy is more common in Maradi and in rural areas (Table B.8).

Among husbands, 92 percent have had no formal education (Table B.9). This is more noticeable in Maradi, Tahoua/Agadez, Dosso, and rural areas, which again reflects the availability, access to, and use of educational institutions. The level of uneducated husbands is 20 percent higher than the census data for

Table B.8 Mother's marital union

Percent distribution of mothers of children under 5 years by type of marital union, according to region and residence, Niger 1992

Region and residence	Marital union				
	Polyg-amous	Monog-amous	Not married	Total	Number
Region					
Dosso	33.6	64.8	1.6	100.0	524
Maradi	48.6	49.3	2.1	100.0	705
Tahoua/Agadez	33.5	62.0	4.5	100.0	793
Tillabéri	26.1	67.7	6.2	100.0	870
Zinder/Diffa	32.3	64.1	3.6	100.0	790
Level of significance		p<0.001			
Residence					
Niamey	27.6	58.1	14.3	100.0	208
Other cities/towns	37.5	52.5	10.1	100.0	393
Rural	34.5	63.2	2.3	100.0	3082
Level of significance		p<0.001			
Overall	34.4	61.8	3.8	100.0	3683

Note: Levels of significance determined using Chi-square test.

Table B.9 Husband's education

Percent distribution of husbands of mothers of children under 5 years by husband's education, according to region and residence, Niger 1992

Region and residence	Husband's education			
	None	Primary+	Total	Number
Region				
Dosso	93.5	6.5	100.0	517
Maradi	94.3	5.7	100.0	677
Tahoua/Agadez	94.1	5.9	100.0	778
Tillabéri	89.0	11.0	100.0	832
Zinder/Diffa	90.5	9.1	100.0	781
Level of significance		p<0.001		
Residence				
Niamey	67.6	32.4	100.0	185
Other cities/towns	76.9	23.1	100.0	368
Rural	95.5	4.5	100.0	3032
Level of significance		p<0.001		
Overall	92.2	7.8	100.0	3586

Note: Levels of significance determined using Chi-square test.

educational levels of economically active males.[2] The latter includes unmarried men who are more likely to be younger and to have attended school (Ministère de l'Economie et des Finances, 1992a). Three-quarters of husbands are farmers, which is consistent with the 1988 census. Farming is more common in Maradi than in the other regions (Table B.10). There are a near equal proportion of men working in non-manual and manual occupations in all regions; most in the urban locations.

Table B.10 Husband's occupation

Percent distribution of husbands of mothers of children under 5 years by husband's occupation, according to region and residence, Niger 1992

Region and residence	Husband's occupation				
	Non-manual	Unskilled/ manual	Farming	Total	Number
Region					
Dosso	12.4	13.1	74.6	100.0	518
Maradi	7.6	8.7	83.7	100.0	701
Tahoua/Agadez	15.0	13.1	72.0	100.0	782
Tillabéri	13.2	12.5	74.4	100.0	848
Zinder/Diffa	13.3	11.8	74.8	100.0	785
Level of significance		p<0.001			
Residence					
Niamey	46.6	41.7	11.8	100.0	192
Other cities/towns	39.7	37.8	22.5	100.0	376
Rural	6.9	6.8	86.3	100.0	3066
Level of significance		p<0.001			
Overall	12.4	11.8	75.8	100.0	3634

Note: Levels of significance determined using Chi-square test.

Over 90 percent of mothers obtain drinking water from a public source: 79 percent from a well and 12 percent from a pipe (Table B.11). Private water supplies are more available in Tillabéri and in urban areas. Households in Tillabéri also use the Niger River as a source of drinking water. The majority of mothers in rural areas are dependent upon public wells as their source of drinking water, whereas urban mothers have access to both public pipes and wells. Despite the widespread use of wells and pipes, the OAU/UNICEF (1992) estimates that only 61 percent of the population have access to safe water: 100 percent in urban areas and 52 percent in rural areas.

[2] Defined as being over 10 years old.

Table B.11 Source of drinking water

Percent distribution of households with children under 5 years by source of drinking water, according to region and residence, Niger 1992

Region and residence	Source of drinking water					Number
	Private	Public pipe	Public well	Open sources	Total	
Region						
Dosso	3.7	8.8	87.0	0.5	100.0	523
Maradi	5.2	13.8	81.0	0.1	100.0	704
Tahoua/Agadez	6.0	12.9	77.4	3.7	100.0	792
Tillabéri	9.4	9.6	72.2	8.8	100.0	864
Zinder/Diffa	4.6	12.8	81.7	0.8	100.0	786
Level of significance		p<0.001				
Residence						
Niamey	30.4	26.6	39.1	3.9	100.0	206
Other cities/towns	23.1	49.4	27.1	0.4	100.0	390
Rural	2.2	5.9	88.5	3.4	100.0	3072
Level of significance		p<0.001				
Overall	6.0	11.7	79.2	3.1	100.0	3668

Note: Levels of significance determined using Chi-square test.

Eighty-four percent of mothers live in houses where there are no toilet facilities (Table B.12). Toilet facilities tend to be less available in Dosso and in Zinder/Diffa than elsewhere. Toilets are found mainly in urban areas; more so in Niamey than other urban areas. These results are consistent with those from the 1988 census (Ministère de l'Economie et des Finances, 1992b).

Table B.12 Availability of toilet

Percent distribution of households with children under 5 years having a toilet, by region and residence, Niger 1992

Region and residence	Toilet			Number
	Yes	No	Total	
Region				
Dosso	7.6	92.4	100.0	522
Maradi	17.4	82.6	100.0	703
Tahoua/Agadez	14.9	85.1	100.0	792
Tillabéri	26.4	73.6	100.0	864
Zinder/Diffa	11.6	88.4	100.0	786
Level of significance		p<0.001		
Residence				
Niamey	81.8	18.2	100.0	206
Other cities/towns	69.3	30.7	100.0	387
Rural	5.3	94.7	100.0	3072
Level of significance		p<0.001		
Overall	16.4	83.6	100.0	3666

Note: Levels of significance determined using Chi-square test.

Eighty-five percent of Nigerien mothers, particularly mothers in Dosso and in rural areas, live in a house with an earth or sand floor (Table B.13). Only 6 percent of mothers live in a house with a corrugated iron roof, 55 percent have a mud roof, and the remainder have a straw roof (Table B.13). The roofing material of houses in Tahoua/Agadez is inferior, and that in Dosso and in Maradi superior, to that in the other regions. Straw roofs are found more often in rural areas than in urban areas.

Table B.13 Type of floor and type of roof material

Percent distribution of households with children under 5 years by type of floor material and type of roof material, according to region and residence, Niger 1992

Region/ residence	Floor material			Roof material				Number
	Earth/ sand	Cement/ tiles	Total	Mud	Straw	Corrugated/ other	Total	
Region								
Dosso	95.2	4.8	100.0	38.0	57.4	4.6	100.0	523
Maradi	78.5	21.5	100.0	33.4	59.0	7.6	100.0	703
Tahoua/Agadez	88.8	11.2	100.0	86.3	11.3	2.5	100.0	793
Tillabéri	78.0	22.0	100.0	53.1	37.3	9.6	100.0	865
Zinder/Diffa	89.7	10.3	100.0	58.1	36.9	5.0	100.0	786
Level of significance	p<0.001			p<0.001				
Residence								
Niamey	20.0	80.0	100.0	47.4	13.1	39.4	100.0	206
Other cities/towns	41.7	58.3	100.0	67.5	6.0	26.6	100.0	387
Rural	95.3	4.4	100.0	54.4	44.4	1.1	100.0	3075
Level of significance	p<0.001			p<0.001				
Overall	85.4	14.6	100.0	55.4	38.6	6.0	100.0	3668

Note: Levels of significance determined using Chi-square test.

Nearly forty percent of Nigerien mothers listen to a radio at least once a week but only about 10 percent watch TV weekly (Table B.14). Access to media is much more limited in Maradi, in Zinder/Diffa, and in rural areas. The 1988 census found a similar trend although only 16 percent of households had access to a radio and 3 percent a television[3] (Ministère de l'Economie et des Finances, 1992b).

Table B.15 shows that 90 percent of the mothers belong to households that do not own any means of transport. A near equal proportion of households own bicycles/carts and motor bikes/cars. More households in Tillabéri and in urban areas own some means of transport.

[3] The census report indicates radio and television ownership may have been underestimated because households feared being taxed.

Table B.14 Exposure to radio and TV

Percentage of mothers of children under 5 years who listen to the radio and watch TV at least once a week, by region and residence, Niger 1992

Region and residence	Listen to radio	Watch TV	Number
Region			
Dosso	40.2	10.7	524
Maradi	26.8	5.1	705
Tahoua/Agadez	38.3	10.3	792
Tillabéri	56.0	24.8	870
Zinder/Diffa	29.7	5.2	790
Level of significance	p<0.001	p<0.001	
Residence			
Niamey	80.3	64.0	208
Other cities/towns	55.6	37.0	392
Rural	33.7	5.0	3080
Level of significance	p<0.001	p<0.001	
Overall	38.7	11.7	3681

Note: Levels of significance determined using Chi-square test.

Table B.15 Transport owned

Percent distribution of household with children under 5 years by type of transport owned, according to region and residence, Niger 1992

Region and residence	Transport owned				Number
	None	Bicycle/ cart	Motor-bike/ car	Total	
Region					
Dosso	91.4	6.3	2.4	100.0	523
Maradi	89.3	6.4	4.3	100.0	703
Tahoua/Agadez	89.6	5.8	4.5	100.0	793
Tillabéri	84.2	7.6	8.1	100.0	865
Zinder/Diffa	94.6	2.8	2.5	100.0	786
Level of significance		p<0.001			
Residence					
Niamey	63.4	8.5	28.2	100.0	206
Other cities/towns	66.4	14.2	19.4	100.0	388
Rural	94.3	4.5	1.1	100.0	3075
Level of significance		p<0.001			
Overall	89.6	5.8	4.6	100.0	3669

Note: Levels of significance determined using Chi-square test.

A possession index was drawn up based upon the availability of electricity and ownership of a radio, TV, refrigerator, and/or cooking stove. This index is used as a scale for relative wealth, with zero being the poorest and two or more being the wealthiest. Table B.16 shows that about 60 percent of mothers live in households that do not have access to any of these amenities and an additional one-third have access to only one. More mothers in Maradi, in Zinder/Diffa, and in rural areas have no amenities than mothers in the other regions.

Table B.16 Possession score

Percent distribution of mothers of children under 5 years by possession score of zero, according to region and residence, Niger 1992

Region and residence	Possession score[1]				
	0	1	2+	Total	Number
Region					
Dosso	59.7	37.7	2.6	100.0	524
Maradi	66.5	29.8	3.7	100.0	705
Tahoua/Agadez	58.8	35.2	6.0	100.0	793
Tillabéri	44.1	44.6	11.3	100.0	870
Zinder/Diffa	69.9	26.4	3.7	100.0	790
Level of significance		p<0.001			
Residence					
Niamey	23.4	37.7	38.9	100.0	208
Other cities/towns	38.1	35.4	26.5	100.0	393
Rural	64.4	34.6	1.0	100.0	3082
Level of significance		p<0.001			
Overall	59.3	34.9	5.8	100.0	3683

Note: Levels of significance determined using Chi-square test.
[1]Based on a score of one for availability/ownership of electricity, radio, TV and/or refrigerator.

Antenatal Care

Only about one-third of mothers had consulted a nurse/midwife/doctor for antenatal care, and the remainder had either had no antenatal care or were seen by an untrained person during the pregnancy of their child(ren) under the age of 5 years (Table B.17). The latter situation is particularly prevalent in Zinder/Diffa and in rural areas. According to the OAU/UNICEF (1992) data, less than one-half of all births are attended by a trained health person, whereas the NDHS found that 30 percent of births in the previous five years were attended by a trained health person (Alichina *et al.*, 1993).

Table B.17 Antenatal care provider

Percent distribution of mothers of children under 5 years by type of antenatal care provider, according to region and residence, Niger 1992

Region and residence	Antenatal care provider: No one/ other	Antenatal care provider: Nurse/ midwife/ doctor	Total	Number
Region				
Dosso	67.3	32.7	100.0	820
Maradi	74.5	25.5	100.0	1076
Tahoua/Agadez	68.4	31.6	100.0	1237
Tillabéri	48.2	51.8	100.0	1357
Zinder/Diffa	82.1	17.9	100.0	1217
Level of significance	p<0.001			
Residence				
Niamey	5.9	94.1	100.0	326
Other cities/towns	15.1	84.9	100.0	636
Rural	78.8	21.2	100.0	5708
Level of significance	p<0.001			
Overall	67.5	32.5	100.0	5708

Note: Levels of significance determined using Chi-square test.

Appendix C

ANTHROPOMETRIC DATA VERIFICATION

Of the 5,717 children under the age of five years who took part in the survey, 67.3 percent were weighed and measured, 13.3 percent were neither weighed nor measured, 12.2 percent did not have the month of birth, and a further 7.2 percent had invalid measurements, i.e., at least one of the anthropometric measurements (age, weight, or height) was highly unlikely given the other two measurements. The invalid measurements were defined as Z-scores for height-for-age and weight-for-age below -6 standard deviations and weight-for-height below -4 standard deviations or any of the indices above 6 standard deviations.

The most frequently cited reasons for not weighing and measuring a child included: the child was away at the time of the interview (41.6 percent), the child refused (19.3 percent), the child was sick (12.7 percent), the child was asleep (11.6 percent), missing information (5.3 percent), the mother refused (2.6 percent), and other reasons (2.6 percent).

Children for whom there were no weight and/or height data tended to be over 36 months of age, have younger mothers (under 24 years old) and live in Dosso and, to a lesser extent, Maradi. Children with incomplete ages also tended to be over 36 months of age, have older mothers (over 30 years old), mothers who had never been to school, and mothers who work in farming. These children tended to live in Maradi and in rural areas. All of these characteristics, however, tended to be interrelated. Invalid data tended to be for infants under 6 months; taking accurate anthropometric measurements on this age group is much more difficult than for older infants and children. In addition children in Zinder/Diffa and in rural areas are more likely to have invalid measurements.

Z-scores were imputed for the children with invalid or missing Z-scores in order to determine whether the missing and outlying data in any way biased the nutrition results. This was done by assigning the Z-scores for the previous child in the data set who was born in the same year and whose mother had attended the same level of school. The distribution of the imputed Z-scores compared with the valid Z-scores show that 44 versus 45, 37 versus 35, and 56 versus 52 percent of the imputed Z-scores for ht/age, wt/age, and wt/ht, respectively, fell in the normal and over-nourished categories and among children born in 1992 or before 1989, i.e., young infants and older children (Table C.1). In other words the children for whom no data were available tended to be the very young and older children who are not acutely undernourished. There was no evidence of a bias by sex in the missing or invalid data.

A comparison was made between the data set used to calculate the prevalences of undernutrition and the data set with the imputed Z-scores for weight-for-age, height-for-age, and weight-for-height included. The results showed that the data set used in the analyses presented may be overestimating the level of underweight and stunting and, to a lesser extent, the level of wasting (Table C.2). These findings are unlikely to affect the main conclusions of this report since the invalid and missing data tended to be for older children. However, it should be borne in mind that more data were missing (for well-nourished children) in Maradi where more undernutrition was found.

Table C.1 Imputed and valid Z-scores

Percent distribution of children age 1 to 59 months by nutritional status, year of birth, and sex according to imputed and valid height-for-age, weight-for-age, and weight-for-height Z-scores, Niger 1992

	Height-for-age		Weight-for-age		Weight-for-height	
	Imputed	Valid	Imputed	Valid	Imputed	Valid
Nutritional status						
Severe undernutrition	14.0	12.8	11.2	10.1	2.9	2.8
Moderate undernutrition	16.9	17.1	19.2	23.6	10.4	12.1
Mild undernutrition	24.7	25.1	32.1	31.2	30.5	33.0
Normal nutrition	29.9	33.6	29.0	28.6	51.0	47.7
Mild overnutrition	5.3	5.9	3.9	3.4	3.7	3.0
Moderate overnutrition	5.1	2.9	2.5	1.6	0.7	0.7
Severe overnutrition	4.1	2.7	2.0	1.5	0.7	0.6
Missing data	0.1	-	0.1	-	0.1	-
Total	100.0	100.0	100.0	100.0	100.0	100.0
Year of birth						
1987	5.4	8.6	5.4	8.6	7.5	7.7
1988	22.6	16.6	22.6	16.6	18.9	18.3
1989	21.8	18.2	21.8	18.2	18.9	19.4
1990	18.0	20.9	18.0	20.9	17.1	20.7
1991	14.2	28.0	14.2	28.0	13.7	26.3
1992	18.0	7.6	18.0	7.6	23.9	7.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
Sex of child						
Male	51.6	52.5	51.6	52.5	50.1	52.7
Female	48.4	47.5	48.4	47.5	49.9	47.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	1674	3945	1674	3945	1080	4539

Table C.2 Verification of anthropometric data

Percentage of children under 5 years by nutritional status, according to imputed and non-imputed anthropometric data and the difference between imputed and non-imputed values, Niger 1992

Nutritional status	Imputed values		Difference
	Yes	No	
Stunted	30.1	32.7	-2.6
Number	5619	3812	
Underweight	32.7	36.5	-3.8
Number	5619	3812	
Wasted	14.6	16.1	-1.5
Number	5619	4507	

There was evidence of digit preference in the height and weight measurements but less so for the aging of children (Table C.3). Digit preference was more prominent with height than with weight measurements. For height and weight, preferences were for terminal digits ending in 0, 5, and 2; for age, the preference was for complete years. It is not possible to comment on whether the tendency was to round upwards or to round downwards. These findings of digit preference should not affect the calculated prevalences of undernutrition. They will, however, reduce the probability of finding significant associations between undernutrition and explanatory variables.

Table C.3 Digit preference in anthropometric data

Percentage of weight, height, and age data falling as specific integers, Niger 1992

Integers/ age	Height	Weight
Decimal integer[1]		
0	14.9	8.4
1	8.6	10.1
2	11.0	10.6
3	10.5	10.1
4	7.9	10.7
5	15.6	10.3
6	8.5	10.7
7	8.5	9.5
8	8.7	10.9
9	6.0	8.8
Total	100.0	100.0
Number	4891	5038

	Observed	Expected
Age		
Complete years	10.1	8.3
Half years	7.5	8.3
Quarter years	9.4	8.3
Three-quarter years	7.9	8.3
Other	65.2	66.7
Total	100.0	100.0
Number	5025	

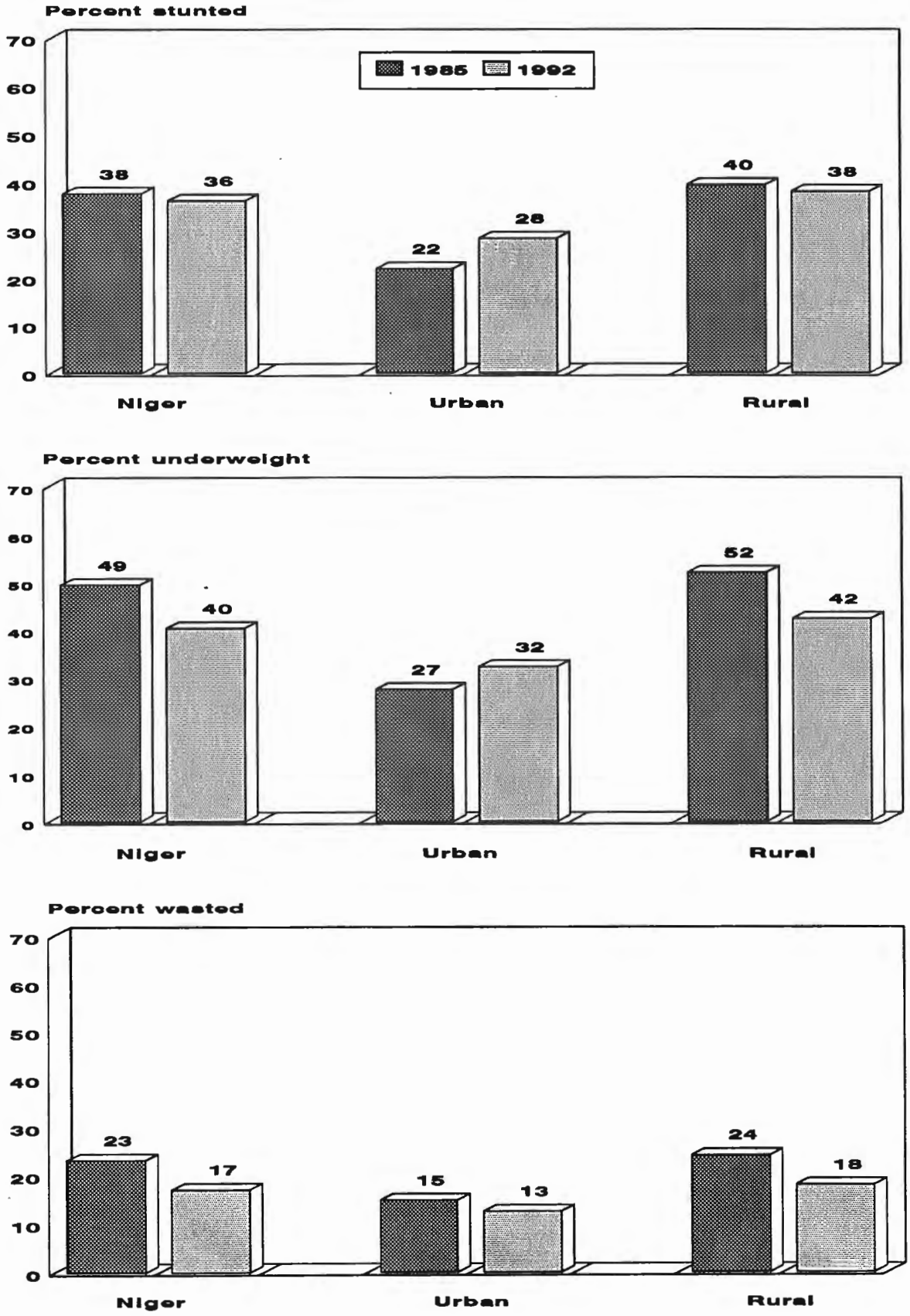
[1]Expect 10 percent in each category.

APPENDIX D

STUNTING, UNDERWEIGHT, AND WASTING AMONG CHILDREN AGE 6 TO 59 MONTHS BY RESIDENCE, 1985 AND 1992

Figure D

Stunting, underweight, and wasting among children age 6 to 59 months by residence, Niger 1985 and 1992



APPENDIX E

UNDERNUTRITION BY REGION, RESIDENCE, AND GENDER, BY AGE GROUP

Table E.1 Undernutrition by region and age group

Percentage of children age 1 to 59 months who are undernourished, by region and age group, Niger 1992

Age group (months)	Undernutrition		
	Stunted	Underweight	Wasted
Niger			
1-5	2.5	3.1	5.9
6-11	9.8	18.6	18.6
12-17	25.6	51.2	32.2
18-23	45.8	55.9	35.0
24-35	47.1	49.0	14.8
36-47	46.3	38.8	8.5
48-59	37.9	32.5	8.9
Number	3812	3812	4507
Dosso			
1-5	0.0	2.9	0.8
6-11	7.0	16.5	12.0
12-17	12.8	33.0	24.5
18-23	35.2	55.3	31.0
24-35	34.5	42.3	16.0
36-47	33.4	34.4	11.4
48-59	36.4	26.2	3.7
Number	613	613	651
Maradi			
1-5	4.5	4.5	4.0
6-11	17.8	33.4	19.2
12-17	41.1	72.8	46.1
18-23	62.5	65.0	46.9
24-35	61.1	72.8	22.6
36-47	64.9	46.2	6.0
48-59	50.6	52.7	13.8
Number	658	658	835
Tahoua/Agadez			
1-5	3.8	3.8	9.4
6-11	5.9	11.3	15.3
12-17	25.6	50.4	32.4
18-23	44.6	52.9	32.7
24-35	50.3	46.2	9.2
36-47	52.4	46.6	9.4
48-59	39.7	32.4	5.4
Number	872	872	978
Tillabéri			
1-5	2.1	4.2	6.9
6-11	7.7	19.6	28.7
12-17	17.2	45.1	27.4
18-23	33.8	50.5	34.1
24-35	32.3	34.8	11.1
36-47	30.9	27.9	5.2
48-59	25.2	20.7	6.2
Number	933	933	1132
Zinder/Diffa			
1-5	1.6	0.0	8.0
6-11	11.9	15.6	14.3
12-17	32.0	53.8	30.4
18-23	61.9	61.9	31.1
24-35	64.8	59.4	17.9
36-47	49.2	36.8	11.2
48-59	40.6	33.5	15.5
Number	736	736	911

Table E.2 Undernutrition by residence, gender, and age group

Percentage of children age 1 to 59 months who are undernourished, by residence and gender, according to age group, Niger 1992

Age group (months)	Undernutrition		
	Stunted	Underweight	Wasted
Niamey			
1-5	1.5	2.9	1.4
6-11	9.5	22.9	18.9
12-17	25.3	42.9	28.9
18-23	21.4	27.4	18.6
24-35	23.4	26.9	8.9
36-47	20.4	19.7	6.2
48-59	24.6	23.0	8.2
Number	255	255	277
Other cities/towns			
1-5	2.1	3.2	7.3
6-11	7.8	22.7	21.8
12-17	31.2	41.3	26.1
18-23	51.0	54.2	24.5
24-35	36.6	38.3	7.5
36-47	35.7	33.8	4.9
48-59	32.6	29.1	3.1
Number	483	483	523
Rural			
1-5	2.6	3.1	6.0
6-11	10.1	17.7	18.1
12-17	24.8	53.1	33.2
18-23	47.3	59.1	38.2
24-35	50.8	52.6	16.3
36-47	50.1	41.2	9.1
48-59	40.1	33.9	1.8
Number	3073	3073	3708
Male			
1-5	3.3	2.0	6.5
6-11	9.5	21.7	23.0
12-17	29.1	53.8	31.7
18-23	47.5	53.0	31.7
24-35	47.8	47.5	14.3
36-47	43.7	36.1	10.7
48-59	38.0	33.1	8.9
Number	2036	2036	2513
Female			
1-5	1.6	4.4	5.2
6-11	10.1	15.7	14.3
12-17	20.7	47.5	32.9
18-23	43.8	59.2	38.6
24-35	46.3	50.8	15.4
36-47	49.2	41.9	6.0
48-59	37.7	31.8	8.9
Number	1776	1776	2094

Appendix F

FEEDING PRACTICES BY AGE

Table F.1 Feeding practices by age

Percent distribution of children under 24 months by feeding practices, according to age group, Niger 1992

Age (months)	Breastfed and: Nothing	Water	Other liquids	Milk	Solids	Milk and solids	Fully weaned	Total	Number
<1	0.5	40.2	24.5	20.6	4.3	3.8	6.1	100.0	261
1-3	2.0	42.2	20.6	10.3	14.9	7.2	2.8	100.0	276
4-5	1.1	36.7	14.2	10.6	28.5	6.5	2.3	100.0	249
6-7	0.0	22.5	7.0	2.3	50.3	15.2	2.7	100.0	222
8-9	0.6	13.7	3.2	1.7	65.7	13.0	2.1	100.0	229
10-11	0.0	6.9	2.5	0.3	74.9	12.3	3.1	100.0	200
12-13	0.5	3.9	0.5	0.7	78.6	11.7	4.0	100.0	265
14-15	0.0	2.9	1.9	0.6	68.1	16.9	9.6	100.0	227
16-17	0.0	4.5	0.0	1.1	61.1	20.4	13.0	100.0	133
18-19	0.0	4.3	3.4	1.7	55.9	11.6	23.0	100.0	164
20-21	0.0	4.6	0.0	0.0	50.1	10.2	35.1	100.0	153
22-23	0.0	3.2	1.0	1.0	41.1	6.5	47.3	100.0	144

Appendix G

LOGISTIC REGRESSION MODELS

Logistic regression analysis, as opposed to multiple regression analysis, is used when the dependent (or outcome variable) has only two values, in other words an event can either occur or not occur. In this document logistic regression models have been developed to explain (or predict) three outcomes, namely diarrhea, nightblindness, and nutritional status among Nigerien children. These models estimate the probability that an event occurs; in this case having a recent history of diarrhea, being nightblind, and being stunted, underweight, or wasted.

In each model the value of one of the categories listed under the variable heading is a reference category against which all other values are compared. For each variable, the category in the bivariate analysis most positively associated with the "outcome variable" has generally been used as the reference category. By default, values for these reference categories are given a regression estimate of 1.00. Regression estimates greater than 1 indicate that the odds for the "outcome variable" for the category in question is greater than for the reference category. Conversely, regression estimates of less than 1 indicate that the odds for the "outcome variable" for the category in question is less than that for the reference category. In presenting the results of the logistic regressions, the ratio of the odds have been transformed into the ratios of probabilities (relative risks) for ease of understanding.

In Table 4.6, for example, the "not having fever" is the reference category for the variable "fever" and has a numerical value of 1.00. The relative risk for a child to have diarrhea if he/she has a fever is over 2 times greater, and this is significantly different from that for a child without a fever. Similarly, children who are wasted only are 19 percent more likely to have diarrhea than children who are neither stunted nor wasted but this difference is not statistically significant. On the other hand, children who are both stunted and wasted are 48 percent more likely to have diarrhea and this is significantly higher than the risk for having diarrhea if the child is neither stunted nor wasted.