

Concurrent prevalence of underweight and overweight among women in India: The case of western states

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Abstract

While under-nutrition is still prevalent in India, the rates of overweight and obesity are steadily increasing — a significant proportion of overweight women coexisting with high rates of under nutrition. This paper consequently examines the levels, trends and determinants of the coexistence of underweight and overweight or obesity among women age 15–49 years in Western states of India using the National Nutrition Monitoring Bureau (NNMB) surveys and the second National Family Health Survey (NFHS-2) data. Decreasing trend in the proportion of underweight and an increasing trend in the proportion of overweight was observed among rural women of Gujarat and Maharashtra in the last three decades from the NNMB surveys. Multivariate analysis reveals that residence, standard of living, and age are significantly associated with both forms of underweight and overweight or obesity. In the western states, both chronic energy deficiency and overweight/obesity are widespread and the prevalence varied significantly by population subgroup, therefore, there is a need for public health programs that are able to tackle both these problems simultaneously on a priority basis.

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Introduction

Epidemiological, demographic and nutritional transitions are taking place in many developing countries (Popkin 1998). In earlier days, developing countries experienced high prevalence of under-nutrition, but this era of transition has brought a double burden of under-nutrition and over-nutrition. Mentez et al., (2005) based on the analysis of anthropometric measurements for women aged 20–49 in 36 developing countries, observed that the proportion overweight exceeded the proportion underweight in a majority of the counties in both urban and rural areas. These results are contrary to the general belief that in developing countries overweight is less prevalent than underweight and that it is primarily concentrated in urban, higher socioeconomic status households. In India, which is typically known for large incidence of under-nutrition, significant proportions of overweight and obese now coexist with the undernourished (IIPS and ORC Macro 2000) and there is also some evidence of even emerging nutrition transition (Arnold et al., 2004; Shetty 2002; Shukla et al., 2002; Griffiths and Bentley 2001).

According to the recent estimates of third National Family Health Survey (NFHS-3, 2005–06), more than one-third (36 percent) of ever-married women aged 15–49 in India have a BMI below 18.5 indicating chronic nutritional deficiency (CED) or underweight, and 13 percent of women are overweight or obese. Out of 29 Indian states, the prevalence of underweight and overweight or obese is more than the national average in 12 and 15 states, respectively and the percentage of overweight exceeded the percentage of underweight in the states of Delhi, Punjab, Sikkim, Kerala, that is, a significant proportion of underweight women coexisting with high rates of overweight or obese in these states. Thus, Indian women suffer from a dual burden of malnutrition, with nearly half (48 percent) being either too thin or overweight. On the other hand, the percentage of thinness and overweight or obese is somewhat lower for men aged 15–49 (34 and 9 percent, respectively) than for women aged 15–49. However, the pattern of differentials in the percentage thinness and overweight or obese is similar for men and women (IIPS & ORC Macro 2006: 303–309).

Once considered a problem related to affluence, overweight and obesity is a risk factor for a number of chronic health problems and non-communicable diseases, such as diabetes, hypertension, asthma, cardiovascular disease, some cancers, gall bladder disease and osteoarthritis and all of these are on the rise in developing countries, particularly among the

middle-class, urban populations (Gopalan 1998; Popkin 1998; Popkin et al., 2001). On the other hand, the chronic energy deficiency or underweight is associated with impaired physical capacity, reduced economic productivity, increased mortality and poorer reproductive outcomes. Some evidence in developing countries indicate that malnourished individuals show a progressive increase in mortality rate as well as increased risk of illness (Rotimi et al. 1999). The World Health Organization (WHO) estimates that in 1995, about one million adult deaths resulted from health problems exacerbated by over-nutrition, while half of it, were associated with under-nutrition (World Health Organization 2003).

The accumulation of extra fat is caused due to interplay of over-nutrition and inadequate physical activity coupled with physiologic, metabolic and genetic factors. Earlier studies had put a lot of emphasis on the heritability of BMI, in some cases to an extent of 66 to 80 percent, but the recent researches put this influence to a mere 33 percent (Stunkard 1996). Although genes appear to increase the susceptibility to overweight or obesity, studies in this field also reveal that the dietary and activity patterns more responsible for overweight or obesity (Foreyt and Poston 1997). Apart from the dietary and activity patterns, many factors have been associated with both forms of malnutrition of women in the literature. These include socioeconomic (e.g., occupation, educational background and the household standard of living); cultural (e.g., religion and caste); demographic (e.g., age and marital status) and dietary characteristics (Griffiths and Bentley 2001; Shukla et al., 2002; Shetty 2002; Monteiro et al., 2004; Roy et al., 2004).

Concurrent prevalence of underweight and overweight among women in India

Table A-1 shows the percentage of ever-married women aged 15–49 according to level of Body Mass Index by state. More than one-third of women in India (36 percent) have a chronic energy deficiency (CED)/underweight (BMI, <18.5 kg/m²). At state level, the disparities are quite widespread. The level of CED is the high in Orissa (48 percent), followed by West Bengal (44 percent) and the lowest percentages (11–12) are found in the states of Arunachal Pradesh, Sikkim, and Delhi. Prevalence was ≥ 20 percent in 19 (70 percent) of the 27 states and ≥ 30 percent in 11 states (41 percent) of India. Although under-nutrition is still prevalent and the focus of attention in the field of nutrition continues to be on the substantial proportion of women with a chronic energy deficiency, the alarming prevalence of overweight and obesity cannot be ignored. Table A-1 also show that 11 percent of ever-married women in India are overweight or obese (BMI, ≥ 25.0 kg/m²) and the

proportion is highest in Delhi (34 percent) followed by Punjab (30 percent). Moreover, in Delhi, Punjab, Sikkim, Kerala and all the three metro cities of India, the proportion of overweight or obese women is more than the proportion of underweight women, that is, a significant proportion of underweight women coexisting with high rates of overweight or obese.

In the analysis, the WHO classification for overweight (BMI, 25.0–29.9) and obese (BMI, >30.0) is used. However, it has been identified that different ethnic groups have different amount of fat content and among Asian population, abdominal or central obesity is more common than obesity defined by BMI, (Mc Keigue et al., 1991) and health risks associated with overweight and obesity occur at lower levels of BMI than in North America or Europe (Dudeja et al., 2001). In this situation, a WHO expert consultation has proposed a BMI lower limit of 23 for overweight among Asians instead of the 25 kg/m² used now (Choo 2002). If 23 had been used as the lower cutoff point for overweight women, the gravity overweight situation in the country would worsen and the proportion of women classified as overweight or obese would increase from 11 percent to 19 percent in India as a whole, and more than 40 percent in the states of Delhi, Punjab and all the three metropolitan areas (Table A-1). Therefore, the substantial proportion of overweight or obese persons, together with continuing high overall levels of under-nutrition, produces a dual burden of nutritional disorders in India. The overweight and obesity makes people prone to non-communicable and degenerative diseases, whereas, under-nutrition may make them prone to communicable diseases and reduce productivity. According to the World Bank estimates, malnutrition costs India at least US\$10 billion annually in terms of lost productivity, illness, and death (World Bank 2000). Therefore, the existence of a double burden poses a big challenge.

Table A-1 Percentage distribution of ever-married women age 15–49 years by level of Body Mass Index (BMI), according to State and metropolitan areas, India, 1998–99

Level of BMI, kg/m ²	16.0–	17.0–	18.5–	25.0–	29.99	≥30.0	≥25.0	≥23.0	
States	<16.0	16.99	18.49	<18.5	24.99	29.99	≥30.0	≥25.0	≥23.0
Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>North</i>									
Delhi	(1.2)	2.6	8.4	12.1	53.9	24.7	9.3	34.0	49.9
Haryana	3.8	6.4	15.9	26.1	57.2	12.8	3.9	16.7	26.4
Himachal Pradesh	5.6	7.9	16.4	29.9	56.8	10.9	2.4	13.3	22.9
Jammu & Kashmir	4.6	5.4	16.6	26.6	59.7	10.7	3.0	13.7	24.3
Punjab	2.7	4.5	9.8	17.0	52.4	21.4	9.2	30.6	43.9
Rajasthan	5.3	8.8	22.5	36.6	56.3	5.5	1.7	7.2	13.5
<i>Central</i>									
Madhya Pradesh	6.1	9.2	23.3	38.6	55.3	4.9	1.2	6.1	12.0
Uttar Pradesh	5.6	8.5	22.1	36.2	56.3	5.9	1.6	7.5	14.6
<i>East</i>									
Bihar	6.9	9.2	23.6	39.7	56.6	3.2	(0.5)	3.7	8.5
Orissa	8.9	12.1	27.4	48.4	47.2	3.8	(0.6)	4.4	9.1
West Bengal	9.6	11.4	23.4	44.4	46.9	7.3	1.3	8.6	15.3
<i>North-east</i>									
Arunachal Pradesh	(1.3)	(2.0)	7.8	11.1	83.7	(4.5)	(0.6)	(5.2)	12.0
Assam	4.4	5.6	17.1	27.1	68.6	3.5	(0.7)	4.3	11.2
Manipur	(2.0)	4.1	13.2	19.3	69.9	9.7	(1.1)	10.8	22.5
Meghalaya	(3.8)	(7.2)	14.8	25.8	68.4	(4.7)	(1.2)	(5.9)	13.7
Mizoram	(1.8)	(4.1)	16.8	22.8	71.9	(4.9)	(0.6)	(5.3)	12.9
Nagaland	(2.0)	(4.0)	12.7	18.7	72.8	7.8	(0.8)	8.6	20.5
Sikkim	(1.2)	(1.5)	8.6	11.3	73.1	13.1	(2.5)	15.6	31.0
Tripura	6.6	7.0	21.9	35.4	56.0	6.8	(1.7)	8.5	18.4
<i>West</i>									
Goa	6.7	6.3	14.5	27.5	51.2	16.8	4.5	21.3	34.4
Gujarat	9.3	9.7	18.6	37.6	46.5	11.4	4.4	15.9	25.5
Maharashtra	9.5	10.6	20.1	40.2	47.9	9.0	2.9	11.9	20.1
<i>South</i>									
Andhra Pradesh	7.7	10.1	20.0	37.8	50.1	9.8	2.3	12.1	20.6
Karnataka	8.3	10.3	20.9	39.4	46.9	10.8	2.9	13.7	21.7
Kerala	2.8	4.0	12.1	18.9	60.3	17.0	3.9	20.9	35.6
Tamil Nadu	5.7	8.0	15.6	29.3	55.9	12.1	2.7	14.7	25.5
<i>Metros</i>									
Chennai	(2.7)	(3.8)	(9.5)	16.0	57.8	20.5	(5.7)	26.2	41.8
Kolkata	(3.3)	(3.3)	11.7	18.2	52.8	22.4	(6.5)	29.0	43.0
Mumbai	(3.8)	4.7	9.3	18.0	50.0	23.7	8.5	32.1	46.8
India	6.8	9.0	20.4	36.2	53.2	8.4	2.3	10.6	18.5

Notes: 1). The body mass index (BMI) is the ratio of weight in kilograms to the square of the height in metres (kg/m²); 2). According to BMI status, women are categorized in to six groups (col. 1–3 & 5–7) — Women who are *Severely thin/underweight* (BMI, <16.00 kg/m²); *Moderately thin* (BMI, 16.00–16.99 kg/m²); *Mildly thin* (BMI=17.00–18.49 kg/m²); *Normal weight* (BMI = 18.5–24.9 kg/m²); *Overweight* (BMI = 25.0–29.9 kg/m²) and *Obese* (BMI ≥ 30 kg/m²). From these six groups, two categories (col. 4 & 8) *Total Thin/underweight* (BMI <18.50 kg/m²) and *Total Overweight/obese* (BMI, ≥25.0 kg/m²) were used for the analysis of nutritional status of women; Col. 9: *WHO proposed Overweight and obese* (BMI, ≥23.0) for Asian population (Choo, 2002); 3). For the 15–17 - year-old adolescent females in the sample, the cut-off points recommended by Cole *et al.*, (2000) for adolescent overweight or obesity were used; 4). Results for states incorporate state-level sample weights, and results for India incorporate national-level sample weights; 5). All-India estimates in these tables will differ slightly from similar estimates in the NFHS–2 national report (IIPS and ORC Macro 2000). Because, Tripura state was not included in the tables of NFHS-2, India report due to late start of fieldwork (survey) in Tripura; 6). Table excludes women who are pregnant and women with a birth in the preceding two months; 7). () Percentage based on fewer than 50 un-weighted cases.

Source: computed from NFHS-2, 1998–99 data files of India

With the above discussion as background, the present paper sheds light on the emerging ‘double burden’ of malnutrition (both underweight and overweight) among women aged 15–49 years and its linkages with socioeconomic, demographic and other factors in three

Western states of India (Goa, Gujarat, and Maharashtra). Specifically, this paper will attempt to examine the trends in the shift from underweight to overweight among rural women during the last three decades and analyses the differentials and identify the distinct factors that may influence malnutrition using the data from National Nutrition Monitoring Bureau (NNMB) diet and nutrition surveys and the second National Family Health Survey (NFHS-2) data. According to the NFHS-2, the proportion of underweight and overweight or obese is more than the national average in the western states. Unit level data of the subsequent survey, the NFHS-3 carried out in 2005–06, are yet to become available for the Western states and India. However, the preliminary findings of the NFHS-3 report is that the prevalence was similar between the two NFHS's leading us to believe that analysis based on the NFHS-2, 1998–99 will still be useful programmatically.

Background features of western states and trends of malnutrition

Table 1 and 2, give some basic demographic indicators and levels of malnutrition for each of the three western states along with India and trends of malnutrition in Maharashtra and Gujarat. It may be observed from the Table 1, that among the three western states, Gujarat is somewhat less demographically developed than the two other states. From the NNMB diet and nutrition surveys, a decreasing trend in the prevalence of chronic energy deficiency/underweight and an increasing trend in the proportions of overweight or obese was observed among rural women. Between 1975–79 and 2000–01, the extent of CED declined from 57 and 49 percent to 45 and 33 percents in Maharashtra and Gujarat, respectively. On the other hand, during the same period, an increasing trend was observed in the proportions of overweight or obese women from 2.5 and 3.9 percent to 5.6 and 7.8 percents, respectively (Table 2).

Table 1: Selected demographic and malnutrition indicators, Western states and India

Indicators	Goa	Gujarat	Maharashtra	India
Demographic indicators				
Population ¹ , 2001 (in '000s)	1 347	50 671	96 878	1028 610
Population decadal growth rate ¹ (%), 1991–2001	14.89	22.48	22.57	21.35
Percent urban ¹ , 2001	49.77	37.35	42.40	27.8
Crude death rate ²	10.1	8.0	9.0	9.7
Crude birth rate ²	16.6	24.3	23.0	24.8
Total fertility rate ²	1.77	2.72	2.52	2.85
Infant mortality rate ²	36.7	62.6	43.7	67.6
Under-five mortality rate ²	46.8	85.1	58.1	94.9
Incidence of Low Birth Weight ² (< 2.5 kg)	18.2	8.1	12.1	5.7
Percent of small size baby's at birth ²	20.3	21.4	16.8	24.4
Percent of miscarriages ² (Still births, induced/spontaneous abortions)	12.1	8.4	7.2	8.1
Prevalence of Asthma ² (No. of persons per 1,00,000 population)	1984	1979	2524	2468
Malnutrition among women age, 15–49 (2005–06)³				
Moderately/severely thin (BMI, <17.00 kg/m ²)	14.5	18.6	17.0	15.8
Mildly thin (BMI, 17.0–18.4 kg/m ²)	13.4	17.7	19.3	19.7
Total thin/underweight (BMI, < 18.0 kg/m ²)	27.9	36.3	36.2	35.6
Overweight (BMI, 25.0–29.9 kg/m ²)	15.4	12.1	10.9	9.8
Obese (BMI ≥ 30 kg/m ²)	4.8	4.6	3.6	2.8
Total Overweight/obese (BMI ≥25.0 kg/m ²)	20.2	16.7	14.5	12.6

Source: ⁽¹⁾ India, Registrar General (2004); ⁽²⁾ IIPS and ORC Macro (2000; 2001, 2002a &b); ⁽³⁾ IIPS and ORC Macro (2006:308)

Table 2: Trends in the prevalence of underweight and overweight/obesity among adult women in rural areas of Maharashtra and Gujarat States

Period	Source	Maharashtra			Gujarat		
		Under weight	Overweight/obesity	N	Under weight	Over weight/obesity	N
1975–79	NNMB	57.1	2.5	2389	49.1	3.9	2666
1991–92	NNMB-NSS	54.9	2.9	787	49.0	3.9	781
1996–97	NNMB	50.2	3.2	2022	55.9	4.0	1691
1998–99	NFHS-2	49.8	4.0	2770	48.7	7.4	1920
2000–01	NNMB-NSS	45.1	5.6	1901	33.3	7.8	1776

Source: National Institute of Nutrition (1991, 1993, 1999, 2000 and 2002); IIPS & ORC Macro, 2002a, b.

Data and Methods

The anthropometric data used for analysis in this paper were derived from the second National Family Health Survey (NFHS-2), 1998–99 for the states of Goa, Gujarat and Maharashtra. The objective of the survey was to provide state-level estimates on fertility, family planning practices, infant and child mortality, reproductive health and child health, nutrition of women and children, and quality of health and family welfare services. Data were collected from 1246, 3845 and 5391 ever-married women of age group 15–49 in Goa, Gujarat

and Maharashtra, respectively. The details of the study design as well as sampling frame and sample implementation are provided in the national and state NFHS reports (IIPS and ORC Macro 2000, 2001, 2002a, 2002b). In addition, the survey also collected measures of height and weight from 1219, 3661 and 5179 ever-married women in Goa, Gujarat and Maharashtra, respectively. The weight and height data were used to calculate the Body Mass Index (BMI). The BMI is defined as weight in kilograms divided by the height in meters squared (kg/m^2). According to the WHO (1995) recommendations, the BMI variable was categorized into three groups for the analysis, indicating underweight (BMI, $<18.50 \text{ kg}/\text{m}^2$), normal weight (BMI, $18.5\text{--}24.99 \text{ kg}/\text{m}^2$), and overweight and obese (BMI, $\geq 25.00 \text{ kg}/\text{m}^2$). For the 15–17 years old females in the NFHS-2 sample, the cut-off points recommended by Cole et al., (2000) for adolescent obesity and overweight were used because the BMI values change substantially with age in adolescents. Women who were pregnant at the time of the survey or women who had given birth during the two months preceding the survey, were excluded from the analysis. This is to avoid the exaggerated BMI values for the women due to their pregnancy status. Thus, 1138, 3385 and 4716 ever-married women from Goa, Gujarat and Maharashtra, respectively were included in the analysis.

In order to examine the net effect of each independent variable on malnutrition of women, while controlling for the other independent variables, multivariate logistic regression analysis (Retherford and Choe 1993) is used. As such two logistic regression models were used to identify and to compare the factors associated with *women being underweight* (BMI $<18.50 \text{ kg}/\text{m}^2$) in the first model and *women being overweight or obese* (BMI $\geq 25.00 \text{ kg}/\text{m}^2$) in the second model for each of the state, separately. In both the models of underweight and overweight or obese, women were compared with normal weight (BMI $18.50\text{--}24.99 \text{ kg}/\text{m}^2$) women. The effect of one variable on the prevalence of malnutrition is likely to be confounded with the effects of other variables. Therefore, the following socioeconomic, demographic and other variables/ characteristics were controlled statistically. They are: residence (rural, small city or large city), religion-caste (Hindu-scheduled caste/tribe, Hindu-other backward class, Hindu-other caste, Muslim, and Christian or others), education (illiterate, literate but less than middle school complete, middle school complete and high school and above), standard of living (high, medium, low, as measured by the NFHS-2, IIPS and ORC Macro 2000:27–29, used as a proxy for economic status), work status of woman (working, non-working), current age (15–24, 25–34 and 35–49) and marital status (currently

married, widowed/divorced). The NFHS-2 did not include many factors on life style, physical activity patterns and diets. Therefore, with the limited information available in the data set, the following variables are used as proxy variables for life-style or physical activity indicators. They are: women who ate fruits (proxy measure for other aspects of economic status not captured in the standard of living index) or consume meat/chicken/fish daily (high energy or nutrient dense diets) and occupation of women and who watch television once a week (physical activity). Parity is not included as an explanatory variable in the analyses. Since, evaluation of women's nutritional status across age and parity is probably not the correct way to investigate maternal depletion (Mendez et al., 2005). As the study being cross-sectional, measurements were taken only once. Therefore, issues of seasonal variation that may occur in anthropometric measurements were not addressed. In the survey, certain geographical regions of Goa, Gujarat and Maharashtra and certain categories of households were over-sampled. Therefore, sample weights are used to restore the representativeness of the sample, and sample sizes were lower in the multivariate analyses than in the bi-variate analyses because of missing data for certain variables.

Results

Characteristics of women

The percentage distribution of non-pregnant women aged 15–49 according to selected characteristics in Goa, Gujarat and Maharashtra are presented in Table 3. In these three states, about 60 percent of women are from rural areas. Two-fifths of women in Goa and about one-fourth of women in Gujarat and Maharashtra are from small city/town. Except in Goa, majority of women belong to Hindu but there is considerable variation by caste/tribe. More than one-fifths of women in Gujarat and Maharashtra belong to the other backward classes. About one-third of women in Gujarat and about two-fifths of women in Maharashtra belong to the scheduled castes/tribes. The percentage of women did not belong to any of these caste or class groups are 58, 42 and 35 in Goa, Maharashtra and Gujarat, respectively. The percentage of illiterate women varies from a high (50 percent) in Gujarat to a low (28 percent) in Goa. About one-third of women in Goa and about two-fifths of women in Gujarat and Maharashtra have completed high school and above level of education. More than half of women in Goa and Gujarat and less than half of women in Maharashtra did not participate in work other than their regular housework during the 12 months preceding the survey. About half of the women in Gujarat and Maharashtra and two-fifths in Goa hail from medium

household standard of living group. The proportion of women from low household standard of living was high in Maharashtra (31 percent) and low in Goa (14 percent). In Gujarat and Maharashtra, more than two-fifths of women are in the age group 15–24 and more than one-third of respondents are in the age group of 25–34.

Table 3: Percentage distribution of women according to selected socio-economic, demographic and lifestyle characteristics, Western states of India, NFHS-2, 1998–99

Characteristic	Goa	Gujarat	Maharashtra
Residence			
Rural	57.9	56.7	58.9
Small city/town	40.9	24.5	22.6
Capital, large city	1.1	18.9	18.5
Religion-caste			
Hindu-Scheduled caste/tribe	5.9	32.4	17.5
Hindu-Other backward class	3.2	22.6	20.4
Hindu-Other caste	57.7	34.7	42.4
Muslim	4.2	8.0	9.2
Others	29.0	2.3	10.4
Education			
Illiterate	28.4	50.3	45.2
Literate, < middle school	28.0	20.9	26.8
Middle school	12.1	8.6	10.5
High school and above	31.5	20.2	17.6
Work status			
Not working	56.6	50.3	45.1
Working	43.4	49.7	54.9
Household standard of living (Index)			
Low	13.5	21.0	30.6
Medium	40.2	46.9	46.4
High	46.2	32.1	23.0
Current age			
15–24	8.3	21.8	22.3
25–34	36.8	35.5	39.6
35–49	54.9	42.7	38.1
Marital status			
Currently married	93.7	93.3	91.5
Widowed/divorced	6.3	6.7	8.5
Watches TV every week			
No	18.6	42.8	37.6
Yes	81.4	57.2	62.4
Consumption of fruits daily/weekly			
No	34.3	55.1	55.8
Yes	65.7	44.9	44.2
Chicken, meat, or fish daily/weekly			
No	10.5	87.8	61.9
Yes	89.5	12.2	38.1
Total %	100.0	100.0	100.0
Total N	1138	3385	4716

Note: For non-pregnant ever-married women age 15–49 years; Table excludes women who are pregnant and women with a birth in the preceding two months.

Total includes a small number of women with missing information on standard of living, education, work participation and life style indicators, who are not shown separately.

Source: NFHS-2, 1998–99 data files of Goa, Gujarat, and Maharashtra

In Goa, more than half of respondents (55 percent) are in the age group 35–49 and a small share (eight percent) are in the age group 15–24. More than 90 percent of respondents are currently married women. With regard to lifestyle indicators, such as media and food habits, 81 percent watches television at least once a week in Goa as compared to 62 and 57 percents in Maharashtra and Gujarat, respectively. About ninety percent of women in Goa consume chicken or meat or fish at least once a week as compared to 38 and 12 percent in Maharashtra and Gujarat, respectively. In addition, 66 percent of women in Goa and about 45 percent in Gujarat and Maharashtra consume fruits at least once a week.

Differentials in the prevalence of underweight and overweight

The percentage distribution of ever-married women of age 15–49 according to underweight and overweight or obese by selected characteristics in the three western states are presented in Table 4. The prevalence of underweight/chronic energy deficiency among women is highest in Maharashtra (40 percent) followed by Gujarat (38 percent) and Goa (28 percent). Chronic energy deficiency was particularly serious for women who belong to households with a low standard of living, younger women and rural women. In addition, underweight or suffering from chronic energy deficiency was pronounced among women of scheduled caste/tribe, illiterate and working women. Women who eat fruits or chicken, meat, or fish on a daily or weekly basis were less likely than the other women to have a CED. On the other hand, more than one-fifths (21 percent) of women in Goa were overweight or obese, followed by Gujarat (16 percent) and Maharashtra (12 percent). The percentage of overweight or obese is considerably higher for some groups of women (women from capital city or small city, or who have completed at least high school education, women from high household standard of living, women who are not working, women of age 35–49, women who eat fruits daily/weekly, or women who consume chicken/meat/fish daily or weekly and women who watches television at least once in a week). Moreover, it has been observed that the prevalence of overweight or obese exceeded underweight mostly among women from capital or large cities, well educated and the higher economic group.

Table 4: Percentage distribution of women classified as Underweight and Overweight/obese, according to socioeconomic, demographic and lifestyle characteristics, Western states of India, NFHS-2, 1998–99

Characteristic	Underweight (BMI, <18.50 kg/m ²)			Overweight or obese (BMI, ≥25.00 kg/m ²)		
	Goa	Gujarat	Maharashtra	Goa	Gujarat	Maharashtra
Residence						
Rural	30.7	48.7	49.8	17.6	7.4	4.0
Small city/town	23.0	26.4	31.3	26.6	24.9	19.4
Capital, large city	–	18.6	20.5	–	29.8	27.9
Religion-caste						
Hindu-SC/ST	–	52.2	49.7	–	6.5	6.3
Hindu-OBC	37.3	42.5	41.4	16.7	12.7	9.3
Hindu-OC	30.3	23.8	40.0	18.4	23.9	12.3
Muslim	–	28.6	27.3	–	23.1	21.6
Others	19.7	21.8	33.2	27.7	34.6	17.4
Education						
Illiterate	41.0	48.4	48.9	12.3	8.6	5.6
Literate, < middle	29.5	33.5	38.5	19.1	17.0	12.9
Middle school	30.4	27.4	34.9	16.7	19.2	14.8
High school & above	12.0	19.5	23.6	33.3	31.5	25.1
Work status						
Not working	24.9	29.6	30.9	24.0	20.9	18.2
Working	30.9	45.8	47.8	17.8	10.9	6.8
Standard of living						
Low	56.8	63.0	55.8	1.9	3.0	2.3
Medium	34.4	39.6	39.8	12.9	11.7	9.3
High	13.0	18.0	20.9	34.0	30.4	29.5
Current Age						
15–24	47.4	49.0	53.1	6.3	4.1	2.4
25–34	31.5	41.1	42.0	14.6	12.0	10.2
35–49	21.8	28.9	30.7	28.0	25.2	19.4
Marital status						
Currently married	26.9	36.8	40.5	22.2	15.9	11.9
Widowed/divorced	37.5	49.8	37.0	8.3	15.9	13.0
Watches TV every week						
No	45.3	50.0	53.3	7.1	7.5	3.5
Yes	23.4	28.4	32.3	24.4	22.2	17.0
Fruits daily						
No	36.3	45.3	47.2	12.3	10.3	6.9
Yes	22.8	28.2	31.3	26.2	22.7	18.3
Chicken, meat, or fish daily						
No	37.2	37.7	42.3	15.7	15.5	11.3
Yes	26.4	37.3	36.8	21.9	18.8	13.1
Total %	27.5	37.6	40.2	21.4	15.9	11.9
Total N	1138	3377	4707	–	–	–

Note: 1. For non-pregnant women aged 15–49 years; Table excludes women who are pregnant and women with a birth in the preceding two months.
 2. Total includes a small number of women with missing information on standard of living, education, work participation, and life style indicators, who are not shown separately.
 3. For the state of Goa, Small city/town includes a small sample of Capital city; Hindu-OBC includes a small sample of SC/ST; Other religion includes a small sample of Muslim.

Source: NFHS-2, 1998–99 data files of Goa, Gujarat, and Maharashtra

Determinants of concurrent prevalence of underweight and overweight/obese

It was observed from the earlier bivariate analysis that there are substantial differentials in the prevalence of both forms of malnutrition by socioeconomic, demographic and other

variables. However, some of these variables are associated. Therefore, as discussed in data methods, logistic regression analysis is carried out in two models to quantify the net effects of these background factors on each of the dependent variable. Table 5 & 6 depicts the results of the multivariate analysis of both underweight and overweight or obese and the results are presented in the form of regression coefficients and odds ratio. The *odds ratio*, which is determined from the logistic regression coefficients, tells us the increased or decreased chance of malnutrition given a set level of the independent variable while controlling for the effects of the other variables in the model. Estimates of odds greater than 1.0 indicate that the risk of malnutrition is greater than that for the reference category. Estimates less than 1.0 indicate that the risk of malnutrition is less than that for the reference category of each variable.

Underweight/chronic energy deficiency

The results of the logistic regression analysis on women with underweight with those of normal weight show that underweight or chronic energy deficiency was negatively and significantly associated with residence, education, household standard of living and current age. It may be observed from the Table 5 that in all the three western states, literate women and women who lived in households with medium and high standard of living were at a significantly lower risk of chronic energy deficiency malnutrition compared to illiterate women and women from poorer households. As compared with women residing in poorer households/low household standard of living, women who lived in households with a medium standard of living (odds=0.77 in Maharashtra and 0.57 in Goa and Gujarat) and with a high standard of living (odds=0.56 in Maharashtra and 0.36 and 0.30 in Goa and Gujarat, respectively) have significantly lower probability of being underweight. Women in the age groups 25–34 and 35–49 were also less likely to be underweight as compared with women in youngest age group (15–19). Except in Goa, women from capital city or small city/town were less likely to be underweight than their rural counterparts. In Gujarat and Maharashtra, workingwomen were much more likely to be underweight (odds=1.3) than the non-working women. In Gujarat, Hindu–SC/ST, OBC and never married women were more likely to be underweight/ undernourished than the Hindu–OC and currently married women. Only in Maharashtra, women who reported eating fruits at least weekly (OR=0.81) were less likely to be underweight than those who ate them occasionally or rarely (Table 5).

Table 5: Results of logistic regression analysis on Women being Underweight (BMI, <18.50 kg/m²) Vs Normal weight (BMI, 18.50–24.99 kg/m²), Western states of India, NFHS-2, 1998–99

Characteristic	Values of β co-efficients			Values of odds ratio		
	Goa	Gujarat	Maharashtra	Goa	Gujarat	Maharashtra
Residence^(a)						
Small city/town	-0.109	-0.508	-0.158	0.896	0.602***	0.854@
Capital, large city	–	-0.510	-0.491	–	0.601***	0.612***
Religion-caste^(b)						
Hindu-SC/ST	–	0.526	0.123	–	1.692***	1.131
Hindu-OBC	0.059	0.432	0.047	1.061	1.540***	1.048
Muslim	–	0.307	-0.212	–	1.360@	0.809
Others	-0.371	0.220	-0.055	0.689*	1.246	0.947
Education^(c)						
Literate, < middle	-0.332	-0.067	-0.081	0.717@	0.935	0.922
Middle school	-0.191	-0.279	-0.208	0.826	0.757@	0.813@
High school &above	-0.915	-0.104	-0.330	0.401***	0.902	0.719**
Work status^(d)						
Working	0.154	0.203	0.251	1.167	1.225*	1.285**
Standard of living^(e)						
Medium	-0.581	-0.556	-0.262	0.559**	0.574***	0.769**
High	-1.198	-1.014	-0.579	0.302***	0.363***	0.560***
Current age^(f)						
25–34	-0.499	-0.150	-0.320	0.607@	0.861	0.726***
35–49	-0.906	-0.616	-0.748	0.404***	0.540***	0.474***
Marital status^(g)						
Widowed/divorced	-0.092	0.513	-0.155	0.912	1.670**	0.856
Fruits daily/weekly^(h)						
Yes	-0.063	-0.061	-0.209	1.065	0.941	0.811**
Chicken, meat/fish daily/ weekly⁽ⁱ⁾						
No®						
Yes	-0.242	0.045	-0.096	0.784	1.046	0.908
-2 Log Likelihood	1041.48	3543.54	5229.95			
Chi-square	107.735	354.21	307.98			
d.f.	14	17	17			
Constant	1.289	0.3912	0.6001			
Total N	889	2830	3703			

Note: See Table 4
 Reference categories: a). Rural; b). Hindu-OC; c). Illiterate; d). Not working; e). Low household standard of living; f). 15–24; g). Currently married; h). No; i). No
 Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05; @p≤0.1

Source: NFHS-2, 1998–99 data files of Goa, Gujarat, and Maharashtra

Overweight and obese

The results of the logistic regression model comparing the overweight and obese women with those of normal weight are similar to those shown for the model of underweight, but in the opposite direction. In this model also, residence, education, standard of living and age of women are found to be significant risk factors of overweight or obesity. Except in Goa, urban residence had played a positive role in increasing the likelihood of overweight or obese. The odds of overweight or obese in capital city and small city are 3.0 and 2.6 in Maharashtra and 1.8 and 2.1 in Gujarat, respectively. Muslim women in Maharashtra and non-Hindu

(Christian) women in Goa were more likely (odds = 1.4) to be overweight or obese than the Hindu-OC women. On the other hand, Hindu-SC/ST women in Gujarat were less likely to be overweight/obese than the Hindu-OC women. In Gujarat and Maharashtra, educated women were at a significantly higher risk of overweight or obese compared to illiterate women. In all the three states, women who lived in households with medium and high standard of living had a significantly higher probability of being overweight or obese. As compared with women residing in households with low standard of living, women residing in medium household standard of living (odds = 3.4 and 1.7 in Goa and Gujarat, respectively) and high household standard of living (odds = 6.0, 2.7 and 2.6 in Goa Maharashtra and Gujarat, respectively) were more likely to be overweight or obese. The risk of being overweight or obese increases rapidly with age, older women displayed a higher probability of being overweight or obese compared to younger women in all the three states. Women in the age group 25–34 (odds = 2.6 and 3.6 in Gujarat and Maharashtra, respectively) and 35–49 (odds = 3.6, 6.3 and 6.5 in Goa Gujarat and Maharashtra, respectively) were more likely to be overweight or obese as compared with women in youngest age group (15–19). It is interesting to note that, in Gujarat, never married women (widowed/divorced) were 1.6 times more likely to be overweight or obese than the currently married women. In Goa and Maharashtra, watching television at least once in a week had significant positive effect (odds=1.8 and 1.4, respectively) on the risk of being overweight or obese. For the diet/nutrition variables, women who reported eating fruits at least weekly (OR = 1.41 in Maharashtra) were more likely to be overweight or obese than those who ate them occasionally or rarely.

Table 6: Results of logistic regression analysis on Women being Overweight/Obese (BMI, ≥ 25.0 kg/m²) Vs Normal weight (BMI, 18.50–24.99 kg/m²), Western states of India, NFHS-2, 1998–99

Characteristic	Values of β co-efficients			Values of odds ratio		
	Goa	Gujarat	Maharashtra	Goa	Gujarat	Maharashtra
Residence^(a)						
Small city/town	0.240	0.737	0.941	1.271	2.089***	2.564***
Capital, large city	–	0.578	1.092	–	1.782***	2.979***
Religion-caste^(b)						
Hindu-SC/ST	–	-0.491	-0.199	–	0.612**	0.819
Hindu-OBC	0.337	-0.126	-0.236	1.401	0.882	0.789
Muslim	–	0.110	0.394	–	1.116	1.482*
Others	0.392	0.199	0.025	1.480*	1.220	1.025
Education^(c)						
Literate, < middle	-0.037	0.074	0.238	0.963	1.077	1.268
Middle school	-0.312	0.284	0.373	0.732	1.329	1.451*
High school +	0.111	0.422	0.385	1.117	1.525*	1.469*
Work status^(d)						
Working	-0.328	-0.195	-0.266	0.721@	0.823	0.767*
Standard of living^(e)						
Medium	1.222	0.508	0.338	3.395*	1.663*	1.402
High	1.795	0.964	1.012	6.017**	2.622***	2.751***
Current age^(f)						
25–34	0.474	0.950	1.269	1.606	2.586***	3.557***
35–49	1.281	1.835	1.873	3.600**	6.264***	6.508***
Marital status^(g)						
Widowed/divorced	-0.856	0.502	0.122	0.425@	1.653*	1.129
Watches TV every week^(h)						
Yes	0.581	0.103	0.321	1.788@	1.109	1.378@
Fruits daily/weekly⁽ⁱ⁾						
Yes	0.283	0.093	0.344	1.327	1.110	1.410**
Chicken, meat, or fish daily/weekly^(j)						
Yes	-0.008	0.174	-0.145	0.992	1.189	0.865
-2 Log Likelihood	883.602	2042.935	2195.910			
Chi-square	102.560	347.927	514.73			
d.f.	15	18	18			
Constant	-4.215	-3.656	-4.537			
Total N	816	2114	2968			

Note: See Table 4

Reference categories: a). Rural; b). Hindu-OC; c). Illiterate; d). Not working; e). Low household standard of living; f). 15–24; g). Currently married; h). No; i). No; j). No

Level of significance: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; @ $p \leq 0.1$

Source: NFHS-2, 1998–99 data files of Goa, Gujarat, and Maharashtra

Conclusions

While under-nutrition is still prevalent in India, the rates of overweight and obesity are steadily increasing, with important public health implications for the burden of diseases associated with both extremes of physical status. Though the malnutrition has long been recognized as a serious problem in India, most of the research on determinants of malnutrition among women has concentrated either on underweight (for example, Singh et al., 1999) or overweight (Gopalan 1998; Dudeja *et al.*, 2001). Very little has been done on the

emerging dual burden of both forms of malnutrition, particularly among women (Griffiths and Bentley 2001; Shukla et al., 2002; Roy et al., 2004). This is mainly because of the non-availability of data. Fortunately, data from the second National Family Health Survey and the National Nutrition Monitoring Bureau conducted diet and nutrition surveys in three periods and two separate rural diet and nutrition surveys in a sub-sample of villages of NSSO, adopting sampling design of NSS consumer expenditure survey provides an opportunity for examining the trends in the prevalence of malnutrition and factors associated with the both forms of malnutrition among women. This paper therefore, has examined the trends and determinants of the coexistence of underweight and overweight or obese among women of age 15–49 years using the NNMB and NFHS-2 data.

Major findings emerged from this study are as follow. First, it was observed from the NNMB data that in Maharashtra and Gujarat, there has been a decreasing trend in the prevalence of chronic energy deficiency and an increasing trend in the proportions of overweight or obese over the last three decades. Second, the findings from the multivariate analysis carried out separately for each of the three western states suggest that, broadly similar set of factors is relevant to both under-and-overweight. For example, education, standard of living and age are positively and significantly associated with overweight or obesity and these factors are all inversely related to under-nutrition or with low BMI. It has been observed that women in the highest socioeconomic groups are more likely to be overweight or obese and less likely to be underweight. Apart from socioeconomic status, age also a significant predictor of malnutrition, with older women are more likely to be overweight or obese, and younger women having a higher probability of being underweight or severely thin. These results are fairly consistent findings in many other developing countries, including India, which are in the early stage of nutrition transition (Monteiro *et al.*, 2004; Shukla et al., 2002; Griffiths and Bentley 2001; Singh et al., 1999). Among other variables, religion–caste, work status, marital status and life-style or physical activity factors are also significantly associated with malnutrition; among religious and caste groups, non-Hindu/Christian and Muslim women are more likely to be overweight or obese and OBC and SC/ST women are more likely to be underweight than the Hindu-OC women. Working women are also more likely to be underweight and less likely to be overweight or obese. Further, women who watch television at least once in a week are more likely to be overweight or obese. Women who reported

eating fruits and consume chicken or meat or fish at least weekly are more likely to be overweight or obese than those who ate them occasionally or rarely.

In sum, this study has shown that both chronic underweight and overweight are widespread in the western states and the prevalence varied significantly by population subgroup. These findings illustrate the need for public health programs that are able to address underweight and overweight simultaneously. As discussed in the earlier section, the WHO classification for overweight (BMI, 25.0–29.9) and obese (BMI, >30.0) is used in the analysis. However, if the WHO proposed BMI lower limit of 23 for overweight (instead of the 25 kg/m²) used as the lower cutoff point for overweight women, the gravity overweight situation in the three western state would worsen and the proportion of women classified as overweight or obese would increase from 21 percent to 35 percent for Goa, 16 percent to 26 percent for Gujarat and 12 percent to 28 percent for Maharashtra. The percentage of overweight and obese women would also rise about two times among women living in households with a high standard of living, urban, Muslim women and older women. Therefore, the substantial proportion of overweight or obese persons, together with continuing high overall levels of under-nutrition, produces a dual burden of nutritional disorders in the region. The proportion of the under-over weight women was consistent with the nutrition transition and therefore, these states are undergoing rapid transition. Therefore, effective policies and programmes are urgently required to reduce the both forms of malnutrition. As these may be coexisting, not only at country level but also even at household level, no uniform intervention strategy can be advocated.

What are the policy implications of these findings? Although the factors associated with underweight, obesity and overweight are very similar, the challenges and solutions required to, tackle the extremes of over-and-underweight in the upper and lower socioeconomic groups are not. Hence, information and health education programs for women are needed to help them to understand the components of a healthy diet and to ensure adequate access to health services. Moreover, further research studies on socio-cultural practices, dietary practices, intra-household food distribution, women's physical activity patterns as well as life styles, seasonal food insecurity, and other related factors are urgently required to obtain a fuller picture of high risk populations for both extremes of malnutrition.

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