CHAPTER 7

NUTRITION AND THE PREVALENCE OF ANAEMIA

This chapter focusses 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 greatly expanded 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. The height and weight measurements and anaemia testing were conducted by a specially-trained health investigator attached to each interviewing team.

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 in Bihar consume vegetables most often (Table 7.1). More than three-quarters of women consume vegetables on a daily basis. Pulses and beans are also an important part of the everyday diet for about one-half (49 percent) of women. On the other hand, very few women eat fruits; eggs; or chicken, meat, or fish on a daily basis. Fruits, which are often available only seasonally, are eaten daily by only 3 percent of women, weekly by 16 percent of women, and occasionally by 76 percent of women. Less than 2 percent eat eggs daily, and only about 1 percent eat chicken, meat, or fish daily. Nineteen percent never eat eggs and 13 percent never eat chicken, meat, or fish. Only 21 percent consume milk or curd daily. The majority of women in Bihar (53 percent) either never consume milk or curd or consume it only occasionally.

Table 7.2 shows that there are substantial differentials in food consumption patterns by selected background characteristics. Age does not play a major role in women's consumption patterns, except that younger women are slightly more likely than older women to eat eggs, as well as chicken, meat, or fish. Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly nutritious foods such as dairy products; fruits; eggs; and chicken, meat or fish. Women in the South Bihar Plain region are considerably more likely to consume milk or curd than women in the North Bihar Plain region or in the Jharkhand region. Use of dairy products is particularly low in the Jharkhand region. Women in the South Bihar Plain region are also somewhat more likely to consume fruits; eggs; and chicken, meat, or fish than women in other regions. Illiterate women have poorer and less varied diets than literate women, and their diets are particularly deficient in dairy products. Consumption of fruits; eggs; and chicken,

Table 7.1 Women's food consumption

Percent distribution of ever-married women by frequency of consumption of specific foods, Bihar, 1998–99

Type of food	Frequency of consumption				Total percent
	Daily	Weekly	Occasionally	Never	
Milk or curd	21.4	25.3	44.5	8.8	100.0
Pulses or beans	49.4	39.3	11.0	0.3	100.0
Green, leafy vegetables	73.3	22.7	4.0	0.0	100.0
Other vegetables	83.9	12.2	3.2	0.7	100.0
Fruits	2.6	15.7	76.2	5.5	100.0
Eggs	1.6	20.5	58.5	19.4	100.0
Chicken, meat, or fish	1.1	20.4	65.3	13.2	100.0

meat, or fish is also positively associated with the level of education. Hindu women consume dairy products more often than Muslim women, and Muslim women consume non-vegetarian food more often than Hindu women. Eighteen percent of Hindu women eat chicken, meat, or fish at least once a week compared with 38 percent of Muslim women. Women from scheduled castes, scheduled tribes, and other backward classes have relatively poor diets compared with the diets of other women. Women from scheduled tribes have a diet particularly deficient in dairy products. As expected, poverty 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 dairy products 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 as 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 Bihar of 150 cm. The mean height varies only slightly (between 149 and 152 cm) for women in different population groups, as shown in Table 7.3. Twenty percent of women are under 145 cm in height. Younger women are more likely than older women to be short, as are women in the South Bihar Plain region, illiterate women, women from scheduled castes, women who are employed by someone else, and women living in households with a low standard of living. Short stature is particularly strongly related to poverty. One in every four women living in households with a low standard of living is below 145 cm in height compared with 1 in every 11 women living in households with a high standard of living.

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, Bihar, 1998–99

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	46.4	88.9	95.8	96.1	17.9	23.3	22.7	2,244
25–34	46.4	89.1	96.0	95.8	18.3	21.8	20.5	2,507
35–49	47.4	88.1	96.0	96.4	18.6	21.3	21.4	2,274
Residence								
Urban	60.3	96.6	98.5	95.5	41.2	43.1	41.8	718
Rural	45.2	87.8	95.7	96.2	15.7	19.7	19.2	6,306
Region								
North Bihar Plain	43.7	87.3	96.3	99.6	15.3	20.1	21.2	3,133
South Bihar Plain	64.1	93.5	95.1	98.5	23.0	24.5	24.7	2,199
Jharkhand	29.6	85.1	96.5	86.6	17.8	22.7	17.9	1,692
Education								
Illiterate	39.9	86.4	95.4	95.6	12.8	19.7	18.4	5,383
Literate, < middle school complete	59.5	94.8	96.8	97.5	24.9	25.2	26.8	779
Middle school complete	68.0	96.5	98.4	95.2	34.1	28.8	29.1	267
High school complete and above	82.4	98.0	98.9	99.1	52.3	36.6	39.0	595
Religion								
Hindu	48.6	88.9	95.7	95.9	18.1	18.3	18.4	5,872
Muslim	38.4	88.3	97.1	97.9	17.7	42.6	38.1	1,038
Christian	21.3	90.7	100.0	94.3	23.3	30.4	39.4	59
Other	32.5	76.5	100.0	84.0	38.8	29.5	19.6	55
Caste/tribe								
Scheduled caste	37.6	83.9	93.9	95.8	15.0	18.9	19.6	1,452
Scheduled tribe	27.0	80.1	95.5	84.7	14.5	20.2	14.3	582
Other backward class	47.9	90.5	96.4	97.4	16.1	20.9	20.4	3,642
Other	61.7	92.7	97.3	98.0	29.2	29.7	29.6	1,348
Standard of living index								
Low	32.6	83.2	94.9	95.1	10.7	16.8	15.6	3,709
Medium	57.2	93.7	96.5	96.9	20.0	25.1	25.0	2,595
High	82.1	99.0	99.3	98.7	51.3	38.6	39.5	712
Total	46.7	88.7	96.0	96.1	18.3	22.1	21.5	7,024

Note: Total includes 8 women with missing information on the standard of living index, who are not shown separately.

Table 7.3 also shows an index that relates a woman's weight to her height. 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). This index excludes women who were pregnant at the time of the survey or women who had given birth during the two months preceding the survey. The mean BMI for women in Bihar is 19.4. Chronic energy deficiency is usually indicated by a BMI of less than 18.5. About two-fifths (39 percent) of women have a BMI below 18.5, indicating a high prevalence of nutritional deficiency among women in Bihar. Nutritional problems are particularly serious for rural women, women in the Jharkhand region, illiterate women, Muslim women, women employed by someone else or

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, Bihar, 1998–99

Background characteristic	Height			Weight-for-height[1]		
	Mean height (cm)	Percent-age below 145 cm	Number of women for height	Mean body mass index (BMI)	Percent-age with BMI below 18.5 kg/m^2	Number of women for BMI
Age						
15–19	149.0	22.6	784	19.4	35.2	725
20–24	149.2	21.3	1,347	19.2	39.8	1,149
25–29	149.7	15.8	1,350	19.4	40.0	1,177
30–34	149.5	19.4	1,051	19.5	39.2	973
35–49	149.6	19.7	2,173	19.7	40.1	2,137
Marital status						
Currently married	149.5	19.6	6,360	19.5	39.1	5,819
Not currently married	149.5	18.9	345	19.3	43.3	342
Residence						
Urban	150.2	18.3	686	20.5	31.1	650
Rural	149.4	19.7	6,020	19.3	40.3	5,511
Region						
North Bihar Plain	149.6	17.7	2,992	19.4	38.7	2,733
South Bihar Plain	149.1	22.3	2,097	19.6	38.7	1,912
Jharkhand	149.9	19.2	1,616	19.3	41.1	1,516
Education						
Illiterate	149.0	21.1	5,115	19.2	42.5	4,668
Literate, < middle school complete	150.6	15.6	770	20.0	33.0	727
Middle school complete	150.5	14.6	263	20.0	33.1	242
High school complete and above	151.5	12.5	557	21.1	22.8	523
Religion						
Hindu	149.4	20.1	5,618	19.5	38.7	5,186
Muslim	149.6	16.8	973	19.2	43.3	863
Christian	152.1	8.9	60	19.2	38.1	59
Other	150.3	16.3	55	(19.2)	(37.4)	53
Caste/tribe						
Scheduled caste	148.5	24.9	1,385	18.9	46.7	1,257
Scheduled tribe	149.7	19.3	548	19.2	41.0	514
Other backward class	149.3	19.8	3,488	19.4	38.8	3,207
Other	151.0	13.1	1,285	20.2	32.1	1,184
Work status						
Working in family farm/business	149.6	18.6	605	19.1	41.5	575
Employed by someone else	148.7	23.5	776	18.8	50.4	720
Self-employed	149.0	21.0	376	19.5	39.6	350
Not worked in past 12 months	149.6	18.9	4,948	19.6	37.3	4,516
Standard of living index						
Low	148.7	23.2	3,523	19.0	44.6	3,212
Medium	149.9	17.1	2,499	19.6	37.2	2,302
High	151.8	9.5	676	21.3	21.0	641
Total	149.5	19.5	6,705	19.4	39.3	6,161

Note: Total includes a small number of women with missing information on the standard of living index, 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).

working on a family farm or in a family business, and women from scheduled castes or scheduled tribes. The standard of living is negatively related to chronic energy deficiency. Women from households with a low standard of living are more than two times as likely to have a low BMI as women from households with a high standard of living. Currently married women are somewhat less likely than women who are currently not married to have a low BMI.

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).

Anaemia may have detrimental effects on the health of women and children, may become an underlying cause of maternal mortality and perinatal mortality, and results in an increased risk of premature delivery and low birth weight (Seshadri, 1997). Early detection of anaemia can help 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 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 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, emphasizing the voluntary nature of the test, and asking 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

[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, Bihar, 1998–99

Background characteristic	Percentage of women with any anaemia	Percentage of women with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of women
Age					
15–19	64.2	43.8	18.9	1.5	731
20–24	63.4	40.0	21.7	1.7	1,241
25–29	63.2	42.6	18.8	1.7	1,249
30–34	63.7	43.2	19.3	1.2	981
35–49	63.1	44.5	17.3	1.3	2,021
Marital status					
Currently married	63.6	43.0	19.1	1.5	5,897
Not currently married	60.6	41.6	17.6	1.4	326
Residence					
Urban	59.6	42.6	15.2	1.8	637
Rural	63.9	43.0	19.4	1.4	5,586
Region					
North Bihar Plain	60.2	44.2	15.0	1.1	2,775
South Bihar Plain	60.7	40.2	18.7	1.8	1,948
Jharkhand	72.9	44.3	26.8	1.8	1,499
Education					
Illiterate	66.2	43.2	21.3	1.7	4,736
Literate, < middle school complete	57.7	43.5	13.4	0.8	725
Middle school complete	54.5	41.6	13.0	0.0	250
High school complete and above	50.0	40.3	8.6	1.1	512
Religion					
Hindu	63.1	42.6	19.1	1.3	5,238
Muslim	63.1	44.3	17.0	1.8	873
Christian	76.9	52.4	20.4	4.2	57
Other	86.6	45.2	33.7	7.7	55
Caste/tribe					
Scheduled caste	67.0	43.8	22.0	1.1	1,274
Scheduled tribe	82.1	43.3	35.9	2.9	512
Other backward class	60.9	42.2	17.0	1.6	3,253
Other	58.5	43.9	13.8	0.8	1,185
Work status					
Working in family farm/business	63.5	42.6	19.1	1.8	573
Employed by someone else	71.8	44.1	24.9	2.8	717
Self-employed	70.1	43.0	25.7	1.4	346
Not worked in past 12 months	61.6	42.8	17.5	1.2	4,586

Contd…

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 health investigator 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. Three levels of severity of anaemia are distinguished: mild anaemia (10.0–10.9 g/dl 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

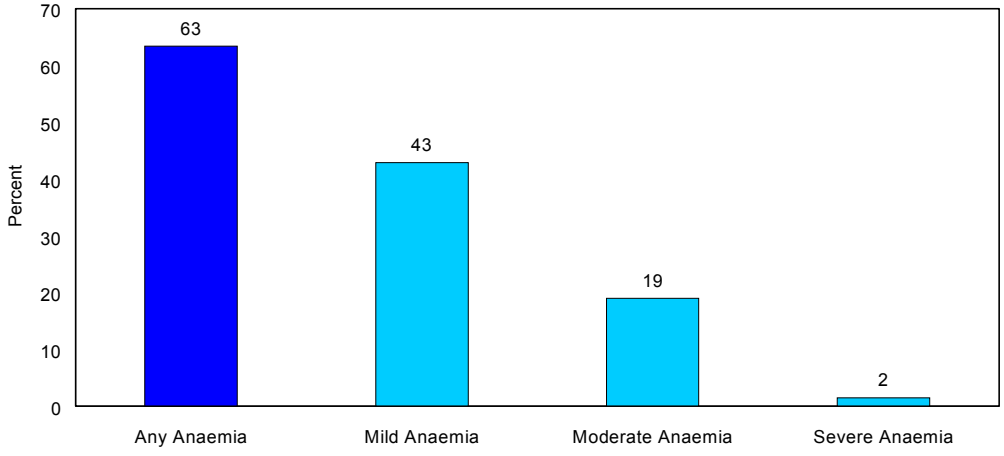
Table 7.4 Anaemia among women (contd.)

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, Bihar, 1998–99

Background characteristic	Percentage of women with any anaemia	Percentage of women with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of women
Standard of living index					
Low	68.9	43.7	23.4	1.8	3,268
Medium	59.5	42.7	15.4	1.3	2,328
High	50.3	40.3	9.4	0.6	620
Pregnancy/breastfeeding status					
Pregnant	49.8	22.1	25.5	2.2	508
Not pregnant (breastfeeding)	67.4	46.8	19.0	1.6	1,907
Not pregnant (non-breastfeeding)	63.2	43.8	18.1	1.3	3,808
Height					
< 145 cm	65.9	41.8	22.1	2.0	1,219
≥ 145 cm	62.8	43.3	18.2	1.3	4,994
Body mass index					
< 18.5 kg/m^2	65.2	42.9	20.5	1.9	2,357
≥ 18.5 kg/m^2	62.3	43.1	18.1	1.2	3,842
Fruit and vegetable consumption[1]					
Fruits and vegetables	59.5	43.2	15.1	1.2	1,137
Vegetables only	63.9	42.8	19.6	1.5	4,864
Neither	74.1	46.7	25.8	1.6	217
Total	63.4	42.9	19.0	1.5	6,223

Note: The haemoglobin levels are adjusted for smoking when calculating the degree of anaemia. No adjustment for altitude of the enumeration area was made because all of the sample PSUs in Bihar are at an altitude below 1,000 metres. Total includes 6 women consuming fruit only and 8, 11, and 24 women with missing information on the standard of living index, height, and body mass index, respectively, who are not shown separately.
[1]Based on consumption at least weekly. Vegetables include only green, leafy vegetables.

Figure 7.1
Anaemia Among Women



NFHS-2, Bihar, 1998–99

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 Bihar, haemoglobin levels were tested for 88 percent of women (see Table B.3 in Appendix B). Overall, 63 percent of women have some degree of anaemia. Forty-three percent of women are mildly anaemic, 19 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 for women in every population group. The prevalence of anaemia does not vary much by age. It is slightly higher for currently married women (64 percent) than for women who are currently not married (61 percent), and slightly higher for rural women (64 percent) than for urban women (60 percent). Differences by region, education, religion, caste/tribe, work status, and standard of living are more pronounced. The prevalence of anaemia is much higher in the Jharkhand region (73 percent) than in the North Bihar Plain or South Bihar Plain regions (60–61 percent). Anaemia is relatively high for illiterate women, women belonging to religions other than Hindu or Muslim, scheduled-tribe women, and self-employed women and women employed by someone else. Anaemia, especially moderate to severe anaemia, decreases as the standard of living rises.

Pregnant women are more likely to have moderate to severe anaemia (28 percent) than nonpregnant women (19–21 percent). However, pregnant women are considerably less likely than other women to have mild anaemia (probably because a substantial proportion of pregnant women consume iron and folic acid tablets or syrup). Overall, pregnant women are considerably less likely to be anaemic (50 percent) than nonpregnant women (63–67 percent). Shorter women and women with a low body mass index have somewhat higher prevalence of moderate to severe anaemia than other women. The diet of women also plays a role in the likelihood that they 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 NFHS-2, differentials in anaemia by consumption of fruits and vegetables are large. Women not eating fruits and green, leafy vegetables regularly have considerably elevated levels of moderate to severe anaemia.

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 UNICEF, recommends initiation of breastfeeding immediately after childbirth. The World Health Organization (WHO) and the

[3]Rates that are not adjusted for altitude and smoking are almost the same as the corresponding adjusted rates (with at most a 0.2 difference in any rate). This is to be expected since, in Bihar, the proportion of women who smoke is small (see Table 2.12), and all of the sample PSUs are at an altitude below 1,000 metres.

United Nations Children's Fund (UNICEF) recommend that infants should be given only breast milk for about 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.(a)). 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 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. 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. These indicators of breastfeeding and other feeding practices are presented in this section.

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 1995, 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 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. It also gives the percentage of children whose mothers squeezed the first milk from the breast before breastfeeding, which is not the recommended practice. Although breastfeeding is nearly universal in Bihar, very few children are put to the breast immediately after birth. Only 6 percent of children began breastfeeding within one hour of birth, and only 21 percent began breastfeeding within one day. Forty-two percent of mothers 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. No more than 13 percent of children in any group were put to the breast within one hour of birth. The percentage of children that started breastfeeding within one day of birth does not vary much by urban-rural residence, mother's education, religion, standard of living, assistance during delivery, or place of delivery. However,

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, Bihar, 1998–99

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	5.3	21.8	41.7	258
Rural	6.3	20.6	42.1	2,689
Region				
North Bihar Plain	5.0	14.1	36.2	1,378
South Bihar Plain	6.3	24.0	38.3	979
Jharkhand	9.0	30.5	62.1	590
Mother's education				
Illiterate	6.3	20.4	43.1	2,262
Literate, < middle school complete	4.7	21.7	42.3	280
Middle school complete	6.2	23.0	45.3	127
High school complete and above	6.7	20.7	32.0	277
Religion				
Hindu	5.6	20.0	41.1	2,378
Muslim	8.4	22.8	45.6	532
Caste/tribe				
Scheduled caste	7.0	22.5	40.9	672
Scheduled tribe	12.6	33.8	60.9	197
Other backward class	4.3	16.8	41.3	1,544
Other	8.5	24.5	38.9	533
Mother's work status				
Working in family farm/business	7.8	18.3	46.0	230
Employed by someone else	7.0	23.8	47.3	290
Self-employed	9.4	33.1	53.0	135
Not worked in past 12 months	5.8	19.8	40.4	2,292
Standard of living index				
Low	6.2	20.7	44.4	1,676
Medium	6.5	20.6	40.9	1,028
High	5.2	20.9	32.1	237
Assistance during delivery				
Health professional[2]	3.8	19.6	38.9	688
Dai (TBA)	7.4	20.9	41.8	1,940
Other	4.8	24.0	57.2	283
Place of delivery				
Public health facility	3.7	20.1	42.5	112
Private health facility	3.2	19.4	37.3	310
Own home	7.4	21.6	42.4	2,076
Parents' home	3.7	18.5	48.3	388
Total	6.2	20.7	42.1	2,947

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 17 and 20 children belonging to Christian and 'other' religions, respectively; 8 and 16 children delivered in nongovernmental organization (NGO) or trust hospitals/clinics and 'other' places of delivery, respectively; and 6, 35, and 36 children with missing information on the standard of living index, assistance during delivery, and place of delivery, 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 by breastfeeding status, according to child's age in months, Bihar, 1998–99

Age in months	Breastfeeding status					Total percent	Number of living children
			Breastfeeding and:				
	Not breastfeeding	Exclusively breastfeeding	Receiving plain water only	Receiving supplements	Don't know if fed supplements		
< 2	3.0	63.0	21.3	12.7	0.0	100.0	137
2–3	2.3	50.4	28.4	19.0	0.0	100.0	226
4–5	3.0	34.8	38.6	23.7	0.0	100.0	207
6–7	4.3	20.7	35.1	39.9	0.0	100.0	174
8–9	4.8	16.1	31.1	48.0	0.0	100.0	122
10–11	2.1	7.8	17.4	72.6	0.0	100.0	102
12–13	1.1	1.7	13.8	83.4	0.0	100.0	175
14–15	8.2	1.0	8.6	82.2	0.0	100.0	199
16–17	6.5	1.7	6.3	85.4	0.0	100.0	171
18–19	7.0	0.7	12.0	80.3	0.0	100.0	140
20–21	18.3	0.9	7.5	73.4	0.0	100.0	105
22–23	11.0	0.0	14.1	74.9	0.0	100.0	92
24–25	34.8	0.0	1.6	63.6	0.0	100.0	131
26–27	33.6	0.7	3.0	62.7	0.0	100.0	140
28–29	37.2	0.0	0.0	62.8	0.0	100.0	154
30–31	34.6	0.0	1.6	63.8	0.0	100.0	184
32–33	41.6	0.7	0.0	57.6	0.0	100.0	143
34–35	38.5	0.0	4.8	56.0	0.7	100.0	128
< 4 months	2.5	55.2	25.7	16.6	0.0	100.0	364
4–6 months	3.6	32.7	36.3	27.4	0.0	100.0	293
7–9 months	4.3	15.2	34.5	46.0	0.0	100.0	210

Note: Table includes only surviving children from among the two most recent births in 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.

some differentials are notable. Children in the Jharkhand region, scheduled-tribe children, and children of self-employed mothers are much more likely than other children to have started breastfeeding within one day of birth, but the majority of children in every group were not breastfed within one day of birth.

The custom of squeezing the first milk from the breast before breastfeeding a child is widely practised in every group, but it is much more common in the Jharkhand region and for scheduled-tribe children. The percentage of children whose mothers squeezed the first milk from the breast is also higher for children of less educated mothers and self-employed mothers. Children who live in households with a high standard of living are less likely than children in other households to have mothers who squeezed the first milk from the breast before breastfeeding. It should be stressed, however, that contrary to recommendations for feeding infants, mothers squeeze the first milk from the breast before breastfeeding for one-third to two-thirds of children in different groups.

Mothers of children born in the three years before 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 before four months of age puts infants at risk of malnutrition because other liquids and solid foods are nutritionally inferior to breast milk.

Table 7.7 Type of food received by children

Percentage of children under age 3 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, Bihar, 1998–99

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	2.3	10.0	1.6	0.0	0.0	0.0	3.8	133
2–3	5.9	13.5	1.8	0.4	0.0	0.9	9.2	221
4–5	7.5	16.5	3.6	1.1	0.0	3.5	8.3	201
6–7	4.8	27.2	13.9	3.6	1.2	12.7	9.3	166
8–9	8.2	27.5	24.2	6.9	1.0	19.9	9.9	117
10–11	9.2	35.4	44.6	18.0	2.1	50.6	10.2	100
12–13	5.4	47.1	48.2	28.5	6.7	64.9	12.5	173
14–15	6.1	45.3	53.8	33.4	5.5	76.9	6.7	183
16–17	3.1	37.4	58.4	38.8	11.5	79.5	6.9	160
18–23	3.9	34.8	51.9	39.5	7.8	75.3	4.1	297
24–29	7.4	43.7	70.4	56.8	8.9	91.3	6.6	275
30–35	3.7	40.0	76.9	57.9	15.0	90.8	5.7	282
< 4 months	4.6	12.2	1.7	0.3	0.0	0.5	7.2	354
4–5 months	7.5	16.5	3.6	1.1	0.0	3.5	8.3	201
6–9 months	6.2	27.3	18.2	5.0	1.1	15.7	9.6	283
NON-BREASTFEEDING CHILDREN								
< 10	(42.3)	(64.7)	(11.2)	(11.4)	(7.5)	(15.0)	(67.7)	29
10–17	(27.0)	(67.6)	(68.1)	(39.8)	(20.8)	(77.5)	(37.1)	32
18–23	(17.9)	(49.1)	(71.7)	(49.4)	(20.7)	(79.3)	(28.4)	39
24–29	6.0	50.5	79.9	72.5	22.8	95.9	11.4	150
30–35	4.7	46.8	81.0	66.9	13.2	96.0	8.9	173
ALL CHILDREN								
< 2	2.9	11.3	1.6	0.0	0.0	0.0	5.1	137
2–3	6.8	14.6	1.8	0.4	0.0	0.8	10.4	226
4–5	8.8	18.5	4.0	1.6	0.5	3.9	10.6	207
6–7	5.8	27.9	14.5	4.7	1.8	14.0	10.7	174
8–9	10.9	30.2	23.1	6.6	0.9	19.0	14.3	122
10–11	10.2	34.7	43.7	18.6	2.0	50.5	11.1	102
12–13	5.9	47.6	48.8	28.2	6.6	65.2	12.9	175
14–15	7.8	48.3	54.6	34.3	7.3	76.8	8.8	199
16–17	4.2	38.6	60.0	38.7	12.1	79.7	8.9	171
18–23	5.5	36.4	54.2	40.6	9.3	75.7	7.0	337
24–29	6.9	46.1	73.7	62.3	13.8	92.9	8.3	425
30–35	4.1	42.6	78.5	61.4	14.3	92.8	6.9	455
< 4 months	5.3	13.4	1.7	0.3	0.0	0.5	8.4	364
4–5 months	8.8	18.5	4.0	1.6	0.5	3.9	10.6	207
6–9 months	7.9	28.9	18.1	5.5	1.4	16.1	12.2	296

Note: Table includes only surviving children from among the two most recent births in the three years preceding the survey. Percents by type of food may sum to more than 100.0 because children may have received more than one type of food.
( ) Based on 25–49 unweighted cases
[1]Includes green, leafy vegetables and fruits

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.

In Bihar, 55 percent of children under four months of age are exclusively breastfed, 26 percent receive breast milk plus water, and 17 percent receive supplements along with breast milk (Table 7.6). The percentage of infants exclusively breastfed drops off after three months to 35 percent at age 4–5 months and 21 percent at age 6–7 months. The proportion of children receiving supplements along with breast milk increases from 24 percent for children age 4–5 months to 85 percent for children age 16–17 months, and declines thereafter as children are weaned from the breast and their food consumption no longer supplements breast milk. However, breastfeeding generally continues for a long period. Ninety-three percent of children age 18–19 months are still being breastfed, as are 62 percent of children age 34–35 months.

Table 7.7 shows in more detail the types of food consumed by children under age three years during the day or night before the interview. Because of the small number of nonbreastfeeding children, some two-month age categories have been combined into broader age groups. 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. About one-half of non-breastfeeding children were given these other types of milk the day or night before the interview. About one-quarter to one-half of breastfeeding children age 6–35 months received non-powdered milk in addition to breast milk. Among all children, other liquids, such as juice or tea, are given less often than milk for children under age 9 months and more often for children age 10–35 months. The consumption of green, leafy vegetables generally increases with age, from 5 percent at age 6–7 months to 61 percent at age 30–35 months for all children. The consumption of fruits is generally quite low for all children under three years in Bihar. Less than 2 percent of infants and only 7–14 percent of children age 12–35 months receive fruits on a regular basis.

From about six months of age, the introduction of complementary food is critical to meeting the protein, energy, and micronutrient needs of children. However, in Bihar, the introduction of complementary food is delayed for a substantial proportion of children. Only 13 percent of breastfeeding children age 6–7 months consume solid or mushy foods. This proportion rises to 65 percent at age 12–13 months and more than 90 percent at age 24–35 months. Only 16 percent of breastfeeding children age 6–9 months receive solid or mushy food, as recommended.

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. The use of bottles with nipples is not common in Bihar, especially for children who are being breastfed. In every age group, less than 13 percent of breastfeeding children drank anything from a bottle with a nipple during the day or night before the interview (Table 7.7). The use of a bottle with a nipple is much 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. The median length of any breastfeeding is more than three years. 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.

Table 7.8 Median duration of breastfeeding by background characteristics

Median duration of breastfeeding among children under age 3 by sex of child and residence, and mean duration of breastfeeding, Bihar, 1998–99

Background characteristic	Median duration (months)[1]			Number of children
	Any breastfeeding	Exclusive breastfeeding	Exclusive breastfeeding or breastfeeding plus water only	
Sex of child				
Male	≥ 36.0	1.6	7.7	1,519
Female	≥ 36.0	2.2	7.3	1,428
Residence				
Urban	24.0	(0.6)	3.1	258
Rural	≥ 36.0	2.1	8.0	2,689
Median duration	≥ 36.0	1.9	7.5	2,947
Mean duration (months)[1]	28.3	4.3	8.7	2,947
Prevalence/incidence mean	27.8	4.2	9.0	2,947

Note: Table includes only the two most recent births during the three years preceding the survey. The median duration of any breastfeeding is shown as ≥ 36.0 months for groups in which the exact median cannot be calculated because the proportion of breastfeeding children does not drop below 50 percent in any age group for children under 36 months of age.
( ) Based on 25–49 unweighted cases
[1]Based on current status

Supplementation begins relatively early, however. The median length of exclusive breastfeeding is 1.9 months, and the median length of exclusive breastfeeding or breastfeeding with water only is 7.5 months.

The mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding with water only are 28.3 months, 4.3 months, and 8.7 months, respectively. The mean durations differ from the median durations because of extreme values of the duration of breastfeeding for some children. (The mean duration is strongly affected by extreme values, but the median duration is not.)

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 duration of breastfeeding is more than three years for both boys and girls. The median length of breastfeeding is two years in urban areas and more than three years in rural areas.

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 type of scales and measuring boards used for women. Children under two years of age were measured lying down and other 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

Table 7.9 Nutritional status of children by demographic characteristics

Percentage of children under age 3 classified as undernourished on three anthropometric indices of nutritional status, according to selected demographic characteristics, Bihar, 1998–99

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	3.4	16.1	5.5	16.5	3.9	15.7	417
6–11 months	19.4	45.1	20.7	40.2	5.6	19.7	319
12–23 months	31.3	65.6	43.6	66.9	6.3	24.9	680
24–35 months	36.2	71.3	47.2	70.0	5.5	21.0	670
Sex of child							
Male	24.6	52.8	33.6	53.0	5.7	21.4	1,078
Female	26.4	56.1	33.6	54.6	5.2	20.5	1,008
Birth order							
1	21.8	51.6	27.4	52.6	6.7	20.7	471
2–3	22.1	52.0	34.9	52.5	4.4	19.1	833
4–5	29.9	57.9	35.5	55.7	6.3	20.7	485
6+	33.4	59.8	36.9	55.8	5.0	27.3	298
Previous birth interval[2]							
First birth	21.9	51.6	27.2	52.3	6.9	20.8	473
< 24 months	31.9	61.3	42.1	61.2	6.4	22.9	271
24–47 months	26.3	55.4	35.7	55.2	4.1	20.6	910
48+ months	23.5	51.1	31.0	47.4	6.1	20.9	432
Total	25.5	54.4	33.6	53.7	5.5	21.0	2,086

Note: Each index is expressed in standard deviation (SD) units from the median of the International Reference Population.
[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.

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 Bihar, NFHS-2 failed to measure height or weight for 11 percent of children under age three (see Table B.3 in Appendix B). 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. More than one-half of children under three years of age are underweight (54 percent), and a similar percentage are stunted (54 percent). The proportion of children who are severely undernourished is also notable—26 percent according to weight-for-age and 34 percent according to height-for-age. Wasting is also quite evident in Bihar, affecting 21 percent of children under three years of age. The proportion of children under three years of age who are underweight decreased from 63 percent in NFHS-1 to 54 percent in NFHS-2 and the proportion severely underweight decreased from 32 percent to 26 percent. There has been relatively little improvement in the proportion stunted or proportion wasted since the time of NFHS-1. The

proportion of children under three years of age who are stunted decreased from 56 percent in NFHS-1 to 54 percent in NFHS-2, and the proportion wasted decreased from 24 percent to 21 percent, respectively.

The proportion of children who are underweight and stunted increases steadily with child's age, whereas wasting increases up to age 12–23 months and then declines slightly at age 24–35 months. Even during the first six months of life, when most babies are breastfed, about 16 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, about one-half are severely stunted and more than one-third are severely underweight.

Girls and boys are about equally undernourished, but girls are slightly more likely than boys to be underweight and stunted, whereas boys are slightly more likely to be wasted. Undernourishment generally increases with increasing birth order. Young children in families with four or more children are nutritionally the most disadvantaged. First births have lower than average levels of undernutrition on almost every measure, and children born after a short birth interval have higher than average levels on all measures.

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, 42–47 percent of children are underweight or 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). Muslim children and Hindu children are about equally likely to be undernourished. Children belonging to scheduled castes, scheduled tribes, or other backward classes have relatively high levels of undernutrition according to all three measures. Interestingly, undernutrition is relatively low for children whose mothers have not worked in the past 12 months.

Undernutrition among children is strongly related to maternal nutritional status. Undernutrition is 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 of the measures of undernutrition are strongly related to the household's standard of living. Children from households with a low standard of living are 2–5 times as likely to be severely undernourished as children from households with a high standard of living. Even among children from high standard of living households, about one-third (33 percent) are underweight and more than one-third (36 percent) are stunted.

Table 7.10 Nutritional status of children by background characteristics

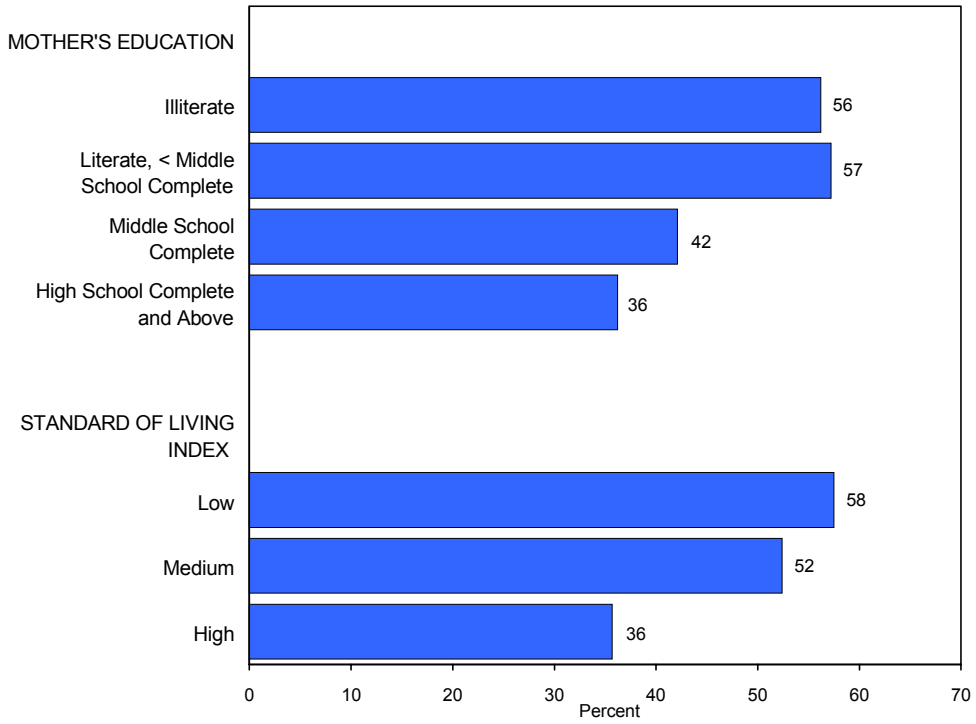
Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected background characteristics, Bihar, 1998–99

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	12.1	47.4	24.2	42.2	3.8	17.1	199
Rural	26.9	55.1	34.6	55.0	5.6	21.4	1,886
Region							
North Bihar Plain	22.7	52.0	33.0	52.3	5.2	18.3	1,022
South Bihar Plain	29.0	58.3	37.6	59.3	6.5	22.4	629
Jharkhand	26.8	54.3	29.4	49.0	4.6	25.4	435
Mother's education							
Illiterate	28.1	57.4	35.7	56.2	5.9	22.4	1,559
Literate, < middle school complete	22.4	55.6	32.7	57.2	2.9	17.8	228
Middle school complete	17.3	43.1	24.0	42.1	8.7	18.3	96
High school complete and above	12.5	35.3	23.4	36.2	3.2	15.5	203
Religion							
Hindu	24.8	54.2	34.0	54.0	5.2	20.7	1,687
Muslim	27.6	55.0	32.2	53.0	6.4	22.1	370
Caste/tribe							
Scheduled caste	28.3	58.5	36.2	57.6	5.5	23.1	463
Scheduled tribe	36.1	59.7	36.4	56.4	7.7	33.5	124
Other backward class	25.5	55.8	34.9	54.7	5.3	19.7	1,125
Other	18.5	43.1	25.6	45.1	5.0	18.3	374
Mother's work status							
Working in family farm/business	33.8	61.9	46.2	64.9	5.0	22.9	162
Employed by someone else	39.2	59.7	38.5	59.1	8.7	28.7	191
Self-employed	28.7	60.8	39.7	62.0	6.8	25.8	89
Not worked in past 12 months	22.9	52.7	31.5	51.6	5.0	19.7	1,644
Mother's height							
< 145 cm	32.7	64.3	39.4	57.8	7.2	25.5	366
≥ 145 cm	24.0	52.2	32.5	52.9	5.1	20.1	1,716
Mother's body mass index							
< 18.5 kg/m^2	31.3	62.2	37.1	58.4	5.4	23.6	803
≥ 18.5 kg/m^2	21.9	49.3	31.5	50.9	5.5	19.4	1,277
Standard of living index							
Low	30.4	59.5	37.4	57.5	6.4	23.4	1,137
Medium	21.9	52.1	31.4	52.4	5.0	19.8	766
High	9.9	32.7	19.4	35.7	1.2	11.1	179
Total	25.5	54.4	33.6	53.7	5.5	21.0	2,086

Note: Each index is expressed in standard deviation (SD) units from the median of the International Reference Population. Total includes 13 and 15 children belonging to Christian and 'other' religions, respectively, and 3, 6, and 4 children with missing information on mother's height, mother's body mass index, and the standard of living index, respectively, who are not shown separately.

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

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



NFHS-2, Bihar, 1998–99

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 and Figure 7.3 show anaemia levels for children age 6–35 months. Overall, four-fifths (81 percent) of these children have some level of anaemia, including 27 percent who are mildly anaemic (10.0–10.9 g/dl), 50 percent who are moderately anaemic (7.0–9.9 g/dl), and 4 percent who are severely anaemic (less than 7.0 g/dl)[4]. Notably, a much higher proportion of children than women are anaemic.

Several groups of children have particularly high levels of moderate to severe anaemia. These include scheduled-tribe children and children of mothers who are employed by someone else. The prevalence of moderate to severe anaemia is also relatively high among children age

[4]Because all sample PSUs in Bihar are at an altitude below 1,000 metres, no adjustment for altitude was made when estimating anaemia levels among children.

Table 7.11 Anaemia among children

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, Bihar, 1998–99

Background characteristic	Percentage of children with any anaemia	Percentage of children with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of children
Age of child					
6–11 months	83.6	30.3	49.0	4.2	303
12–23 months	83.4	26.9	52.4	4.1	678
24–35 months	78.1	25.3	48.6	4.1	676
Sex of child					
Male	80.5	25.6	51.0	3.9	852
Female	82.1	28.3	49.5	4.3	805
Birth order					
1	80.2	26.0	51.6	2.6	383
2–3	81.6	28.5	48.7	4.4	647
4–5	81.5	26.8	49.7	5.0	385
6+	81.6	24.0	53.0	4.6	242
Residence					
Urban	80.7	27.5	48.4	4.8	167
Rural	81.3	26.8	50.5	4.0	1,490
Region					
North Bihar Plain	81.2	28.9	47.9	4.4	777
South Bihar Plain	80.6	24.4	52.5	3.7	512
Jharkhand	82.4	26.2	52.2	4.0	368
Mother's education					
Illiterate	82.5	26.1	52.0	4.4	1,238
Literate, < middle school complete	79.4	21.0	52.4	6.0	184
Middle school complete	79.3	30.3	46.4	2.6	74
High school complete and above	75.0	37.9	36.4	0.7	162
Religion					
Hindu	81.0	27.1	49.7	4.1	1,373
Muslim	81.5	25.2	52.0	4.3	261
Caste/tribe					
Scheduled caste	83.5	25.1	53.6	4.7	368
Scheduled tribe	93.5	24.1	63.0	6.4	114
Other backward class	80.2	28.1	48.3	3.7	894
Other	76.8	26.4	46.8	3.6	281
Mother's work status					
Working in family farm/business	83.2	30.0	51.7	1.5	148
Employed by someone else	85.5	18.6	62.1	4.7	150
Self-employed	84.9	19.9	56.1	8.9	77
Not worked in last 12 months	80.3	27.9	48.3	4.1	1,281

Contd…

12–23 months, male children, rural children, Muslim children, scheduled-caste children, children of self-employed mothers, and children from poor families. The prevalence of moderate to severe anaemia among children whose mothers have completed at least a high school education is lower than among children whose mothers are illiterate or have less than a high school education. As expected, there is a strong positive relationship between the anaemia status of mothers and prevalence of moderate to severe anaemia among children. The prevalence of mild anaemia among children age 6–35 months varies little by most background characteristics.

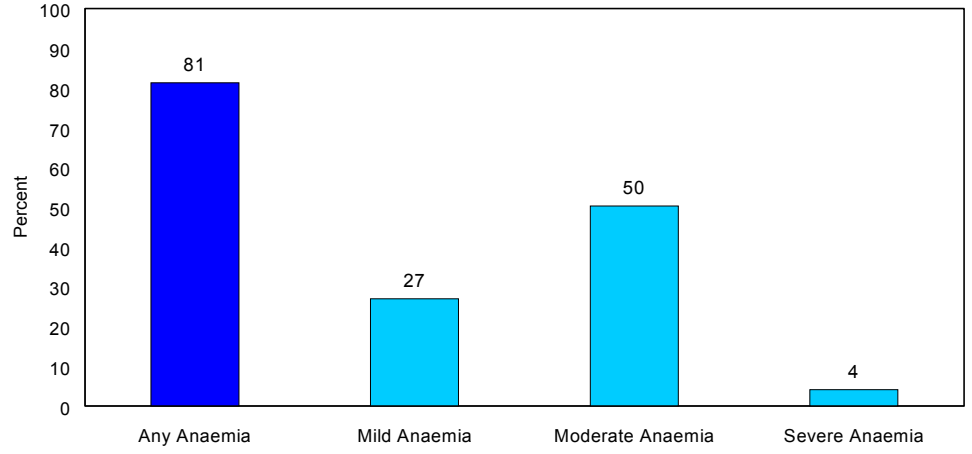
Table 7.11 Anaemia among children (contd.)

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, Bihar, 1998–99

Background characteristic	Percentage of children with any anaemia	Percentage of children with:			Number of children
		Mild anaemia	Moderate anaemia	Severe anaemia	
Standard of living index					
Low	83.3	25.0	53.6	4.7	891
Medium	79.5	28.6	47.2	3.7	621
High	76.4	32.0	42.2	2.3	142
Mother's anaemia status					
Not anaemic	78.4	29.6	45.2	3.6	595
Mildly anaemic	79.9	25.6	51.7	2.6	711
Moderately anaemic	88.0	26.5	54.3	7.1	327
Total	81.3	26.9	50.3	4.1	1,657

Note: Haemoglobin levels are not adjusted for altitude when calculating the degree of anaemia among children because all of the sample PSUs in Bihar are at an altitude below 1,000 metres. Total includes 12 and 11 children belonging to Christian and 'other' religions, respectively, 21 children whose mothers are severely anaemic, and 3 children each with missing information on the standard of living index and mother's anaemia status, who are not shown separately.

Figure 7.3
Anaemia Among Children



NFHS-2, Bihar, 1998–99

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. It 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 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 non-iodized salt was lifted in September, 2000.

NFHS-2, with its representative sample of households throughout Bihar and the rest of India, is an ideal vehicle for measuring the degree of salt iodization in the country. 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 of 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 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 reasonable 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, only about one-half of households (47 percent) use cooking salt that is iodized at the recommended level of 15 ppm or more. About one-quarter of households (23 percent) use salt that is not iodized at all and about one-third (30 percent) use salt that is inadequately iodized (less than 15 ppm). Differentials in salt iodization by background characteristics are pronounced. More than three-fourths of households in urban areas use salt with 15 ppm or more of iodine compared with only 43 percent of households in rural areas. Hindu households and Muslim households are less likely to use iodized salt than Christian or 'other' households. The use of iodized salt is relatively low in households headed by persons from scheduled castes, scheduled tribes, or other backward classes. The widest differentials are observed for the standard of living index. Eighty-one percent of households with a high standard of living use adequately iodized salt compared with only 38 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, Bihar, 1998–99

Background characteristic	Not iodized	7 ppm	15 ppm	30 ppm	Missing	Total percent	Number of households
Type of place of residence							
Large city	1.3	21.3	12.0	65.3	0.0	100.0	77
Small city	8.9	7.5	25.1	58.5	0.0	100.0	163
Town	10.4	14.0	22.8	52.8	0.0	100.0	480
Rural area	24.7	32.3	27.1	15.9	0.0	100.0	5,625
Religion of household head							
Hindu	23.7	30.1	25.9	20.2	0.0	100.0	5,276
Muslim	20.1	31.7	30.5	17.8	0.0	100.0	938
Christian	8.8	17.8	23.7	49.7	0.0	100.0	70
Other	12.1	27.7	22.4	37.9	0.0	100.0	61
Caste/tribe of household head							
Scheduled caste	26.1	33.6	25.2	15.1	0.0	100.0	1,320
Scheduled tribe	22.2	31.2	25.1	21.5	0.0	100.0	631
Other backward class	24.0	30.7	27.2	18.1	0.0	100.0	3,169
Other	17.0	24.5	27.0	31.4	0.1	100.0	1,225
Standard of living index							
Low	27.1	35.1	26.0	11.8	0.0	100.0	3,641
Medium	19.7	26.5	29.7	24.1	0.0	100.0	2,151
High	7.8	11.3	18.0	62.9	0.0	100.0	545
Total	22.9	30.1	26.6	20.4	0.0	100.0	6,345

Note: Total includes 8 households with missing information on the standard of living index, which are not shown separately.
ppm: Parts per million