CHAPTER 7

NUTRITION AND THE PREVALENCE OF ANAEMIA

This chapter focuses on the nutrition of women and young children, examining both the types of food consumed and the consequences of inadequate nutrition and poor feeding practices. NFHS-1 included basic information about feeding practices and the nutritional status of young children. NFHS-2 contains more comprehensive information on these topics, and, for the first time, information on the diet of women. Measurement of height and weight has been expanded to include ever-married women as well as young children. Two additional tests have been included for the first time—anaemia testing for women and young children and the testing of cooking salt to determine the extent of iodization. A specially trained health investigator attached to each interviewing team conducted height and weight measurements and anaemia testing.

7.1 Women's Food Consumption

The consumption of a wide variety of nutritious foods is important for women's health. Adequate amounts of protein, fat, carbohydrates, vitamins, and minerals are required for a well-balanced diet. Meat, fish, eggs, and milk, as well as pulses and nuts, are rich in protein. Green, leafy vegetables are a rich source of iron, folic acid, vitamin C, carotene, riboflavin, and calcium. Many fruits are also good sources of vitamin C. Bananas are rich in carbohydrates. Papayas, mangoes, and other yellow fruits contain carotene, which is converted to vitamin A. Vitamin A is also present in milk and milk products, as well as egg yolks (Gopalan et al., 1996).

NFHS-2 asked ever-married women how often they consume various types of food (daily, weekly, occasionally, or never). Women consume pulses or beans and milk or curd most often (Table 7.1). A majority of women consume each of these types of food every day. Vegetables (both green, leafy vegetables and other vegetables) are also an important part of the diet for women. More than 90 percent of women eat vegetables at least once a week and more than one-third eat each type of vegetable every day. Fruits are eaten every day by only 15 percent of women, but 54 percent of women eat fruits at least once a week. More than one-quarter of women in Karnataka (28 percent) never eat chicken, meat, or fish. One-third of women eat chicken, meat, or fish at least once a week, but only 1 percent of women eat this type of food every day. Thirty-eight percent of women eat chicken, meat, or fish occasionally. Eggs are consumed about as often as chicken, meat, or fish. More than one-quarter of women say that they never eat eggs.

Table 7.2 shows that there are substantial differentials in food consumption patterns by background characteristics. Age does not play an important role in women's consumption patterns. Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly fruits, eggs, milk/curd, and chicken, meat, or fish. Illiterate women have poorer and less varied diets than literate women, and their diets are particularly deficient in such nutritious foods as fruits and milk/curd. Christians are more likely than either Hindus or Muslims to consume every food item except pulses or beans. Muslims are twice as likely as Hindus to eat chicken, meat, or fish and they are also much more likely to eat eggs. About one-third of Hindu women (29 percent) say that they eat chicken, meat, or fish at least once a week. Women from scheduled tribes and scheduled castes have a relatively poor diet that

Table 7.1 Women's food consumption

Percent distribution of ever-married women by frequency of consumption of specific foods, Karnataka, 1999

Type of food	Frequency of consumption				Total percent
	Daily	Weekly	Occasionally	Never	
Milk or curd	61.7	13.8	19.4	5.1	100.0
Pulses or beans	73.3	25.3	1.3	0.0	100.0
Green, leafy vegetables	36.4	56.8	6.6	0.2	100.0
Other vegetables	41.7	50.1	8.2	0.0	100.0
Fruits	14.7	39.0	45.8	0.5	100.0
Eggs	2.3	37.6	32.6	27.6	100.0
Chicken, meat, or fish	1.2	32.7	37.7	28.4	100.0

Table 7.2 Women's food consumption by background characteristics

Percentage of ever-married women consuming specific foods at least once a week by selected background characteristics, Karnataka, 1999

Background characteristic	Type of food							Number of women
	Milk or curd	Pulses or beans	Green, leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat, or fish	
Age								
15–24	74.8	98.8	92.6	89.9	49.9	39.4	33.4	1,205
25–34	76.0	98.5	94.3	93.1	55.6	43.0	37.0	1,584
35–49	75.5	98.7	92.7	91.9	54.7	37.1	31.2	1,585
Residence								
Urban	85.7	99.2	96.1	96.1	72.2	50.8	44.6	1,523
Rural	70.1	98.3	91.7	89.5	43.8	34.0	28.2	2,851
Education								
Illiterate	65.2	98.5	91.6	88.8	38.2	36.6	31.1	2,414
Literate, < middle school complete	82.2	97.9	92.9	92.4	60.7	41.1	34.8	818
Middle school complete	87.7	99.7	95.5	96.2	66.8	45.7	39.6	289
High school complete and above	94.1	99.3	97.5	98.2	86.3	46.0	39.0	853
Religion								
Hindu	75.7	98.6	93.5	91.5	53.3	35.8	29.1	3,741
Muslim	70.8	99.0	90.5	92.5	48.6	64.3	62.6	492
Christian	84.5	97.0	96.2	96.0	84.7	81.8	79.2	105
Other	(97.3)	(97.3)	(100.0)	(94.4)	(71.6)	(2.7)	(2.7)	35
Caste/tribe								
Scheduled caste	55.7	97.9	92.2	91.0	39.8	49.4	44.5	704
Scheduled tribe	62.7	98.1	90.2	82.6	38.2	37.2	26.6	252
Other backward class	78.0	98.8	93.7	92.8	54.2	43.6	34.8	1,809
Other	83.1	98.9	93.8	92.4	62.2	32.1	29.6	1,559
Standard of living index								
Low	57.6	98.0	90.2	86.9	33.3	35.3	29.9	1,314
Medium	78.4	98.7	93.2	92.1	54.0	40.6	33.8	2,141
High	94.6	99.4	97.7	98.1	82.6	44.4	39.8	904
Total	75.5	98.6	93.3	91.8	53.7	39.9	33.9	4,374

Note: Total includes 49 and 15 women with missing information on caste/tribe and the standard of living index, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases

is particularly deficient in fruits and milk/curd. As expected, the household's standard of living has a strong negative effect on the consumption of nutritious types of food. Women in households with a low standard of living are much less likely than other women to eat fruits and milk or curd on a regular basis.

7.2 Nutritional Status of Women

In NFHS-2, ever-married women age 15–49 were weighed using a solar-powered digital scale with an accuracy of ±100 grams. Their height was measured using an adjustable wooden measuring board specially designed to provide accurate measurements (to the nearest 0.1 cm) of women and children in a field situation. The weight and height data were used to calculate several indicators of women's nutritional status, which are shown in Table 7.3. The height of an adult is an outcome of several factors including nutrition during childhood and adolescence. A woman's height can be used to identify women at risk of having a difficult delivery, since small stature is often related to small pelvic size. The risk of having a baby with a low birth weight is also higher for mothers who are short.

The cutoff point for height, below which a woman can be identified as nutritionally at risk, varies among populations, but it is usually considered to be in the range of 140–150 centimetres (cm). NFHS-2 found a mean height for women in Karnataka of 152 cm (one cm taller than the mean height for women in India as a whole). The mean height varies only slightly (between 151 and 154 cm) for women in different population groups, as shown in Table 7.3. Ten percent of women in Karnataka are under 145 cm in height.

Table 7.3 also shows two measures of an index that relates a woman's weight to her height. These measures exclude women who were pregnant at the time of the survey or women who gave birth during the two months preceding the survey. The body mass index (BMI) can be used to assess both thinness and obesity. The BMI is defined as the weight in kilograms divided by the height in metres squared (kg/m^2). The mean BMI for women in Karnataka is 20 (varying within a narrow range of 19–23 for all the groups shown in the table). Chronic energy deficiency is usually indicated by a BMI of less than 18.5. More than one-third of women (39 percent) in Karnataka have a BMI below 18.5, indicating a high prevalence of nutritional deficiency. Nutritional problems, as indicated by the BMI, are particularly serious for younger women, rural women, illiterate women, scheduled-tribe women, working women who are not self-employed, and women living in households with a low standard of living. Women from households with a low standard of living are three times as likely to have a low BMI as women from households with a high standard of living.

7.3 Anaemia Among Women

Anaemia is characterized by a low level of haemoglobin in the blood. Haemoglobin is necessary for transporting oxygen from the lungs to other tissues and organs of the body. Anaemia usually results from a nutritional deficiency of iron, folate, vitamin B_{12}, or some other nutrients. This type of anaemia is commonly referred to as iron-deficiency anaemia. Iron deficiency is the most widespread form of malnutrition in the world, affecting more than two billion people (Stolzfus and Dreyfuss, 1998). In India, anaemia affects an estimated 50 percent of the population (Seshadri, 1998).

Table 7.3 Nutritional status of women

Among ever-married women, mean height, percentage with height below 145 cm, mean body mass index (BMI), and percentage with BMI below 18.5 kg/m^2 by selected background characteristics, Karnataka, 1999

Background characteristic	Height			Weight-for-height[1]		
	Mean height (cm)	Percentage below 145 cm	Number of women for height	Mean body mass index (BMI)	Percentage with BMI below 18.5 kg/m^2	Number of women for BMI
Age						
15–19	152.1	7.7	416	19.0	45.6	367
20–24	151.9	7.4	749	19.1	48.5	643
25–29	152.4	9.3	830	20.0	39.4	789
30–34	151.9	9.7	702	20.6	37.6	691
35–49	151.8	11.3	1,503	21.3	33.2	1,497
Marital status						
Currently married	152.0	9.6	3,854	20.4	38.4	3,640
Not currently married	151.7	9.2	346	20.1	43.0	346
Residence						
Urban	151.8	11.4	1,461	22.3	23.8	1,406
Rural	152.1	8.6	2,739	19.3	47.0	2,581
Education						
Illiterate	151.6	10.6	2,306	19.3	48.3	2,188
Literate, < middle school complete	151.9	8.9	793	20.8	36.2	760
Middle school complete	152.6	6.7	283	21.2	30.1	260
High school complete and above	152.9	8.5	818	22.7	17.8	778
Religion						
Hindu	152.0	9.4	3,599	20.2	40.2	3,421
Muslim	151.7	10.6	469	21.0	33.3	437
Christian	153.6	8.0	101	23.1	16.4	97
Other	(151.7)	(22.6)	32	(20.4)	(36.0)	31
Caste/tribe						
Scheduled caste	151.5	11.3	683	19.7	44.2	637
Scheduled tribe	151.9	9.4	236	18.9	49.0	226
Other backward class	152.2	9.2	1,738	20.2	40.1	1,657
Other	152.0	9.4	1,495	21.2	32.8	1,422
Work status						
Working in family farm/business	152.3	8.2	689	19.1	51.7	652
Employed by someone else	151.5	10.8	1,232	19.2	47.8	1,183
Self-employed	151.7	14.0	246	20.2	39.0	239
Not worked in past 12 months	152.2	8.8	2,031	21.5	28.8	1,911
Standard of living index						
Low	151.4	11.0	1,248	18.9	50.5	1,173
Medium	151.8	9.6	2,073	20.1	41.4	1,966
High	153.3	7.5	865	23.1	16.5	833
Total	152.0	9.6	4,200	20.4	38.8	3,986

Note: Total includes 44, 1, and 15 women with missing information on caste/tribe, work status, and the standard of living index, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases
[1]Excludes women who are pregnant and women with a birth in the preceding two months. The body mass index (BMI) is the ratio of the weight in kilograms to the square of the height in metres (kg/m^2).

Anaemia may have detrimental effects on the health of women and children and may become an underlying cause of maternal mortality and perinatal mortality. Anaemia results in an increased risk of premature delivery and low birth weight (Seshadri, 1997). Early detection of anaemia can help to prevent complications related to pregnancy and delivery as well as child-

development problems. Information on the prevalence of anaemia can be useful for the development of health-intervention programmes designed to prevent anaemia, such as iron-fortification programmes.

In India, under the Government's Reproductive and Child Health Programme, iron and folic acid tablets are provided to pregnant women in order to prevent anaemia during pregnancy. Because anaemia is such a serious health problem in India, NFHS-2 undertook direct measurement of the haemoglobin levels of all ever-married women age 15–49 years and their children under three years of age. Measurements were taken in the field using the HemoCue system.[1] This system uses a single drop of blood from a finger prick (or a heel prick in the case of infants under six months old), which is drawn into a cuvette and then inserted into a portable, battery-operated instrument.[2] In less than one minute, the haemoglobin concentration is indicated on a digital read-out.

Before the anaemia testing was undertaken in a household, the health investigator read a detailed informed consent statement to the respondent, informing her about anaemia, describing the procedure to be followed for the test, and emphasizing the voluntary nature of the test. She was then asked whether or not she would consent to have the test done for herself and her young children, if any. The health investigator then signed the questionnaire at the bottom of the statement to indicate that it had been read to the respondent and recorded her agreement or lack of agreement to the testing. If the test was conducted, at the end of the test the respondent was given a written record of the results for herself and each of her young children. In addition, the health investigator described to her the meaning of the results and advised her if medical treatment was necessary. In cases of severe anaemia, the respondent was read an additional statement asking whether or not she would give her permission for the survey organization to inform a local health official about the problem. For each Primary Sampling Unit, a local health official was given a list of severely anaemic women (and children) who had consented to the referral.

Table 7.4 and Figure 7.1 show anaemia levels for ever-married women age 15–49. The table and figure distinguish three levels of severity of anaemia: mild anaemia (10.0–10.9 grams/decilitre for pregnant women and 10.0–11.9 g/dl for nonpregnant women), moderate anaemia (7.0–9.9 g/dl), and severe anaemia (less than 7.0 g/dl). Appropriate adjustments in these cutoff points were made for women living at altitudes above 1,000 metres and women who smoke, since both of these groups require more haemoglobin in their blood (Centers for Disease Control and Prevention, 1998).

In Karnataka, the haemoglobin levels were tested for 94 percent of women (see Table B.3 in Appendix B), compared with 88 percent of women in India as a whole. Overall, 42 percent of women have some degree of anaemia. Twenty-seven percent of women are mildly anaemic, 13

[1]The HemoCue instrument has been used extensively throughout the world for estimating the concentration of haemoglobin in capillary blood in field situations. The HemoCue has been found to give accurate results on venous blood samples, comparable to estimates from more sophisticated laboratory instruments (Von Schenk et al., 1986; McNulty et al., 1995; Krenzicheck and Tanseco, 1996). A recent small–scale study in India (Prakash et al., 1999), however, found that the HemoCue provided slightly higher estimates of haemoglobin than the standard blood cell counter (BCC) method.

[2]Because the first 2–3 drops of blood are wiped away to be sure that the sample used for analysis consists of fresh capillary blood, it is actually the third or fourth drop of blood that is drawn into the cuvette.

Table 7.4 Anaemia among women

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, Karnataka, 1999

Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age					
15–19	50.7	26.8	22.4	1.5	408
20–24	45.7	30.8	13.0	1.9	737
25–29	40.0	26.1	11.2	2.6	812
30–34	40.6	24.5	13.9	2.1	690
35–49	40.7	25.8	12.2	2.7	1,474
Marital status					
Currently married	42.2	26.6	13.3	2.3	3,783
Not currently married	45.4	27.6	15.5	2.3	338
Residence					
Urban	35.7	24.5	9.8	1.3	1,435
Rural	46.0	27.8	15.4	2.8	2,686
Education					
Illiterate	47.5	28.8	15.4	3.2	2,262
Literate, < middle school complete	40.6	26.9	11.4	2.3	775
Middle school complete	37.5	21.7	15.4	0.4	278
High school complete and above	31.7	22.1	9.1	0.5	806
Religion					
Hindu	42.6	26.4	13.8	2.4	3,534
Muslim	41.5	27.1	12.4	2.0	455
Christian	36.6	30.3	6.3	0.0	100
Other	(50.7)	(34.8)	(12.8)	(3.1)	32
Caste/tribe					
Scheduled caste	46.6	26.0	18.2	2.4	673
Scheduled tribe	45.9	27.3	16.4	2.1	233
Other backward class	41.9	26.9	12.6	2.4	1,709
Other	40.3	26.3	11.8	2.2	1,460
Work status					
Working in family farm/business	47.3	28.1	15.2	4.0	677
Employed by someone else	47.4	29.8	15.3	2.3	1,207
Self-employed	43.1	25.9	14.7	2.4	243
Not worked in past 12 months	37.7	24.4	11.6	1.8	1,993
Standard of living Index					
Low	51.3	30.4	17.1	3.8	1,224
Medium	41.2	26.4	13.1	1.7	2,036
High	32.6	21.9	9.0	1.7	846
Pregnancy/breastfeeding status					
Pregnant	48.6	20.9	24.9	2.9	279
Breastfeeding (not pregnant)	45.7	30.7	12.6	2.4	704
Not pregnant/not breastfeeding	41.1	26.3	12.6	2.3	3,138
Height					
< 145 cm	43.8	27.3	11.7	4.8	398
≥ 145 cm	42.3	26.6	13.6	2.0	3,720

Contd…

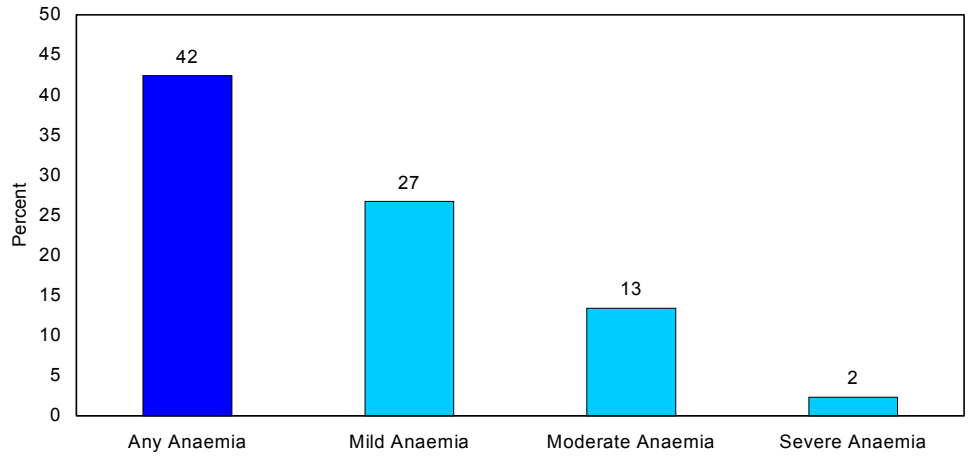
Table 7.4 Anaemia among women (contd.)

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, Karnataka, 1999

Background characteristic	Percentage of women with any anaemia	Percentage of women with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of women
Body mass index					
< 18.5 kg/m^2	48.8	29.3	16.5	3.1	1,564
≥ 18.5 kg/m^2	38.5	25.1	11.6	1.8	2,549
Fruit and vegetable consumption[1]					
Fruits and vegetables	39.1	25.0	11.9	2.2	2,173
Fruits only	32.9	15.7	17.2	0.0	52
Vegetables only	46.2	28.5	15.2	2.5	1,674
Neither	48.9	31.7	14.2	3.0	222
Total	42.4	26.7	13.4	2.3	4,121

Note: The haemoglobin levels are adjusted for altitude of the enumeration area and for smoking when calculating the degree of anaemia. Total includes 46, 1, 15, 3, and 7 women with missing information on caste/tribe, work status, the standard of living index, height, and body mass index, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases
[1]Based on consumption at least weekly. Vegetables include only green, leafy vegetables.

Figure 7.1
Anaemia Among Women



NFHS-2, Karnataka, 1999

percent are moderately anaemic, and 2 percent are severely anaemic.[3] There are some differences in the prevalence of anaemia by background characteristics, but anaemia is substantial (more than 30 percent) for women in every population group. Prevalence is higher for younger women less than age 25 than for older women. It is also higher for rural women (46 percent) than for urban women (36 percent). The prevalence of anaemia is relatively high for illiterate women, women belonging to scheduled castes or scheduled tribes, and working women who are not self-employed. Anaemia decreases sharply with increases in the standard of living index.

The prevalence of anaemia is slightly higher for pregnant women and breastfeeding women than for other women. The provision of iron and folic acid supplements to pregnant women has undoubtedly reduced the overall prevalence of anaemia in pregnant women to some extent (78 percent of pregnant women received IFA tablets or syrup during pregnancy for births in the three years preceding the survey—see Table 8.6). However, pregnant women are still twice as likely as nonpregnant women to be moderately anaemic.

Women with a low body mass index have a considerably higher prevalence of anaemia than other women. The diet of women also plays a role in the likelihood that women have anaemia. Consumption of iron-rich foods can reduce the prevalence or severity of anaemia, and the absorption of iron from the diet can be enhanced (for example, by vitamin C) or inhibited (for example, by tea or coffee) if particular items are consumed around the time that a meal is eaten. In Karnataka, women who eat fruit (alone or in addition to green, leafy vegetables) at least weekly have a much lower level of anaemia than women who do not eat fruit regularly. Women who do not eat either fruit or vegetables regularly have the highest level of anaemia (49 percent).

7.4 Infant Feeding Practices

Infant feeding practices have significant effects on both mothers and children. Mothers are affected through the influence of breastfeeding on the period of postpartum infertility, and hence on fertility levels and the length of birth intervals. These effects vary by both the duration and intensity of breastfeeding. Proper infant feeding, starting from the time of birth, is important for the physical and mental development of the child. Breastfeeding improves the nutritional status of young children and reduces morbidity and mortality. Breast milk not only provides important nutrients but also protects the child against infection. The timing and type of supplementary foods introduced in an infant's diet also have significant effects on the child's nutritional status.

The Baby Friendly Hospitals Initiative, launched by the United Nations Children's Fund (UNICEF) recommends initiation of breastfeeding immediately after childbirth. The World Health Organization (WHO) and UNICEF recommend that infants should be given only breast milk for the first six months of their life. Under the Reproductive and Child Health Programme, the Government of India recommends that infants should be exclusively breastfed from birth to age four months (Ministry of Health and Family Welfare, n.d.). Most babies do not require any other foods or liquids during this period. By age seven months, adequate and appropriate complementary foods should be added to the infant's diet in order to provide sufficient nutrients for optimal growth. It is recommended that breastfeeding should continue, along with

[3]Rates that are not adjusted for altitude and smoking are exactly the same as the adjusted rates, except that the unadjusted rate for mild anaemia (26.6) is slightly lower than the adjusted rate (26.7). The small impact of the adjustment factor is to be expected since, in Karnataka, the proportion of women who smoke is negligible (see Table 2.12), and only 1 of the 133 sample PSUs is at an altitude above 1,000 metres.

complementary foods, through the second year of life or beyond. It is further recommended that a feeding bottle with a nipple should not be used at any age, for reasons related mainly to sanitation and the prevention of infections.

WHO has suggested several indicators of breastfeeding practices to guide countries in gathering information for measuring and evaluating infant feeding practices. These indicators include the ever breastfed rate, the exclusive breastfeeding rate, the timely complementary feeding rate, the continued breastfeeding rate, and the bottle feeding rate. The *exclusive breastfeeding rate* is defined as the proportion of infants under age four months who receive only breast milk.[4] The *timely complementary feeding rate* is the proportion of infants age 6–9 months who receive both breast milk and solid or semi-solid food. The *continued breastfeeding rate through one year of age* is the proportion of children age 12–15 months who are still breastfed. The *continued breastfeeding rate until two years of age* is the proportion of children age 20–23 months who are still breastfed. The *bottle feeding rate* is the proportion of infants who are fed using a bottle with a nipple.

In NFHS-2, data on breastfeeding and complementary feeding were obtained from a series of questions in the Woman's Questionnaire. These questions pertain to births since January 1996, but the tables are restricted to children born in the three years preceding the survey. For any given woman, information was obtained for a maximum of two births.

Initiation of breastfeeding immediately after childbirth is important because it benefits both the mother and the infant. As soon as the infant starts suckling at the breast, the hormone oxytocin is released, resulting in uterine contractions that facilitate expulsion of the placenta and reduce the risk of postpartum haemorrhage. It is also recommended that the first breast milk (colostrum) should be given to the child rather than squeezed from the breast and discarded, because it contains colostrum, which provides natural immunity to the child.

Table 7.5 shows the percentage of children born during the three years before the survey who started breastfeeding within one hour and one day of birth. The table also gives the percentage of children whose mothers squeezed the first milk from the breast before breastfeeding. Although breastfeeding is nearly universal in Karnataka, very few children are put to the breast immediately after birth. Only 19 percent of children begin breastfeeding within one hour of birth, and only 42 percent begin breastfeeding within one day of birth. Three out of every five women who gave birth to children during the three years preceding the survey squeezed the first milk from the breast before they began breastfeeding.

Differentials in the early initiation of breastfeeding and in squeezing the first milk from the breast are also shown in Table 7.5. Less than 30 percent of children in every group shown in the table were put to the breast within one hour of birth and no more than 59 percent started breastfeeding within one day of birth. Urban women, women who have completed at least high school, and women who live in households with a high standard of living are more likely than other women to start breastfeeding their children early. The circumstances surrounding delivery of the baby can have an important effect on the early initiation of breastfeeding. Children whose delivery was assisted by a health professional, as well as children born in health facilities, tend to begin breastfeeding relatively early.

[4]International recommendations have recently been revised to promote exclusive breastfeeding up to six months of age.

Table 7.5 Initiation of breastfeeding

Percentage of children born during the three years preceding the survey who started breastfeeding within one hour and within one day of birth and percentage whose mother squeezed the first milk from her breast before breastfeeding by selected background characteristics, Karnataka, 1999

Background characteristic	Percentage started breastfeeding within one hour of birth	Percentage started breastfeeding within one day of birth[1]	Percentage whose mother squeezed first milk from breast	Number of children
Residence				
Urban	23.8	51.0	55.6	398
Rural	16.1	37.3	63.9	882
Mother's education				
Illiterate	13.2	32.0	69.9	672
Literate, < middle school complete	21.7	41.3	53.8	211
Middle school complete	17.9	53.7	49.9	110
High school complete and above	28.8	59.3	51.3	287
Religion				
Hindu	18.6	41.7	60.7	1,037
Muslim	15.3	37.7	65.8	213
Caste/tribe				
Scheduled caste	15.6	39.8	66.6	250
Scheduled tribe	11.2	23.6	69.9	81
Other backward class	20.7	42.6	59.2	451
Other	19.4	44.0	59.6	483
Mother's work status				
Working in family farm/business	8.2	31.7	64.9	157
Employed by someone else	16.8	33.3	67.8	307
Self-employed	19.9	39.7	56.5	60
Not worked in past 12 months	21.3	47.1	58.3	755
Standard of living index				
Low	13.9	32.9	68.1	432
Medium	20.8	43.7	62.4	623
High	21.0	52.0	45.3	221
Assistance during delivery				
Health professional[2]	24.7	53.6	53.7	757
Dai (TBA)	7.6	23.1	67.2	193
Other	10.8	24.6	75.4	330
Place of delivery				
Public health facility	27.9	57.1	56.2	356
Private health facility	21.9	54.7	48.2	281
Own home	11.9	26.8	73.3	357
Parents' home	10.2	25.6	67.3	263
Total	18.5	41.5	61.4	1,280

Note: Table includes only the two most recent births during the three years preceding the survey, whether living or dead at the time of interview. Total includes 23 Christian children, 7 children belonging to 'other' religions, 17 children delivered at a nongovernmental organization (NGO) or trust hospital/clinic, 7 children delivered at an 'other' place of delivery, and 15, 1, and 4 children with missing information on caste/tribe, mother's work status, and the standard of living index, respectively, who are not shown separately.
TBA: Traditional birth attendant
[1]Includes children who started breastfeeding within one hour of birth
[2]Includes doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, and other health professionals

Table 7.6 Breastfeeding status by child's age

Percent distribution of children under age 3 years by breastfeeding status, according to child's age in months, Karnataka, 1999

Age in months	Breastfeeding status				Total percent	Number of living children
	Not breastfeeding	Exclusively breastfeeding	Breastfeeding and receiving: Plain water only	Breastfeeding and receiving: Supplements		
< 2	(0.0)	(72.4)	(5.0)	(22.6)	100.0	39
2–3	0.0	63.5	9.5	27.0	100.0	75
4–5	0.0	42.4	22.8	34.8	100.0	83
6–7	3.7	17.0	22.2	57.1	100.0	81
8–9	5.9	9.4	26.1	58.6	100.0	84
10–11	5.3	5.5	20.3	68.9	100.0	54
12–13	11.1	1.3	18.6	69.1	100.0	74
14–15	16.0	1.4	13.5	69.1	100.0	74
16–17	25.8	2.9	11.6	59.6	100.0	69
18–19	38.7	4.5	9.1	47.7	100.0	68
20–21	52.5	1.4	6.9	39.2	100.0	71
22–23	57.7	0.0	0.0	42.3	100.0	70
24–25	64.7	0.0	8.3	27.0	100.0	73
26–27	68.0	0.0	3.1	28.9	100.0	65
28–29	67.5	1.7	0.0	30.8	100.0	58
30–31	77.9	0.0	1.8	20.2	100.0	54
32–33	(86.4)	(0.0)	(2.3)	(11.3)	100.0	44
34–35	80.5	0.0	2.4	17.1	100.0	83
< 4 months	0.0	66.5	8.0	25.5	100.0	114
4–6 months	0.8	33.1	22.5	43.6	100.0	123
7–9 months	5.6	12.7	25.0	56.7	100.0	124

Note: Table includes only surviving children from among the two most recent births during the three years preceding the survey. Breastfeeding status refers to the day or night before the interview. Children classified as 'breastfeeding and receiving plain water only' receive no supplements.
( ) Based on 25–49 unweighted cases

The custom of squeezing the first milk from the breast before breastfeeding a child is widely practised in Karnataka. Contrary to recommendations regarding infant feeding, mothers squeeze the first milk from the breast before breastfeeding for more than half of children in almost every group.

Mothers of children born in the three years preceding the survey were asked if the child had been given plain water, other liquids, or solid or mushy (semi-solid) food at any time during the day or night before the interview. Results are shown in Tables 7.6 and 7.7. Children who received nothing but breast milk during that period are defined as being *exclusively breastfed.* The introduction of supplementary foods too early may put infants at risk of malnutrition because other liquids and solid foods are nutritionally inferior to breast milk. Consumption of liquids and solid or mushy foods at an early age also increases children's exposure to pathogens and consequently puts them at a greater risk of getting diarrhoea. However, a recent study based on findings from NFHS-1 (Anandaiah and Choe, 2000) concluded that breastfeeding with supplements is more beneficial than exclusive breastfeeding even for children at very young ages (less than four months). That report suggests that mothers who are not well nourished and who are in poor health themselves may not be able to provide adequate breast milk for their infants.

Table 7.7 Type of food received by children

Percentage of children under age 3 years who received specific types of food the day or night before the interview and percentage using a bottle with a nipple by current breastfeeding status and child's age in months, Karnataka, 1999

Age in months	Type of food received						Using bottle with a nipple	Number of living children
	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]		
BREASTFEEDING CHILDREN								
< 2	(2.5)	(15.0)	(2.7)	(0.0)	(0.0)	(2.5)	(9.9)	39
2–3	5.3	16.2	5.5	0.0	0.0	2.8	11.1	75
4–5	1.2	15.4	10.8	0.0	1.2	20.6	7.1	83
6–7	6.4	32.1	11.5	3.9	10.4	37.5	14.2	78
8–9	1.3	34.0	19.1	16.6	21.7	43.1	7.8	79
10–11	3.8	41.7	21.8	21.6	21.7	62.7	5.9	51
12–13	1.6	46.9	25.9	22.6	35.3	71.5	9.1	66
14–15	3.4	50.2	24.6	32.1	24.3	72.5	13.0	62
16–17	0.0	37.2	19.7	35.2	31.6	74.6	7.9	51
18–23	2.9	34.4	27.4	32.4	36.2	80.0	11.5	105
24–29	7.5	40.3	33.4	39.6	33.3	77.3	6.1	65
30–35	(0.0)	(38.0)	(38.1)	(50.3)	(38.2)	(79.4)	(5.8)	34
< 4 months	4.4	15.8	4.5	0.0	0.0	2.7	10.7	114
4–5 months	1.2	15.4	10.8	0.0	1.2	20.6	7.1	83
6–9 months	3.8	33.1	15.3	10.3	16.1	40.3	11.0	157
NON-BREASTFEEDING CHILDREN								
<16	(19.3)	(71.4)	(29.1)	(35.6)	(38.8)	(81.0)	(64.5)	31
16–23	4.1	69.5	46.0	55.7	58.1	91.5	18.9	122
24–29	4.6	57.6	45.7	60.7	65.6	94.6	11.7	131
30–35	4.8	69.4	50.4	70.0	63.6	95.2	8.8	146
ALL CHILDREN								
< 2	(2.5)	(15.0)	(2.7)	(0.0)	(0.0)	(2.5)	(9.9)	39
2–3	5.3	16.2	5.5	0.0	0.0	2.8	11.1	75
4–5	1.2	15.4	10.8	0.0	1.2	20.6	7.1	83
6–7	7.4	33.4	12.3	4.9	11.2	38.5	17.4	81
8–9	3.6	35.6	19.1	15.7	20.4	45.3	10.9	84
10–11	5.4	43.1	20.6	20.5	20.5	61.1	10.9	54
12–13	4.2	51.5	25.7	25.6	38.3	73.3	13.6	74
14–15	2.9	52.9	27.4	35.0	28.4	75.6	20.3	74
16–17	1.4	50.7	29.0	40.5	42.1	79.7	13.2	69
18–23	3.4	50.2	35.9	44.0	45.9	85.5	14.4	209
24–29	5.6	51.8	41.6	53.6	54.8	88.8	9.8	196
30–35	3.9	63.5	48.1	66.3	58.8	92.2	8.2	180
< 4 months	4.4	15.8	4.5	0.0	0.0	2.7	10.7	114
4–5 months	1.2	15.4	10.8	0.0	1.2	20.6	7.1	83
6–9 months	5.5	34.5	15.8	10.4	15.9	42.0	14.1	165

Note: Table includes only surviving children from among the two most recent births during the three years preceding the survey.
( ) Based on 25–49 unweighted cases
[1]Includes green, leafy vegetables and fruits

In Karnataka, 67 percent of children under four months of age are exclusively breastfed (much higher than the national level of 55 percent), 8 percent receive breast milk plus water, and 26 percent receive supplements along with breast milk (Table 7.6). The percentage of infants exclusively breastfed drops off after three months to 42 percent at age 4–5 months and 17 percent at age 6–7 months. Very few children are exclusively breastfed after the first year of life. The proportion of children receiving supplements along with breast milk increases from 23 percent in the first two months of life to 69 percent for children age 10–15 months, and declines thereafter as children are weaned from the breast and their food consumption is no longer

supplementing their consumption of breast milk. However, breastfeeding often continues for a long period. Eighty-nine percent of children are still being breastfed at 12–13 months of age, as are 35 percent of children age 24–25 months. For the majority of children in Karnataka, breastfeeding usually stops at about 20–21 months of age, but 20 percent of children age 34–35 months are still breastfed.

Table 7.7 shows in more detail the types of food consumed by children under age three years the day or night before the interview. Because of the small number of non-breastfeeding children, two-month age categories have been combined into broader age groups for the younger children. Powdered milk is rarely given to young children at any age, but other milk (such as cow's milk or buffalo's milk) is given to young children more often. The majority of non-breastfeeding children in each age group were given these other types of milk the day or night before the interview. About one-third to one-half of breastfeeding children age 6–35 months received non-powdered milk in addition to breast milk. Other liquids, such as juice or tea, are given much less often than milk. Among all children, the consumption of green, leafy vegetables increases with age, from 5 percent at age 6–7 months to 66 percent at age 30–35 months. The consumption of fruits increases from 1 percent or less below six months to 59 percent at age 30–35 months.

From about six months of age, the introduction of complementary food is critical for meeting the protein, energy, and micronutrient needs of children. However, in Karnataka the introduction of complementary food is delayed for a substantial proportion of children. Only 38 percent of breastfeeding children age 6–7 months consume solid or mushy foods. This proportion rises to 75 percent or more at age 16–35 months. Only 40 percent of breastfeeding children age 6–9 months receive solid or mushy food, as recommended (somewhat better than the level of 35 percent for India as a whole).

Bottle feeding has a direct effect on the mother's exposure to the risk of pregnancy because the period of amenorrhoea may be shortened when breastfeeding is reduced or replaced by bottle feeding. Because it is often difficult to sterilize the nipple properly, the use of bottles with nipples also exposes children to an increased risk of getting diarrhoea and other diseases. For children who are being breastfed, the use of bottles with nipples is not common in Karnataka. In every age group, less than 15 percent of breastfeeding children drank anything from a bottle with a nipple the day or night before the interview (Table 7.7). The use of a bottle with a nipple is somewhat more common for children who are not being breastfed, particularly in the early months of life.

Table 7.8 shows several statistics that describe the duration of breastfeeding. Estimates of both means and medians are based on the current proportions of children breastfeeding in each age group because information on current status is usually more accurate than information based on mother's recall. The median length of any breastfeeding in Karnataka is slightly more than one and a half years (20 months), which is five months shorter than the median for India as a whole. Supplementation begins relatively early, however. The median length of exclusive breastfeeding is 3.2 months, and the median length of exclusive breastfeeding or breastfeeding with water is 5.6 months.

The mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding with water only are 22.0 months, 4.7 months, and 8.2 months,

Table 7.8 Median duration of breastfeeding

Median duration of breastfeeding among children under age 3 years by sex of child and residence, and mean duration of breastfeeding, Karnataka, 1999

Background characteristic	Median duration (months)[1]			Number of children
	Any breastfeeding	Exclusive breastfeeding	Exclusive breastfeeding or breastfeeding plus water only	
Sex of child				
Male	19.9	3.2	5.7	656
Female	20.2	3.1	5.5	624
Residence				
Urban	18.0	2.2	4.3	398
Rural	21.2	3.9	6.3	882
Median duration	20.0	3.2	5.6	1,280
Mean duration (months)[1]	22.0	4.7	8.2	1,280
Prevalence/incidence mean	21.8	4.0	7.7	1,280

Note: Table includes only the two most recent births during the three years preceding the survey.
[1]Based on current status

respectively. The mean durations are about two months longer than the median durations for all three measures.

An alternative measure of the duration of breastfeeding is the prevalence-incidence mean, which is calculated as the 'prevalence' of breastfeeding divided by its 'incidence'. In this case, prevalence is defined as the number of children whose mothers were breastfeeding at the time of the survey, and incidence is defined as the average number of births per month (averaged over a 36–month period to overcome problems of seasonality of births and possible reference-period errors). For each measure of breastfeeding, the prevalence-incidence mean is about the same as the mean calculated in the conventional manner.

The median length of breastfeeding is three months longer in rural areas than in urban areas. The median length of exclusive breastfeeding is nearly twice as long in rural areas as in urban areas. The median duration of breastfeeding is about the same for girls and boys.

7.5 Nutritional Status of Children

Nutritional status is a major determinant of the health and well-being of children. Inadequate or unbalanced diets and chronic illness are associated with poor nutrition among children. To assess their nutritional status, measurements of weight and height/length were obtained for children born in the three years preceding the survey. Children were weighed and measured with the same types of scales and measuring boards used for women. Children under two years of age were measured lying down and older children were measured standing up. Data on weight and height/length were used to calculate the following three summary indices of nutritional status:

- weight-for-age
- height-for-age
- weight-for-height

The nutritional status of children calculated according to these three measures is compared with the nutritional status of an international reference population recommended by the World Health Organization (Dibley et al., 1987a; 1987b). The use of this reference population is based on the empirical finding that well-nourished children in all population groups for which data exist follow very similar growth patterns (Martorell and Habicht, 1986). A scientific report from the Nutrition Foundation of India (Agarwal et al., 1991) has concluded that the WHO standard is generally applicable to Indian children.

The three indices of nutritional status are expressed in standard deviation units (z-scores) from the median for the international reference population. Children who are more than two standard deviations below the reference median on any of the indices are considered to be *undernourished*, and children who fall more than three standard deviations below the reference median are considered to be *severely undernourished*.

Each of these indices provides somewhat different information about the nutritional status of children. Weight-for-age is a composite measure that takes into account both chronic and acute undernutrition. Children who are more than two standard deviations below the reference median on this index are considered to be *underweight*. The height-for-age index measures linear growth retardation. Children who are more than two standard deviations below the median of the reference population in terms of height-for-age are considered short for their age or *stunted*. The percentage in this category indicates the prevalence of chronic undernutrition, which often results from a failure to receive adequate nutrition over a long period of time or from chronic or recurrent diarrhoea. Height-for-age, therefore, does not vary appreciably by the season in which data are collected.

The weight-for-height index examines body mass in relation to body length. Children who are more than two standard deviations below the median of the reference population in terms of weight-for-height are considered too thin or *wasted*. The percentage in this category indicates the prevalence of acute undernutrition. Wasting is associated with a failure to receive adequate nutrition in the period immediately before the survey and may be the result of seasonal variations in food supply or recent episodes of illness.

The validity of these indices is determined by many factors, including the coverage of the population of children and the accuracy of the anthropometric measurements. The survey was not able to measure the height and weight of all eligible children, usually because the child was not at home at the time of the health investigator's visit or because the mother refused to allow the child to be weighed and measured. In Karnataka, NFHS-2 did not measure 11 percent of children under age three (see Table B.3 in Appendix B), slightly better than the national nonresponse rate of 13 percent. Also excluded from the analysis are children whose month and year of birth were not known and those with grossly improbable height or weight measurements. In addition, two of the three indices (weight-for-age and height-for-age) are sensitive to misreporting of children's ages, including heaping on preferred digits.

Table 7.9 shows the percentage of children classified as undernourished by selected demographic characteristics. Forty-four percent of children under three years of age are underweight and 37 percent are stunted. Similar estimates at the national level are 47 and 46 percent, respectively. The proportion of children who are severely undernourished is also very high—17 percent according to weight-for-age and 16 percent according to height-for-age. In

Table 7.9 Nutritional status of children by demographic characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected demographic characteristics, Karnataka, 1999

Demographic characteristic	Weight-for-age		Height-for-age		Weight-for-height		Number of children
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	
Age of child							
< 6 months	0.0	6.4	1.2	4.2	1.7	9.2	171
6–11 months	8.4	38.5	5.2	20.7	5.7	24.1	189
12–23 months	20.7	52.6	20.9	48.8	4.9	26.4	370
24–35 months	25.5	57.4	24.4	49.5	2.8	15.9	315
Sex of child							
Male	14.9	42.2	14.6	35.1	4.2	21.4	534
Female	18.2	45.7	17.2	38.1	3.5	18.5	511
Birth order							
1	10.4	34.1	11.4	30.0	2.9	14.9	375
2–3	16.2	46.5	16.8	38.1	4.0	19.9	477
4–5	28.2	55.4	20.4	43.0	6.2	28.1	144
6+	(32.8)	(61.2)	(28.5)	(53.7)	(3.8)	(36.5)	49
Previous birth interval[2]							
First birth	10.6	34.1	11.8	30.2	2.9	14.8	378
< 24 months	22.0	51.7	20.5	43.7	5.2	22.8	169
24–47 months	18.7	48.4	17.7	39.2	4.9	23.1	387
48+ months	21.0	50.0	16.4	38.5	1.7	22.9	110
Total	16.5	43.9	15.9	36.6	3.9	20.0	1,045

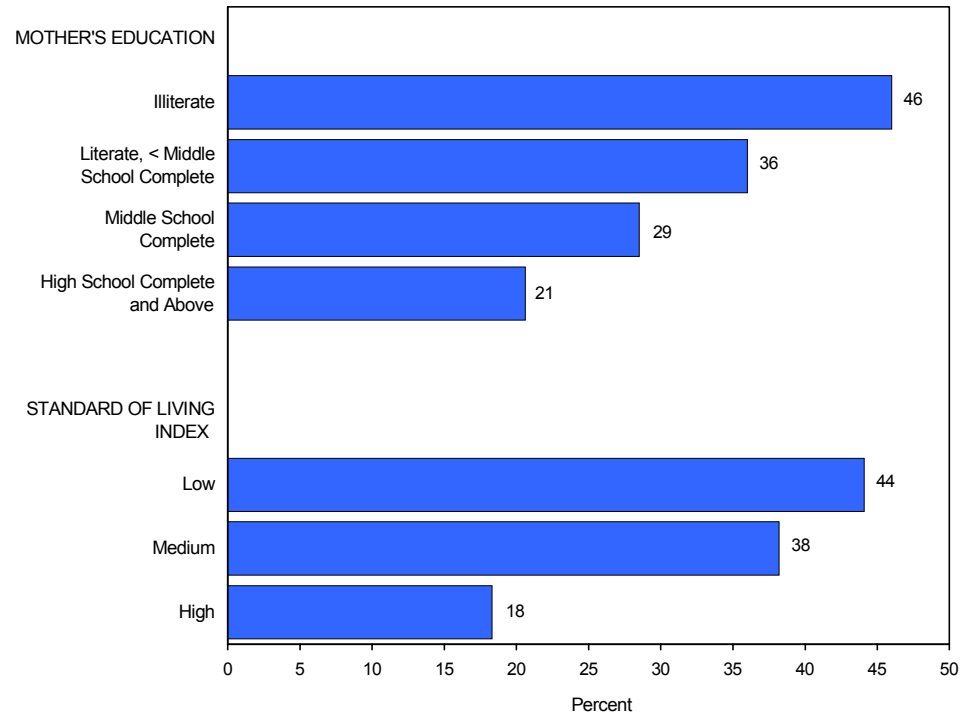
Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population.
( ) Based on 25–49 unweighted cases
[1]Includes children who are below –3 SD from the International Reference Population median
[2]First-born twins (triplets, etc.) are counted as first births because they do not have a previous birth interval.

addition, wasting is quite evident in Karnataka, affecting 20 percent of children under three years of age. This percentage is somewhat higher than the national estimate of 16 percent. The proportion of children under three years of age who are underweight decreased from 51 percent in NFHS-1 to 44 percent in NFHS-2, and the proportion severely underweight decreased from 19 percent to 17 percent. There was a smaller decrease in the prevalence of stunting (from 40 percent in NFHS-1 to 37 percent in NFHS-2). The prevalence of wasting did not change between the two surveys.

The proportion of children who are undernourished increases steadily with the child's age for all measures except wasting. Even during the first six months of life, when most babies are breastfed, 4–9 percent of children are undernourished, according to the three nutritional indices. It is notable that at age 24–35 months, when most children have been weaned from breast milk, one-quarter of children are severely stunted and one-quarter are severely underweight

Overall, girls are more likely than boys to be underweight and stunted, whereas boys are more likely to be wasted. Undernutrition increases steadily with increasing birth order for all of the nutritional measures. First births have lower than average levels of undernutrition, but there is no consistent pattern of nutritional status by the length of the birth interval for second-order and higher-order births.

Figure 7.2
Stunting Among Children Under Three Years by Mother's Education and SLI



NFHS-2, Karnataka, 1999

Table 7.10 shows the nutritional status of children by selected background characteristics. Undernutrition is substantially higher in rural areas than in urban areas. Even in urban areas, however, 39 percent of children are underweight and 31 percent are stunted. Children whose mothers are illiterate are much more likely to be undernourished than children whose mothers have completed at least high school (see Figure 7.2). As the level of mother's education increases, the percentage undernourished declines substantially. Muslim children are more likely than Hindu children to be wasted, but there is not much difference by religion in the other two measures. Children belonging to scheduled castes and scheduled tribes have higher levels of undernutrition than other children on all three measures. Undernutrition is relatively low for children whose mothers have not worked in the past 12 months, which is not unexpected in the Indian situation where non-working women are likely to be from better off households.

The nutritional status of children is strongly related to maternal nutritional status. Undernutrition is much more common for children of mothers whose height is less than 145 centimetres or whose body mass index is below 18.5 than for other children. All three measures of undernutrition are strongly related to the household's standard of living. Children from households with a low standard of living are more than twice as likely to be undernourished as are children from households with a high standard of living.

Table 7.10 Nutritional status of children by background characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected background characteristics, Karnataka, 1999

Background characteristic	Weight-for-age		Height-for-age		Weight-for-height		Number of children
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	
Residence							
Urban	9.9	38.7	12.2	30.9	2.1	16.2	334
Rural	19.7	46.4	17.6	39.3	4.7	21.8	711
Mother's education							
Illiterate	24.6	56.5	22.1	46.0	6.5	24.8	519
Literate, < middle school complete	12.7	43.8	16.0	36.0	1.7	19.9	180
Middle school complete	8.5	34.6	10.5	28.5	1.1	13.6	95
High school complete and above	5.7	21.6	5.1	20.6	1.2	12.5	251
Religion							
Hindu	16.9	43.9	15.5	36.9	3.4	19.3	842
Muslim	16.5	44.4	18.1	37.7	6.2	24.3	176
Caste/tribe							
Scheduled caste	23.0	52.8	17.9	43.7	6.8	27.9	201
Scheduled tribe	28.7	55.7	22.1	41.2	1.6	21.0	64
Other backward class	12.2	40.0	12.7	34.4	2.5	15.1	363
Other	15.6	41.3	17.0	35.0	4.2	20.5	405
Mother's work status							
Working in family farm/business	12.3	49.0	15.7	37.6	1.6	17.9	122
Employed by someone else	30.0	60.0	24.6	46.4	8.0	29.0	237
Self-employed	(34.3)	(63.8)	(19.1)	(45.4)	(6.5)	(32.1)	47
Not worked in past 12 months	11.1	35.6	12.5	32.2	2.6	16.2	639
Mother's height							
< 145 cm	20.6	54.4	22.5	51.1	2.3	20.7	88
≥ 145 cm	16.2	43.0	15.3	35.3	4.0	20.0	957
Mother's body mass index							
< 18.5 kg/m^2	22.2	55.4	20.9	43.2	5.4	25.4	456
≥ 18.5 kg/m^2	12.1	35.0	12.0	31.5	2.7	15.8	589
Standard of living index							
Low	21.9	54.6	21.9	44.1	5.6	25.0	334
Medium	17.4	45.3	15.3	38.2	3.8	20.2	527
High	4.0	20.0	6.1	18.3	1.2	10.1	179
Total	16.5	43.9	15.9	36.6	3.9	20.0	1,045

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 22 Christian children, 4 children belonging to 'other' religions, and 12, 1, and 4 children with missing information on caste/tribe, mother's work status, and the standard of living index, respectively, who are not shown separately.

( ) Based on 25–49 unweighted cases

[1]Includes children who are below –3 SD from the International Reference Population median

7.6 Anaemia Among Children

Anaemia is a serious concern for young children because it can result in impaired cognitive performance, behavioural and motor development, coordination, language development, and scholastic achievement, as well as increased morbidity from infectious diseases (Seshadri, 1997). One of the most vulnerable groups is children age 6–24 months (Stoltzfus and Dreyfuss, 1998).

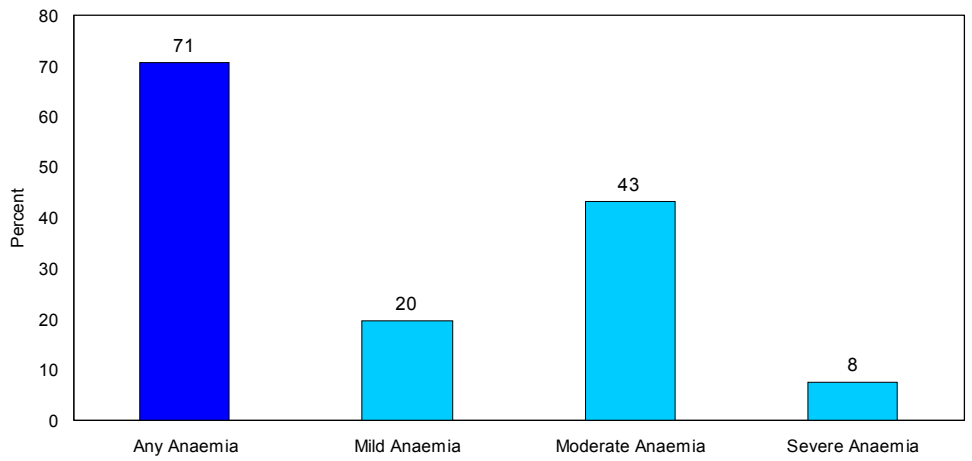
Table 7.11 Anaemia among children

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, Karnataka, 1999

Background characteristic	Percentage of children with any anaemia	Percentage of children with anaemia			Number of children
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age of child					
6–11 months	70.7	23.5	45.0	2.2	185
12–23 months	77.6	20.3	48.0	9.2	362
24–35 months	62.3	16.5	36.8	9.1	309
Sex of child					
Male	72.7	17.5	45.8	9.4	436
Female	68.4	21.9	40.8	5.8	420
Birth order					
1	62.7	16.4	40.8	5.5	294
2–3	74.8	21.8	44.2	8.7	404
4–5	72.3	22.2	40.8	9.3	120
6+	(81.7)	(13.4)	(60.7)	(7.7)	38
Residence					
Urban	66.3	19.5	41.7	5.1	279
Rural	72.7	19.7	44.1	8.9	577
Mother's education					
Illiterate	77.4	19.2	46.9	11.4	433
Literate, < middle school complete	65.5	21.1	40.5	4.0	148
Middle school complete	71.3	17.7	47.7	5.9	68
High school complete and above	59.6	20.3	36.4	2.9	207
Religion					
Hindu	71.0	20.1	44.2	6.6	693
Muslim	71.1	18.7	38.7	13.8	141
Caste/tribe					
Scheduled caste	77.7	21.9	46.4	9.4	170
Scheduled tribe	71.9	18.1	43.8	10.1	51
Other backward class	68.8	19.6	45.8	3.4	296
Other	67.9	18.4	39.4	10.1	330
Mother's work status					
Working in family farm/business	75.3	17.0	47.8	10.5	105
Employed by someone else	72.1	20.9	43.0	8.1	198
Self-employed	(77.6)	(15.6)	(52.8)	(9.2)	44
Not worked in past 12 months	68.5	20.0	41.7	6.7	510
Standard of living index					
Low	78.8	18.1	51.0	9.7	268
Medium	68.7	19.3	41.8	7.5	439
High	62.0	23.9	34.6	3.5	146
Mother's anaemia status					
Not anaemic	64.1	20.7	38.0	5.5	460
Mildly anaemic	74.5	18.4	47.1	9.0	259
Moderately anaemic	84.4	17.2	55.6	11.5	113
Total	70.6	19.6	43.3	7.6	856

Note: Haemoglobin levels are adjusted for altitude when calculating the degree of anaemia. Total includes 21 Christian children, 2 children belonging to 'other' religions, 23 children whose mothers are severely anaemic, and 9, 3, and 1 children with missing information on caste/tribe, the standard of living index, and mother's anaemia status, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases

Figure 7.3
Anaemia Among Children



NFHS-2, Karnataka, 1999

In Karnataka, haemoglobin levels were tested for 84 percent of children (see Table B.3 in Appendix B). Table 7.11 and Figure 7.3 show anaemia levels for children age 6–35 months. Overall, 71 percent of these children have some level of anaemia,[5] including 20 percent who are mildly anaemic (10.0–10.9 g/dl), 43 percent who are moderately anaemic (7.0–9.9 g/dl), and 8 percent who are severely anaemic (less than 7.0 g/dl). Notably, a much larger proportion of children than women are anaemic, and the difference is particularly pronounced for moderate to severe anaemia.

Several groups of children have particularly high levels of anaemia. These include children age 12–23 months (an age at which children are often being weaned), boys, higher birth order children, children living in rural areas, children whose mothers are illiterate, children from scheduled castes, children whose mothers work, and children from households with a low standard of living. As expected, there is a strong positive relationship between the anaemia status of mothers and prevalence of anaemia among children. Despite these differentials, anaemia is very widespread in Karnataka. At least 60 percent of children in every group shown in the table are anaemic.

7.7 Iodization of Salt

Iodine is an important micronutrient. A lack of iodine in the diet can lead to Iodine Deficiency Disorders (IDD), which, according to the World Health Organization, can cause miscarriages, brain disorders, cretinism, and retarded psychomotor development. Iodine deficiency is the single most important and preventable cause of mental retardation worldwide.

It has been estimated that 200 million people in India are exposed to the risk of iodine deficiency and 70 million suffer from goitre and other IDDs (IDD & Nutrition Cell, 1998). In addition, about one-fifth of pregnant women are at considerable risk of giving birth to children

[5]Rates that are not adjusted for altitude are exactly the same as the adjusted rates.

who will not reach their optimum physical and mental potential because of maternal iodine deficiency (Vir, 1995).

Iodine deficiency can be avoided by using salt that has been fortified with iodine. In 1983–84, the Government of India adopted a policy to achieve universal iodization of edible salt by 1992. In 1988, the Prevention of Food Adulteration Act was amended to fix the minimum iodine content of salt at 30 parts per million (ppm) at the manufacturing level and 15 ppm at the consumer level (Ministry of Health and Family Welfare, 1994). The Government of India advised all states and union territories to issue notifications banning the sale of edible salt that is not iodized. However, the ban on iodized salt was lifted in September, 2000.

NFHS-2, with its representative sample of households throughout Karnataka, is an ideal vehicle for measuring the degree of salt iodization in the state. Iodine levels in salt can be measured in the laboratory using a standard titration test or in the field using a rapid-test kit. In NFHS-2, interviewers measured the iodine content of cooking salt in each interviewed household using a rapid-test kit. The test kit consists of ampoules of a stabilized starch solution and a weak acid-based solution. The interviewer squeezes one drop of the starch solution on a sample of cooking salt obtained from the household respondent. If the colour changes (from light blue through dark violet), the interviewer matches the colour of the salt as closely as possible to a colour chart on the test kit and records the iodine level as 7, 15, or 30 ppm. If the initial test is negative (no change in colour), the interviewer is required to conduct a second confirmatory test on a new salt sample, using the acid-based solution in addition to the starch solution. This test is necessary because the starch solution will not show any colour change even on iodized salt if the salt is alkaline or is mixed with alkaline free-flow agents. If the colour of the salt does not change even after the confirmatory test, the salt is not iodized. Because of uncertainties and subjective judgement in the matching process, the rapid test should not be seen as giving an exact quantitative estimate of salt iodization, but it does provide useful information on whether or not salt is iodized, as well as the extent of iodization. A recent multicentric study in eight centres in India concluded that the rapid test kit can be used for semi-quantitative estimation of the iodine content of salt to monitor the quality of salt being used in a community (Kapil et al., 1999).

Table 7.12 shows the extent of salt iodization at the household level. Overall, less than half of households (43 percent) use cooking salt that is iodized at the recommended level of 15 ppm or more. This level is quite low in light of the government regulations on salt iodization that were in effect at the time of the survey. Almost one-quarter of households (24 percent) use salt that is not iodized at all and 32 percent use salt that is inadequately iodized (less than 15 ppm). Differentials in salt iodization by background characteristics are pronounced. Eighty-seven percent of households in large cities in Karnataka use salt with 15 ppm or more of iodine, compared with 65 percent of households in small cities, 59 percent of households in towns, and only 30 percent of households in rural areas. Households with Christian heads are much more likely to use iodized salt than other households. The use of iodized salt is relatively low in households headed by persons from scheduled castes or scheduled tribes. Wide differentials are observed for the standard of living index. Seventy-five percent of households with a high standard of living use adequately iodized salt, compared with only 25 percent of households with a low standard of living.

Table 7.12 Iodization of salt

Percent distribution of households by degree of iodization of salt, according to selected background characteristics, Karnataka, 1999

Background characteristic	Not iodized	7 ppm	15 ppm	30 ppm	Missing	Total percent	Number of households
Type of place of residence							
Large city	5.9	6.4	7.7	79.7	0.3	100.0	344
Small city	13.1	21.5	11.4	53.7	0.3	100.0	403
Town	19.4	21.2	13.3	45.9	0.1	100.0	805
Rural area	29.4	40.6	13.7	16.2	0.1	100.0	2,721
Religion of household head							
Hindu	24.5	32.9	13.1	29.3	0.1	100.0	3,649
Muslim	26.1	36.6	11.5	25.7	0.0	100.0	452
Christian	6.6	10.3	11.6	70.8	0.7	100.0	137
Other	(19.8)	(14.2)	(14.3)	(51.6)	(0.0)	100.0	35
Caste/tribe of household head							
Scheduled caste	28.2	38.2	13.0	20.6	0.0	100.0	715
Scheduled tribe	32.8	43.5	11.2	12.5	0.0	100.0	241
Other backward class	22.9	30.8	14.3	31.8	0.1	100.0	1,723
Other	21.6	30.0	11.5	36.7	0.2	100.0	1,551
Standard of living index							
Low	30.9	43.6	12.3	13.0	0.2	100.0	1,417
Medium	25.4	32.1	15.0	27.4	0.1	100.0	1,971
High	9.7	15.3	9.3	65.6	0.1	100.0	868
Total	24.1	32.4	12.9	30.5	0.1	100.0	4,273

Note: Total includes 42 and 17 households with missing information on caste/tribe of household head and the standard of living index, respectively, which are not shown separately.
ppm: Parts per million
( ) Based on 25–49 unweighted cases