

## 7.7. DIETARY INTAKE AND NUTRITIONAL STATUS OF ADULT

### Dietary Intake

NNMB surveys provide data on time trends in dietary intake (by 24 hours dietary recall) and nutritional status of the adult population in eight states from 1975 to 2005. INP survey provides data on dietary intake (by 24 hours dietary recall) and nutritional status of adults in non NNMB states in mid nineties.

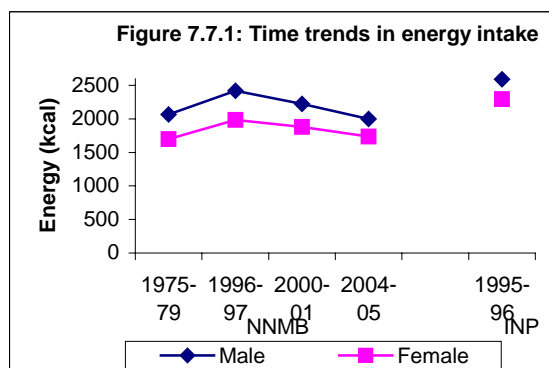
Data from NNMB and INP surveys show that in the mid nineties average intake of cereals was near RDA. The reported intake of foodstuffs is higher in INP states as compared to NNMB states (Table 7.7.1 and Figure 7.7.1); this is attributable to higher dietary intake especially cereals and pulses in the non-NNMB states, which were covered in the INP. Intake of pulses, vegetables and fruits are low among both men and women in all states (Table 7.7.1). NNMB data showed that over time there has been an increase in fats and oil intake; there has been a reduction in average intake of cereals among both men and women especially since mid nineties (Table 7.7.1).

			Cereals & Millets	Dairy products	Pulses & Legumes	Vegetables	Green leafy vegetables	Others (includes tubers)	Fruits	Fats & oil	Sugar & jaggery
NNMB	Men	75-79	495	66	37	59	13	55	14	11	18
		88-92	531	86	32	51	9	53	23	16	23
		96-97	541	74	35	56	17	54	31	15	21
		00-01	457	85	34	75	18	57	28	14	17
		05-06	418	94	31	68	17	63	27	16	15
	Women	75-79	386	56	31	51	11	47	11	9	16
		88-92	445	92	32	40	8	45	30	14	23
		96-97	434	72	29	53	16	49	24	13	21
		00-01	389	67	26	69	18	50	20	12	16
		05-06	365	80	27	63	18	52	26	13	14
INP (1995-96)	Men	543	119	41	112	41	81	20	17	19	
	Women	468	113	37	101	37	72	19	26	18	
RDI	Men	460	150	40	50	40	60	*	20	30	
	Women	410	100	40	50	100	40	*	20	35	

Source: Reference 7.7.6, 7.7.2. \* not available.

### Nutrient intake

Data on time trends in nutrient intake is available from NNMB and INP surveys (Table 7.7.2). Data from NNMB surveys shows that energy intake was high in mid nineties and subsequently there has been a small decline in energy intake. There has been some decline in intake



			Protein (g)	Total Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit A (ug)	Thiamin (mg)	Ribo (mg)	Niacin (mg)	Vit. C (mg)
<b>NNMB</b>	<b>Adult Men</b>	1975-79	55.7	20.3	2065	98	26	142	1.3	0.8	13	28
		1996-97	60.1	27.4	2418	421	27	172	1.1	1	14	36
		2000-01	58.7	34.4	2225	523	17.5	242	1.4	0.8	17.1	51
		2004-05	54.8	26.9	2000	511	16.9	267	1.3	0.7	16.1	50
	<b>Adult Women (NPNL)</b>	1975-79	45.4	17.1	1698	330	21	118	1	0.7	11	24
		1996-97	49.9	24.5	1983	382	22	148	0.9	0.8	12	32
		2000-01	48.2	27.6	1878	445	14.1	220	1.2	0.6	14.9	44.7
		2004-05	46.5	21.8	1738	443	13.8	254	1.1	0.6	14.2	47
<b>INP</b>	<b>Men</b>	1995-96	79.7	35.2	2592	716	26.1	397	2.12	1.2	22.6	66.8
	<b>Women</b>	1995-96	70.8	32.1	2293	659	23	376	1.84	1	20.3	62.6

Source: Reference 7.7.6, 7.7.2

of most of the nutrients among both men and women over the last three decades. In spite of increasing oil and fat intake the proportion of dietary energy from fat remains lower than 15 %. Dietary intake of iron in Indian dietaries has always been low. The steep decline in iron intake reported in the last NNMB survey can be attributed to different estimation methods, which showed that absorbable iron was 50 % less as compared to earlier values.

### Source of dietary energy

Data on time trends on total energy intake, % of energy intake from fat, carbohydrate and protein from NNMB (9 states) and data on in total energy

		Survey	Year	Men	Women
		>18 <sup>#</sup>			
Total Dietary Energy Intake (Kcals)	NNMB		<b>1975-79</b>	2065	1698
			<b>1996-97</b>	2488	2106
			<b>2000-01</b>	2225	1878
			<b>2004-05</b>	2000	1738
		INP	<b>1995-96</b>	2592	2293
% Dietary energy from fat	NNMB		<b>1975-79</b>	8.9	9.1
			<b>1996-97</b>	12.4	13.9
			<b>2000-01</b>	13.9	13.9
			<b>2004-05</b>	12.1	11.3
		INP	<b>1995-96</b>	12.2	12.6
% Dietary energy from protein	NNMB		<b>1975-79</b>	10.8	10.7
			<b>1996-97</b>	10.2	9.9
			<b>2000-01</b>	10.6	10.6
			<b>2004-05</b>	11	10.7
		INP	<b>1995-96</b>	12.3	12.4
% Dietary energy from Carbohydrates	NNMB		<b>1975-79</b>	80.3	80.2
			<b>1996-97</b>	74.8	76.2
			<b>2000-01</b>	75.5	75.5
			<b>2004-05</b>	76.9	78
		INP	<b>1995-96</b>	75.5	75

<sup>#</sup>, No dis-aggregation of data age-wise after 18 years of age Source: Reference 7.7.6, 7.7.2. Survey Population: Rural (NNMB), Rural & Urban (INP)

intake, % of energy intake from fat, carbohydrate and protein from all the major states from India Nutrition Profile for adult men and women is given in Table 7.7.3. Carbohydrates remain the major source of energy in the Indian diet. Data from diet surveys suggest that dietary intake has not under gone any major shift towards increase in consumption of fat/oils, sugar and processed food; neither has there been any increase in energy intake. Since mid-nineties there was a reduction in the % of energy from cereals. There was increase in percentage of energy from fat till 2001, but subsequently there was a reduction in percentage energy from fat. However, even in 2001 the percentage of energy from fat was below 15% (WHO/FAO recommendation)

### Nutritional status of adults

NNMB surveys provide data on time trends in nutritional status of adults in rural and urban slums (Table 7.7.4). NFHS surveys 2 and 3 provide data on nutritional status of women in reproduction age and NFHS-3 has provided data on nutritional status of men and women in all major states. All these surveys show that prevalence of undernutrition in adults is higher in rural areas as compared to

				Rural	Urban	Men	Women
<b>Undernutrition</b>	<b>NNMB</b>	<b>Rural</b>	1975-79	53.2		55.6	51.8
			1989-90	49		49	49.3
			1996-97	48.5		45.5	47.7
			2000-01	38.6		37.4	39.3
			2004-05	34.8		33.2	36
		<b>Urban slum</b>	1993-94		20.3	22.2	19.4
	<b>INP</b>	<b>U+R</b>	1995-96	34.6	27.7	28.6	36.3
	<b>NFHS-3</b>	<b>Men</b>	2005-06	33.1	17.5	28.1	
	<b>NFHS-2</b>	<b>Women</b>	1998-99	40.6	22.6		35.8
<b>NFHS-3</b>	2005-06		38.8	19.8		33	
<b>Overnutrition</b>	<b>NNMB</b>	<b>Rural</b>	1975-79	2.9		2.3	3.4
			1989-90	3.1		2.6	4.1
			1996-97	4.5		4.1	6
			2000-01	6.6		5.7	8.2
			2004-05	9.6		7.8	10.9
		<b>Urban</b>	1993-94		8.8	5	10.6
	<b>INP</b>	<b>U+R</b>	1995-96	4.1	6	4.3	4.6
	<b>NFHS-3</b>	<b>Men</b>	2005-06	7.3	22.2	12.1	
	<b>NFHS-2</b>	<b>Women</b>	1998-99	5.9	23.5		10.6
<b>NFHS-3</b>	2005-06		8.6	28.9		14.8	
<i>Source: National Nutrition Monitoring Bureau 1988-90, 1996-97, 2000-01; India Nutrition Profile, 1995-96; National family Health Survey, 2005-06. Survey Population: NNMB Rural (1975-79, 1988-90, 1995-96, 2000-01) &amp; Urban (1993-94); INP (1995-96) Sample size: NNMB, 11973 (1975-79), 21398 (1989-90), 30773 (1996-97), 11074 (2000-01); INP, 177841 (1995-96), 2772 (1993-94)</i>							

urban areas. Prevalence of overnutrition is higher in urban areas. Over the last three decades there has been a progressive decline in undernutrition and some increase in overnutrition both in urban and in rural areas. Prevalence of both undernutrition and overnutrition are higher in women as compared to men.

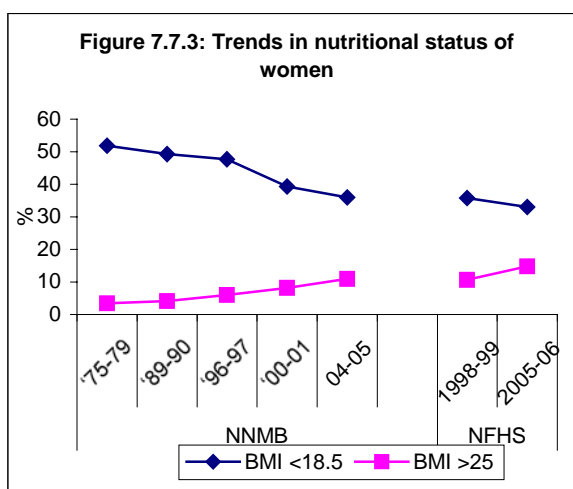
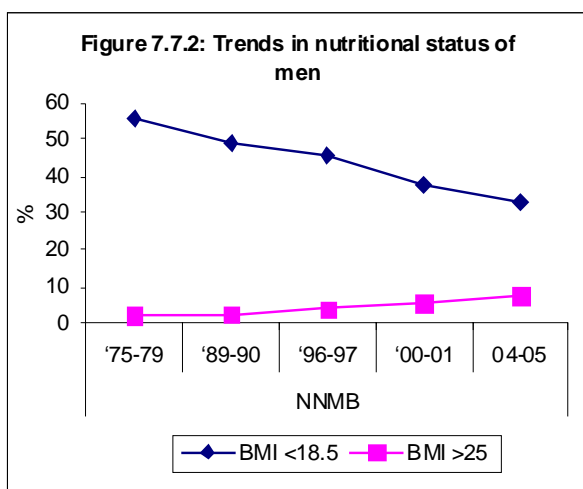
NFHS-2 (1998-99) data showed prevalence of overnutrition is four fold higher in urban as compared to rural areas. There is a progressive decline in the prevalence of under nutrition and progressive increase in the prevalence of overnutrition in adult women with increase in age. All the available data from NSSO and NNMB surveys show that from mid-nineties there has been a progressive reduction in the energy intake. In spite of this there has been a progressive increase in overnutrition rates. This is most probably due to changes in life style, reduction in physical activity and consequently reduction in energy requirement. Data from NNMB reports also show that undernutrition rates in both men and women have decreased and overnutrition rates have increased over the last three decades (Figure 7.7.2 and 7.7.3)

**Table 7.7.5: Prevalence of Under-nutrition and over nutrition among adults**

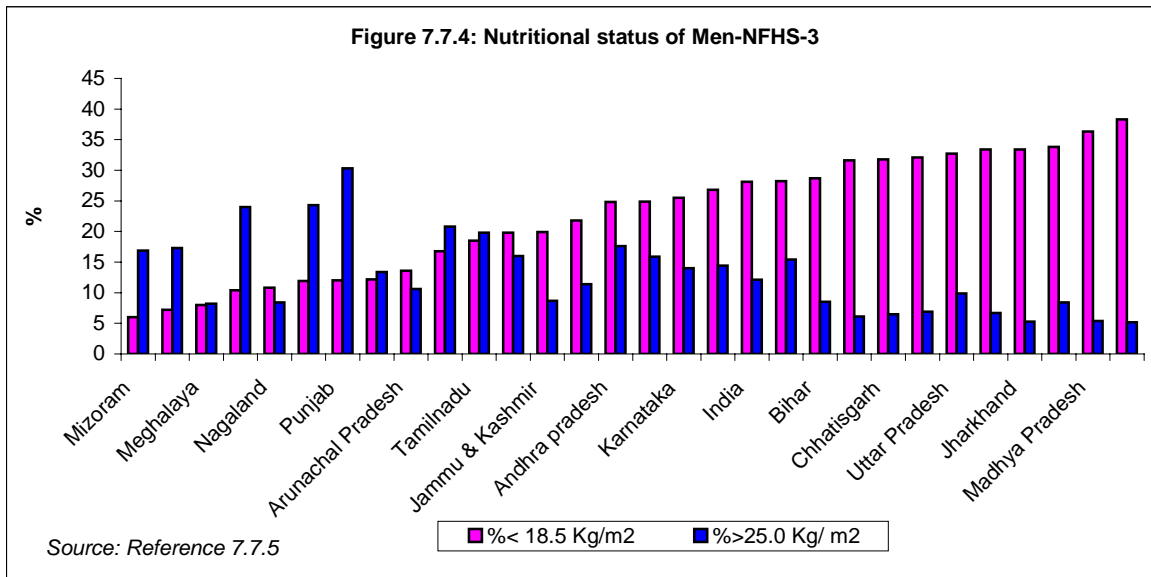
Profile	Mean BMI	Undernutrition	Overnutrition
	1998-99	1998-99	1998-99
Rural	19.6	40.6	5.9
Urban	21.1	22.6	23.5
<b>Women</b>			
<b>Age (Years)</b>			
15-19	19.3	38.8	1.7
20-24	19.3	41.8	3.6
25-29	19.8	39.1	7.3
30-34	20.4	35.0	11.7
35-49	21.1	31.1	16.8
All	20.3	35.8	10.6

Source: Reference 7.7.5.  
Survey Population: Rural & Urban  
Sample Size: 77119 (1998-99)

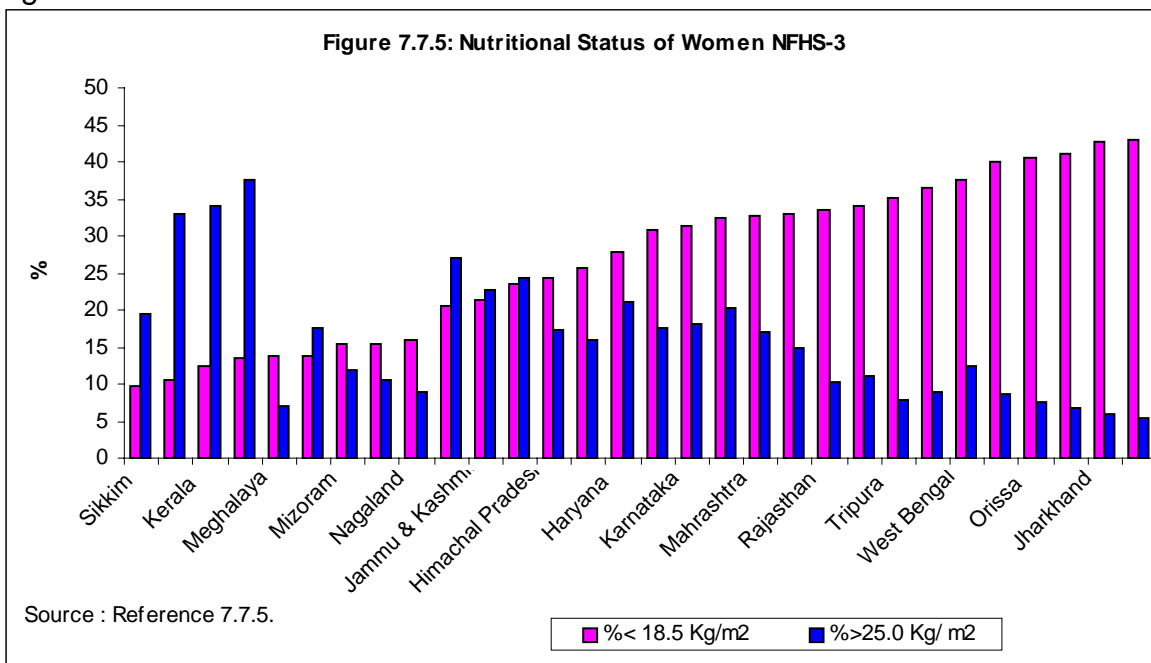
Data from NFHS showed that in the last decades in India (Figure 7.7.3) in majority of the states, there have been reductions in undernutrition and an increase in overnutrition in women (Annexure 7.7.2). Undernutrition rates have increased in Bihar, Jharkhand, Chhatisgarh, Madhya Pradesh, West Bengal, Assam, and Maharashtra. Overnutrition rates have increased in Punjab, Kerala, Goa, Tamilnadu, Jammu and Kashmir, Haryana and Gujarat. West Bengal and Maharashtra showed a reduction in overnutrition rates but concomitant increase in undernutrition rates.

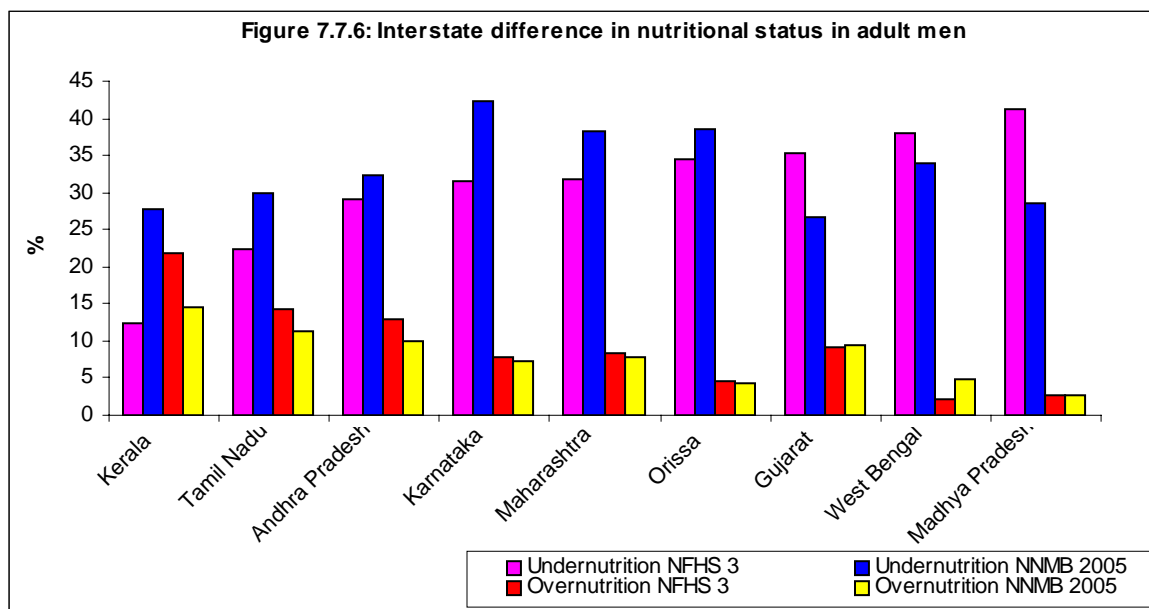


### Interstate differences in adult nutritional status



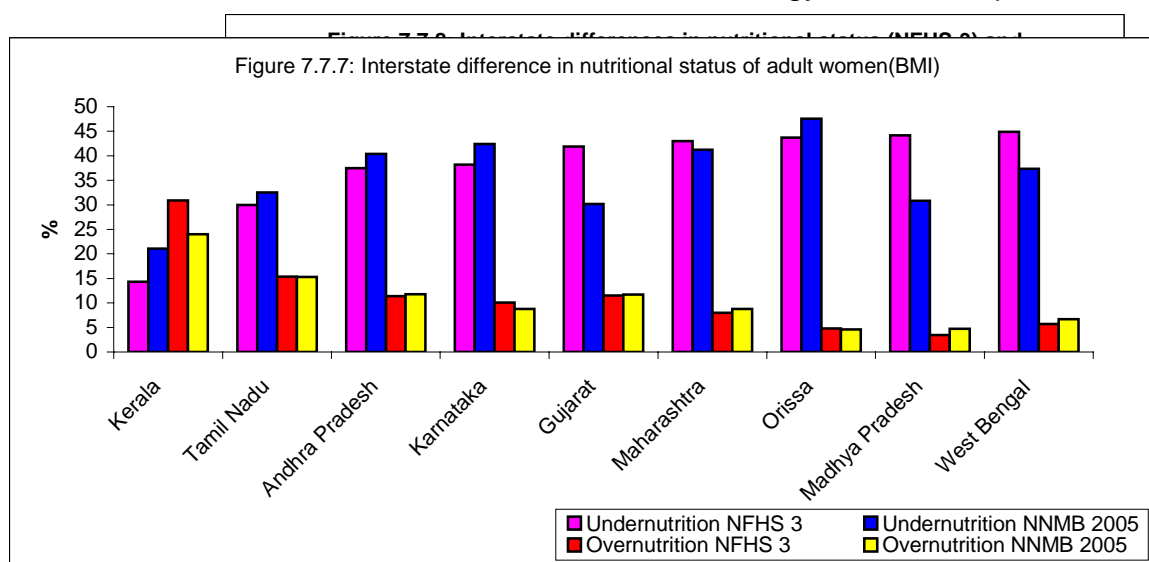
Data from the INP, NNMB and NFHS showed that all the states in India have entered the dual nutrition burden era (Annexure 7.7.1). Data from NFHS-3 show that prevalence of both under and overnutrition in women is higher than men (Figure 7.7.4 & 7.7.5). Populous states like Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan and Orissa have high undernutrition and low overnutrition rates. States like Delhi, Punjab has low undernutrition and high overnutrition rates. However, there are states like Goa, Tamilnadu, Himachal have relatively high undernutrition and overnutrition rates.





Comparison on prevalence of over nutrition in men and women as reported by NFHS (05-06) and NNMB 2005 is shown in Figure 7.7.6 and 7.7.7. NFHS-3 has reported higher overnutrition rates in men and women in Kerala. Except for this in most of the states there was concordance in reported overnutrition rates between the two surveys. But there is less concordance in the data on prevalence of undernutrition reported by NFHS-3 and NNMB. NFHS-3 has reported higher undernutrition rates in West Bengal, Madhya Pradesh and Gujarat. This disparity may be partly attributable to the different sampling framework adopted in the two surveys.

There are substantial interstate differences in the energy intake and prevalence



of undernutrition in women (Figure 7.7.8). In most of the states with low energy intake, undernutrition rates are high (Bihar). In states with high-energy intake eg Punjab, undernutrition rates in women are lower. However there are exceptions

to this. In Orissa in spite of high energy intake undernutrition rates are high. In Tamil Nadu inspite of low energy intake, undernutrition rates are not high. Kerala with relatively low energy intake has undernutrition rates comparable to Punjab. Lower physical activity levels in occupational and household activities, better availability of transport, fuel and water in Kerala and Tamil Nadu may account for the low undernutrition rates in adults' inspite of low energy intake.

## Physical activity

Physical activity is one of the major determinants of energy requirement. Physiologists recognize four domain of physical activity; work, domestic, transport and discretionary time. Until two decades ago in most developing countries including India, physical activity in work, domestic and transport domains were very high. As a result majority of the population expended very little energy in discretionary physical activity. Because of the high physical activity level in daily chores, majority of the population were moderately active and hence their energy requirement were that of moderately active population. They enjoyed the health benefits of moderate physical activity without any discretionary physical activity (Figure 7.7.9).

The last two decades witnessed tremendous change in lifestyle. The availability of transport both personal and public has improved several fold (Figure 7.7.10) and energy expenditure in reaching places of study/work has become a fraction of what it was two decades ago. This is also reflected in the consumption expenditure pattern. The NSSO surveys have shown steep increase in expenditure on transport. Better access to water and fuel both in urban and rural have resulted in substantial reduction in energy spent by women on collecting water and fuel.

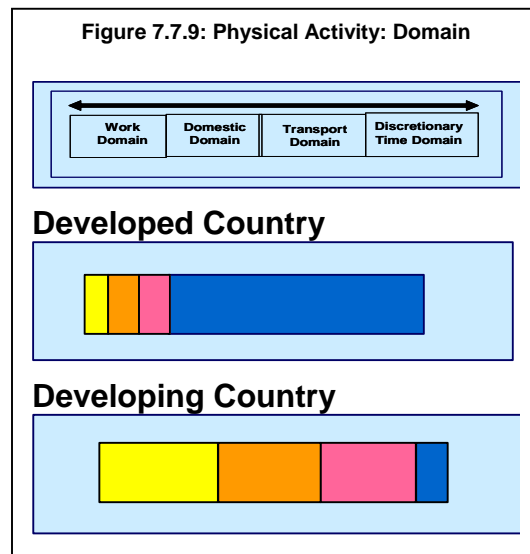
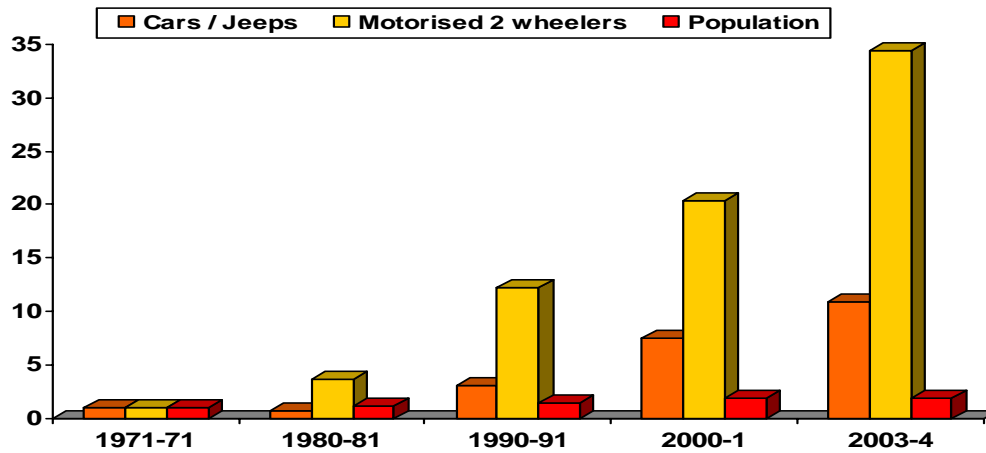


Figure 7.7.10: Relative increase in the production of vehicles and the population (1970-2004)

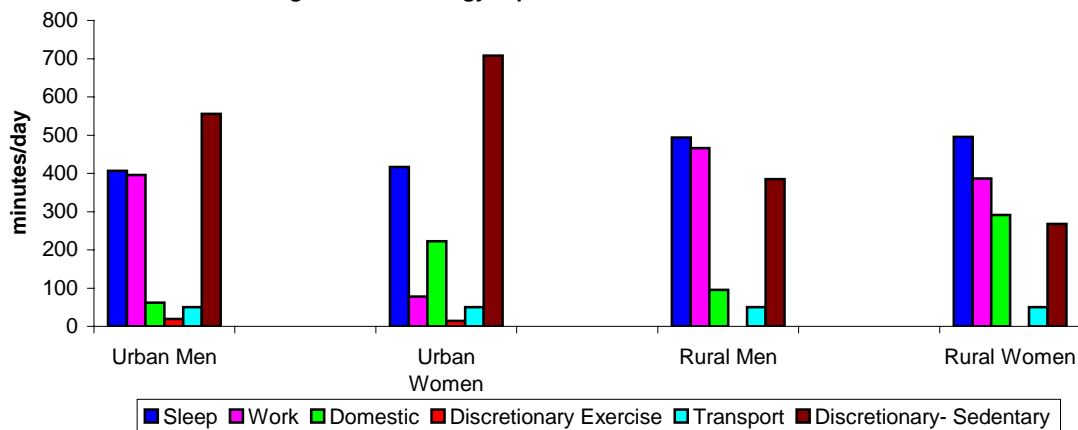


Source: Reference 7.7.1

During the last decade some well-planned studies investigating physical activity pattern in urban and rural areas and in different income group have been initiated. The PURE India study documented level of mechanization for transport and domestic activities in urban and rural areas (Table 7.7.6).

It is obvious that in urban areas, transport as well as household activity is highly mechanized. Majority of urban population are working in white or blue-collar jobs; where occupation related physical activity levels are low. As a result even though urban men and women spend time in domestic and occupation related activities, their energy expenditure for these activities is low (Figure 7.7.11). Their discretionary activities are TV watching, computer games etc with very low

Figure 7.7.11: Energy expenditure on various activities



Source: Reference 7.7.8

energy expenditure. Unlike the developed countries population do not undertake energy intensive discretionary activities. This is one of the major factors responsible for the reduction in energy required. Unchanged dietary intake and reduced physical activity is responsible for increase in overnutrition in the population.



## Energy balance studies in urban affluent population

Cross sectional studies undertaken among affluent housewives (PhD dissertation - 2003) in the age group of 30 - 70 years in Delhi showed that their dietary intake remained unaltered between 2100 - 2300 kcal/day. In each age group the energy expenditure was lower by about 70 - 100 kcal/day. This positive energy balance was associated with a weight gain of about five kg per decade (Table 7.7.7). These women did not make any conscious effort to increase physical activity or take up regular exercise regime

until they were over sixty years of age or had health problems. It is possible that similar situation exists among men in these segments of population. Small but persistent positive energy balance accounts for the slow but steady weight gain in adults among affluent segments of population.

	Rural	Urban
Monthly Household income (Rs)	1860	12674
Transport		
Motorized two-wheelers	7.9	78.2
Car	0.2	12.2
Household appliances		
Washing machine	0.1	41.4
Kitchen mixer / blender	4.5	95.2
Leisure		
Television	24.9	98.2

*Source: Reference 7.7.8*

During the last three decades there has been a progressive decline in poverty

Groups	Weight (Kg)	BMI (kg/m <sup>2</sup> )	BF%	TDEI (kcal)	TDEE (Kcal/day)	Energy Balance (Kcal)	Measured RMR (kcal/day)	PAR <sub>RMR</sub> (TDEE/ measured RMR)
D3 (30-39y) [n=22]	59	24.8	32.8	2,134	2056±238.7 (1724.5-2665.5)	+78	1562± 260 (1166-2059)	1.33±0.14 (1.12-1.59)
D4 (40-49y) [n=20]	64	26.4	36.5	2,264	2191±306.6 (1785.4-2817.3)	+73	1779± 273 (1267-2304)	1.24±0.10 (1.10-1.49)
D5 (50-59y) [n=20]	69	28.6	40.3	2,195	2146±173.1 (1849.4-2494.0)	+49	1752± 274 (1224-2203)	1.24±0.12 (1.06-1.51)
D6 (60-69y) [n=14]	66	29.3	44.0	2,065	1971±118.4 (1770.0-2144.3)	+94	1457 ±154 (1224-1742)	1.36±0.14 (1.16-1.69)
D7 (70-88y) [n=07]	56	24.5	38.5	1562	1736±162.8 (1553.0-2012.0)	-174	1292± 108 (1152-1454)	1.35±0.14 (1.15-1.52)

*Source: Reference 7.7.7*

ratio and a steep increase in per capita income. Economic improvement inevitably results in improved purchasing power, ability to purchase variety of food items and consume many of them. This in turn can lead to some increase in energy intake. Simultaneously there is a reduction in physical activity and perhaps increase in work related stress because of change in occupation. The combination of all these factors might be responsible for the rapid increase in

overnutrition, and hypertension in segments of population who have just emerged from poverty. This situation might also apply to rural migrants who had settled down in urban areas.

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