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). In Maharashtra, women consume pulses or beans most often (Table 7.1). Two-thirds of women consume pulses or beans on a daily basis and 95 percent consume pulses or beans at least once a week. Vegetables (both green, leafy vegetables and other vegetables) are also an important part of the diet for women. More than one-third of women consume each type of vegetable on a daily basis and about 90 percent consume each type of vegetable at least once a week. Milk or curd is not a common part of the diet for a majority of women; only 47 percent of women consume milk or curd daily or weekly. The remaining women consume milk or curd only occasionally or never. Fruits are eaten every day by only 9 percent of women, and a majority of women (55 percent) eat fruits only occasionally or never. One-third of women in Maharashtra never eat chicken, meat, or fish. Only 3 percent eat chicken, meat, or fish daily, 35 percent consume these food items weekly, and another 29 percent only occasionally. Eggs are consumed about as often as chicken, meat, or fish.

Table 7.2 shows that there are substantial differentials in food consumption patterns of women in Maharashtra by selected background characteristics. Age does not play an important role in women's consumption patterns but younger women (age 15–34) are somewhat more likely than older women to consume 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 fruits, eggs, and chicken, meat, or fish. Women in Mumbai are more likely to include all type of foods in their diet than women in other parts of Maharashtra. Within Mumbai, there are sharp differentials between slum and non-slum areas. Women from slum areas are more likely to eat eggs and chicken, meat, or fish at least once a week, while women from non-slum areas are more

Table 7.1 Women's food consumption

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

Type of food	Frequency of consumption				Total percent
	Daily	Weekly	Occasionally	Never	
Milk or curd	24.8	22.5	32.1	20.5	100.0
Pulses or beans	67.7	26.9	5.2	0.3	100.0
Green, leafy vegetables	35.2	52.7	11.7	0.4	100.0
Other vegetables	35.0	56.0	8.4	0.5	100.0
Fruits	8.6	36.1	51.4	4.0	100.0
Eggs	2.8	31.7	30.4	35.2	100.0
Chicken, meat, or fish	3.0	35.3	28.7	33.1	100.0

likely to consume fruits and milk or curd. 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 or curd. A much lower proportion of Hindu women consume fruits, eggs, and chicken, meat or fish than Muslim or Christian women. Jain women are far more likely to consume fruits and milk or curd than other women, but very few Jain women eat eggs and chicken, meat, or fish at least once a week. Women from scheduled tribes have a relatively poor diet that is particularly deficient in milk or curd, fruits, eggs, and chicken, meat, or fish. Scheduled-caste women are more likely to eat eggs and chicken, meat, or fish at least once a week than women in other castes or tribes. 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, milk or curd, eggs, and chicken, meat, or fish 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 Maharashtra of 151 cm (the same as the mean height for women in India as a whole). The mean height varies only slightly (between 150 and 154 cm) for women in different population groups, as shown in Table 7.3. Women living in households with a low standard of living are more than 2 cm shorter than women living in households with a high standard of living, and illiterate women are almost 2 cm shorter than women who have completed at least a high school education. Other women who are relatively short are scheduled-caste women and Buddhist/Neo-Buddhist women. Jain women (154 cm) and women from non-slum areas of Mumbai (153 cm) are taller than women in any other group. Twelve percent of women in Maharashtra are under 145 cm in height. The highest percentage of women in any group who are less than 145 cm tall is 18 percent for Buddhist/Neo-

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, Maharashtra, 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	45.8	93.8	87.6	89.7	44.7	35.3	40.8	1,453
25–34	47.9	95.0	88.5	91.7	45.2	36.6	39.3	2,048
35–49	47.9	94.5	87.4	91.3	44.0	31.4	35.0	1,890
Residence								
Urban	56.0	95.2	92.2	91.4	58.2	45.2	49.3	2,229
Rural	41.3	94.0	84.8	90.8	35.1	26.8	30.4	3,162
Mumbai	61.0	98.1	92.3	96.5	68.5	57.5	55.4	682
Slum	53.3	98.0	91.0	95.6	60.5	65.2	62.0	397
Non-slum	71.8	98.2	94.1	97.8	79.7	46.9	46.1	285
Education								
Illiterate	31.4	92.9	83.1	87.8	31.1	29.9	37.2	2,405
Literate, < middle school complete	49.4	95.9	89.4	93.2	45.4	37.8	40.0	1,448
Middle school complete	59.8	96.6	94.2	94.5	56.3	42.1	43.0	582
High school complete and above	76.8	95.3	93.8	94.0	70.5	36.3	35.1	956
Religion								
Hindu	47.6	94.7	86.9	91.3	42.6	29.9	32.7	4,318
Muslim	44.5	93.3	91.1	91.6	57.3	59.9	74.8	531
Christian	44.3	97.6	95.6	95.1	56.4	60.5	62.0	71
Buddhist/Neo-Buddhist	41.9	93.3	93.5	88.4	42.2	50.7	51.0	368
Jain	89.6	95.4	97.6	87.7	75.4	2.1	2.1	68
Other	(43.6)	(88.6)	(73.5)	(78.3)	(52.9)	(43.8)	(45.7)	36
Caste/tribe								
Scheduled caste	42.4	94.1	88.4	89.1	42.4	47.3	54.3	728
Scheduled tribe	36.0	94.0	82.3	87.2	33.9	30.9	34.8	552
Other backward class	48.4	95.2	90.5	93.3	44.5	33.7	37.0	1,162
Other	50.6	94.4	87.8	91.4	47.4	32.1	35.2	2,923
Standard of living index								
Low	27.9	93.0	80.3	88.2	26.6	27.2	34.7	1,639
Medium	49.3	94.8	89.8	91.3	44.2	38.2	41.5	2,409
High	70.1	95.8	94.5	94.7	68.5	35.2	36.4	1,176
Total	47.3	94.5	87.9	91.1	44.7	34.4	38.2	5,391

Note: Total includes 25 and 167 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

Buddhist women. The lowest percentage of women in any group who are less than 145 cm tall is 6 percent for Jain women and for women from non-slum areas of Mumbai.

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 and 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 Maharashtra is 20, the same as that for India as a whole. It varies within a range of 19–25 for various groups shown in the table. Chronic energy deficiency is usually indicated by a BMI of less than 18.5. Two-fifths

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, Maharashtra, 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	150.8	11.5	482	18.7	49.8	404
20–24	151.6	9.8	920	18.9	50.5	757
25–29	151.4	13.7	1,055	19.6	45.2	971
30–34	151.9	10.6	921	20.4	38.2	908
35–49	151.1	12.7	1,802	21.4	30.7	1,791
Marital status						
Currently married	151.4	11.7	4,778	20.2	40.0	4,430
Not currently married	151.0	13.5	402	20.5	37.0	400
Residence						
Urban	151.6	11.5	2,141	21.9	26.2	1,999
Rural	151.2	12.1	3,038	19.0	49.3	2,831
Mumbai	152.0	10.0	655	23.0	17.7	620
Slum	151.3	12.8	384	22.0	23.9	357
Non-slum	153.0	6.1	271	24.5	9.4	263
Education						
Illiterate	150.8	13.2	2,301	19.2	48.6	2,153
Literate, < middle school complete	151.3	12.6	1,392	20.4	38.1	1,298
Middle school complete	151.7	10.9	567	20.6	33.8	515
High school complete and above	152.7	8.1	920	22.2	23.5	864
Religion						
Hindu	151.3	11.8	4,152	20.0	42.0	3,883
Muslim	152.7	9.4	506	21.7	27.7	452
Christian	150.7	9.9	68	22.6	28.2	63
Buddhist/Neo-Buddhist	150.0	17.5	360	20.3	35.8	343
Jain	153.7	5.6	59	24.0	12.2	56
Other	(152.1)	(11.2)	36	(20.6)	(42.2)	34
Caste/tribe						
Scheduled caste	150.1	17.4	708	20.2	38.1	660
Scheduled tribe	150.9	10.6	536	18.9	54.8	489
Other backward class	150.9	12.2	1,122	19.9	40.7	1,056
Other	151.9	10.7	2,789	20.6	36.8	2,603
Work status						
Working in family farm/business	151.5	8.9	1,066	19.0	49.2	995
Employed by someone else	150.8	14.6	1,486	19.5	46.0	1,414
Self-employed	151.2	12.3	323	20.5	43.7	312
Not worked in past 12 months	151.7	11.4	2,304	21.2	30.5	2,110
Standard of living index						
Low	150.6	14.4	1,567	18.6	55.2	1,425
Medium	151.3	11.9	2,325	20.0	39.5	2,175
High	152.7	8.3	1,137	22.7	20.6	1,090
Total	151.4	11.9	5,180	20.2	39.7	4,830

Note: Total includes women with missing information on caste/tribe and 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).

(40 percent) of women in Maharashtra 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 below age 25, rural women, illiterate women, scheduled-tribe women, women working on a family farm or in a family business, and women employed by someone else. The standard of living is strongly related to chronic energy deficiency. Women from households with a low standard of living are more than two and half times as likely to have a low BMI as women from households with a high standard of living. Only 9 percent of women from non-slum areas of Mumbai suffer from chronic energy deficiency as against 24 percent from slum areas. Jain, Muslim, and Christian women have a lower prevalence of nutritional deficiency than Hindu or Buddhist/Neo-Buddhist women.

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 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

[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.

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 Maharashtra, 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, 49 percent of women have some degree of anaemia. Thirty-two percent of women are mildly anaemic, 14 percent are moderately anaemic, and 3 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 is highest among scheduled-tribe women (64 percent). The prevalence is slightly higher for younger women (below age 20) than for older women. It is substantially higher for women who are not currently married (58 percent) than for currently married women (48 percent), and higher for rural women (51 percent) than for urban women (45 percent). It is lower in Mumbai (42 percent) than in other parts of Maharashtra, and within Mumbai, it is lower in non-slum areas (37 percent) than in slum areas (46 percent). The prevalence of anaemia decreases steadily with an increase in the standard of living, but the notable decline is observed only at the high standard of living. Similarly, the prevalence decreases steadily with the level of education, but the notable decline is observed only for women who have completed at least a high school education. Prevalence of anaemia among Muslim and Jain women (37 percent) is much lower than that among Hindu women (50 percent). Women employed by someone else (53 percent) and women working on a family farm or in a family business (50 percent) also have slightly higher levels of anaemia than other women.

The prevalence of anaemia is higher for pregnant women (53 percent) than for non-pregnant, breastfeeding women (50 percent) and for non-pregnant, non-breastfeeding women (48 percent). The prevalence of mild anaemia is lower among pregnant women, but the prevalence of

[3]Rates that are not adjusted for altitude and smoking (46.4 percent for any anaemia, 31.1 percent for mild anaemia, 13.5 percent for moderate anaemia, and 1.8 percent for severe anaemia) are slightly lower than the corresponding adjusted rates. The small impact of the adjustment factor is to be expected since, in Maharashtra, the proportion of women who smoke is very small (see Table 2.12), and only 1 of the 218 sample PSUs is at an altitude above 1,000 metres.

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, Maharashtra, 1999

Background characteristic	Percentage of women with any anaemia	Percentage of women with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of women
Age					
15–19	51.7	30.6	17.9	3.2	462
20–24	48.9	30.0	16.3	2.6	882
25–29	48.3	33.0	12.8	2.5	1,022
30–34	47.7	32.3	12.4	3.0	901
35–49	48.1	31.3	13.6	3.2	1,749
Marital status					
Currently married	47.7	31.2	14.0	2.5	4,629
Not currently married	58.2	35.5	14.9	7.8	387
Residence					
Urban	44.8	29.2	14.0	1.6	2,074
Rural	51.2	33.1	14.2	3.9	2,942
Mumbai	42.1	29.7	11.5	0.9	634
Slum	45.5	32.4	11.8	1.2	373
Non-slum	37.4	25.8	11.0	0.5	261
Education					
Illiterate	51.1	33.4	14.1	3.6	2,216
Literate, < middle school complete	50.2	31.8	15.3	3.1	1,364
Middle school complete	49.7	31.9	15.6	2.1	551
High school complete and above	38.9	26.0	11.3	1.5	886
Religion					
Hindu	50.4	32.7	14.4	3.2	4,016
Muslim	37.1	25.2	11.1	0.7	492
Christian	41.4	29.1	9.9	2.4	59
Buddhist/Neo-Buddhist	45.9	28.6	14.0	3.2	358
Jain	37.4	22.0	15.4	0.0	57
Other	(57.3)	(36.2)	(16.9)	(4.1)	34
Caste/tribe					
Scheduled caste	49.7	31.5	15.2	3.0	695
Scheduled tribe	64.2	43.8	16.6	3.9	515
Other backward class	48.6	32.1	14.6	2.0	1,088
Other	45.2	29.0	13.1	3.1	2,695
Work status					
Working in family farm/business	50.0	32.6	13.7	3.7	1,032
Employed by someone else	52.5	33.3	14.7	4.4	1,441
Self-employed	43.2	28.5	12.4	2.2	317
Not worked in past 12 months	46.1	30.3	14.1	1.7	2,226
Standard of living Index					
Low	51.8	33.6	14.0	4.2	1,510
Medium	49.4	32.1	14.8	2.5	2,260
High	42.7	27.9	13.0	1.9	1,098
Pregnancy/breastfeeding status					
Pregnant	52.6	20.2	27.3	5.1	363
Breastfeeding (not pregnant)	50.4	36.2	12.8	1.5	1,050
Not pregnant/not breastfeeding	47.6	31.3	13.1	3.1	3,603

Contd…

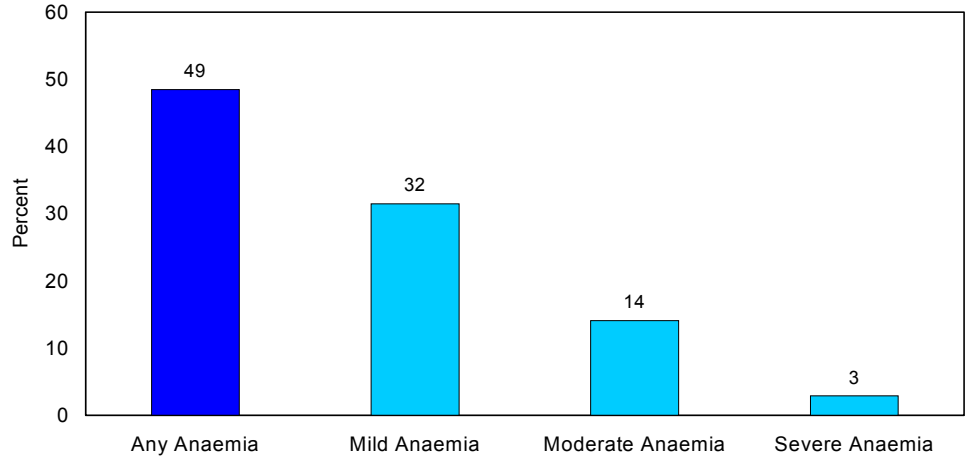
Table 7.4 Anaemia among women (contd.)

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

Background characteristic	Percentage of women with any anaemia	Percentage of women with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of women
Height					
< 145 cm	49.1	33.6	11.9	3.6	592
≥ 145 cm	48.5	31.3	14.4	2.8	4,422
Body mass index					
< 18.5 kg/m^2	53.1	33.2	16.3	3.7	1,953
≥ 18.5 kg/m^2	45.6	30.5	12.7	2.5	3,051
Fruit and vegetable consumption[1]					
Fruits and vegetables	46.7	29.6	15.0	2.2	2,119
Fruits only	45.5	30.5	12.1	2.9	124
Vegetables only	50.1	32.5	13.8	3.8	2,292
Neither	49.7	35.4	12.0	2.4	481
Total	48.5	31.5	14.1	2.9	5,016

Note: The haemoglobin levels are adjusted for altitude of the enumeration area and for smoking when calculating the degree of anaemia. Total includes 22, 148, 2, and 12 women with missing information on caste/tribe, 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, Maharashtra, 1999

moderate to severe anaemia is much higher among pregnant women than among other women. The provision of iron and folic acid supplements to pregnant women is expected to reduce the overall prevalence of anaemia in pregnant women to some extent. Despite the fact that mothers in Maharashtra received IFA supplements for 85 percent of their births in the last three years (see Table 8.6), a higher prevalence of moderate to severe anaemia among pregnant women is a cause for concern.

The prevalence of any anaemia does not vary much by the height of women, but severe anaemia is slightly more common among shorter women. Women with a low body mass index have a higher prevalence of anaemia (53 percent) than other women (46 percent). 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 Maharashtra, differentials in anaemia by fruit and vegetable consumption are surprisingly small. However, women who eat fruits (alone or in addition to green, leafy vegetables) at least once a week have a lower level of anaemia (46–47 percent) than women who do not eat fruits regularly (50 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 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.). 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.[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 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 recommended. Although breastfeeding is nearly universal in Maharashtra, less than one in four children begin breastfeeding within one hour of birth, and less than one in two begin breastfeeding within one day of birth. Two out of every three 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. With the exception of non-slum women in Mumbai, no more one-third of children in any group shown in the table were put to the breast within one hour of birth, and no more than two-thirds started breastfeeding within one day of birth. Urban women are somewhat more likely to start breastfeeding within one hour and one day of birth than rural women (25 and 57 percent, compared with 21 and 42 percent, respectively). In Mumbai, 33 percent of mothers put their child to the breast within one hour of birth and 62 percent started breastfeeding within one day after delivery. There is not much difference between slum and non-slum areas in this respect. More educated women, women from higher standard of living households, Buddhist/Neo-Buddhist women, scheduled-tribe women, and non-working women 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.

The custom of squeezing the first milk from the breast before breastfeeding a child is widely practised in Maharashtra in all groups of women shown in Table 7.5. This custom is particularly common among rural women (73 percent), illiterate women (78 percent), scheduled-

[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, Maharashtra, 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	25.3	56.7	56.1	707
Rural	21.1	41.9	73.0	1,103
Mumbai	32.7	61.9	55.0	208
Slum	31.8	61.6	59.3	152
Non-slum	35.1	62.9	43.2	56
Mother's education				
Illiterate	20.6	38.7	77.6	735
Literate, < middle school complete	21.4	48.6	66.4	465
Middle school complete	25.4	52.8	60.0	260
High school complete and above	27.0	61.5	47.6	351
Religion				
Hindu	23.1	46.4	69.2	1,385
Muslim	17.1	47.2	57.1	263
Christian	(15.9)	(62.4)	(33.3)	27
Buddhist/Neo-Buddhist	27.0	57.0	64.7	107
Caste/tribe				
Scheduled caste	24.6	51.6	71.8	239
Scheduled tribe	31.6	52.7	73.8	215
Other backward class	25.8	55.6	65.0	356
Other	19.5	43.0	63.7	988
Mother's work status				
Working in family farm/business	20.2	41.6	80.9	339
Employed by someone else	18.4	38.7	69.5	398
Self-employed	17.0	42.9	57.1	73
Not worked in past 12 months	25.8	53.7	60.9	999
Standard of living index				
Low	19.0	38.3	76.5	618
Medium	24.2	51.4	64.2	832
High	25.9	54.3	52.0	300
Assistance during delivery				
Health professional[2]	27.0	56.2	56.9	1,076
Dai (TBA)	20.4	41.7	78.8	358
Other	12.9	28.9	81.7	376
Place of delivery				
Public health facility	31.9	66.8	58.0	441
Private health facility	24.3	49.3	54.4	494
Own home	20.6	39.1	75.3	458
Parents' home	13.9	33.6	80.6	388
Total	22.8	47.7	66.4	1,810

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 15 and 13 children belonging to Jain and 'other' religions, respectively, 18 and 12 children delivered in nongovernmental organization or trust hospitals/clinics and 'other' places, respectively, and 11 and 60 children with missing information on caste/tribe and the standard of living index, respectively, who are not shown separately.
TBA: Traditional birth attendant
( ) Based on 25–49 unweighted cases
[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

caste and scheduled-tribe women (72–74 percent), women working on a family farm or in a family business (81 percent), and women from low standard of living households (77 percent). It is much less common among Christian women (33 percent) and women from non-slum areas of Mumbai (43 percent). Women who gave birth with the assistance of a health professional and women who gave birth in a health facility are much less likely to squeeze the first milk from the breast (54–58 percent) than women who delivered without the assistance of a health professional or women who delivered at home (75–82 percent).

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 before four months of age 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

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, Maharashtra, 1999

	Breastfeeding status						
			Breastfeeding and:				
Age in months	Not breastfeeding	Exclusively breastfeeding	Receiving plain water only	Receiving supplements	Don't know if fed supplements	Total percent	Number of living children
< 2	0.0	55.9	36.6	7.4	0.0	100.0	87
2–3	0.0	20.6	70.0	9.4	0.0	100.0	85
4–5	0.7	7.1	54.0	38.3	0.0	100.0	101
6–7	1.0	1.1	45.8	52.1	0.0	100.0	129
8–9	1.1	4.6	30.7	63.6	0.0	100.0	93
10–11	8.7	0.0	18.6	72.7	0.0	100.0	97
12–13	13.2	0.0	5.7	81.1	0.0	100.0	90
14–15	8.8	1.8	5.3	82.5	1.7	100.0	86
16–17	20.8	0.0	1.8	77.3	0.0	100.0	71
18–19	25.9	0.0	2.2	71.9	0.0	100.0	130
20–21	32.3	0.0	1.2	66.5	0.0	100.0	111
22–23	40.7	0.0	1.4	57.9	0.0	100.0	102
24–25	55.2	0.0	0.4	42.8	1.6	100.0	89
26–27	63.2	0.0	0.0	36.8	0.0	100.0	82
28–29	66.7	0.0	2.2	31.1	0.0	100.0	68
30–31	64.5	0.0	0.0	35.5	0.0	100.0	109
32–33	67.4	0.0	0.0	32.6	0.0	100.0	110
34–35	81.2	0.0	0.0	18.8	0.0	100.0	90
< 4 months	0.0	38.5	53.1	8.4	0.0	100.0	172
4–6 months	1.2	5.1	52.4	41.3	0.0	100.0	168
7–9 months	0.6	2.8	34.9	61.7	0.0	100.0	154

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.

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, Maharashtra, 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	0.8	2.8	3.8	1.7	1.7	1.7	4.4	87
2–3	0.8	8.6	0.4	0.0	0.0	0.0	11.4	85
4–5	3.4	28.8	12.6	0.3	2.1	5.9	19.4	101
6–7	3.9	26.0	24.7	1.4	12.4	25.5	16.7	127
8–9	2.6	44.0	27.2	5.2	15.4	39.0	14.0	92
10–11	3.0	46.4	40.6	5.7	21.1	63.3	15.3	88
12–13	0.0	49.3	55.4	16.8	33.4	82.3	10.5	78
14–15	2.3	48.0	54.0	21.1	45.0	81.2	11.4	79
16–17	0.0	59.2	62.1	16.7	52.5	83.9	12.3	57
18–23	3.0	57.2	56.5	27.6	45.4	87.8	9.7	232
24–29	1.7	55.8	63.5	38.7	44.3	91.6	5.6	93
30–35	0.0	49.6	66.0	53.6	49.6	93.9	3.7	92
< 4 months	0.8	5.7	2.1	0.9	0.9	0.9	7.9	172
4–5 months	3.4	28.8	12.6	0.3	2.1	5.9	19.4	101
6–9 months	3.3	33.5	25.8	3.0	13.6	31.2	15.6	219
NON-BREASTFEEDING CHILDREN								
< 14	(11.9)	(89.3)	(64.3)	(18.9)	(64.9)	(83.9)	(57.8)	23
14–17	(6.5)	(94.0)	(78.9)	(45.0)	(60.5)	(86.4)	(41.7)	22
18–23	4.4	76.5	68.6	42.5	56.6	90.9	9.8	111
24–29	1.1	65.8	77.3	48.8	56.2	93.0	15.7	146
30–35	2.8	72.3	73.6	56.9	61.8	94.7	11.4	218
ALL CHILDREN								
< 2	0.8	2.8	3.8	1.7	1.7	1.7	4.4	87
2–3	0.8	8.6	0.4	0.0	0.0	0.0	11.4	85
4–5	3.4	29.3	12.9	0.3	2.1	6.2	19.9	101
6–7	3.8	26.7	25.5	2.4	13.3	26.3	16.5	129
8–9	3.2	44.2	27.3	5.1	15.2	39.3	14.9	93
10–11	4.6	49.2	39.6	6.6	24.4	64.8	18.9	97
12–13	0.4	55.6	59.8	16.4	38.9	83.1	16.9	90
14–15	3.8	51.0	57.6	22.0	47.3	82.4	15.3	86
16–17	0.0	67.7	63.9	24.0	53.0	83.5	16.9	71
18–23	3.4	63.4	60.4	32.4	49.0	88.8	9.8	344
24–29	1.3	61.9	71.9	44.9	51.6	92.4	11.8	239
30–35	2.0	65.6	71.3	55.9	58.2	94.5	9.1	309
< 4 months	0.8	5.7	2.1	0.9	0.9	0.9	7.9	172
4–5 months	3.4	29.3	12.9	0.3	2.1	6.2	19.9	101
6–9 months	3.6	34.1	26.2	3.5	14.1	31.7	15.8	222

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

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 Maharashtra, 39 percent of children under four months of age are exclusively breastfed (much lower than the national level of 55 percent), 53 percent receive breast milk plus water, and 8 percent receive supplements along with breast milk (Table 7.6). The percentage of infants exclusively breastfed drops off sharply after three months to 7 percent at age 4–5 months.

Children in Maharashtra are rarely breastfed exclusively after nine months of age. The proportion of children receiving supplements along with breast milk increases from 7 percent in the first month of life to 83 percent for children age 14–15 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 generally continues for a long period. Eighty-seven percent of children are still being breastfed at 12–13 months of age, as are 59 percent of children age 22–23 months. For the majority of children in Maharashtra, breastfeeding usually stops at about 24–25 months of age, but 19 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. Among non-breastfeeding children, about two-thirds or more children in each age group were given these other types of milk the day or night before the interview. Among breastfeeding children age 8–35 months, 44–59 percent received non-powdered milk in addition to breast milk. Other liquids, such as juice or tea, are given somewhat less often than milk during the first year of life and somewhat more often during the second and third years of life. Among all children, the consumption of green, leafy vegetables generally increases with age, from 2 percent at age 6–7 months to 56 percent at age 30–35 months. The consumption of fruits also increases with age, from 2 percent or less below six months to 58 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 Maharashtra the introduction of complementary food is delayed for a substantial proportion of children. Only 26 percent of breastfeeding children age 6–7 months consume solid or mushy foods. This proportion rises to more than 80 percent at age 12–23 months and further rises to more than 90 percent at age 24–35 months. Only 31 percent of breastfeeding children age 6–9 months receive solid or mushy food, as recommended (as compared to 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 Maharashtra. In almost every age group, less than one-sixth 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 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. 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 Maharashtra is about two years (23.8 months). Supplementation begins relatively early, however. The median length of

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, Maharashtra, 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	24.5	1.1	5.8	949
Female	23.2	0.9	5.9	861
Residence				
Urban	23.0	1.2	5.3	707
Rural	24.9	0.9	6.2	1,103
Median duration	23.8	1.0	5.9	1,810
Mean duration (months)[1]	24.1	2.4	7.3	1,810
Prevalence/incidence mean	23.8	1.6	6.9	1,810

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

exclusive breastfeeding is one month, and the median length of exclusive breastfeeding or breastfeeding with water is about six months.

The mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding with water only are 24.1 months, 2.4 months, and 7.3 months, respectively. The mean durations are 1.4 months longer than the median durations for the last two measures, but are about the same for the overall duration of breastfeeding.

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 slightly lower than the mean calculated in the conventional manner.

The median duration of breastfeeding is slightly shorter (by 1.3 months) for girls than for boys. This pattern is often observed in societies where son preference is strong because the parents may stop breastfeeding a girl at a younger age to increase their chances of having another child earlier (with the hope that the next child will be a boy). The median length of any breastfeeding is 1.9 months longer in rural areas than in urban areas. But urban children are exclusively breastfed for a longer median period (1.2 months) than rural children (0.9 months).

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 Maharashtra, NFHS-2 did not measure 6 percent of children under age three (see Table B.3 in Appendix B), a much lower nonresponse rate than the

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, Maharashtra, 1999

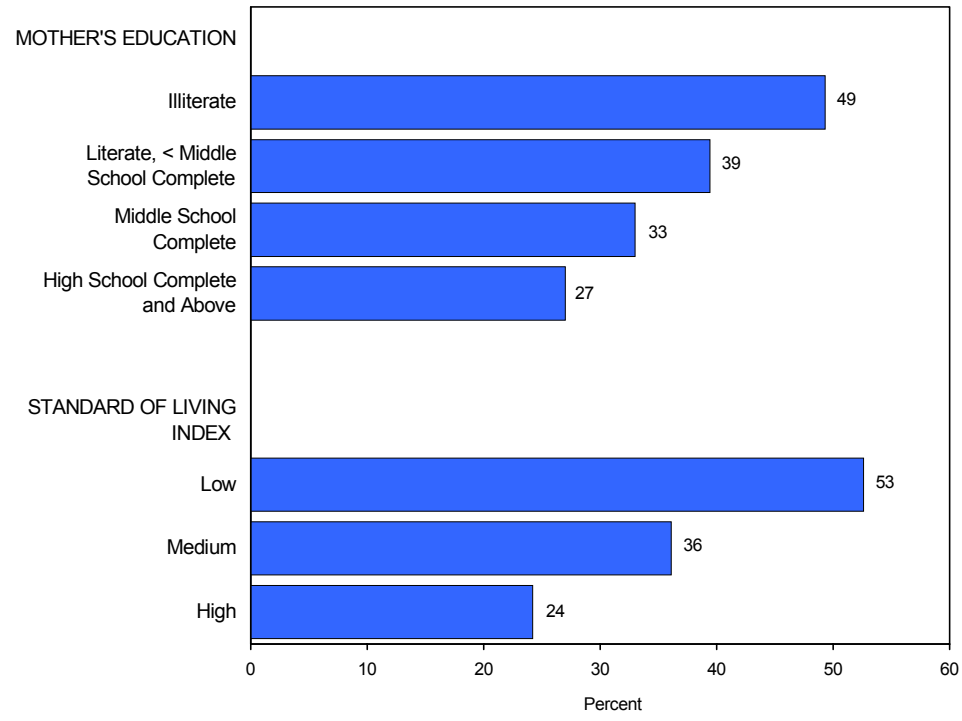
Demographic characteristic	Weight-for-age		Height-for-age		Weight-for-height		Number of children
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	
Age of child							
< 6 months	1.2	6.2	1.9	11.4	1.9	8.9	230
6–11 months	10.1	38.0	3.5	25.8	2.2	14.3	295
12–23 months	22.8	63.7	18.5	51.6	4.6	30.6	548
24–35 months	24.0	61.3	21.4	48.7	0.7	20.7	488
Sex of child							
Male	16.8	49.2	14.1	38.8	2.6	20.3	823
Female	18.4	50.0	14.2	41.0	2.5	22.3	739
Birth order							
1	15.3	46.6	14.3	36.1	3.2	17.1	503
2–3	16.4	48.6	12.9	39.2	2.3	22.1	780
4–5	25.5	59.2	19.0	50.0	2.5	25.1	214
6+	23.3	52.5	11.3	44.2	0.5	29.6	65
Previous birth interval[2]							
First birth	15.3	46.5	14.3	36.0	3.2	17.0	505
< 24 months	19.6	52.5	16.0	41.6	2.7	23.2	295
24–47 months	17.3	51.1	12.5	42.7	1.8	21.9	613
48+ months	22.5	48.3	16.5	38.2	3.2	28.5	149
Total	17.6	49.6	14.1	39.9	2.5	21.2	1,562

Note: Each index is expressed in standard deviation units (SD) 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.

national 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. Fifty percent of children under three years of age are underweight and 40 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—18 percent according to weight-for-age and 14 percent according to height-for-age. In addition, wasting is quite evident in Maharashtra, affecting 21 percent of children under three years of age, which is higher than the national estimate of 16 percent. All indicators show marginal improvements in the nutritional status of children in Maharashtra over time. The proportion of children under three years of age who are underweight, stunted, and wasted declined from 51, 41, and 23 percent in NFHS-1 to 50, 40, and 21 percent in NFHS-2, respectively. The corresponding declines in severely underweight, severely stunted, and severely wasted children are from 21, 19, and 5 percent in NFHS-1 to 18, 14, and 3 percent in NFHS-2, respectively.

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



NFHS-2, Maharashtra, 1999

The proportion of children who are undernourished increases steadily with the child's age through age 12–23 months, where it peaks at 31 percent for wasting and 64 and 52 percent for underweight and stunting, respectively. Even during the first six months of life, when most babies are breastfed, 6–11 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-quarter of children are severely underweight and more than one-fifth are severely stunted.

In Maharashtra, girls are slightly more likely to be underweight (50 percent), stunted (41 percent), and wasted (22 percent) than boys (49, 39, and 20 percent, respectively). Undernutrition generally increases with increasing birth order for all three measures. Young children in families with four or more children are nutritionally the most disadvantaged. First births have lower than average levels of undernutrition on all three measures. However, there is no consistent pattern of nutritional status by the length of the birth interval.

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, 44 percent of children are underweight and 33 percent are stunted. In Mumbai, differentials between slum and non-slum areas are quite sharp for underweight children (43 and 24 percent, respectively) and for stunted children (31 and 17 percent, respectively). 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 underweight, stunted, and wasted declines substantially. Hindu children

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, Maharashtra, 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	10.9	44.1	11.1	33.3	1.6	15.7	615
Rural	22.0	53.2	16.1	44.2	3.2	24.8	946
Mumbai	10.6	38.0	10.1	27.1	1.9	13.9	183
Slum	12.6	42.9	12.3	30.8	1.8	14.8	135
Non-slum	5.1	24.0	3.7	16.8	2.1	11.7	48
Mother's education							
Illiterate	25.0	57.3	18.8	49.3	3.4	24.4	611
Literate, < middle school complete	16.3	53.4	15.8	39.4	1.7	23.4	415
Middle school complete	14.5	40.3	11.5	33.0	2.3	13.9	229
High school complete and above	7.0	36.1	4.7	27.0	2.3	17.4	308
Religion							
Hindu	19.4	51.4	15.4	41.8	3.1	22.8	1,194
Muslim	13.7	45.2	11.2	35.7	1.2	17.8	225
Christian	(16.4)	(34.1)	(12.2)	(34.7)	(1.3)	(20.3)	26
Buddhist/Neo-Buddhist	7.2	47.4	8.8	32.8	0.4	12.5	95
Caste/tribe							
Scheduled caste	15.1	51.4	15.5	43.7	0.8	15.6	210
Scheduled tribe	35.4	65.2	19.0	57.1	8.1	31.0	172
Other backward class	13.9	48.4	11.0	40.3	2.8	20.9	319
Other	15.7	46.3	14.0	35.0	1.6	20.7	849
Mother's work status							
Working in family farm/business	18.6	54.2	16.0	44.7	3.3	18.8	301
Employed by someone else	27.2	59.0	22.4	50.7	3.3	26.7	343
Self-employed	13.7	52.1	8.9	36.4	0.0	27.7	63
Not worked in past 12 months	13.6	44.0	10.6	34.1	2.2	19.4	855
Mother's height							
< 145 cm	33.4	66.0	34.0	69.1	1.0	19.8	176
≥ 145 cm	15.6	47.6	11.6	36.1	2.7	21.4	1,384
Mother's body mass index							
< 18.5 kg/m^2	23.9	60.4	16.1	45.7	3.3	28.0	728
≥ 18.5 kg/m^2	12.1	40.2	12.4	34.7	1.9	15.3	832
Standard of living index							
Low	29.1	60.4	21.4	52.6	4.6	28.2	516
Medium	14.1	49.5	11.8	36.1	1.9	19.0	748
High	4.2	27.5	5.8	24.2	0.8	14.7	253
Total	17.6	49.6	14.1	39.9	2.5	21.2	1,562

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 11 and 12 children whose mothers belong to Jain and 'other' religions, respectively, and 11, 2, 2, and 45 children with missing information on caste/tribe, mother's height, mother's body mass index, 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

are more likely than other children to be underweight, stunted, and wasted. Children belonging to scheduled tribes have substantially 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 families.

The nutritional status of children in strongly related to maternal nutritional status. Undernutrition is much more common among children of mothers with a height of less than 145 cm or among children of mothers whose body mass index is below 18.5 kg/m^2. This is true for all three measures of undernutriton except for wasting by the mother's height. 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 children from households with a high standard of living.

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).

In Maharashtra, haemoglobin levels were tested for 87 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, more than three-quarters (76 percent) of these children have some level of anaemia, including 24 percent who are mildly anaemic (10.0–10.9 g/dl), 47 percent who are moderately anaemic (7.0–9.9 g/dl), and 4 percent who are severely anaemic (less than 7.0 g/dl).[5] Notably, a much larger proportion of children than women are anaemic, and the difference is particularly pronounced for moderate 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, children of birth order four or higher, rural children, children in Mumbai slums, children of mothers with less than a middle school education, children from scheduled castes and scheduled tribes, children of mothers working on a family farm or in a family business, children of mothers employed by someone else, and children from low standard of living households. The prevalence of anaemia is the lowest among children whose mothers have received at least a high school education (65 percent) and among children from high standard of living households (67 percent). The prevalence does not vary much by religion. As expected, there is a positive relationship between the anaemia status of mothers and the prevalence of anaemia among children. Despite these differentials, anaemia among children is very widespread in Maharashtra. More than two-thirds of children in almost every group shown in the table are anaemic.

[5]Rates that are not adjusted for altitude (75.9 percent for any anaemia, 25.6 percent for mild anaemia, 46.3 percent for moderate anaemia, and 4.0 percent for severe anaemia) differ only slightly from the corresponding adjusted rates.

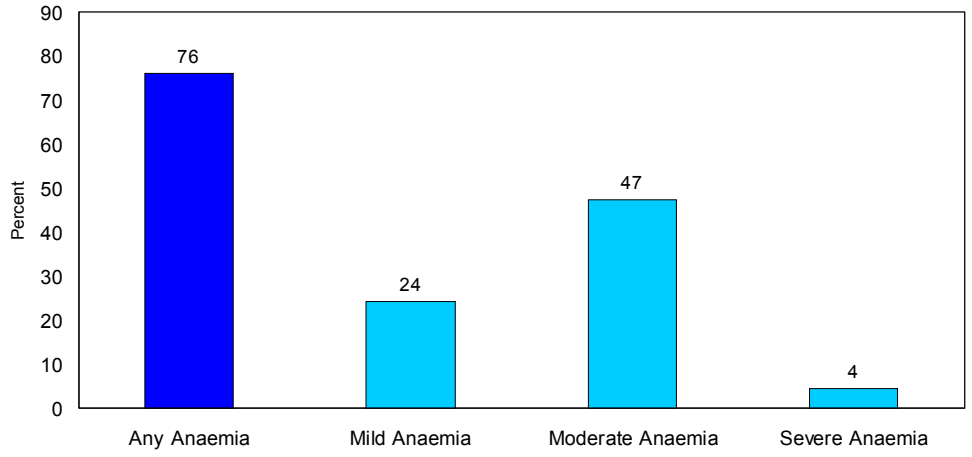
Table 7.11 Anaemia among children

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

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	74.0	29.8	38.4	5.8	262
12–23 months	79.6	22.5	52.6	4.5	518
24–35 months	73.1	22.8	46.7	3.6	478
Sex of child					
Male	78.7	23.6	50.5	4.6	665
Female	72.9	24.6	44.0	4.3	593
Birth order					
1	71.5	23.8	42.1	5.6	386
2–3	76.1	22.6	49.7	3.7	645
4–5	82.6	29.3	49.3	4.0	181
6+	(85.3)	(27.0)	(51.8)	(6.4)	46
Residence					
Urban	72.8	24.9	42.8	5.1	489
Rural	78.0	23.6	50.4	4.0	769
Mumbai	76.2	29.1	43.6	3.5	148
Slum	78.2	27.8	46.2	4.2	113
Non-slum	70.0	33.5	35.4	1.1	35
Mother's education					
Illiterate	79.7	25.7	49.5	4.5	499
Literate, < middle school complete	79.3	23.2	50.1	5.9	339
Middle school complete	73.6	23.6	45.8	4.2	184
High school complete and above	65.1	22.5	40.4	2.2	236
Religion					
Hindu	76.4	23.9	48.4	4.1	968
Muslim	76.2	24.8	46.1	5.4	173
Buddhist/Neo-Buddhist	73.3	29.4	41.5	2.5	81
Caste/tribe					
Scheduled caste	81.4	26.3	48.6	6.5	173
Scheduled tribe	83.2	25.2	52.7	5.3	154
Other backward class	70.9	22.2	46.4	2.4	257
Other	75.1	23.7	46.8	4.6	664
Mother's work status					
Working in family farm/business	80.7	27.1	51.2	2.4	242
Employed by someone else	80.2	23.7	49.2	7.2	289
Self-employed	75.7	18.0	57.2	0.6	58
Not worked in past 12 months	72.5	23.7	44.4	4.3	670
Standard of living index					
Low	81.5	22.3	53.4	5.7	423
Medium	74.3	25.0	44.5	4.8	607
High	67.4	23.7	42.4	1.2	197
Mother's anaemia status					
Not anaemic	71.3	24.6	43.2	3.4	612
Mildly anaemic	79.3	23.3	50.7	5.2	423
Moderately anaemic	82.8	24.4	54.8	3.6	195
Total	76.0	24.1	47.4	4.4	1,258

Note: Haemoglobin levels are adjusted for altitude when calculating the degree of anaemia. Total includes 18, 8, and 10 children belonging to Christian, Jain and 'other' religions, respectively, 26 children whose mothers are severely anaemic, and 10, 31, and 3 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, Maharashtra, 1999

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 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 Maharashtra, 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

Table 7.12 Iodization of salt

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

Background characteristic	Not iodized	7 ppm	15 ppm	30 ppm	Missing	Total percent	Number of households
Type of place of residence							
Large city	24.4	6.1	4.9	63.0	1.6	100.0	1,184
Small city	19.7	6.3	9.7	63.5	0.7	100.0	838
Town	24.6	1.3	7.1	65.9	1.1	100.0	510
Rural area	39.1	8.2	14.1	37.8	0.8	100.0	3,298
Mumbai							
Slum	35.6	3.4	4.6	54.3	2.1	100.0	468
Non-slum	11.0	3.3	2.9	81.4	1.3	100.0	395
Religion of household head							
Hindu	32.6	7.2	11.3	48.1	0.9	100.0	4,644
Muslim	32.2	5.1	9.0	51.8	1.9	100.0	570
Christian	28.1	2.7	3.5	65.2	0.5	100.0	77
Buddhist/Neo-Buddhist	30.1	8.0	12.9	48.0	1.1	100.0	416
Jain	10.4	4.0	9.8	75.8	0.0	100.0	79
Other	(40.0)	(5.0)	(7.4)	(47.5)	(0.0)	100.0	44
Caste/tribe of household head							
Scheduled caste	29.6	7.6	11.3	50.0	1.4	100.0	781
Scheduled tribe	47.7	7.0	14.2	30.1	1.0	100.0	595
Other backward class	34.3	8.0	9.9	47.4	0.5	100.0	1,319
Other	28.6	6.4	10.7	53.3	1.1	100.0	3,108
Standard of living index							
Low	47.3	7.5	14.6	29.1	1.5	100.0	1,884
Medium	31.3	8.0	11.1	48.8	0.8	100.0	2,560
High	10.8	3.7	6.1	78.8	0.6	100.0	1,206
Total	32.0	6.9	11.0	49.1	1.0	100.0	5,830

Note: Total includes 27 and 180 households with missing information on caste/tribe and the standard of living index, respectively, which are not shown separately.
ppm: Parts per million
( ) Based on 25–49 unweighted cases

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, 60 percent of the households in Maharashtra use cooking salt that is iodized at the recommended level of 15 ppm or more, which is higher than the average of 49 percent for India as a whole. This level is low in light of the government regulations on salt iodization that were in effect at the time of the survey. Almost one-third of households (32 percent) use salt that is not iodized at all and 7 percent use salt that is inadequately iodized (less than 15 ppm). Differentials in salt iodization by

background characteristics are pronounced. More than two-thirds (68–73 percent) of households in cities and towns in Maharashtra use salt with 15 ppm or more of iodine, compared with 52 percent of households in rural areas. Households with Jain heads are much more likely (86 percent) to use adequately iodized salt than other households (55–69 percent). The use of iodized salt is lower in households headed by persons from scheduled tribes than other households. The widest differentials are observed by the standard of living index. Eighty-five percent of households with a high standard of living use adequately iodized salt, compared with only 44 percent of households with a low standard of living. Only half the households in rural areas of Maharashtra use adequately iodized salt while nearly three-quarters of households in small cities and towns use adequately iodized salt. In Mumbai, 59 percent of households in slum areas use adequately iodized salt, compared with 84 percent of households in non-slum areas.