Does Fertility Influence Nutrition? : The Emerging Linkages in Low and High Fertility States of India

Introduction

India, the second most populous country in the world is in the midst of rapid socioeconomic, demographic, and health transition. In India, fertility declined progressively in the last three decades, but there are large interstate variations. Fertility is uniformly low and has been continuously declining in almost all South Indian and Western states while there is mixed picture in northern states. On one side, eleven Indian states have reached replacement or below replacement level fertility while states like Bihar, Uttar Pradesh and Rajasthan have TFR greater than three. Except for Bihar, Uttar Pradesh and Northeastern states, most states of India exhibited continuous fertility decline in the past one decade.

In the backdrop of modest progress of fertility decline, widespread undernutrition among women and child is a major concern. The poor nutritional condition of young children in India has received much attention recently, but Indian adults are also experiencing a variety of nutritional problems. There are a number of consequences of fertility decline, such as improvement in women and child health, reduction in poverty and infant mortality. However there is new emerging evidence of increasing rate of overweight/obese women (Subramanian et al 2007, NFHS, 2005-06). With fertility decline, nutritional status of adults is likely to improve particularly among women and children. Consequently it is likely to be seen a significant greater prevalence of overweight and obesity while the prevalence of undernutrition is slowed down.

In terms of current nutritional status across states, the percentage of women, who are undernourished, in terms of BMI is high in Bihar (45 percent), Chhattisgarh, and Jharkhand (43 percent each) but comparatively low in Delhi, Punjab, and many of the small northeastern states. Conversely, the percentage of women who are overweight or obese is highest in Punjab (30 percent) followed by Kerala (28 percent) and Delhi (26 percent) which are all low fertility states (NFHS, 2005-06). The percentage of ever-married women age 15-49 who are overweight or obese increased from 11 percent in NFHS-2 to 15 percent in NFHS-3 during which period, TFR declined modestly in several low fertility states.

Indian women and children also suffer from very high prevalence of anaemia. The anaemia prevalence levels are more than two times higher among women than men with almost half of them with moderate to severe anaemia. A cursory look at the pattern of declining fertility and

1

that of the persisting high level of undernutrition and anaemia among women and children may seem unrelated. However, the recent sharp rise in the percentage of overweight and obese women in most of the low fertility states give rise to a hypothesis that fertility decline possibly accentuates the prevalence of overweight and obesity among women.

Problem of overweight and obesity is emerging rapidly and has been recognized world wide. Several researchers concluded that obesity has already reached to the epidemic proportions in developed countries and their observation is that the developing world is on the way to fall into its grip very soon (Hill and Peters 1998, Popkin and Doak 1998).

Countries like India are still burdened with major problem of undernutrition and at the same time now on the verge of facing the challenges of dealing with the problem of overweight and obesity. Though, the major nutrition problem facing women continues to be undernutrition (Griffiths and Bentley 2001). Overweight and obesity are risk factors for diseases such as diabetes, hypertension, asthma, cardiovascular diseases etc. which are on rise in developing countries, particularly among the middle class and urban population (Gopalan, 1998; Popkin et al., 2001). While chronic energy deficiency is associated with impaired physical capacity (Durnin, 1994), reduced economic productivity (Kennedy, 1994; Untoro, 1998), increased mortality (National Institute of Nutrition, 1991) and poorer reproductive outcomes (World Health Organization, 1995; Schieve et al., 2000). Some evidence in developing countries indicates that malnourished individuals (BMI<18.5) show a progressive increase in mortality rates as well as increased risk of illness (Rotimi et al., 1999)

Nutritional status of a person is known to be greatly influenced by socio-economic factors. Socio-economically disadvantaged groups have greater chances of being severely undernourished than their counterparts and this situation is likely to be just reversed in case of overnourishment (Roy et al. 2004, Subramanian et al. 2007). Undernutrition is more prevalent in rural areas. In contrast overweight and obesity are more than three times higher in urban than in rural areas. The prevalence of anaemia is marginally higher in rural than urban areas but anaemia is a common problem in both urban and rural areas. More than 50 percent of women in urban areas are anaemic, with almost a third of them with moderate to severe anemia (NFHS, 2005-06). Prevalence of anaemia is more among adolescent girls and women than among other groups. About 80 percent of the total anaemic cases are due to iron deficiency in the diet (Muratee, 1990).

The prevalence of malnutrition and anaemia varies among men and women by different characteristics such as religion, place of residence, caste, marital status etc. Despite the knowledge that discrimination in nutrition and health care may lead to severe growth faltering and increased mortality, people tend to discriminate (The World Bank, 1991). Gender inequalities in health are the part of the gender inequalities in social, economic and political lives of the third world societies (Okojie, 1994)

In nutshell, women suffer from a dual burden of malnutrition with nearly half of them being either too thin or overweight. As undernutrition decreases, overweight and obesity increases by about the same amount (IIPS, 2005-06; Subramanian, 2007). It highlights that undernutrition is still a major problem; at the same time there is an emerging challenge of dealing the problem of overweight and obesity.

The compounded problems leading to rise in overweight and obese are that during the past three decades there has been-

- A very small (2-4cm) increase in adult height.
- Significant increase in the mean body weight; this is mostly due to increase in body fat.

Increase in body fat, in the absence of increase in energy consumption, is attributed to the reduction in physical activity. There are very few studies, documenting the physical activity pattern over the last three decades. However it is well documented that over this period there has been-

- Reduction in the number of persons engaged in manual work.
- Substantial improvement in mechanical aids in agriculture industry and allied activities.
- Improvement in access to water and fuel near households, both in urban and rural areas.
- Availability of urban mass transport of affordable cost has resulted in less number people working or cycling to work place, school or market.
- Mechanical aids have reduced physical activity during cooking and other household chores.

 (World Health Organization 2000, 2003)

Apparently declining fertility coupled with reduced physical activity and increased intake of nutrients as a result of improvement in economic status seems to contribute to the rise in the prevalence of overweight and obese.

The demographic literature recognizes positive relationship between nutritional improvement and child survival. Most of the research on determinants of malnutrition among India is done either on underweight (Shetty and James, 1994; Singh, 1999) or on overweight (Gopalan, 1998; Dudeja et al., 2001) but there are very less studies had been done on the emerging dual burden of both forms of malnutrition, particularly in women (Shukla, 2002; Roy et al., 2004; Subramanian 2007). Current evidences suggest a possible reverse causational effect of declining fertility on rising overweight and obesity. However, there has been so far no effort to examine these evidences. In the context of new evidences this study makes an effort to study the reverse causational effect of fertility decline on nutrition including gender-gap in nutrition. In particular, this study examines the changing pattern of women's under vis-à-vis overweight and obesity with fertility decline.

Objectives

The following are the main objectives of the study in accordance with the foregoing discussion.

- To study macro evidence of fertility and nutrition linkages
- To examine micro evidence of differentials in nutrition by levels of fertility and socio-economic and demographic characteristics.
- To study fertility impact on mother's nutrition through multivariate analysis.

Data and Methodology

Data from NFHS-3 are used in this study. Macro level analysis is carried out using estimates given in NFHS-3 reports. Micro level analysis is based on women data file of NFHS-3 data.

In macro level analysis, the estimates of women's nutritional status indicators are compared with fertility rates across the major states of India.

In micro level analysis, women's nutritional indicators are compared by women's parity and background characteristics with comparison of high and low fertility states. Logistic regression analyses are carried out to examine the effect of fertility on the nutritional status of adults by controlling the effect of various socio-economic and demographic factors. Separate analysis is carried out for both high fertility and low fertility states. For the simplification of interpretation, the multinomial regression coefficients are changed to adjusted percentages.

The following two nutritional status indicators have been used in this analysis and WHO definition is used to measure nutritional status:

- Body Mass index
- Anaemia level

NFHS-3 data on height and weight were taken; with these heights and weight Body Mass Index (BMI) is calculated. BMI is defined as weight in kilograms divided by height in meters squared (kg/m2).

As per WHO definition, a cut-off point of 18.5 is used to define thinness or acute undernutrition and a BMI of 25 or above indicates overweight or obesity. A BMI of over 30.0 refers to obesity. A BMI from 18.5 to 24.99 refers to normal weight. The sample for analysis of BMI excludes women who were pregnant at the time of the survey and women who gave birth during the two months preceding the survey.

As per WHO definition, anaemia levels are classified as mild anaemia (10-10.9 grams/deciliter for pregnant women, 10-11.9 g/dl for non-pregnant women, and 12-12.9 g/dl for men), moderate anaemia (7-9.9 g/dl for women and 9-11.9 g/dl for men), and severe anaemia (less than 7 g/dl for women, and less than 9 g/dl for men).

Appropriate adjustments in these cut off points were made for respondents living at altitudes above 1000 metres and respondents who smoke, since both of these group require more haemoglobin in their blood. NFHS-3 report may be referred for more details of procedures equipments used in collecting nutritional data (IIPS, 2005-06)

A comparative analysis of selected high and low fertility states are undertaken to see variation in parity impact on nutrition. The high fertility states in this analysis comprise Uttar Pradesh, Bihar, Rajasthan and Madhya Pradesh and the low fertility states are Kerala, Tamil Nadu, Punjab and Karnataka. These states are purposively chosen on the basis of state TFR levels. The high fertility states have TFR of more than '3' and low fertility states have TFR of less than '2.1'.

The detailed description of variable used in this paper is provided below.
The dependent variables in the regression analysis are:
1) BMI status- (underweight, normal weight and overweight).

2) Any Anaemia (yes and no).

Women parity is used to study the impact of fertility on malnutrition levels. The parity variable comprises 1-2 and 2+. In this analysis, the sample excludes women with parity equal to 0.

Since socioeconomic and demographic factors are important covariates that affect the prevalence of malnutrition, the following socio-economic factors are used as co-predictors in the analysis.

- Place of residence (urban, rural)
- Religion (Hindu, Muslims and others)
- Caste (SC, ST and others)
- Education (no education, primary, secondary and higher)
- Marital status (currently married, ever married)
- Wealth index (poorest, poorer, middle, richer and richest)
- Age group ("15-24", "25-34" and "35-49")
- Working status of respondent (currently working, not currently working)
- Food consumption pattern- Consumption of Fruits/vegetables (frequently, occasionally) and Consumption of Egg/fish/meat (frequently, occasionally)

Results

Fertility and Nutrition

Figure 1 compares the prevalence of nutritional status in the terms of undernutrition, overweight and obesity and anaemia level with total fertility rates across the states. Results show that with declining fertility, the percent of overweight and obese women is increasing but the percent of women with undernutrition and anaemia are decreasing. Bihar with high fertility, has the lowest prevalence of anaemia and obesity and highest prevalence of undernutrition as overweight and obese and undernourished women are 6 percent and 44 percent respectively while Punjab with low fertility has just reverse i.e. highest percent of overweight and obese women and lowest percent of undernourished women (31 percent and 18 percent respectively). With the lowest fertility in the country, Kerala has the lowest percent of anaemic women (33percent).

Figure 2 similarly compares prevalence of anaemia with total fertility rates across the states. Anaemia prevalence by levels of severity show that with declining fertility the prevalence of mild

anemia is decreasing. However the prevalence of moderate and severe anaemia level does not show noticeable variation by fertility.

Figure 1 Prevalence of undernutrition, overweight and obesity and anaemia among women aged 15-49 by total fertility rate in major states of India, NFHS-3, 2005-06
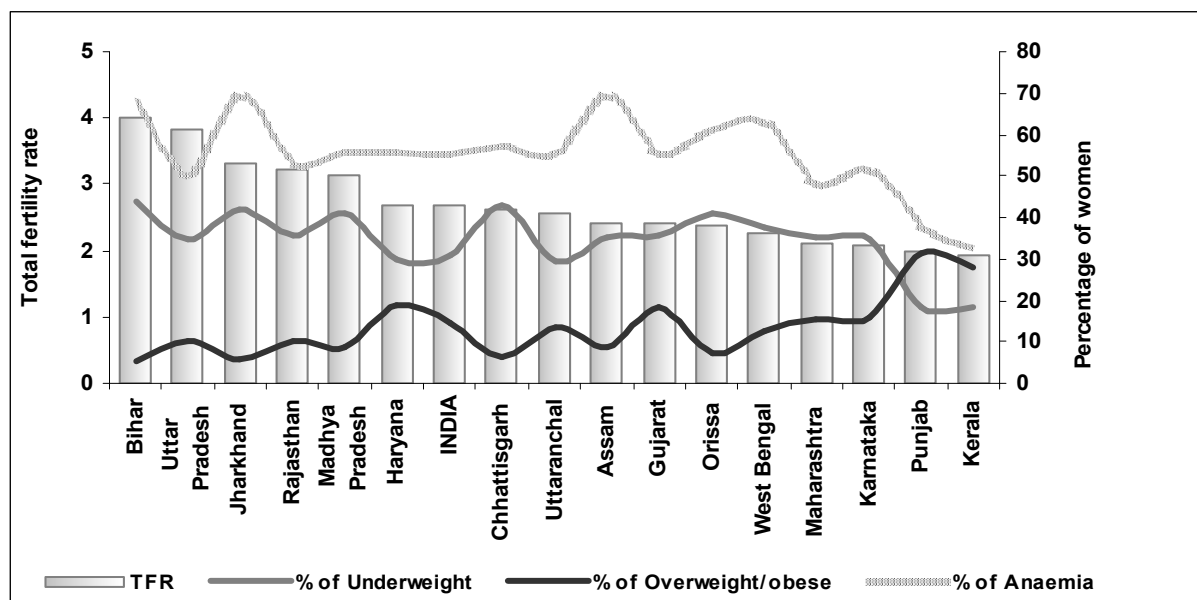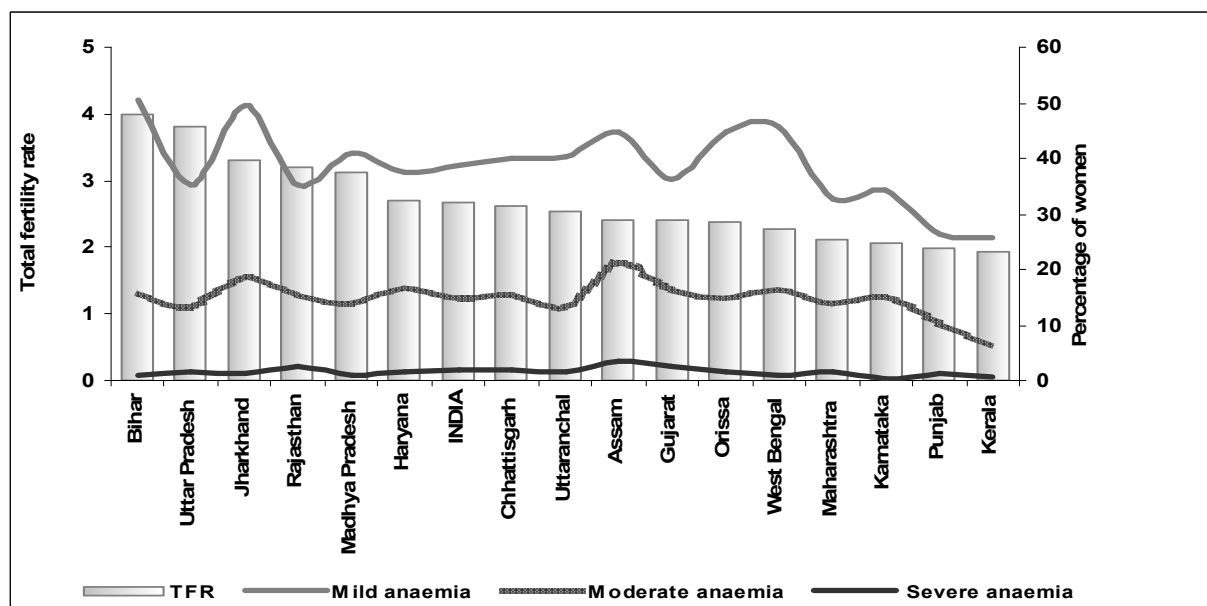

Figure 2 Prevalence of mild, moderate and severe anaemia among women aged 15-49 by total fertility rate in major States of India, NFHS-3, 2005-06

Micro evidence of fertility impact on nutrition

Table 1 and 2 present prevalence of undernutrition, overweight and obesity among women and anaemia level among women by parity and major back ground characteristics with comparison of high and low fertility states. There is a clear trend that the percent of undernourished women decreases for low parity women. Conversely the prevalence of overweight and obesity increases for low parity women.

It is important to note that the trend of higher prevalence of overweight and obesity among low parity women of both high and low fertility states. Secondly, the prevalence of overweight and obesity are substantially higher among low parity women of low fertility states compared to high fertility states. The raising prevalence of overweight/obesity is emerging concern in low fertility states, although the low fertility states show better socio-economic and demographic indicators.

The prevalence of malnutrition of both under and overweight and obesity also shows variation by background characteristics. The percentage of underweight women shows decline and the percent of overweight women shows an increasing trend with increasing age. This trend is evident in both high fertility states as well as in low fertility states and among the women of high parity and low parity. In the high fertility states and among women of high parity, prevalence of undernutrition is highest among women in age 15-24 (44 percent). In the low fertility states and among low parity women, the percent of overweight/obese is highest in 35-49 age group women (38 percent). The difference in the magnitude of undernutrition or overweight and obesity in the high and low fertility states is low for women in age 25-34. It also shows that prevalence of undernutrition is high among not currently married women in high fertility states among high parity women (43 percent) and overweight and obesity is highest among currently married women (32 percent) in low fertility states and among low parity women.

The prevalence of undernutrition is higher in rural areas of high fertility states and among high parity women (40 percent) and prevalence of overweight and obesity is higher in urban areas of low fertility states and among low parity women (41 percent). The prevalence of undernutrition is higher among women in poorest wealth quintile (51 percent) and among women with no education (41 percent). The prevalence of overweight/obese is higher among women with higher education (47 percent) and among in richest quintile (49 percent) among lower parity women. Similar differences are indicated by other socio-economic characteristics.

Table 2 shows differentials in anaemia prevalence by women's parity and background characteristics with comparison of low and high fertility states. The prevalence of anaemia level is highest in high fertility states and among women of high parity. Women in age 15-24 have high prevalence of anaemia (57 percent). Prevalence of anaemia is highest among high parity women, living in rural areas and in high fertility sates (59 percent). The percent of anaemic women is higher among no educated women in high fertility states (61 percent).

Results of Multinomial Logistic Regression

Table 3 presents results of multinomial regression analysis in terms of adjusted percent prevalence of under and overnutrition among ever married women by women's parity and other background characteristics with comparison between low and high fertility states. Multinomial regression analysis also shows that the prevalence of overweight/obesity is higher in the low fertility states compared to women of high fertility states and conversely prevalence of undernutrition is more in high fertility states.

Further, undernutrition is more prevalent among low parity women in age 15-24 in the low fertility states, while in the high fertility states undernutrition is more prevalent among high parity women in age-group 15-24. In contrast overweight/obesity is found to be more prevalent among older women of low parity than young women in low fertility states. Overweight/obesity is more prevalent among older women than younger women of high parity in high fertility states. With lower fertility, a shift in percent overweight/obese is observed to be consistent with the changes in percent of women with normal nutritional status.

As urban women are more likely to report lower fertility and better nutrition levels, significantly greater prevalence of overweight and obesity is found in urban areas compared to rural areas with comparatively lower prevalence of undernutrition. As a consequence of lower social and economic conditions, prevalence of undernutrition is found to be significantly higher among SC/ST women in both low and high fertility states.

Women with higher education and better economic condition are more likely to be found with overweight and obesity as most of them have lower parity due to desire of lesser number of children. At the same time, highly educated and economically better off women with low fertility are at a higher risk of reporting greater physical inactivity. As a consequence, prevalence of overweight and obesity is significantly higher among highly educated and economically better off women and also relatively greater among those women from low fertility states.

Table 4 presents estimates of odd ratios (along with 95% confidence interval) from logistic regression analysis women by parity and background characteristics between low and high fertility states. Odds of being anaemic are higher among women in the high fertility states compared to women of low fertility states. Further, anaemia is more widely prevalent among low parity women in age 15-24 in both low and high fertility states. Anaemia prevalence is more predominant among those women who are less educated and are not economically better off, as a result of poor social and economic condition indeed. As a consequence of lower socio-economic status, anemia prevalence is found to be significantly higher among SC/ST women compared to women in general category.

Summary and conclusions

In this study, an effort has been made to examine emerging reverse causational effect of fertility decline on changing patterns of nutritional status among Indian women. Both macro and micro level evidence documented in this paper suggests that fertility decline tend to lower prevalence of undernutrition and to increase prevalence of overweight and obesity among women. At macro level, the states with high fertility have shown greater prevalence of undernutrition and relatively lower prevalence of overnourishment. In contrast, overweight/ obesity prevalence is found to be significantly higher among low fertility states with comparatively lower prevalence of undernutrition. Similar pattern prevailed for anaemia level among both men and women and between high and low fertility states.

At the micro level, the prevalence of undernutrition is higher among women with higher parity and women of older ages are highly undernourished compared to younger women of lower parity. Contrastingly, problem of overweight/obesity is found to be significantly higher among women in older ages and with lower parity compared to women in younger ages and with higher parity. This pattern is found in both high and low fertility states.

At macro level overall anaemia prevalence shows a declining trend with decline in fertility, but severe and moderate anaemia levels are not showing much variation with declining fertility among women. This pattern is consistent across the major states of India. Mild anaemia is showing declining trend with declining fertility across the major states of India.

The evidences presented in this analysis suggests that fertility decline has a gross or even stronger pattern of association with increasing prevalence of overweight and obesity among women. However, the proximate and other compounding factors of increasing overweight and obesity

needs to be explored through more detailed investigation of changing food consumption pattern, life style and work related activities and so on.

References

Butz, William, P., Habitch, Jean- Pierre (1976) "The Effect of Nutrition and Health on Fertility: Hypothesis, Evidence, and Interventions" Rand Corp., Santa Monica, California (Not published in any Journal)

Doak, C. M. et. al. (2000) "Overweight and Underweight Coexist with in Households in Brazil, China and Russia" *Journal of Nutrition.* Vol. 130, pp. 2965-2971.

Dudeja, V.; Mishra, A. and Pandey, R.M. (2001), BMI does not Accurately Predict Overweight in Asian Indians in Northen India, *British Journal of Nutrition* Vol. 86 pp. 105-12

Durnin, J.V.G.A. (1994), "Low Body Mass Index, Physical Work Capacity and Physical Activity Levels", *European Journal of Clinical Nutrition*, Vol. 48, pp.S39-44.

Frisch, R. E. (1982) "Malnutrition and Fertility" *Science*, Vol. 215 No. 4537, pp. 1272-1274.

Gopalan, C. (1998), Obesity in the Indian Urban 'Middle Class', *Bulletin of Nutrition Foundation of India.* Vol. 19 pp. 1-5

Griffiths, P. L. and Bentley M. E. (2001) "The Nutrition Transition Is Underway in India", *Journal of Nutrition.* Vol. 131, pp. 2692-2700.

Hill, J.O. and Peters J.C. (1998) "Environmental Contribution to the Obesity Epidemic". *Science,* Vol. 280, pp. 1371-1374.

International Institute for Population Sciences, Macro International (2007) *"National Family Health Survey (NFHS-3): 2005-06"* Vol. 1 and 2

Kennedy, E. and Garcia, M. (1994), Body Mass Index and Economic Productivity, *European Journal of Clinical Nutrition*, Vol. 48 pp.45–55.

Muratee, S. (1990) "About Anaemia" *Nutrition*, Vol. 24(2), pp. 3-12.

National Institute of Nutrition (1991), Body Mass Index and Mortality Rates: A Ten Year Retrospective Study, in *Annual Report, 1989–90*, Hyderabad: NIN.

---------- (1991), *Report of NNMB Repeat Surveys (1988-90)*, Hyderabad: NIN.

---------- (1993), *Report of NNMB Repeat Surveys (1991-92)*, Hyderabad: NIN.

Okojie, C.E. (1994) "Gender inequalities of health in third world", *Social Science and Medicine* Vol. 39(9), pp. 1237-1247.

Popkin, B.M.; Horton S.H. and Kim, S. (2001), The Nutrition Transition and Prevention of Diet-related Diseases in Asia and the Pacific, *Food Nutrition Bulletin*, Vol.22 (Suppl. 1) pp.: 58.

Rotimi, C.; I. Okosun; L. Johnson; E. Owoaje; T. Lawoyin; M. Asuzu; J. Kaufman; A. Adeyemo and R. Cooper (1999), The Distribution and Mortality Impact of Chronic Energy Deficiency among Adult Nigerian Men and Women, *European Journal of Clinical Nutrition, Vol.* 53, pp 734-739.

Roy, T.K.; Sumati Kulkarni and Vaidehi, Y. (2004), Social Inequalities in Health and Nutrition in Selected States, *Economic and Political Weekly,* Vol. XXXIV, No 7, February 14-20.

Schieve, L.A.; Cogswell, M.E. and Scahlon K.S. (2000), Pre-pregnancy Body Mass Index and Pregnancy Weight Gain: Associations with Preterm Delivery, The NMIHS Collaborative Study Group, *Obstetric Gynecology,* Vol. 96, pp.194–200.

Shetty, P.S. and James, W.P.T. (1994), *Body Mass Index: A Measure of Chronic Energy Deficiency in Adults*, Food and Agriculture Organization, Food and Nutrition Paper No. 56, Rome: FAO.

Shukla, H.C.; Gupta, P.C.; Mehta, H.C. and Hebert, J.R. (2002), Descriptive Epidemiology of Body Mass Index of an Urban Adult Population in Western India, *Journal of Epidemiology Community Health*, Vol. 56, pp 876–880.

Singh, R. B.; Beegom, R.; Mehta, A. S.; Niaz, M. A.; De, A. K.; Mitra, R. K.; Haque, M.; Verma, S. P.; Dube, G. K.; Siddiqui, H. M.; Wanders, G. S.; Janus, E. D.; Postiglione, A. and Haque, M. S. (1999), Social Class, Coronary Risk Factors and Under-nutrition, a Double Burden of Diseases, in Women During Transition, in Five Indian Cities, *Int. J. Cardiology,* Vol. 69, pp 139–147.

Subramanian S. V., Kawachi I. and Smith G. D. (2007) "Income inequality and the double burden of under- and overnutrition in India", Journal of Epidemiology Community Health, Vol. 61, pp. 802-809.

The World Bank, (1991) *"Gender and poverty in India: A World Bank Country Study"*, Washington DC, The World Bank.

Untoro J.; Gross, R. and Schultink, W. (1998), The Association between BMI and Haemoglobin and Work Productivity among Indonesian Female Factory Workers, *Euro. J. of Clinical Nutrition,* Vol. 52, pp. 131–135.

World Health Organization (1995), *Physical Status: The Use and Interpretation of Anthropometry*, Report of a WHO Expert Committee, Geneva.

---------- (1998), *Obesity: Preventing and Managing the Global Epidemic*, Report of WHO Consultation on Obesity, 3–5 June 1997. Geneva.

---------- (2003), *Diet, Nutrition and the Prevention of Chronic Diseases*, Report of a Joint WHO/FAO Expert Consultation, Technical Report Series No. 916. WHO: Geneva.

World Health Organization (WHO), International Association for the Study of Obesity (IASO), International Obesity Task Force (IOTF) (2000), *The Asia–Pacific Perspective: Redefining Obesity and Its Treatment*, Geneva.

Table 1: Prevalence of undernutrition and overnutrition among women by parity and other background characteristics in selected low and high fertility states, 2005-06

Background Characteristics	Low fertility States						High fertility States					
	Parity<=2			Parity>2			Parity<=2			Parity>2		
	Underweight	Normal weight	Overweight	Underweight	Normal weight	Overweight	Underweight	Normal weight	Overweight	Underweight	Normal weight	Overweight
Age												
15-24	32.7	52.5	14.8	28.6	62.9	8.4	38.2	58.1	3.7	44.4	52.7	2.9
25-34	19.8	53.2	27.0	29.1	53.3	17.6	31.2	54.7	14.1	40.5	52.1	7.4
35-49	14.5	47.2	38.3	18.7	49.9	31.4	21.8	52.6	25.6	34.4	51.4	14.2
Marital status												
Currently married	17.7	50.2	32.2	21.6	50.8	27.6	29.5	55.4	15.1	36.3	51.9	11.8
Not currently married*	26.8	51.6	21.6	23.8	54.6	21.6	35.7	48.5	15.8	42.9	48.6	8.6
Place of residence												
Urban	12.0	47.0	41.0	13.9	47.8	38.3	19.9	51.3	28.8	24.1	48.8	27.1
Rural	23.5	53.0	23.5	25.9	52.8	21.3	35.4	56.7	7.9	40.4	52.5	7.1
Women's education												
No education	34.7	49.1	16.2	28.5	53.2	18.4	38.8	54.8	6.4	40.6	51.4	8.0
Primary	23.7	54.7	21.6	20.3	54.6	25.1	31.3	56.2	12.5	30.7	53.3	15.9
Secondary	13.5	50.1	36.3	13.5	45.8	40.7	23.8	55.2	21.0	24.1	51.8	24.1
Higher	5.9	47.3	46.8	5.2	38.2	56.5	12.7	52.5	34.7	8.9	51.8	39.3
Wealth index												
Poorest	51.4	43.8	4.8	41.2	54.0	4.8	45.4	51.2	3.3	50.8	46.8	2.4
Poorer	41.2	50.6	8.2	38.2	51.1	10.7	36.6	58.6	4.8	43.6	51.5	5.0
Middle	27.6	55.2	17.2	27.2	57.3	15.6	39.3	54.4	6.3	34.7	55.0	10.3
Richer	15.0	55.9	29.1	13.6	54.5	31.9	26.9	57.9	15.2	23.7	57.7	18.6
Richest	5.9	44.8	49.3	5.3	38.5	56.2	13.7	53.2	33.1	12.1	49.6	38.3
Religion												
Hindu	21.0	51.1	27.9	26.4	53.1	20.5	30.0	55.7	14.3	37.4	52.0	10.6
Muslim	11.5	45.9	42.6	12.3	43.2	44.5	35.0	47.6	17.4	33.3	48.6	18.1
Others	9.7	48.7	41.7	9.5	48.4	42.1	13.5	48.0	38.6	17.0	57.0	26.0
Caste												
SC	26.1	51.6	22.4	25.3	52.8	22.0	40.2	52.4	7.4	43.4	49.0	7.6
ST	45.1	46.2	8.7	48.4	44.6	7.0	48.4	48.0	3.6	52.6	45.0	2.4
Others	16.9	49.9	33.2	19.8	50.7	29.5	26.9	55.8	17.4	32.8	53.3	14.0
Overall	18.4	50.3	31.3	21.8	51.1	27.1	30	54.8	15.2	36.7	51.7	11.7

*It excludes never married women

13

Table 2: Prevalence of anaemia among women by parity and background characteristics in selected low and high fertility states, 2005-06

Background characteristics	Low fertility States				High fertility States			
	Parity<=2		Parity>2		Parity<=2		Parity>2	
	Anaemic	Not anaemic	Anaemic	Not anaemic	Anaemic	Not anaemic	Anaemic	Not anaemic
Age								
15-24	51.6	48.4	54.9	45.1	60.4	39.6	64.7	35.3
25-34	43.1	56.9	49.8	50.2	52.3	47.7	56.0	44.0
35-49	43.0	57.0	47.1	52.9	49.9	50.1	55.6	44.4
Marital status								
Currently married	44.4	55.6	48.0	52.0	55.9	44.1	56.5	43.5
Not currently married*	51.6	48.4	52.1	47.9	58.7	41.3	55.1	44.9
Place of residence								
Urban	44.6	55.4	49.3	50.7	48.6	51.4	53.5	46.5
Rural	45.0	55.0	47.8	52.2	59.0	41.0	57.2	42.8
Women's education								
No education	54.5	45.5	51.1	48.9	61.1	38.9	57.6	42.4
Primary	49.5	50.5	48.0	52.0	57.9	42.1	54.3	45.7
Secondary	42.7	57.3	44.8	55.2	50.8	49.2	52.4	47.6
Higher	34.5	65.5	41.2	58.8	44.2	55.8	53.6	46.4
Wealth index								
Poorest	62.0	38.0	56.2	43.8	65.9	34.1	60.6	39.4
Poorer	55.9	44.1	54.0	46.0	58.0	42.0	58.3	41.7
Middle	52.2	47.8	51.0	49.0	56.8	43.2	55.5	44.5
Richer	43.9	56.1	44.9	55.1	52.8	47.2	51.1	48.9
Richest	36.2	63.8	41.1	58.9	46.3	53.7	49.2	50.8
Religion								
Hindu	47.6	52.4	50.5	49.5	56.0	44.0	56.6	43.4
Muslim	41.4	58.6	48.2	51.8	58.3	41.7	56.0	44.0
others	33.9	66.1	39.1	60.9	42.4	57.6	42.8	57.2
Caste								
SC	53.4	46.6	48.3	51.7	59.6	40.4	57.1	42.9
ST	56.0	44.0	50.3	49.7	74.8	25.2	70.5	29.5
others	43.4	56.6	48.5	51.5	53.6	46.4	54.4	45.6
Overall	44.8	55.2	48.3	51.7	56	44	56.5	43.5

*It exclude never married women

14

Table 3: Adjusted prevalence of malnutrition among women in high and low fertility states by different predictors- Results of Multinomial regression analysis, 2005-06

Background Characteristics	Low fertility states			High fertility states		
	Underweight	Overweight	Normal	Underweight	Overweight	Normal
Parity						
<=2®	19.2	23.6	57.2	31.3	6.6	62.1
>2	18.5	23.0	58.5	33.7*	6.2	60.1
Age						
15-24®	25.3	14.1	60.6	34.2	2.7	63.1
25-34	19.7*	21.9***	58.4	32.0	7.5***	60.5
35-49	13.8***	33.9***	52.3	26.8**	13.9***	59.3
Place of residence						
Urban®	16.6	27.7	55.8	32.5	8.8	58.7
Rural	20.6**	20.5***	59.0	30.8**	5.8***	63.4
Caste						
SC®	18.2	25.4	56.3	35.1	5.7	59.1
ST	29.9***	12.4**	57.7	39.4*	3.5**	57.1
Others	18.7	23.2*	58.1	29.6***	7.2**	63.2
Marital status						
Currently Married®	18.7	23.6	57.7	31.1	6.6	62.4
Not currently married	20.2	20.4*	59.5	34.7*	6.5	58.8
Religion						
Hindu®	20.8	20.9	58.3	31.1	6.2	62.7
Muslim	16.6	32.0***	51.4	32.8*	9.2***	58.1
Others	12.9***	29.6***	57.5	26.9	6.5	66.6
Women's education						
No education®	22.9	20.0	57.1	32.3	5.6	62.1
Primary	20.0**	19.9	60.0	30.3	7.0**	62.7
Secondary	17.9***	25.4***	56.7	31.0	8.0***	60.9
Higher	13.9***	26.6**	59.5	26.1	8.5**	65.4
Wealth quintile						
Poorest®	41.0	6.0	53.0	44.4	2.6	53.0
Poorer	36.6	10.9***	52.5	38.8***	4.1**	57.1
Middle	26.8***	16.2***	56.9	33.6***	6.7***	59.7
Richer	16.9***	24.9***	58.2	23.8***	10.7***	65.4
Richest	9.0***	40.4***	50.7	15.0***	18.3***	66.8
Women's work status						
Working®	20.3	19.9	59.8	31.5	5.3	63.1
Not working	17.9	25.6***	56.4	31.1	7.4***	61.5

*P<0.10, **P<0.05, ***P<0.01, ®: Reference category in regression analysis

Table 4: Relationship between fertility and Anaemia prevalence among ever married women- Result of Logistic regression analysis, 2005-06

Background characteristics	Low fertility states		High fertility states	
	Odd Ratio	95% C. I.	Odd Ratio	95% C. I.
Parity				
<=2®				
>2	1.04	0.96-1.13	1.05	0.97-1.14
Age				
15-24®				
25-34	0.78***	0.70-0.88	0.76***	0.69-0.83
35-49	0.76***	0.68-0.86	0.75***	0.68-0.83
Place of residence				
Urban®				
Rural	0.83***	0.77-0.90	0.99	0.91-1.08
Caste				
SC®				
ST	0.93	0.74-1.17	1.76***	1.54-2.01
Others	0.95	0.86-1.04	0.92*	0.85-1.00
Religion				
Hindu®				
Muslim	1.01	0.89-1.14	1.07	0.97-1.18
Others	0.72***	0.65-0.80	0.79	0.59-1.06
Marital status				
Currently Married®				
Not currently married	1.13	0.98-1.30	1.00	0.86-1.16
Women's education				
No education®				
Primary	0.97	0.87-1.08	0.97	0.88-1.06
Secondary	0.89**	0.80-0.98	0.90**	0.82-0.99
Higher	0.72***	0.60-0.85	0.9	0.75-1.08
Wealth quintile				
Poorest®				
Poorer	0.88	0.74-1.04	0.92*	0.84-1.00
Middle	0.78***	0.67-0.92	0.87**	0.79-0.96
Richer	0.62***	0.53-0.73	0.76***	0.68-0.84
Richest	0.52***	0.43-0.62	0.69***	0.60-0.79
Women's work status				
Working®				
Not working	0.92**	0.85-0.99	1.07*	1.00-1.14
Log likelihood =	-8411.23		-11907.8	

*P<0.10, **P<0.05, ***P<0.01, ®: Reference category in regression analysis