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 also 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 the 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 age 15–49 how often they consume various types of food (daily, weekly, occasionally, or never). Women consume vegetables (other than green, leafy vegetables) most often (Table 7.1). More than one-half of the women eat these vegetables every day and 86 percent of women eat these vegetables at least once a week. Green, leafy vegetables, as well as pulses and beans, are also an important part of the diet. Forty-one percent of women eat green, leafy vegetables every day and 43 percent eat pulses or beans every day. Milk or curd is not an important part of the diet for the majority of women. Only one-third of women (32 percent) consume milk or curd at least once a week and half consume milk or curd only occasionally. Seventeen percent never consume milk or curd. Fruits are eaten daily by only 5 percent of women and less than one-fourth of women eat fruits at least once a week. Nearly half of women in Madhya Pradesh never eat chicken, meat, or fish (Table 7.1), and the majority of those who do eat chicken, meat, or fish, do so only occasionally. Very few women (1 percent) eat chicken, meat, or fish every day. Eggs are consumed about as often as chicken, meat, or fish.

Table 7.2 shows that there are substantial differentials in food consumption patterns by selected background characteristics. Age does not play an important role in women's consumption patterns. Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly nutritious foods such as fruits and milk or curd. Illiterate women have poorer and less varied diets than literate women, and their diet is particularly deficient in the consumption of fruits and eggs. Hindus are less likely than Muslims to eat eggs, chicken, meat, or fish at least once a week. Only 10 percent of Hindus eat eggs or chicken, meat, or fish at least weekly. Most Jain women never eat chicken, meat, fish, or eggs, but

Table 7.1 Women's food consumption

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

| Type of food | Frequency of consumption | | | | Total percent |
	Daily	Weekly	Occasionally	Never	
Milk or curd	20.3	12.1	50.2	17.4	100.0
Pulses or beans	43.0	36.9	19.5	0.6	100.0
Green, leafy vegetables	40.9	40.1	18.7	0.3	100.0
Other vegetables	53.0	33.1	13.6	0.4	100.0
Fruits	5.0	17.6	71.7	5.6	100.0
Eggs	0.9	10.8	36.8	51.4	100.0
Chicken, meat, or fish	0.5	10.7	40.2	48.6	100.0

they are more likely than women in any other religious group to consume milk or curd, pulses or beans, and fruits.

There is also substantial regional variation in the diet of women. There is no region where women consistently consume more of all the types of food. For example, women in the Northern Region are more likely than women in other regions to consume milk or curd and pulses or beans, but are less likely than women in most other regions to consume eggs and chicken, meat, or fish. Women from the South Western Region are most likely to eat chicken, meat, or fish and women from the Chattisgarh Region are most likely to eat eggs, at least once a week. Women from scheduled castes, scheduled tribes, and other backward classes have a relatively poor diet, compared with the diet of other women. Women from scheduled tribes have a diet particularly deficient in fruits and 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, green leafy vegetables, and milk or curd on a regular basis. Notably, however, in Madhya Pradesh, there is almost no variation in the consumption of chicken, meat, or fish by standard of living and women's education. The consumption of eggs is twice as common among women who have completed at least high school as among illiterate women.

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 Madhya Pradesh of 152 cm. The mean height varies only slightly (between 151 and 153 cm) for women in different population

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, Madhya Pradesh, 1998–99

	Type of food							
Background characteristic	Milk or curd	Pulses or beans	Green, leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat, or fish	Number of women
Age								
15–24	31.1	80.0	80.1	85.9	21.4	13.0	12.0	2,191
25–34	33.9	78.9	80.5	85.9	23.4	11.6	11.4	2,544
35–49	32.3	80.9	82.3	86.4	23.1	10.7	10.3	2,206
Residence								
Urban	41.1	87.1	87.1	90.2	36.1	21.0	16.5	1,756
Rural	29.6	77.5	78.9	84.7	18.1	8.6	9.4	5,185
Region								
Chattisgarh	23.2	84.0	90.5	88.2	24.1	18.0	15.3	1,779
Vindhya	30.0	74.1	65.4	94.5	16.7	9.1	10.8	1,030
Central	48.2	82.1	80.8	82.5	37.8	13.0	9.7	667
Malwa Plateau	29.2	71.0	76.7	77.2	20.8	5.6	5.1	1,155
South Central	33.2	77.5	86.5	89.1	25.1	13.9	13.6	841
South Western	25.4	79.7	66.3	75.6	15.5	11.0	18.9	620
Northern	51.4	91.2	90.8	91.0	20.3	7.5	4.9	848
Education								
Illiterate	26.2	76.3	78.8	84.7	15.9	9.8	10.9	4,753
Literate, < middle school complete	37.6	84.3	81.7	87.3	26.6	14.4	12.1	1,133
Middle school complete	46.1	89.3	88.7	91.0	35.2	12.2	11.3	398
High school complete and above	61.2	93.0	90.3	90.5	57.1	20.5	11.5	656
Religion								
Hindu	32.3	79.3	80.6	86.3	21.8	10.1	10.0	6,396
Muslim	33.4	86.9	83.6	83.8	29.8	37.8	33.2	372
Jain	54.3	88.9	84.3	76.2	50.0	2.6	2.6	70
Other	26.0	86.1	87.7	88.4	32.6	23.4	15.1	103
Caste/tribe								
Scheduled caste	27.8	76.4	83.0	86.4	17.4	16.2	13.4	1,050
Scheduled tribe	15.7	77.2	75.7	83.1	16.1	10.3	12.9	1,571
Other backward class	33.8	78.6	82.1	86.7	22.4	10.5	10.2	2,863
Other	51.4	88.1	83.0	88.0	34.2	12.7	9.8	1,452
Standard of living index								
Low	18.9	71.7	76.4	83.3	14.4	10.1	11.2	2,149
Medium	32.4	81.0	81.5	86.3	19.0	11.3	10.9	3,491
High	55.2	90.7	86.8	90.2	46.1	15.6	12.0	1,283
Total	32.5	79.9	80.9	86.1	22.7	11.7	11.2	6,941

Note: Total includes 1, 4, and 18 women with missing information on education, caste/tribe, and the standard of living index, respectively, who are not shown separately.

groups, as shown in Table 7.3. Eleven percent of women are under 145 cm in height. Short stature is strongly related to poverty. One in every eight women living in households with a low standard of living is below 145 cm in height, compared with 1 in every 15 women living in households with a high standard of living. Women in the Malwa Plateau Region, women who have completed at least middle school, women who do not belong to the scheduled tribes, scheduled castes, and other backward classes, and self-employed women are also less likely than most other women to be less than 145 cm in height. Women belonging to 'other' religions (15 percent), the scheduled castes (14 percent), and households with a low standard of living (14 percent), as well as women living in the Chattisgarh Region (13 percent) are slightly more likely

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, Madhya Pradesh, 1998–99

	Height			Weight-for-height[1]		
Background characteristic	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	151.1	14.0	847	19.5	36.6	761
20–24	151.8	8.9	1,243	19.1	46.1	1,021
25–29	152.0	10.6	1,344	19.4	42.5	1,191
30–34	152.0	10.3	1,137	20.0	37.0	1,076
35–49	151.5	11.1	2,122	20.5	33.2	2,079
Marital status						
Currently married	151.7	10.8	6,341	19.8	37.9	5,778
Not currently married	151.3	12.4	352	19.5	43.3	350
Residence						
Urban	151.8	10.7	1,692	21.1	28.2	1,589
Rural	151.7	10.9	5,001	19.4	41.8	4,538
Region						
Chattisgarh	151.3	13.0	1,718	19.2	48.1	1,605
Vindhya	151.1	11.4	992	20.1	25.0	905
Central	152.2	9.6	643	20.5	30.5	578
Malwa Plateau	152.5	8.9	1,114	20.2	36.3	1,019
South Central	151.8	10.1	810	19.3	47.1	738
South Western	151.6	10.5	599	20.0	36.9	536
Northern	151.7	10.5	817	19.9	33.8	746
Education						
Illiterate	151.4	11.6	4,575	19.4	41.6	4,170
Literate, < middle school complete	151.7	10.6	1,102	20.0	37.7	1,001
Middle school complete	152.7	7.1	380	20.4	36.1	357
High school complete and above	153.0	7.9	635	22.2	17.0	598
Religion						
Hindu	151.7	10.8	6,174	19.7	38.6	5,654
Muslim	152.3	9.3	350	20.6	32.9	312
Jain	152.8	12.4	71	23.3	15.3	68
Other	151.5	15.4	98	19.3	49.0	94
Caste/tribe						
Scheduled caste	151.1	13.7	1,008	19.4	39.9	917
Scheduled tribe	151.3	10.9	1,510	18.8	49.2	1,353
Other backward class	151.5	11.4	2,769	19.8	37.4	2,540
Other	152.9	7.8	1,403	21.1	27.4	1,315
Work status						
Working in family farm/business	151.7	10.0	1,753	19.4	40.5	1,609
Employed by someone else	151.4	12.4	1,841	19.3	43.2	1,692
Self-employed	152.0	8.3	238	20.8	29.9	222
Not worked in the past 12 months	151.9	10.6	2,861	20.3	34.4	2,604
Standard of living index						
Low	151.1	12.9	2,074	19.0	45.7	1,860
Medium	151.5	11.1	3,368	19.6	39.4	3,097
High	153.2	6.8	1,234	21.6	22.9	1,156
Total	151.7	10.8	6,693	19.8	38.2	6,128

Note: Total includes a small number of women with missing information on education, caste/tribe, work status, and the standard of living index, who are not shown separately.
[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).

than most other women to be less than 145 cm in height. The relatively high proportion of women with a height less than 145 cm among women age 15–19 is probably because some women in this age group are still putting on height.

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 Madhya Pradesh is 19.8. Chronic energy deficiency is usually indicated by a BMI of less than 18.5. More than one-third (38 percent) of women have a BMI below 18.5, indicating a high prevalence of nutritional deficiency. The BMI and chronic energy deficiency estimates for Madhya Pradesh are similar to those for India as a whole. However, there are only five other states in India in which women have higher levels of energy deficiency than in Madhya Pradesh. In Madhya Pradesh, 42 percent of women in rural areas and 28 percent in urban areas have a BMI below 18.5. Nutritional problems are particularly serious for women age 20–29, women living in the Chattisgarh and South Central Regions, women of 'other' religions, and women from the scheduled tribes. Almost one out of every two women in these groups has a chronic energy deficiency. Chronic energy deficiency varies strongly with the household standard of living and women's education. Women from households with a low standard of living are twice as likely to have a low BMI as are women from households with a high standard of living. Women who are illiterate are about two and one-half times as likely to have a low BMI as are women who have completed at least high school. Jain women (15 percent) and women who have completed at least high school (17 percent), however, are less likely than all other women to have a low BMI. Nutritional deficiency is more common among employed women, other than self-employed women, than among women who have not worked in the 12 months preceding the survey.

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 may also result 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 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, 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. Three levels of severity of anaemia are distinguished: mild anaemia (10.0–10.9 grams per decilitre (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 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 Madhya Pradesh, haemoglobin levels were tested for 95 percent of women (see Table B.3 in Appendix B). Overall, 54 percent of women in Madhya Pradesh have some degree of anaemia[3] slightly higher than the average for the country as a whole (52 percent). Thirty-eight percent of women are mildly anaemic, 16 percent are moderately anaemic, and 1 percent are severely anaemic. There are some differences in the prevalence of anaemia by background

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[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.

[3]Anaemia rates that are not adjusted for altitude and smoking are almost the same as the corresponding adjusted rates (with at most a 0.2 decimal point difference in any rate). This is to be expected since, in Madhya Pradesh, only 1 percent of women smoke (see Table 2.12) and almost all of the sample PSUs (232 of the 233 PSUs) are at an altitude below 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, Madhya Pradesh, 1998–99

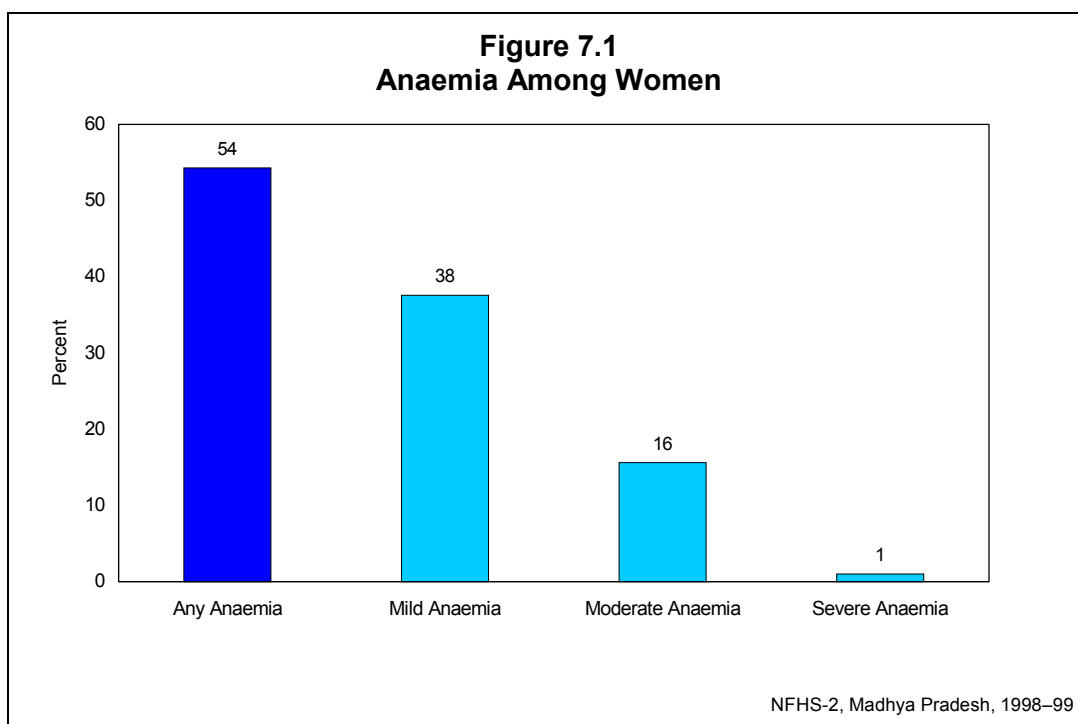| Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age					
15–19	54.9	36.4	17.5	1.0	842
20–24	56.6	37.0	18.2	1.4	1,212
25–29	55.9	39.1	16.1	0.7	1,326
30–34	52.5	36.5	15.2	0.8	1,116
35–49	52.5	38.2	13.3	1.1	2,086
Marital status					
Currently married	54.2	37.6	15.6	1.1	6,238
Not currently married	55.8	38.8	16.9	0.2	344
Residence					
Urban	46.2	33.7	11.5	1.0	1,665
Rural	57.0	39.0	17.0	1.0	4,917
Region					
Chattisgarh	68.7	46.1	21.0	1.5	1,687
Vindhya	57.1	43.2	13.0	0.9	977
Central	42.9	30.2	12.0	0.8	633
Malwa Plateau	38.2	26.7	11.5	0.0	1,095
South Central	59.5	39.9	18.5	1.0	798
South Western	44.8	30.5	13.1	1.3	588
Northern	53.0	36.7	14.9	1.4	804
Education					
Illiterate	56.6	38.8	16.8	1.1	4,488
Literate, < middle school complete	52.2	35.8	15.4	1.0	1,095
Middle school complete	50.2	38.4	10.2	1.5	381
High school complete and above	43.4	31.9	11.2	0.3	617
Religion					
Hindu	54.5	37.9	15.6	1.0	6,073
Muslim	46.6	29.7	15.2	1.7	345
Jain	42.2	33.8	8.4	0.0	69
Other	78.5	50.2	27.3	1.0	95
Caste/tribe					
Scheduled caste	50.5	37.9	11.4	1.2	990
Scheduled tribe	70.3	46.5	22.4	1.3	1,479
Other backward class	52.2	36.8	14.5	0.9	2,730
Other	44.0	29.5	13.7	0.7	1,379
Work status					
Working in family farm/business	59.1	41.3	16.6	1.1	1,719
Employed by someone else	55.3	37.7	16.5	1.0	1,812
Self-employed	46.6	31.7	14.6	0.3	238
Not worked in the past 12 months	51.3	35.8	14.5	1.0	2,812
Standard of living index					
Low	62.2	42.8	18.0	1.4	2,033
Medium	53.1	36.8	15.3	0.9	3,317
High	44.2	31.0	12.5	0.7	1,214

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, Madhya Pradesh, 1998–99

Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Pregnancy/breastfeeding status					
Pregnant	53.8	21.9	31.0	0.9	533
Breastfeeding (not pregnant)	58.0	42.0	14.8	1.2	1,806
Not pregnant/not breastfeeding	52.7	37.7	14.0	0.9	4,244
Height					
< 145 cm	58.5	41.3	16.5	0.7	732
≥ 145 cm	53.7	37.2	15.5	1.0	5,845
Body mass index					
< 18.5 kg/m^2	56.4	36.9	18.3	1.1	2,438
≥ 18.5 kg/m^2	53.0	38.0	14.1	0.9	4,106
Fruit and vegetable consumption[1]					
Fruit and vegetables	51.1	36.8	13.7	0.6	1,364
Fruit only	52.3	35.4	16.9	0.0	131
Vegetables only	55.5	38.0	16.2	1.2	3,974
Neither	54.0	37.4	15.6	1.0	1,112
Total	54.3	37.6	15.6	1.0	6,582

Note: The haemoglobin levels are adjusted for altitude of the enumeration area and for smoking when calculating the degree of anaemia. Total includes 1 woman each with missing information on education, work status, and fruit and vegetable consumption and 3, 18, 5, and 38 women with missing information on caste/tribe, the standard of living index, height, and body mass index, respectively. These women are not shown separately.
[1]Based on consumption at least weekly. Vegetables include only green, leafy vegetables.

characteristics, but anaemia is substantial for women in every population group. Forty-six percent of women in urban areas are anaemic compared with 57 percent of women in rural areas.

Anaemia decreases with education and standard of living; nonetheless, 43 percent of women who have completed at least high school and 44 percent of women from households with a high standard of living are anaemic. Differences by religion, caste/tribe, and region are also pronounced. Anaemia is relatively high for women in the 'other' religion category (79 percent), women from scheduled tribes (70 percent), and women living in the Chattisgarh Region of the state (69 percent). Anaemia is relatively low for women living in the Malwa Plateau Region.

The prevalence of anaemia is higher among Hindu women than among Muslim women; but Jain women are less likely to be anaemic than women in all other religious groups. In fact, Jain women have a much lower prevalence of moderate anaemia (no Jain women were found to have severe anaemia) than women from any other group shown in the table. Fifty-nine percent of women who work on a family farm or family business, followed by 55 percent of women who work for someone else are anaemic; however, only 44 percent of women who are self-employed are anaemic.

The prevalence of anaemia is slightly higher for breastfeeding women (58 percent) than for other groups, but there is little difference in the prevalence of anaemia between pregnant women and nonpregnant women who are not breastfeeding. Since anaemia is often considered to be particularly problematic for pregnant women, it is noteworthy that these women have about

Figure 7.1
Anaemia Among Women

NFHS-2, Madhya Pradesh, 1998–99

average levels of anaemia. The provision of iron and folic acid supplements to pregnant women has undoubtedly reduced the overall prevalence of anaemia in pregnant women (49 percent of pregnant women received IFA tablets or syrup during pregnancy for births in the three years preceding the survey—see Table 8.6). However, by far the highest levels of moderate anaemia are experienced by pregnant women (31 percent). For this reason, anaemia remains a serious problem among pregnant women.

Shorter women and women with a low body mass index have a somewhat higher prevalence of 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. Although the differentials are small, women who have a diet which regularly includes both fruits and vegetables are less likely to be anaemic than women whose diet includes vegetables (and not fruits) or neither fruits nor vegetables on a regular basis. The consumption of green, leafy vegetables alone does not appear to have a protective effect against anaemia. In fact, women who regularly consume green, leafy vegetables, but not fruit, have the highest prevalence of anaemia (56 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. 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 Madhya Pradesh, very few children are put to the breast immediately after birth. Only 10 percent of children began breastfeeding within one hour of birth, and only 29 percent began breastfeeding within one day. Almost three-fourths of the women (71 percent) squeezed the first milk from the breast before

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, Madhya Pradesh, 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	12.3	36.1	68.7	613
Rural	9.3	27.4	71.8	2,224
Region				
Chattisgarh	13.9	30.0	75.3	642
Vindhya	2.6	9.7	78.8	466
Central	14.6	46.2	63.5	282
Malwa Plateau	15.1	38.3	67.4	481
South Central	9.9	35.5	75.2	336
South Western	7.9	30.5	65.8	279
Northern	3.2	21.1	64.8	351
Mother's education				
Illiterate	9.5	25.4	71.6	1,950
Literate, < middle school complete	8.0	30.9	71.9	479
Middle school complete	13.6	41.9	70.9	192
High school complete and above	15.3	49.7	65.5	216
Religion				
Hindu	9.9	28.7	71.1	2,618
Muslim	8.9	32.5	72.2	169
Caste/tribe				
Scheduled caste	7.7	26.1	67.4	467
Scheduled tribe	15.4	33.0	70.0	697
Other backward class	7.9	26.9	73.4	1,191
Other	9.3	33.0	70.6	480
Mother's work status				
Working in family farm/business	10.4	26.9	73.5	684
Employed by someone else	8.2	27.5	73.8	758
Self-employed	1.4	37.0	73.1	70
Not worked in the past 12 months	11.2	31.1	68.2	1,325
Standard of living index				
Low	8.6	26.7	71.5	1,030
Medium	9.7	27.3	70.8	1,376
High	14.2	42.2	71.3	423
Assistance during delivery				
Health professional[2]	13.0	42.1	71.5	842
Dai (TBA)	9.9	25.2	72.0	1,325
Other	6.2	21.7	69.8	658
Place of delivery				
Public health facility	13.0	46.7	68.2	372
Private health facility	15.3	46.8	69.8	190
Own home	8.9	24.1	72.2	1,950
Parents' home	10.3	29.7	70.1	280
Total	9.9	29.3	71.1	2,837

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 22 Jain children, 28 children belonging to 'other' religions, 8 children who were delivered in a nongovernmental organization or trust hospital/clinic, 26 children with 'other' as place of delivery, and 1, 8, 12, and 10 children with missing information on caste/tribe, the standard of living index, assistance at delivery, and place of delivery, respectively. These children 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

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 15 percent of children in any group were put to the breast within one hour of birth. Only between one-tenth and one-half of the children in the different population subgroups were first breastfed in the first day of their life. The early initiation of breastfeeding is slightly higher in urban areas than in rural areas, and increases sharply with mother's education and household standard of living. Children of illiterate mothers, for example, are only half as likely (25 percent) as children of mothers who have completed at least high school (50 percent) to initiate breastfeeding within one day of birth. The likelihood that a child is breastfed within one day of birth is much higher in the Central Region (46 percent) and much lower in the Vindhya Region (10 percent), than in the other regions (21–38 percent). Children of self-employed mothers are more likely to be breastfed within one day (37 percent) than are children of other employed and unemployed mothers (27–31 percent), but are least likely to be breastfed within one hour of birth (1 percent). 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, and children born in health facilities (public or private), are much more likely to initiate breastfeeding within one day than most other children.

The custom of squeezing the first milk from the breast before breastfeeding a child is widely practised in every group, and differentials between groups are very small in most cases. The variation in the extent to which this practice is followed is relatively large only in the case of region. Less than two-thirds of women (64 percent) in the Central Region follow the custom of squeezing the first milk from the breast before breastfeeding a child for the first time, compared with more than three-fourths of women (79 percent) in the Vindhya Region. Even among institutional births, the first milk was squeezed out for 68–70 percent of cases. Thus contrary to recommendations for feeding infants, mothers squeeze the first milk from the breast before breastfeeding for a majority of children in all 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 at any time during the day or night before the interview 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 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 Madhya Pradesh, only 64 percent of children under four months of age are exclusively breastfed, 19 percent receive breast milk plus water, and 15 percent receive supplements along with breast milk (Table 7.6). The percentage of infants exclusively breastfed drops steadily from 72 percent for children under two months of age to 58 percent for children age 2–3 months, 37 percent for children age 4–5 months, and 24 percent for children age 6–7 months. Very few older

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, Madhya Pradesh, 1998–99

| | Breastfeeding status | | | | | | |
| | | | Breastfeeding and: | | | | Number of living children |
Age in months	Not breastfeeding	Exclusively breastfeeding	Receiving plain water only	Receiving supplements	Don't know if fed supplements	Total percent	
< 2	0.6	71.5	15.0	12.9	0.0	100.0	145
2–3	2.5	58.3	22.6	16.6	0.0	100.0	182
4–5	0.5	36.5	34.9	26.9	1.2	100.0	157
6–7	4.0	24.2	31.2	40.5	0.0	100.0	178
8–9	4.2	8.8	26.5	60.5	0.0	100.0	157
10–11	6.1	7.3	16.3	70.4	0.0	100.0	109
12–13	8.6	0.7	15.5	75.2	0.0	100.0	137
14–15	8.5	2.3	11.0	78.2	0.0	100.0	178
16–17	10.4	6.0	9.9	73.7	0.0	100.0	177
18–19	17.0	0.5	10.1	72.4	0.0	100.0	132
20–21	24.1	1.8	10.8	63.4	0.0	100.0	107
22–23	29.7	0.0	4.7	65.6	0.0	100.0	102
24–25	43.9	0.9	4.3	50.9	0.0	100.0	129
26–27	43.5	0.6	5.0	50.9	0.0	100.0	149
28–29	52.4	0.0	0.4	47.1	0.0	100.0	177
30–31	50.7	0.0	1.7	47.5	0.0	100.0	151
32–33	64.8	0.0	0.0	35.2	0.0	100.0	115
34–35	44.2	0.0	2.5	53.3	0.0	100.0	101
< 4 months	1.7	64.2	19.2	14.9	0.0	100.0	327
4–6 months	1.4	34.5	34.9	28.4	0.8	100.0	245
7–9 months	4.5	12.0	26.9	56.6	0.0	100.0	247

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.

children are exclusively breastfed. The proportion of children receiving breast milk and supplements increases from 13 percent for children less than two months of age to 27 percent for children age 4–5 months to 78 percent for children age 14–15 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-one percent of children age 12–13 months are still being breastfed, as are 70 percent of children age 22–23 months. For the majority of children in Madhya Pradesh, breastfeeding usually stops before age 28–29 months, but 35 percent of children age 32–33 months are still breastfed.

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 non-breastfeeding children, some of the 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. The majority of non-breastfeeding children were given these other types of milk the day before the interview. The proportion of breastfeeding children who received non-powdered milk increases from 10 percent for children age 0–3 months to 28 percent for children age 6–9 months and 40 percent or more for children age 10 months or more. Other liquids, such as juice or tea, are given less often than non-powdered milk to children at most ages before they are 18 months old. The consumption of green, leafy vegetables generally increases with age from 1–2 percent before age 6 months and 6

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, Madhya Pradesh, 1998–99

	Type of food received							
Age in months	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]	Using bottle with a nipple	Number of living children
BREASTFEEDING CHILDREN								
< 2	0.0	9.2	6.8	0.4	0.4	0.4	4.1	144
2–3	3.9	10.9	4.9	1.6	0.0	3.0	5.4	177
4–5	1.1	22.3	9.1	1.2	0.8	5.9	13.3	156
6–7	2.1	23.9	16.6	5.9	5.8	19.3	12.1	171
8–9	2.1	32.2	33.8	14.8	12.5	38.9	11.8	151
10–11	0.9	42.6	33.1	18.8	14.4	50.1	10.7	103
12–13	4.7	45.6	45.0	30.2	20.9	67.3	10.8	125
14–15	1.2	40.1	41.5	32.4	21.7	79.4	7.5	163
16–17	1.7	40.1	40.4	40.8	23.5	77.0	5.9	158
18–23	1.8	42.3	54.1	43.2	27.0	76.9	5.6	263
24–29	2.6	45.0	52.7	55.2	31.0	89.9	1.6	241
30–35	1.0	42.6	56.3	61.0	34.9	93.2	5.8	172
< 4 months	2.1	10.1	5.7	1.1	0.2	1.8	4.8	321
4–5 months	1.1	22.3	9.1	1.2	0.8	5.9	13.3	156
6–9 months	2.1	27.8	24.7	10.1	8.9	28.5	11.9	322
NON-BREASTFEEDING CHILDREN								
< 12	(0.0)	(89.5)	(46.4)	(10.4)	(6.9)	(31.0)	(76.5)	27
12–15	(0.0)	(82.7)	(51.9)	(58.2)	(35.5)	(79.7)	(32.6)	27
16–23	3.5	70.0	59.4	52.1	37.8	91.9	18.5	97
24–29	1.1	61.6	61.0	61.1	35.4	93.2	9.9	214
30–35	1.3	58.2	57.3	62.9	36.9	92.4	9.2	196
ALL CHILDREN								
< 2	0.0	9.1	6.7	0.4	0.4	0.4	4.0	145
2–3	3.8	12.1	5.5	1.5	0.0	3.4	6.8	182
4–5	1.1	22.7	9.1	1.2	0.8	5.9	13.7	157
6–7	2.0	26.9	17.7	5.6	5.6	19.6	14.5	178
8–9	2.0	35.1	34.6	15.2	12.4	38.6	15.1	157
10–11	0.8	46.1	35.2	18.8	14.6	50.1	15.3	109
12–13	4.3	47.4	45.6	33.4	22.2	68.6	12.9	137
14–15	1.1	44.8	42.4	33.9	22.8	79.3	9.5	178
16–17	1.6	43.0	40.1	40.0	23.4	78.0	7.8	177
18–23	2.4	48.8	56.5	46.3	30.4	80.7	8.3	341
24–29	1.9	52.8	56.6	58.0	33.1	91.4	5.5	455
30–35	1.2	50.9	56.8	62.0	36.0	92.8	7.6	367
< 4 months	2.1	10.8	6.0	1.0	0.2	2.1	5.6	327
4–5 months	1.1	22.7	9.1	1.2	0.8	5.9	13.7	157
6–9 months	2.0	30.7	25.6	10.1	8.8	28.5	14.8	335

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

percent at age 6–7 months to 62 percent at age 30–35 months for all children. The consumption of fruits is negligible for children less than six months old, but it increases rapidly thereafter. Nonetheless, only about one-third of children age 18–35 months receive any fruits.

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 Madhya Pradesh the introduction of complementary food is delayed for a substantial proportion of children. Only

19 percent of breastfeeding children who are age 6–7 months consume solid or mushy foods. This proportion rises to only 39 percent of breastfeeding children at age 8–9 months and is 90 percent only at age 24–29 months. Even at 12–13 months of age, one-third of breastfeeding children did not eat any solid or mushy food the day or night before the interview. Only 29 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. For children who are being breastfed, the use of bottles with nipples is not common in Madhya Pradesh. Thirteen percent or less of breastfeeding children in each age group drank something 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 during the first year or 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 is 25.4 months or slightly more than two years. Supplementation begins relatively early, however. The median length of exclusive breastfeeding is 2.6 months, and the median length of exclusive breastfeeding or breastfeeding with water only is 6.6 months.

The mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding with water only are 25.8 months, 4.6 months, and 8.6 months, respectively. The mean durations are slightly 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 about the same as the mean calculated in the conventional manner.

In societies with strong son preference, 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). This does not appear to be the case in Madhya Pradesh where, despite a strong preference for sons, the median duration of breastfeeding is two months shorter for boys than for girls. The median duration of breastfeeding is four months longer in rural areas (26 months) than in urban areas (22 months). The duration of exclusive breastfeeding, however, is almost equally short in urban and rural areas: about 2 months in urban areas and 3 months in rural areas.

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, Madhya Pradesh, 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	24.0	2.6	6.9	1,438
Female	25.9	2.8	6.3	1,399
Residence				
Urban	22.4	1.6	4.3	613
Rural	26.2	3.0	7.1	2,224
Median duration	25.4	2.6	6.6	2,837
Mean duration (months)[1]	25.8	4.6	8.6	2,837
Prevalence/incidence mean	25.3	4.4	8.7	2,837

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

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 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 Madhya Pradesh, NFHS-2 did not measure 7 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 half of the children under age three in Madhya Pradesh are underweight (55 percent), and a similar percentage are stunted (51 percent). The proportion of children who are severely undernourished is also notable—24 percent according to weight-for-age and 28 percent according to height-for-age. Wasting is also very evident in Madhya Pradesh, affecting 20 percent of children under three years of age. In fact, Madhya Pradesh has the highest proportion of children underweight of any state in India, and according to the other two indicators also, children in Madhya Pradesh are more likely to be undernourished than children in the country as a whole. The proportion of children under three years of age who are underweight is unchanged, at 56 percent, since NFHS-1, while the proportion severely underweight increased slightly from 22 percent in NFHS-1 to 24 percent in NFHS-2. A similar comparison cannot be made for stunting and wasting because children's height was not measured in NFHS-1 in Madhya Pradesh.

The proportion of children who are undernourished increases rapidly with the child's age through age 12–23 months, where it peaks at 27 percent for wasting and 64 percent for stunting and plateaus at 67 percent for underweight. Even during the first six months of life, when most babies are breastfed, 11–17 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, 38 percent are severely stunted and 32 percent are severely underweight.

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, Madhya Pradesh, 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	2.4	16.0	3.1	16.8	2.7	11.3	353
6–11 months	17.8	46.7	17.2	38.4	5.1	17.5	385
12–23 months	31.4	67.4	37.6	64.0	4.6	27.2	681
24–35 months	31.8	67.3	38.0	62.4	4.2	18.3	708
Sex of child							
Male	22.3	52.8	26.1	49.2	4.4	19.8	1,092
Female	26.3	57.6	30.6	52.9	4.1	19.9	1,035
Birth order							
1	20.8	49.8	25.3	48.7	2.9	19.3	523
2–3	22.9	54.4	26.5	48.9	4.6	18.1	855
4–5	26.2	57.5	29.9	53.5	3.9	21.8	467
6+	31.5	63.1	36.7	57.3	6.1	22.8	283
Previous birth interval[2]							
First birth	20.8	49.8	25.3	48.7	2.9	19.3	523
< 24 months	29.1	62.4	36.7	58.1	5.6	17.5	353
24–47 months	25.0	56.6	28.6	51.4	4.0	20.8	931
48+ months	22.3	51.3	23.2	45.8	5.8	20.5	321
Total	24.3	55.1	28.3	51.0	4.3	19.8	2,127

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

Overall, girls and boys are about equally undernourished, but girls are slightly more likely than boys to be underweight and stunted. Undernutrition increases with increasing birth order. Young children in families with six or more children are nutritionally the most disadvantaged. First births have lower than average levels of undernutrition according to all three measures, and children born after a short birth interval (less than 24 months) are much more likely than other children to be stunted and underwieght.

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, 40 percent are stunted, and 17 percent are wasted. A higher proportion of children are underweight and stunted in the Chattisgarh Region than in any other region, and wasting is most widespread in the Malwa Plateau Region. Children whose mothers are illiterate are about twice as likely to be undernourished as children whose mothers have completed at least high school (see Figure 7.2), and the differentials are even larger in the case of severe undernutrition. Muslim children are less likely to be undernourished than Hindu children according to all three measures. Children from scheduled tribes have the poorest nutritional status, and the high prevalence of wasting in this group (25 percent) is of particular concern. Undernutrition is relatively low for children whose mothers have not worked in the past 12 months. Children of mothers who work on a family farm or family business have particularly
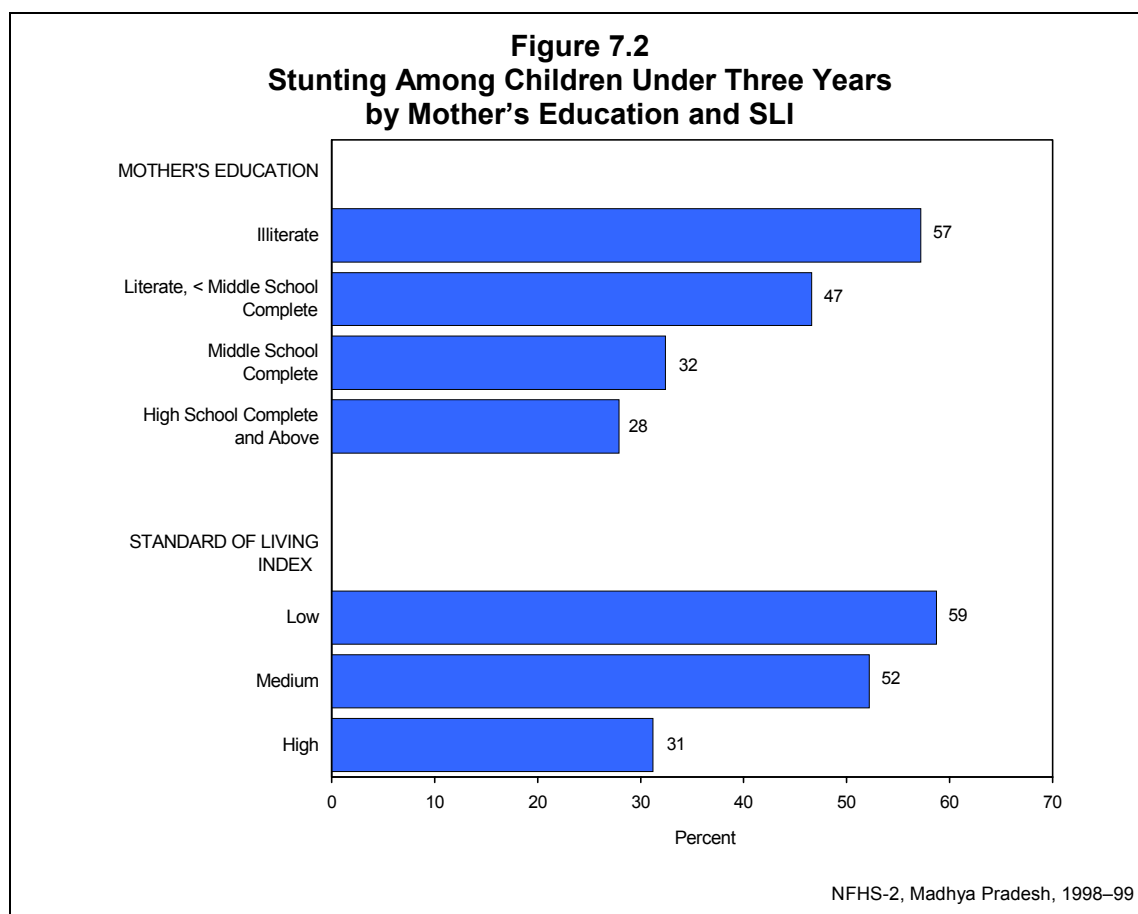
Table 7.10 Nutritional status of children by background characteristics

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

Background characteristic	Weight-for-age		Height-for-age		Weight-for-height		
	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]	Number of children
Residence							
Urban	19.5	44.3	19.6	39.8	4.0	17.3	492
Rural	25.7	58.4	30.9	54.3	4.3	20.6	1,635
Region							
Chattisgarh	25.9	60.8	35.1	57.9	3.5	18.5	486
Vindhya	23.4	53.5	32.6	50.3	6.1	20.2	294
Central	20.4	49.5	24.4	43.3	4.9	16.1	192
Malwa Plateau	23.2	46.4	20.1	43.1	2.2	22.9	391
South Central	24.7	59.4	29.3	55.7	3.9	18.7	263
South Western	25.1	57.9	25.8	48.8	5.1	19.6	219
Northern	25.3	56.6	26.9	53.3	5.8	21.1	281
Mother's education							
Illiterate	29.9	61.2	33.4	57.2	5.0	22.7	1,419
Literate, < middle school complete	18.0	51.0	24.8	46.6	2.5	15.7	361
Middle school complete	11.1	41.9	11.3	32.4	4.8	15.2	159
High school complete and above	4.9	28.0	10.9	27.9	1.3	9.8	188
Religion							
Hindu	24.9	55.9	29.0	51.9	4.4	20.1	1,958
Muslim	17.6	47.1	20.9	43.4	2.8	14.5	130
Caste/tribe							
Scheduled caste	30.0	57.5	32.2	52.7	4.7	19.9	351
Scheduled tribe	31.4	64.5	33.6	59.9	4.9	24.7	480
Other backward class	22.4	55.4	28.1	51.5	4.2	18.7	908
Other	14.5	40.5	18.5	37.2	3.2	16.3	387
Mother's work status							
Working in family farm/business	29.1	65.5	33.6	58.2	6.5	25.8	488
Employed by someone else	30.3	61.4	34.6	57.0	2.9	19.4	563
Self-employed	22.7	56.9	29.6	48.9	3.7	15.6	57
Not worked in the past 12 months	18.7	46.6	22.2	44.3	4.0	17.5	1,019
Mother's height							
< 145 cm	31.9	61.5	41.1	63.2	2.7	20.2	217
≥ 145 cm	23.4	54.4	26.8	49.6	4.4	19.8	1,910
Mother's body mass index							
< 18.5 kg/m^2	27.4	60.5	28.0	52.0	4.1	21.7	871
≥ 18.5 kg/m^2	21.9	51.2	28.6	50.4	4.3	18.4	1,248
Standard of living index							
Low	29.4	61.5	34.6	58.7	4.3	21.6	739
Medium	25.5	58.0	29.1	52.2	4.7	20.9	1,026
High	9.6	33.6	12.7	31.2	2.9	13.0	354
Total	24.3	55.1	28.3	51.0	4.3	19.8	2,127

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 22 Jain children, 17 children belonging to 'other' religions, 1 child with missing information on caste/tribe, and 8 children each with missing information on mother's body mass index and the standard of living index, 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**

MOTHER'S EDUCATION

Illiterate — 57

Literate, < Middle School Complete — 47

Middle School Complete — 32

High School Complete and Above — 28

STANDARD OF LIVING INDEX

Low — 59

Medium — 52

High — 31

Percent

NFHS-2, Madhya Pradesh, 1998–99

high levels of undernutrition. These children are more likely to be underweight (66 percent) or stunted (26 percent) than any other group of children.

The nutritional status of children is strongly related to maternal nutritional status. Underweight and stunting is more common for children of mothers whose height is less than 145 cm and undernutrition according to all three indicators is more common for children whose mothers have a body mass index 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 about 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).

Table 7.11 and Figure 7.3 show anaemia levels for children age 6–35 months. In Madhya Pradesh, three-quarters of children age 6–35 months have some level of anaemia, including 22 percent who are mildly anaemic (10.0–10.9 g/dl), 48 percent who are moderately anaemic (7.0–
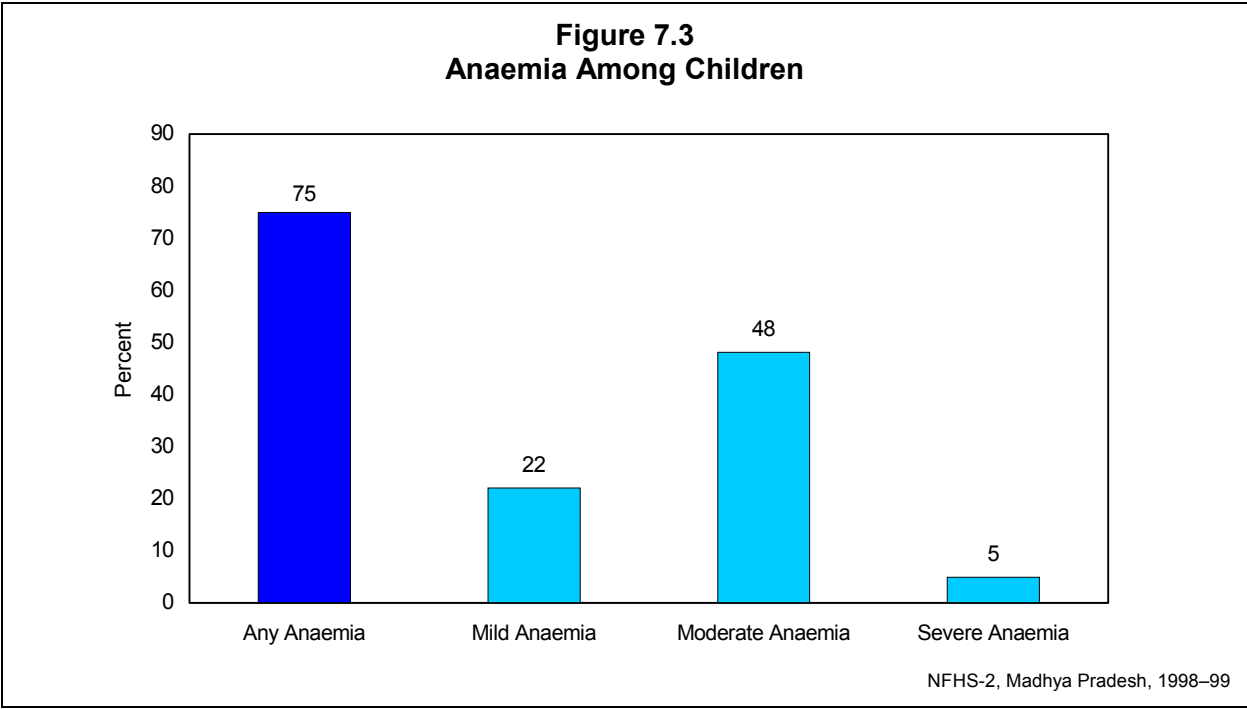
Table 7.11 Anaemia among children

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

| Background characteristic | Percentage of children with any anaemia | Percentage of children with: | | | Number of children |
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age of child					
6–11 months	70.9	23.5	45.5	1.9	402
12–23 months	81.0	20.7	55.7	4.7	751
24–35 months	71.0	22.4	41.8	6.8	726
Sex of child					
Male	74.2	22.8	45.5	5.9	954
Female	75.8	21.1	50.9	3.9	926
Birth order					
1	72.7	24.5	44.6	3.5	473
2–3	75.2	20.9	49.2	5.1	748
4–5	77.4	19.8	51.1	6.5	406
6+	75.0	23.7	46.8	4.4	253
Residence					
Urban	73.7	23.6	43.6	6.4	425
Rural	75.4	21.5	49.5	4.5	1,455
Region					
Chattisgarh	87.7	23.9	60.7	3.1	425
Vindhya	54.9	23.9	29.0	2.0	283
Central	66.2	23.6	39.9	2.7	190
Malwa Plateau	68.8	19.5	44.6	4.7	334
South Central	80.5	23.3	49.5	7.7	222
South Western	76.9	17.4	52.6	7.0	190
Northern	85.1	20.6	55.0	9.5	238
Mother's education					
Illiterate	76.7	20.2	50.7	5.8	1,251
Literate, < middle school complete	75.6	24.4	47.4	3.8	323
Middle school complete	76.2	27.9	47.1	1.2	136
High school complete and above	60.4	25.2	31.6	3.7	169
Religion					
Hindu	74.4	20.9	48.9	4.6	1,725
Muslim	79.6	32.7	37.1	9.8	112
Caste/tribe					
Scheduled caste	71.4	22.4	45.7	3.3	297
Scheduled tribe	83.9	20.0	57.8	6.1	449
Other backward class	73.1	22.4	46.0	4.7	791
Other	70.9	23.2	42.5	5.3	343
Mother's work status					
Working in family farm/business	73.7	19.8	50.1	3.8	460
Employed by someone else	76.9	22.1	49.7	5.0	510
Self-employed	62.4	15.3	44.8	2.3	52
Not worked in the past 12 months	75.3	23.4	46.3	5.6	858

Contd…

Table 7.11 Anaemia among children (contd.)

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, Madhya Pradesh, 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	77.5	21.8	51.1	4.6	642
Medium	74.9	21.6	47.9	5.3	928
High	70.0	23.6	42.2	4.2	305
Mother's anaemia status					
Not anaemic	67.7	21.8	43.0	2.9	839
Mildly anaemic	78.1	23.9	49.2	5.0	718
Moderately anaemic	86.9	17.1	60.4	9.5	306
Total	75.0	22.0	48.1	4.9	1,880

Note: Haemoglobin levels are adjusted for altitude when calculating the degree of anaemia. Total includes 19 Jain children, 24 children belonging to 'other' religions, 13 children whose mothers are severely anaemic, 1 child with missing information on caste/tribe, and 4 children each with missing information on the standard of living index and on mother's anaemia status. These children are not shown separately.

Figure 7.3
Anaemia Among Children

NFHS-2, Madhya Pradesh, 1998–99

9.9 g/dl), and 5 percent who are severely anaemic (less than 7.0 g/dl)[4]. Notably, children are more than three times as likely as women to have moderate to severe anaemia. The anaemia rates for children in Madhya Pradesh are very similar to the anaemia rates for India as a whole.

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[4]The unadjusted rates for anaemia among children are almost identical to the corresponding rates adjusted for altitude which are presented. This is to be expected since only 1 PSU out of the 233 sample PSUs was above 1,000 metres in Madhya Pradesh.

Several groups of children have particularly high prevalence of anaemia (more than 80 percent). These include children age 12–23 months (an age at which children are often being weaned), children in the Chattisgarh, Northern, and South Central Regions, and scheduled-tribe children. In addition, one out every ten children in the Northern Region is severely anaemic. Anaemia is relatively low (60-66 percent) only among children in the Central Region, children whose mothers have completed at least high school, and children whose mothers are self-employed. As expected there is a strong relationship between haemoglobin levels of mothers and prevalence of anaemia among children. Sixty percent of children whose mothers are moderately anaemic are moderately anaemic themselves and 10 percent are severely anaemic. Nonetheless, even among children whose mothers are not anaemic, 68 percent are anaemic and 46 percent have moderate to severe anaemia.

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 Madhya Pradesh 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 of a weak acid-based solution. The interviewer squeezes one drop of the starch solution onto a sample of cooking salt obtained from the household. If the colour changes (from light blue through dark violet), the interviewer matches the colour of the salt as closely as possible to a colour chart on the test kit and records the iodine level as 7, 15, or 30 ppm. If the initial test is negative (no change in colour), the interviewer is required to conduct a second confirmatory test on a new salt sample, using the acid-based solution in addition to the starch solution. This test is necessary because the starch solution will not show any colour change even on iodized salt if the salt is alkaline or is mixed with alkaline free-flow agents. If the colour of the salt does not change even after the confirmatory test, the salt is not iodized. Because of uncertainties and subjective judgement in the matching process, the rapid test should not be seen as giving an

Table 7.12 Iodization of salt

Percent distribution of households by degree of iodization of salt, according to selected background characteristics, Madhya Pradesh, 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	4.8	10.1	10.8	72.7	1.7	100.0	276
Small city	5.9	10.4	17.4	65.3	1.0	100.0	384
Town	11.1	10.7	14.4	62.0	1.8	100.0	1,051
Rural area	30.5	18.2	14.3	34.7	2.2	100.0	5,037
Religion of household head							
Hindu	26.2	16.6	14.2	40.9	2.2	100.0	6,219
Muslim	12.0	14.8	17.0	54.9	1.3	100.0	339
Jain	7.2	5.7	15.7	71.3	0.0	100.0	69
Other	10.1	9.4	18.4	62.2	0.0	100.0	121
Caste/tribe of household head							
Scheduled caste	25.3	17.9	15.7	38.1	3.0	100.0	1,089
Scheduled tribe	38.6	17.7	14.0	28.7	1.1	100.0	1,602
Other backward class	23.0	16.2	15.4	43.0	2.4	100.0	2,689
Other	12.9	13.4	11.7	60.1	1.9	100.0	1,366
Standard of living index							
Low	33.5	19.3	15.6	28.5	3.0	100.0	2,481
Medium	24.7	17.3	14.7	41.7	1.6	100.0	3,187
High	6.2	6.2	10.4	76.0	1.2	100.0	1,061
Total	25.0	16.3	14.4	42.3	2.1	100.0	6,749

Note: Total includes 1, 3, and 20 households with missing information on religion, caste/tribe, and the standard of living index, respectively, which are not shown separately.
ppm: Parts per million

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, only 57 percent of households in Madhya Pradesh use cooking salt that is iodized at the recommended level of 15 ppm or more. This level is particularly low in light of the government regulations on salt iodization that were in effect at the time of the survey. One-fourth of households use salt that is not iodized at all and 16 percent use salt that is minimally iodized (less than 15 ppm).

Differentials in salt iodization by background characteristics are pronounced. Over three-fourths of households in large cities, small cities, and towns use salt with 15 ppm or more of iodine, compared with 49 percent of households in rural areas. Households headed by Hindus are much less likely than households headed by persons of any of the other religions to have salt that is adequately fortified by iodine. The use of iodized salt is particularly low in households headed by persons from the scheduled tribes and is only slightly higher in households headed by persons from the scheduled castes or other backward classes. The widest differentials are observed by the standard of living index. Eighty-six 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.