NUTRITION TRANSITION IN INDIA
1947-2007

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Acknowledgement

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Prema Ramachandran

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1. INTRODUCTION

1. INTRODUCTION

India is a vast and varied subcontinent, with 2.4% of its global landmass supporting over one-sixth of the world's population. As of 2001, India's population is 1028 million; they live in 220 million households in 35 states and Union Territories (Annexure 1.1). As a developing country with high population density India's planners recognized right from the time of India's independence, the importance of planned growth of the economy with emphasis on human resource development. They also recognized that optimal nutrition and health are prerequisites for human development. Article 47 of the Constitution of India states that, "the State shall regard raising the level of nutrition and standard of living of its people and improvement in public health among it's primary duties".

At the time of Independence both acute and chronic undernutrition were major problems. There was the recurrent threat of famine and the resultant acute starvation due to low agricultural production and the lack of an appropriate food distribution system. The not-so-dramatic, chronic energy deficiency (CED) and micronutrient deficiencies such as goiter, beriberi, blindness due to Vitamin A deficiency and anaemia were very widespread and took perhaps a higher toll in terms of both morbidity and mortality than faminies. Major factors responsible for chronic macro and micronutrient deficiencies were:

- Low dietary intake because of poverty and low purchasing power;
- High prevalence of infection because of poor access to safe-drinking water, sanitation and health care;
- Poor utilisation of available facilities due to low literacy and lack of awareness.

Successive Five Year Plans laid down the policies and multi-sectoral, multi-pronged strategies to combat nutrition related public health problems and improve nutritional and health status of the population.

The last five decades have witnessed some major achievements. There has been a slow but steady economic growth, which is accompanied by reduction in poverty. The Green Revolution ensured that the increase in food grain production stayed ahead of the increase in population. The country has moved from chronic shortages to self-sufficiency and later surplus and export of food grains. Along with the steps to achieve adequate production, initiatives were taken to build up buffer stock of food grains; Public Distribution System (PDS) has ensured that foodstuffs of the right quality and quantity reach the right places and persons, at the right time and at an affordable cost. The food for work programme provided wages to meet minimum food needs of the vulnerable out-of-work persons.

The ICDS programme providing food supplementation for vulnerable groups such as pre-school children, pregnant and lactating women, nearly covers all blocks in the country. The Mid-day-meal programme aimed at improving the dietary intake of primary school children and reduction in the school dropout rates has been operationalised throughout the country. There has been substantial improvement in access to health care. National programmes for tackling anaemia, iodine deficiency disorders and Vitamin A deficiency are being implemented (Text Box 1.1). As a result of all these interventions, there has been a substantial reduction in severe grades of under-nutrition in children and some improvement in the nutritional status of all the segments of population. Kwashiorkor, marasmus, pellagra, beriberi and blindness due to severe Vitamin A deficiency have become rare.

Text Box 1.1: Initiatives to improve nutritional status of the population during the last five decades include:

- Economic growth and reduction in poverty
- Increasing food production-building buffer stocks.
- Improving food distribution- building up the Public Distribution System (PDS)
- Improving household food security through
    - Improving purchasing power
    - Food for work programme
    - Direct or indirect food subsidy
- Food supplementation to address special needs of the vulnerable groups- Integrated Child Development Services (ICDS), Mid-Day Meals
- Nutrition education especially through Food and Nutrition Board (FNB) and ICDS
- Efforts of the health sector to tackle
    - Adverse health consequences of under nutrition
    - Adverse effects of infection and unwanted fertility on the nutritional status
    - Micronutrient deficiencies and their health consequences

India today is a country of contrasts. It is one of the fastest economies of the world where there has been substantial growth in industrial and service sectors but growth in the critical agricultural sector has been sub optimal. Poverty rates have declined though rather slowly. In the last five decades, poverty and mortality rate has come down by 50 % and the fertility rate by 40 % but the reduction in under nutrition is only 20 %. To meet all the nutritional needs of the growing population, the country will have to produce an extra five million tonnes of food grains annually and increase the production of livestock, fish and horticultural products. This has to be achieved in the face of shrinking arable land and farm size, low productivity, growing regional disparities in productivity and depletion of the natural resource base. Appropriate steps have to be taken to minimize the potential adverse consequences of globalization on domestic production, employment and price stability of food commodities. In spite of adequate food availability the poorest of the poor still do not get two square meals a day and there are pockets where severe undernutrition takes its toll even today. Every third child born in the country is underweight. Low birth weight is associated not only with higher infant mortality and low growth trajectory but also long-term health consequences including increased risk of non-communicable diseases. Around half of the pre-school children suffer from undernutrition. Micronutrient deficiencies are widespread; more than 75% women and children are anaemic; reduction in Vitamin A deficiency and iodine deficiency disorders (IDD) is sub-optimal (Text Box 1.2). Under nutrition associated with HIV/AIDS will soon emerge as a public health problem.

Text Box 1.2: Major nutrition-related public health problems

- Chronic energy deficiency and undernutrition
- Micro-nutrient deficiencies
  - Anaemia due to iron and folate deficiency
  - Vitamin A deficiency
  - Iodine Deficiency Disorders

India is currently undergoing rapid socioeconomic, demographic, nutrition and health transition (Annexure 1.2). While the country is yet to overcome poverty, undernutrition and communicable diseases, it is increasingly facing problems related to affluence due to industrialization, urbanization and economic betterment. With increasing affluence there are undesirable lifestyle alterations. In some segments of urban affluent population excessive energy intake, consume diets rich in saturated fats, decreased physical activity, addiction to tobacco and alcohol, and increase in psychosocial stress are common. There has been substantial reduction in physical activity in all segments of the population while energy intake has remained unaltered; as a result overnutrition, heart disease and diabetes are emerging as newer public health problems. Henceforth the country will have to gear itself up to prevent and combat the dual burden of undernutrition and overnutrition and associated health problems.

There are substantial differences in the economic, social, nutrition and health profiles between states. Different states in the country are undergoing socio-economic, demographic, nutrition and health transition at different rates. Efforts are being made to minimize inter state disparities in economic and human development. While in some indices the inter state differences have been reduced, there are others where the gap has widened.

Districts in India are the major administrative units with an average population of 20 million; they vary in size, population and developmental status. Currently efforts are on to increasing availability of data at district level for various indices so that district based area specific planning, implementation and monitoring progress could be taken up. In addition specific efforts are underway to improve quality of life of the vulnerable groups such as tribal population, people living in drought prone areas or those affected by disaster natural or manmade.

In this report an attempt is made to capture the ongoing economic, demographic, social, nutritional and health transition in India between 1947-2007 by reviewing

- Time trends in the last five decades,
- Current status,
- Inter state/ inter district differences and
- Inter-group differences in specific vulnerable groups.

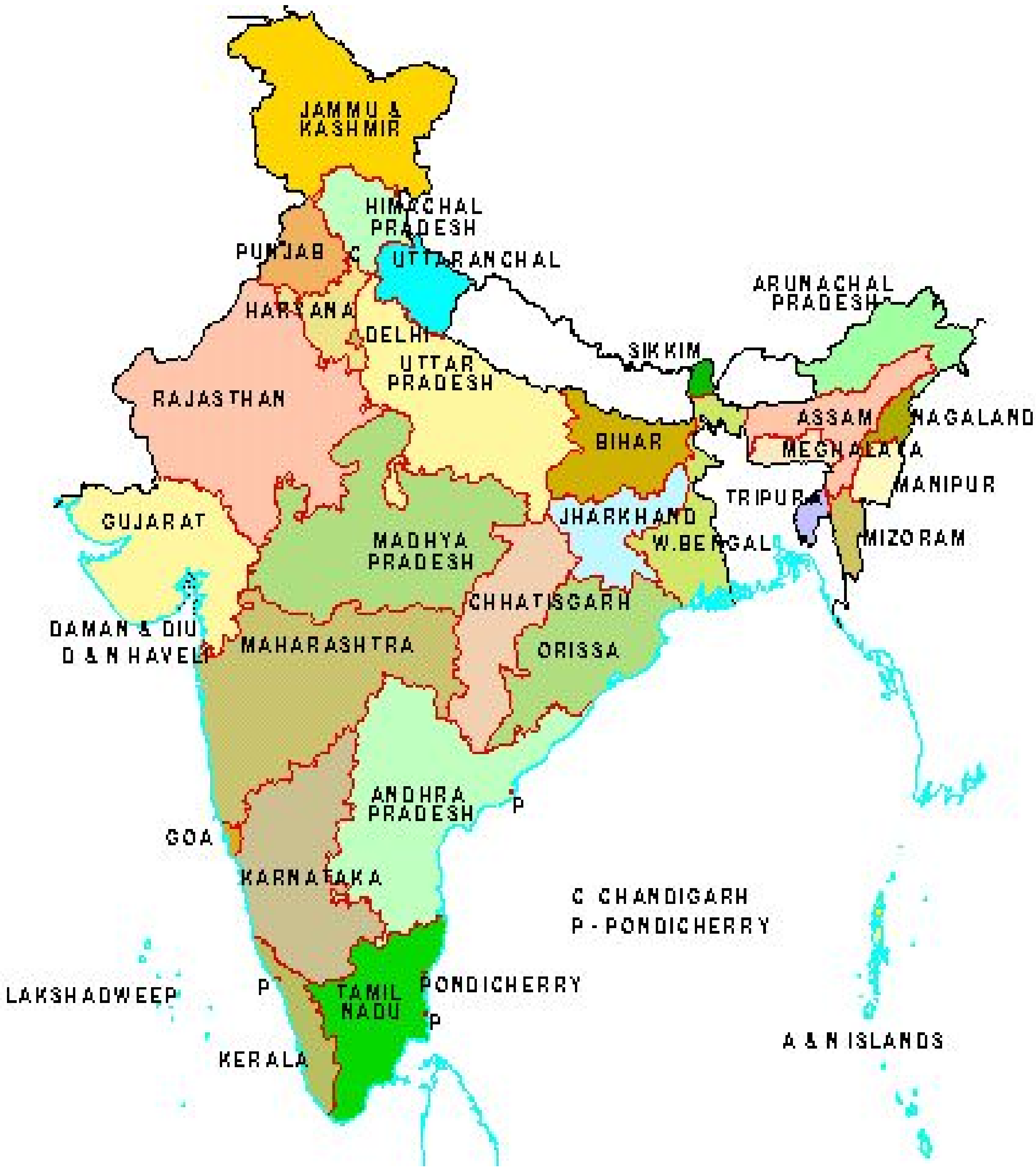
References

1.1 Census of India 2001: http://www.censusindia.gov.in/maps/State_Maps/maps.htm; last accessed on 20/09/07

1.2 Economic Survey of India 2006-07: http://indiabudget.nic.in/es2006-07/esmain.htm; last accessed on 20/09/07

Annexure 1.1

India and its states (Census 2001)



Annexure 1.2

India in transition – selected indicators

	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
ECONOMIC INDICATORS											
GDP at factor cost:											
(i) At current prices (Rs. crore)	9547	16220	42222	130176	510954	1930184	2097446	2255574	2543396	2843897	3250932
(ii) At constant prices (Rs. crore)	140466	206103	296278	401128	692871	1870387	1978055	2052586	2226041	2393671	2604532
Per capita net nationalproduct, at constant prices (Rupees)	3687	4429	5002	5352	7321	16223	16910	17281	18517	19649	20734
Index of industrial productiona (Base: 1993-94=100)	7.9	15.6	28.1	43.1	91.6	162.6	167	176.6	189	204.8	221.5
Index of agricultural production (Base: trienniumending 1981-82)	46.2	68.8	85.9	102.1	148.4	165.7	178.8	150.4	181	179.2	189.3
Gross domestic capital formation (as per cent of GDPat current market prices)	8.7	14.4	15.4	20.3	26.3	24.2	23	25.3	27.2	30.1	33.8
Gross domestic savings (as per cent of GDP at current market prices)	8.9	11.6	14.6	18.9	23.1	23.5	23.6	26.5	28.9	29.1	32.4
(a) Food grains (million tonnes)	50.8	82	108.4	129.6	176.4	196.8	212.9	174.8	213.5	204.6	208.3
SOCIAL INDICATORS											
Population											
Population (million)	359	434	541	679	839	1019	1038	1055	1073	1090	1112
Birth rate (per 1000)	39.9	41.7	36.9	33.9	29.5	25.4	25	24.8			
Death rate (per 1000)	27.4	22.8	14.9	12.5	9.8	8.4	8.1	8			
Life expectancy at birth (in years)											
(a) Male	32.5	41.9	46.4	50.9	58.6	63.87					
(b) Female	31.7	40.6	44.7	50	59	66.91					
Total	32.1	41.3	45.6	50.4	58.7						
Education											
Literacy rate (percentage)											
(a) Male	27.16	40.4	45.96	56.38	64.1	75.85					
(b) Female	8.86	15.35	21.97	29.76	39.3	54.16					
Total	18.33	28.3	34.45	43.57	52.2	65.38					
Health & Family Welfare											
Registered Medical Practitioners (RMP) ('000)(on 31st Dec.)	61.8	83.7	151.1	268.7	393.6	575.6					
RMP per 10,000 population	1.7	1.9	2.8	3.9	4.7	5.6					
Beds (all types)** per 10,000	3.2	5.7	6.4	8.3	9.5						

Source: Reference 1.2

2. DEMOGRAPHIC TRANSITION

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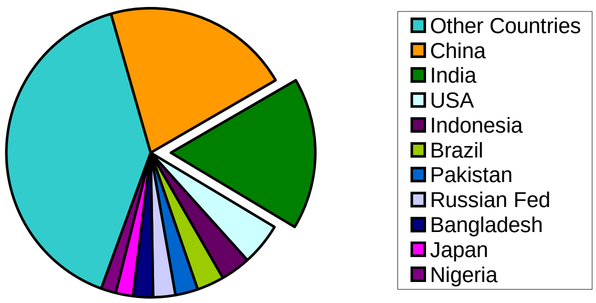
Figure 2.1: Population: India and the world



Source: Reference 2.2

India accounts for only 2.4 % of the world surface areas and yet it supports and sustains 16.2 % of the world population (Figure 2.1). In 1950, China with 21 % share of the population was the most populous country followed by India, which had a share of 14.2 %. It is estimated that by 2050, India will overtake China to become the most populous country with about 17.2 % of global population. A comparison of some demographic parameters between India and some of the neighboring countries is given in Table 2.1. China and Sri Lanka are far ahead of India in all these parameters.

Demographic transition 1947-2007

Demographic transition is a global phenomenon. Demographers recognize four phases of demographic transition. In the first phase improved health care technologies and improved access to health care result in reduction in mortality rates but, birth rate continues to be high and therefore population growth occurs. In the second there is reduction in birth rate but the reduction in death rate is higher than reduction in birth rate, as a result population increases. In the third phase, birth rates and death rates are both low; however population growth continues because of a large number of individuals in the reproductive age group. In the fourth phase the

Table 2.1: Some demographic parameters: India and its neighbors

Country	Life expectancy at birth (years)	Under-five mortality rate (per 1000 live births)		Infant mortality rate (per 1000 live births)		Maternal mortality ratio (per 100,000 live births)
	2000-05	**1990**	**2004**	**1990**	**2004**	**2004**
China	71	49	31	38	26	51
India	63	123	85	80	62*	540*
Nepal	61	145	76	100	59	740
Pakistan	63	128	101	96	80	530
Sri Lanka	74	23	14	19	12	92
Bangladesh	63	144	77	96	56	380
South Asia	63	126	84	84	62	NA

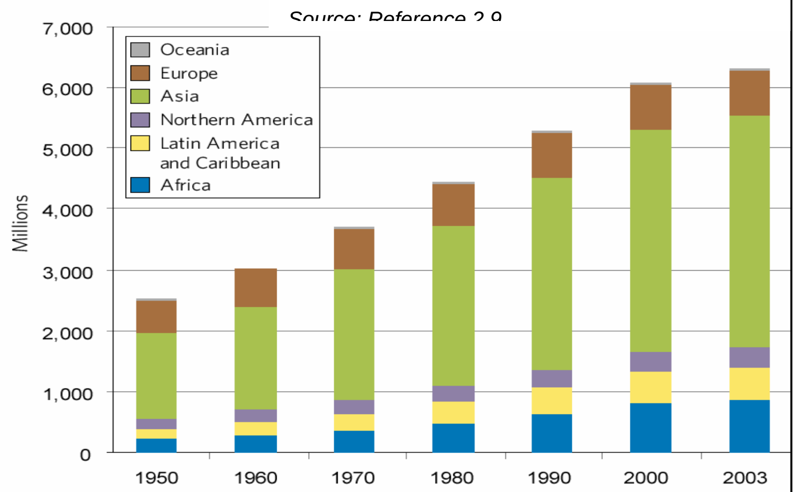
NA: Not available

** Figures shown for India are at variance with official figures of the Office of Registrar General of India for MMR and IMR. Data shown in the table are as per the methodology and adjustment made by UNDP.*

Source: Reference 2.2

population level stabilizes with number of births and deaths being low and equal. Different countries are in different stages of demographic transition. Change in mid year population over the last five decades in different regions of the world is shown in Figure 2.2. All the regions have shown some increase in population. Asia has the largest population and has shown the largest increase in population. Sub-Saharan Africa comes a close second; in terms of population growth in Europe and North America has experienced the lowest population growth rates. India is currently in the third phase of demographic transition, during which the increase in population is mainly among the 15-60 age; optimal use of this demographic opportunity window can result in rapid improvement in economic growth, nutrition and health status of the population.

Figure 2.2: Mid-year population estimate



Accurate information on vital indices is an essential prerequisite for effective monitoring of the ongoing demographic transition. In India the Civil Registration System has not been generating accurate and dependable data on vital events in all states. Census provides data once in ten years but once decade information is inadequate for planning new interventions and monitoring impact of ongoing programmes. The Sample Registration System (SRS) was established in order to provide dependable annual, state-specific data on vital rates. The SRS was initiated by the Office of the Registrar General, India on a pilot basis in a few selected states in 1964-65. It became fully operational during 1969-70 covering about 3700 sample units. Thereafter the sample size was periodically increased. At present SRS covers 6671 sample units (4436 rural and 2235 urban) in all States and Union territories. The sample unit in rural areas is a village or a segment of it if the village has a population of 1500 or more. In urban areas the sampling unit is a census enumeration block with a population ranging from 750 to 1000. Data from SRS and Census are widely used for assessing on going demographic transition in the country.

Time trends in demographic indices in India

Time trends in some of the major demographic indices are shown in Table 2.2. Rapid fall in the crude death rate (CDR) from 25.1 in 1951 to 7.6 in 2005 occurred because of technological advances and the improved quality and coverage of health care. The reduction in crude birth rate (CBR) has been less steep, declining from 40.8 in 1951 to 23.8 in 2005. As a result, the annual exponential population growth rate has been over 2 % in the 1971-1991 periods (Table 2.2). The 1991 Census showed that the population growth rate had fallen below 2 % after three decades (Figure 2.3). Census

Table 2.2: India selected- health indicators

No. Parameter	1951	1981	1991	Current level
Crude birth rate (per 1000)	40.8	33.9	29.5	23.8 (2005)
Crude death rate (per 1000)	25.1	12.5	9.8	7.6 (2005)
Total fertility rate (per woman)	6	4.5	3.6	2.9 (2005)
Maternal mortality ratio (Per 100,000 live births)	NA	NA	437	301 (2001-03)
Infant mortality rate (Per 1000 live births)	146 (1951-61)	110	80	58 (2005)
Child (0-4) mortality rate (Per 1000 children)	57.3 (1972)	41.2	26.5	17.0 (2004)
Couple protection rate (%)	10.4 (1971)	22.8	44.1	48.2 (1998-99)
Life expectancy at birth				
Male	37.2	54.1 (1995)	59.7	63.8 (2006)
Female	36.2	54.7 (1995)	60.9	66.9 (2006)

Source: Reference 2.5; 2.13; NA: Not available

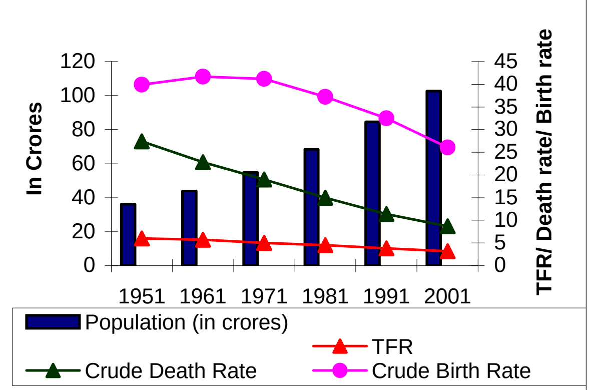
2001 confirmed that the pace of demographic transition in India has been steady even though it is slow and that the India has joined China as the population billionaire. Demographic profile of India from Census 2001 is given in Annexure 2.1. As of 2006, India's population is 1112 million. There are 25 million births and 2.3 million under five deaths in the country. Life expectancy is 65.4 years.

Decadal growth: 1991-2001

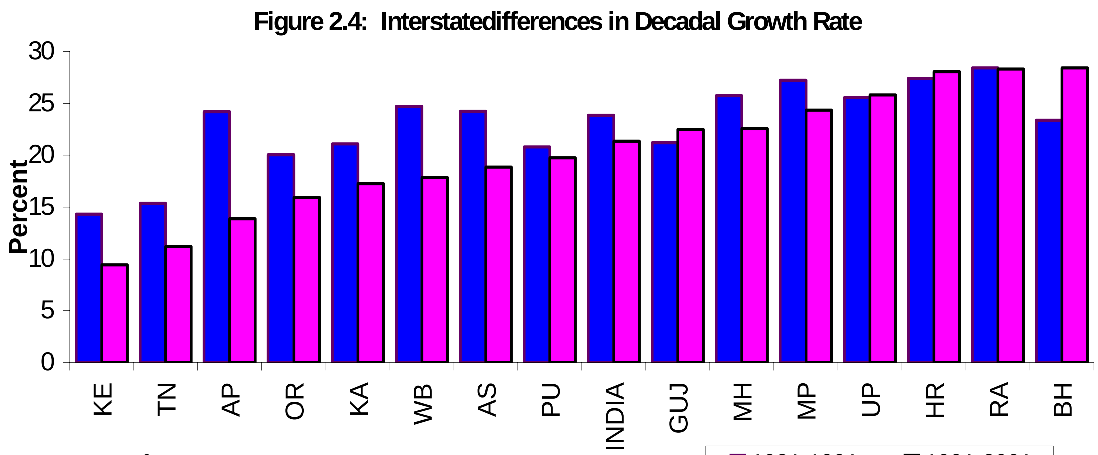
The population of India, which at the turn of the twentieth century, was only around 238 million increased by over four times to reach 1027 million by 2001. The population grew by one and half times in the first half of the twentieth century, while in the next fifty years it recorded a three-fold increase. In absolute terms, the population of India during the decade 1991-2001 increased by a 180.6 million, more than the estimated population of Brazil, the fifth most populous country in the world.

The decadal growth rate has declined from 23.9% for 1981-91 to 21.3% for 1991-2001. Interstate differences in decadal growth are given in Annexure 2.2. The decadal growth rate in a majority of the states has shown a decline. Tamil Nadu and Karnataka have attained replacement level of fertility and Andhra Pradesh has shown a remarkable fall in fertility and decadal growth rate during the 1990s. Only Bihar has shown a substantial increase in the decadal growth rate (Figure 2.4). The National Population Policy has set the goal that the country will achieve the replacement level of fertility by 2010. If this were achieved, the 2001-2011 will witness a very steep decline in decadal growth rate.

Figure 2.3: Demographic transition in India



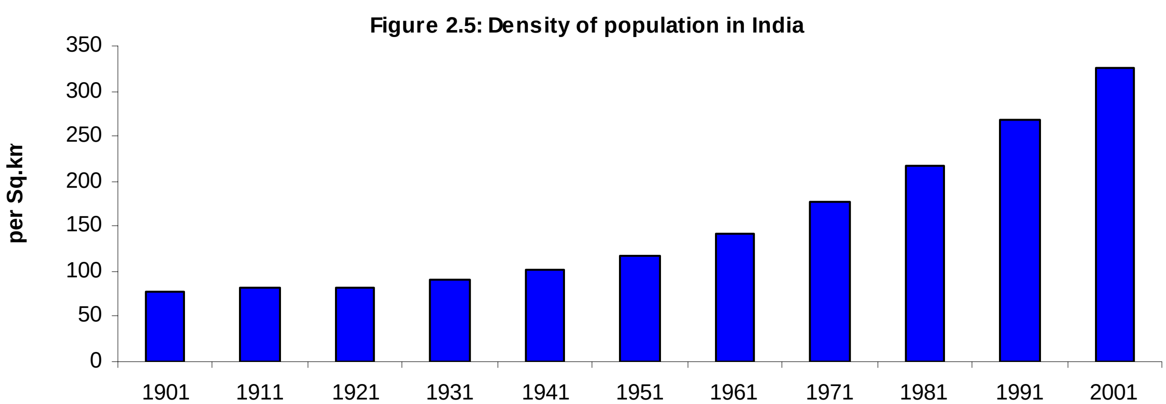
Source: Reference 2.8



Source: Reference 2. 5

In India, the proportion of children in the age group of 0-6 years decreased from 18% in 1991 to 15% in 2001. A fairly strong positive relationship exists between percentage of child population in the age group 0-6 years and the level of fertility. In 1991 only four states/Union Territories had child population less than fourteen %; in 2001 the number of the states and Union Territories with child population less than 14% is sixteen. This is indicative of a fairly wide spread fall in fertility across many states/Union Territories.

One of the major consequences of population growth is the increase in the population density (Figure 2.5). In the last hundred years population density has increased from 77/sq.km to 325/sq.km. Interstate differences in population density are indicated in Annexure 2.3. The Malthusian assumption that population growth will lead to overcrowding, poverty, undernutrition, environmental deterioration, poor quality of life and increase in disease burden has been challenged in the last few decades. The East Asian countries have shown that population can be a major resource for economic growth. India currently faces a window of opportunity during demographic transition when there is increase among younger, better-educated, well-nourished and healthy population. If the country successfully faces the challenge of



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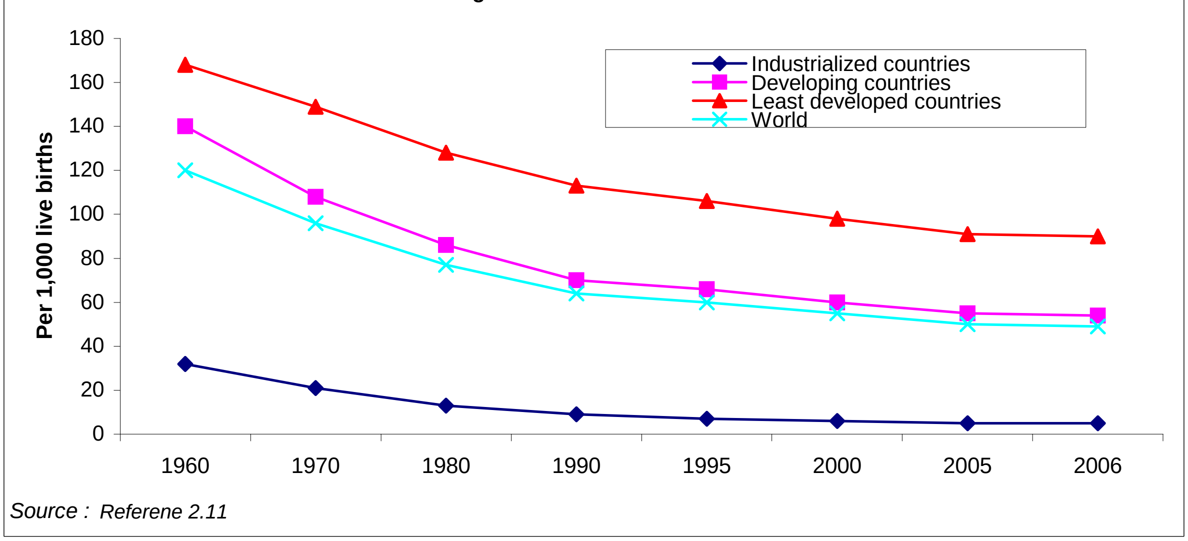


Figure 2.6: Time trends of IMR

providing education, appropriate employment with adequate remuneration, promoting healthy life styles, improving access to and utilization of available social services it is possible for the country to achieve rapid economic growth and improvement in quality of life.

Mortality rates

Neonatal, Infant and under-five Mortality Rates (IMR)

A time trend in IMR and U5MR in industrialized, developing, least developing countries and world is given in Figure 2.6 & 2.7. By middle of 20^{th} century industrialized countries had reached relatively low level of IMR and U5MR and thereafter there has been a slow, progressive decline. IMR and U5MR in developing and least developed countries had been 5-6 times higher than the industrialized countries. In spite of relatively steep decline in IMR and U5MR between 1960-1990,

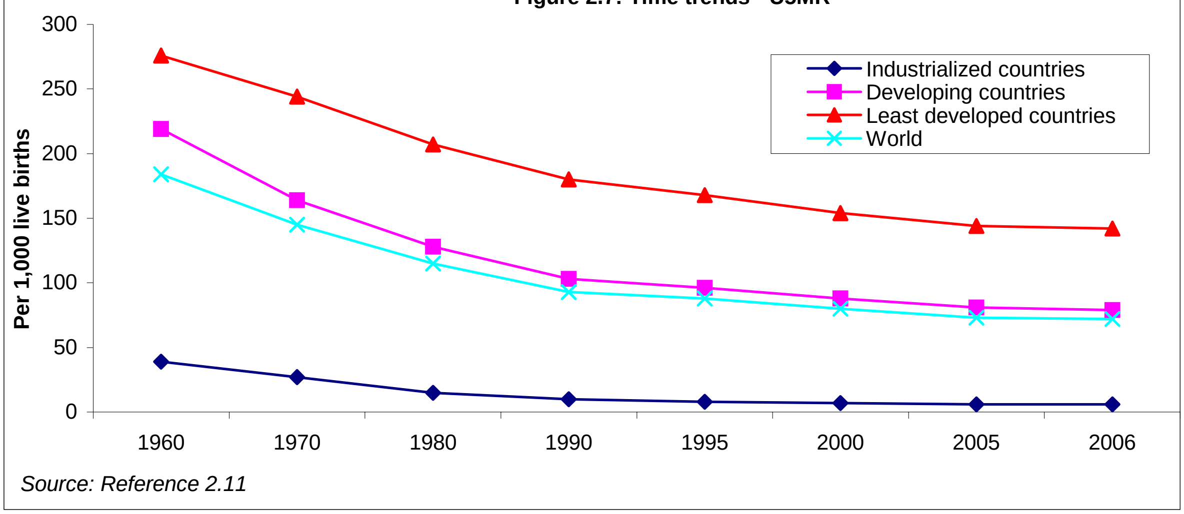
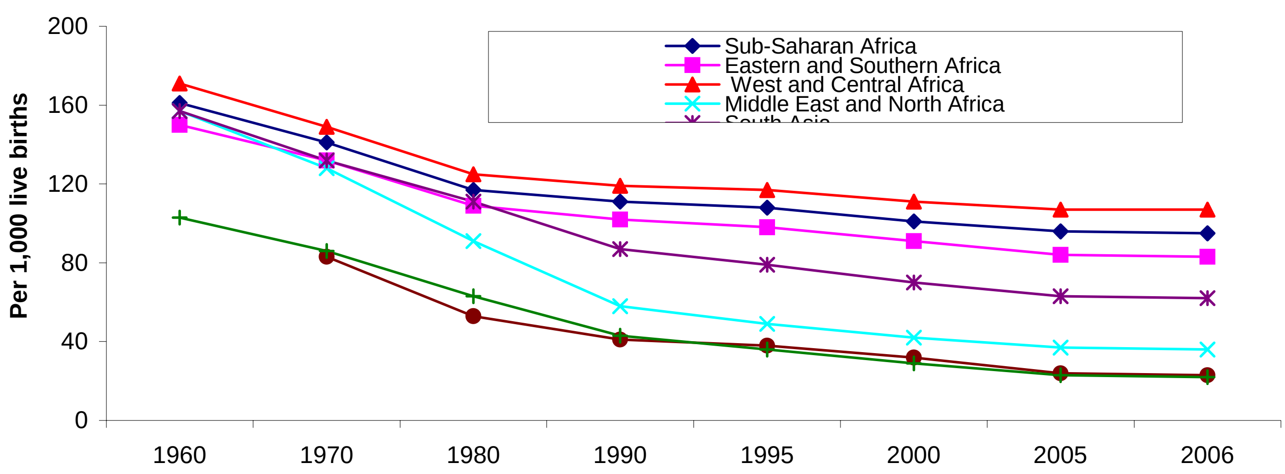


Figure 2.7: Time trends - U5MR

Figure 2.8: Time trends of IMR



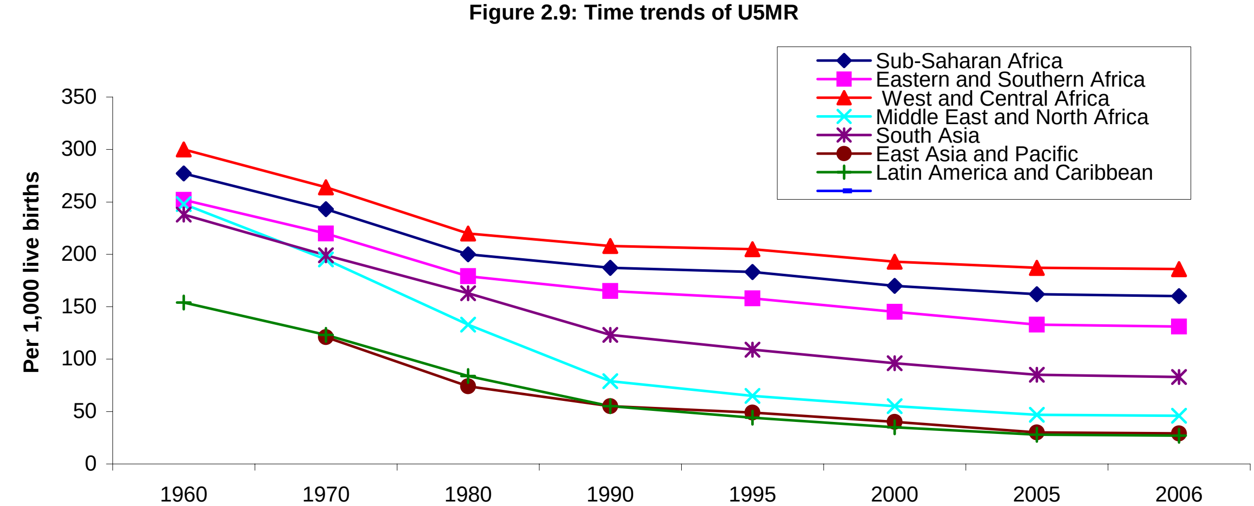
Source: Reference 2.11

the IMR and U5MR in developing countries is still unacceptably high. These countries have to redouble their efforts to achieve the Millennium Development Goal.

Time trends in IMR and U5MR in developing countries in different regions of the world is given in Figure 2.8 & 2.9. Over the last five decades there has been a progressive reduction in IMR and U5MR in all regions. Among all the regions South Asia recorded a steepest decline in IMR and U5MR between 1960-1990. Subsequent decline in IMR and U5MR in South East Asia has been less steep. The countries of this region will have to strive hard to reach to IMR and U5MR seen in East Asia.

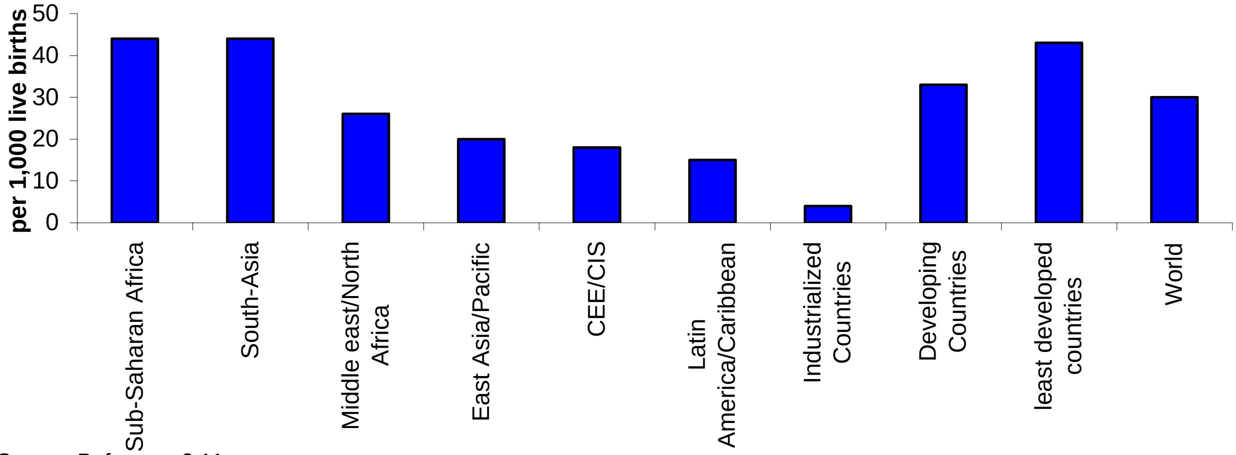
Neonatal mortality rates account for 2/3rd or more of the IMR in most regions of the world. NNMRs in most developing countries are unacceptably high (Figure 2.10). It is a matter of concern that the reported neonatal mortality rates are in South Asia is as high as the reported NNMR in Sub-Saharan Africa

Figure 2.9: Time trends of U5MR



Source: Reference 2.11

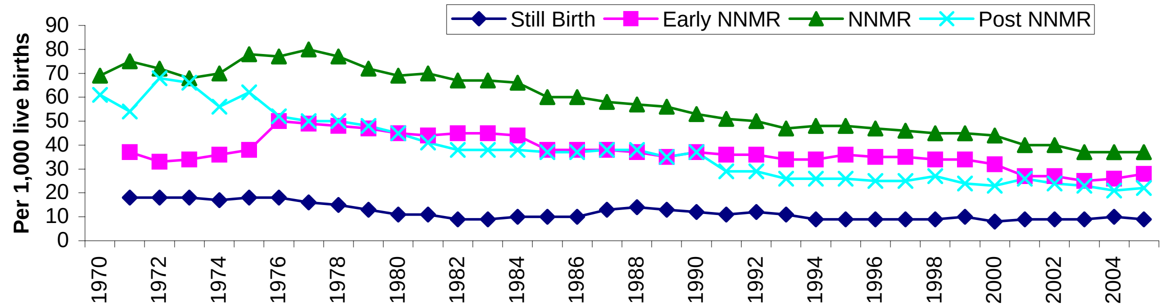
Figure 2.10: Neonatal Mortality rates, by region (2000)



Source: Reference 2.11

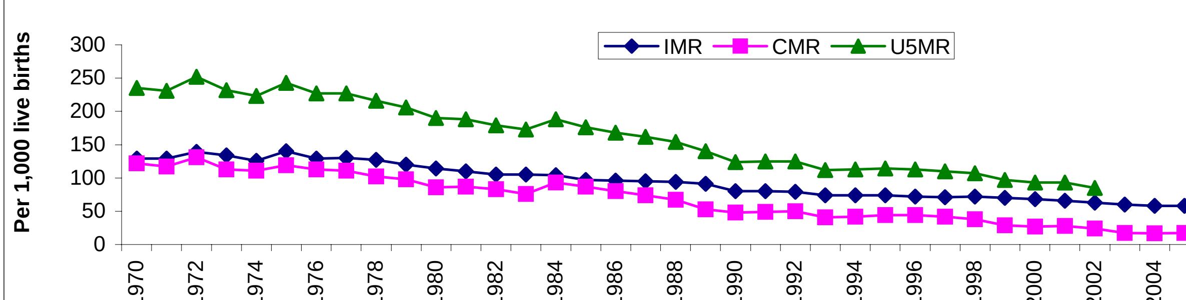
In India SRS provides annual information on vital rates including NNMR, IMR and U5MR at state level in urban and rural areas. Improved access to immunization, health care and nutrition programmes have resulted in substantial decline in IMR and U5MR between 1970 to 2005 Figure (2.12). In the last two decades the reduction in IMR and U5MR are relatively slower. Reduction in neonatal mortality (Figure 2.11 & 2.12) has been very slow as compared to decline in IMR. This is because of the poor access to antenatal and intrapartum care.

Figure 2.11: Time trends in Still Birth, Early NNMR, NNMR & Post NNMR



Source: Reference 2.7

Figure 2.12: Time trends in IMR, CMR & U5MR



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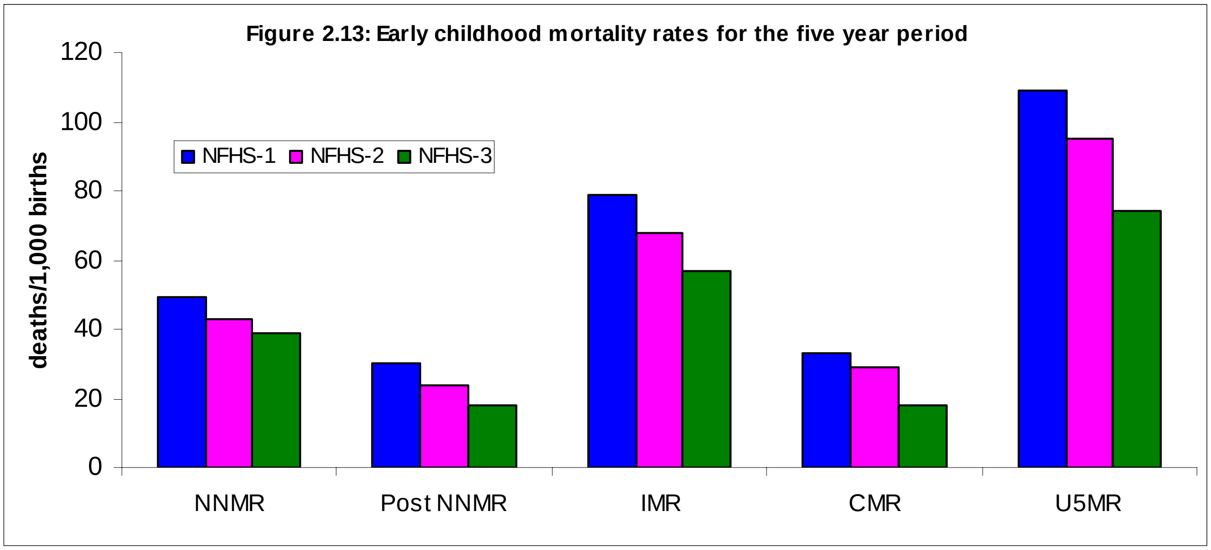
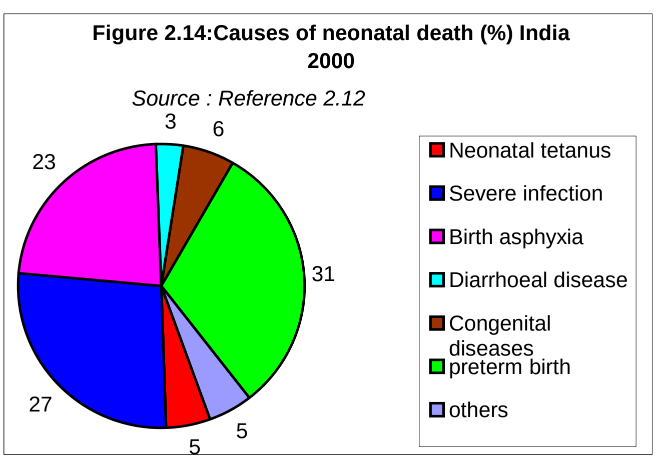
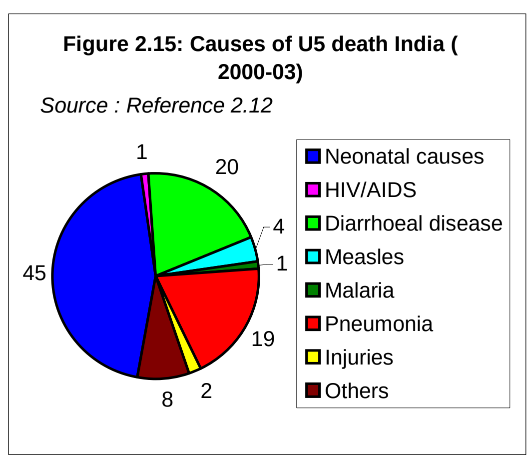


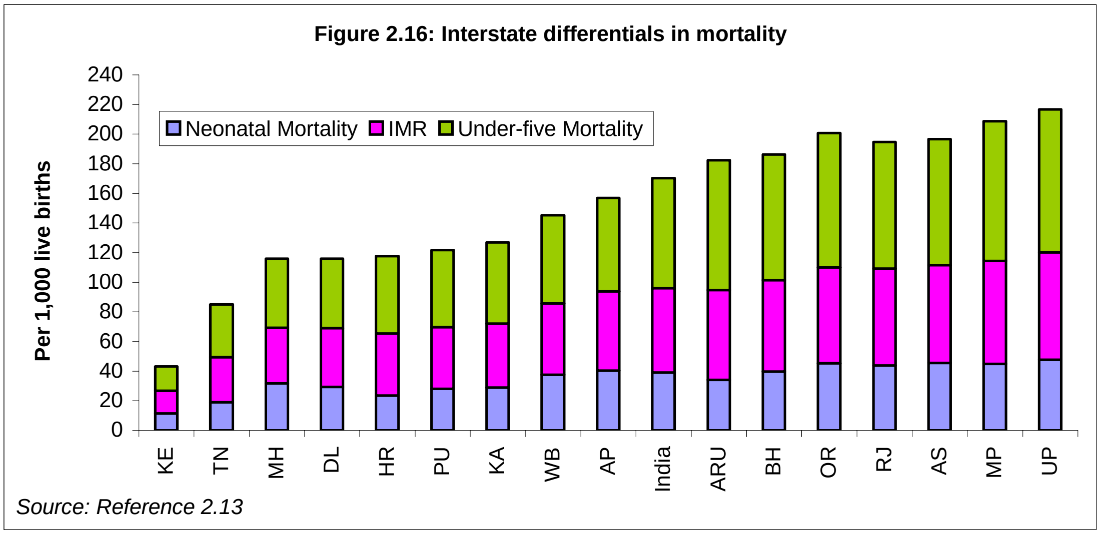
Data on changes in NNMR, PNMR, IMR, CMR, and U5MR between 1991-2006 from NFHS 1, 2 and 3 are shown in figure 2.13. These data also confirm that as compared to IMR and PNMR, the decline in NNMR is slow. Even in 2005, one in 18 children die within the first year of life, and one in 13 die before reaching age 5.

Major causes of NNMR and U5MR in India in 2000 are given in Figure 2.14 & 2.15. Over the last three decades there has not been any substantial change in the major causes of death either in the neonatal period or causes of death in under 5 age.

- In the absence of system for collection and analysis of data on morbidity during childhood available mortality data and analysis of causes of death from SRS have been utilized for drawing up priority interventions for improving child survival and health. Ongoing major intervention programmes in child health include: essential new born care;
- Immunization to prevent morbidity and mortality due to vaccine preventable diseases;
- Programmes for reducing mortality due to acute respiratory infection and diarrhea and







- Food and micronutrient supplementation programmes aimed at improving the nutritional status.

Interstate differences in IMR, NNMR and U5MR

Data on interstate differences in NNMR, IMR and U5MR computed from NFHS-3 is given in Figure 2.16. Interstate differences in birth rate, death rate, normal growth rate and infant mortality rate (SRS 2006) are given in Annexure 2.4. Interstate differences in IMR are given in Annexure 2.5. Census of India counts living population but it also computes mortality rates. Data on interdistrict variation in under 5 mortality computed from Census of India is given in Annexure 2.6. This information is available and should be used for decentralized district level planning. In order to achieve decentralized planning on year-to-year basis reliable district-specific data on birth rates and IMR must be available on an annual basis. This can be achieved only though 100% recording of birth and death through Civil Registration System and collation and analysis of this data at the district level. Such a system would also

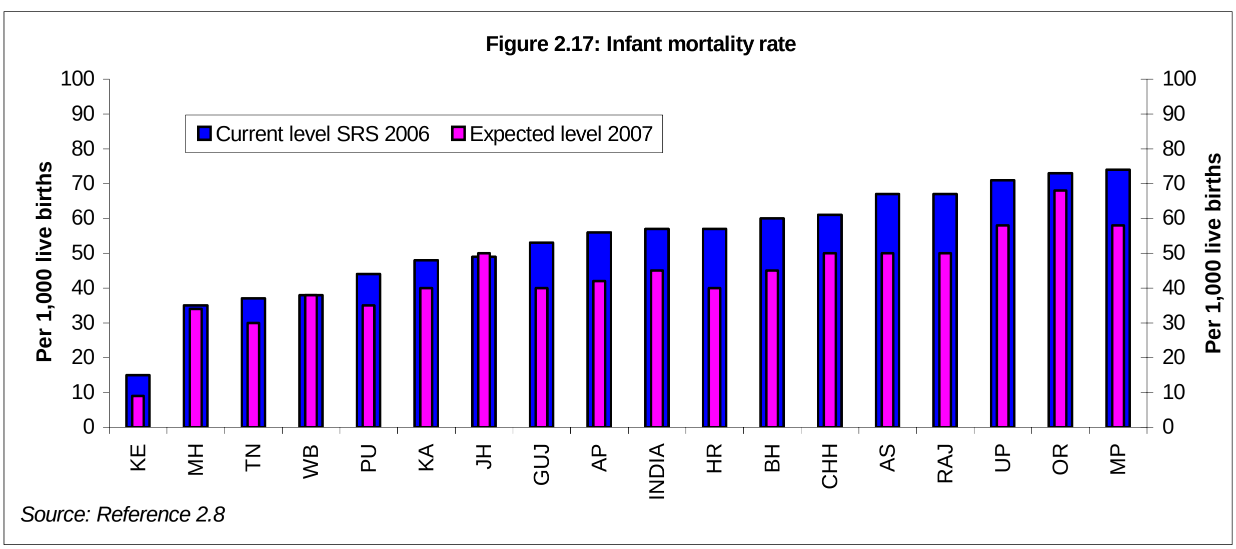
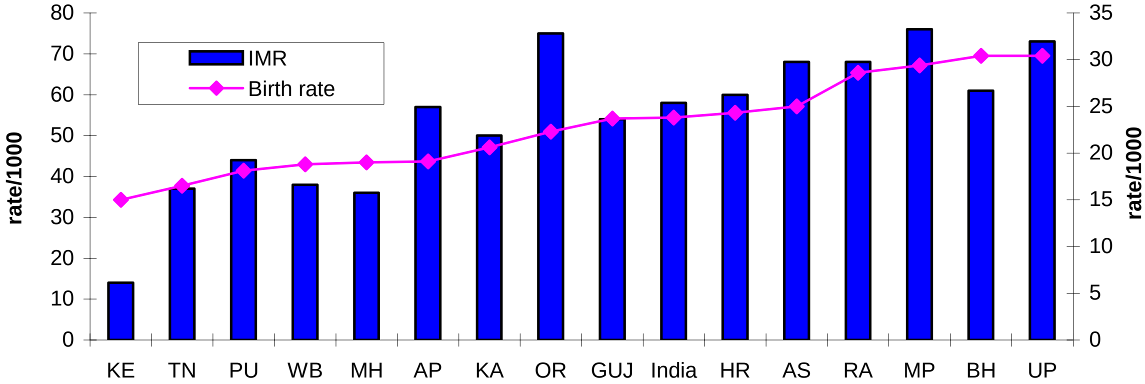


Figure 2.18: Interrelation between IMR and CBR, 2005



Source : Reference 2.5

enable continuous monitoring of the impact of the intervention and mid-course corrections. In order to achieve this, strengthening of the CRS has been given high priority during the Eleventh Plan period. The interstate differences in mortality are partly due to differences in availability and utilisation of health care and partly due to differences in nutritional status. Kerala has mortality rates comparable to several developed countries showing that it is possible for India to achieve low IMR within all the existing constraints. Tenth Five year Plan took the large interstate differences in IMR into account and suggested differential strategy to address the problem in different states and set state specific goals to be achieved by 2007 (Figure 2.17). Data from SRS 2006 indicate that Maharashtra, West Bengal and Jharkhand are likely to achieve the goals set.

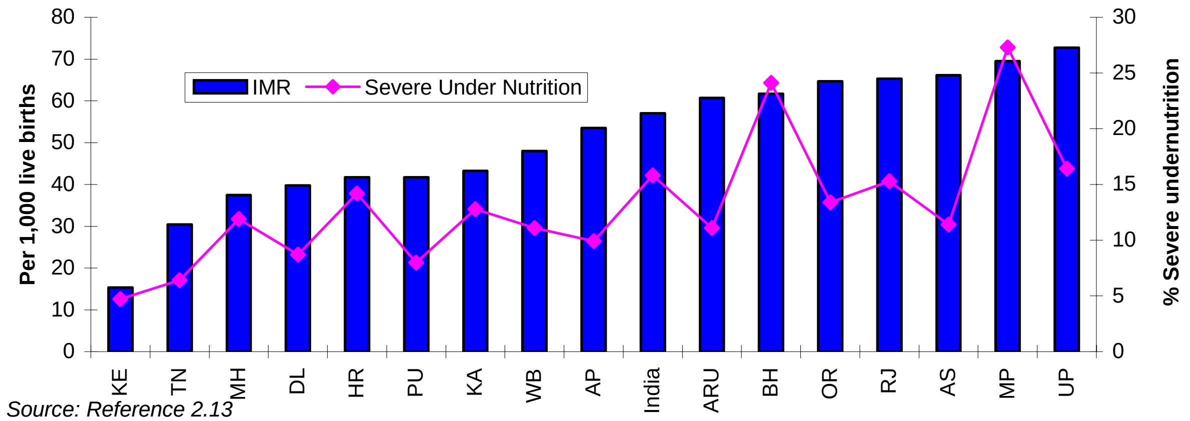
Inter-relationship between IMR and CBR

Access to family welfare services and contraceptive care are critical determinants of birth rate and infant mortality. In spite of the fact that health and contraceptive care are provided by the same personnel, the decline in these indices do not always go hand in hand. In spite of a relatively high IMR, states like Tamil Nadu and Andhra Pradesh have achieved a replacement level of fertility (Figure 2.18). States like Bihar have high fertility rates in spite of relatively low IMR. In states/districts where fertility has declined without a commensurate decline in IMR, there should be a focused, area-specific situation analysis and intervention to reduce IMR.

Interrelationship between infant mortality and under nutrition

It is well known that under nutrition increases susceptibility to infections; infections aggravate undernutrition. If uninterrupted this vicious circle could result in death. Poor dietary intake, poor caring practices and lack of access to health care are major factors responsible both for undernutrition in children and high infant mortality. Relationship between undernutrition and IMR in different states computed from NFHS 2005-06 is given in Figure 2.19. There are marked differences in undernutrition rates and IMR between states (Figure 2.19).

Figure 2.19: IMR and Severe Undernutrition (<5 years)

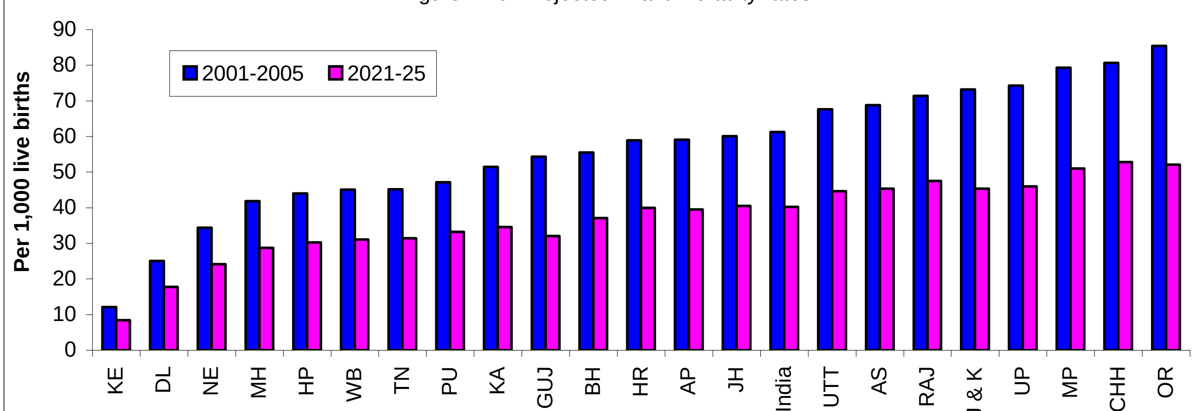


Source: Reference 2.13

In most of the states (e.g. Orissa) with high undernutrition, infant mortality is high; states with low undernutrition rates (e.g. Kerala) have low IMR. However there are exceptions. In spite of high under nutrition rates in Bihar and Maharashtra, IMR is relatively low. In spite of relatively high per capita income, dietary intake and health care both undernutrition and IMR are relatively high in Punjab. There are substantial inter district variation in infant mortality with in the states. The Tenth Plan envisaged that each district will collect, collate, analyze and utilize their district data for planning interventions to improve nutritional status, reduce IMR, monitor progress and effect midterm corrections.

Realizing the urgent need to reduce in IMR the Ministry of Health and Family Welfare has initiated efforts to strengthen health care delivery system in the states with high IMR rates. Additional funds, equipment and manpower are being provided to bridge the gaps in health services and improve access to essential child health care during the Eleventh Plan period. Projected IMR for different states in 2001-05 and for 2025 is given in Figure 2.20. Projections take into account ongoing efforts to achieve reduction in IMR in all the states and reduction in interstate differences.

Figure 2.20: Projected infant mortality rates

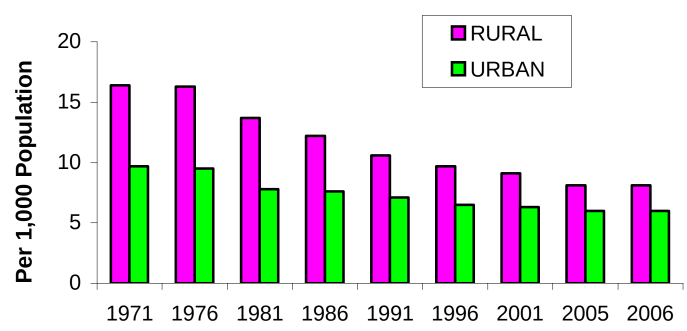


Source: Reference 2.6

Crude Death Rate

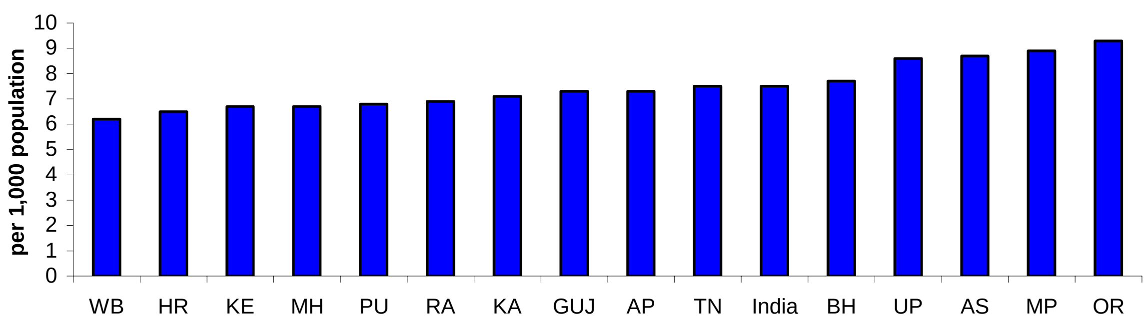
Data from SRS indicate that there has been a steady decline in crude death rates in last three decades (14.9 in 1971 to 7.6 in 2005). CDR in Urban areas is lower as compared to CDR in rural areas (Figure 2.21). There are large interstate differences in CDR. CDRs are higher than the national average in Orissa, Uttar Pradesh, Madhya Pradesh, Assam and Bihar. Kerala and West Bengal have lowest CDR in India (Figure 2.22 and Annexure 2.4).

Figure 2.21: Time trends in Death rate



Source: Reference 2.7

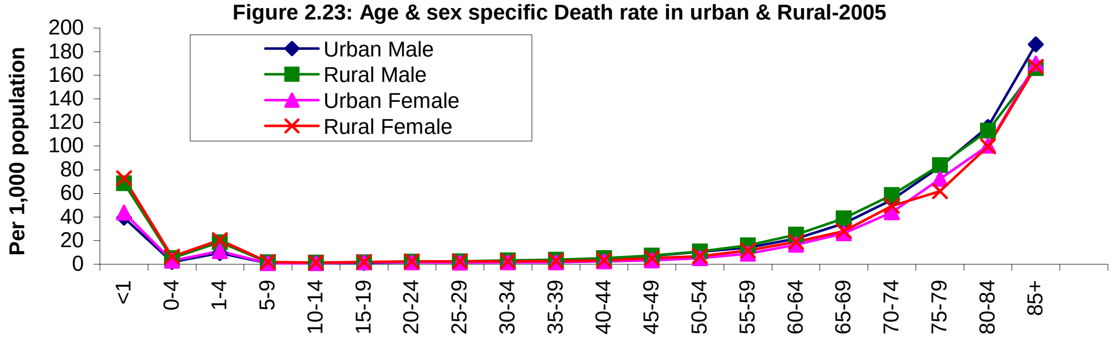
Figure 2.22: Inter State differences in Death Rates (2006)



Source : Reference 2.5 , 2.7

Age and sex specific mortality rates for urban and rural population is shown in Figure 2.23. Mortality rates are higher in under five and over sixty years of age. Mortality rates in urban areas are lower as compared to rural areas especially in children and elderly.

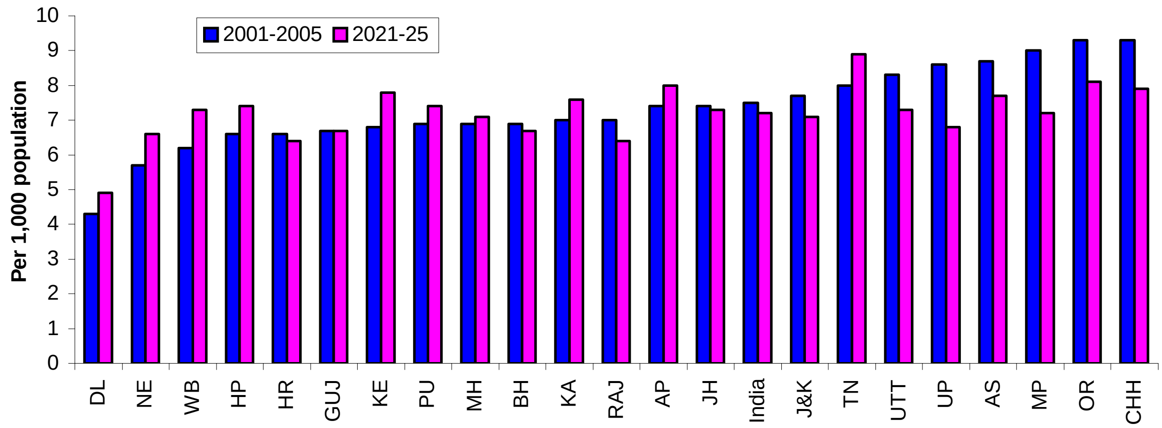
Figure 2.23: Age & sex specific Death rate in urban & Rural-2005



Source: Reference 2.7

Projected crude death rates for India and its states are shown in Figure 2.24. At the

Figure 2.24: Projected crude death rates



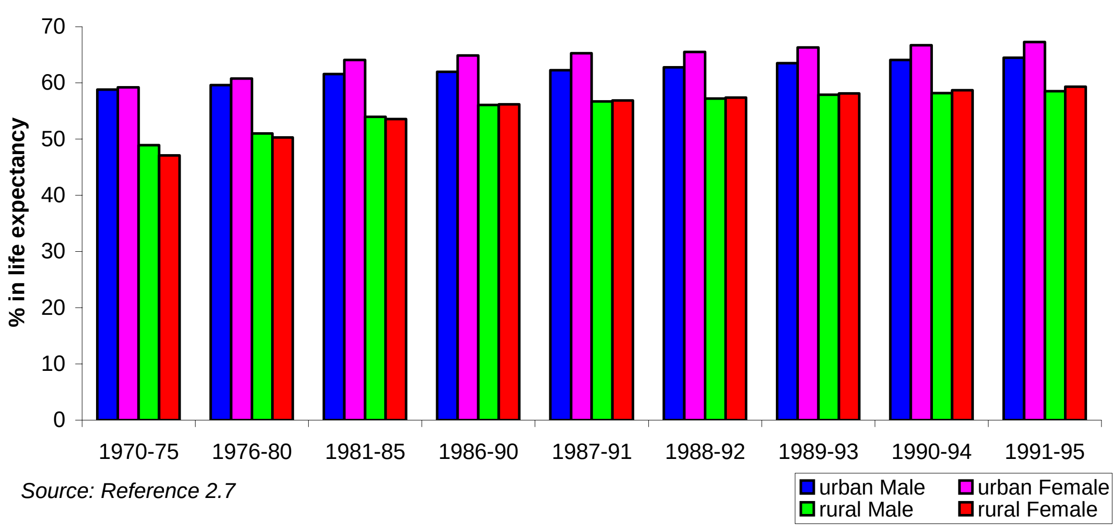
Source: Reference 2.6

national level, the crude death rate is expected to fall marginally from 7.5 during 2001-05 to 7.2 during 2021; the low magnitude of decline in CDR is because of a relatively steep increase in the proportion of the elderly during this period. The crude death rates in states like, Himachal Pradesh, Punjab, Delhi, and West Bengal, Andhra Pradesh, Karnataka, Kerala and North Eastern states are likely to increase during 2021-25, because of increase in proportion of elderly population.

Time trends in life expectancy at birth and at one-year age

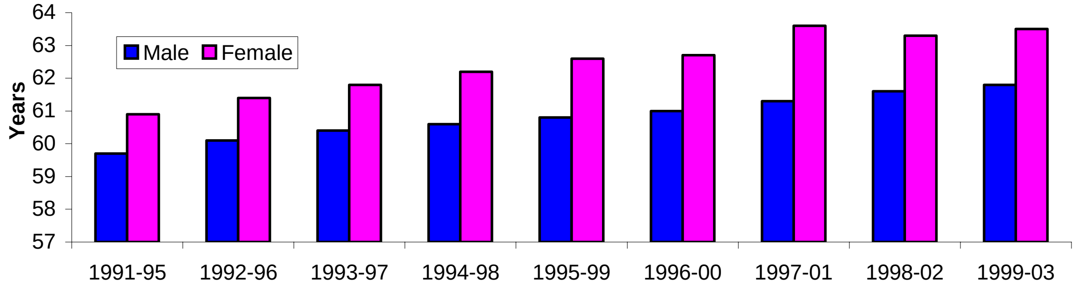
Data on time trends in life expectancy at birth and at one year in urban and rural areas and in men and women are presented in Figure 2.25, 2.26 & 2.27. It is obvious that the there has been a progressive increase in life expectancy both in urban and rural areas. But in all periods life expectancy is lower in rural as compared to the urban areas. Currently life expectancy at birth for females is higher than the life expectancy at birth for males. Improvement in life expectancy over the last decade is indicated in Figure 2.26 and Annexure 2.7.

Figure 2.25: Time trends in life expectancy at birth



Source: Reference 2.7

Figure 2.26: Life expectancy at birth

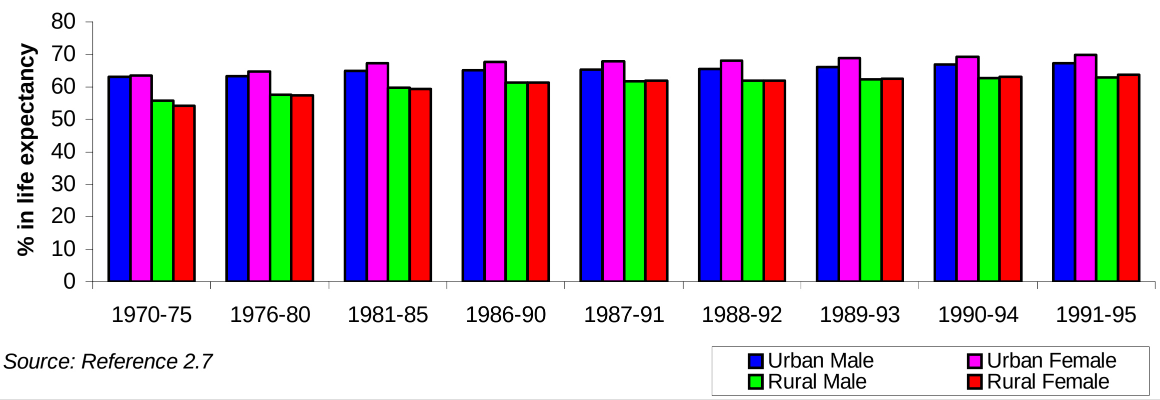


Source: Reference 2.5

Interstate differences in life expectancy at birth

There had always been substantial interstate differences in life expectancy. Over years there has been an increase in life expectancy in all the states but the rate of increase differ (Figure 2.28 and Annexure 2.7); in 1970 in most of the states women had lower life expectancy as compared to men. By 1995, in majority of the states

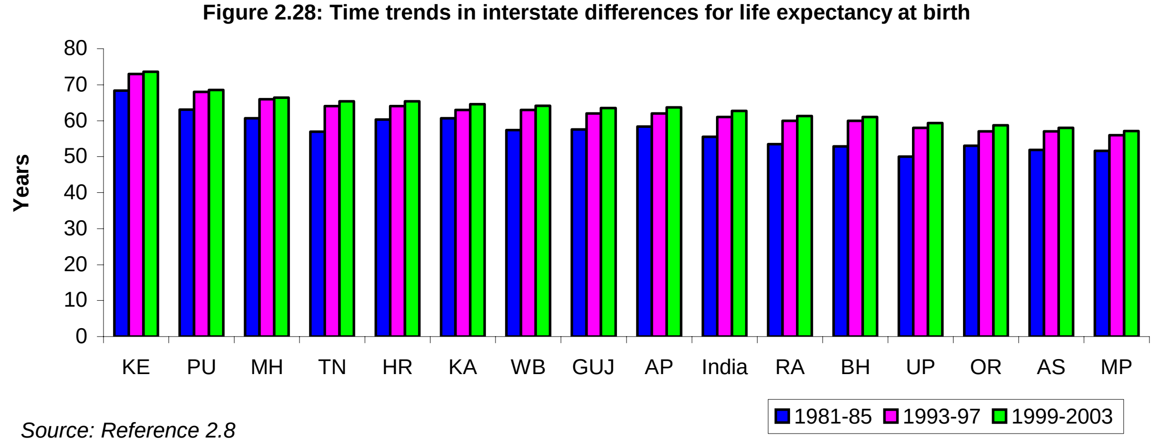
Figure 2.27: Time trends in life expectancy at age of 1



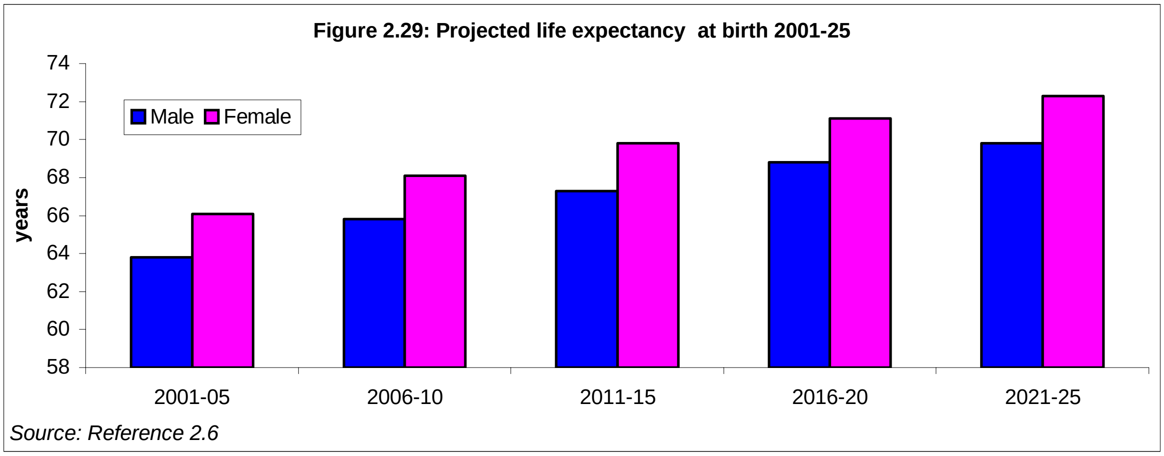
Source: Reference 2.7

women lived longer. Projected life expectancy at birth at national level in 2001-25 is shown in Figure 2.29. SRS based information on interstate differences in life expectancy for men and women at different ages are given in Annexure 2.8 & 2.9. Longer survival of elderly women who are illiterate and have been housewives, in the

Figure 2.28: Time trends in interstate differences for life expectancy at birth



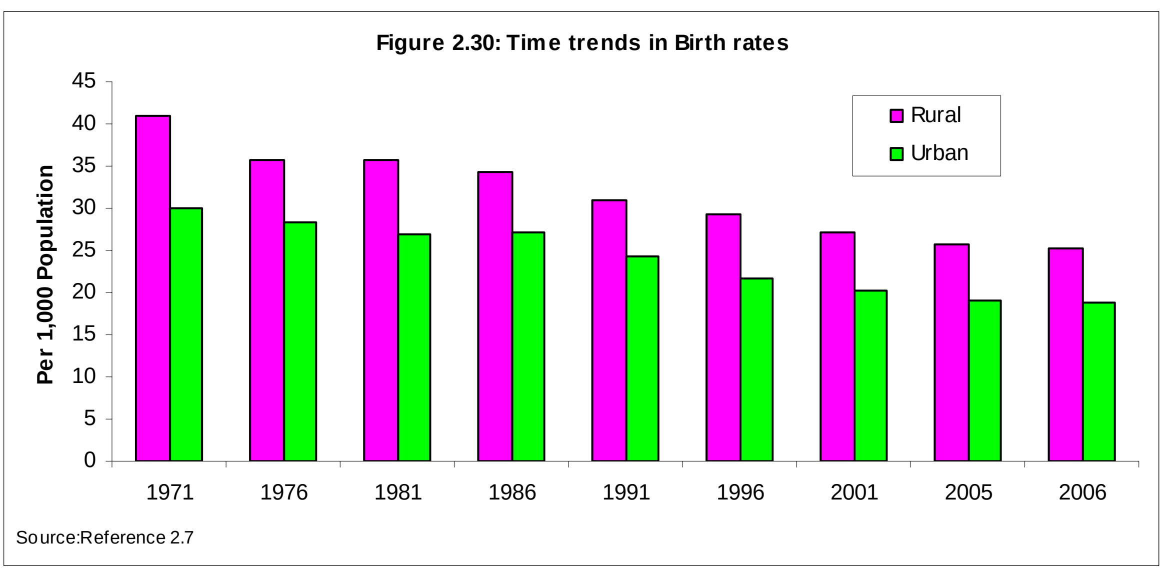
Source: Reference 2.8



current trend of breaking up of the joint family system and changing life styles may have adverse effect on health and nutritional status of elderly women.

Crude Birth Rate

Crude birth rates have shown a decline in last three decades, from 40.8 in 1971 to 23.8 in 2005 (Figure 2.30). Urban areas have lower CBR as compared to rural areas (Figure 2.30). There are large interstate differences in CBR. Uttar Pradesh, Madhya Pradesh, and Bihar have CBR higher; Kerala, Tamil Nadu, Punjab and West Bengal have lower CBR than national average (Annexure 2.4) as compared to national average. Tenth Five Year Plan goals for 2007 were set taking these into account (Figure 2.31). Kerala, Karnataka, Punjab and Tamilnadu have achieved birth rate goals set in the Tenth Plan; the gap between goals and current CBR is high in populous states like Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan. Under NRHM/RCH special efforts are being made to improve access to services and meet unmet needs for contraception. These efforts are expected to result in reduction in CBR. The magnitude of reduction is expected to be higher in states, which are currently having high birth rate, so that the difference in CBR between states will be reduced.



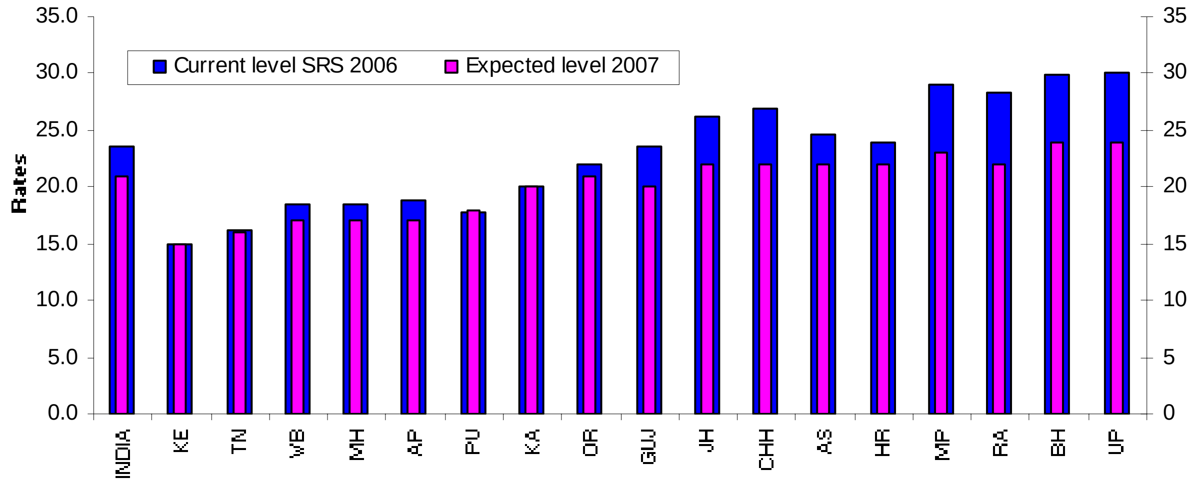


Figure 2.31: Crude Birth Rate

Source: Reference 2.7, 2.8

Projected CBR for India and the states in 2001 and 2025 is shown in Figure 2.32. Population projections envisage that crude birth rate in India will decline from 23.2 during 2001-05 to 16.0 during 2021-25, mainly due to decline in CBR in populous Northern states.

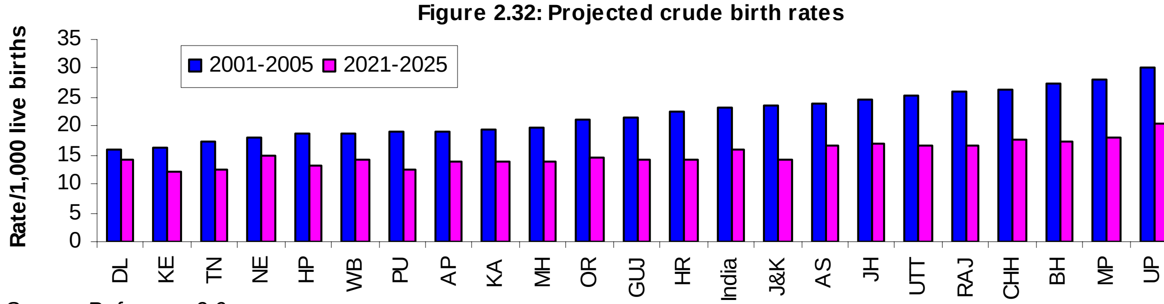


Figure 2.32: Projected crude birth rates

Source: Reference 2.6

Total fertility rate (TFR)

TFR has declined from 6 in 1951 to 3.6 in 1991 (Annexure 2.10) an average decline of 0.35 per quinquennium. There was some acceleration in decline of TFR (Figure

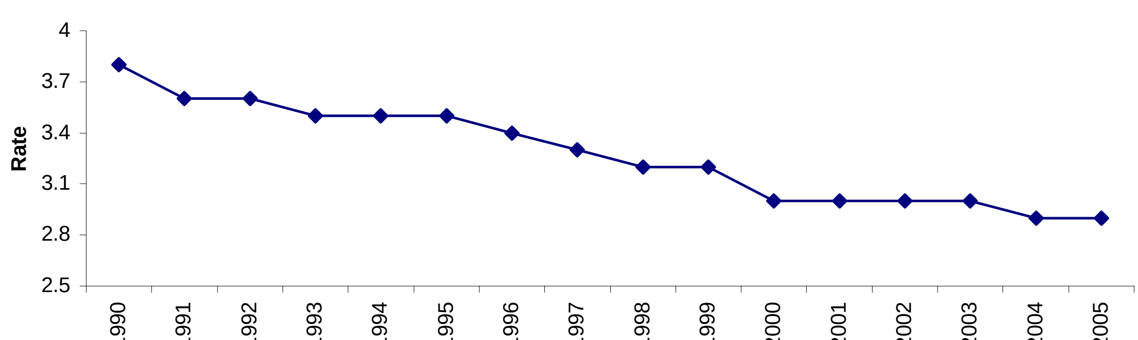
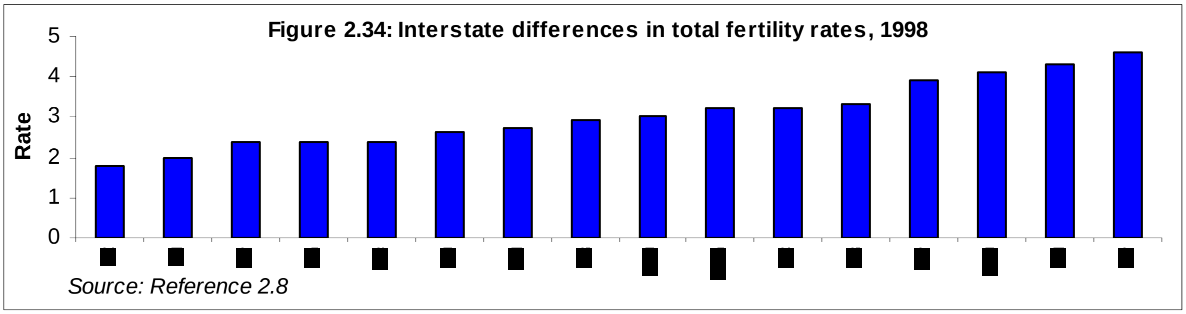


Figure 2.33: Time trends in TFR in India

Source: Reference 2.14

2.33) in the decade of the nineties. National Population Policy set the goal of TFR of



2.1.by 2010.

Population projections assume that the TFR decline could be by 0.8 children for the decade 2001-2011 and that TFR for 2011 will be 2.3 and TFR of 2.1 will be achieved between 2011 and 2015.

Table 2.3: Year by which TFR of 2.1 will be Achieved

India & States	Years by which projected TFR will be 2.1
India	2015
Andhra Pr.	2002
Assam	2019
Bihar	2021
Chhatisgarh	2022
Delhi	Achieved in 2001
Gujarat	2012
Haryana	2012
Himachal Pr.	Achieved in 2002
J & K	NA
Jharkhand	2018
Karnataka	2005
Kerala	Achieved in 1998
Madhya Pr.	2025
Maharashtra	2009
Orissa	2010
Punjab	2006
Rajasthan	2021
Uttar Pr.	2027
Uttranchal	2027
Tamil Nadu	Achieved in 2000
West Bengal	2003
Northeast (Exd. Assam)	2005
India (weighted)	2021

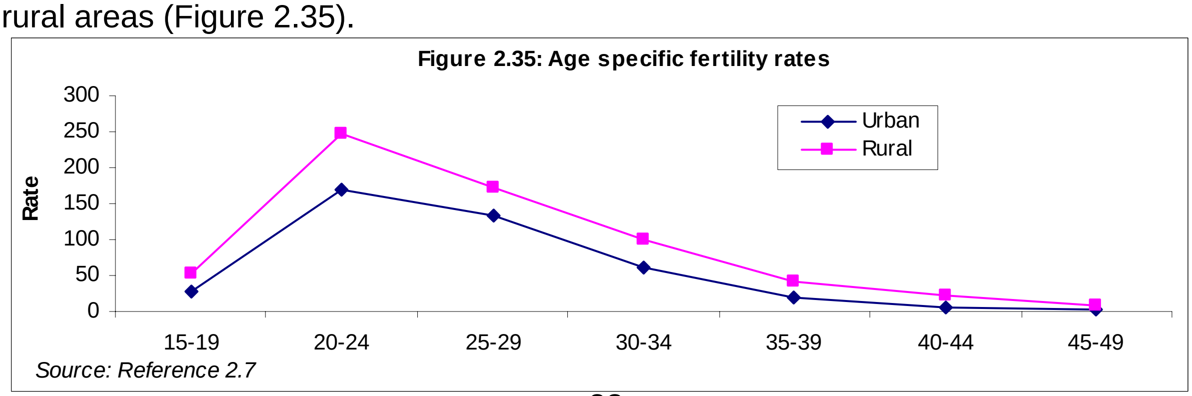
NA: Not available

Interstate differences in TFR

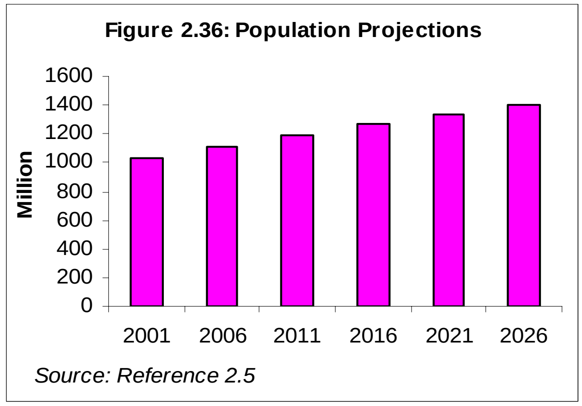
Interstate differences in TFR between states in 1998 are shown in Figure 2.34. Projected time by which different states are expected to achieve replacement level of fertility is given in Table 2.3. There are large interstate differences in TFR. Kerala, Tamil Nadu, West Bengal and Andhra Pradesh have all already achieved TFR level of 2.1 whereas Madhya Pradesh, Rajasthan, Bihar and Uttar Pradesh are projected to achieve the goal much later. With increased awareness among population and improved access to contraceptive care there could be steeper decline in fertility over the next two decades

Age and sex specific fertility rates

There has been substantial decline in fertility rate in all age groups in India over the last five decades. Age specific fertility rates in urban areas are substantially lower as compared to rural areas (Figure 2.35).



Population projections and nutrition transition

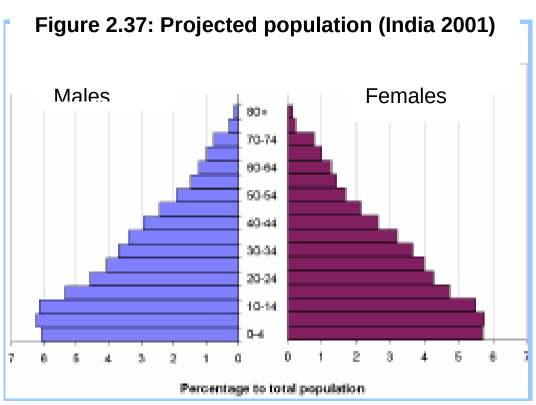


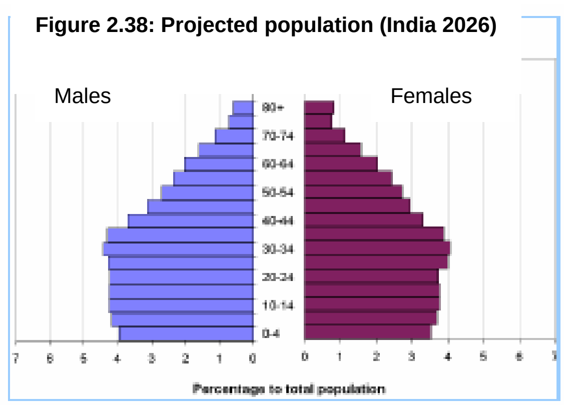
India has been undertaking population projections and utilizing these data in planning not only to ensure provision of essentials necessities such as food, shelter and clothing but also prerequisites for human development such as education, employment and health care. Over the years there has been considerable refinement in the methodology used for population projections and substantial improvement in the accuracy of predictions. Technical Group on Population Projections worked out the population projections for the country and the states for the period 2001 to 2026 on the basis of census 2001 and other available demographic data are shown in the Figure 2.36. Projected IMR, crude death rates and crude birth rates, in different states in 2001-2005 and 2021 – 2025 are given in Figure 2.20, 2.24 and 2.32 respectively.

In spite of the fact that there has been substantial reduction in birth rates, population growth rate will continue to be high due to:

- the large size of the population in the reproductive age-group (accounting for an estimated 60 % of the total population growth);
- higher fertility due to the unmet need for contraception (contributing to around 20 % of population growth); and
- high wanted fertility due to the prevailing high IMR and other socio-economic reasons (Estimated contribution of about 20 % to population growth).

The population pyramids for 2001 and 2021 are shown in Figure 2.37 and 2.38. Characteristics of projected population of India in 2001 to 2026 are given in Annexure 2.11. The average age of Indians was 23 in 2001 and is expected to rise to 31 years old in 2026.





Source: Reference 2.6

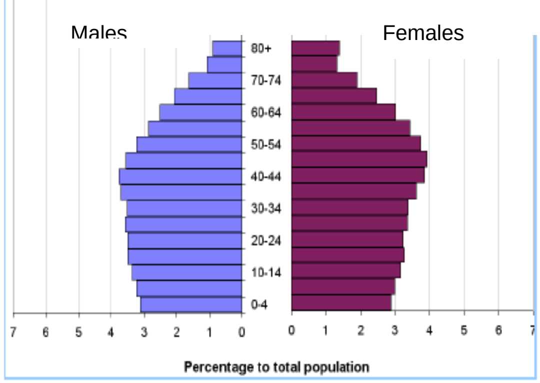


Figure 2.39: Projected population (Kerala 2026)

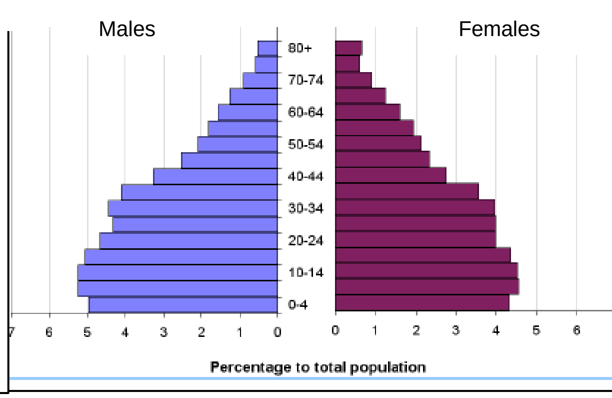


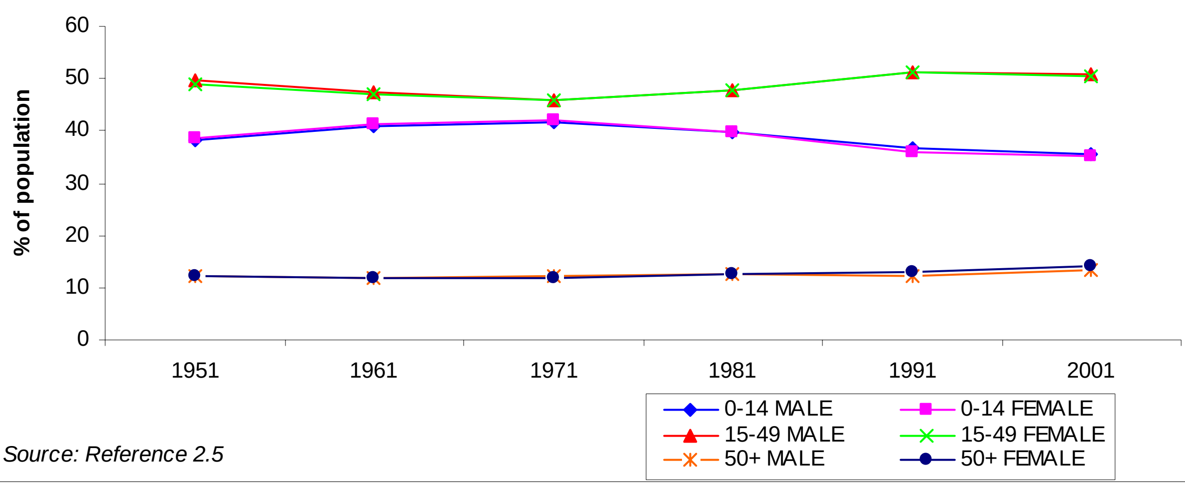
Figure 2.40: Projected population (Uttar Pradesh 2026)

The substantial interstate differences in age structure and consequently population pyramid will persist even in 2026 because different states have achieved fertility and mortality transition at different rates (Figure 2.39 and 2.40). These have to be taken into account while planning nutrition and health interventions in these states.

Changes in age distribution of the population between 1951 and 2021 in three major age groups are shown in Figure 2.41 and 2.42. Between 2001 and 2026, because of the declining fertility, the proportion of population aged under 15 years is projected to decline from 35.4 to 23.4 percent; the proportion of the middle (15-59 years) and the older ages (60 years and above) are set to increase considerably. With the declining fertility, along with the increases in life expectancy, the number of older persons in the population is expected to increase by more than double from 71 million in 2001 to 173 million in 2026 an increase in their share to the total population from 6.9 to 12.4 percent. The proportion of population in the working age-group 15-59 years is expected to rise from 57.7 percent in 2001 to 64.3 percent in 2026.

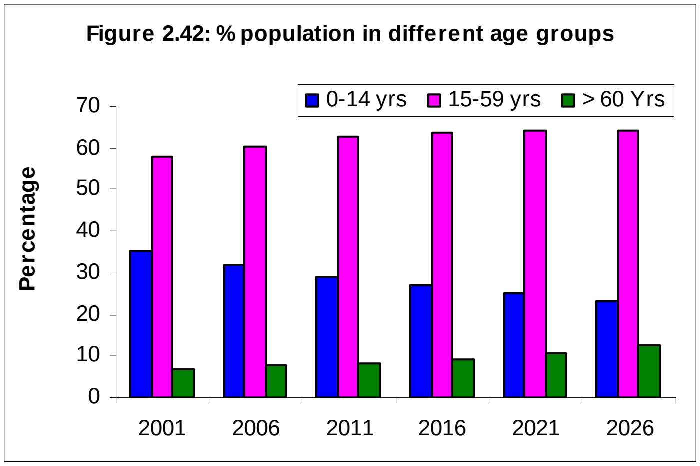
In the under 15-year age group there will be no increase in numbers. The health and nutrition infrastructure will therefore be not grappling with ever increasing number of children for providing care and they will be able to concentrate on:

Figure: 2.41: % distribution of population by age & sex India



Source: Reference 2.5

➢ quality and coverage of health and nutrition services and achieve improvement in health and nutritional status and
➢ improve access to education & skill development.



There will be a massive increase in the 15-59 years age group. They will be more literate and be aware of their needs and expect better quality of services and fulfillment of their felt needs for nutrition/ MCH/family planning care. The country has a major opportunity to rapidly improve their health and nutritional status by merely meeting their felt needs through effective implementation of National Rural Health Mission its urban counterpart and ICDS programme.

There will be a substantial increase in the population of elderly (more than 60 years) in the next two decades. Most of the increase will be in the relatively active healthy 60-70 years and by catering to their essential nutrition and health care it will be possible to minimize the health and nutrition problems in this group. The country will have to gear up to make the best use of the demographic opportunity window over the next two decades and improve the health and nutritional status of all the segments of the population. The coming two decades represent an unparalleled demographic opportunity to improve health and nutritional status of all age groups in the population. If this window of opportunity is optimally utilized it will be possible for the country to achieve very significant decline in undernutrition rates.

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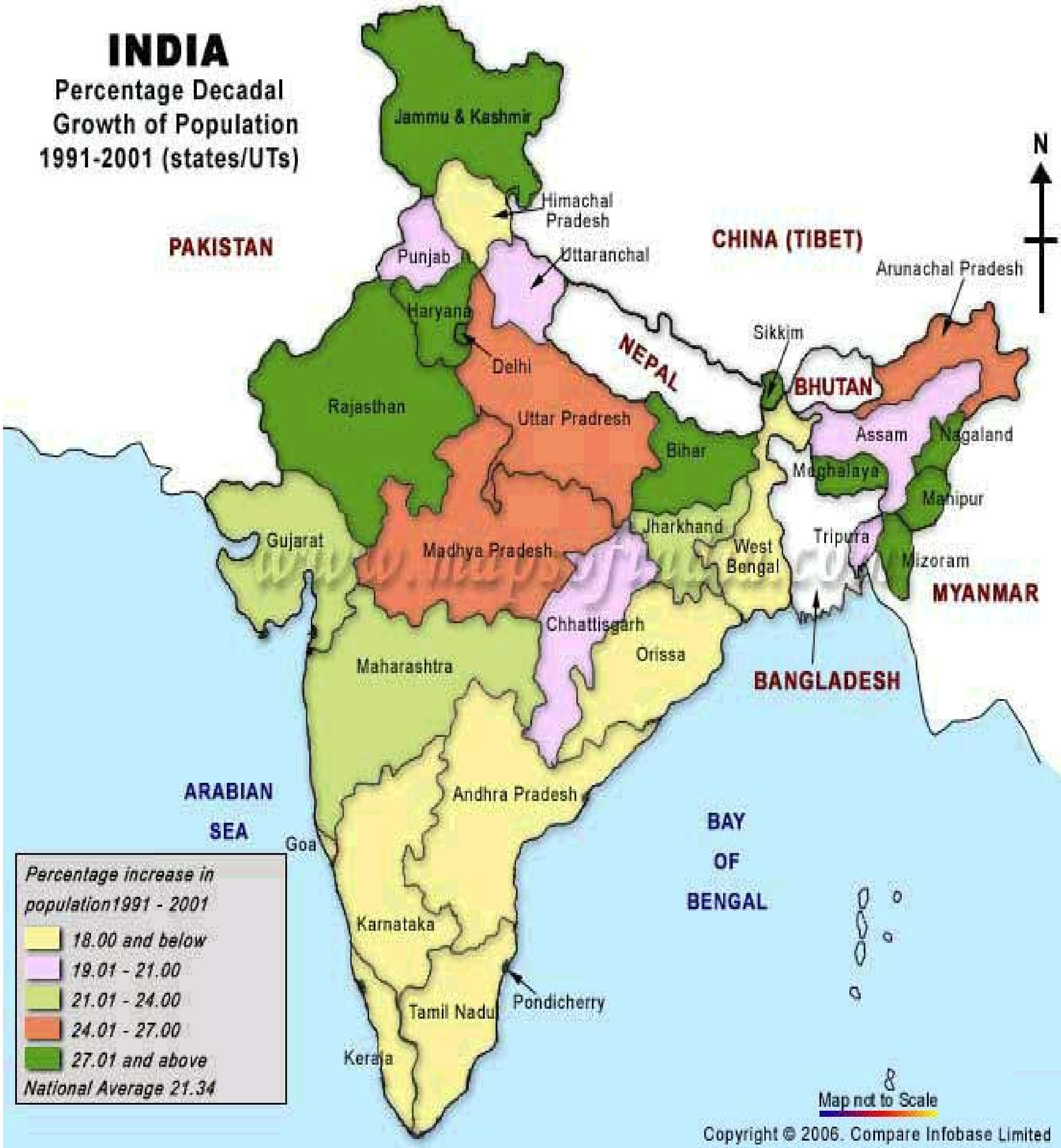
Demographic profile of India -Census 2001

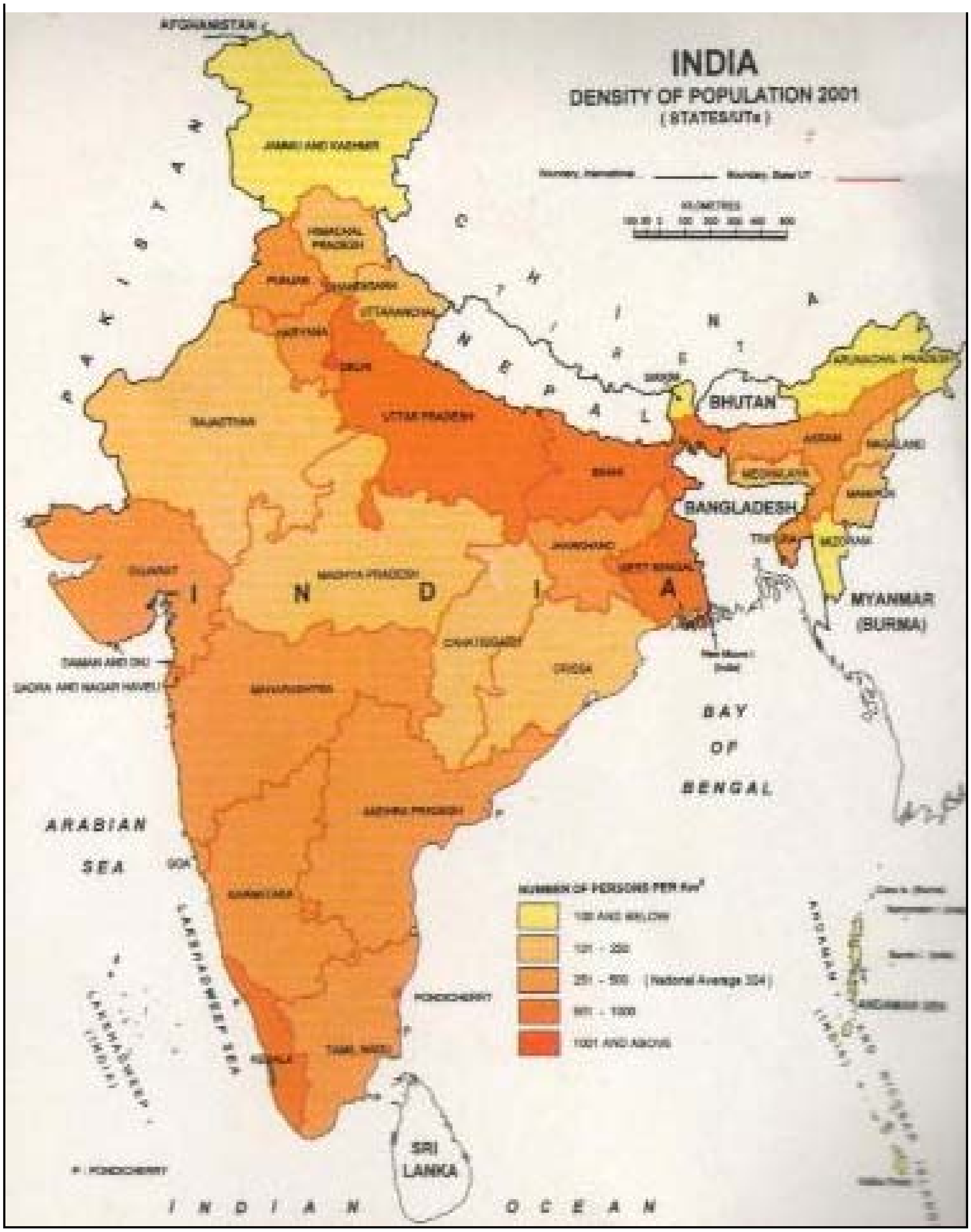
India, States/ Union territories	Number of			Total population			Percentage decadal growth 1991-2001	Sex ratio	Population density	Percentage of urban population
	Districts	Tahsils	Towns	Persons	Males	Females				
INDIA	593	5,453	5,161	1,027,015,247	531,277,078	495,738,169	21.34	933	324	27.78
Jammu & Kashmir	14	59	75	10,069,917	5,300,574	4,769,343	29.04	900	99	24.88
Himachal Pradesh	12	109	57	6,077,248	3,085,256	2,991,992	17.53	970	109	9.79
Punjab	17	72	157	24,289,296	12,963,362	11,325,934	19.76	874	482	33.95
Chandigarh *	1	1	1	900,914	508,224	392,690	40.33	773	7,903	89.78
Uttaranchal	13	49	86	8,479,562	4,316,401	4,163,161	19.2	964	159	25.59
Haryana	19	67	106	21,082,989	11,327,658	9,755,331	28.06	861	477	29
Delhi *	9	27	62	13,782,976	7,570,890	6,212,086	46.31	821	9,294	93.01
Rajasthan	32	241	222	56,473,122	29,381,657	27,091,465	28.33	922	165	23.38
Uttar Pradesh	70	300	704	166,052,859	87,466,301	78,586,558	25.8	898	689	20.78
Bihar	37	533	130	82,878,796	43,153,964	39,724,832	28.43	921	880	10.47
Sikkim	4	9	9	540,493	288,217	252,276	32.98	875	76	11.1
Arunachal Pradesh	13	149	17	1,091,117	573,951	517,166	26.21	901	13	20.41
Nagaland	8	93	9	1,988,636	1,041,686	946,950	64.41	909	120	17.74
Manipur	9	38	33	2,388,634	1,207,338	1,181,296	30.02	978	107	23.88
Mizoram	8	22	22	891,058	459,783	431,275	29.18	938	42	49.5
Tripura	4	38	23	3,191,168	1,636,138	1,555,030	15.74	950	304	17.02
Meghalaya	7	32	16	2,306,069	1,167,840	1,138,229	29.94	975	103	19.63
Assam	23	142	125	26,638,407	13,787,799	12,850,608	18.85	932	340	12.72
West Bengal	18	341	375	80,221,171	41,487,694	38,733,477	17.84	934	904	28.03
Jharkhand	18	210	152	26,909,428	13,861,277	13,048,151	23.19	941	338	22.25
Orissa	30	388	138	36,706,920	18,612,340	18,094,580	15.94	972	236	14.97
Chhatisgarh	16	97	97	20,795,956	10,452,426	10,343,530	18.06	990	154	20.08
Madhya Pradesh	45	258	394	60,385,118	31,456,873	28,928,245	24.34	920	196	26.67
Gujarat	25	226	242	50,596,992	26,344,053	24,252,939	22.48	921	258	37.35
Daman & Diu	2	2	2	158,059	92,478	65,581	55.59	709	1,411	36.26
Dadra& Nagar Haveli*	1	1	2	220,451	121,731	98,720	59.2	811	449	22.89
Maharashtra	35	353	378	96,752,247	50,334,270	46,417,977	22.57	922	314	42.4
Andhra Pradesh	23	1,125	210	75,727,541	38,286,811	37,440,730	13.86	978	275	27.08
Karnataka	27	175	270	52,733,958	26,856,343	25,877,615	17.25	964	275	33.98
Goa	2	11	44	1,343,998	685,617	658,381	14.89	960	363	49.77
Lakshadweep	1	4	3	60,595	31,118	29,477	17.19	947	1,894	44.47
Kerala	14	63	159	31,838,619	15,468,664	16,369,955	9.42	1,058	819	25.97
Tamilnadu	30	201	832	62,110,839	31,268,654	30,842,185	11.19	986	478	43.86
Pondicherry *	4	10	6	973,829	486,705	487,124	20.56	1,001	2,029	66.57
A & N Island *	2	7	3	356,265	192,985	163,280	26.94	846	43	32.67

Source: Census of India, 2001

Decadal growth of population 1991-2001 (Census India 2001)



Density of population (Census India 2001)

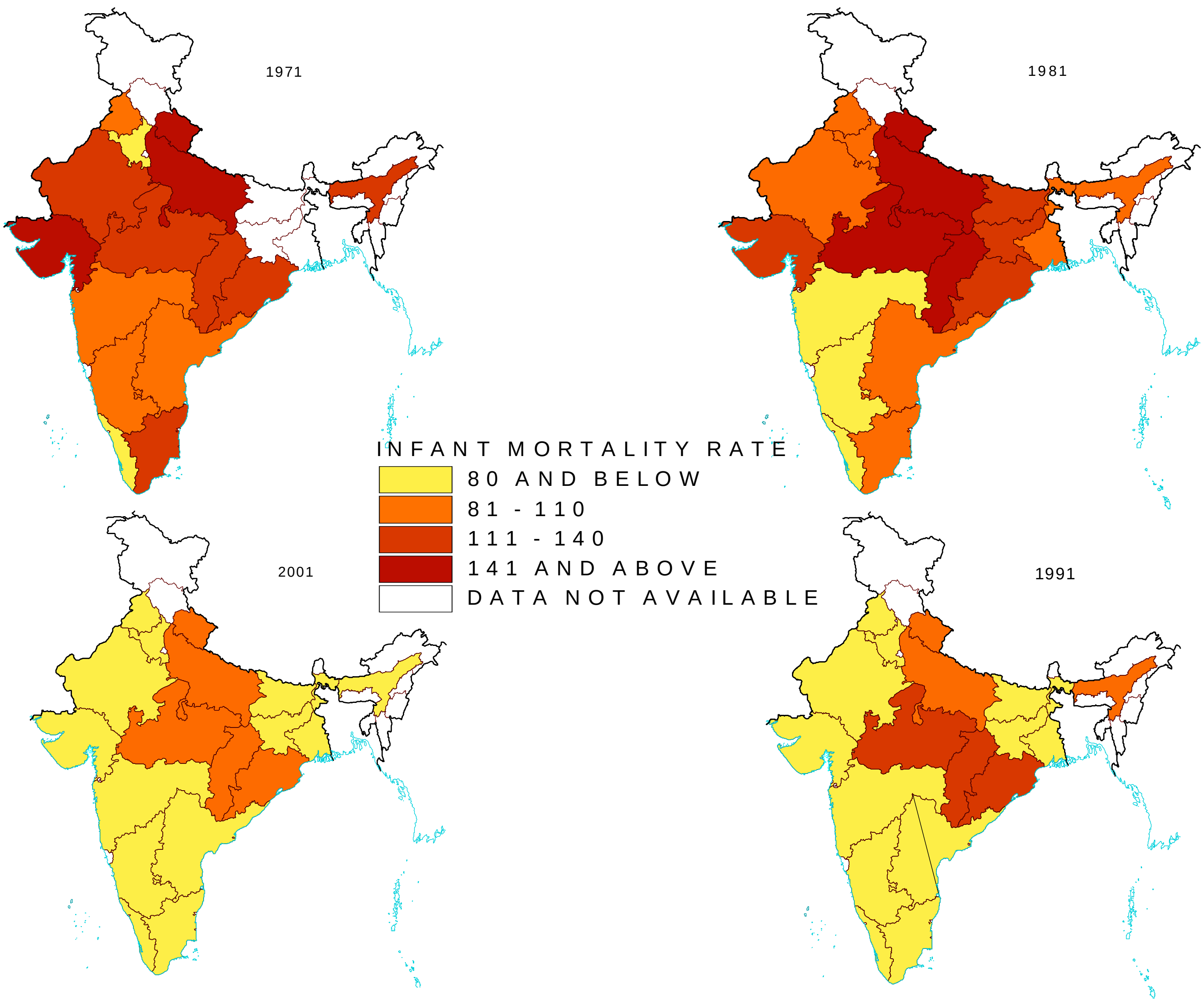


Estimated Birth rate, Death rate, Natural growth rate and Infant mortality rate, 2006												
India/States/ Union Territories	Birth rate			Death rate			Natural growth rate			Infant mortality rate		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
India	23.5	25.2	18.8	7.5	8.1	6	16	17.2	12.8	57	62	39
Bigger states												
Andhra Pradesh	18.9	19.8	16.5	7.3	7.9	5.8	11.6	11.9	10.7	56	62	38
Assam	24.6	26.1	15.4	8.7	9.2	5.8	15.9	17	9.6	67	70	42
Bihar	29.9	30.7	23	7.7	7.8	6.3	22.3	22.9	16.7	60	62	45
Chhattisgarh	26.9	28.5	19.9	8.1	8.5	6.3	18.8	20	13.6	61	62	50
Delhi	18.4	19.5	18.2	4.7	5.4	4.6	13.7	14.2	13.7	37	42	36
Gujarat	23.5	25	21.1	7.3	8.2	5.9	16.2	16.8	15.2	53	62	37
Haryana	23.9	25.1	21.1	6.5	6.9	5.6	17.4	18.2	15.5	57	62	45
Jammu & Kashmir	18.7	20	14.2	5.9	6.1	5	12.9	13.9	9.3	52	54	38
Jharkhand	26.2	28	18.8	7.5	7.9	5.9	18.6	20.1	12.8	49	52	32
Karnataka	20.1	21.5	17.7	7.1	8	5.5	13	13.4	12.2	48	53	36
Kerala	14.9	15	14.6	6.7	6.8	6.5	8.2	8.2	8.1	15	16	12
Madhya Pradesh	29.1	31.2	21.9	8.9	9.6	6.3	20.2	21.6	15.6	74	79	52
Maharashtra	18.5	19.2	17.5	6.7	7.4	5.8	11.8	11.9	11.7	35	42	26
Orissa	21.9	22.8	16.2	9.3	9.7	6.9	12.6	13.1	9.3	73	76	53
Punjab	17.8	18.4	16.8	6.8	7.4	5.8	11	11	11	44	48	36
Rajasthan	28.3	29.7	23.9	6.9	7.2	6.1	21.3	22.5	17.8	67	74	41
Tamil Nadu	16.2	16.5	15.9	7.5	8.3	6.4	8.8	8.3	9.5	37	39	33
Uttar Pradesh	30.1	31	26	8.6	9.1	6.6	21.4	21.9	19.3	71	75	53
West Bengal	18.4	20.7	12.3	6.2	6.2	6.3	12.2	14.5	6	38	40	29
Smaller states												
Arunachal Pradesh	22.5	23.8	17.4	5	5.5	2.8	17.5	18.3	14.6	40	44	19
Goa	15.1	13.5	16.2	7.4	8.2	6.9	7.7	5.3	9.3	15	14	16
Himachal Pradesh	18.8	19.5	12.4	6.8	7.1	4.8	12	12.4	7.6	50	52	26
Manipur	13.4	13.5	13.1	4.5	4.4	4.6	9	9.1	8.6	11	11	11
Meghalaya	24.7	26.4	17.1	8	8.5	5.8	16.7	17.8	11.3	53	54	43
Mizoram	17.8	21.6	14	5.5	6.2	4.8	12.3	15.4	9.2	25	32	13
Nagaland	17.3	16.8	19.2	4.8	4.9	4.1	12.5	11.9	15	20	18	27
Sikkim	19.2	19.5	17.7	5.6	5.7	4.7	13.7	13.8	13	33	35	16
Tripura	16.6	17.3	13.4	6.3	6.2	6.8	10.3	11.1	6.7	36	37	30
Uttarakhand	21	22	17.3	6.7	7	5.5	14.2	14.9	11.7	43	54	22
Union Territories												
Andaman & Nicobar Islands	15.7	17.1	13.2	5.1	5.7	3.8	10.7	11.4	9.4	31	35	21
Chandigarh	15.8	23.5	15.1	4.1	3.1	4.2	11.8	20.4	10.9	23	23	23
Dadra & Nagar Haveli	28.1	27.8	29.4	4.8	5.3	3.1	23.3	22.5	26.3	35	38	24
Daman & Diu	18.4	20.2	15.5	5.5	5	6.1	12.9	15.1	9.4	28	33	18
Lakshadweep	18.9	18.7	19.1	6.4	6.8	6	12.5	11.9	13.1	25	19	31
Puducherry	15.7	16.3	15.4	7.3	8	7	8.4	8.3	8.4	28	35	24

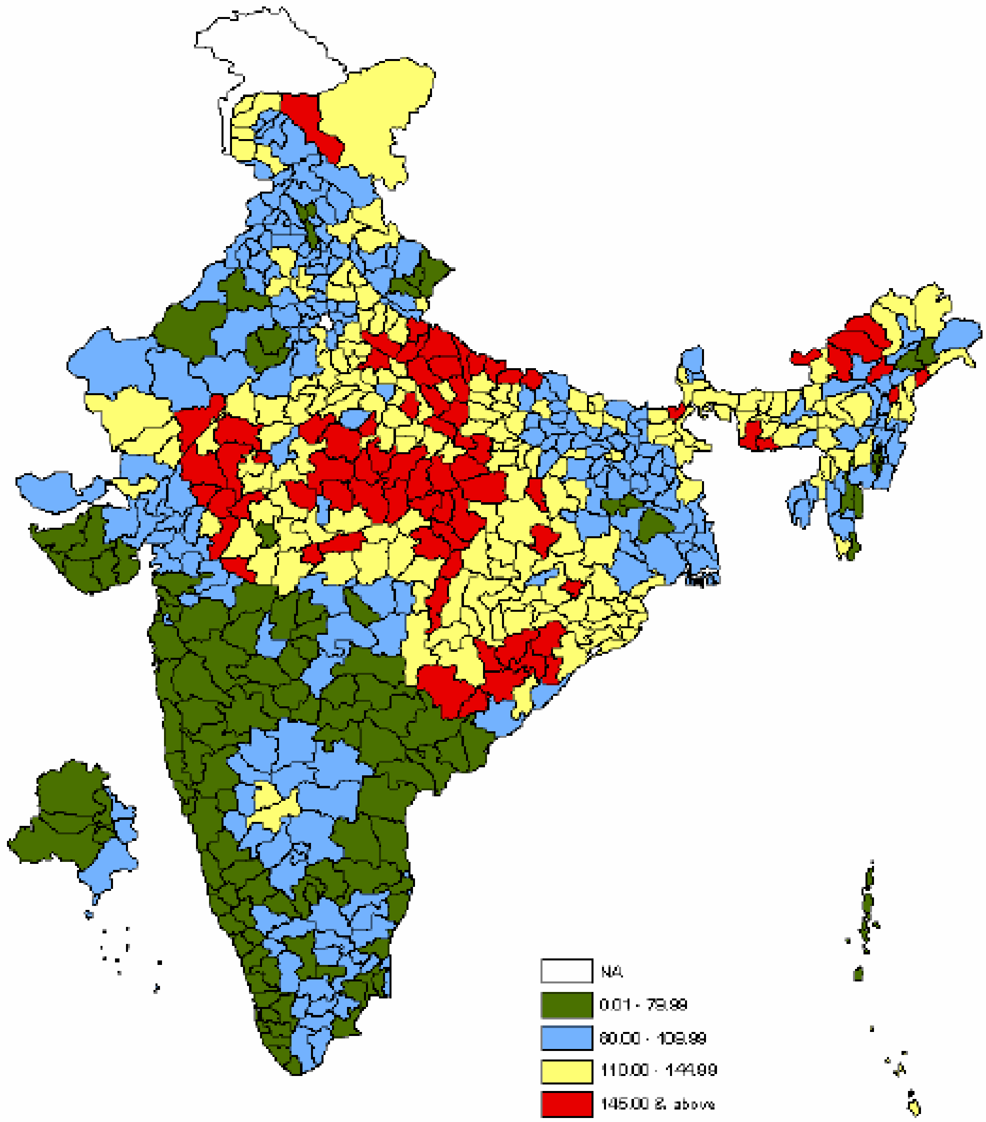
Note: Infant mortality rates for smaller States and Union Territories are based on three-years period 2004-06. Source: Office of the Registrar General, India, Ministry of Home Affairs, Govt. of India,

Annexure 2.5

Time trends in Infant Mortality Rates (Census India)



District wise under-five mortality rate in India, Census 2001



Annexure ***2.7***

Time trend in life expectancy 1970-1995 State wise -SRS								
States	**1970-75**			**1991-95**			**Per annum increase in expectation of life**	
	Male	Female	F/M ratio	Male	Female	F/M ratio	Male	Female
India	50.5	49	0.97	59.7	60.9	1.02	0.46	0.59
Andhra Pradesh	48.4	49.3	1.02	60.3	62.8	1.04	0.6	0.68
Assam	46.2	44.8	0.97	55.6	56.1	1.01	0.47	0.57
Bihar	54.2+	51.5+	0.95	60.1	58	0.97	0.29	0.33
Gujarat	48.8	48.8	1	60.2	62	1.03	0.57	0.66
Haryana	59	55.6	0.94	63	64	1.02	0.2	0.42
Himachal Pradesh	54.8	50.9	0.93	64.1	65.7	1.01	0.46	0.69
Karnataka	55.4	55.1	0.99	60.6	63.9	1.05	0.26	0.44
Kerala	60.8	63.3	1.04	69.9	75.6	1.08	0.46	0.62
Madhya Pradesh	47.6	46.3	0.97	54.7	54.6	1	0.35	0.41
Maharashtra	53.3	54.5	1.02	63.5	65.8	1.04	0.51	0.56
Orissa	46	45.3	0.98	56.6	56.2	0.99	0.53	0.55
Punjab	59	56.8	0.96	66.1	68.4	1.03	0.36	0.58
Rajasthan	49.2	47.5	0.97	58.3	59.4	1.02	0.45	0.59
Tamilnadu	49.6	49.6	1	62.3	64.4	1.03	0.63	0.74
Uttar Pradesh	45.4	40.5	0.89	57.3	56	0.98	0.6	0.78
West Bengal	56.8+	58.0+	1.02	61.5	62.8	1.02	0.24	0.24

Annexure 2.8

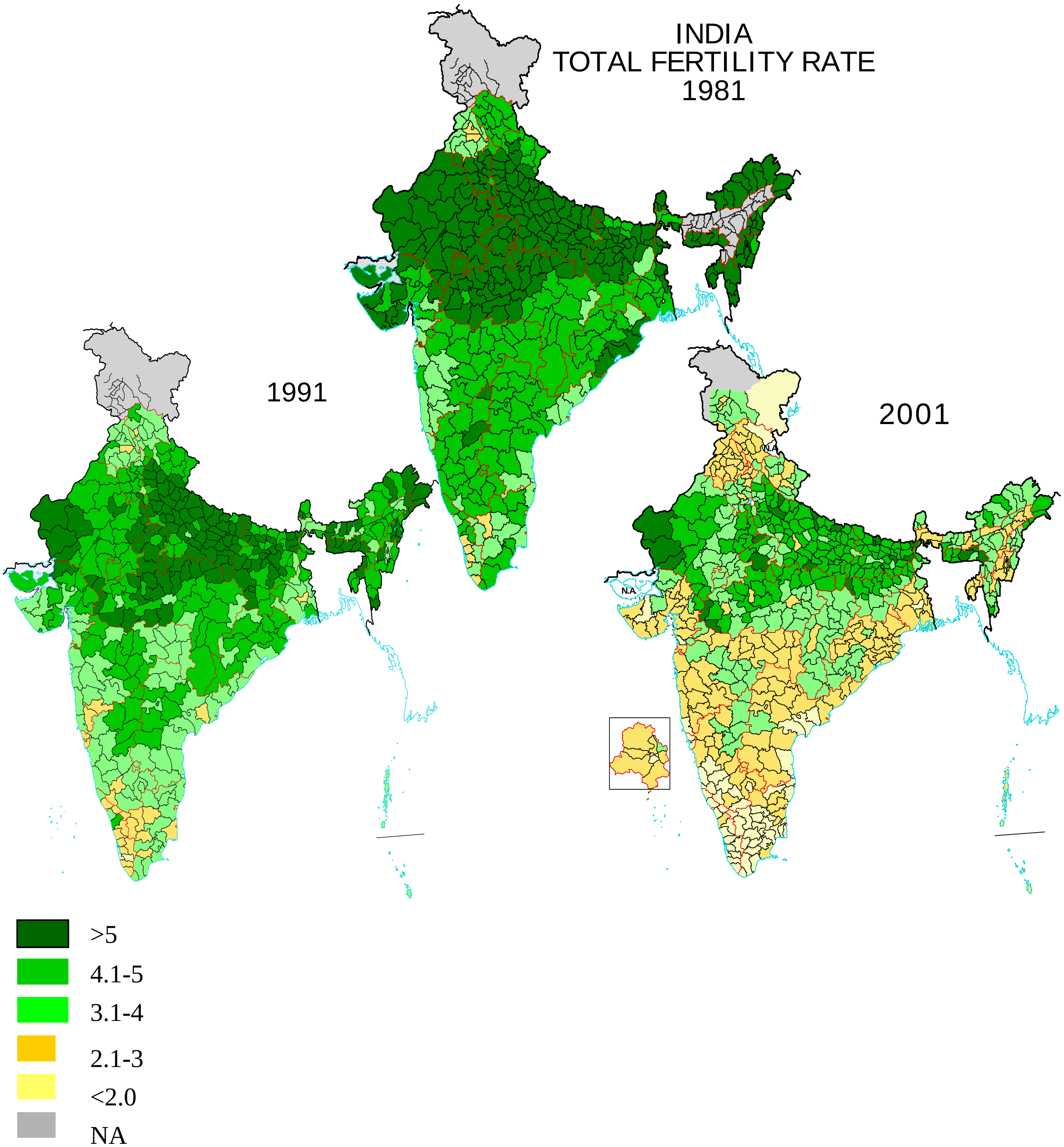
Expectation of life at different ages females state wise-SRS 1991-95										
India/State	**Expectation of life at age**									
	0 (birth)	1	5	10	20	30	40	50	60	70+
India	60.9	65.1	63.9	59.8	50.8	42.2	33.4	24.8	17.1	11
Andhra Pradesh	62.8	65.8	63.1	58.6	49.4	40.5	31.6	22.9	15.1	8.8
Assam	56.1	60.6	59.8	56.1	47.2	39	30.7	22.3	15.5	10.1
Bihar	58	61.5	61.2	57.5	48.8	40.5	32.1	23.9	16.7	11.3
Gujarat	62	65.6	64	59.5	50.2	41.4	32.5	23.7	15.6	8.9
Haryana	64	68.2	67	62.6	53.6	44.7	35.7	26.7	18.7	12.1
Himachal Pradesh	64.7	68.2	65.1	60.7	51.3	41.9	32.7	23.9	16.2	9.4
Karnataka	63.9	67.8	65.4	60.9	51.7	42.8	33.9	25.1	17.1	10.9
Kerala	75.6	75.7	72	67.1	57.4	47.9	38.4	29.2	20.6	13.2
Madhya Pradesh	54.6	60.7	60.8	56.9	48.4	40.1	31.7	23.1	15.3	9.4
Maharashtra	65.8	68.7	66.1	61.6	52.4	43.6	34.8	26	18.1	11.9
Orissa	56.2	61.8	61.7	57.5	48.6	39.9	31.4	23.3	15.4	9.8
Punjab	68.4	71.8	69.5	65	55.8	46.7	37.6	28.7	20.8	14.4
Rajasthan	59.4	64.7	63.8	59.5	50.5	41.9	33.2	24.4	16	9.1
Tamilnadu	64.4	66.8	64	59.4	50.3	41.4	32.4	23.6	15.7	9.6
Uttar Pradesh	56	61.2	61.5	57.6	48.7	40.4	31.9	23.4	15.7	6.7
West Bengal	62.8	66.3	64.1	59.8	50.8	41.9	32.9	24.1	16.4	10.4

Annexure 2.9

Expectation of life at different ages State wise -males SRS 1991-95										
India/State	Expectation of life at age									
	0 (birth)	1	5	10	20	30	40	50	60	70+
India	59.7	63.9	61.8	57.5	48.3	39.3	30.5	22.3	15.3	10
Andhra Pradesh	60.3	63.8	61	56.5	47.4	38.5	29.8	21.5	14.4	9.2
Assam	55.7	60.6	59.2	55.1	46	37	28.5	20.5	13.9	8.9
Bihar	60.1	63.8	62.3	58.3	49.2	40.2	31.5	23.4	16.5	11.5
Gujarat	60.2	63.9	61.5	57	47.6	38.6	29.9	21.7	14.6	9.5
Haryana	63	66.4	64	59.4	50.2	41.3	32.9	24.9	17.5	11.5
Himachal Pradesh	64.1	68	64.8	60.2	50.8	42.2	33.6	25.5	18.6	13.3
Karnataka	60.6	64.7	61.9	57.4	47.9	38.9	30.1	21.9	15	9.8
Kerala	69.9	70.1	66.5	61.7	52	42.7	33.7	25.2	18.1	12.5
Madhya Pradesh	54.7	61.3	60.2	56.1	47.1	38.3	29.6	21.4	14.5	9.6
Maharashtra	63.5	66.6	63.6	59	49.5	40.3	31.4	23.3	16.1	10.6
Orissa	56.6	62.5	61	56.8	47.7	39	30.3	22.6	16	11
Punjab	66.1	69	66	61.2	52	43.8	35.4	27.5	20.7	15.5
Rajasthan	58.3	63.4	61.5	57	47.8	38.9	30	21.8	14.7	9
Tamilnadu	62.3	64.6	61.6	57.1	47.8	39	30.3	22.1	15	9.6
Uttar Pradesh	57.3	62.3	60.8	56.6	47.5	38.7	30	21.9	14.9	9.3
West Bengal	61.5	65	62.5	58.1	48.8	39.7	30.7	22.1	15	9.6

Annexure2.10

Time Trends in Total fertility rates (Census India)



Annexure 2.11

Projected population characteristics as on 1st March: 2001-2026, INDIA							
S.no	Indicators	2001	2006	2011	2016	2021	2026
1	**Population (Millions)**						
	Persons	1028.6	1112.2	1192.5	1269	1339.7	1399.8
	Males	532.2	575.5	617.3	657.2	694.1	725.2
	Females	496.5	536.7	575.2	611.8	645.7	674.7
	Sex Ration	933	932	932	931	930	930
	Population density (sq.km)	313	338	363	386	408	426
2	**Population by Broad age group (Millions)**						
	18 y & above	599.5	682.4	772.4	858.4	935.8	1005.4
	0-14	364.6	357	346.9	340.3	336.9	327
	15-59	593.3	671.6	747.1	810.6	859.6	899.7
	60^+	70.7	83.6	98.5	118.1	143.2	173.2
3	**Proportion (%)**						
	0-14	35.4	32.1	29.1	26.8	25.1	23.4
	15-59	57.7	60.4	62.6	63.9	64.2	64.3
	15-49 (Female)	51.1	53.1	54.5	54.8	54.1	53.3
	60^+	6.9	7.5	8.3	9.3	10.7	12.4
	Median age (years)	22.51	23.88	25.47	27.37	29.33	31.39
4	**Dependency Ratio**						
	Young (0-14)	614	532	464	420	392	363
	Old (60^+)	119	124	132	146	167	192
	Total (Young & Old	734	656	596	566	559	556
5	**Projected demographic indicators**	2001-05	2006-10	2011-2015	2016-2020	2021-25	
	Population growth rates	1.6	1.4	1.3	1.1	0.9	
	Crude birth rates (CBR)	23.2	21.3	19.6	18	16	
	Crude death rate (CDR)	7.5	7.3	7.2	7.1	7.2	
	Infant mortality rate (IMR)	61.3	54.3	49.2	44	40.2	
	Under 5 mortality rates (U5MR)	82	72.8	65.9	59	54	
	Total fertility rate (TFR)	2.9	2.6	2.3	2.2	2	
	Life expectancy of males	63.8	65.8	67.3	68.8	69.8	
	Life expectancy of females	66.1	68.1	69.6	71.1	72.3	

3. SOCIAL TRANSITION

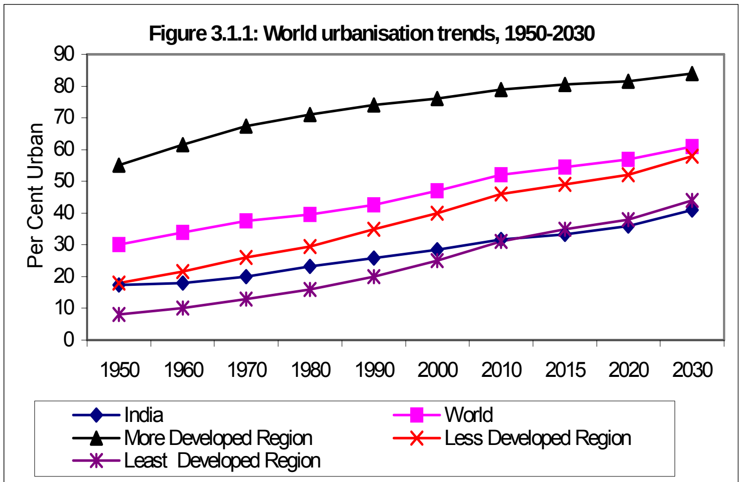
3. SOCIAL TRANSITION

India, the second most populous country in the world, has no more than 2.5% of global land but is the home of 1/6th of the world's population. Being a developing country with high population density, India invested in human development and improvement in quality of life of its citizens; to achieve rapid social transition efforts were focused on interventions to improve per capita income, availability of food, clothing, education, employment and health care. India's policies and programmes aimed at promotion of both equity and excellence. Urbanization, improvement in water supply and sanitation and investment in all tiers of education have led social transition and resulted in human capital formation. Transition in each of these aspects has occurred at different rates; there are large inter state variations in the progress achieved in these aspects. While most of the aspects ongoing social transition is beneficial there are some adverse effects such as problems of urban slum dwellers and the worsening of gender bias and consequent adverse sex ratio.

The benefits of national economic progress reach different segments of the population through different channels at different rates. The needs of people above the poverty line and an improvement in their standards of living can be achieved through optimum utilisation of existing market mechanism; governmental programmes are aimed to improve access to available facilities or fully meet the essential needs of the population with poor purchasing power. The Eleventh Plan has focused on inclusive growth; accelerating the progress in all these efforts to improve quality of life and reducing inter state variations in quality of life.

3.1 Urbanization

The proportion of people in developing countries who live in cities has almost doubled since 1960 (from less than 22 per cent to more than 40 per cent), while in more developed regions the urban share has grown from 61 per cent to 76 per cent. Urbanization is projected to continue well into the twenty first century. By 2030, it is expected that nearly 5 billion (61 per cent) of the world's 8.1 billion people will live in cities. India shares this global trend toward urbanization (Figure 3.1.1).

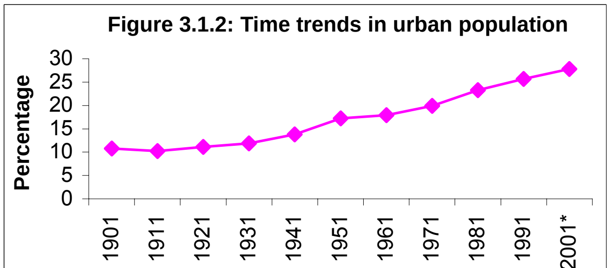


Source :- Reference 3.1.1 and 3.1.3

Globally, the number of cities with 10 million or more inhabitants is increasing rapidly, and most of these new "megacities" are in developing regions. In 1960, only New York and Tokyo had more than 10 million people. By 1999, the number of megacities had grown to 17 (13 in developing countries). It is projected that there will be 26 megacities by 2015, (18 in Asia; of these five in India); more than 10 per cent of the world's population will live in these cities (1.7% in 1950).

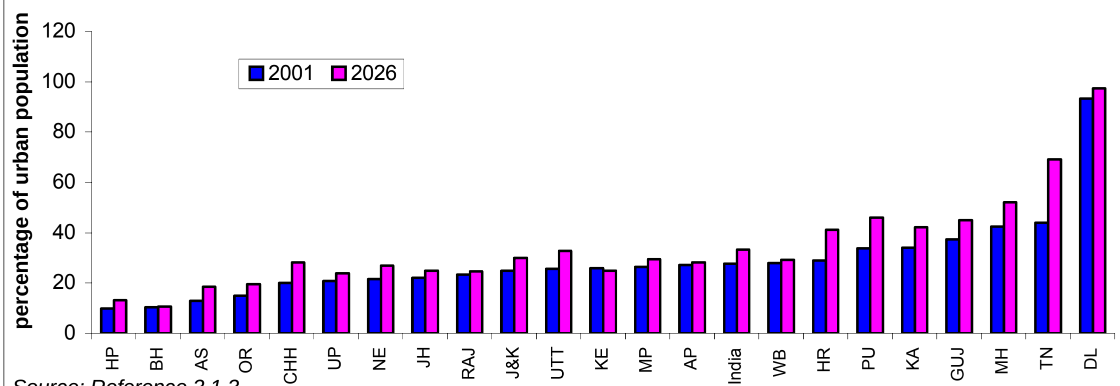
Like all the developing countries India too had undergone progressive urbanization. Decadal increase in urban population as proportion of the total population of India during the last century is shown in Figure 3.1.2. India's urban population has doubled from 109 million to 218 million during the last two decades.

Percentage of urban population in 2001 in different states and the projected urban population percentage by 2026 are shown in Figure 3.1.3 and India's million plus cities are given in Annexure 3.1.1. There are large interstate differences in proportion of urban population. Delhi has almost all population residing in urban area. Maharashtra, Tamil Nadu, Gujarat, Punjab and Karnataka are some of the states with over 35 % of the population are living in urban areas. Among the smaller states Mizorum has high urban population. At the other end of the



Source: Reference 3.1.2

Figure 3.1.3: Projected urban population



Source: Reference 3.1.3

spectrum are states like Himachal, Bihar, Assam and Orissa, which have only about 10% of the population, are living in urban areas. In all states there will be increase in urban population over the next two decades but the large interstate differences in %urban population will continue to exist even in 2026. State-wise proportion of population expected to live in urban areas by 2026 is depicted in Figure 3.1.3. It is observed that by 2026, 98 percent of Delhi' s population would be living in urban areas, which is highest among the states, included for projecting the population by component method. In contrast only 11 percent of the population of Bihar would be expected to live in urban areas in 2026.

Like many other demographic changes, urbanization has both positive and negative effects. One of the major problems associated with urbanization is the inability of the existing infrastructure and services to cope with needs of the rapidly expanding population especially poor migrants. Urban population growth has outpaced the development of basic minimum services; housing, water supply, sewerage and solid waste disposal are far from adequate; increasing waste generation at home, offices and industries, coupled with poor waste disposal facilities result in rapid environmental deterioration. Increasing automobiles add to air pollution. All these have adverse effect on ecology and health. Health and nutritional status of the urban slum population especially the recent migrants are worse than the rural population. Poverty persists in urban and peri-urban areas; awareness about the glaring inequities in close urban setting may lead to social unrest.

Rapid economic growth will inevitably lead to an increase in urbanisation as cities provide large economies of agglomeration for individual activity. As urban infrastructure is inadequate and of poor quality in the urban population is not able to fully benefit from these large economies. Poor urban infrastructure inflicts a severe hardship on people. Congested roads, poor public transport, inadequate availability of water, improper treatment of sewage, uncollected solid waste and inadequate housing that forces more than 50% of our population in some metropolis to live in slums, all these severely compromise the quality of life and well being of urban population. Urban poor urgently need sectoral policies aimed at improving livelihood support and increasing employment and a strategy for providing essential services education, health and other basic public facilities. Inadequate access essential facilities deny urban poor the opportunity to share fully in the benefits of growth. Curtails the quality of human resource development and consequently limit the growth process itself.

In order to cope with this massive problem due rapid urban growth, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in 2005. The mission envisages providing focused attention to integrated development of infrastructural services in 63 selected cities to secure effective linkages between asset creation and asset management, to ensure adequate investment of funds to fulfill deficiencies, to scale up delivery of civic amenities on universal access to urban poor and to encourage planned development of cities.

But urbanisation also provides new opportunities. Cities and towns have become the engines of social change and rapid economic development. Urbanisation is associated with improved access to education, employment and health care. These can result in increase in age at marriage, create demand for maternal and child health and nutrition higher contraceptive use, and fewer unwanted pregnancies, smaller better nourished healthier families. As people have moved towards and into cities, information has flowed outward. Better communication and transportation now link urban and rural areas both economically and socially creating an urban-rural continuum of communities with improvement in some aspects of lifestyle of both. The ever increasing reach of telephone net works and mass media result in communication of information, new ideas and points of reference; available options are becoming more widely recognized, appreciated and sought. The country has to fully utilise the opportunities provided by the ongoing process of urbanization to improve the quality of the citizens.

References

3.1.1 **State of Worlds Population 2000** www.unfpa.org/swp/2000/English
3.1.2 **Census of India, 2001**: http://www.censusindia.gov.in/ last accessed on 21/12/07
3.1.3 **Population projection for India and States 2001-2026,** Report of the Technical group on population projections, RGI – New Delhi May 2004

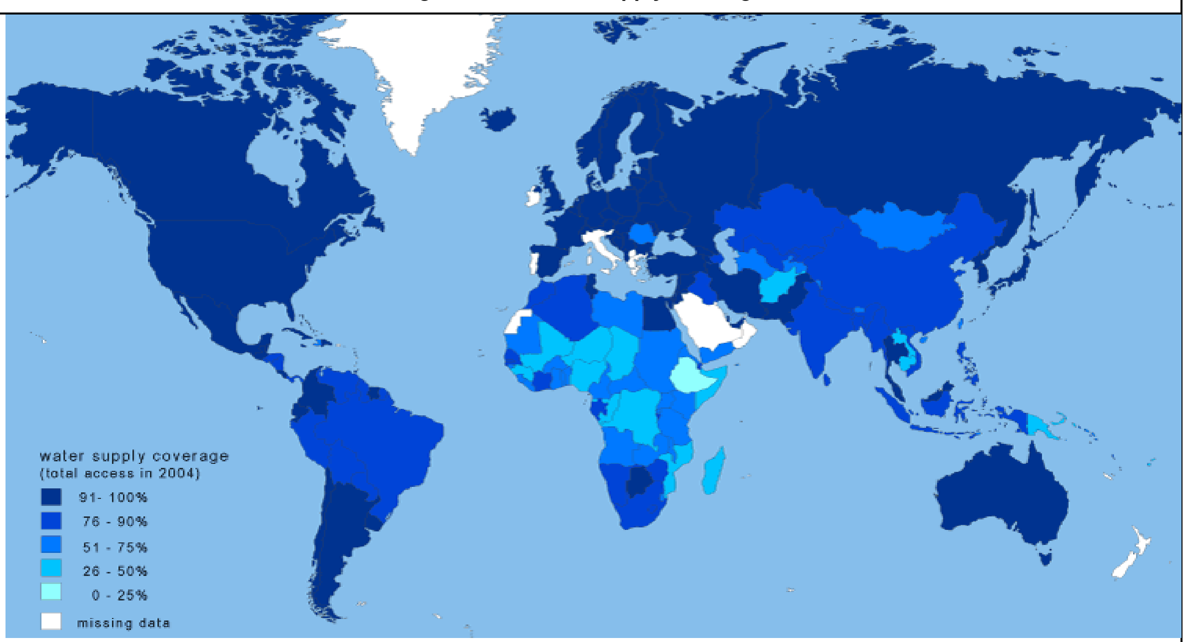
India's million plus cities, 2001

3.2 Water supply

Relationship between water supply and nutrition is two fold: water is the essential and often limiting factor for improving agricultural productivity; access to safe drinking water is a critical determinant for reduction in water borne infections and improvement in health and nutritional status. In many parts of developed and developing world, water demand substantially exceeds sustainable water supply. It is estimated that currently 430 million (8% of the global population) is living in countries affected by water stress; by 2020 about one fourth of the global population may be facing chronic and recurring shortage of fresh water (Figure 3.2.1). In India, water withdrawal is estimated to be the twice the rate of aquifer recharge; as a result water tables are falling by one to three meters every year; tapping deeper aquifers have resulted in larger population groups being exposed to health hazards such as high fluoride or arsenic content in drinking water. At the other end of the spectrum, excessive use of water has led to water logging and increasing salinity in some parts of the country. Eventually, both lack of water and water logging could have adverse impact on India's food production. There is very little arable agricultural land, which remains unexploited,
and in many areas, agricultural technology improvement may not be able to ensure further increase in yield per hectare. Research efforts are therefore focusing on biotechnology for improving development of food grains strains that would tolerate salinity and those which would require less water. Simultaneously, a movement towards making water harvesting, storage and need based use part of every citizens life should be taken up.

Drinking water is less than one percent of the total water demand and should have the first priority among all uses of water. Provision of clean drinking water,

Figure 3.2.1: Water supply coverage



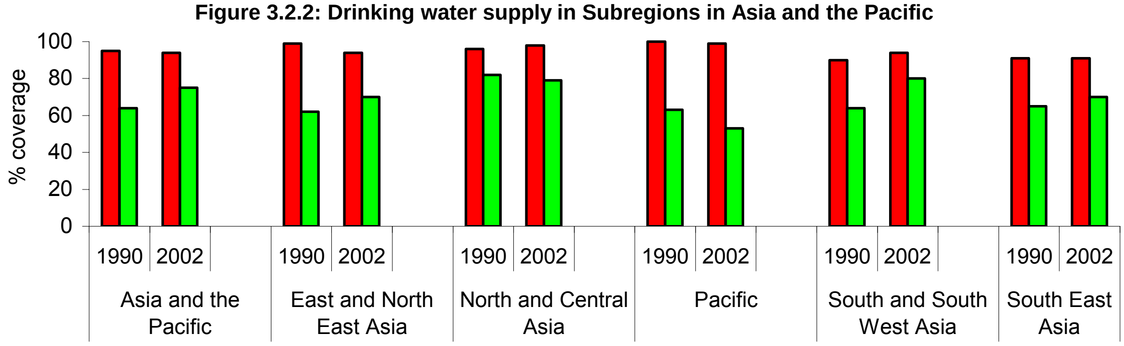
Source: Ref 3.2.1

sanitation and a clean environment are vital for reducing morbidity, improving health and nutritional status of the population. Recognizing the link between healthy environment and sanitation, the Millennium Development Goals (MDGs) stipulate, halving, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. Access to safe drinking water is the key element for prevention of water borne infection, which is a major factor responsible for undernutrition especially in young children. Global position regarding access to safe drinking water is shown in Figure 3.2.1. While all the developed countries have achieved universal access to safe drinking water, the populous developing countries have not been able to ensure this to substantial proportion of their population. In all the countries of the world access to safe drinking water is higher in urban as compared to rural areas.

Progress towards universal access to safe drinking water in urban and rural areas in India and some of the neighboring countries is shown in Figure 3.2.2 and Figure 3.2.3. Most of the Asian countries had ensured that their urban population had access to safe drinking water by 1990. Over the last decade there has been some improvement in rural people getting safe drinking water; but even in 2002 nearly one fourth of the rural population lacked access to safe drinking water.

Prior to India's independence water supply and sanitation were part of the responsibility of the public health engineering section of the department of health. However, realizing the magnitude of the task of providing access to safe drinking water to the growing population these two services were made a part of the urban and rural development departments. Special focus was given to improving rural water supply during the last three decades. Government of India's major intervention in water sector started in 1972-73 through Accelerated Rural Water Supply Programme (ARWSP) for assisting States/UTs to accelerate the coverage of drinking water supply. In 1986, the entire programme was given a mission approach with the launch of the Technology Mission on Drinking Water and Related Water Management. This Technology Mission was later renamed as Rajiv Gandhi National Drinking Water Mission (RGNDWM) in 1991-92. In 2002-03 the Swajaldhara programme was launched.

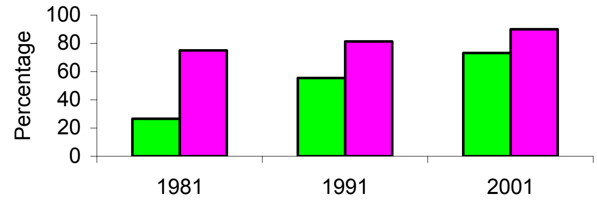
Figure 3.2.2: Drinking water supply in Subregions in Asia and the Pacific



Source: Reference 3.2.2

Census figures show that there has been considerable improvement in rural water supply position in the last two decades (Figure 3.2.3). As on 1.4.2007, Department of Rural Development has reported that out of a total of 15,07,349 rural habitations in the country, 74.39%(11,21,366 habitations) are fully covered, and 14.64% (2,20,165 habitations) are partially covered. The 10th Plan target of providing potable drinking water to all villages has clearly not been achieved; 55067 uncovered habitations will be covered in 4 years (2005-09) under Bharat Nirman Yojana). Rural Water Supply is, beset with the problem of sustainability, maintenance and water quality. Out of the 14.22 lakh habitations in the country, although more than 95% coverage was achieved prior to Bharat Nirman, about 2.8 lakh habitations have slipped back from either fully covered to partially covered category. Another 2.17 lakh habitations have problems with the quality of water, with about 60,000 habitations facing the serious problems of salinity or arsenic and fluoride contamination. Present estimates shows that out of the 2.17 lakh water quality affected habitation as on 1.4.05, about 70,000 habitations have been addressed. Under Bharat Nirman, it is proposed to tackle the habitations that have slipped back or have problems with water quality.

Figure 3.2.3: Access to safe drinking water in households in India



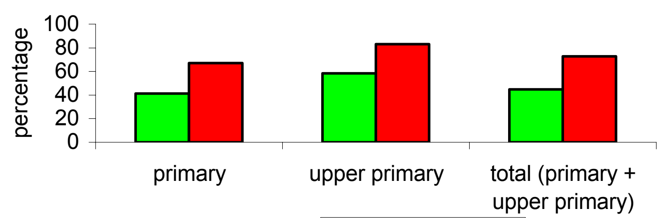
Source: Reference 3.2.3

Although on 31.3.2004, about 91% of the urban population has got access to water supply facilities; access does not ensure adequacy and equitable distribution. Average access to drinking water is highest in class I towns (73%), followed by class II towns (63%), class III towns (61%) and other towns (58%). Poor people in slums and squatter settlements are poor. As water supply is not round the clock there is lot of wastage of water; taps are left open kept open; often-stored water is not fully used.

There are substantial inter state and inter district variations in the access to safe drinking water. District wise information on access to safe drinking water provided by Census India is widely used for decentralized district based planning and monitoring of the progress in access to safe drinking water (Annexure 3.2.1)

Special efforts are being made to provide access to safe drinking water to schools, anganwadis and hospitals where vulnerable segments of population such as children and mothers assemble; this will enable the institutions to maintain appropriate standards

Figure 3.2.4: School Drinking water coverage

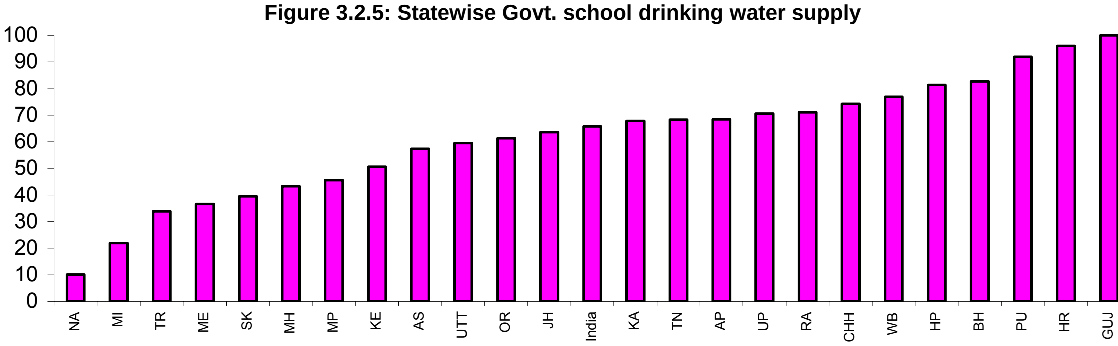


Source: Reference 3.2.4

of hygiene and also enable these institutions to provide health education in the right ambience. The efforts are more successful in upper primary schools than in primary schools (Figure 3.2.4). There are considerable interstate differences in access to safe drinking water to school children (Figure 3.2.5). While almost all schools in Gujarat, Punjab and Haryana have access to safe drinking water; Maharashtra, MP and Kerala lag behind.

The problems of sustainability of water availability, maintenance of supply system and dealing with the issue of water quality are the major challenges. The conjunctive use of groundwater, surface water and roof top rainwater harvesting systems have to encourage as means of improving sustainability and drinking water security. Where groundwater quality and availability, is unsatisfactory surface water sources need to be developed. Restoration and building of tanks and other water bodies along with rainwater harvesting structures for recharge and for direct collection at community and household levels constitute an attractive option. There is a huge growing gap between the demand and supply of water in urban areas, due to increasing population. There should efforts to tackle both supply and demand side problems. Recycling and reuse of water, reducing the water demand through rainwater harvesting, using water efficient household equipments including flushing cisterns would go a long way in conserving water and reducing ever growing urban demand for water.

Figure 3.2.5: Statewise Govt. school drinking water supply



Source: Reference 3.2.5

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3.2.1 **Joint Monitoring Programme – UNICEF** http://www.wssinfo.org/en/22_wat_global.html last accessed on 21/12/07

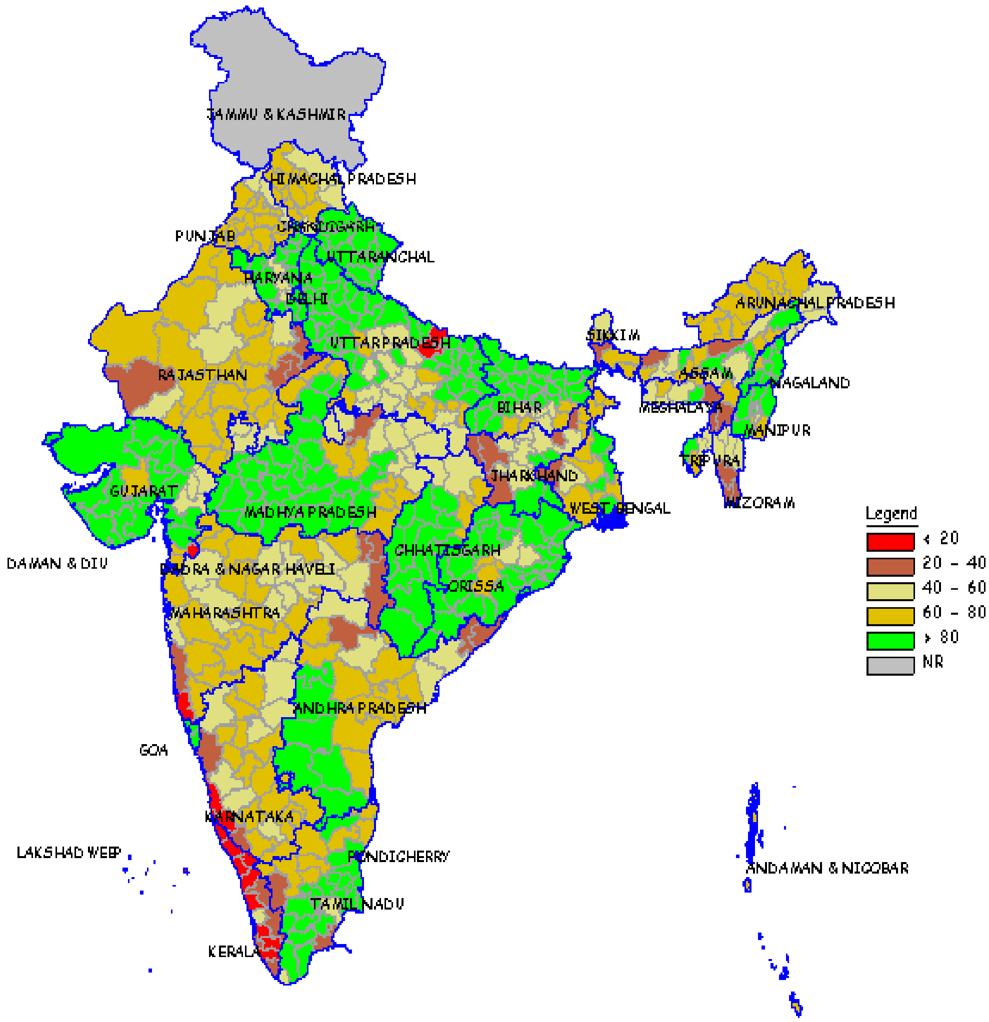
3.2.2 **MDG, WHO and UNICEF 2004:** http://www.who.int/water_sanitation_health/monitoring/jmp2004/en/ last accessed on 21/12/07

3.2.3 **Office of the Registrar General of India**: http://www.censusindia.gov.in/ last accessed on 21/12/07

3.2.4 **Sixth All India Educational Survey**, http://www.ncert.nic.in/sites/educationalsurvey/saies.htm last accessed on 21/12/07

3.2.5 **Baseline Survey Data PIP** http://ddws.nic.in/tsc/crsp/pip_rep_hs.asp?ST=&flag=2 last accessed on 21/12/07

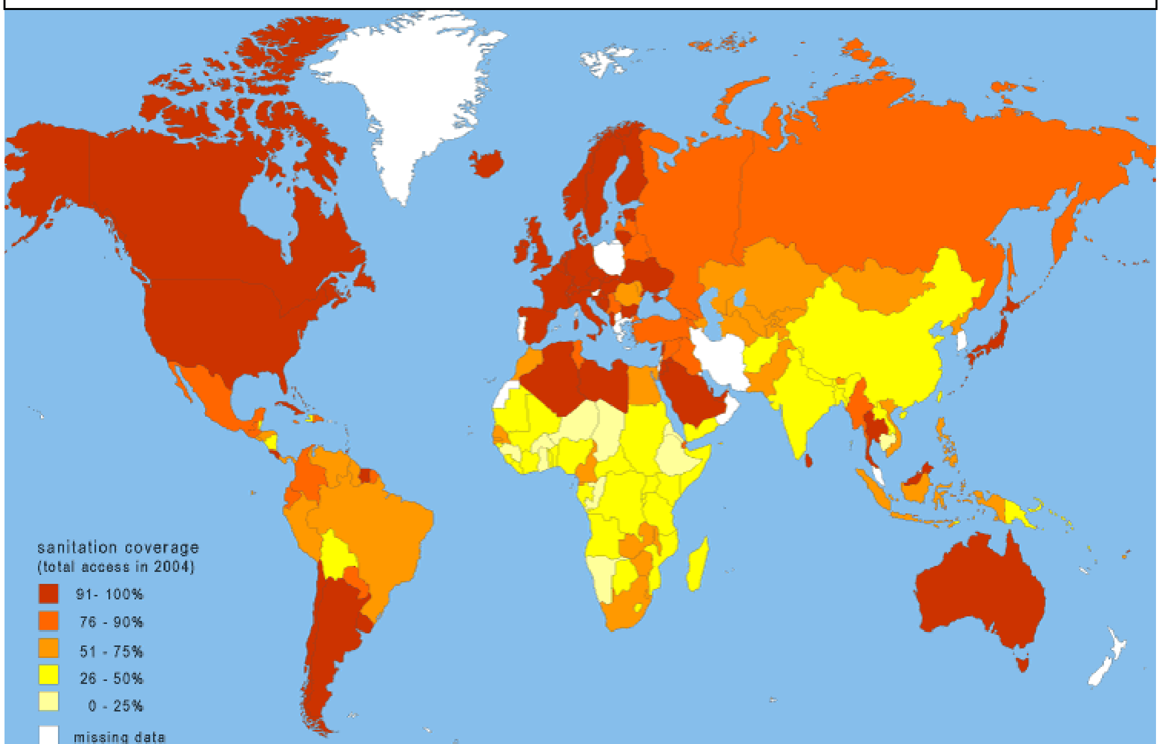
PERCENTAGE OF COVERAGE OF SAFE DRINKING WATER(HABITATIONS)



3.3 Sanitation

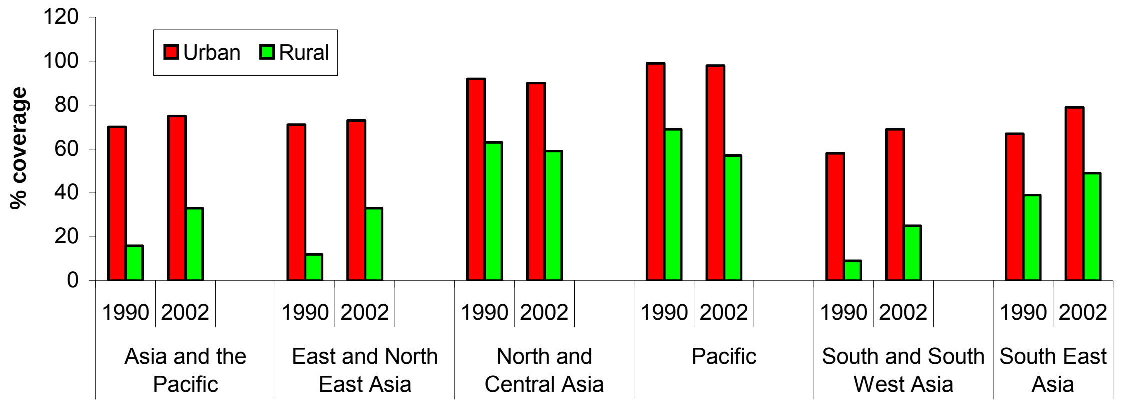
Sanitation covers the whole range of activities including human waste disposal, liquid and solid wastes from household and industrial waste. Lack of drains and the presence of ditches create unsanitary conditions, which contaminate water, breed mosquitoes and cause water-borne diseases. Sanitation is to be seen as a need, as basic as drinking water or food. A sanitary toilet within or near home provides privacy and improves environmental sanitation. Provision of clean drinking water sanitary toilets is critical for reducing water borne infections. While majority of the developed countries have achieved universal access to toilets, developing countries lag behind (Figure 3.3.1); as a result prevalence of water borne diseases in these countries continue to be high with all the attendant adverse effects on health and nutritional status of vulnerable population especially children.

Figure 3.3.1: Sanitation coverage



Source: Reference 3.3.1

Figure 3.3.2 : Sanitation coverage in Subregions in Asia and the Pacific

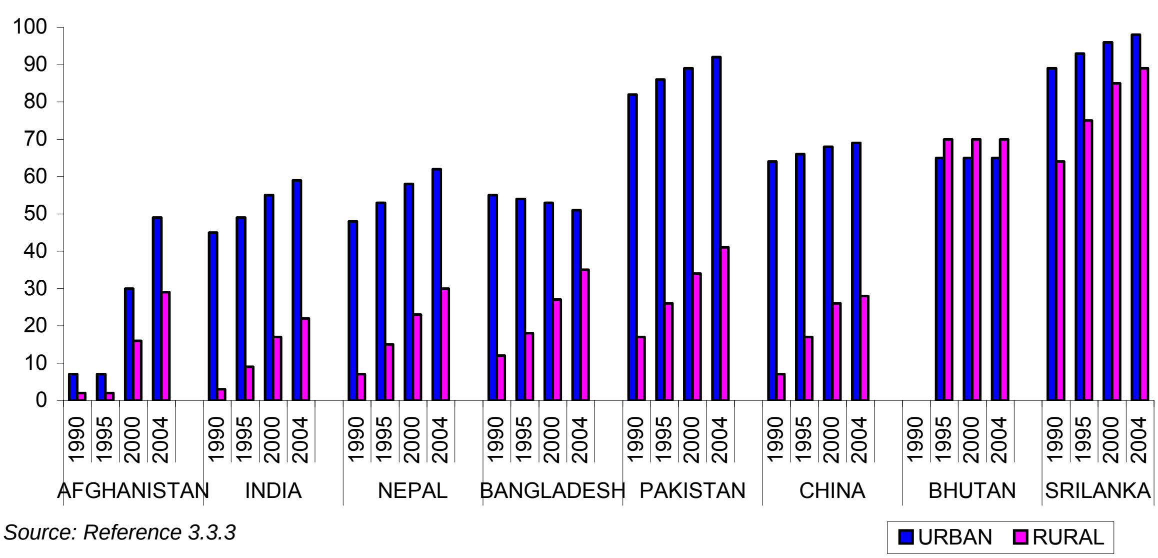


Source: Reference 3.3.2

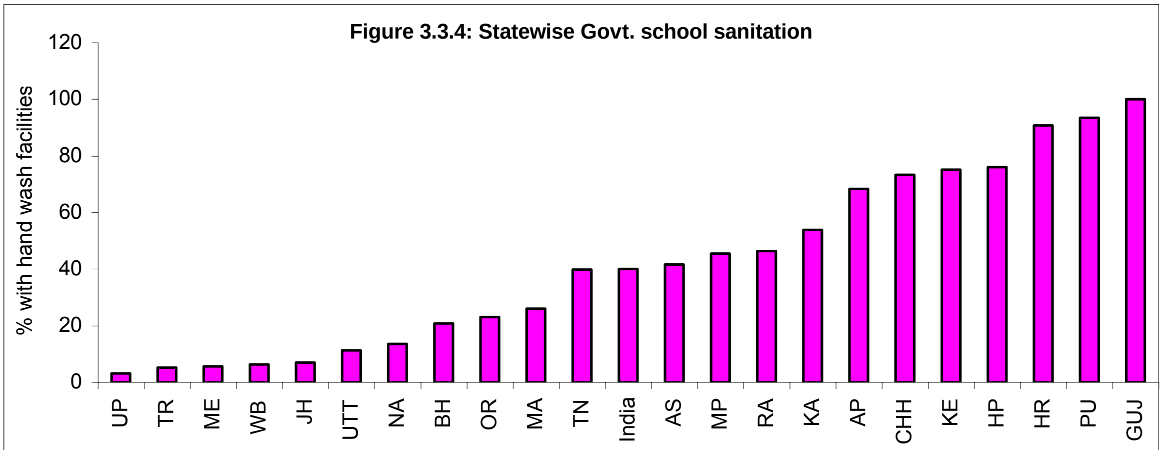
In developing countries sanitation coverage is higher among urban areas as compared to rural areas. Progress in terms of improvement in sanitation coverage in Asian region and in some of the neighboring countries in Asia is shown in Figure 3.3.2 and Figure 3.3.3. There has been progressive improvement in access to sanitary toilets over the last two decades both in urban and rural areas but the gap between urban and rural areas persists. Among the neighboring countries, Srilanka has been most successful in providing access to sanitary toilets to urban and rural population.

Rural sanitation coverage was only 1% in the 1980s. With the launch of the Central Rural Sanitation Programme in 1986, the coverage improved to 4% in 1988 and then to 22% in 2001. The programme was modified as Total Sanitation Campaign in 1999 changing the earlier supply driven, high subsidy and departmentally executed programme to a low subsidy, demand driven one, with

Figure 3.3.3: Sanitation coverage in ASIA (%)



Source: Reference 3.3.3

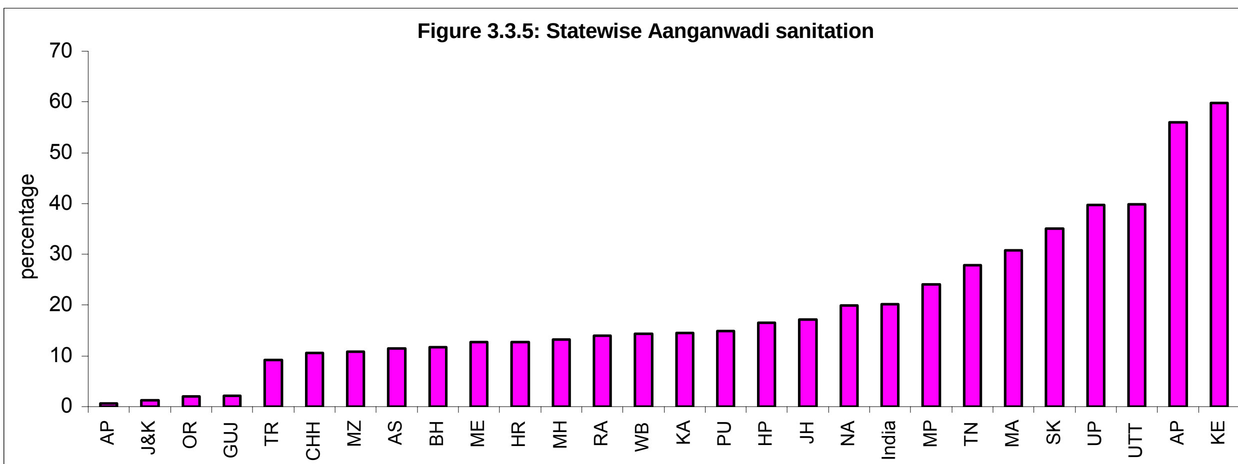


Source: Reference 3.3.4

emphasis on hygiene education. Census 2001 indicates that of the 200 million dwelling units across the country, only some 40 million dwelling units have a toilet inside the house. Only 61 per cent households in urban areas and 17 per cent households in rural areas have access to improved sanitation; about 63% of the urban population has access to sewerage and sanitation facilities. However, adequacy, equitable distribution and per-capita provision of these basic services may not be as per prescribed norms in most of the cities. The poor, particularly those living in slums and squatter settlements, do not have access to these basic facilities.

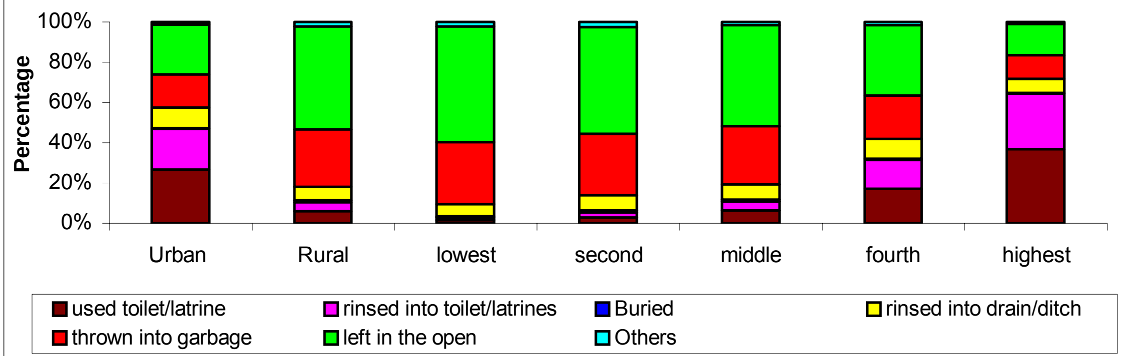
During the Tenth Five Year Plan period an attempt was made to provide toilet facilities in schools and anganwadi's on priority basis. Data on the coverage levels as of 2003 is given in Figure 3.3.4 and Figure 3.3.5. Data indicate that while Kerala, and Andhra have fared well in improving toilet facilities in anganwadis, Gujarat, Punjab and Haryana were providing better toilet facilities in schools.

In view of the importance of sanitary disposal of the human excreta, the National Family Health Survey obtained information on the disposal of child's stools from each of the households surveyed. Data from the survey confirmed that sanitary



Source: Reference 3.3.5

Figure 3.3.6: Manner of Disposal of child's stool according to residence & wealth index

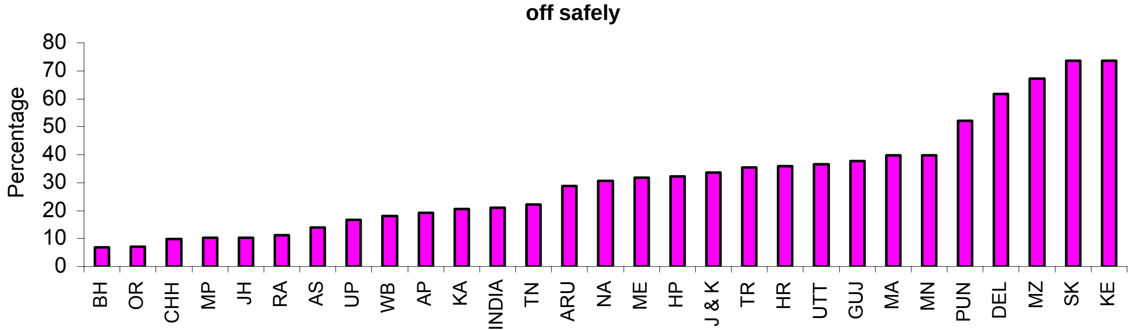


Source: Reference 3.3.5

disposal of human excreta was better in urban as compared to rural areas. There was a socioeconomic gradient in the safe disposal of child's stools with the poor having the least access to safe disposal methods (Figure 3.3.6). There are large interstate differences in the safe disposal of the children's stools. In Kerala, Sikkim, Mizorum, Delhi and Punjab majority of the households disposed the child's stools safely; at the other end of the spectrum are states like Bihar, Orissa, MP and Rajasthan where only about one tenth of the households had access to safe methods of disposal of the child's stools (Figure 3.3.7).

In order to rapidly achieve universal access to sanitary toilets, Govt of India has initiated the Total Sanitation Campaign. TSC programme is being implemented in 578 districts of 30 States/UTs with support from the Central Government and the respective State/UT Governments. Against a target of 10.85 crore individual household toilets, the toilets reported completed is about 2.89 crore up to Jan 2007. In addition, about 3.12 lakh school toilets, 8900 sanitary complex for women and 99150 balwadi toilets have been constructed. The Eleventh Five Year Plan has set the target of completing 7.29 crore individual toilets for achieving universal sanitation coverage in rural areas. In order to achieve 100 per cent coverage of clean water and sanitation in rural areas, rural sanitation programme are being linked with the National Rural Health Mission.

Figure 3.3.7: Interstate differences in percentage of children whose stools are disposed off safely



Source : Reference 3.3.5

The strategies include:

- convergence of health care, hygiene, sanitation and drinking water at the village level
- participation of stake holders at all levels, from planning, design and location to
- implementation and management of the projects
- institution water quality monitoring and surveillance systems by involving PRIs,
- community, NGOs and other civil society organizations
- increased attention to IEC campaign

References

3.3.1 **Joint Monitoring Report – UNICEF** http://www.wssinfo.org/en/32_san_global.html last accessed on 21/12/07

3.3.2 **WHO, UNICEF Joint Monitoring Programme for water supply and sanitation**, 2006 http://www.wssinfo.org/en/335_san_asiaS.html last accessed on 21/12/07

3.3.3 **MDG, WHO and UNICEF 2004:** http://www.who.int/water_sanitation_health/monitoring/jmp2004/en/ last accessed on 21/12/07

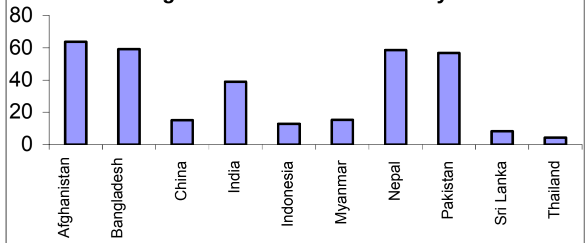
3.3.4 **Baseline Survey Data PIP** http://ddws.nic.in/tsc/crsp/pip_rep_hs.asp?ST=&flag=2 last accessed on 21/12/07

3.3.5 **National Family Health Survey – 3** : http://www.nfhsindia.org/nfhs3-national-report.html last accessed on 21/12/07

3.4 Education

The role of education in accelerating social and economic development and improving the quality of life of the citizens is well recognized. Education opens up opportunities, empowers people with skills and knowledge, gives them access to productive employment, enhances efficiency and improves overall quality of life. India, the second most populous country in the world realized the importance of education in human resource development and invested heavily in education right from the time of Independence. Since independence the country has witnessed substantial improvement both access to education and in the quality of education. However, the national goals of universal elementary education and total eradication of illiteracy still continues to elude us. Adult literacy rates in India and some of its neighboring countries are shown in Figure 3.4.1. In Afghanistan 63.75% of the adults are illiterates; illiteracy rates in Bangladesh, Nepal and Pakistan are high. China Srilanka and Thailand have nearly eliminated illiteracy. Even in the current decade about a third of the Indians are illiterate.

Figure 3.4.1: %Adult illiteracy



Source: Reference 3.4.1

Table 3.4.1: Literacy rates in India

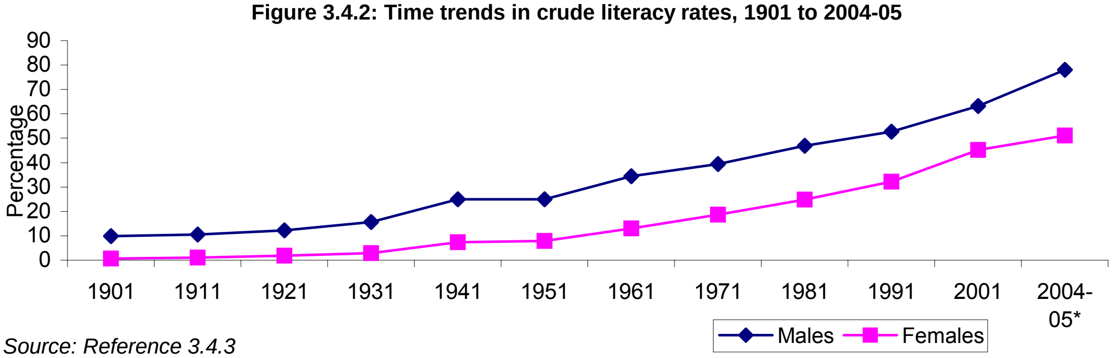
Year	Persons	Males (M)	Females (F)	MF gap
1951	18.33	27.16	8.86	18.30
1961	28.30	40.40	15.35	25.05
1971	34.45	45.96	21.97	23.98
1981	43.57	56.38	29.76	26.62
1991	52.21	64.13	39.29	24.84
2001	65.38	75.85	54.16	21.70

Source: Reference 3.4.2

Literacy rates in India

Time trends in literacy rates over the last five decades computed from the census are given in Figure 3.4.2, Figure 3.4.3,Table 3.4.1 and Annexure 3.4.1. 1961 and 1971 censuses relate to the population aged five years and above while those for the 1981,1991 and 2001 censuses relate to the population seven years and above. There has been a progressive increase in literacy rates over the last five decades but inspite of the efforts universal literacy continues to be elusive. The gap in literacy rates between men and women has not decreased substantially (Annexure 3.4.2).

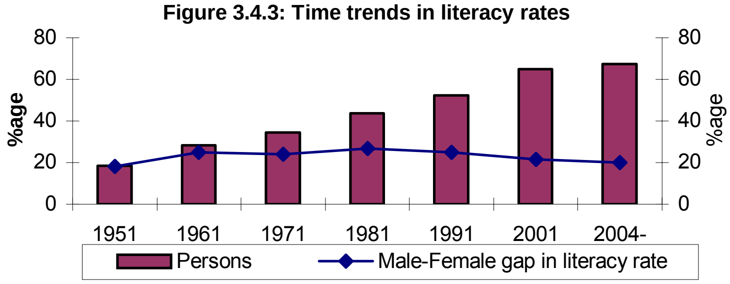
Figure 3.4.2: Time trends in crude literacy rates, 1901 to 2004-05



Source: Reference 3.4.3

Literacy rates are lower in rural areas. There are substantial interstate differences in literacy Kerala and northeastern states like Mizorum and Meghalaya have high literacy rates with very little urban rural or gender disparity in literacy rates. Inspite of substantial progress over the last three decades literacy rates especially in rural areas, among women and those belonging to scheduled caste and tribes are lower in states like Rajasthan, Madhya Pradesh and UP.

Figure 3.4.3: Time trends in literacy rates



Source: Reference 3.4.3

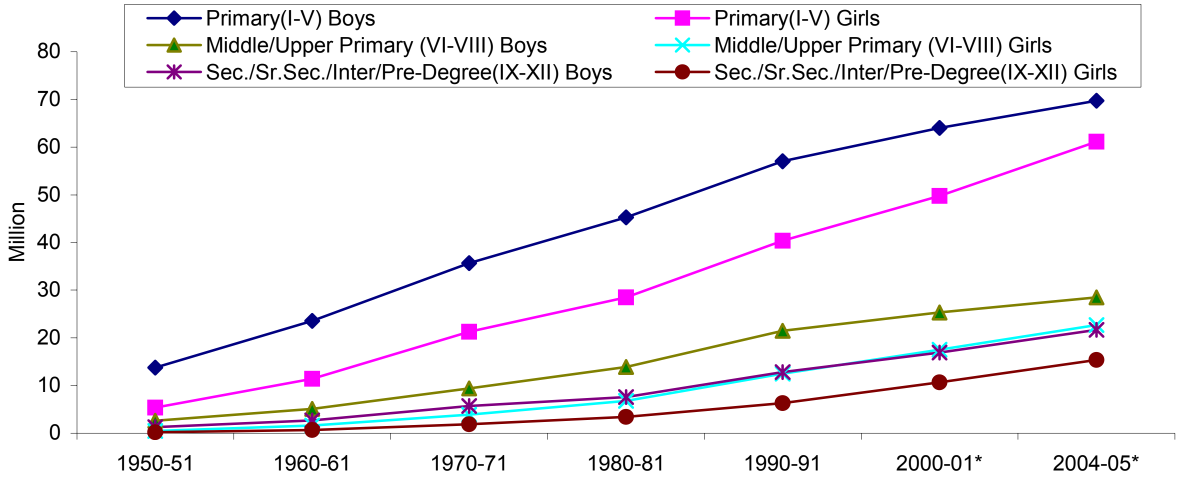
School education

Time trends in over all enrolment and girls enrolment as % of over all enrolment in primary, upper primary and secondary schools over the last five decades is shown in Figure 3.4.4 and Figure 3.4.5. There has been a steep increase in primary school enrolment and girls' form nearly 50% of the enrolled children. However the enrolment in upper primary and secondary schools is considerably lower; though there has been improvement in the girls attending higher classes, the gender gaps persist.

Universal of Elementary Education

Elementary education i.e. classes IVIII consisting of primary (I-V) and upper primary (VI-VIII) is the foundation of the pyramid in the education system. A broad objective of the National Policy on Education (NPE), 1986 modified in 1992 has been that education should play a positive and interventionist role in correcting social and regional imbalances, empowering women and in securing

Figure 3.4.4: Enrolement by stages from1950-1951 to 2004-05

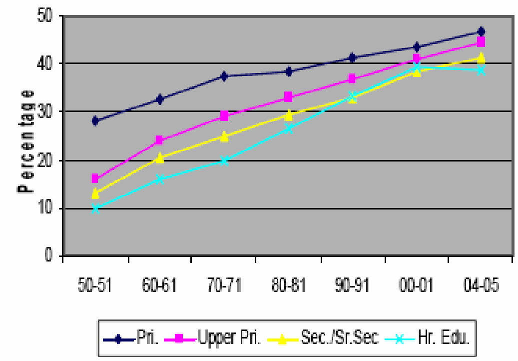


Source: Reference 3.4.3

rightful place for the disadvantaged and the minorities. The National Policy of Education had indicated three thrust areas in elementary education:

- Universal access enrolment;
- Universal retention of children upto 14 years of age; and
- A substantial improvement in the quality of education to enable all children to achieve essential levels of learning.

Figure 3.4.5: Percentage of girl's enrolment to total enrolment



Source: Reference 3.4.3

The 86th Constitutional Amendment Act 2002 made education a Fundamental Right for children in the age group of 6-14 years by providing that "the State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine". Unlike the other rungs of educational institutions elementary educational institutions are predominantly run by the government or is government aided. Therefore government has to play the critical role in ensuring that the right for education is translated into reality. Sarva Shiksha Abhiyan which is the flagship programme of the Ministry of Human Resource Development (MHRD) Government of India for primary education and Mid Day Meal programme are interventions to ensure that the objectives do get achieved within the time frame.

Sarva Shiksha Abhiyan (SSA)

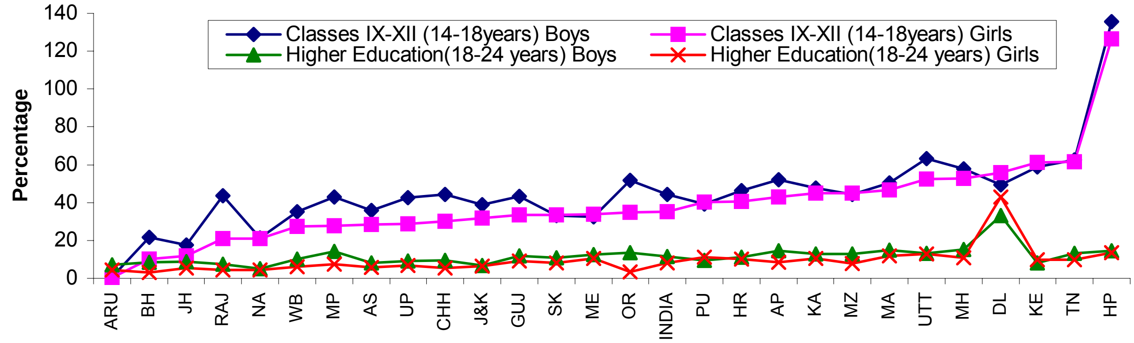
SSA, the principal programme for UEE, is the culmination of all previous endeavors and experiences in implementing various education programmes. Implemented in partnership with the States, SSA addresses the needs of 194 million children in the age group of 6-14 years. Under the SSA the Ministry of HRD has reported that the total enrolment at elementary education level increased from 131 million in 2001-02 to 182 million in 2004-05. This included enrolment of over 25 million out -of-school children. Enrolment in primary, and upper primary schools in 2002 and 2005 is shown. State/UTs have reported a significant reduction in the number of out of school children; and as on March 31, 2006, there were only 70.5 lakh children in the 6-14 age group who were not enrolled in a school. There has been substantial increase in the gross enrolment ratio

Table 3.4.2: GER in Primary and upper primary schools

Stage	Gross Enrolment Ratio				% Point increase
	01-02	02-03	03-04	04-05	
Primary (I-V)					
Boys	105.3	97.5	100.6	110.7	5.4
Girls	86.9	93.1	95.6	104.7	17.8
All	96.3	95.3	98.2	107.8	11.3
Upper primary (VI-VIII)					
Boys	67.8	65.3	66.8	74.3	6.5
Girls	52.1	56.2	57.6	65.1	13
All	60.2	61	62.4	69.9	9.7
Elementary (I-VIII)					
Boys	90.7	85.4	87.9	96.9	6.2
Girls	73.6	79.3	81.4	89.9	16.3
All	82.4	82.5	84.8	93.5	11.1

Source: Reference 3.4.3

Figure 3.4.6: Interstate differences in gross enrolment ratio(GER)-All categories



Source: Reference 3.4.3

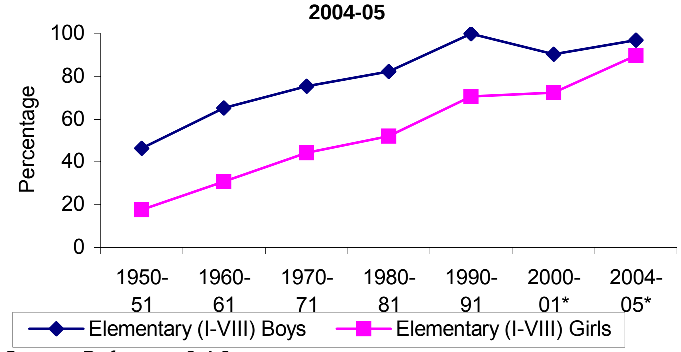
(GER) at the primary and upper primary school levels. There are huge interstate variations in GER (Figure 3.4.6, Table 3.4.2 and Figure 3.4.7).

It is increasingly realized that retaining the disadvantaged children enrolled in schools is a far more challenging task than enrolling them into educational system. Time trends in drop out rates in primary, elementary and secondary schools in the last two decades are shown in Figure 3.4.8. Drop out rates in primary schools have come down substantially over the last five decades but he drop out rates in elementary and secondary schools still continue to be very high. Around 22% children dropout in classes I and II. Several factors, apart from their adverse socio-economic conditions are responsible for this. Drop out rates are higher among girls and among SC and ST (Table 3.4.3).

Some of the major achievements during the Tenth Plan period in the quest for universalisation of elementary education are:

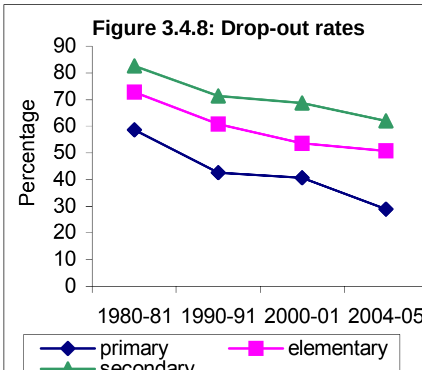
- Reduction in the number of out of school children: from about 320 lakh in 2002-03 to 70.5 lakh in March 2006.
- Decline in gender and social gaps:
    - ✓ The gender gap at the primary stage reduced from 5.5 % in 2002-03 to 4.2% in 2005-06.

Figure 3.4.7: Gross enrolment ratios (GER), 1950-51 to 2004-05



Source: Reference 3.4.3

Figure 3.4.8: Drop-out rates



Source: Reference 3.4.3

- ✓ At the upper primary stage this gap reduced from 10.7% to 8.8%
- ✓ The GPI at the primary stage in 2005 was 0.95 and 0.88 for the upper primary stage.
- ✓ The share of SC students in total enrolment was 20.72% at the primary stage and 19.42% at the upper primary stage.
- ✓ For ST students, share in total enrolment was 11.75% at the primary stage in 2005-06 and 9.28% at the upper primary stage.

Table 3.4.3: Dropout rates by social composition 2004-05

Categories	Primary (I-V)			Elementary (I-VIII)		
	Boys	Girls	Total	Boys	Girls	Total
SC's	32.7	36.1	34.2	55.2	60	57.3
ST's	42.6	42	42.3	65	67.1	65.9
All	31.8	25.4	29	50.5	51.3	50.8

Source: Reference 3.4.3

Table 3.4.4: Learning achievements at elementary level (percentage)

Stages of education	Maths	Lang.	EVS / science	Social Science
At end of class III	58.25	63.12	-	-
Class V	46.51	58.57	50.30	-
Class VII	29.87	53.00	35.98	32.96
Class VIII	38.47	52.45	40.54	45.00

Source: Reference 3.4.4

- ➢ Reduction in dropout rates:
  - ✓ gross dropout rate declined from 39.03% in 2001-02 to 28.49% in 2004-05.
  - ✓ For girls, the decline in dropout rate has been from 39.88% to 24.82%

Quality and equity are two major issues yet to be addressed satisfactorily under UEE. The results of learning achievement surveys conducted by NCERT (Table 3.4.4) highlight poor quality of learning

Eleventh plan targets for elementary education

- ➢ Universal enrolment of 6-14 age group children including the hard to reach segments.
- ➢ Substantial improvement in quality and standards improved through a range of coherent, integrated and comprehensive strategies with the ultimate objective to achieve standards of KVs under the CBSE pattern.
- ➢ All gender, social and regional gaps in enrolments to be eliminated by 2011-12.
- ➢ One year pre-schools education for children entering primary school.
- ➢ Dropout at primary level to be eliminated and the dropout rate at the elementary level to be reduced from over 50% to 20% by 2011-12.
- ➢ Universal coverage of ICT at upper primary schools by 2011-12.
- ➢ Significant improvement in learning conditions with emphasis on learning basic skills, verbal and quantitative.

Mid-Day Meal (MDM) Scheme

MDM scheme aims at promoting school enrolment, reduction in drop out rates, preventing classroom hunger, instilling educational values and fostering social and gender equity. Under the last revised scheme (June, 2006), cooked midday meal with a energy content of 450 calories, 12 grams protein and vegetable 50 g is to be served to children 12 crore children studying in over 9.50 lakh schools at primary level in government, government-aided, and local body schools; and in Education Guarantee Scheme (EGS) /Alternative & Innovative Education (AIE) Centres. The Scheme is being implemented by all States/UTs. The number of children covered under the programme has risen from 3.34 crore in 3.22 lakh schools in 1995 to 12 crore in 9.5 lakh primary schools/EGS centres in 2006-07.

A review of MDM indicates absence of proper management structure in many States. Even the reported average number of school days on which meals are provided varied widely. NUEPA reports 209 days per annum, while MHRD reports 230 days at the national level .On the whole, despite the prevalence of good practices, a systematic supervision and monitoring of the programme and transparency in implementation are lacking in most of the states. Notwithstanding these shortcomings, MDM appears to have had a positive impact on school attendance.

Unlike the other rungs of the educational pyramid primary and upper primary schools are predominantly funded by the government or get government aid. During the Eleventh Plan the scheme has been extended to upper primary schools in 3479 EBBs from 1st October, 2007 to cover 17 million additional children and will be extended to all upper primary schools from April, 2008 to cover 54 million children. Thus, MDMS will cover about 18 crore children by 2008-09. The nutritional value of meals for upper primary children will be fixed at 700 calories derived from 150 gm of cereals and 20 gm of protein from pulses and 75 grams of vegetables. MDMS will be universalized at elementary level by 2008-09.

Secondary education

Over years there has been an increase in enrolment in secondary education. But there are huge urban rural, interstate and gender disparities in secondary education. It is increasingly realised that a person with a mere 8 years of schooling will be as not be able to thrive in modern industry and services. There is a need to aim at a progressive rise in the minimum level of education towards high school level or Class X. The demand for secondary education will expand significantly as SSA reaches its goal of universal and complete elementary education. The needed expansion of secondary education will require not only public but also private effort. At present, private aided and unaided schools account for 58% of the total number of secondary schools. The striking feature is that their proportion is actually increasing at a faster pace than public funded schools. During the Eleventh Plan strategies for secondary schooling will emphasize the primacy of public responsibility for providing secondary schooling and also allow scope for private schools to expand if they complement the public effort.

Vocational training

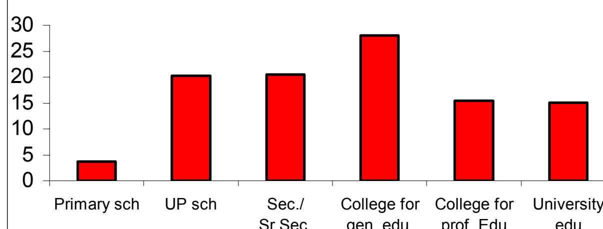
India has historically lagged behind in the area of technical/vocational training and even today enrolment rates in ITIs and other vocational institutes, including nursing and computer training schools, is only about a third of that in higher education. This is quite the opposite of other Asian countries. Technical and vocational training have to be substantially expanded not only in terms of the persons they train but also in the number of different skills and trades they teach. The quality and range of their training should keep pace with the changing needs of the economy. Data collected in 60th round of NSS shows that only 3% of the rural youth (15-29 years) and 6 per cent of the urban youth have gone through a formal course of vocational training of any kind. Most of them have acquired the skills they have from taking up or changing employment. Therefore, the principal planning issue will be how to expand vocational training from the present capacity of a mere 2 to 3 million to 15 million new entrants to the labor force. More importantly, the scope and content of the training they provide must be made relevant to the needs of industry and available jobs by involving industries and industrial associations in running them. The number of skills for which training is provided must be increased hundred fold from the current 40.

Higher education

India invested in building up educational institutions at all levels right form 1951. During the period 1950-51 and 2004-05, the number of Primary Schools increased by 3.66 times, while the Upper Primary Schools and Secondary/Hr. Secondary Schools increased by more than 20 times each. The number of Colleges for general education and professional education increased by about 28 and 15 times respectively while the number of Universities increased by 15 times during the period. India has a well developed higher education system but only about 8% of the relevant age group go to university; in many developing countries 20 and 25% of the age group go to colleges. (Figure 3.4.9)

At the time of independence, the number of universities was no more than 20, of colleges around 500 and the total enrolment was less than 1.0 lakh. By the end of the X Plan, the Indian higher education system has grown into one of the largest in the world with 378 universities, 18,064 colleges, a faculty strength of 4.92 lakh and an estimated enrolment of 140 lakh students. The higher education institutions include 23 Central Universities, 216 State Universities, 110 Deemed Universities, 11 Private Universities and 33

Figure 3.4.9: Growth of educational institutions since 1950-51



Source: Reference 3.4.3

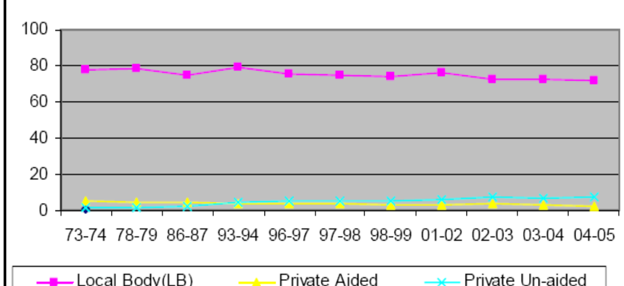
Institutions of National Importance established through Central legislation and another 5 institutions established through state legislations. There has been an impressive growth in the area of higher education with an increase in annual student enrolment from 7.26 million in 1997-98 to 10.48 million in 2004-05. Enrolment of women students rose from 2.45 million in 1997-98 to 4.04 million in 2004-05, constituting 40.4 per cent of the total enrolment NSSO survey (55th Round 1999-00) showed that, there were inequalities in enrolment in higher education across various social groups in rural and urban areas, and also in terms of gender. Women belonging to SCs and STs and those living in rural areas are the most disadvantaged.

The investment made in higher education in the 1950s and 1960s has given the country a strong knowledge base in many fields and contributed significantly to economic and social development. The country is currently reaping the benefits of these investments in terms of GDP growth mainly due to manufacturing service sector growth. Despite the expansion the higher education system is unable to provide adequate number of qualified and skilled persons needed for rapidly expanding manufacturing and service sectors. Clearly there is a need undertake major expansion. While some of the institutions of higher education compare well in te4rms of quality with the best in the world, the average standard is much lower. Even the high quality institutions are finding it difficult to get faculty of suitable quality because of the enormous increase in opportunities in the private sector for many of the skills most in demand. Over decades there has been a change in investments in educational institutions. Earlier majority of the educational institutions at all levels were funded by the government; a small proportion were funded by not for profit educational foundations. Currently majority of the primary and upper primary schools are still under local body management; but there has been increase in high schools and colleges funded by the private sector (Figure 3.4.10).

Education in the Eleventh Plan

The Eleventh Plan places the highest priority on education as a central instrument for achieving rapid and inclusive growth. It presents a comprehensive strategy for strengthening the education sector covering all segments of the education pyramid. It aims to achieve universal elementary education .In view of the demands of rapidly changing technology and the growth of knowledge economy, a mere eight years of elementary education would be inadequate for children to acquire necessary skills

Figure 3.4.10: Management wise growth of upper primary schools



Source: Reference 3.4.3

to compete in the job market. Therefore, a Mission for Secondary education is essential to consolidate the gains of Sarva Siksha Abhyan and to move forward in establishing a knowledge society. The Eleventh plan will also have to address major challenges including bridging regional, social and gender gaps at all levels of education. Due attention will also be paid to higher education so that the manpower for growing knowledge, service and manufacturing sectors is provided.

References

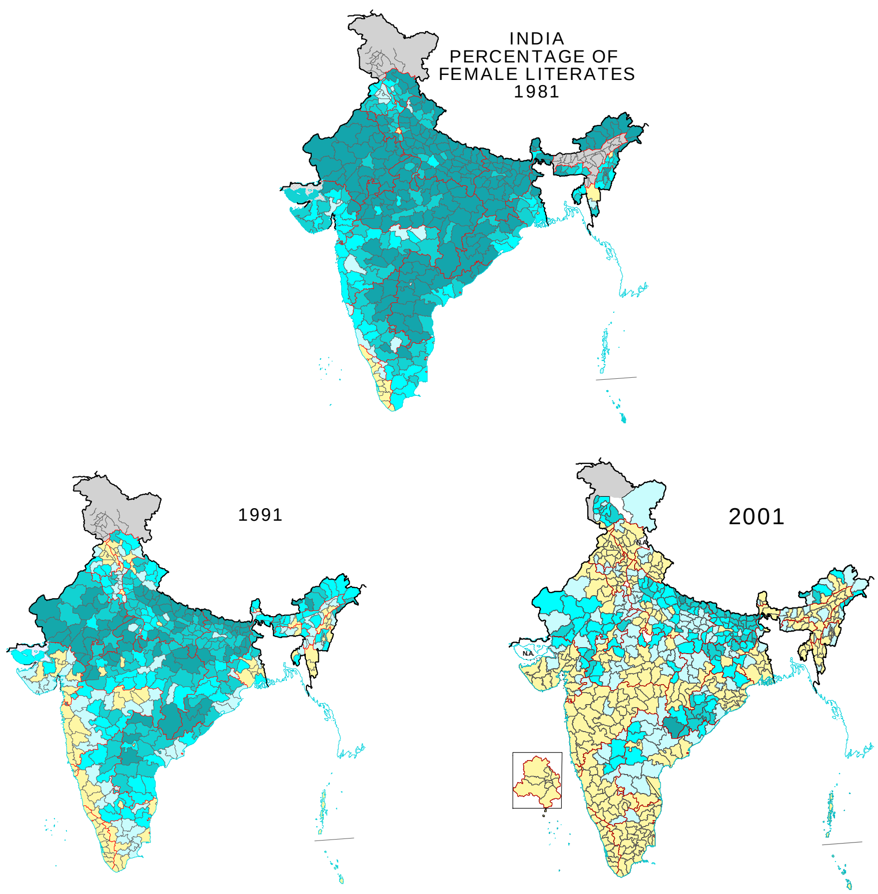
3.4.1 **World Development Indicators, database, World Bank 2004:** www.worldbank.org last accessed on 21/12/07

3.4.2 **Census of India, 2001:** http://www.censusindia.net/ last accessed on 21/12/07

3.4.2 **NCERT Selected Educational Statistics** 2004-05: www.ncert.nic.in last accessed on 21/12/07

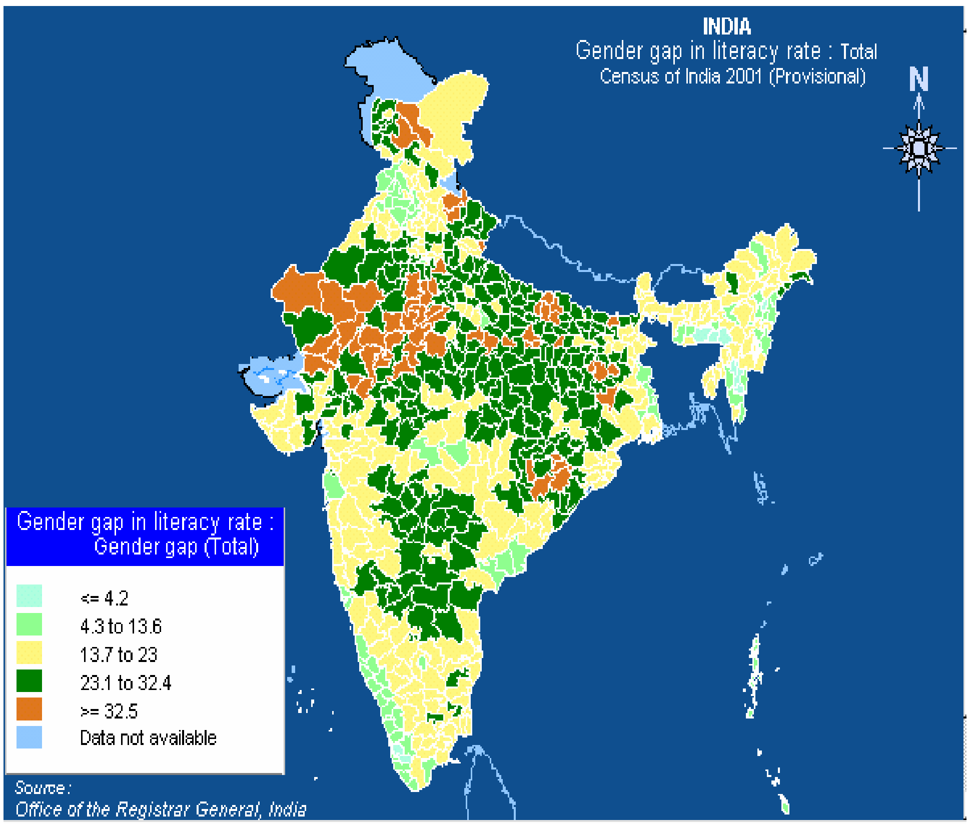
3.4.3 **Approach paper to the Eleventh Five year Plan**

Decadal changes in female literacy



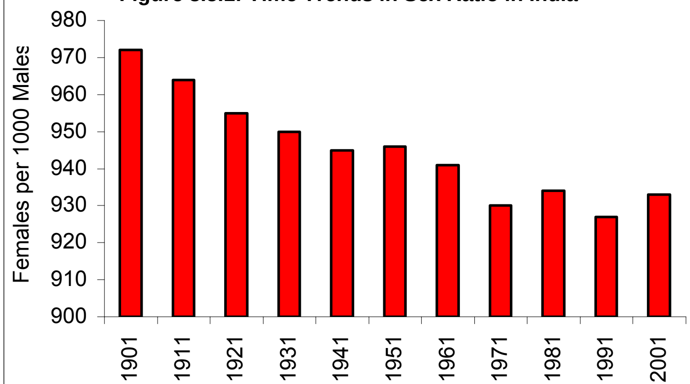
Annexure 3.4.2

Gender gap in literacy rate



3.5 Sex ratio

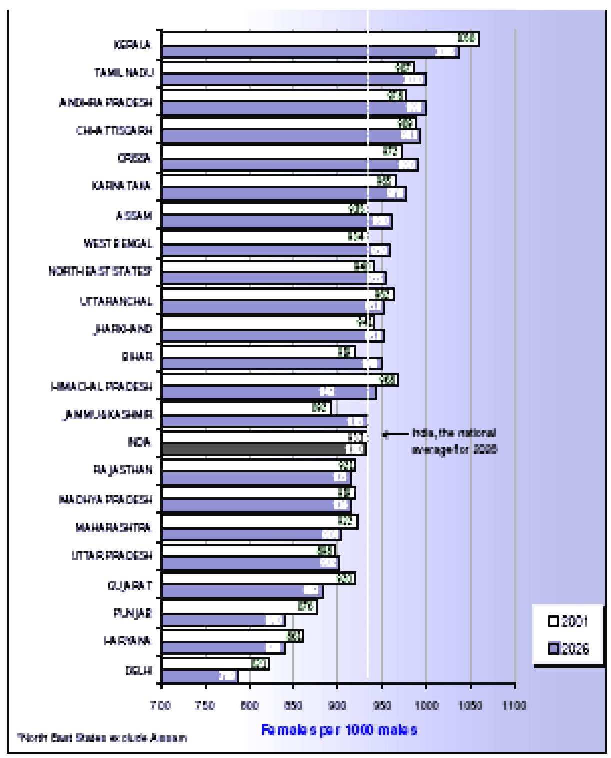
Figure 3.5.1: Time Trends in Sex Ratio in India



Source: Reference 3.5.1

Sex Ratio (defined as the number of females per thousand males) is an important social indicator to measure the extent of prevailing equity between males and females in a society. Census 2001 recorded that sex ratio for India as a whole, was 933. Over the last century there has been decline in the sex ratio (Figure 3.5.1). Among the states, Kerala has registered the highest sex ratio (1058) and Haryana the lowest (861). There is a decline in the sex ratio between 1991-2001 in Himachal Pradesh, Punjab, Haryana, Gujarat, Sikkim, Maharashtra and Goa. District map of India for sex ratio in 2001 is shown in Annexure 3.5.1. Districts with sex ratio less than 900 are shown in Annexure 3.5.2. District wise decadal changes in sex ratio in India is shown in Annexure 3.5.3.The reasons for the continued decline in sex ratio is as yet not clearly identified. However, it is well recognized that the adverse sex ratio is a reflection of gender disparities, which have to be combated. Projected sex ratio for 2026 indicate that in some of the northern states, the ratio will decrease in 2026. Lowest sex ratio of 789 is expected to be in Delhi in 2026,followed by 839 and 840 in Haryana and Punjab respectively. In the southern and eastern states except Kerala, the situation would be reverse. In Kerala, where there are excess females than males in Census 2001, the trend would remain the same in 2026. Tamil Nadu is the other state, where the number of females is expected to be equal to the number of males in 2026 (Figure 3.5.2).

Figure 3.5.2: Projected sex ratio during 2001-2026, India and selected states



Source: Reference 3.5.2

Sex ratio at birth

Computed sex ratio at birth

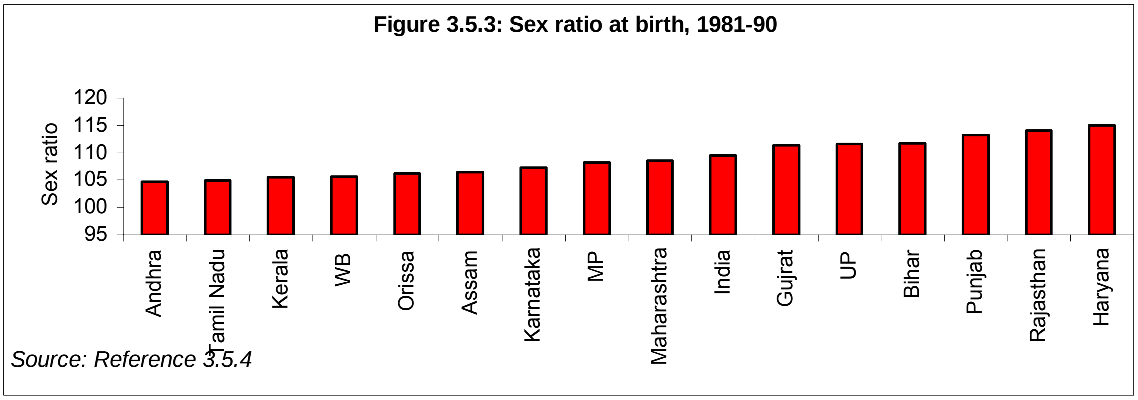


Figure 3.5.3: Sex ratio at birth, 1981-90

Source: Reference 3.5.4

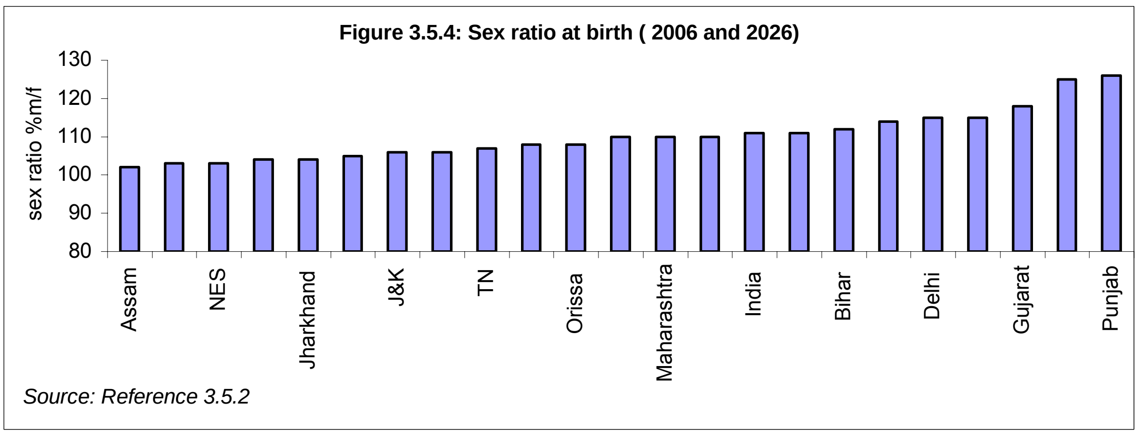


Figure 3.5.4: Sex ratio at birth (2006 and 2026)

Source: Reference 3.5.2

(defined as number of boys /100 girls) in India and different states of India in 1981-90 (Figure 3.5.3), for 2006 and 2026 (Figure 3.5.4); Sex ratio state wise in 1982,1991 and 1999 from SRS is shown in Annexure 3.5.4

The global figures for sex ratio at birth are 106. However in India the national sex ratio at birth is 111 ratio at birth and the projections indicate that they will remain at the same level. The available data is based on sample registration and not on universal registration of births as all births are not registered in the country. There are huge interstate differences in sex ratio at birth; Assam, Northeastern states,

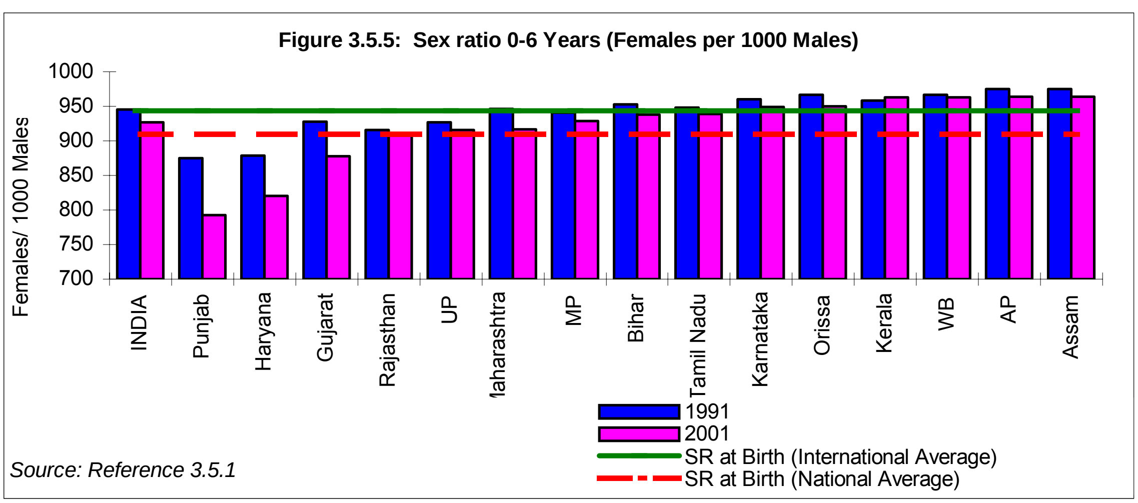
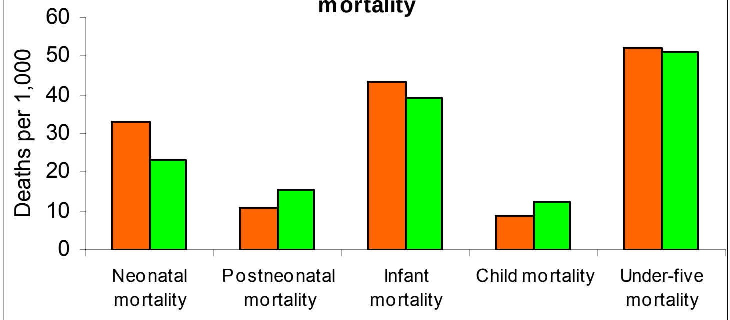


Figure 3.5.5: Sex ratio 0-6 Years (Females per 1000 Males)

Source: Reference 3.5.1

Andhra and West Bengal are some of the states with sex ratio lower than 106; at the other end of the spectrum are Haryana, Punjab, Gujarat, Rajasthan, Bihar and UP where sex ratio at birth are reported to be over 110. There are inter district variations in sex ratio at birth (Annexure 3.5.5). The reasons for such high variation in sex ratio at birth between states is not clear; however it is possible that in some of these states status of women is low and female foeticide or infanticide is atleast in part responsible for the observed distortion in sex ratio in these states.

Figure 3.5.6: Sex differences in infant & child mortality



Source: Reference 3.5.4

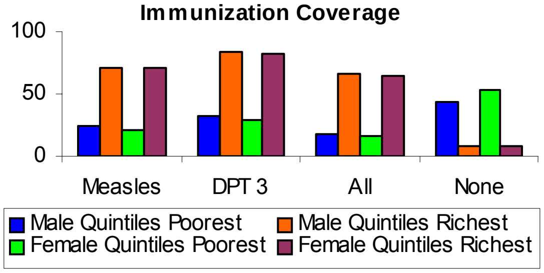
Child sex ratio

The sex ratio in the age group 0-6 years is an important indicator of the future trends of the sex composition of population in the country. Census of India, 2001 reported a child sex ratio for the country as a whole as 927 girls per thousand boys, which is lower than 945 recorded at the 1991 Census (Annexure 3.5.6). District map of child sex ratio (urban rural and over all) from census 2001 is given in Annexures 3.5.7, 3.5.8 and 3.5.9. The child sex ratio in certain states like Himachal Pradesh, Punjab, Haryana, Gujarat and union territories of Delhi and Chandigarh are inordinately low and a cause of serious concern (Figure 3.5.5). Even within the same state there are substantial inter *tehsil* variations in child sex ratio (Annexure 3.5.10, 3.5.11 & 3.5.12). There had been speculation as to whether female infanticide, sex determination tests and selective female foeticide are, at least in part responsible for this. The Government of India has enacted a legislation banning the prenatal sex determination and selective abortion while female infanticide is a cognizable offence. However, unless there is a change in social attitudes, these legislations cannot achieve the desired change. Intensive community education efforts to combat these practices, especially in pockets from where female infanticide and foeticide have been reported, are being taken up.

Gender differences in mortality and access to services

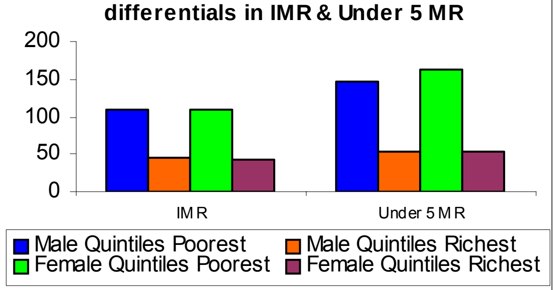
Data from NFHS-3 regarding mortality rates in relation to gender is indicated in

Figure 3.5.7: Gender Differentials in Immunization Coverage



Source: Reference 3.5.3

Figure 3.5.8: Gender based differentials in IMR & Under 5 MR



Source: Reference 3.5.3

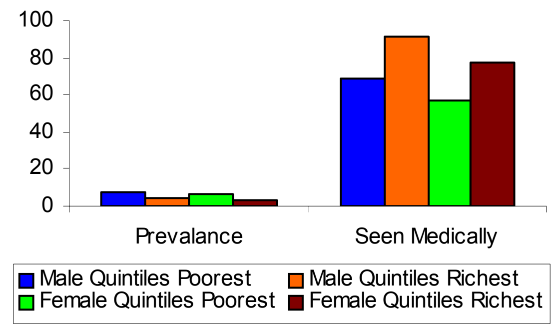


Figure 3.5.9: Gender Differentials in Treatment of ARI (%)

Source: Reference 3.5.3

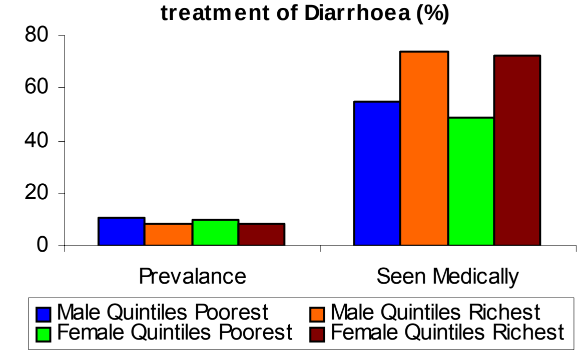
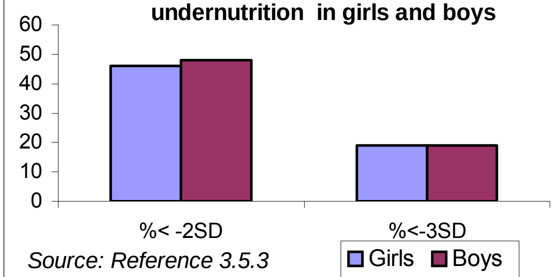


Figure 3.5.10: Gender differentials in treatment of Diarrhoea (%)

Source: Reference 3.5.3

Figure 3.5.6. U5MR in girls is higher than that of the boys consistently though the difference is small. Data from NFHS indicate that the gender differential in mortality is more in the poorest quintiles. Access to prophylactic services like immunization is lower among girl from poorest quintiles. Data from NFHS2 suggest that poorer segments of population do not seek health care for sick girls as often as they would for boys (Figure 3.5.7-10).

Figure 3.5.11: Prevalence of undernutrition in girls and boys

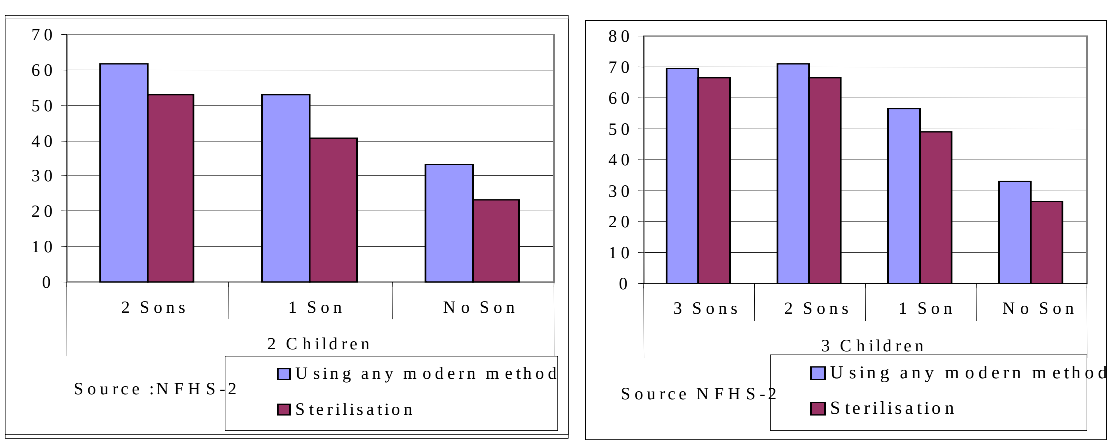


Source: Reference 3.5.3

Contrary to the popular belief there is not much difference in the prevalence of under-nutrition between the girls and boys. Similar trend has been reported by NNMB for the last three decades (Figure 3.5.11).

It is important to understand whether there is gender bias in the mindset of the

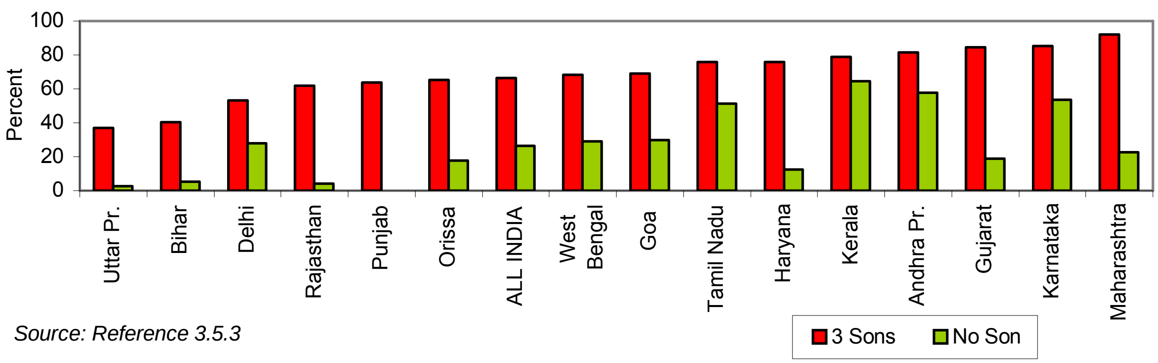
Figure 3.5.12: Gender bias in contraceptive acceptance



Source: Reference 3.5.3

population, and if so whether there are interstate differences in the bias, so that appropriate interventions for mind set and behavioral modifications can be attempted. In order to find this out, data from NFHS-2 on acceptance of contraception by families, which had two or three children, was analysed and the results are in Figures 3.5.12. It is obvious that there are huge differences in

Figure 3.5.13: Gender bias in acceptance of sterilisation : interstate differences- NFHS II



Source: Reference 3.5.3

acceptance of contraception between families with two or more sons as compared to those with no sons. This reluctance to accept terminal methods of contraception with no sons exists in all states; the magnitude of the difference in % of women undergoing sterilization with three sons and no sons is lowest in Kerala, relatively low in Karnataka, Andhra, and Tamil Nadu. The difference is very high in Punjab, Rajasthan, UP, Bihar, Haryana and Gujarat. The fact that the family does not want to accept permanent methods of contraception if they have no sons clearly indicates that they do not feel that the family is complete if they do not have a son. It is interesting that most of the states with high % differences in acceptance of contraception with no sons are also the states with adverse child sex ratio (Figure 3.5.13).

It is essential that the efforts for appropriate communications for behavioral change are taken up with utmost vigor so that the problem of gender bias with all its adverse implications can be minimized.

References

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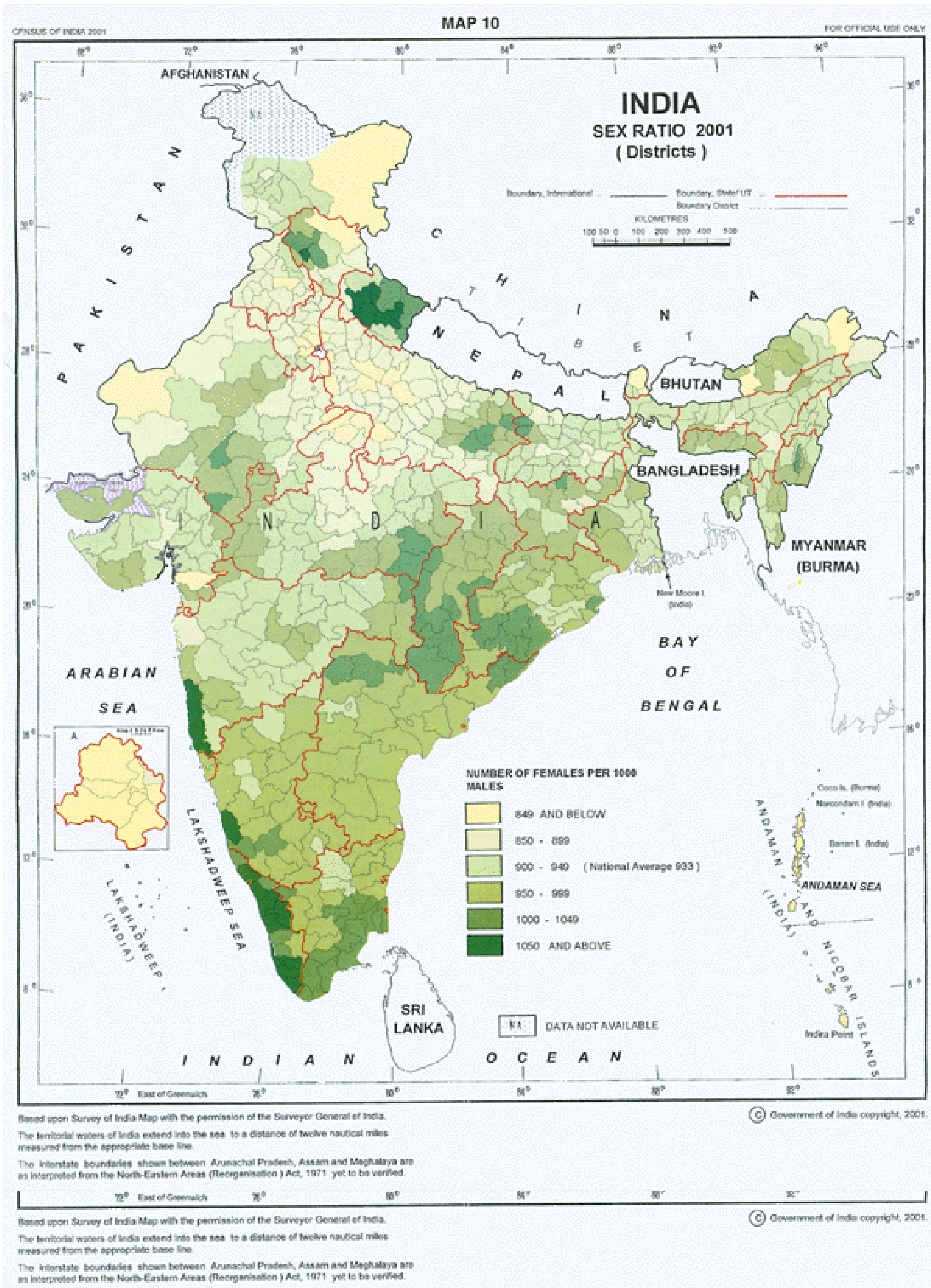
3.5.2 **Population projection for India and States 2001-2026** Report of the Technical group on population projections, RGI – New Delhi may 2004

3.5.3 **NFHS 2**:http://www.nfhsindia.org/pnfhs2.html last accessed on 21/12/07 and graphics created from the data

3.5.4 **NFHS 3**:http://www.nfhsindia.org/pnfhs2.html last accessed on 21/12/07 and graphics created from the data

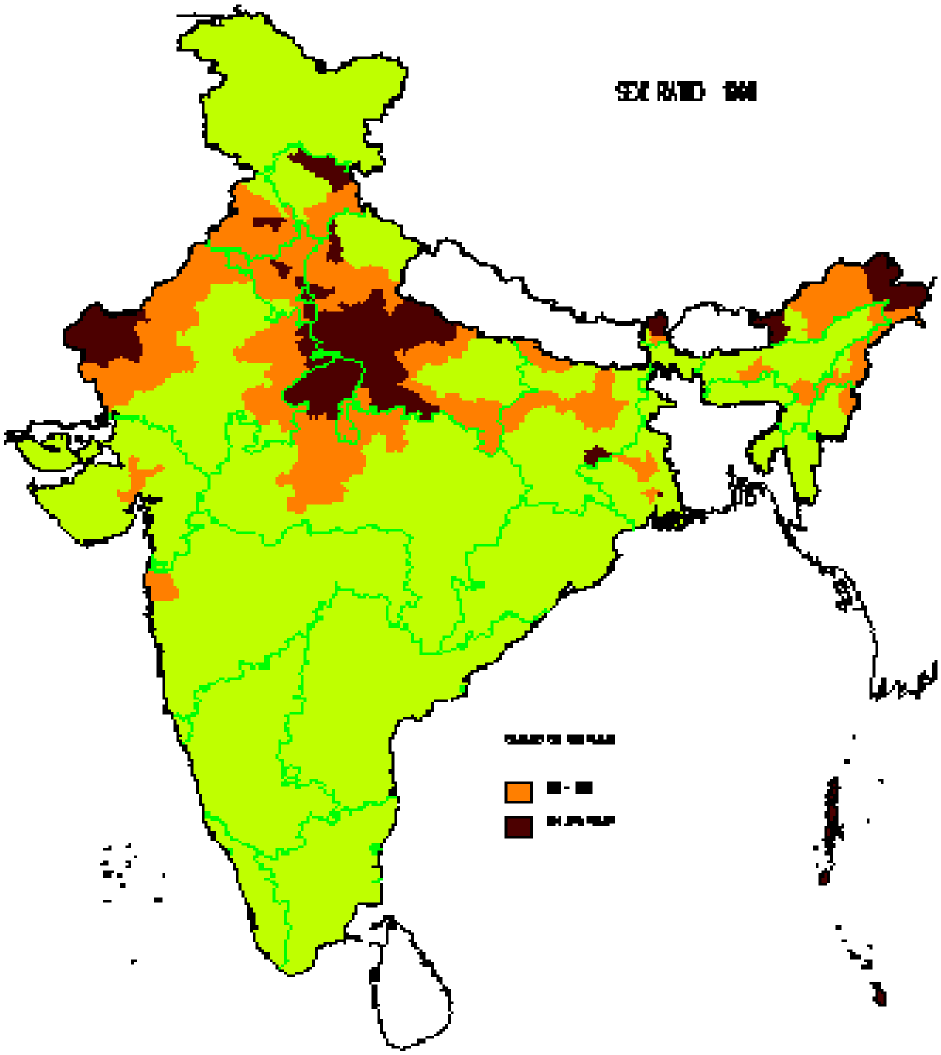
3.5.5 **Sample Registration System, RGI:** http://www.censusindia.gov.in/Vital_Statistics/SRS/Sample_Registration_System.aspx

Sex ratio – District wise (Census 2001)



Source: Census 2001

District Map indicating districts less than a sex ratio of 900 (census 2001)

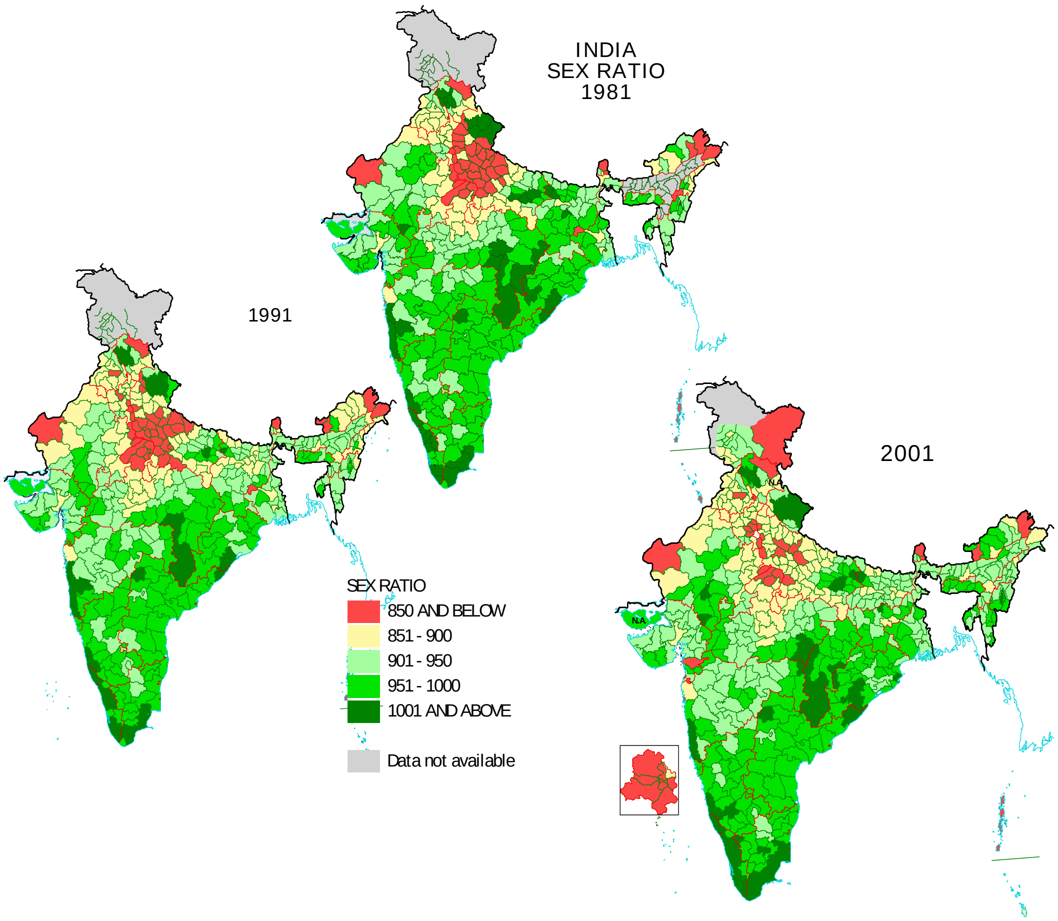


Source: Census 2001

Total Number of Districts (excluding J & K) in 1991:452
Number of districts with sex ratio less than 900: 143 or 31.6% districts

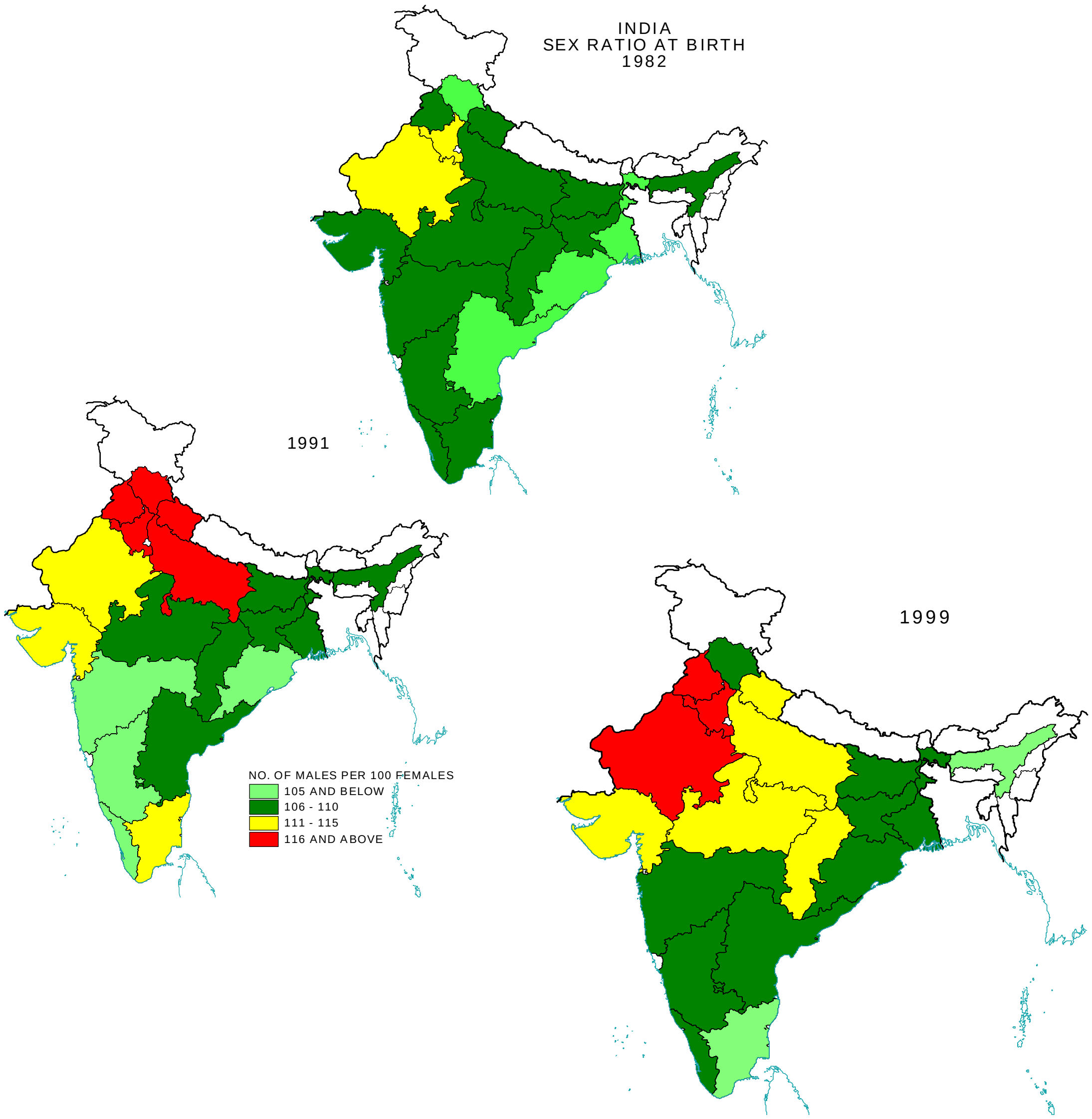
Annexure 3.5.3

India Sex Ratio, 1981, 1991 and 2001



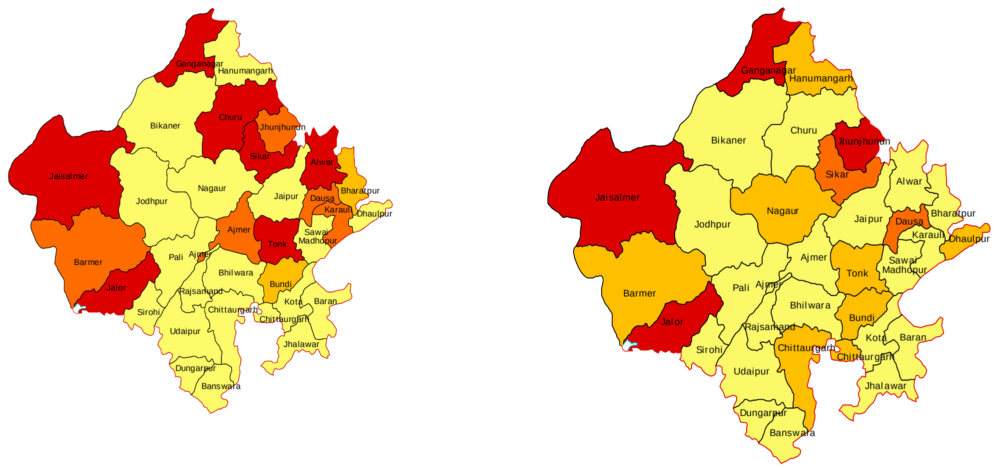
Source: Census 2001

Sex ratio at birth, 1982, 1991 and 1999



Source: Sample Registration Survey

Child sex ratio at birth: Rajasthan

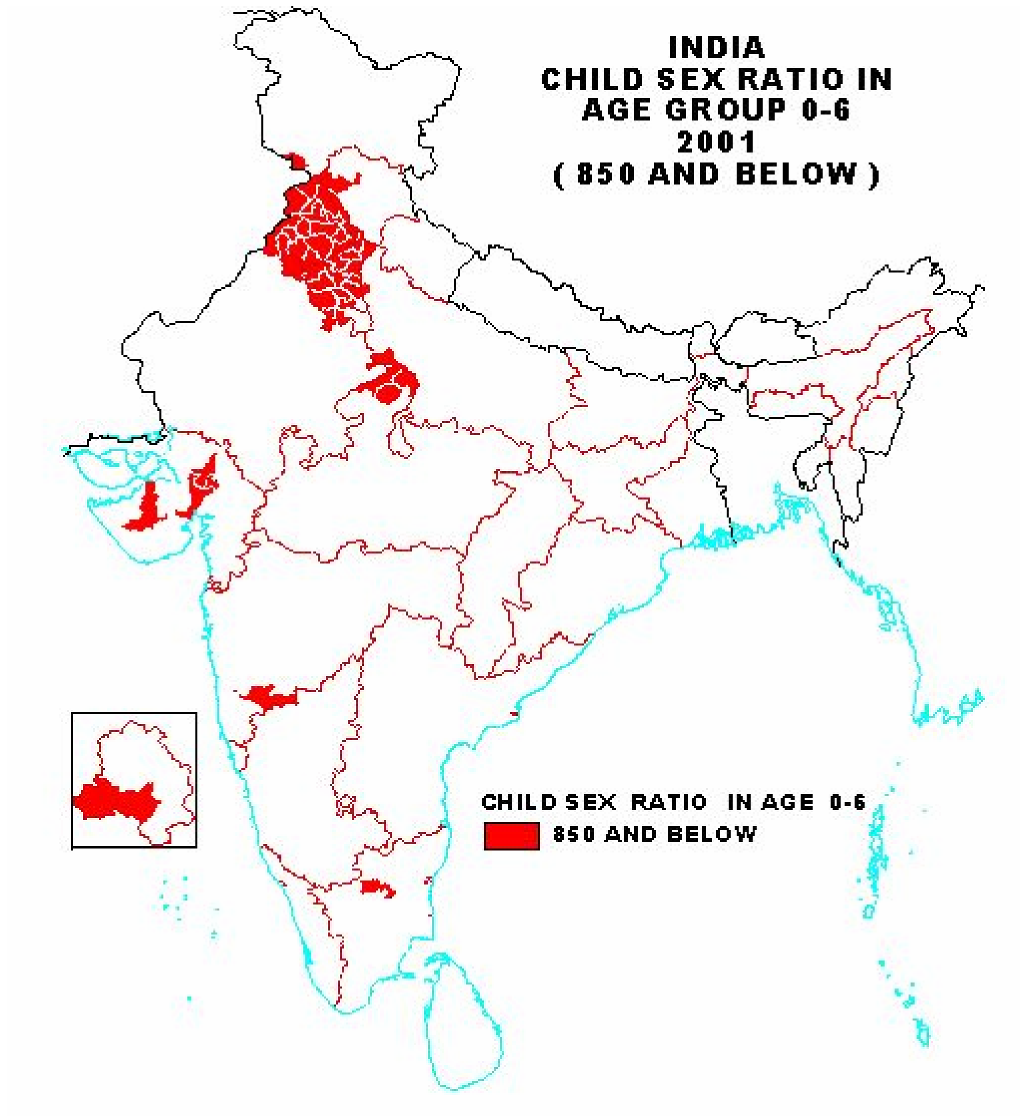


NO. OF MALES PER 100 FEMALES
- 120 AND BELOW
- 121 - 125
- 126 - 130
- 131 AND ABOVE

Source: Sample Registration Survey

Annexure 3.5.6

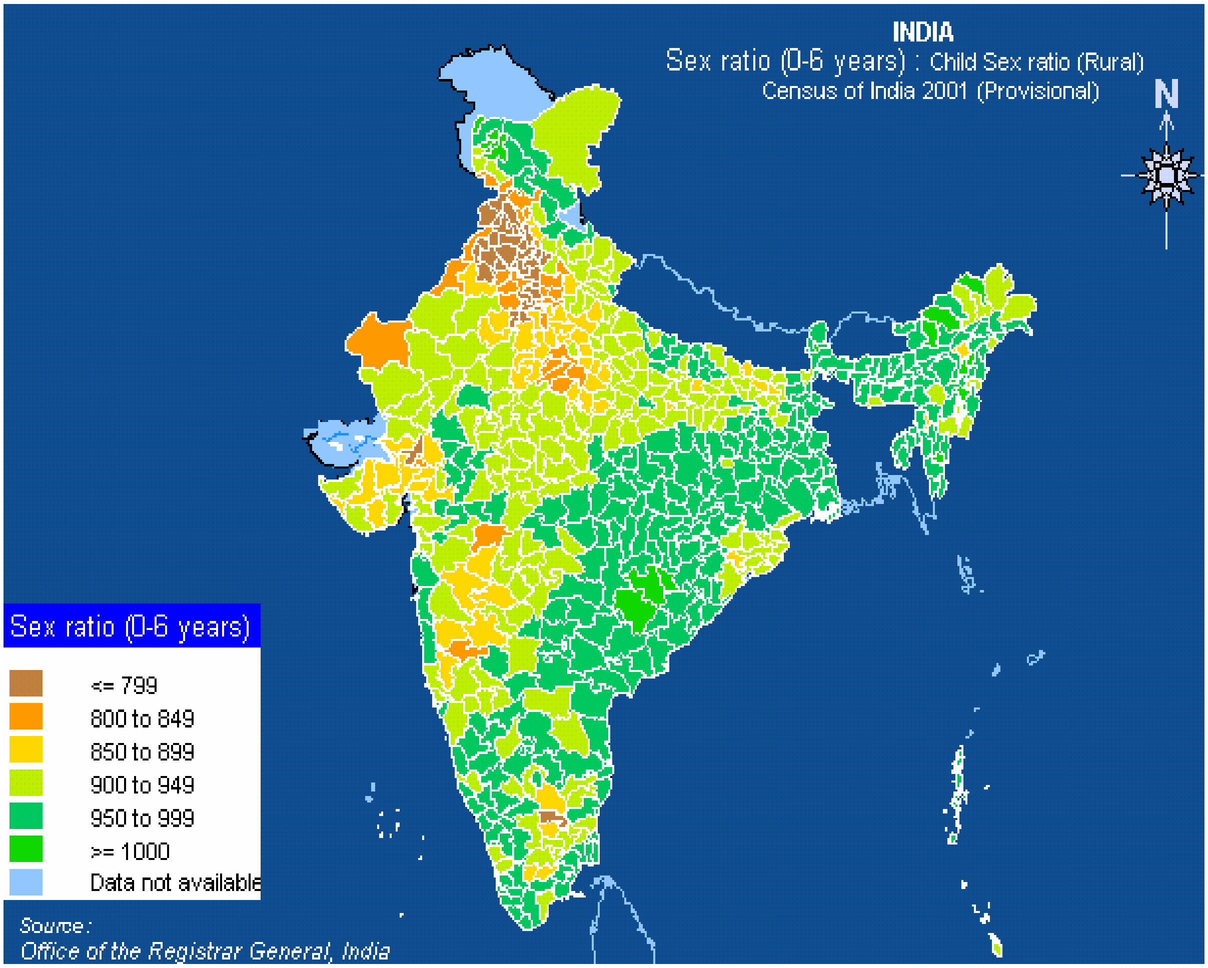
Child sex ratio in age group 0-6 yrs (850 and below) (District wise)



Source: Census 2001

Annexure 3.5.7

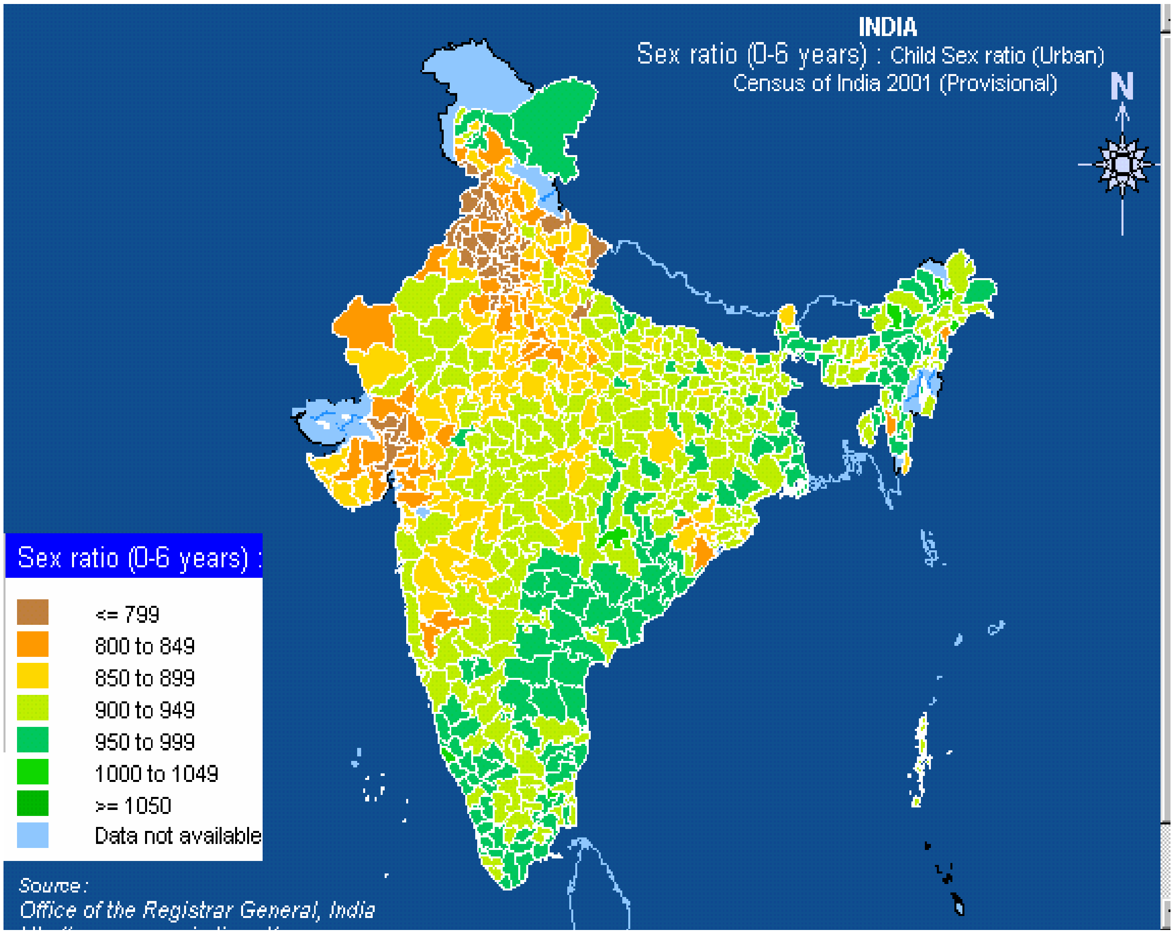
Rural Child (0-6 years) sex ratio district wise (Census 2001)



Source: Census 2001

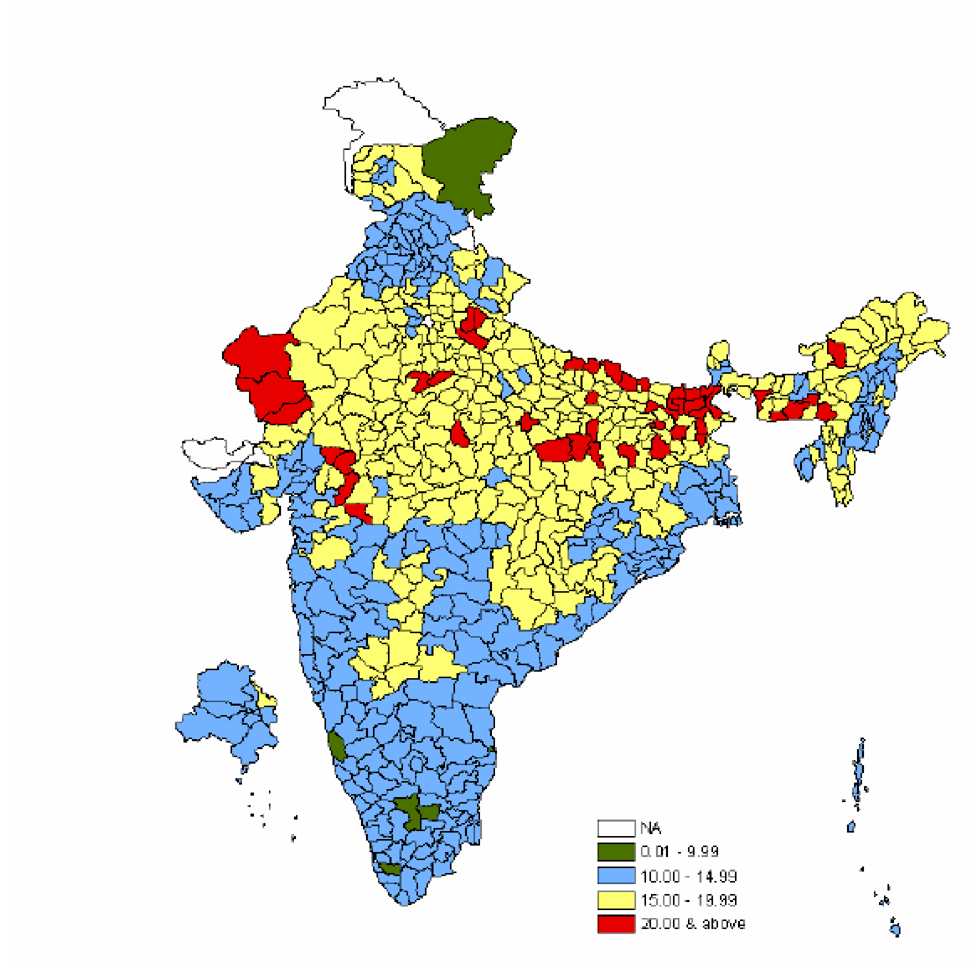
Annexure 3.5.8

Urban Child (0-6 years) sex ratio district wise (Census 2001)



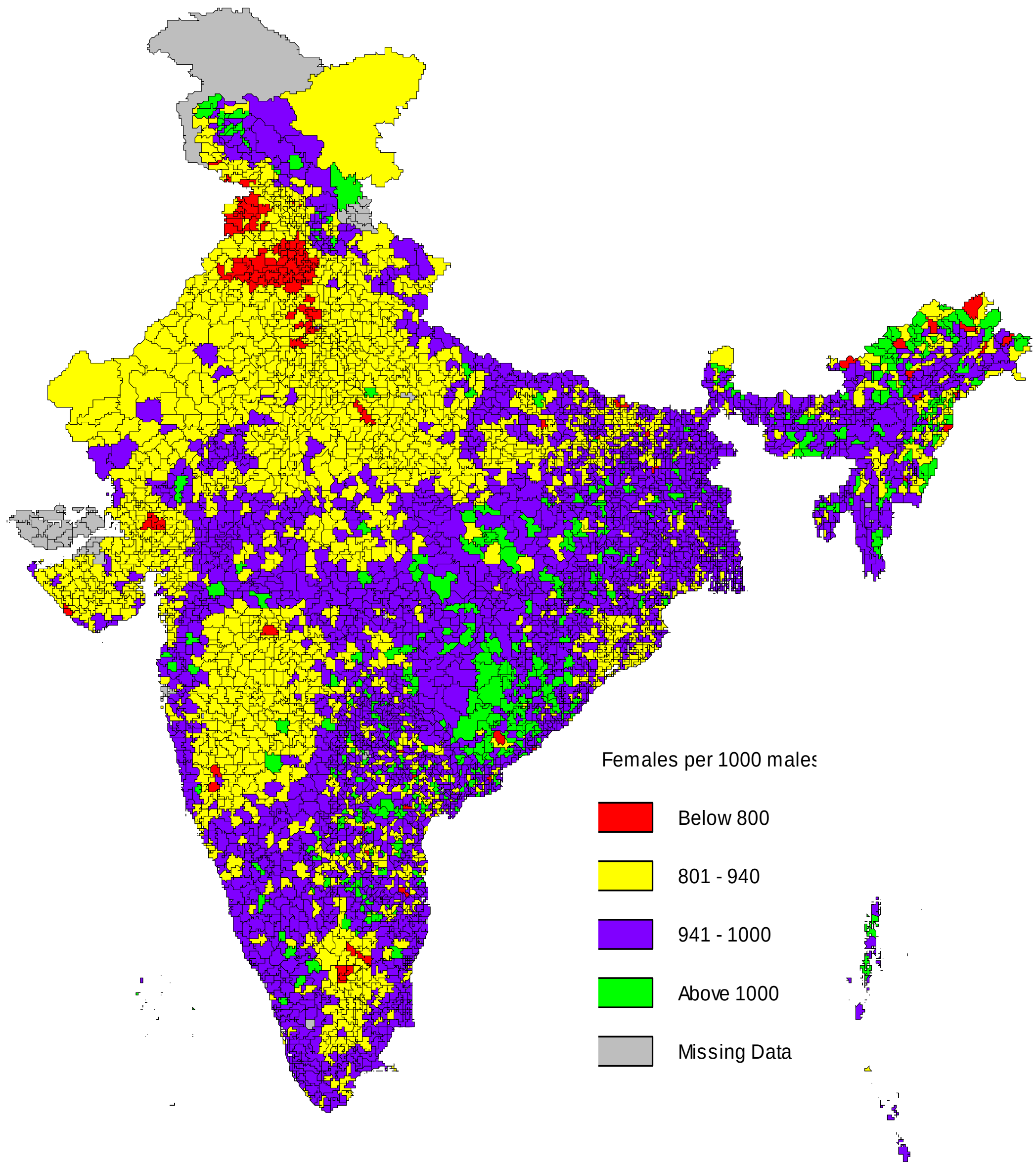
Source: Census 2001

Percentage of 0-6 year children district wise (Census 2001)

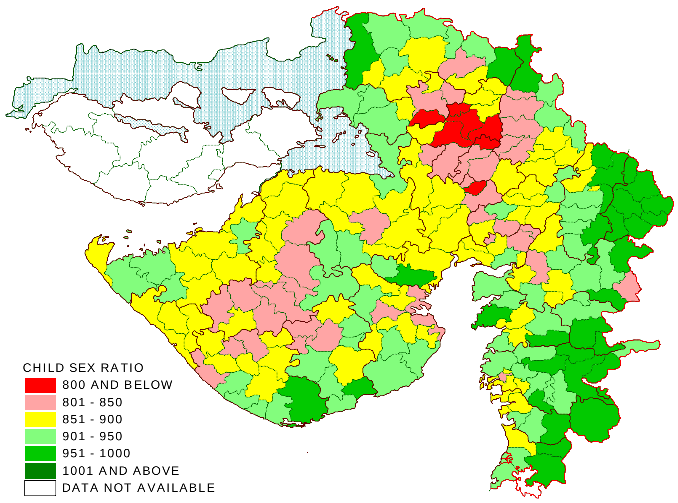


Source: Census 2001

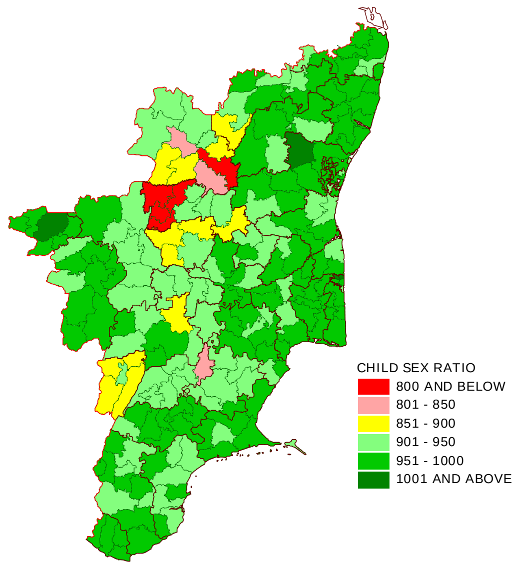
Child Sex Ratio (0-6) INDIA (Tehsil wise)



Child sex ratio in 0-6 yrs: Gujarat (by tehsil)



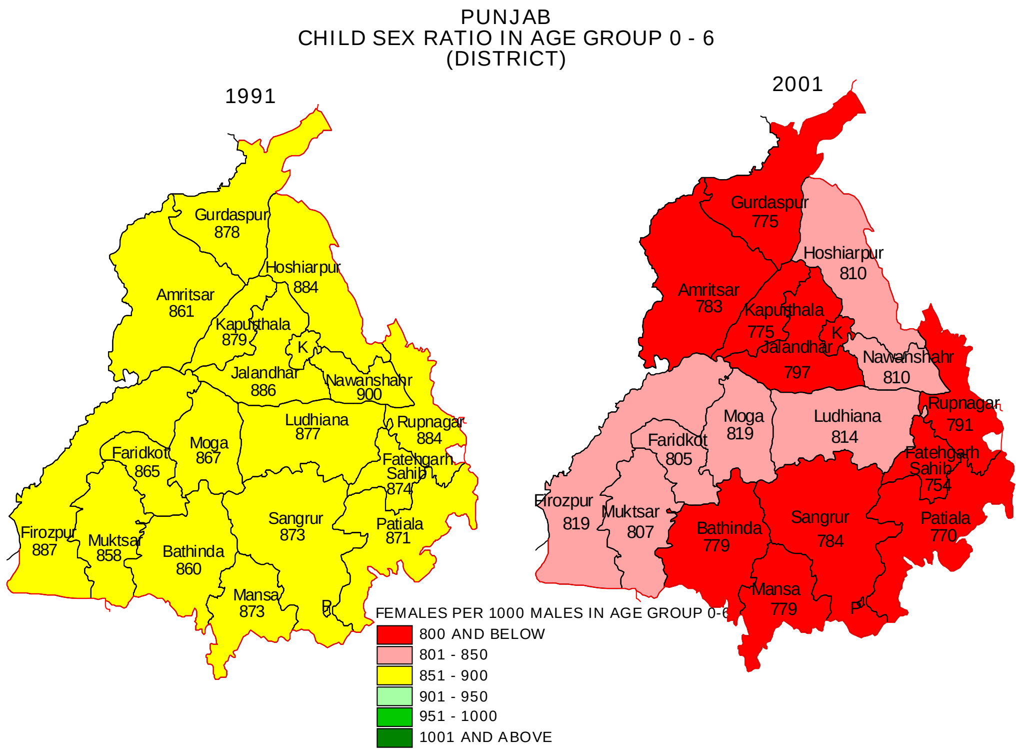
Child sex ratio in 0-6 yrs: Tamil Nadu (by tehsils)



Source: Census 2001

Annexure 3.5.12

Child sex ratio in 0-6 yrs: Punjab (Decadal change- by district)



4. ECONOMIC TRANSITION

4.1 ECONOMIC TRANSITION

India recognised the importance of planned growth of the economy and fostered both agricultural and industrial development. Realising the need to carefully monitor ongoing economic transition, Government of India set up the Central Statistical Organisation (CSO) to monitor the economic growth and expenditure (both public and private) on various goods and services. The CSO has the mandate to:

- Prepare and release estimates of national income, consumption expenditure, saving and capital formation.
- Compute consumer price indices for urban non-manual employees, human development statistics and gender statistics in all the states and union territories.
- Disseminate statistical information.

Time trends in economic growth

Data from CSO provides valuable information on ongoing economic transition in the last five decades. Time trends in gross national product (GNP), net national product (NNP) and per capita NNP at 1993-04 and current prices as computed by CSO are given in Annexure 4.1.1. The data indicate that economic growth in India over the last five decades has been slow but steady (Table 4.1.1, Fig 4.1.1)

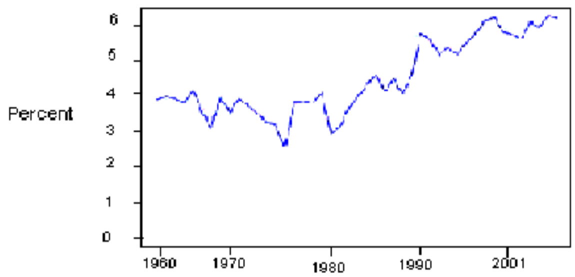
A comparison of the targeted and actual rates of growth recorded in the Ninth Five Year Plan periods show that while up to the Fifth Plan the actual growth

Table 4.1.1: Gross National Product and Net National Product

Year	Gross national product at factor cost		Net national product at factor cost		Per capita net national product	
	Current prices in	1993-94 prices in	Current prices in	1993-94 prices in	Current prices in	1993-94 prices in
I Plan (1951-56)	1.8	3.7	1.5	3.6	-0.3	1.8
II Plan (1956-61)	9.5	4.2	9.4	4.1	7.3	2
III Plan (1961-66)	9.6	2.8	9.5	2.5	7.1	0.2
Three annual plans (1966-69)	12.2	3.9	12.2	3.8	9.8	1.5
IV Plan (1969-74)	11.1	3.4	11	3.3	8.5	1
V Plan (1974-79)	10.7	5	10.4	5	7.9	2.7
Annual plan (1979-80)	9.4	-5	8.3	-6	5.7	-8.3
VI Plan (1980-85)	15.2	5.5	15.1	5.4	12.7	3.2
VII Plan (1985-90)	14.4	5.8	14.2	5.8	11.8	3.6
Two annual plans (1990-92)	15.7	3.3	15.5	3	13.2	0.9
VII Plan (1992-97)	16.3	6.8	16.3	6.7	14	4.6
IX Plan (1997-2002)	10.7	5.5	10.8	5.5	8.8	3.5

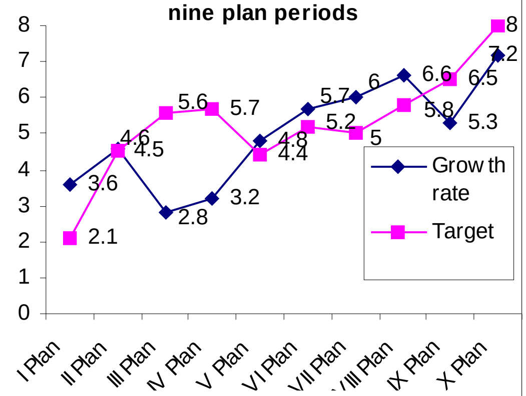
Note: Growth rates from 2000-01 based on New Series with base year 1999-2000; *Source: Reference 4.1.3*

Fig 4.1.1: India: Accelerating growth (Simple average of rates of growth of GDP in the preceding ten years)



Source: Reference 4.1.3

Fig 4.1.2: Growth rates of GDP over nine plan periods



Source: Reference 4.1.3

rates fell generally short of the targeted rates of growth, from the Fifth Plan to the Eighth Plan growth rates achieved were consistently higher than those targeted. This trend got broken with a shortfall in the actual versus targeted growth in the Ninth Plan. However, the gross domestic product (GDP) of the country as a whole has grown steadily over years and in all the Five Year Plans (Figure 4.1.1, 4.1.2).

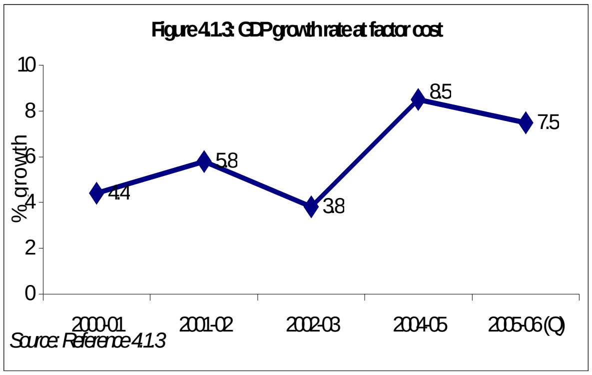
Comparison of macro economic indicators between the Ninth and Tenth Plan is given in Table 4.1.2. Propelled by buoyant economic growth, the domestic saving, investments and foreign exchange reserves have increased. Inflation rate is below 5%; however urgent and energetic measures are required to reduce in the combined fiscal deficit, which has remained essentially unaltered over the last five years.

Table 4.1.2: Macro-economic Indicators

	IX Plan (97-98 to 2001-02)	X Plan (2002-03 to 2006-07)
GDP growth (%) of which	5.5	7.2
• Agriculture	2	1.7
• Industry	4.6	8.3
• Services	8.1	9
Gross Domestic Savings (% of GDP, at market prices)	23.1	28.2
Gross Domestic Investment (% of GDP, at market prices)	23.8	27.5
Current Account Balance (% of GDP, at market prices)	-0.7	0.7
Combined Fiscal Deficit of Centre and States (% of GDP at market prices)	8.8	8.4
Foreign Exchange Reserves (US$ billion)	54.2	165.3
Rate of Inflation (based on WPI)	4.9	4.8

Notes: 1. The growth rate for 2006-07 is as projected by the Economic Advisory Council to the Prime Minister. 2. Gross savings rate, gross investment rates and the Current Account Balance are expressed in current prices and are averages for the Plan. For the 10th Plan, these are the average of the first three years i.e., for the years 2002-03 to 2004-05. 3. Combined Fiscal deficit is the average of the Plan. For the 10th Plan, it is the average of the first 4 years of the Plan, i.e., for the years 2002-03 to 2005-06. 4. Foreign Exchange Reserves are as on 29th March 2002 for the 9th Plan and 31st March 2006 for the 10th Plan. 5. The rate of inflation for the 10th Plan is the average up to January 2006.

Source: Reference 4.1.3



India's gross national product in the year 1999–2000 was 440 billion US dollars at current prices (1US $ = Rs 40). India's national income of (NNP at factor cost) US $ 50 billion in 1992–93 was five times higher than NNP in 1950–51 (US $ 10 billion) at constant (1980–81) prices. From 1993–94 to 1998–99, the NNP increased by an additional 38 %, reaching US $ 237 billion at 1993–94 prices. Between 1950–51 and 1992–93, per capita income doubled; it increased further by 27 % between 1993–94 and 1998–99. In 1998–99, India's per capita income was 367 US $ at current prices. The growth rate of national income at constant prices increased from 3.6 % per annum during the first plan (1951–56) to 6.6 % per annum during the Eighth Plan (1992–97). The corresponding increase in the growth rate of per capita income was from 1.8 % to 4.6 % per annum (Ministry of Finance, 2000). Between 1950–51 and 1998–99, gross domestic savings and gross domestic capital formation as a percentage of the gross domestic product (GDP) increased from around 10 % to 22 %. As of 2002 GNI per capita is $480. However it is a matter of concern that there is inequitable distribution of income between groups and different regions in the country. It is estimated that 40% of the poor household's share in income is only 20% while highest 20% households have 46% of the national income (Economic Survey 2006-07).

On the eve of the Eleventh Plan, Indian economy is in a much stronger position than it was a few years ago. After slowing down to an average growth rate of about 5.5% in the Ninth Plan period (1997-98 to 2001-02), it has accelerated significantly. The average growth rate in the last four years of Tenth Plan period (2003-04 to 2006-07) is likely to be a little over 8%, making the growth rate for target of 8%, but it is the highest growth rate achieved in any plan period

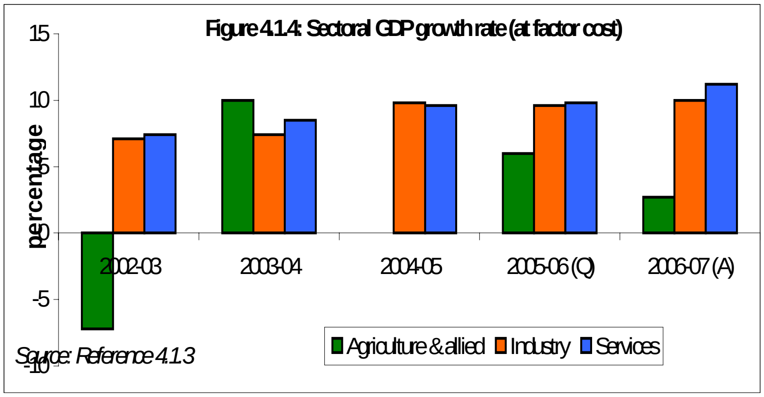
Table 4.1.3: Sectoral real growth rates in GDP at factor cost (at 1999-2000 prices)

Item	%age change over the previous year						
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06 (Q)	2006-07 (A)
I. Agriculture & allied	-0.2	6.3	-7.2	10	0	6	2.7
II. Industry	6.4	2.7	7.1	7.4	9.8	9.6	10
Mining & quarrying	2.4	1.8	8.8	3.1	7.5	3.6	4.5
Manufacturing	7.7	2.5	6.8	6.6	8.7	9.1	11.3
Electricity, gas & water supply	2.1	1.7	4.7	4.8	7.5	5.3	7.7
Construction	6.2	4	7.9	12	14.1	14.2	9.4
III. Services	5.7	7.2	7.4	8.5	9.6	9.8	11.2
Trade, hotels, transport & communication	7.3	9.1	9.2	12.1	10.9	10.4	13
Financial services	4.1	7.3	8	5.6	8.7	10.9	11.1
Community, social & personal services	4.8	4.1	3.9	5.4	7.9	7.7	7.8
IV. Total GDP at factor cost	4.4	5.8	3.8	8.5	7.5	9	9.2

P: Provisional; Q: Quick estimates; A: Advance estimates;
Source: Reference 4.1.2, 4.1.3

(Approach paper to the 11th Plan).

Economic growth in different sectors in the Tenth plan period is shown in Table 4.1.3 and Figure 4.1.4. Agriculture lost its growth momentum and fluctuated between low and negative growth. In contrast industry and services have continued to expand and grow steadily. Since the beginning of the Tenth Plan in 2002-03, annual growth of economy has been 7 % or more with industry and services acting as the twin engines propelling economic growth. In the six years between 2000-01 and 2005-06 (Advance estimate), on average, services with a share of 52 % of GDP, contributed 65 % of GDP growth, and increased its share in GDP from 49.8 % to 54.1 %. During the same reference period, industry on average, with a share of 25.8 % of GDP, contributed 28 % of GDP growth, increased its share in GDP from 25.9 % to 26.2 % (Economic Survey 2006-07).



Economists in India have always recognized that in spite of five decades of efforts and the progress achieved in accelerating all round development, agriculture remains the major determinant of GDP growth in the country; even today agriculture remains the major sector for rural employment and livelihood in India. Poor agricultural production has an adverse effect on GDP. In 2002-03 drought and low agricultural production has resulted (Table 4.1.4) in a dip in GDP growth rate.

Table 4.1.4: Annual average growth rate (at constant prices) (%)

Five Year Plan	Overall GDP growth rate	Agriculture & Allied Sectors
Seventh Plan (85-90)	6	3.2
Annual Plan (90-92)	3.4	1.3
Eighth Plan (92-97)	6.7	4.7
Ninth Plan (97-2002)	5.5	2.1
Tenth Plan (02-07)	7.6	2.3
2002-03	3.8	-7.2
2003-04	8.5	10
2004-05 (P)	7.5	0
2005-06 (Q)	9	6
2006-07 (A)	9.2	2.7

P: Provisional,Q: Quick estimates,A: Advance estimates Note : Growth rates prior to 2001 based on 1993-94 prices and from 2000-01 onwards based on new series at 1999- 2000 prices. Source: Reference 4.1.2

A good monsoon and good agricultural production remains a major determinant of economic and nutritional well being of the rural population; good agricultural production improves rural purchasing power and indirectly determines off take of good and services and economic growth in the country. Over years several steps have been taken to insulate agriculture from the vagaries of nature and fickleness of markets. But the outreach of these reforms remains sub optimal. These will have to receive priority attention during the next few years to enable rapid all round agricultural growth and economic development.

The major rationale for economic growth is to improve quality of life of citizen. It is a matter of concern that economic growth has not been sufficiently inclusive and has not resulted in commensurate improvement in quality of life of citizens (Table 4.1.5). Despite faster growth, jobs in the organised sector have not increased and the pace of decline in proportion of population below the poverty line has been modest. Far too many people have not got access to clean drinking water and sanitation facilities, education, health and nutrition services. Despite increase in participation in the labour force and economic activities, women continue to face discrimination beginning right from birth –as shown by adverse and declining child sex ratio. Undernutrition is declining very slowly and paradoxically overnutrition is emerging as a public health problem. These problems require to be addressed expeditiously; so that the country's rapid economic growth does result in rapid improvement in human development indices.

Goals for the Eleventh Plan

The Approach paper has stated that the Eleventh Plan provides an opportunity "to restructure policies to achieve a new vision based on faster, more broad-based and inclusive growth, reduce poverty and focus on bridging the various divides that continue to fragment Indian society". Rapid economic growth is needed to raise the incomes of the families, improve quality of life and to generate the resources needed to provide basic services to all. Goals for

Table 4.1.5: Status of some socio-economic Indicators

	Average/All India		Best State	Worst State
	Around 1990	Recent Year	Recent Year	Recent Year
Per Capita Net National Product: (Rs. per person at 1993-94 Prices)[1]	7321	11799	16679	3557
Consumption Poverty: Head Count Ratio (%)[2]	36	27.8	5.2	46.5
Literacy (age 7+) Male:[3]	64.1	75.3	94.2	59.7
Literacy (age 7+) Female:[3]	39.3	53.7	87.7	33.1
Attending Elementary Schools (6-14 years)[3]	55.3	71.1	103.1	55.8
Child Sex Ratio (0-6 year olds): (females/1000 males)[3]	945	927	975	793
Infant Mortality Rate: (2003) (Per 1000 live births)[4]	80	60	11	83
Maternal Mortality Rate: (1997) (Per 1000 live births)[4]		4		
Undernourished Children: (1998-99)[5]				
Weight-for-age		47	20.6	55.7
Height-for-age		45.5	18.1	55.5
Weight-for-height		15.5	4.8	24.3

1. For the years 1990-91 and 2003-04. 2. The poverty estimates given are for 1993-94 and the latest estimates based on the NSS 2004-05 survey that is comparable with 1993-94. 3. Calculated from information based on Census 1991 and 2001. 4. Based on SRS. 5. %age below 2 standard deviation from the mean of an international reference population.

Source: Reference 4.1.1

Eleventh Plan are to:

- accelerate growth rate of GDP from 8% to 10% and then maintain it at 10% in the 12th Plan in order to double per capita income by 2016-17
- ensure a broader spread of benefits by
  - creating productive employment at a faster pace than before (create 70 million new work opportunities).
  - Targeting robust agriculture growth at 4% per year
  - Raising real wage rate of unskilled workers by 20 %
  - reducing educated unemployment to below 5%
- reduce the headcount ratio of consumption poverty by 10 %
- reduce disparities across regions and communities by ensuring access to basic physical infra structure as well as health and education services to all.

Interstate differences in economic growth

In India there are wide differences between states in many economic parameters. Growth of State Domestic Product (SDP) is the single most important indicator of development for a State. Ideally, the SDP series of each state should be fully consistent with the national accounts estimates of GDP. However, this is not the case. Information on SDP compiled by the state governments is collected by the Central Statistical Organisation (CSO) and is used as one of the inputs of National Accounts estimation. In this process, the CSO takes notes of the differences in methods of estimating the SDP in different states, but it does not refine the series to make them statistically comparable with each other and with the national accounts. In order to reduce the error margin inherent in the data and avoid direct inter-state comparison of data, as far as possible Planning Commission has restricted the use of the SDP data to comparison of the trends in growth rate only. Trends in rates of growth for state domestic product from 1960s to 1990s of major states are given in Annexure 4.1.2 and 4.1.3.

Comparison is made between major states only, as comparable data are not available for smaller states and new states created during this period. With the exception of Assam, Haryana, Himachal Pradesh and Punjab, the state income data from 1960-61 is available for all of the other major states (Annexure 4.1.4). For Assam, Haryana and Punjab, data for 1960-61 and from 1965-66 onwards is available. For Himachal Pradesh the data set begins from 1967-68. Base years taken for arriving at the trend real rates of decadal growth are 1960-61, 1970-71, 1980-81 and 1993-94 for the four decades respectively. These

Table 4.1.6: Disparity in Growth amongst States / Union Territories

Period	Measure of Disparity in Growth @ (standard deviation)		Relative Measure of Disparity in Growth between Per Capita Income and NSDP @ (Covariance)
	NSDP	Per capita NSDP	
1970-71 to 1979-80	2.22	1.81	3.67
1980-81 to 1990-91	1.71	1.02	0.71
1993-94 to 1998-99	3.13	2.4	5.23

Source: Reference 4.1.2, 4.1.3

data indicate that in fifties and sixties the GDP growth was quite low in all states; Punjab had the highest growth and Bihar the lowest. In the seventies Maharashtra, Tamil Nadu and Karnataka joined Punjab and Haryana as states with higher growth rates and Kerala and Madhya Pradesh were in the bottom of the list. In the eighties the national growth improved from 3.6% to 5.6%. In this period Haryana, Punjab, Maharashtra and Tamil Nadu recorded the highest growth rates while J&K and Assam slipped to the bottom. In the nineties Punjab and Haryana registered slower rates of growth, while Rajasthan, Karnataka, Gujarat, Tamil Nadu and West Bengal had higher growth rates; Assam registered the lowest growth. Over all interstate disparities in NSDP and per capita NSDP has increased substantially during the nineties as compared to eighties and the seventies (Table 4.1.6) The decade of the eighties appears to be the decade with minimal interstate disparity in economic growth; the disparities were widest in the nineties.

Comparison of the trends in economic growth in the nineties in given in Annexure 4.1.5. The national growth rate improved by one % and most of the states shared this improvement. However the less developed regions including Northeastern states, Orissa, Bihar, UP and MP had lower growth rates as compared to the all India average. There is further widening of the gap between the more and less developed states. This might be at least in part be due to faster growth of some states which have implemented economic reforms and were able to achieve better realization of their economic potential.

Intra-state (inter district) disparities

It is now well recognized that there are large inter district variations in economic growth within the same state. Some of the factors explaining interstate disparities such as differences in natural resources, allocations from the centre and external funding cannot contribute to intra-state disparities because states are administratively homogenous units. Interestingly, some of the most prosperous states eg. Maharashtra has the largest intra-state disparities. While particular areas may have certain limitations and constraints in making very rapid progress owing to geography and limitations of natural resources, a minimum standard should be attainable for all. One way of reducing inter district disparities would to focus attention on the districts lagging behind, and direct priority attention to these areas. During the Tenth Plan efforts were made through the Rashtriya Samvikas Yojana to reduce the interdistrict disparities by identifying the poorly performing districts, providing them with additional funds for critical areas of development and carefully monitoring the progress.

Role of governance in economic growth

Poverty, human deprivation and inequalities are not merely due to social and economic reasons but are rooted in poor governance. It is increasingly realized that good governance is a critical factor that ensures sustained economic growth and development and improvement human well-being. Poor governance which is manifested by

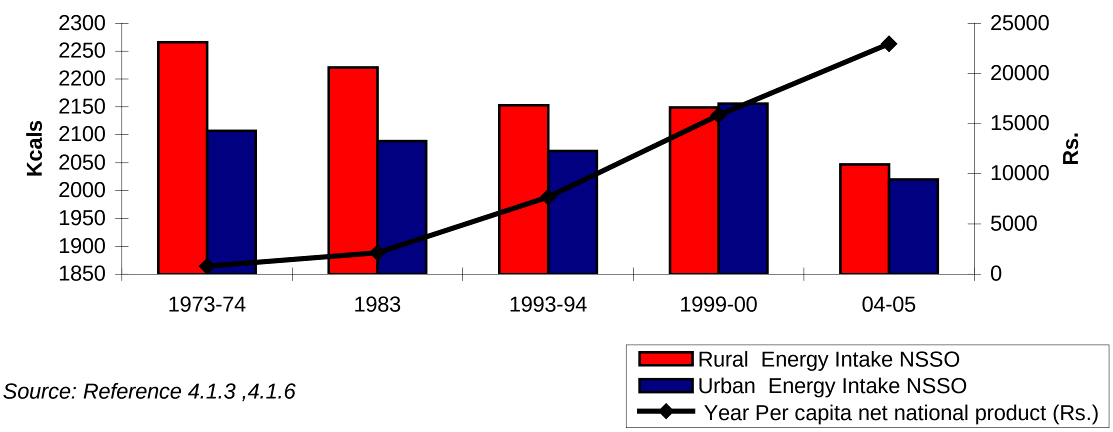
- poor management of economies/persisting fiscal imbalances/disparities in the pace and level of development across regions and districts;
- threat to life and personal security in face of inadequate State control on law and order;
- lack of sensitivity, transparency, accountability in State machinery; and
- lack of credibility.

These have contributed to gaps between inherent economic potentialities of states and actual realization. There are states in the country where good governance has led to equitable economic growth and development, which in turn led to important gains in human development; other states have not optimally utilized the opportunities, natural advantage and favorable initial conditions. It is essential that all the efforts are directed towards improving governance at the central, state and local level to achieve optimal growth and reduce disparities.

Economic growth, dietary intake and nutritional status

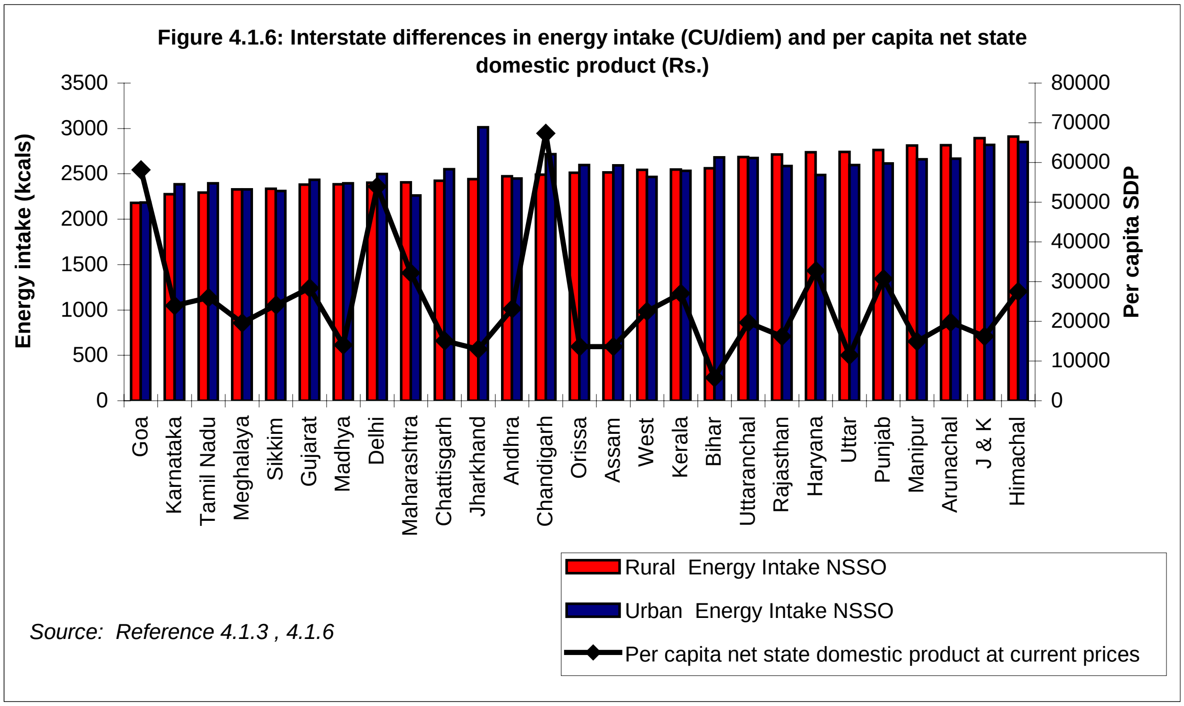
The interrelationship between per capita income, dietary intake and nutritional status in India are complex. An attempt was made to explore the dimensions of these interrelationships using the data on time trends and interstate variations in these parameters. Time trends in per capita net national product and per capita energy intake urban rural population is given in the Figure 4.1.5. The slow increase in per capita income till the nineties was accompanied by a slow reduction in energy intake. The last five years witnessed a sharp increase in per capita income; contrary to expectations, which rise in income levels may result in increased energy intake, there has been a relatively sharp decline in energy intake. As food grain costs still remain low, the decline appears to be mainly related to changes in life style and consequent reduction in energy requirement.

Figure 4.1.5: Time trends in per capita energy intake and per capita net national product (Rs.)-All India



Source: Reference 4.1.3 ,4.1.6

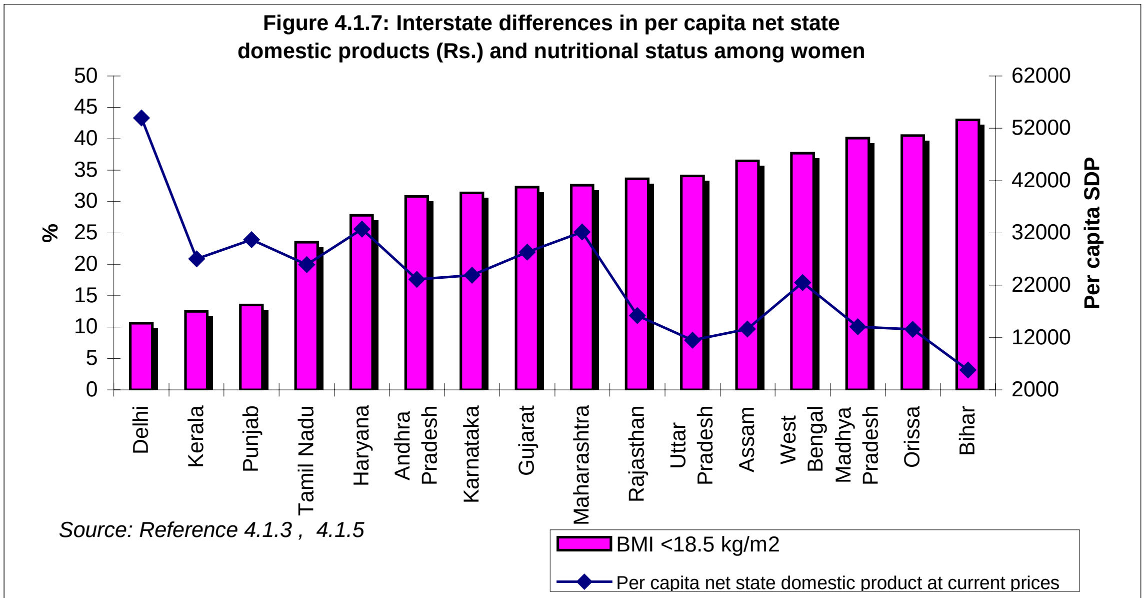
This hypothesis is further supported by the fact that while expenditure on food



Source: Reference 4.1.3 , 4.1.6

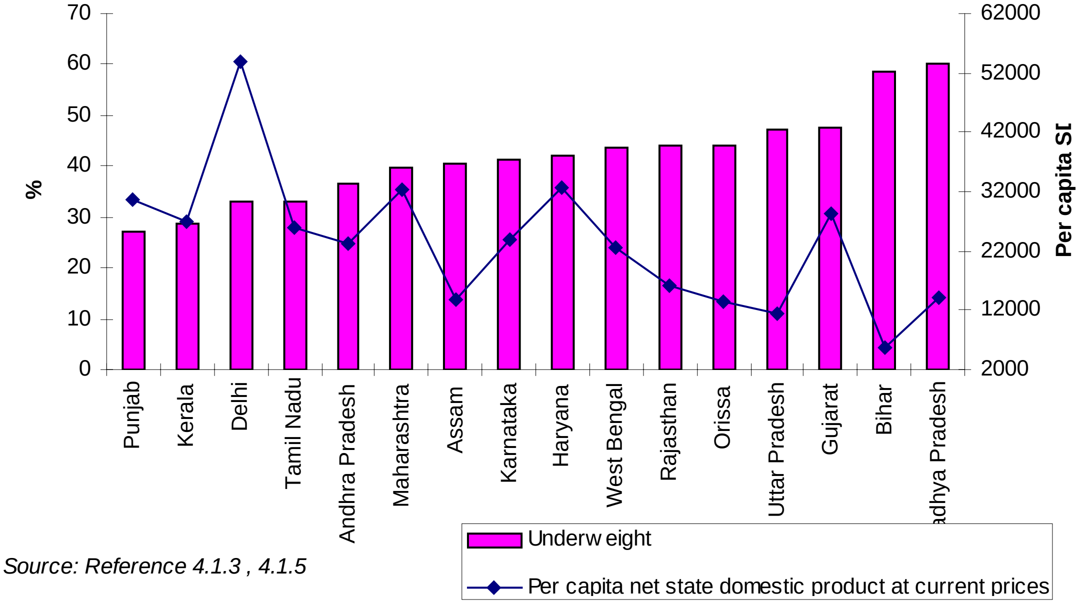
has shown continuous decline as proportion of household expenditure, expenditure on transport (one major source of energy expenditure), education and health have shown continuous increase over this period.

Interstate differences in per capita net state domestic product and energy intake are shown in Figure 4.1.6. Some states like Himachal Pradesh, Punjab and Haryana have high per capita income and high energy intake. At the other end, are states like Goa, Delhi and Chandigarh, where per capita income is very high but energy intake is relatively low. In states like Assam, per capita income is low but energy intake is relatively high. Thus it would appear that, at present when food grains are available at low cost especially for the poor, life style and energy



Source: Reference 4.1.3 , 4.1.5

Figure 4.1.8: Interstate differences in per capita net state domestic product at current price (Rs.) and nutritional status among children under 3 years



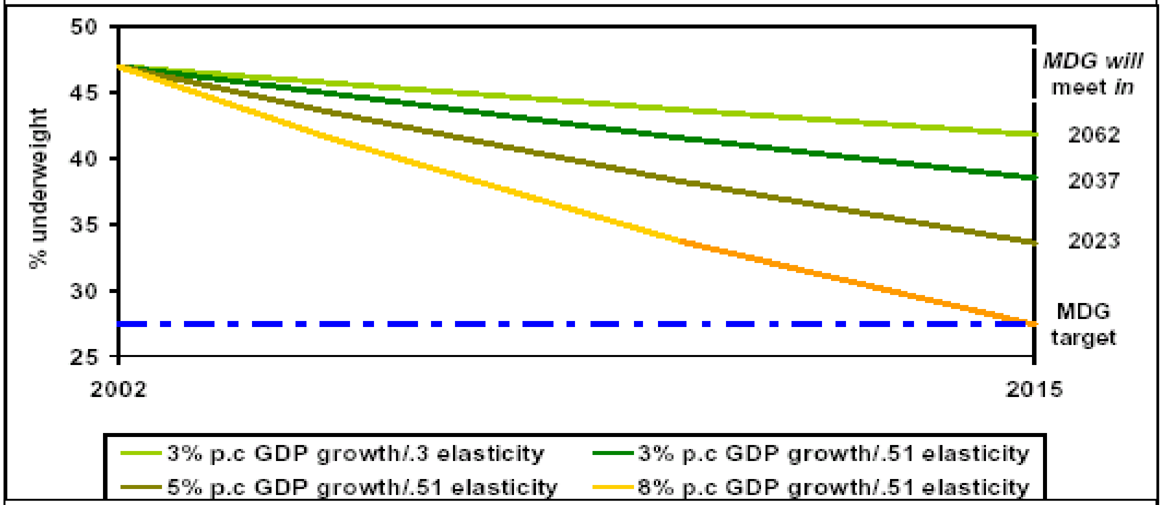
Source: Reference 4.1.3 , 4.1.5

requirement rather than per capita income is the major determinant of energy intake in different states.

Data on interstate differences in per capita income and undernutrition in women and children under three years is given in the Figure 4.1.7 & 4.1.8 respectively. States like Orissa, Bihar, Uttar Pradesh, Assam, Madhya Pradesh, and Rajasthan have low per capita income and high undernutrition rates in women and children under three years. States like Delhi have high per capita income and low on undernutrition rates. However, Maharashtra, Gujarat with high per capita income has high undernutrition rates perhaps because of inter regional differences with in the states; eg poverty and undernutrition rates are high in Vidharbha in Maharastra and Sourashtra in Gujarat. Kerala, with relatively low per capita income has low undernutrition rate comparable to Punjab with much higher per capita income; this is perhaps due to more equitable access to food and adequate health care for women and children in Kerala. State per capita income is undoubtedly one of the determinants of undernutrition rate but it is not the only factor that affects nutritional status of women.

Projections on prevalence of underweight

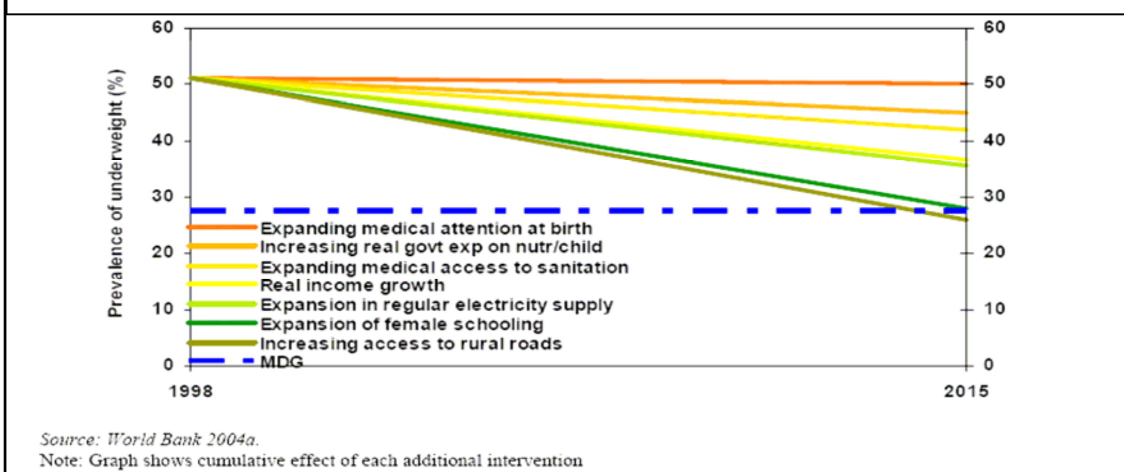
Figure 4.1.9 Predicted prevalence of underweight in 2015



Source: Reference 4.1.4

World Bank had computed the impact of economic growth assumptions and policy interventions on undernutrition rates in preschool child (Graganolati M, Shekar M, Gupta MD, Bredenkamp C, Lee YK: India's undernourished children: A call for reform and action. HNP discussion paper, World Bank, August 2005). Sustained economic growth of over five % alone will enable the country to achieve Millennium Development Goal for child undernutrition only by 2023 (Figure 4.1.9). However when coupled with provision of other essential goods and services it will be possible to achieve MDG by 2015 (Figure 4.1.10). World Bank computations show that even if poor states were brought up to the national

Figure 4.1.10: Projected %age of children under three who are underweight in poor states under different intervention scenarios, 1998 to 2015



Source: Reference 4.1.4

average in terms of coverage of sanitation, road access, electricity, medical attention at time of delivery, female schooling, household income (consumption) and public spending on nutrition per child, the cumulative reduction in the national prevalence of underweight would only be about 8 %age points (or 15%). If the magnitude of the proposed interventions were further scaled up so as to bring the poor states to the average level prevailing in the non-poor states, the cumulative reduction in the prevalence of underweight rate would be 21 %age points or % underweight 38% still short of the MDG. Only when seven particular interventions (Figure 4.1.10) are pursued simultaneously can one expect a reduction of 25 %age points in the child underweight rate in the poor states enough for them to reach their MD Goal of 27.4% of children being underweight.

Realizing the need for integrated package of services, the Ministry of Health and Family Welfare and Ministry of Women and Child Development have been striving to improve convergence of policies, strategies and services between these two critical sectors. The National Rural Health Mission puts people in the centre and attempts to deliver health, family welfare, nutrition, education, water supply and sanitation services as an integrated package to all. Once this paradigm shift is understood and fully operationalised, it is possible to rapidly achieve substantial improvement in health and nutritional status of the population.

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Annexure 4.1.1

Gross national product and net national product

Year	Gross national product at factor cost (Rs. crore)		Net national product at factor cost (Rs. crore)		Per capita net national product (Rs.)		Index numbers (1950-51=100) Net national product (Rs.)		Index numbers (1950-51=100) Per capita net national product (Rs.)	
	At current prices	At 1993-94 prices	At current prices	At 1993-94 prices	At current prices	At 1993-94 prices	At current prices	At 1993-94 prices	At current prices	At 1993-94 prices
1950-51	9506	139912	9142	132367	255	3687	100	100	100	100
1951-52	10045	143399	9634	135551	264	3714	105.4	102.4	103.6	100.7
1952-53	9916	147544	9474	139379	255	3747	103.6	105.3	100	101.6
1953-54	10805	156590	10341	148159	273	3909	113.1	111.9	107.1	106
1954-55	10139	163126	9628	154184	249	3994	105.3	116.5	98	108.3
1955-56	10322	167535	9776	158001	249	4020	106.9	119.4	97.7	109
1956-57	12317	177006	11706	166793	292	4159	128	126	114.6	112.8
1957-58	12590	174756	11928	163902	292	4007	130.5	123.8	114.5	108.7
1958-59	14071	187925	13299	176483	318	4222	145.5	133.3	124.9	114.5
1959-60	14759	191717	13916	179592	327	4216	152.2	135.7	128.3	114.3
1960-61	16148	205196	15204	192235	350	4429	166.3	145.2	137.6	120.1
1961-62	17018	211287	15960	197514	359	4449	174.6	149.2	141.1	120.7
1962-63	18194	215601	17029	200895	375	4425	186.3	151.8	147.3	120
1963-64	20804	226577	19491	210946	420	4546	213.2	159.4	165	123.3
1964-65	24291	243472	22814	226640	481	4781	249.5	171.2	189	129.7
1965-66	25422	234394	23752	216244	490	4459	259.8	163.4	192.3	120.9
1966-67	28893	236846	26918	217427	544	4392	294.4	164.3	213.5	119.1
1967-68	33967	255843	31745	235418	627	4653	347.2	177.9	246.4	126.2
1968-69	35837	262687	33421	241234	645	4657	365.6	182.2	253.4	126.3
1969-70	39420	279791	36742	257359	695	4865	401.9	194.4	272.7	131.9
1970-71	41938	293933	38968	270597	720	5002	426.2	204.4	282.8	135.7
1971-72	44632	296688	41340	272252	746	4914	452.2	205.7	293	133.3
1972-73	49113	295752	45392	270061	801	4763	496.5	204	314.4	129.2
1973-74	60235	309950	55896	283061	964	4880	611.4	213.8	378.4	132.4
1974-75	70992	314509	65432	286417	1103	4830	715.7	216.4	433.3	131
1975-76	75454	343173	69005	313643	1137	5167	754.8	236.9	446.4	140.1
1976-77	81148	347530	74242	316358	1197	5103	812.1	239	470.2	138.4
1977-78	92648	373464	85151	340751	1343	5375	931.4	257.4	527.4	145.8
1978-79	99667	394335	91094	359732	1406	5551	996.4	271.8	552	150.6
1979-80	109080	374640	98631	338124	1485	5092	1078.8	255.4	583.3	138.1
1980-81	130523	401970	118236	363417	1741	5352	1293.3	274.6	683.8	145.2
1981-82	152096	425168	137388	384392	1985	5555	1502.8	290.4	779.6	150.7
1982-83	168891	436577	151716	393274	2143	5555	1659.5	297.1	841.5	150.7
1983-84	197686	469293	178121	423265	2464	5854	1948.3	319.8	967.4	158.8
1984-85	221281	489206	198794	440119	2690	5956	2174.4	332.5	1056.3	161.5
1985-86	248118	511058	221401	459185	2932	6082	2421.7	346.9	1151.5	165
1986-87	276453	532021	246064	477158	3191	6189	2691.5	360.5	1253.2	167.9
1987-88	313374	551409	279400	493312	3546	6260	3056.1	372.7	1392.3	169.8
1988-89	373995	607207	334302	545572	4153	6777	3656.6	412.2	1630.7	183.8
1989-90	432289	648108	385729	582518	4693	7087	4219.1	440.1	1842.7	192.2
1990-91	503409	683670	450145	614206	5365	7321	4923.7	464	2106.8	198.5

1991-92	579009	691143	514607	617372	6012	7212	5628.8	466.4	2360.7	195.6
1992-93	661576	726375	587064	648182	6732	7433	6421.4	489.7	2643.7	201.6
1993-94	769265	769265	685912	685912	7690	7690	7502.6	518.2	3019.5	208.6
1994-95	903975	824816	805981	734358	8857	8070	8815.9	554.8	3477.9	218.9
1995-96	1059787	886961	941861	787809	10149	8489	10302.2	595.2	3985.4	230.2
1996-97	1230465	959359	1093962	852084	11564	9007	11965.9	643.7	4541	244.3
1997-98	1376943	1005946	1224946	891086	12707	9244	13398.6	673.2	4989.7	250.7
1998-99	1583159	1070773	1415093	948580	14396	9650	15478.5	716.6	5652.9	261.7
1999-00	1746407	1137185	1564048	1008114	15625	10071	17107.7	761.6	6135.5	273.1
New Series base year -1999-2000										
	At current prices	At 1999-2000 prices	At current prices	At 1999-2000 prices	At current prices	At 1999-2000 prices	At current prices	At 1999-2000 prices	At current prices	At 1999-2000 prices
1999-00	1771094	1771094	1585501	1585501	15839	15839	100	100	100	100
2000-01	1902682	1842228	1696387	1643998	16648	16133	107	103.7	105.1	101.9
2001-02	2080119	1952241	1847667	1739876	17800	16762	116.5	109.7	112.4	105.8
2002-03	2248614	2028928	1993846	1801430	18899	17075	125.8	113.6	119.3	107.8
2003-04	2531168	2204746	2246465	1959599	20936	18263	141.7	123.6	132.2	115.3
2004-05 (P)	2833558	2367711	2501067	2103350	22946	19297	157.7	132.7	144.9	121.8
2005-06(Q)	3225963	2580761	2846762	2295243	25716	20734	179.5	144.8	162.4	130.9
P: Provisional estimates; Q: Quick estimates										
Source : Reference 4.1.2 , 4.1.3										

Net state domestic product at current prices											
	(Rs. Crore)										
State\UT	1993-94	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001	2001-2002	2002-2003	2003-04	2004-05 (P)
Andhra Pradesh	51655	71796	81517	85791	103915	112966	126321	136296	147257	166953	183123
Arunachal Pradesh	812	1071	1083	1192	1354	1457	1595	1729	1896	2160	2266
Assam	13477	17170	18465	20211	22710	26273	28262	30674	33516	35700	38624
Bihar	20780	21835	29449	30307	34837	38178	42251	42160	47972	46732	51194
Jharkhand	13403	16183	17243	23251	26485	26094	23347	27257	30810	33733	37161
Goa	2002	2756	3323	4166	5212	5827	6634	6926	8486	8233	8582
Gujarat	42560	61736	74183	77266	89810	92280	89877	101064	117400	140937	152516
Haryana	19422	26166	31345	33909	38358	42922	48421	53244	58315	65310	73645
Himachal Pradesh	4250	5930	6803	7807	9507	10882	12108	13337	14408	16033	17884
J & K	5500	6973	7851	8858	11128	12182	12805	13824	15342	16597	18009
Karnataka	36982	50028	58071	64757	78756	84696	93386	96230	105426	115834	132198
Kerala	23851	35330	40699	44883	51021	56944	63737	64854	73697	80116	89452
Madhya Pradesh	33937	42096	48590	53141	61391	69051	64553	74597	71757	87396	91432
Chattisgarh	12163	14435	16372	18345	20313	21331	20539	25147	26470	32620	33614
Maharashtra	101767	140730	158683	172530	186364	216674	210267	235117	266435	290410	328451
Manipur	1141	1410	1654	1882	2125	2466	2517	2947	3054	3323	3680
Meghalaya	1309	1729	1898	2166	2579	2908	3338	3699	3976	4349	4754
Mizoram	618	859	983	1022	1139	1288	1635	1777	2027	NA	NA
Nagaland	1251	1656	1849	2137	2184	2330	3427	3864	4458	NA	NA
Orissa	16185	23822	22669	28000	31211	34299	33776	36523	38078	47977	52240
Punjab	27068	34218	39112	43099	49612	54257	58843	63012	65483	72284	79010
Rajasthan	28977	41690	50986	56912	65596	69491	69898	78089	73864	93846	98573
Sikkim	364	467	531	612	711	759	878	974	1111	1242	1375
Tamil Nadu	51643	69720	79118	92689	105728	112554	125970	126866	137188	148907	167183
Tripura	1619	2073	2500	3015	3473	4193	4869	5559	6044	6728	NA
Uttar Pradesh	70935	92811	112146	120125	133022	144160	150676	156854	171060	186433	205249
Uttaranchal	5109	6726	7312	7946	8812	9464	10828	11538	13023	15051	17707
West Bengal	48398	67136	74422	89595	106170	116899	128975	141357	151632	170782	189489
A & N islands	468	615	720	813	756	848	867	936	1040	NA	NA
Chandigarh	1371	1976	2377	2732	3203	3650	3953	4401	5141	5932	6879
Delhi	18967	25434	30420	37411	43369	48567	57745	62328	66062	73944	83085
Pondicherry	829	1074	1671	2350	2678	2787	3400	3734	4559	5209	5839
P: Provisional estimates. N.A.: Not available.											
Note: Estimates based on 1993-94 series											
Source: Reference 4.1.2, 4.1.3											

Per capita net state domestic product at current prices

State\UT	1993-94	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001	2001-2002	2002-2003	2003-04	2004-05 (P)
	(Rs. Crore)										
Andhra Pradesh	7416	9999	11202	11650	13965	15049	16708	17932	19087	21372	23153
Arunachal Pradesh	8733	10956	10816	11642	12955	13669	14699	15577	16916	19029	19724
Assam	5715	7001	7394	7966	8826	10080	10718	11423	12247	12821	13633
Bihar	3037	3041	4001	4014	4495	4794	5161	5004	5606	5362	5772
Jharkhand	5897	6904	7235	9581	10715	10362	8749	10129	11139	11999	13013
Goa	16558	22207	26418	32647	40248	44349	49693	51073	60787	57369	58184
Gujarat	9796	13665	16153	16585	19001	18831	17938	19713	22624	26672	28355
Haryana	11079	14213	16611	17530	19340	21105	23214	24883	26818	29504	32712
Himachal Pradesh	7870	10607	11960	13488	16144	18160	19925	21570	22902	25059	27486
J & K	6543	7783	8667	9491	11591	12373	12781	13444	14507	15318	16190
Karnataka	7838	10217	11670	12832	15396	16345	17816	18091	19576	21238	23945
Kerala	7983	11626	13280	14523	16370	18117	20107	20287	22776	24492	27048
Madhya Pradesh	6584	7809	8819	9440	10678	11764	10777	12209	11500	13722	14069
Chattisgarh	6539	7479	8353	9218	10056	10405	9922	12032	12369	14963	15073
Maharashtra	12183	16152	17844	19016	20143	22978	21891	24044	26858	28848	32170
Manipur	5846	6901	7920	8813	9742	11070	11066	12683	12878	13732	14901
Meghalaya	6893	8641	9243	10270	11914	13088	14632	15813	16803	18135	19572
Mizoram	8319	10953	12210	12393	13479	14909	18491	19704	22207	NA	NA
Nagaland	9129	11057	11805	13052	12408	12594	17629	18911	20746	NA	NA
Orissa	4896	6985	6548	7973	8766	9507	9245	9879	10164	12645	13601
Punjab	12710	15471	17353	18764	21194	22745	24206	25868	26395	28607	30701
Rajasthan	6182	8467	10102	10997	12360	12765	12514	13621	12641	15738	16212
Sikkim	8402	10239	11332	12665	14270	14761	16503	17644	20013	22062	24115
Tamil Nadu	8955	11819	13269	15388	17383	18337	20346	20326	21740	23358	25965
Tripura	5534	6828	8109	9658	11012	13195	15253	17383	18550	20357	NA
Uttar Pradesh	5066	6331	7476	7826	8470	8970	9162	9320	9963	10637	11477
Uttaranchal	6896	8746	9334	9961	10848	11443	12863	13466	14947	16982	19652
West Bengal	6756	9041	9857	11682	13641	14817	16146	17499	18494	20548	22497
A & N islands	15192	18604	21017	22855	20504	22262	24418	25999	28340	NA	NA
Chandigarh	19761	26734	31158	34583	39112	42942	44516	47734	53886	60105	67370
Delhi	18166	22542	25952	30736	34332	37065	42509	44286	45579	49494	53976
Pondicherry	9781	12202	18631	25720	28768	29383	35190	37926	45431	50936	56034

P: Provisional estimates. N.A.: Not available.

Note: Estimates based on 1993-94 series

Source :Reference 4.1.2 , 4.1.3

Annexure 4.1.4

Trends of Rates of Growth in Net state domestic product at current prices in decades of sixties and seventies				
States	Net state domestic product (NSDP)		Net state domestic product per capita (NSDP)	
	1960-61 to 1969-70	1970-71 to 1979-80	1960-61 to 69-70	1970-71 to 1979-80
Goa	na	6.1	na	3.6
Maharashtra	2.9	5.7	0.04	3.3
Punjab	5.6	5.4	3.5	3.2
Haryana	5.5	4.8	2.6	2.2
Gujarat	2.7	4.5	0.1	2
Karnataka	3.4	4.3	1.2	1.8
Delhi	5.1	6.2	0.7	1.7
Jammu & Kashmir	3.1	4.4	0.5	1.6
Tamil Nadu	2.1	3.4	0.1	1.6
All India	3	3.6	0.8	1.2
Andhra Pradesh	1.5	3.2	-0.4	1.1
Assam	4	3	0.9	0.8
West Bengal	2.5	2.9	0.02	0.7
Bihar	0.7	2.8	-1.3	0.6
Uttar Pradesh	1.6	2.6	-0.2	0.4
Orissa	9.7	2.3	7.3	0.3
Rajasthan	1.3	3	-1.1	0.2
Himachal Pradesh	5.6	2.4	3.4	0.2
Kerala	3.8	1.7	1.4	-0.2
Madhya Pradesh	1.5	1.3	-1.1	-1
Note: Deflators used in estimation of NSDP for Orissa in this period have discrepancies as a result of which the stated growth rates is arranged in order of rank in rates of growth of per capita				
Source : Reference 4.1.2 , 4.1.3				

Annexure 4.1. 5

Trends in Rates of Growth in Gross State Domestic Product at Current Prices - Decades of Eighties and Nineties				
States	Gross States Domestic Product		Gross States Domestic Product per capita	
	1980-81 to 1990-91	1993-94 to 1998-99	1980-81 to 1990-91	1993-94 to 1998-99
Karnataka	5.4	8.2	3.3	6.4
Gujarat	5.1	8	3	6.2
Tamil Nadu	5.4	6.8	3.9	5.8
Maharashtra	6	7.1	3.6	5.4
Rajasthan	5.9	7.7	3.8	5.3
West Bengal	4.8	6.8	2.6	5
All India	5.6	6.8	3.3	4.8
Goa	5.5	8.3	3.9	4.5
Kerala	3.2	5.5	1.7	4.2
Himachal Pradesh	5	6.7	3.1	3.9
Haryana	6.2	5.8	3.9	3.6
Andhra Pradesh	4.3	4.9	2.1	3.5
Punjab	5.4	5	3.5	3
Orissa	5	4.3	3.1	2.9
Bihar	4.7	4.2	2.5	2.6
Madhya Pradesh	4	4.4	2.1	2.3
Uttar Pradesh	4.9	4.5	2.5	2.3
Jammu & Kashmir	2.2	4.7	-0.4	1.6
Delhi	7.6	6.7	3.2	1.6
Assam	3.6	2.7	1.4	1
Note: Name of States is arranged in order of rank in rates of growth of per capita GSDP in 1993-94 to 1998-99.				
Source : Reference 4.1.2 , 4.1.3				

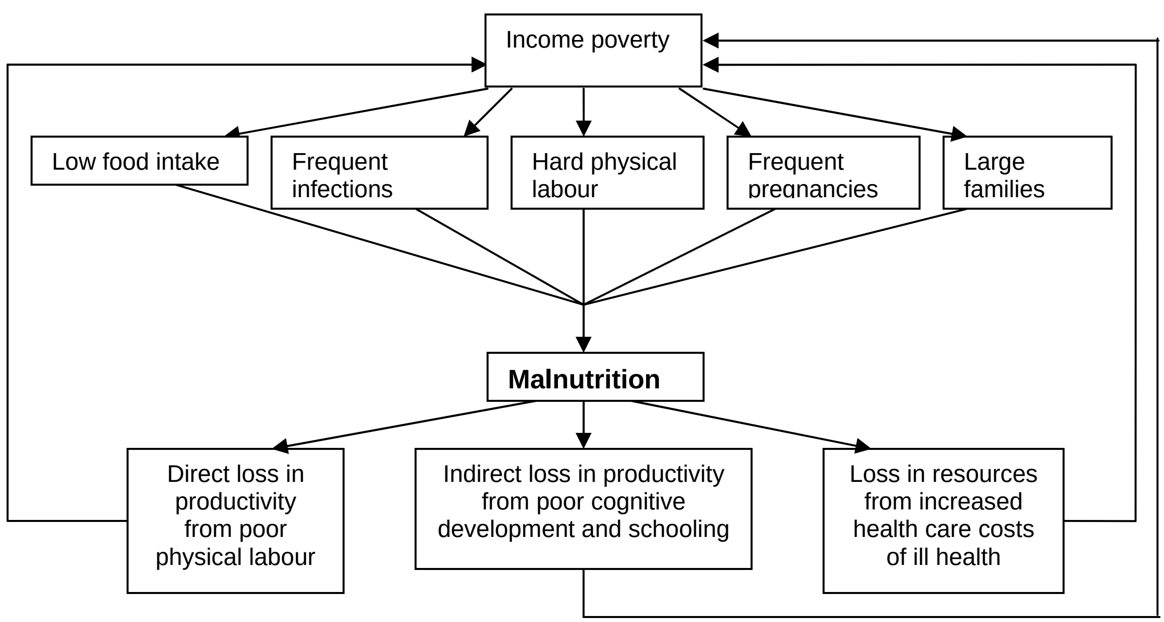
4.2 POVERTY ALLEVIATION

During the fifties, poverty was the major factor responsible undernutrition in India. The country recognized that the association between income poverty and undernutrition was mediated through several pathways (Figure 4.2.1). Income poverty might result in

- food insecurity and low dietary intake due to poor purchasing capacity and poor access to food stuffs;
- poor environmental hygiene resulting in repeated infections
- duration and severity of infections was not reduced because of lack of public sector health care for effective treatment of infections and
- low literacy hampering access to available services;

Majority of the low income group population were unskilled labourers engaged in manual labour. Undernutrition had an adverse effect on work capacity and increased susceptibility to infections. Poor work output and absenteeism due to illness reduced their earning and purchasing power. Efforts were therefore directed towards cutting this mutually reinforcing linkage between poverty and undernutrition.

Figure 4.2.1: The vicious cycle of poverty and malnutrition



Source: Modified from Reference 4.2.3); Bhagwati and others (2004)

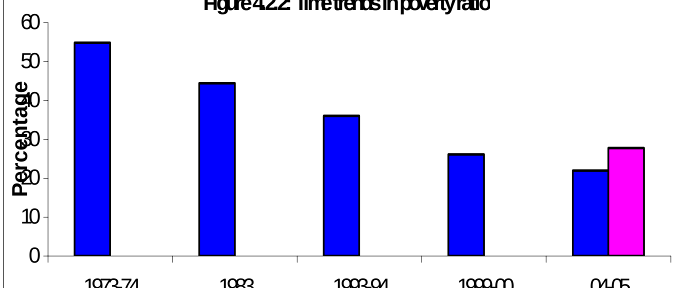
Definition of poverty

India was the first country in the world to define poverty as the total percapita expenditure of the *lowest* expenditure class, which consumed 2400 kcal /day in rural and 2100 kcal/day in urban areas and attempt to provide comprehensive package of essential goods and services to people below the poverty line. Initially the poverty line was defined on the basis of NSS Household Consumption Expenditure data for 1973-74. The poverty lines, defined as the basket of goods and services, have not been changed subsequently in order to preserve inter-temporal comparability, but the rupee value of the lines is regularly updated using the large sample consumer expenditure survey of the NSSO in order to reflect price increases that have taken place over the years.

Time trends in poverty

Time trends in poverty ratio computed by the Planning Commission on the basis of the quinquinial NSSO large sample survey is given in Figure 4.2.2. The NSSO released the result of the latest large sample survey data on household consumer expenditure (NSSO 61st Round), covering the period July 2004 to June 2005. From this data, two different consumption distributions for the year 2004-05 have been computed. The first one from the consumption data collected using 30-day recall period (also known as reference period) for all the items. The other distribution is obtained from the consumer expenditure data collected using 365-day recall period for five infrequently purchased non-food items, namely, clothing, footwear, durable goods, education and institutional medical expenses and 30-day recall period for the remaining items. These two consumption distributions have been termed as Uniform Recall Period (URP) consumption distribution and Mixed Recall Period (MRP) consumption distribution respectively. The Planning Commission, using the Expert Group methodology has estimated poverty in 2004-05 using both the distributions.There was a slow but steady decline in poverty during seventies and eighties. During the nineties there was a change in the methodology used for computation of poverty line. In order to eliminate possible differences in reported poverty ratios due to the changed methodology, the Approach Paper to the Eleventh Plan has computed and presented the poverty ratios for 2004-05 according to both the methodologies. These revised data suggest that the decline in poverty in the nineties is not as high as reported earlier.

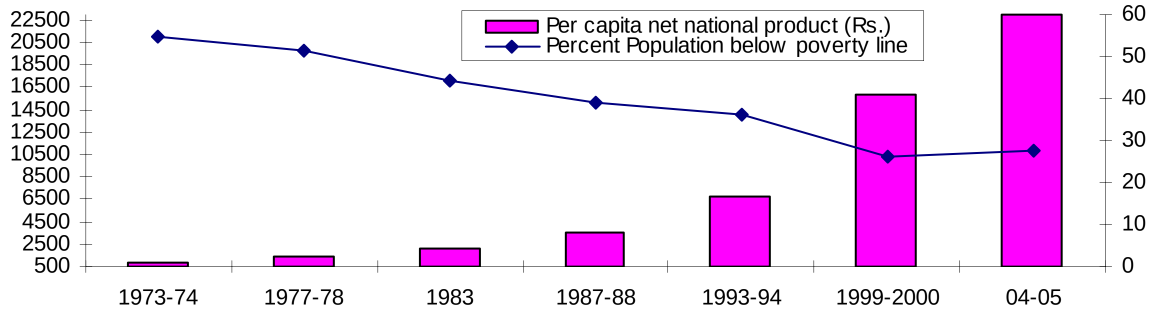
Figure 4.2.2: Time trends in poverty ratio



Source: Reference 4.2.1

Poverty and percapita net national product

Figure 4.2.3: Time trends in per capita net national product and percent population below poverty line



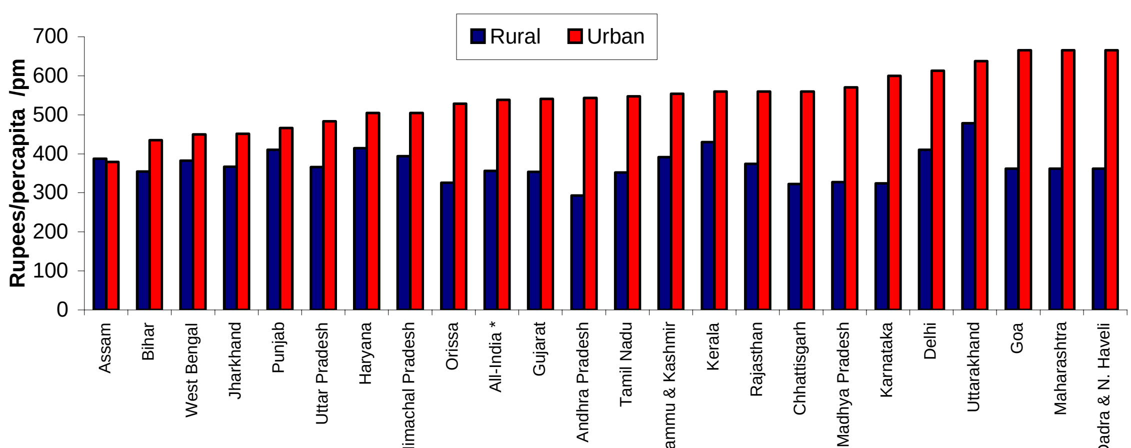
Source: Reference 4.2.1 , 4.2.2

Poverty reduction is one of the major objectives of economic growth. Economists recognise that even when there is robust economic growth poverty reduction may not always be fully achieved. Time trends in percapita net national product and poverty ratio over the last three decades is shown in Figure 4.2.3. Seventies and eighties witnessed a slow but sustained economic growth and slow reduction in poverty ratio. During the last ten years there has been a steep increase in the economic growth; however this has not resulted in a commensurate decline in poverty ratios (Approach paper to the Eleventh Plan)

Interstate, urban rural differences in poverty

There are large interstate and urban rural differentials in cost of goods and services. These are taken into account and state and urban and rural area specific poverty lines are defined. Rupee value of poverty line in different states in urban and rural areas in 2004-05 is shown in Figure 4.2.4. The importance of this adjustment can be gauged from the fact that the poverty lines for the states

Figure 4.2.4: Urban rural and state specfic poverty lines (Rs/pm)



Source: Reference 4.2.6

Table 4.2.1: Percentage of People living below Poverty Line						
Year	Rural			Urban		
	SCs	**STs**	**All-Population**	**SCs**	**STs**	**All-Population**
1993-94	48.1 (1.29)	51.9 (1.39)	37.3 (1.00)	49.5 (1.53)	41.1 (1.27)	32.4 (1.00)
1999-00	36.3 (1.34)	45.9 (1.69)	27.1 (1.00)	38.5 (1.63)	34.8 (1.47)	23.7 (1.00)

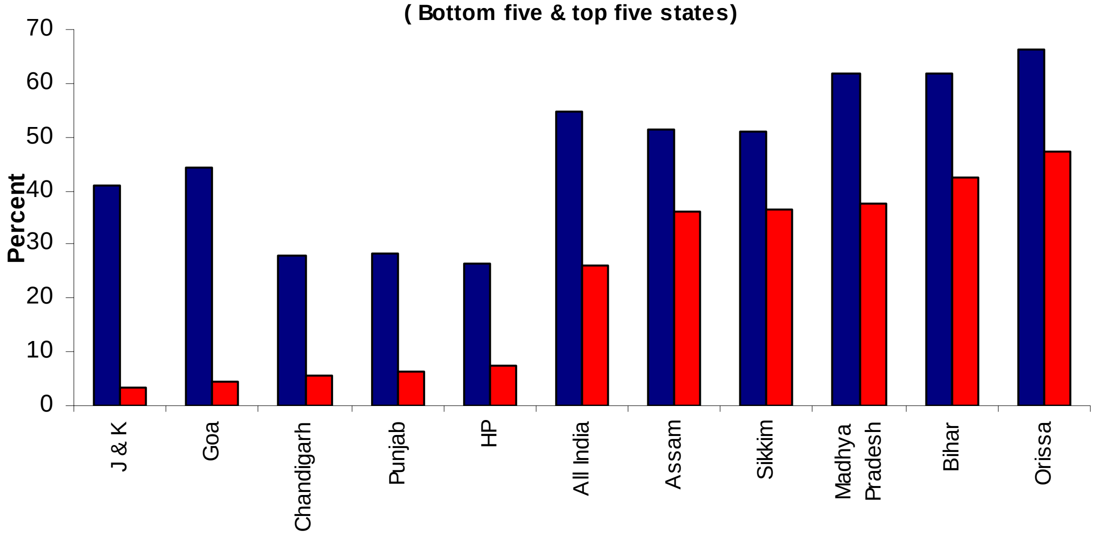
NOTE: *Figures in brackets are the ratios of SC and ST population below the poverty line to the total Population below the poverty line.*
Source: *Reference 4.2.7*

with the highest prices are 43% and 57% higher for rural and urban areas respectively than those of the states with the lowest prices. In all states except rural Assam the rupee value of poverty line is lower as compared to urban areas; the urban and rural differences are higher in Mahrashtra, Madhya Pradesh, Karnataka and relatively lower in Bihar, West Bengal, Punjab, Haryana and Uttar Pradesh.

Both in urban and in rural areas higher percentage of people belonging to SC and ST are below the poverty line as compared to all the population (Table 4.2.1). During the nineties there was some reduction in poverty in all the groups but the difference between groups has not decreased. In fact the disparity between ST and rural population had widened during the nineties.

There are wide interstates differences in terms of poverty reduction over time. Trends in poverty in top five and bottom five states during the nineties are shown in Figure 4.2.5. In 1983 more than 50 % of the population in Orissa, Bihar, West Bengal and Tamil Nadu were living below the poverty line. By 2000 In West Bengal and Tamil Nadu the poverty ratios declined by half but Orissa and Bihar continue to be the poorest states with nearly half of their population being below poverty line. J&K, Himachal, Haryana, Andhra, Punjab and Maharashtra are the

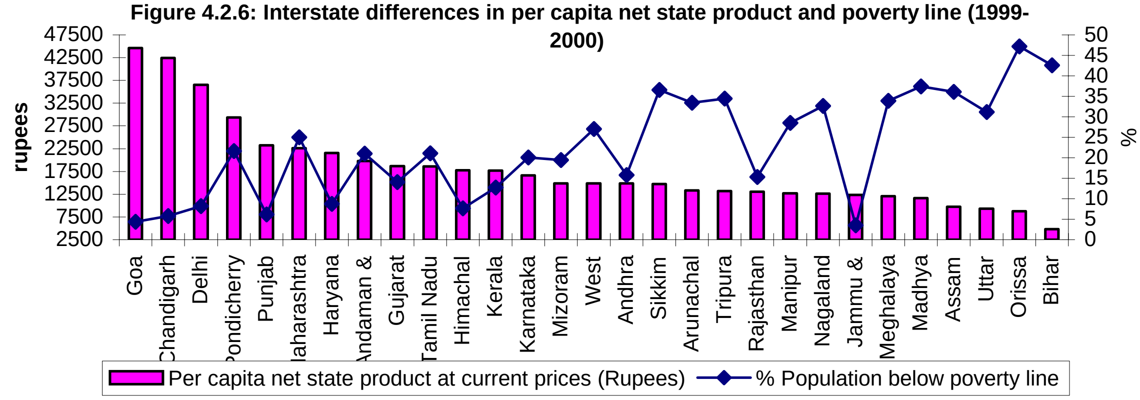
Figure 4.2.5: Percentage of population in poverty in states during 1999-2000 in comparison to 1973-74 (Bottom five & top five states)



Source: Reference 4.2.9

other states which have achieved significant decline in prevalence of poverty. The difference in rates of decline in poverty has resulted in widening of the gap between states; for instance poverty ratio in Orissa is eight times higher than the poverty ratio in Punjab. The differences in poverty ratios between states may have to be considered while assessing factors responsible for the interstate differences in dietary intake and nutritional status.

Figure 4.2.6: Interstate differences in per capita net state product and poverty line (1999-2000)

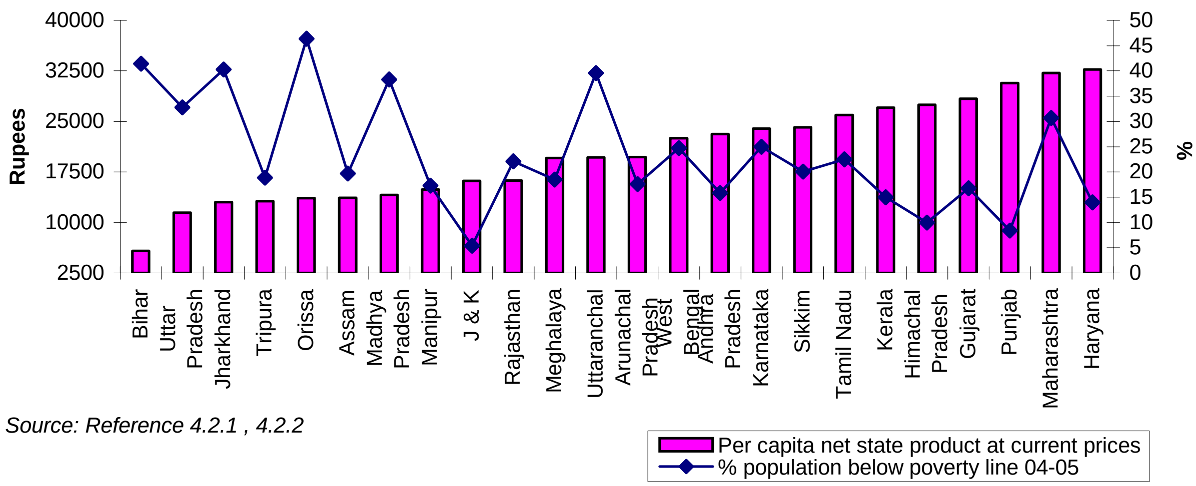


Source: Reference 4.2.2

Poverty and percapita net state product

Data on per capita state net product and poverty ratio for the states in 2000 and 2005 are given in figure 4.2.6 and figure 4.2.7. Analysis of the data on interstate differences in net state product and poverty ratios provides several interesting findings. The top five major states with low and high percapita state net product and poverty ratios were similar at both the time points. Both in 2000 and 2005, most of the states with high net state product had low poverty ratio and vice versa. However there are exceptions like J&K where poverty ratios are low inspite of low per capita net state product. Maharashtra has relatively high

Figure 4.2.7: Interstate differences in poverty ratio and per capita net state product



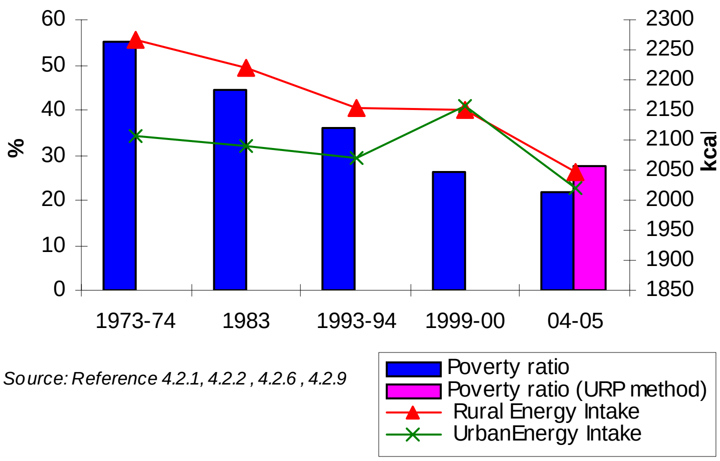
Source: Reference 4.2.1 , 4.2.2

poverty ratios in spite of high per capita net state product. Thus state per capita income is an important but not the only determinant of poverty rates in the state. Large interdistrict disparities in development may account for relatively high poverty ratio in states like Maharashtra inspite of high per capita net state product.

Poverty and energy intake

Energy intake has been used as the major factor for determining the poverty line in India. It is therefore logical to explore the current relationship between these two parameters. Data on time trends in poverty ratio and energy consumption computed from NSSO consumer expenditure survey is given in Figure 4.2.8. Contrary to the expectations the decline in poverty is not associated with an increase in the energy intake. Over this time period the food grain were readily available and accessible to all and prices have been quite low especially for the below poverty line families. Therefore the decline in energy intake cannot be due to problems in access or affordability of the food. Perhaps the major factor responsible for the decline is the reduction in energy requirements due to changes in the life style among the population.

Figure 4.2.8: Time trends in poverty ratio and per capita energy intake- All India



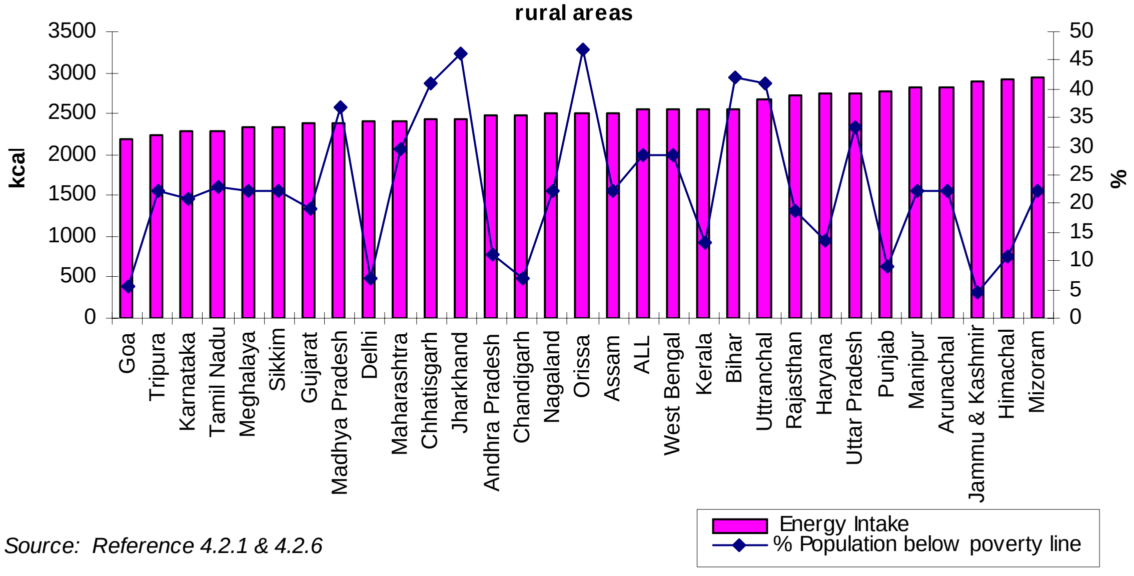
Source: Reference 4.2.1, 4.2.2 , 4.2.6 , 4.2.9

Interstate differences in poverty and energy intake

Interstate differences in poverty ratio and energy intake in rural and urban areas from NSSO consumption expenditure surveys and INP survey are shown in Figure4.2.9, Figure 4.2.10 and Figure 4.2.11. In most of the states both poverty ratios and energy intake were lower in urban areas. In some states such as Mahrashtra there were substantial differences in the urban-rural poverty ratios as well as energy intake.

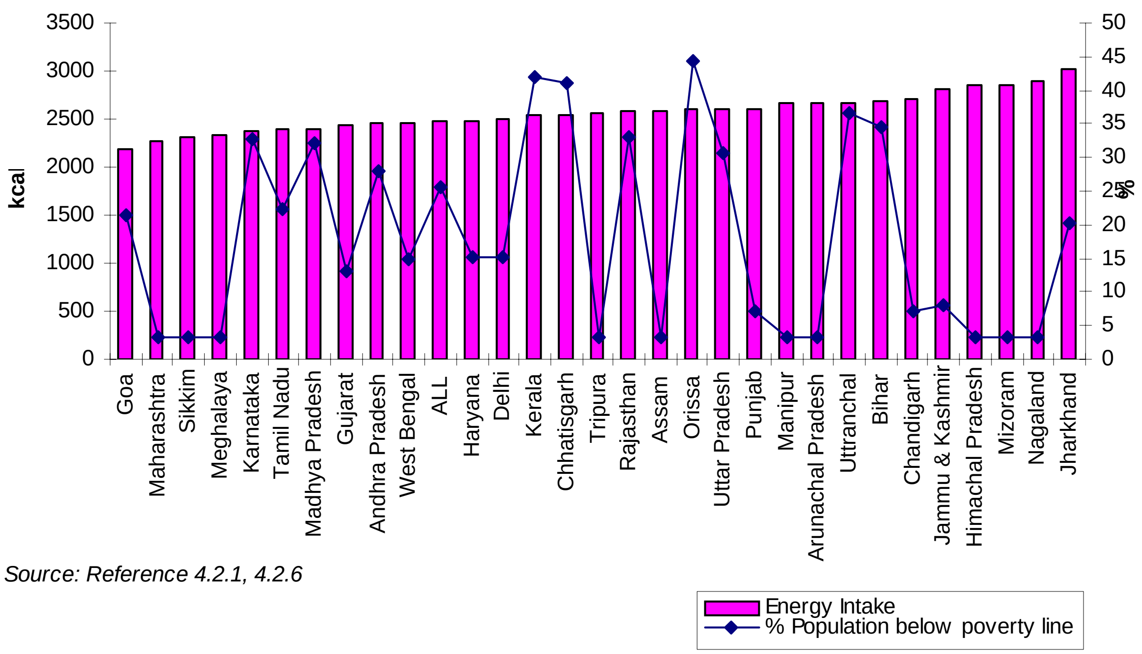
In states like Punjab, Himachal and J&K poverty ratios were low and energy consumption was high. However in other states with low poverty ratios such as such as Goa, Karnataka, Tamil Nadu and Gujarat energy intake was also low. At the other end of the poverty spectrum were states like Bihar, Jharkhand, Orissa, and Chattisgarh and UP where in spite of high poverty levels energy intake was high. This is most probably because substantial proportions of the population in these states are still engaged manual work for livelihood and require higher energy intake. These data suggest in majority of the population poverty and economic constraints are not the major factors affecting energy intake; energy requirement mostly related to occupational and household chores continues to be an important factor determining energy intake among poorer segments of the population.

Figure 4.2.9: Interstate diference in poverty and Energy intake (CU/diem) in rural areas



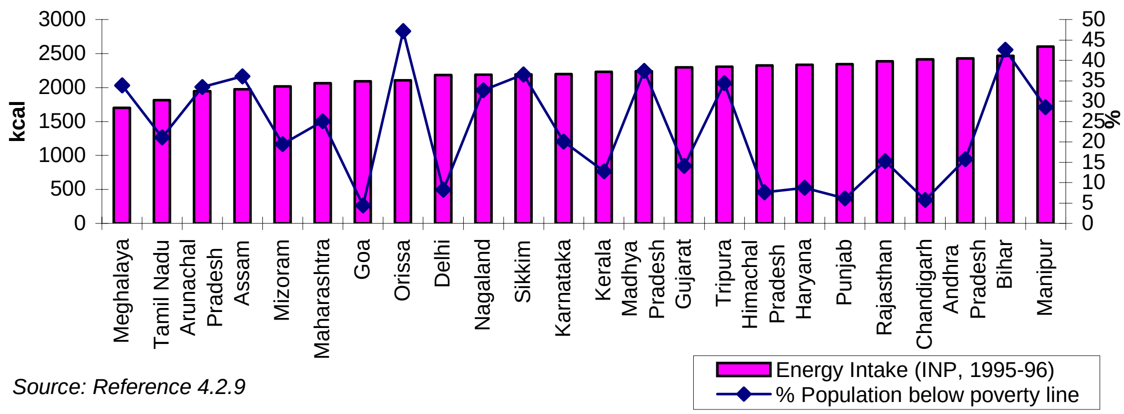
Source: Reference 4.2.1 & 4.2.6

Figure 4.2.10: Interstate differences in poverty and energy intake (CU/diem) in urban areas



Source: Reference 4.2.1, 4.2.6

Figure4.2.11: Interstate differences in poverty ratio and Energy intake



Source: Reference 4.2.9

Available data from NSSO indicate that over the last three decades there has been substantial change in the food preferences of the population. These changes have some cost implications and could result in changes in the amount spent per calorie energy. The NSS Household Consumption Expenditure data for 1999- 2000 indicates that the actual calorie intake of the poverty-line class in every state and in both rural and urban areas is significantly below the calorie norm (except in urban Orissa). However data from NSSO clearly shows that the actual cost per calorie consumed varies widely between different income groups in every state and in both the rural and urban areas. NSSO data suggest that in each state there does exist a food basket which is actually consumed by a large class of people and which yields much higher calories per rupee spent on food and that if the poverty-line class were to consume this particular basket, it would be able to meet the calorie norms with its actual expenditure on food (Table 4.2.2). These data suggest that the apparent low energy consumption is not so much the result of a lack of income or purchasing power, but of the choice of a food basket by the BPL population.

Table4.2.2: Potential Calorie Intake of Poverty-line Class

State	Rural		Urban	
	Calories per day	**Percentage of Norm (2400)**	**Calories per day**	**Percentage of Norm (2100)**
AP	2424	101	2457	117
Assam	2258	94	1481	71
Bihar	2252	94	2605	124
Gujarat	2197	92	2069	99
Haryana	2311	96	1526	73
HP	2714	113	2277	108
Karnataka	2304	96	2682	128
Kerala	1456	61	2004	95
MP	2584	108	2360	112
Maharashtra	2326	97	2451	117
Orissa	2507	104	2720	130
Punjab	2266	94	2183	104
Rajasthan	3016	126	2561	122
TN	2215	92	2050	98
UP	2266	94	2027	97
WB	2633	110	2089	99

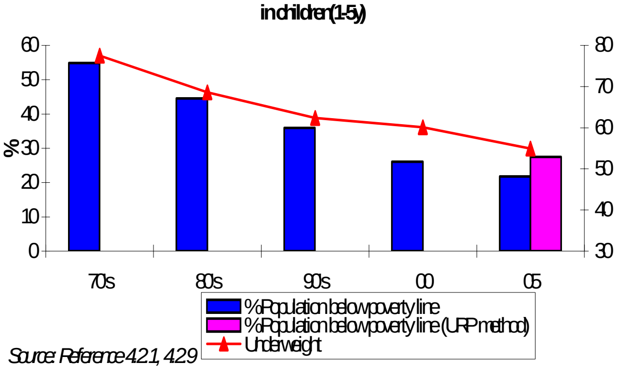
Source:; Reference 4.2.8 , Pranab Sen's article

There is also an ongoing debate whether in addition time has come change from only energy to a basket of foodstuffs essential for balanced diet such as cereals, pulses and vegetables in the definition of the essential cost of food for defining the poverty line.

Poverty and nutritional status

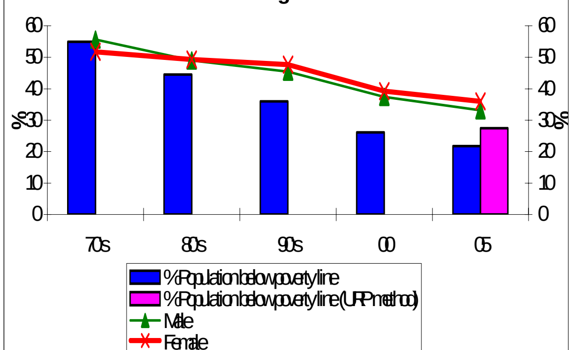
Time trends in poverty and nutritional status of preschool children and adults during the last three decades is shown in Figure 4.2.12 & 4.2.13. The eighties and early nineties witnessed a relatively slow but steady decline in poverty and undernutrition in children. The decline in undernutrition rate in children during this period mainly was due to improved access to health care rather than increase in dietary intake. During the last decade the reduction in both poverty and undernutrition in children has been relatively slower. The slow reduction in undernutrition might be due to the fact that there has not been any improvement in infant and young child feeding practices, deterioration in intrafamily distribution of food and caring practices for preschool children. All these are unrelated to either income or poverty and can be improved only through persistent behavioral change communication.
Recognizing the potential linkages between child undernutrition and human development UN have included child under nutrition as one of the indices for computation of. Human Poverty Index for measuring deprivation for developing countries. Human poverty index is a composite index which takes into account the probability at birth of not surviving to age of 40, adult literacy rates, and population without sustained access to improved water source and children under weight for age. Data presented above indicates that in India undernutrition exists even in the absence of socioeconomic deprivation. It is essential to investigate in depth the relationship between indices for assessment of undernutrition in children and poverty and deprivation in India.

Figure 4.2.12: Time trends in poverty ratio and Prevalence of undernutrition in children (1-5y)



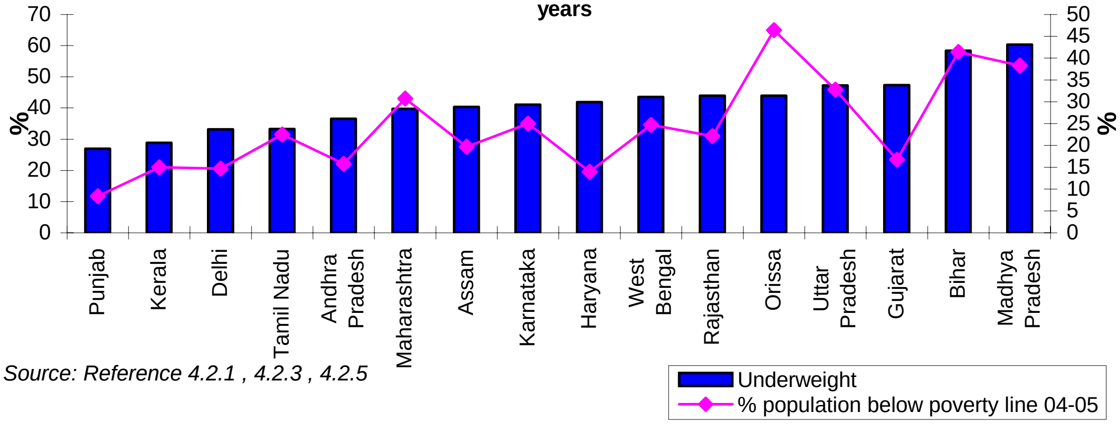
Source: Reference 4.21, 4.29

Figure 4.2.13: Time trends in poverty ratio and prevalence of undernutrition among adults



Source: Reference 4.21, 4.29

Figure 4.2.14: Interstate differences in poverty and nutritional status of children under 3 years

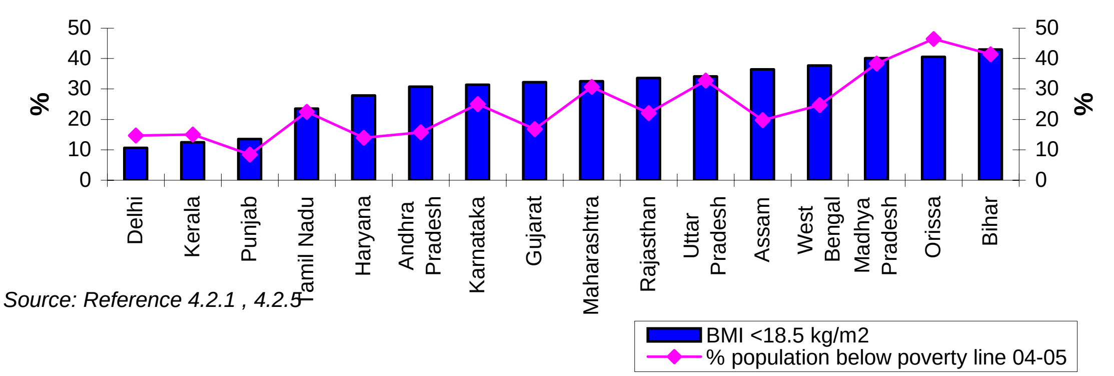


Source: Reference 4.2.1 , 4.2.3 , 4.2.5

Interstate differences in poverty and nutritional status

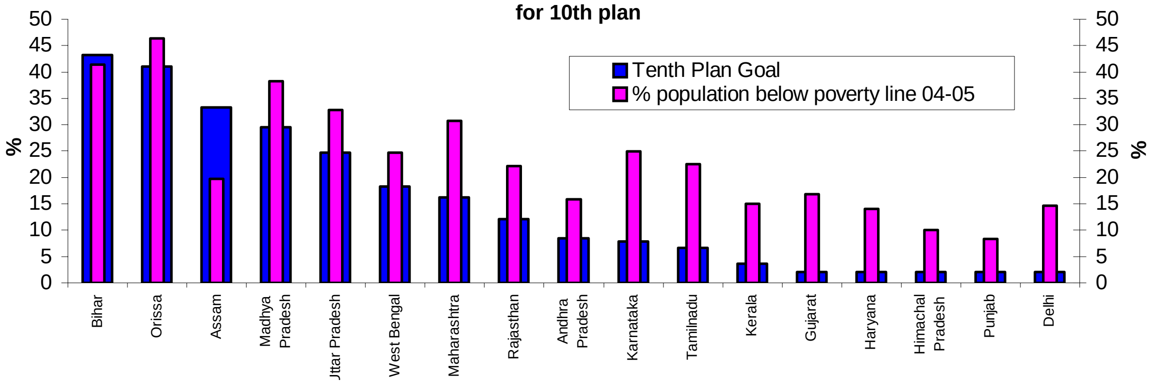
Inter state differences poverty and undernutrition in preschool children and women in shown in Figure 4.2.14 and Figure 4.2.15. States with high poverty have higher undernutrition rates as compared to states with low poverty ratio. None of the states with high poverty have low under nutrition rates and vice versa. It would thus appear that unlike the relationship between per capita income and poverty and poverty and energy intake, there is a much greater concordance between poverty and nutritional status at the state level. This is perhaps because poor people have a poor energy balance (more energy expenditure as compared to energy intake) due to heavy manual work, high morbidity due to infections (because they live in areas with poor environmental sanitation and lack of access to safe drinking water) and more severe and prolonged infections (due to poor access to health care). These data emphasize the need for focus on programmes aimed at reducing poverty and simultaneously programmes aimed at providing access to all essential goods and services to the poor in order to achieve sustained improvement in nutritional status of the population.

Figure 4.2.15: Interstate difference in poverty and nutritional status among women



Source: Reference 4.2.1 , 4.2.5

Figure 4.2.16: Interstate differences in poverty ratio and state specific poverty reduction goal for 10th plan



Source: Reference 4.2.1 , 4.2.9

The ambitious national goal of 8 % GDP growth during Tenth Five Year Plan was not achieved, but the Tenth Plan witnessed the highest ever GDP growth till now. The Approach paper to the Eleventh Plan indicates that the country expects to surpass this and achieve a 10% GDP growth during the next five years. State specific Tenth Plan goals for poverty reduction (by 2007) and the poverty ratios (in 2005) are given in Figure 4.2.16. It is noteworthy that two states that have achieved the goals set for 2007 by 2005 are Bihar and Assam. All other states are yet to achieve the goals. It is surprising that states, which are doing well in terms of state GDP growth such as Maharashtra, Gujarat and Tamil Nadu have not been able to achieve goals, set for reduction in poverty. Taking note of this the Approach paper to the Eleventh Plan has laid a major emphasis not only on accelerating the economic growth but also on achieving inclusive growth which results in reduction in economic disparities, greater employment opportunities, reduction in poverty and improved access to essential goods and services to all. Such a focus could result significant reduction both in poverty and undernutrition.

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5. AGRICULTURAL TRANSITION

5. AGRICULTURAL TRANSITION

Nutrition scientist view agricultural produce as a major input required for improving dietary intake and nutritional status of the individuals. However, the farmers have to be assured of returns for their investment if they are to meet the nutritionists' prescription on what to grow to meet the nutritional need of the population. Whenever steps have been taken to ensure that there is congruence between the economic policies especially those related to agriculture and nutritional perspectives, the response of the farming community has been excellent and resulted in improvement in nutritional status of the population. The green revolution in India and massive increase in production of rice and wheat are the best examples of what could be achieved if economists and nutrition scientist pull together. The country has achieved self-sufficiency in food grains to meet the needs of the growing population; and adequate buffer stocks within a relatively short time; this resulted in improved access to food for poorer segments of the population and reduction in under nutrition.

Agriculture development in the country during the last five decades could be divided into the following phases:

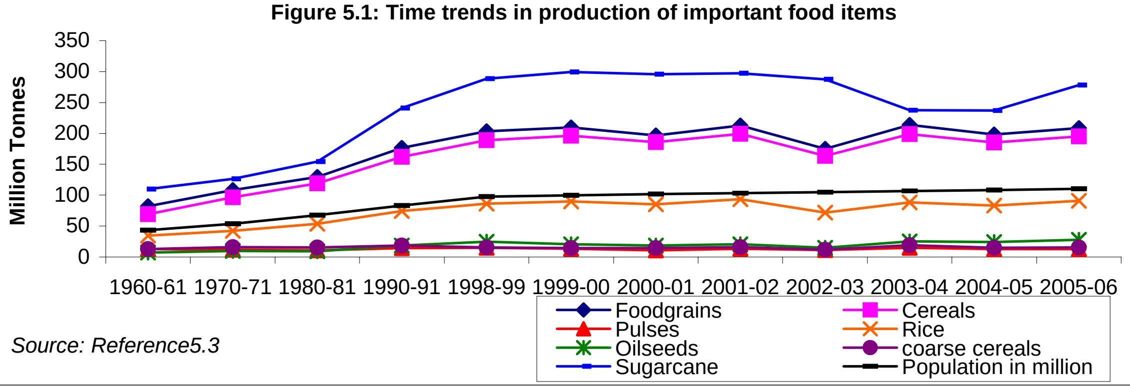
- the expansion of net sown area (NSA), irrigated area, development of rural infrastructure and land reforms;
- high yielding dwarf varieties, agricultural inputs like fertilisers, pesticides and improved crop production technologies which ushered in the Green Revolution';
- minimum support prices (MSP) and procurement of agricultural commodities , food grains storage and distribution system expanded at the national level;
- the thrust on liberalization and globalization.

The impact of these on food production is reviewed in the following pages.

Food production

The time trends in production of major crops are given in Annexure 5.1. Agricultural production increased nearly threefold from 1960–61 to 1998–99

Figure 5.1: Time trends in production of important food items



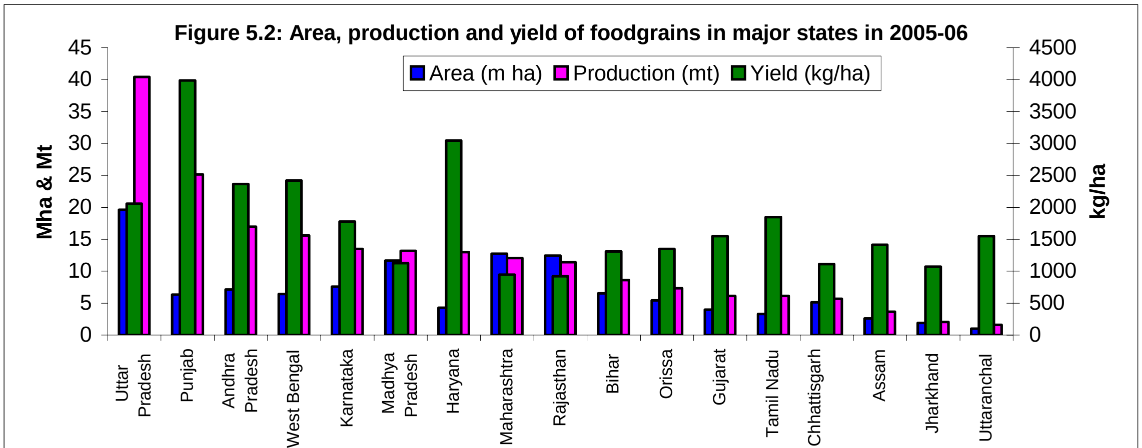
Source: Reference5.3

(Figure 5.1). The century ended with the country's output of food grains crossing 200 million tonnes, a fourfold increase since 1960–61, mainly due to the success of the green revolution since the 1970s. Over years most farmers have shifted to rice and wheat cultivation because of the MSP offered by the Government. The coarse grain production has remained stagnant. Although the area under cultivation with food grains has remained virtually constant since 1970–71, the yield has increased by 65 %. India which had to import food grains for some time after independence, but now it has emerged as a marginal exporter of food grains (Ministry of Finance, 2000). Agriculture contributes nearly one-fourth of the GDP (Reserve Bank of India, 1999) and provides a livelihood to about two-thirds of all workers in the country (Central Statistical Organisation, 1999). Although the %age of land cultivated with food crops that is irrigated increased from 24 % in 1970–71 to 41 % in 1996–97, the performance of Indian agriculture still largely depends on monsoon rains. In spite of a fourfold increase in food production since the early fifties, daily per capita net availability of food grains has increased by only 18 %, from 395 grams to 467 grams per day (Ministry of Finance, 2000). During the 1990s the growth rate of foodgrains production declined to 1.9 % per annum from 3.5 % per annum during 1980s. Similarly the growth rate of productivity in food grains decelerated to 1.3 % % as compared to 3.3 % per annum during the 1980s. In terms of productivity the country lags behind others. Production under various crops over the last five decades and the net availability of cereals and pulses over the period is shown in Annexure 5.1 and Annexure 5.2.

The production of kharif food grains during 2006-07 is estimated at 209.2 million tonnes (second advance estimates), which is higher than 208.6 million tones estimated during 2005-06. The production of rice is estimated at 90.1 million tonnes compared to 91.8 million tonnes during the previous year. The production of wheat is estimated at 72.5 million tonnes, which is higher than the previous year's production of 69.3 million tonnes. The production of coarse cereals is estimated at 32 million tonnes, which is lower than the previous year's production of 34 million tonnes. Sugarcane production is estimated to be higher at 315.5 million tonnes (first advance estimates), as against 281.2 million tonnes during the previous year.

It is a matter of concern that massive improvement in food grain availability, substantial decline in cost of cereals, improved access to subsidized food grains through Targeted Public Distribution System have not resulted in elimination of hunger or reduction in under-nutrition especially in vulnerable groups.

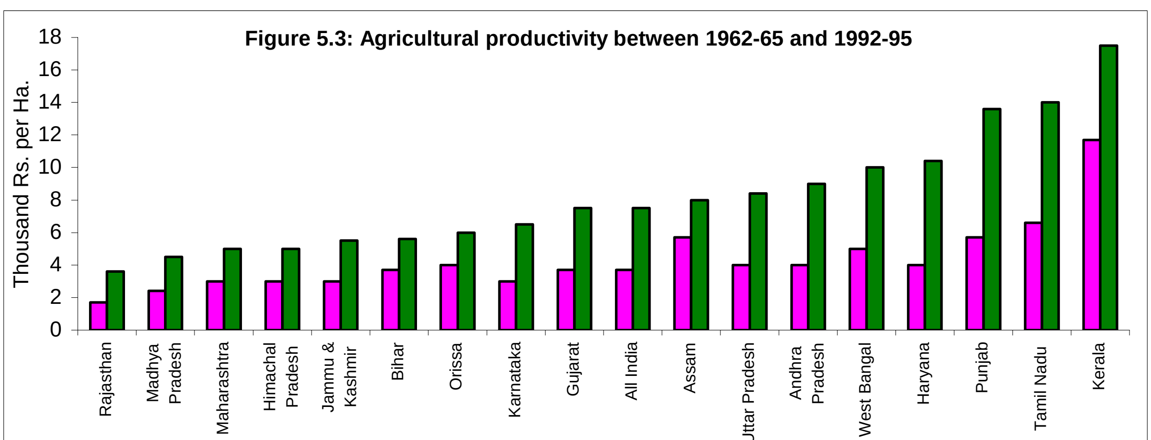
The production of important crops in three largest food grain producing states is given in Annexure 5.3. Uttar Pradesh, Punjab and Haryana are the major producers of food grains in 2004-05. Rajasthan, Madhya Pradesh and Gujarat are oilseeds producing states; major sugarcane producing states are Uttar Pradesh, Maharashtra and TamilNadu. Data on area under cultivation, production and yield is given in major states in Figure 5.2. Almost all states



Source: Reference 5.1

produce food grains. Punjab and Uttar Pradesh rank highest in production of food grains. Punjab and Haryana top the yield of food grains. It is obvious that there are huge differences not only in area under cultivation but also in yield between states. Agricultural productivity in different states is given in Figure 5.3. Improvement in productivity in large states like UP will have a major impact on food grain availability in the country. As there is not such scope in terms of increase in area under cultivation, an effort to increase productivity has to be given priority over the next decade.

The very success of Green Revolution brought about some major problems. Many states have attempted to increase production through subsidies on inputs such as power, water and fertilizers, rather than by building new capital assets in irrigation and power. Unsustainable practices like excessive use of water together with imbalanced use of fertilizers especially in the Green Revolution areas of northern and northwestern parts of the country have adversely affected soil health and environment. Though the consumption of pesticides seems to have declined, because of the propagation of the Integrated Pest Management (IPM) approach and the increasing awareness about the hazards of pesticides,



Source: Reference 5.1

Text Box 5.1: Land

- Land available for food grain cultivation has been dropping steadily and now is 120 million hectare.
- Fragmented holdings of land- the average size of holdings decline from 2.63 ha in 1960-61 to 1.06 in 2002-03, making it difficult for farmers to come out of the poverty trap
- Restrictive and outdated land laws that do not give farmers flexibility
- Overdependence on agriculture for employment due to slow growth of non farm sector in villages.

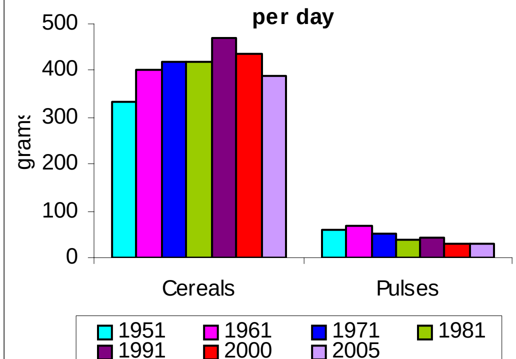
Text Box 5.2: Yield

- No new technological breakthrough in terms of high yielding varieties for food grain crops.
- Soil fatigue due to over exploitation of nutrients and organic matter in intensive cropping areas.
- Nutrient imbalance due to use of improper combination of fertilizers
- Non availability of quality seeds resulting in low seed replacement rates.
- Inadequate or poor harvest management infrastructure at the farm level.

the availability of quality pesticides and pesticide residues in foodstuffs, remained a matter of concern. Many of the erstwhile high producing states are experiencing Green Revolution fatigue. Very little attention is being paid to achieve integrated farming systems that will ensure sustainable evergreen revolution essential for appropriate dietary diversification to achieve nutrition security (Text Box 5.1& 5.2).

To meet all the nutritional needs of the growing population, the country will have to produce an extra five million tonnes of food grains annually and increase the production of livestock, fish and horticultural products. This has to be achieved in the face of shrinking arable land and farm size, low productivity, growing regional disparities in productivity and depletion of the natural resource base. Appropriate steps have to be taken to minimise the potential adverse consequences of globalisation on domestic production, employment and price stability of food commodities. In India the productivity has been quite low. The challenge is to take appropriate steps to improve productivity in all the states. The low productivity can also be viewed as an opportunity, which can readily help the country to increase production without worrying about the country's inability to expand the area under cultivation.

Figure 5.4: Per capita net availability per day

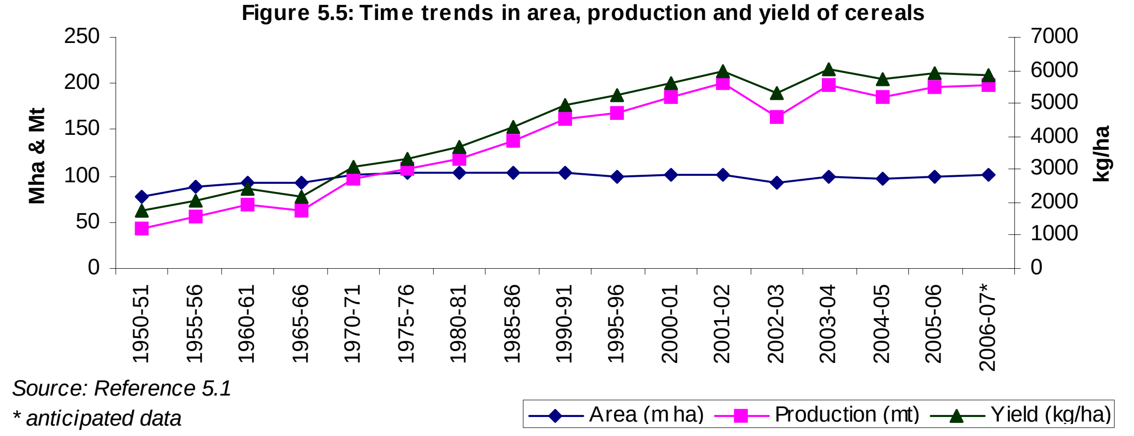


Source: Reference 5.3

Cereal production

The country has been producing adequate cereals to meet the needs of the population since mid seventies. Over the last five decades per capita net availability has been showing improvement and by 1991 it was sufficient to meet the RDA for cereals (Figure 5.4). The production of cereals has increased tremendously in last five decades though the area under the cereal production has not increased much (Figure 5.5). Annexure 5.3 gives

Figure 5.5: Time trends in area, production and yield of cereals



information on production of various cereals in largest cereal producing states. West Bengal, Andhra Pradesh and Uttar Pradesh are the largest rice producing states. Uttar Pradesh, Punjab and Haryana are largest producers of wheat in the country; coarse cereals are mainly produced in Maharashtra, Karnataka and Rajasthan.

Inputs needed to achieve a sustainable increase in food grain production to meet the needs of the growing population have to be provided. Locally produced and procured coarse grains made available through the Targeted Public Distribution System (TPDS) at a subsidized rate may substantially bring down the subsidy cost without any reduction in calories provided. This will also improve targeting as only the most needy are likely to buy these coarse grains. Millets are rich in minerals and micronutrients and hence increased consumption will improve the intake of these vital nutrients by the poor. Some states have taken steps to include coarse grains under the TPDS. This is a welcome step and may result in increased local production and consumption of the coarse grains.

Pulse production

India is the key player with 25% share in the global pulse basket from an area of about 32%, the annual production being 13.63 million tonnes in latest triennium.

Figure 5.6: Time trends in area, production and yield of pulses

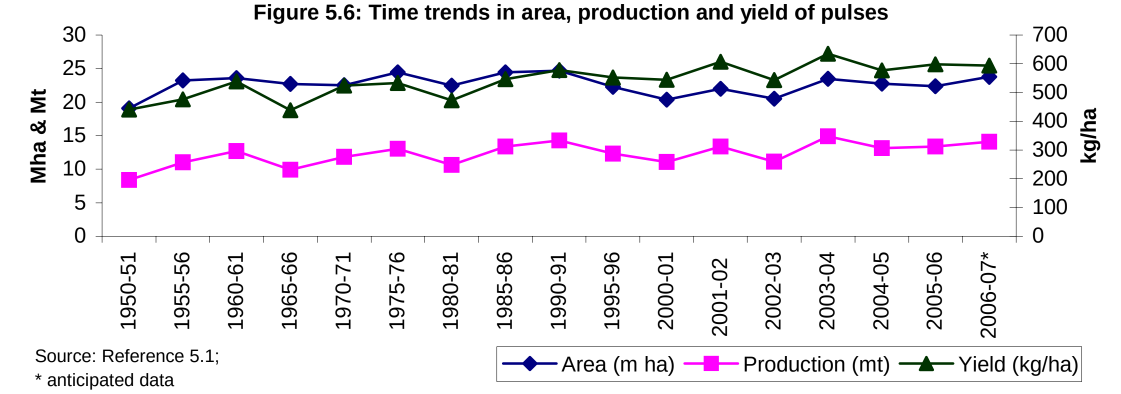
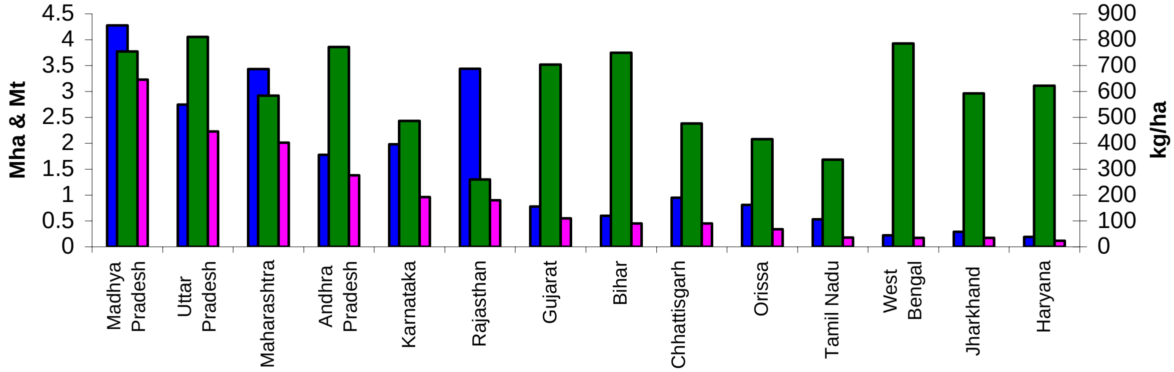


Figure 5.7: Area, production and yield of pulses in major states in 2005-06



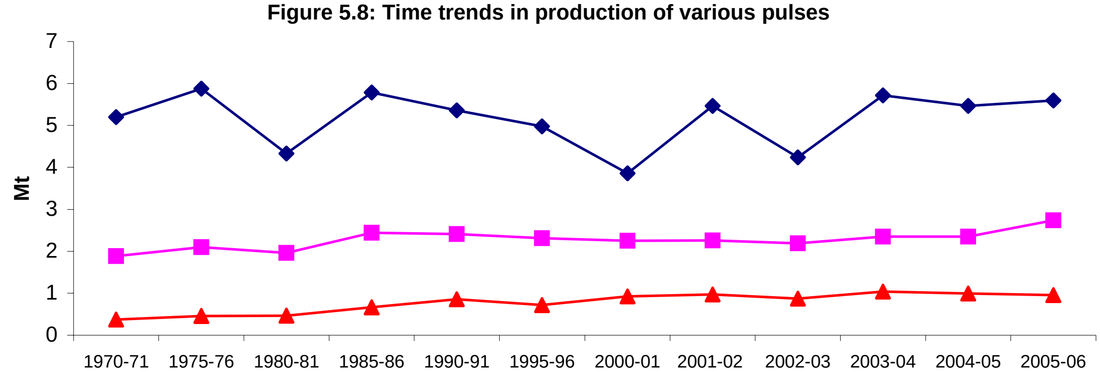
Source: Reference 5.1

The important pulse producing states are Madhya Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, Karnataka and Andhra Pradesh, which together account for 75% production. In the last five decades, there has been a progressive decline in per capita availability of pulses (Figure 5.4) and pulse consumption, especially among the poorer segments of the population. This is due to stagnant production and consequent rising cost of pulses. This trend has to be reversed.

Time trends in area, production and yield of pulses is shown in Figure 5.6. The source of growth varied in different periods. Area expansion was the major factor for growth during 1951-67; the yield improvement has been the key element in the post-All India Coordinated Pulses Improvement Programme (AICPIP) period (1967-2002). National pulse production has increased from 10.6 million tonnes in 1980-82 to 13.4 million tonnes in 2005-06, registering a growth of 1.7% annually. However, the share of pulses in the total food grain production has declined from 15.8% in 1951-55 to 6.3% in 2005-06.

Interstate differences in area, production and yield of pulses in 2005-06 are shown in Figure 5.7. Madhya Pradesh, Uttar Pradesh and Maharashtra are the largest producers of pulses. The production of gram is highest but has not

Figure 5.8: Time trends in production of various pulses



Source: Reference 5.1

Table 5.1: Import and export of pulses in India				
Year	Import		Export	
	Quantity (000' tonnes)	Value(Rs crores)	Quantity (000' tonnes)	Value (Rs crore)
1990-91	791.95	473.24	-	-
1995-96	490.75	685.57	61.36	131.91
1999-2000	250.77	354.69	194.18	419.56
2000-2001	349.84	498.47	244.08	537.08
2001-2002	2177.13	3155.66	159.55	366.18
Source: Reference 5.4				

changed over the years. However, over the years there has been some increase in production of *arhar* and lentil (Figure 5.8).

In post-Green Revolution period, the per capita availability of pulses has declined sharply in the country, as growth in pulse production did not keep pace with the population growth. The country has experienced progressive decline in per capita availability of pulses from 69 g in 1961 to 32 g in 2005. Because of the shortfall in national production, the country has been importing pulses. During 2001-02, the country imported 21.8 lakh tonnes of pulses valued at Rs 3155.7 crore (Table 5.1).

It is estimated that to meet the needs of the growing population the requirement in pulses will go up to 19.6 million tonnes by 2007, and 21.3 million tonnes by 2012. To make the nation pulse sufficient there is a need to increase the area under pulse cultivation and improve productivity. A proactive strategy from researchers, planners, policy makers, extension workers, market forces and farmers aiming not only at boosting the per unit productivity of land but also at reduction in the production costs is needed to improve availability and affordability of pulses.

Lack of assured market is one factor responsible for the stagnation in pulse production. Due to serious problem of stored grain pest infestation and lack of storage facilities, farmers are compelled to sell their produce to middlemen at low price. The minimum support price announced by the Government does not benefit farmers in absence of procurement mechanism. Moreover, all pulse crops are not covered under the minimum support price. Therefore, procurement policy for pulses needs to be strengthened immediately and reasonable buffer stock needs to be built up to meet the contingencies. Appropriate market intervention and promotion of post harvest technology are also necessary to encourage farmers to invest more in pulses production. Distribution of pulses through TPDS may improve access to pulses and help in stabilization of cost of pulses.

Horticultural production

Vast areas of India have tropical and agro-climatic conditions, which are well suited for cultivation of horticulture and plantation crops. Horticulture is an ideal crop for marginal and degraded lands. Besides, providing nutritional and livelihood security and helping poverty alleviation and employment generation, this sub-sector can sustain a large number of agro-Industries, which can generate huge additional non-farming employment opportunities. These factors

Table 5.2: Estimated area and production of fruits and vegetables in 2004-05					
Fruits	**Area (000'ha)**	**Production (000;MT)**	**Vegetables**	**Area (000'ha)**	**Production (000;MT)**
Apple	230.7	1739.0	Brinjal	530.32	8703.8
Banana	529.7	16225.3	cabbage	290.29	6147.7
Citrus	712.4	5996.9	cauliflower	238.17	4507.9
Grape	60.2	1546.3	okra	358.31	3524.9
Guava	162.0	1685.6	Peas	276.72	1971.8
Litchi	60.0	368.6	Tomato	497.65	8637.7
Mango	1961.9	11605.2	Onion	593.94	7515.4
Papaya	73.0	2568.2	Potato	1542.3	29189
Pineapple	81.2	1229.4	sweet potato	136.46	1211
Pomegranate	112.5	792.5	tapoica	281.29	7900.8
Sapota	133.1	1060.2	Others	2010.2	22124
others	847.0	4476.7	All vegetables	6755.6	101433
All fruits	4963.8	49294.8			
Source: Reference 5.4					

have led to greater area being brought under horticulture and consequent increase in production of fruits and vegetables. Horticultural products provide higher yield per hectare and the sale price is also higher. The horticulture sector contributes about 24.5% towards agriculture GDP from only about 8% of the cultivated area. It is only recently that a reasonably reliable database for horticultural products has become available. The estimated area and production of some of the major horticultural crops in recent years is given in Table 5.2.

India has identified horticultural crops as a means of diversification for making agriculture more profitable through efficient land use, optimum utilization of natural resources (soil, water and environment) and creating skilled employment for rural masses, especially women folk. However, if these efforts are to succeed some of the concerns of the farmers have to be addressed. The shelf life of food grains is over 3 years or more but shelf life fruits and vegetables ranges from a week to 3 months. Currently hardly 1 % of over 140 million tonnes of fruits and vegetables produced in the country goes through the processing route. Losses during packaging and transport are estimated to be about 30% and when coupled with poor off take, it can spell major economic disaster for the farmers. It is therefore imperative that creation of essential infrastructure for preservation, cold storage, refrigerated transportation, rapid transit, grading, processing, packaging and quality control get the necessary investment to enable the horticultural sector to achieve its full economic potential. The Tenth Plan has emphasized the need for Nutrition Security with rapid increase in dietary diversification. With the increasing economic growth and emergence of a large middle class, which is aware of the importance of vegetable and fruit intake in their diet, it is expected that the demand for fruits and vegetables over the next few years will show a steep rise. This must be met through increased production of these in the country.

Efforts are on to encourage private investment in hi-tech horticulture with micro-propagation, protected cultivation, drip irrigation, and integrated nutrient and pest management besides making use of latest post-harvest technology particularly in the case of perishable commodities. As a result, horticulture crop production has begun to move from rural confines to commercial ventures and has attracted young entrepreneurs, since it has proved to be intellectually satisfying and economically rewarding. This will not only help in retaining educated youth in the farm sector but would also enable the micro-nutrient needs of the population to be met through a sustainable food-based approach. The processing, storage and transportation for horticultural products in a manner that there is no glut and distress sale, will make their production economically attractive to farmers and improve availability to the consumers.

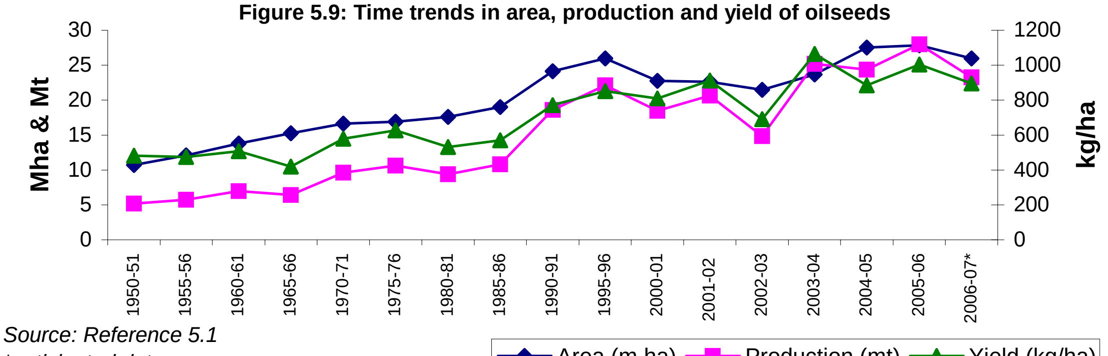
The Ministry of Food Processing is setting up food parks in different parts of the country. The idea behind setting up of food parks is to enable small and medium entrepreneurs find access to capital intensive facilities, such as cold storage, warehouse, quality control labs and effluent treatment plants. Development of such facilities is expected to make the food processing units in the food parks economical and competitive and may improve their market accessibility.

In spite of being a major vegetable and fruit producing country in the world per capita consumption of these in India is very low. Consumption of adequate quantities of vegetables, especially green leafy ones, is essential for meeting the dietary requirement of vital micronutrients. Besides, vegetables also provide several phytochemicals and fibre essential for health. At present, there is insufficient focus on the cultivation and marketing of low-cost, locally-acceptable green leafy vegetables, yellow vegetables and fruits. As a result, these vegetables are not available at affordable cost throughout the year. Health and nutrition education emphasising the importance of consuming these inexpensive but rich sources of micronutrients will not result in any change in food habits unless the horticultural resources in the country are harnessed and managed effectively to meet the growing needs of the people at an affordable cost.

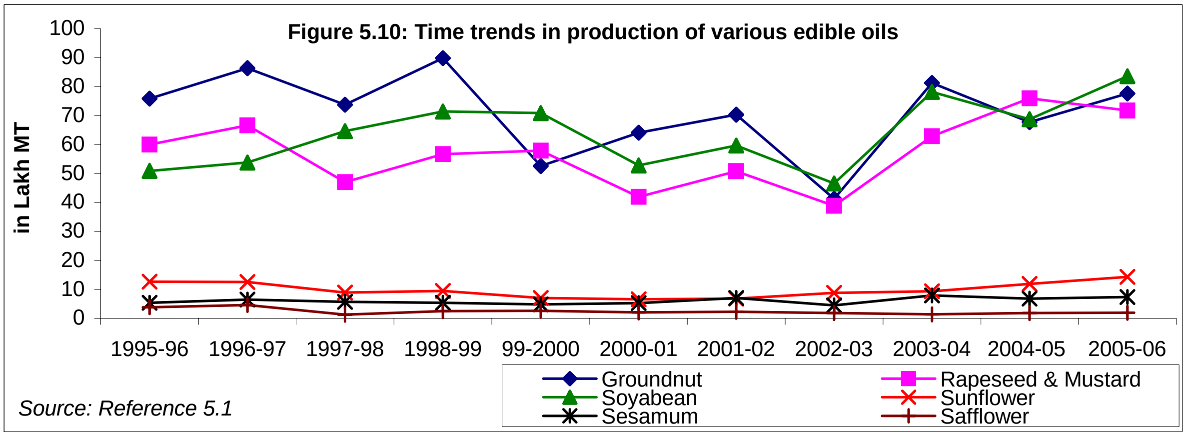
Oilseeds

In India vegetable oils are used mainly for cooking. Groundnut, sesame, coconut and mustard oils are used traditionally in India. Oilseeds production has increased over the last five decades (Figure 5.9) – but the increase is not

Figure 5.9: Time trends in area, production and yield of oilseeds



Source: Reference 5.1
**anticipated data*

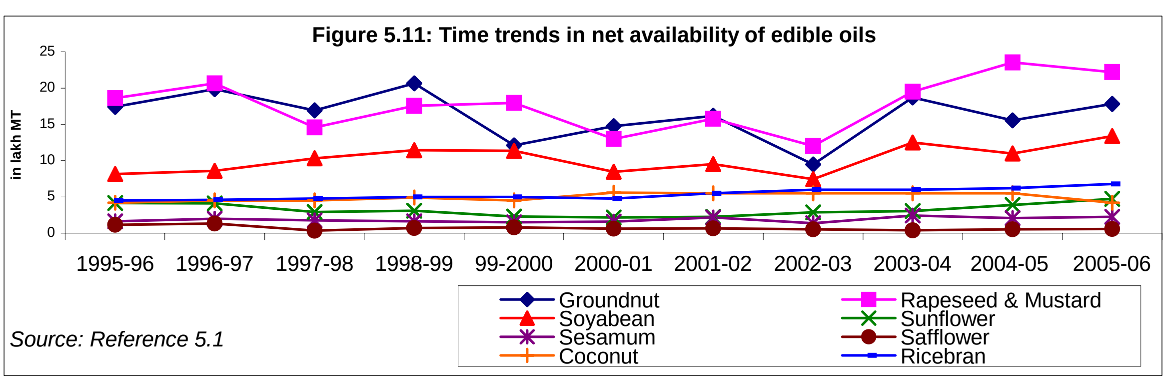


sufficient to meet the demand; the country therefore continues to import oil. National Mission on Oilseeds and Pulses was formed in 1986 to give focused thrust to oilseed production in the country and improve availability of oil. A major effort was to introduce the newer oilseeds/ oils in the Indian market. Over the last two decades soybean, sunflower, safflower, corn, rice bran oils have been introduced and have found acceptance.

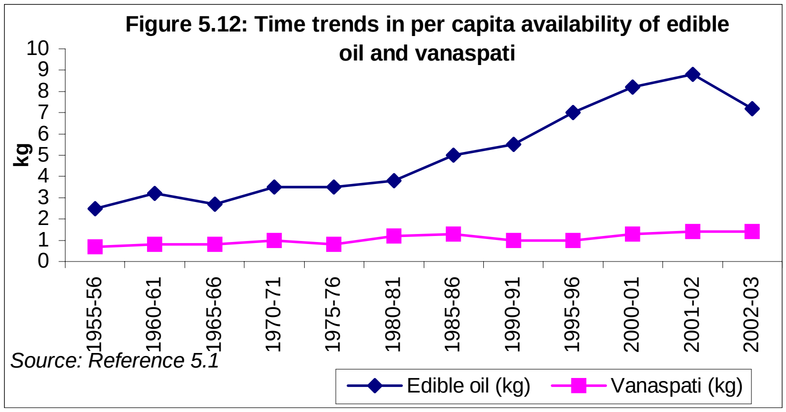
Review of the edible oil production in the last decades (Figure 5.10, 5.11) shows that there was not much change in production of groundnut oilseeds. Mustard and rapeseed production has increased in the last ten years; there has been tremendous increase in production of soybean, which was introduced as the newer oilseed. There was not much change in production of sunflower, safflower and sesame seeds in last ten years. Net availability of rice bran, soy, and mustard oils has increased over the last ten years (Figure 5.11).

Trans-fats are a popular component in various food products and widely used by all - from housewives to food product manufacturers. The fast food industries use trans-fats instead of ghee because it is inexpensive. Trans-fats are found in margarine, crackers, candies, cookies, snack foods, baked goods, and other processed foods. Lack of time for cooking due to busy lifestyles has resulted in many persons from all income group consuming ready to eat foods from various eateries; many of the products in these eateries are fried in trans-fat to reduce rancidity and improve shelf life and this results in people inadvertently consuming large quantities of trans-fatty acids.

Trans-fats are manufactured from hydrogenation of vegetable oils. During the hydrogenation process, the oils loose their natural content of antioxidants like carotenes, tocopherol and tocotrienols. Trans-fats adversely affect lipoprotein



metabolism and are hypercholesterolemic. It is reported that trans-fatty acids attack and weaken cell membranes reducing the efficiency of the immune system, making individuals more vulnerable to carcinogens. Research studies have unequivocally demonstrated that trans-fat consumption increases the risk of non-communicable diseases, especially coronary heart disease. The World Health Organization (WHO) in 2003 recommended that trans-fat use be limited to less than 1% of overall energy intake.



Currently, in India there are no specific guidelines for regulating use of trans-fats. Government of India has taken the first step in the regulation of transfatty acid use by making it mandatory from September 2007 to indicate the amount of transfatty acids in the label of all manaufactured food products.The annual production of *vanaspati* (fully or partially hydrogenated vegetable cooking oil) in India is 5% of total edible oil. The consumption of *vanaspati* has declined over the years as a proportion of total edible oils consumption, even though awareness on the dangers of trans-fats remains very low (Figure 5.12). There is an urgent need to improve awareness among the consumers and producers. Simultaneously the government may have to impose stringent rules and regulations to reduce or even ban trans-fats in food products. A combination of both awareness and regulations against usage or production of trans fat would perhaps help rapid in reduction and elimination of use of trans fats.

Animal Products

Milk Production

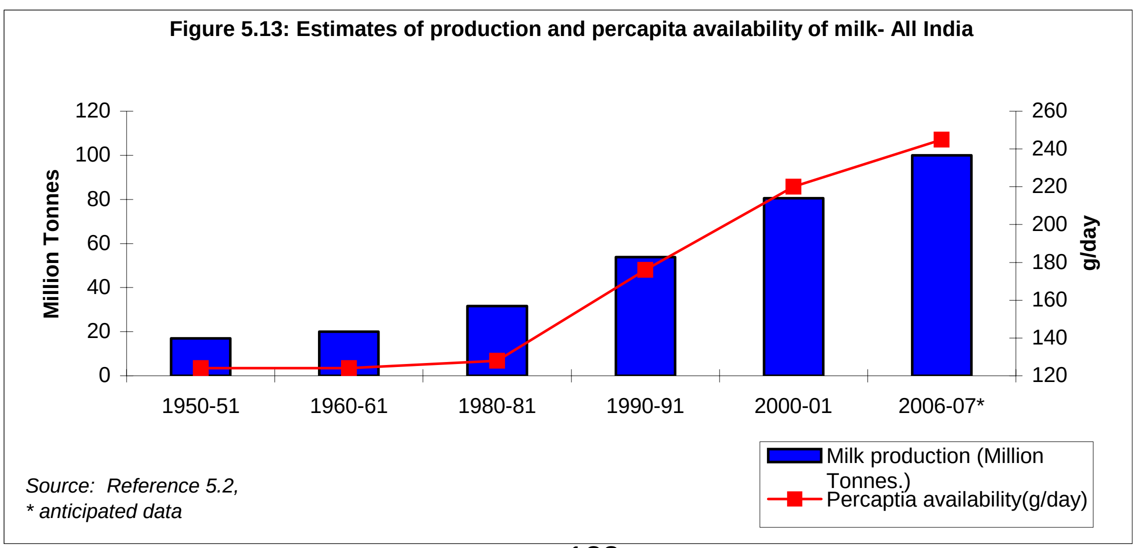
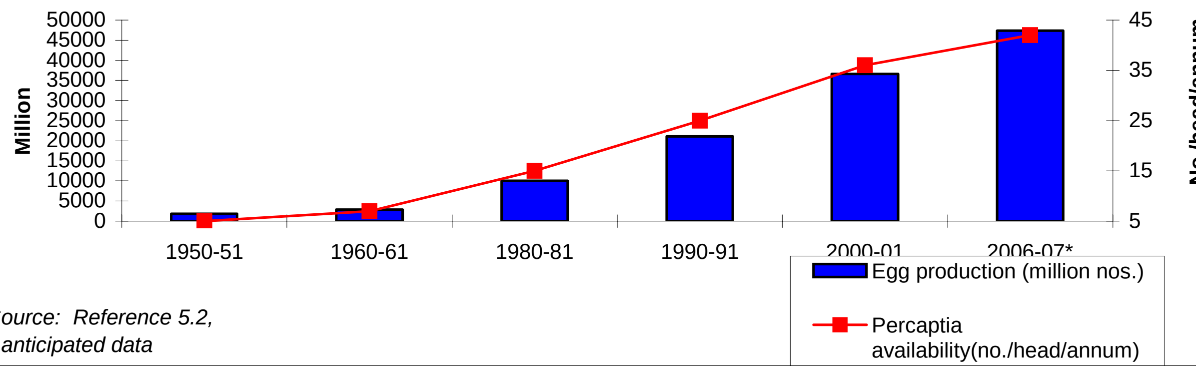


Figure 5.14: Estimates of production and percapita availability of egg-All India



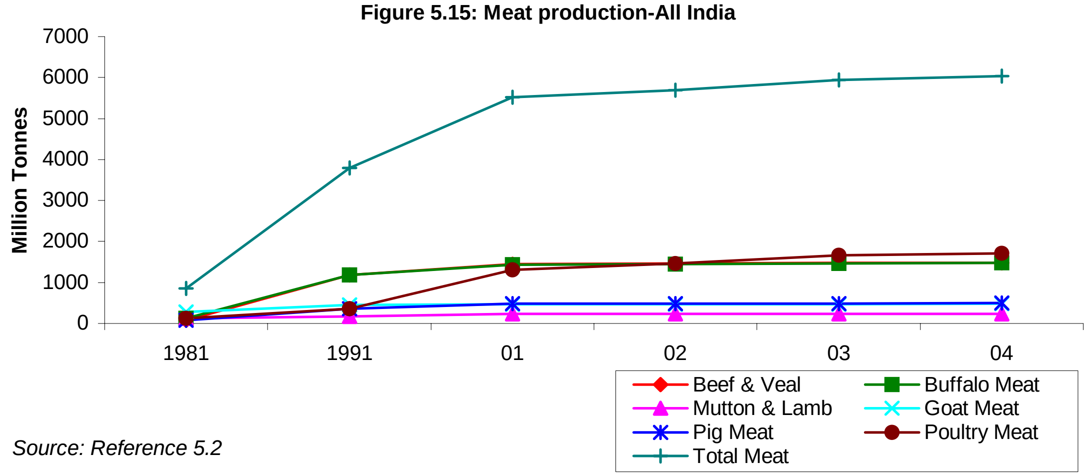
Source: Reference 5.2,
** anticipated data*

Time trends in milk production and percapita availability of milk since independence is given in Figure 5.13. India's success in improving milk production through cooperative movements over the last three decades has been globally recognized. Production of milk has gone up over five folds since independence. There has been a steep increase in percapita availability of milk. To India's large vegetarian population milk and milk products are the only source of animal protein. Milk is expensive and milk intake among the poorer segment of population continues to be low. Consumption of milk and milk products in high-income group both in urban and rural areas has increased.

Poultry

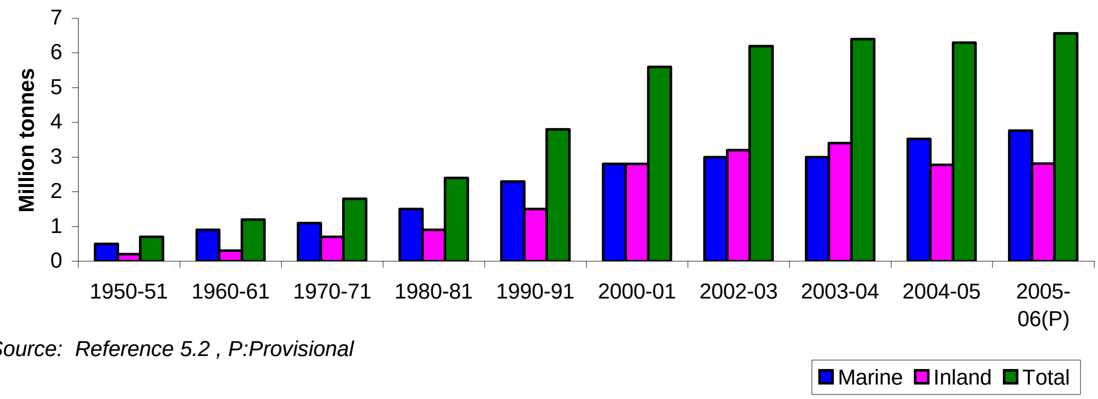
Estimate of egg production and percapita availability of eggs in the country over the last five decades is shown in Figure 5.14. There has been a steep increase in egg production in the last two decades. With an output of over 45 billion eggs in 2006-07 India ranks among the top six eggs producing countries in the world. India among the top five chicken meat producing countries in the world: around 1.7 million tonnes of chicken meat was produced in 2004. Both chicken and egg are expensive and hence consumption of these is more common among the affluent segments of population.

Figure 5.15: Meat production-All India



Source: Reference 5.2

Figure 5.16: Production of marine products



Source: Reference 5.2 , P:Provisional

Meat products

Information on meat production in country since 1981 is given in Figure 5.15. Available data suggest that there has been a steep increase in meat production between 1981 and 2001; thereafter the increase in meat production has slowed down.

Marine products

Estimated production of marine products over the last five decades is shown in Figure 5.16. There has been a steep increase in fish production in the last decade. India is currently the third largest producer of marine fish and second largest producer of inland fish in the world. In addition to the catering to the needs of India's large population, fisheries sector is a major foreign exchange earner and provides livelihood to over 10 million people.

Consumption of animal products

In India percapita availability and consumption of meat, fish, milk and milk products and eggs is quite low. Current consumption levels of these products and the per capita deficit as compared to ICMR guidelines are shown in Table 5.3. The animal products are expensive and are consumed mainly by the middle and high-income group; even among these segments they are not consumed on

Table 5.3: Per capita availability and deficit

Food Items	Per capita availability	ICMR dietary guidelines for Indians	Per capita deficit
Milk	216 g**/day	300 ml*/day	34 g/day
Egg	30 eggs/annum	180 eggs/annum	150 eggs/annum
Meat	3.24 kg/annum	10.95 kg/annum	7.71 kg/annum

* *millilitre* ** *grams*
Source: Reference 5.5

a daily basis or in large quantity because of high cost and ready availability of nutritious and tasty vegetables at a substantially lower cost.

Industrial level production has been the traditional method used for increasing production of animal food products. In India increase in milk production has been achieved through cooperative movement. Homestead production is another method for increasing production and consumption of vegetables, milk and animal products and reducing the gap in consumption especially among poorer segments of population. Farm wastes as well as food grains unfit for human consumption can be used to feed backyard poultry in order to increase homestead production of eggs and chicken and also increase consumption of these at home among poorer segments of the rural population.

Eleventh Plan goals for agricultural sector

The current challenges faced by the agriculture sector are to:

- continue to improve food grain production to meet the needs of the growing population;
- increase production of coarse grains to meet the energy requirements of the BPL families at a lower cost;
- increase production of pulses and make them affordable to increase consumption;
- improve the availability of vegetables at an affordable cost throughout the year in urban and rural areas.

The Approach Paper for the Eleventh Plan has taken into account all the challenges and will focus on strategies to overcome these and ensure that agriculture plays its critical role in economic growth as well as nutrition security for the population. The Approach Paper to the Eleventh Five Year Plan has emphasized on rapid increase in agriculture growth to 4 %. Accelerated agricultural growth will require diversification into horticulture and floriculture which in turn imply structural changes in the relation between agriculture and non-agriculture. Diversification requires effective marketing linkages, supported by modern marketing practices including introduction of grading, post-harvest management, and cold chains.

The National Agriculture Policy (NAP), 2000 and the Eleventh Plan have set a target of a 3.9 % growth for agriculture. This is to be achieved through:

Growth that is based on efficient use of:

- resources and conservation of soil, water and bio-diversity;
- growth with equity, i.e., growth which is widespread across regions and covers all farmers;

- growth that is demand driven and caters to domestic markets as well as maximizes benefits from exports of agricultural products in the face of the challenges arising from economic liberalization and globalization;
- growth that is sustainable technologically, environmentally and economically.

The sector has the opportunity to contribute towards substantial increase in GDP, provide employment in rural areas, improve nutrition security of the population and achieve significant decline in macro and micronutrient under-nutrition.

Reference

5.1 Agricultural Statistics at a Glance 2007: http://dacnet.nic.in/eands/Area,%20Production%20and%20Yield%20of%20Principal%20Crops.htm; last accessed on 27/09/07

5.2 Department of Animal Husbandry, Dairying and Fisheries: http://dahd.nic.in/stat_files/BAHS2006%20web%20web.pdf; last accessed on 27/09/07

5.3 Economic Survey of India 2006-07: http://indiabudget.nic.in/es2006-07/esmain.htm; last accessed on 24/09/07

5.4 Indian Horticulture Production at a glance, 2004-05: http://dacnet.nic.in/eands/Area,%20Production%20and%20Yield%20of%20Horticulture%20&%20Plantation%20Crops.htm; last accessed on 27/09/07

5.5 Tenth Five-Year Plan 2002-2007: http://planningcommission.nic.in/plans/planrel/fiveyr/welcome.html; last accessed on 24/09/07

5.6 Approach paper to the Eleventh Five-year Plan http://planningcommission.nic.in/plans/planrel/app11_16jan.pdf accessed on 24/09/07.

Annexure: 5.1

Production of major crops (million units)

Group/Commodity	Unit	1960-61	1970-71	1980-81	1990-91	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06*
Foodgrains	Tonnes	82	108.4	129.6	176.4	203.6	209.8	196.8	212.9	174.8	213.5	198.4	208.3
Kharif	Tonnes	N.A.	68.9	77.7	99.4	102.9	105.5	102.1	112.1	87.2	116.9	103.3	109.7
Rabi	Tonnes	N.A.	39.5	51.9	77	100.7	104.3	94.7	100.8	87.6	96.6	95.1	98.6
Cereals	Tonnes	69.3	96.6	119	162.1	188.7	196.4	185.7	199.5	163.6	198.5	185.2	195.2
Kharif	Tonnes	N.A.	65	73.9	94	97.8	100.7	97.6	107.2	83.1	110.7	98.6	105
Rabi	Tonnes	N.A.	31.6	45.1	68.1	90.9	95.7	88.1	92.3	80.5	87.8	86.6	90.2
Pulses	Tonnes	12.7	11.8	10.6	14.3	14.9	13.4	11	13.3	11.1	14.9	13.1	13.1
Kharif	Tonnes	N.A.	3.9	3.8	5.4	5.1	4.8	4.4	4.8	4.2	6.2	4.7	4.6
Rabi	Tonnes	N.A.	7.9	6.8	8.9	9.8	8.6	6.6	8.5	6.9	8.7	8.4	8.5
Rice	Tonnes	34.6	42.2	53.6	74.3	86.1	89.7	85	93.3	71.8	88.2	83.1	91
Kharif	Tonnes	N.A.	39.5	50.1	66.3	72.7	77.5	72.8	80.5	63.1	78.3	72.2	78
Rabi	Tonnes	N.A.	2.7	3.5	8	13.4	12.2	12.2	12.8	8.7	9.9	10.9	13
Wheat	Tonnes	11	23.8	36.3	55.1	71.3	76.4	69.7	72.8	65.8	72.1	68.6	69.5
Jowar	Tonnes	9.8	8.1	10.4	11.7	8.4	8.7	7.5	7.6	7	7.2	7.2	8
Kharif	Tonnes	N.A.	5.8	7.5	8.3	5.3	4.8	4.5	4.2	4.2	4.9	4	4.2
Rabi	Tonnes	N.A.	2.3	2.9	3.4	3.1	3.9	3	3.4	2.8	2.3	3.2	3.8
Maize	Tonnes	4.1	7.5	7	9	11.1	11.5	12	13.2	11.2	14.9	14.2	15.1
Bajra	Tonnes	3.3	8	5.3	6.9	7	5.8	6.8	8.3	4.7	12.1	7.9	7.7
Gram	Tonnes	6.3	5.2	4.3	5.4	6.8	5.1	3.9	5.5	4.2	5.8	5.5	5.6
Tur	Tonnes	2.1	1.9	2	2.4	2.7	2.7	2.2	2.3	2.2	2.4	2.3	2.6
Oilseeds	Tonnes	7	9.6	9.4	18.6	24.7	20.7	18.4	20.6	14.8	25.3	24.4	27.7
Kharif	Tonnes	N.A.	7	5	9.8	15.8	12.5	11.9	13.2	9	16.8	14.2	16.8
Rabi	Tonnes	N.A.	2.6	4.4	8.8	8.9	8.2	6.5	7.4	5.8	8.5	10.2	10.9
Groundnut	Tonnes	4.8	6.1	5	7.5	9	5.3	6.4	7	4.1	8.2	6.8	7.9
Kharif	Tonnes	N.A.	N.A.	3.7	5.1	6.9	3.8	4.9	5.6	3.1	6.9	5.3	6.2
Rabi	Tonnes	N.A.	N.A.	1.3	2.4	2.1	1.5	1.5	1.4	1	1.3	1.5	1.7
Rapeseed and Mustard	Tonnes	1.4	2	2.3	5.2	5.7	5.8	4.2	5.1	3.9	6.2	7.6	7.9
Sugarcane	Tonnes	110	126.4	154.2	241	288.7	299.3	296	297.2	287.4	237.3	237.1	278.4
Cotton	Bales@	5.6	4.8	7	9.8	12.3	11.5	9.5	10	8.6	13.9	16.4	19.6
Jute and Mesta	Bales+	5.3	6.2	8.2	9.2	9.8	10.6	10.5	11.7	11.3	11.2	10.3	10.7
Jute	Bales+	4.1	4.9	6.5	7.9	8.8	9.4	9.3	10.6	10.3	10.3	9.4	9.9
Mesta	Bales+	1.1	1.3	1.7	1.3	1	1.2	1.2	1.1	1	0.9	0.9	0.8
Plantation Crops													
Tea	Tonnes	0.3	0.4	0.6	0.7	0.9	0.8	0.8	0.9	0.9	0.9	—	—
Coffee	Tonnes	Neg.	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	—	—
Rubber	Tonnes	Neg.	0.1	0.2	0.3	0.6	0.6	0.6	0.6	0.6	0.7	—	—
Potato	Tonnes	2.7	4.8	9.7	15.2	23.6	24.7	22.5	23.9	23.3	23.3	23.6	N.A.

*, Provisional estimates
Source: Reference 5.3

Annexure 5.2

Net availability and per capita availability of cereals and pulses									
		Cereals (million tonnes)				Pulses (million tonnes)	per capita availability per day (grams)		
Year	Population (million)	Net production	Net imports	Change in government stocks	Net availability (3+4+5)	Net availability	Cereals	Pulses	Total
1951	363.2	40.1	4.1	(+)0.6	44.3	8	334.2	60.7	394.9
1952	369.2	40.7	3.9	(+)0.6	44	8	325.4	59.1	384.5
1953	375.6	45.5	2	(-)0.5	48	8.6	349.9	62.7	412.6
1954	382.4	53.6	0.8	(+)0.2	54.2	9.7	388.1	69.7	457.8
1955	389.7	51.7	0.6	(-)0.8	53.1	10.1	372.9	71.1	444
1956	397.3	50.4	1.4	(-)0.6	52.4	10.2	360.4	70.3	430.7
1957	405.5	52.8	3.6	(+)0.9	55.5	10.6	375.3	71.8	447.1
1958	414	49.5	3.2	(-)0.3	52.9	8.8	380.5	58.5	439
1959	423.1	57.4	3.9	(+)0.5	60.8	11.6	393.4	74.9	468.3
1960	432.5	57.1	5.1	(+)1.4	60.8	10.4	384.1	65.5	449.6
1961	442.4	60.9	3.5	(-)0.2	64.6	11.1	399.7	69	468.7
1962	452.2	61.8	3.6	(-)0.4	65.8	10.2	398.9	62	460.9
1963	462	60.2	4.6	Neg.	64.8	10.1	384	59.8	443.8
1964	472.1	61.8	6.3	(-)1.2	69.3	8.8	401	51	452
1965	482.5	67.3	7.4	(+)1.1	73.7	10.8	418.5	61.6	480.1
1966	493.2	54.6	10.3	(+)0.1	64.8	8.7	359.9	48.2	408.1
1967	504.2	57.6	8.7	(-)0.3	66.6	7.3	361.8	39.6	401.4
1968	515.4	72.6	5.7	(+)2.0	76.2	10.6	404.1	56.1	460.2
1969	527	73.1	3.8	(+)0.5	76.5	9.1	397.8	47.3	445.1
1970	538.9	76.8	3.6	(+)1.1	79.3	10.2	403.1	51.9	455
1971	551.3	84.5	2	(+)2.6	84	10.3	417.6	51.2	468.8
1972	563.9	82.3	(-)0.5	(-)4.7	86.5	9.7	419.1	47	466.1
1973	576.8	76.2	3.6	(-)0.3	80.1	8.7	350.5	41.1	421.6
1974	590	82.8	5.2	(-)0.4	88.4	8.8	410.4	40.8	451.2
1975	603.5	78.6	7.5	(+)5.6	80.6	8.8	365.8	39.7	405.5
1976	617.2	94.5	0.7	(+)10.7	84.4	11.4	373.8	50.5	424.3
1977	631.3	87.3	0.1	(-)1.6	89	10	386.3	43.3	429.6
1978	645.7	100.1	(-)0.8	(-)0.3	99.6	10.7	422.5	45.5	468
1979	660.3	104.8	(-)0.3	(+)0.4	104.1	10.8	431.8	44.7	476.5
1980	675.2	88.5	(-)0.5	(-)5.8	93.8	7.6	379.5	30.9	410.4
1981	688.5	104.1	0.5	(-)0.2	104.8	9.4	417.3	37.5	454.8
1982	703.8	106.6	1.6	(+)1.3	106.8	10.1	415.6	39.2	454.8
1983	718.9	103	4.1	(+)2.7	104.4	10.4	397.8	39.5	437.3
1984	734.5	122	2.4	(+)7.1	117.4	11.3	437.8	41.9	479.7
1985	750.4	116.9	(-)0.3	(+)2.7	113.9	10.5	415.6	38.4	454
1986	766.5	119.9	(-)0.1	(-)1.6	121.5	12.3	434.2	43.9	478.1
1987	782.7	115.2	(-)0.4	(-)9.5	124.4	10.4	435.4	36.4	471.8
1988	799.2	113.2	2.3	(-)4.6	120.1	10.7	411.8	36.7	448.5
1989	815.8	136.6	0.8	(+)2.6	134.7	12.5	452.6	41.9	494.5
1990	832.6	138.4	Neg.	(+)6.2	132.3	12.5	435.3	41.1	476.4
1991	851.7	141.9	(-)0.6	(-)4.4	145.7	12.9	468.5	41.6	510.1
1992	867.8	136.8	(-)0.7	(-)1.6	137.7	10.9	434.5	34.3	468.8
1993	883.9	145.8	2.6	(+)10.3	138.1	11.7	427.9	36.2	464.1
1994	899.9	149.6	0.5	(+)7.5	142.6	12.2	434	37.2	471.2
1995	922	155.3	(-)3.0	(-)1.7	154	12.7	457.6	37.8	495.4
1996	941.6	147.1	(-)3.5	(-)8.5	152.1	11.3	442.5	32.7	475.2
1997	959.8	162	(-)0.6	(-)1.8	163.2	13	466	37.1	503.1
1998	978.1	156.9	(-)2.9	(+)6.1	147.9	11.7	414.2	32.8	447
1999	996.4	165.1	(-)1.5	(+)7.5	156.1	13.3	429.2	36.5	465.7
2000	1014.8	171.8	(-)1.4	(+)13.9	156.6	11.7	422.7	31.8	454.4
2001	1033.2	162.5	(-)4.5	(+)12.3	145.6	11.3	386.2	30	416.2
2002	1050.6	174.5	(-)8.5	(-)9.9	175.9	13.6	458.1	35.4	494.1
2003	1068.2	143.2	(-)7.1	(-)23.2	159.3	11.3	408.5	29.1	437.6
2004	1085.6	173.5	(-)7.7	(-)3.3	169.1	14.2	426.9	35.8	462.7
2005*	1102.8	162.1	(-)7.2	(-)2.4	157.4	12.7	390.9	31.5	422.4

*, Provisional estimates
Source: Reference 5.3

Annexure 5.3

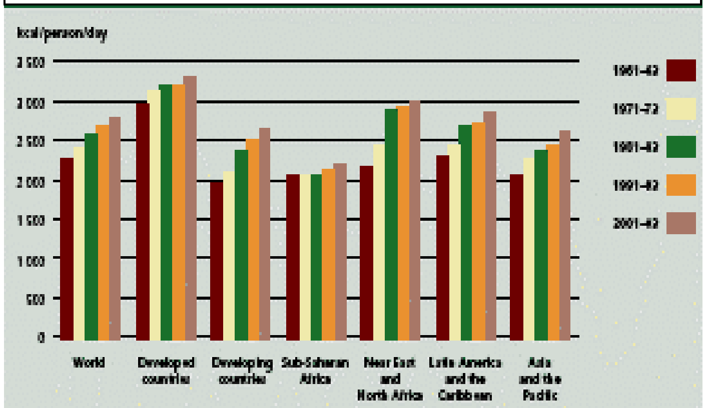
Production of three major crops in states (2004-05)					
Crops/Groups of crops		States	Production (Million Tonnes)	% Share of production	Cumulative % of production
I. Foodgrains	Rice	West Bengal	14.86	16.32	16.32
		Andhra Pradesh	11.69	12.84	29.16
		U.P.	11.13	12.23	41.39
	Wheat	Uttar Pradesh	23.57	33.92	33.92
		Punjab	14.49	20.85	54.78
		Haryana	8.88	12.78	67.56
	Maize	Andhra Pradesh	3.06	20.28	20.28
		Karnataka	2.65	817.56	37.84
		Bihar	1.42	9.41	47.25
	Total Coarse Cereals	Maharashtra	6.71	19.35	19.35
		Karnataka	6.16	17.77	37.12
		Rajasthan	3.9	11.25	48.37
	Total Pulses	Madhya Pradesh	3.23	24.64	24.64
		Uttar Pradesh	2.21	16.86	42.5
		Maharashtra	1.8	13.73	55.23
	Total Foodgrains	Uttar Pradesh	39.86	19.14	19.14
		Punjab	25.19	12.09	31.23
		Andhra Pradesh	1.89	8.11	39.34
Oilseeds	Groundnut	Gujarat	3.22	40.91	40.91
		Madhya Pradesh	1.37	17.41	58.32
		Tamil Nadu	1.16	14.74	73.06
	Rapeseed & Mustard	Rajasthan	4.39	55.64	55.64
		Madhya Pradesh	0.15	10.77	66.41
		Haryana	0.78	9.89	76.3
	Soyabean	Madhya Pradesh	4.5	53.89	53.89
		Maharashtra	2.63	53.89	53.89
		Rajasthan	0.86	10.3	95.69
	Sunflower	Karnataka	0.75	50.34	50.34
		Andhra Pradesh	0.28	18.79	69.13
		Maharashtra	0.28	18.79	87.92
	Total Oilseeds	Rajasthan	5.93	21.38	21.38
		Madhya Pradesh	5.72	20.63	42.01
		Gujarat	4.52	16.3	58.31
Other Cash Crops	Sugarcane	Uttar Pradesh	131.42	41.8	41.8
		Maharashtra	62.7	19.94	72.01
		Tamil Nadu	32.3	10.27	61.67
	Cotton @	Gujarat	7.38	37.71	37.71
		Maharashtra	3.63	18.55	56.26
		Punjab	2.4	12.26	68.52
	Jute & Mesta$	West Bengal	7.94	73.86	73.86
		Bihar	1.49	13.86	87.72
		Assam	0.61	5.67	93.4
	Potato#	Uttar Pradesh	9.82	41.56	41.56
		West Bengal	7.08	29.96	72.52
		Punjab	1.34	5.67	77.19
	Onion#	Maharashtra	1.65	25.66	25.66
		Gujarat	1.22	18.97	44.63
		Karnataka	0.86	13.37	58.01

@, Production in million bales of 170 kgs. Each; $, Production in million bales of 180 kgs each; #; For the year 2002-03; (P) Provisional
Source: Reference 5.1

6. TRANSITION IN FOOD CONSUMPTION

6. TRANSITION IN FOOD CONSUMPTION PATTERNS

Figure 6.1: Per capita food consumption



Source Ref 6.4

Food and Agricultural Organisation monitors global, regional and country wise data on food production, availability and consumption of foodstuffs. Time trends and interregional differences in energy intake in the world over the last four decades are shown in Figure 6.1. Per capita food consumption (energy / person / day) in different regions is shown in Figure 6.1. Energy intake is higher in developed countries as compared to developing countries. In 1960-61 energy intake in Sub Saharan Africa is similar to Asia & Pacific but in 2001-02, energy intake in Asia is higher.

Reported time trends in global and regional per capita food consumption in k cal / per person / per capita is between 1964-1999 and projected consumption in 2015 and 2030 is given in (Table 6.1). South Asia remains to be a region with relative low per capita energy consumption right from sixties till now and is projected to remain the region with lowest energy consumption even in 2030.

Food consumption patterns in India

In India the surveys carried out by the National Sample Survey Organization (NSSO), a permanent survey organization, set up in the Department of Statistics of the Government of India in 1950, provides data on time trends and interstate differences in food consumption patterns. NSSO collects data on various facets of the Indian economy through nationwide large-scale sample surveys to assist in socio-economic planning and policy making. The NSSO has been carrying out Consumer Expenditure Surveys quinquennially since 1972-73 (27th, 32nd, 38th, 43rd, 50th, 55th and 61st rounds of NSS, at roughly 5-year intervals). A two-stage stratified sampling design was used and at the household selection stage those belonging to the affluent section and others were sampled separately. This survey provides information on consumption expenditure on food and non-food items.

Table 6.1: Global and regional per capita food consumption (kcal per capita per day)

Region	1964-66	1974-76	1984-86	1997-99	2015	2030
World	2358	2435	2855	2803	2940	3050
Developing countries	2064	2152	2450	2881	2850	2980
Near East & North Africa	2290	2591	2953	3008	3090	3170
Sub-Saharan Africa	2058	2079	2057	2196	2380	2540
Latin America & the Carribean	2393	2546	2689	2824	2980	3140
East Asia	1957	2106	2559	2921	3080	3190
South Asia	2017	1986	2205	2403	2700	2900
Industrialized countries	2947	3066	3206	3380	3440	3500
Transition countries	3222	3385	3379	2906	3060	3180

Source: Reference 6.4

Consumption expenditure of food items on per capita and per consumption units are provided using two reference periods of 7 and 30 days immediately preceding the day of the survey. The survey is carried out in sub rounds covering the four seasons. The results presented in the report are based on the 30-day reference period.

As part of these quinquennial surveys data on monthly per capita expenditure on food consumption at the national and state level are collected. The seventh of such surveys was carried out during July 2004-June 2005. The survey covered all the States and UT's in the country. The data were collected from a sample of 79298 rural and 45346 urban households spread over 7999 villages and 4602 urban blocks respectively. The number of persons surveyed was 4, 03,207 in rural areas and 2, 06,529 in urban areas.

NSSO provides data on

- Consumption expenditure on food and non food items:
- Average quantity of consumption of different foodstuffs per 30 days.
- Food security at the household level
- Per capita and per consumption unit consumption of calorie, protein and fat per day.
- Percentage of total intake of protein and calorie from different groups of food item
- Distribution of households and individuals by calorie intake level
- Cross-tabulations of the above by monthly expenditure classes at national and state levels in urban and rural areas.

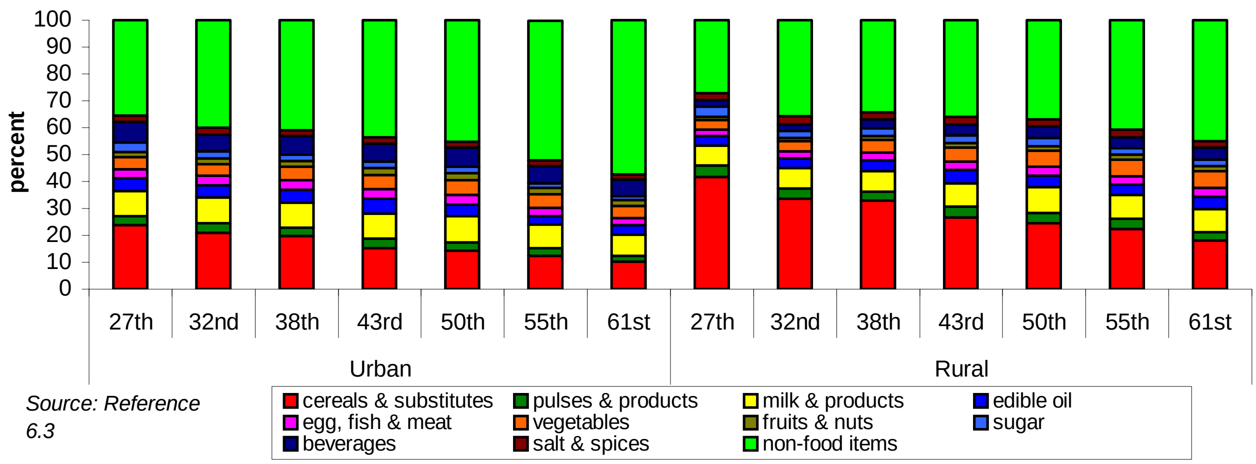
NSSO surveys provide time-series data of expenditure on food and non-food items in different income groups, residence (rural & urban) and state. Taking into account the cost of food in the corresponding year, NSSO computes and reports household level of consumption of different food items.

The dietary data from NSSO, though strong on sampling design, sample size, explicitly stated estimation procedure, national coverage and length of reference period (7 and 30 days) has a potential shortcoming namely, the reliability and validity of data collected on consumption expenditure by a single interview with a reference period of 30 days. Another major problem is that while it captures expenditure of household on food items and derives household consumption of foodstuffs, it does not provide any insight into the critical intrafamilial distribution or food consumption of individuals.

Time trends in consumer expenditure

There has been a decline in the proportion of expenditure on food items in last three decades in both urban and rural areas. The proportion of expenditure on non-food items has increased from 24% to 37.7%. However, the expenditure on food remained higher in rural areas as compared to urban areas (Figure 6.2). Between 1972-73 and 2004-05, the share of food in total consumer expenditure has fallen from 73% to 55% in rural areas and from 64% to 42% in urban areas. The share of cereals has fallen from 41% of consumer expenditure to 18% in rural India and from 23% to 10% in urban India over the same period (Figure 6.2). The decline in consumption expenditure on food items has mainly due to low cost of cereals; in addition there has been a decline in cereal

Figure 6.2: Time trends for % expenditure on various food items as share of total expenditure - NSSO



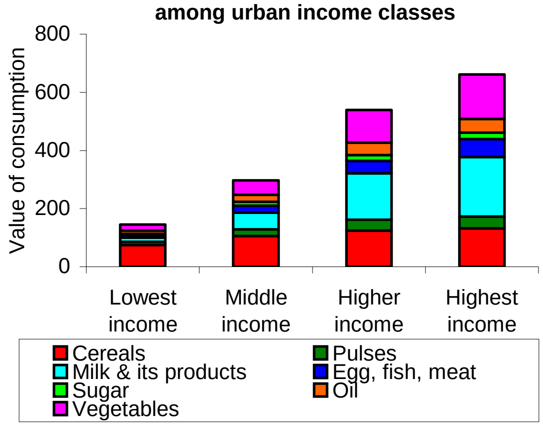
Source: Reference 6.3

consumption especially among the middle and high-income group. Over years diet has become more diverse especially in the middle and upper income groups. In urban areas expenditure on vegetables, oil and sugar has decreased after 50th round whereas in rural areas expenditure on vegetables had increased and expenditure on beverages has almost doubled. The percentage of households reporting milk consumption has grown in both rural and urban areas between 1993-94 and 2004-05 by 5 percentage points – 66% to 71% in rural areas and 80% to 85% in urban areas. Per capita consumption of edible oil has risen over the eleven years following 1993-94 (50th round) by as much as 30% in rural India and about 18% in urban India. Over the same period the expenditure on beverages has nearly doubled from 2.4 % to 4.5 % in rural areas. The growing oil consumption is a matter of concern in view of the increasing overnutrition, diabetes and CVD risks factors. If the expenditure on beverages and tobacco are used for purchase of vegetables and fruits, there can be substantial benefit in terms of micronutrient intake.

Dietary diversification and an increase in vegetable intake is the only sustainable method of improving micro nutrient status of the population. One of the major factors responsible for the low consumption of vegetables is the non-availability of vegetables; especially green leafy vegetables through out the year at an affordable cost both in urban and rural areas. Data from NNMB also shows that over this period there has not been any significant increase in the intake of vegetables and micro nutrients (vitamin – A, iron and folic acid). The Tenth Plan envisaged a paradigm shift from food security to nutrition security to meet the needs of macro, micro and phyto nutrients through dietary diversification. In order to ensure sustained increase in vegetable consumption, it is important to improve availability, affordability, access and awareness about the need for increased vegetable intake. Focus on cultivation of low cost vegetables at home and in wasteland areas can go a long way in meeting vegetable needs of rural poor. Horticulture products provide higher yield per hectare and are economically viable options for small farmers especially when backed up by appropriate storage, processing and transportation facilities. If sustained, it would also improve access to vegetables at an affordable cost throughout the year in urban and rural areas. A small increase in expenditure on vegetable and phytonutrient may ensure that there is increased vegetable consumption to meet the nutritional needs of the population.

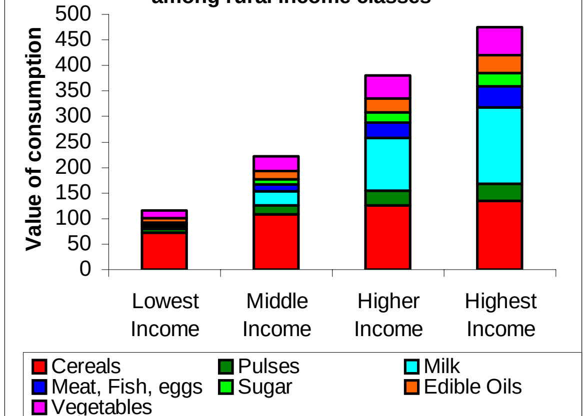
Consumption expenditure in different income groups

Figure 6.3: Consumption of foods (in Rs) among urban income classes



Source: Reference 6.3

Figure 6.4: Consumption of foods (in Rs.) among rural income classes

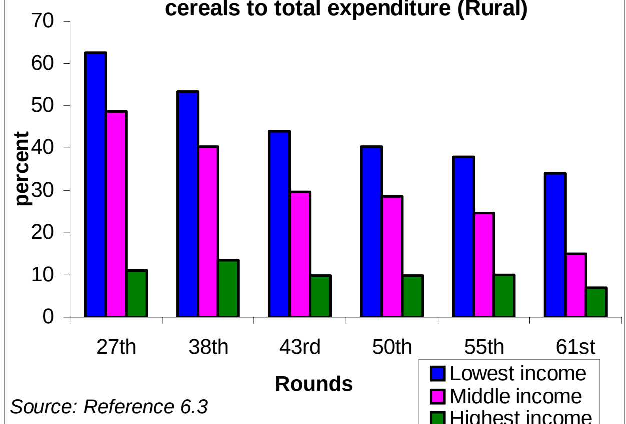


Source: Reference 6.3

Dietary diversification increases with increasing family income. Consumption of milk and animal products increases with increase in income. In the highest income group, they are the major sources of protein in the diet (Figure 6.3 and 6.4). There is also an increase in the intake of vegetables with increasing family income. However, the current high levels of consumption of sugar and oil in the highest income group are a matter of concern. Health education efforts are underway to reduce the current high levels of consumption of “empty” calories.

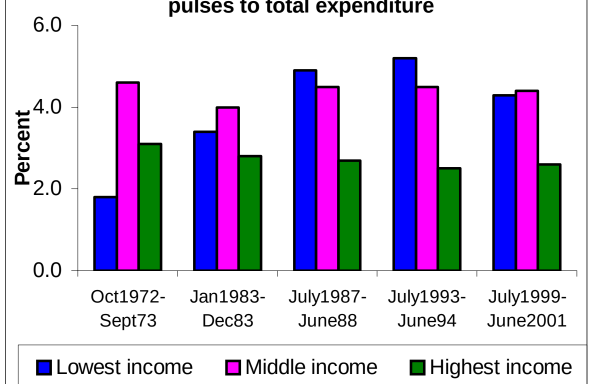
Data from NSSO surveys from 1972 to 2005 shows that in the lowest and middle-income groups, the expenditure on cereal had declined. In the highest income group expenditure on cereals form relatively low proportion of the total expenditure and the proportion have remained essentially unaltered over the last three decades except in 2004-05 where it showed a decline (Figure 6.5). Figure 6.6 shows that between 1972-2001 there has been a substantial increase in the proportion of expenditure on pulses to total expenditure in the lowest income group. Expenditure on pulses has remained relatively unaltered in the middle and the

Figure 6.5: % per capita expenditure on cereals to total expenditure (Rural)



Source: Reference 6.3

Figure 6.6: % per capita expenditure on pulses to total expenditure



Source: Reference 6.3

highest income group. Inspite of continued high expenditure on pulses there has been a fall in amount of pulses consumed because of escalating cost of pulses.

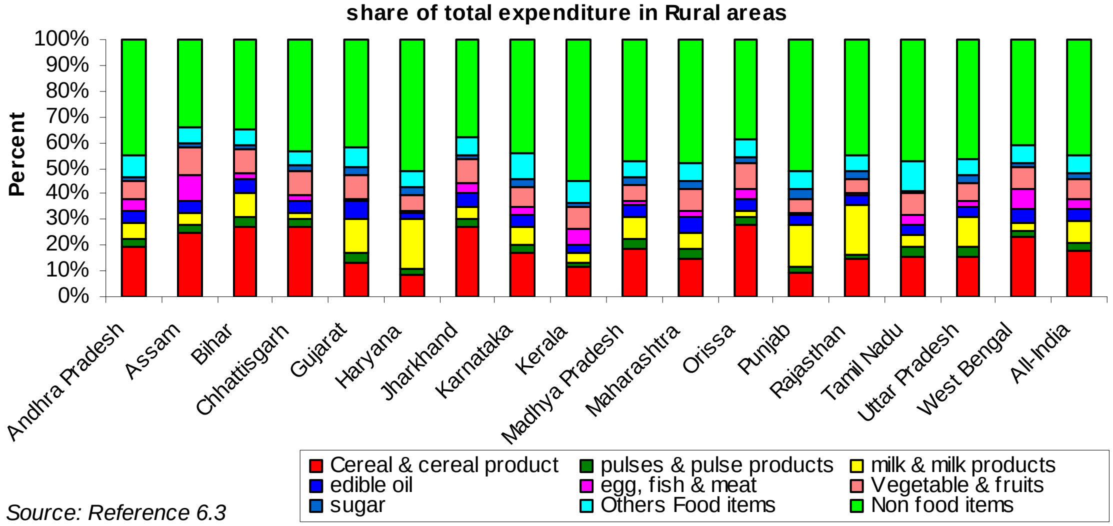
Table 6.2: Percapita private final consumption expenditure at 1993-94 prices (Rs)							
	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Cereals	900.86	908.87	907.48	966.27	855.43	898.00	894.34
Pulses	134.61	139.94	122.59	138.34	124.59	136.85	116.95
Sugar & Gur	226.29	211.57	215.95	254.57	228.81	251.62	268.79
Oil & Oilseeds	260.43	239.79	252.08	288.20	211.65	337.09	268.20
Fruits & Veg.	702.24	743.25	742.94	729.53	783.95	837.35	861.69
Potato & tubers	69.69	67.47	70.40	83.67	66.56	78.46	75.97
Milk & milk products	522.94	537.33	587.82	621.78	651.48	668.94	752.62
Meat, egg & fish	243.96	257.14	263.46	275.57	273.45	285.82	291.91
Source: Reference 6.1							

Time trends in consumption expenditure on different food items compiled from the National Accounts Statistics (NAS) are given in is given in (Table 6.2). Data from NAS indicates that expenditure on cereals and pulses have remained essentially unaltered, expenditure on sugar and oil fluctuates. There is a considerable increase in the consumption expenditure on vegetables and fruits and milk and milk products. This is an encouraging trend suggesting that the people are aware of the need for dietary diversification in order to meet the nutritional needs (macro, micro and phyto nutrients) and are making efforts to diversify their dietary intake. It is important to improve access to the vegetables, fruits, dairy products at affordable cost through out the year in urban and rural areas in all states, because this trend towards dietary diversification is the first step towards sustainable food based intervention for prevention of macro and micronutrient deficiencies.

Interstate differences in consumption expenditure

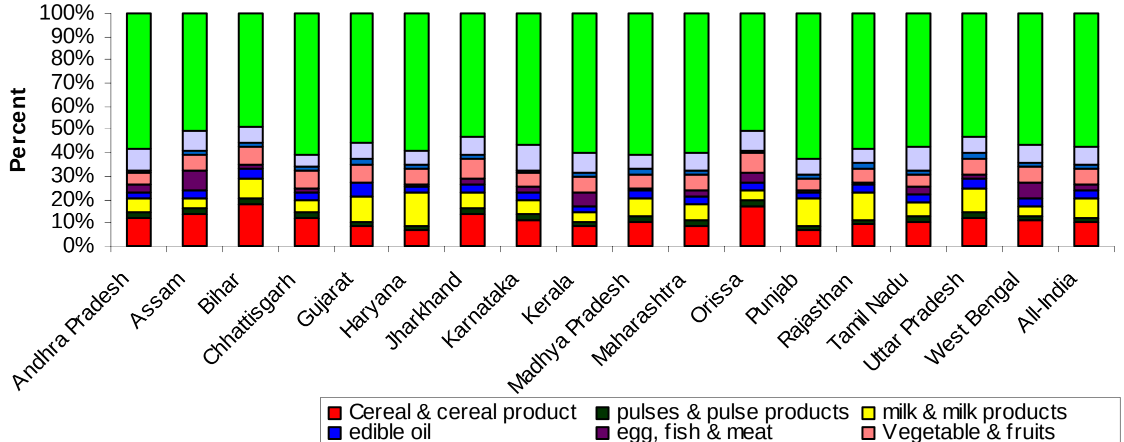
In rural areas of Haryana and Punjab, expenditure on cereals in 2004-05 formed only 9% of total consumer expenditure. But in rural areas of West Bengal and Assam cereals contributed 23% or more to total consumer expenditure, and in rural areas of Orissa, Chattisgarh, Jharkhand and Bihar, they formed 27-28% of consumer expenditure

Figure 6.7: Interstate differences for % expenditure on various food items as share of total expenditure in Rural areas



Source: Reference 6.3

Figure 6.8: Interstate differences for expenditure on various food items as share of total expenditure in Urban areas



Source: Reference 6.3

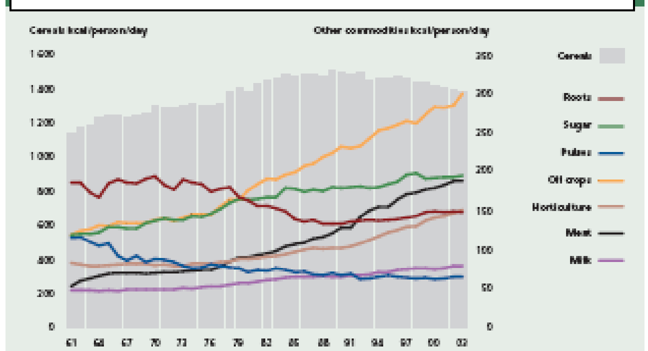
(Figure 6.7). In urban areas of Punjab and Haryana cereals took up 6-7% of the household (consumption) budget in 2004-05; in urban areas of Bihar and Orissa they took up 17% (Figure 6.8). Differences in states are partly due to differences in the food and non-food expenditures and partly to the food basket consumed. For instance the low food expenditure in Punjab and Haryana are due to more diverse food basket while in rural Orissa and Bihar with higher poverty rates and low per capita income, cereals formed the major food item.

Consumption pattern of foodstuffs

Over the last four decades there has been major changes in energy consumption from different food commodities in developing countries. Data from FAO computation show that

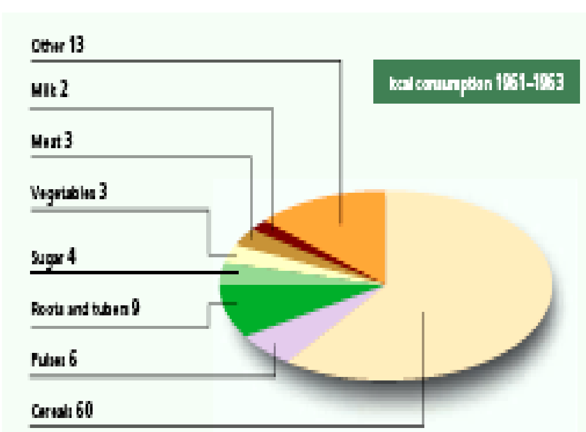
Over the last four decades energy

Figure 6.9: Consumption of different food commodities in developing countries.



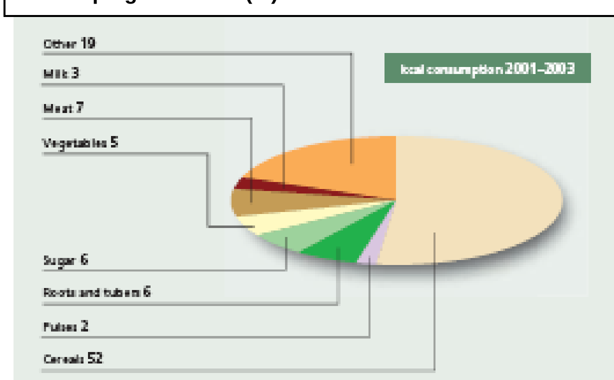
Source: Reference 6.4

Figure 6.10: Composition of food consumption in developing countries (%)



Source: Reference 6.4

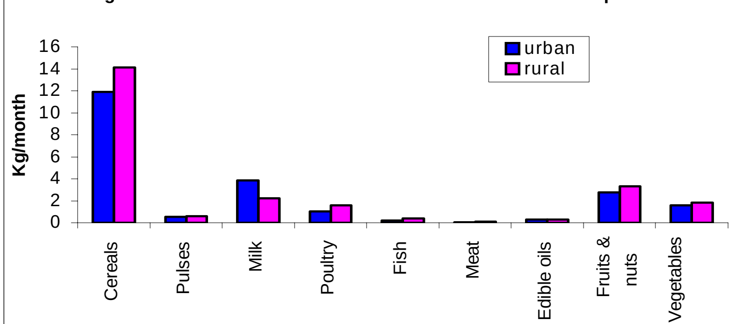
Figure: 6.11: **Composition of food consumption in developing countries (%) 2001-03**



Source: Reference 6.4

from oils, meats, vegetables and sugar have gone up while energy from pulse and roots & tubers has decreased. Energy from cereals showed an increase till mid nineties but subsequently there has been a reduction in energy derived from cereals. (Figure 6.9, 6.10 and 6.11),

Figure 6.12: Urban Rural differences in food consumption



Source: Reference 6.3

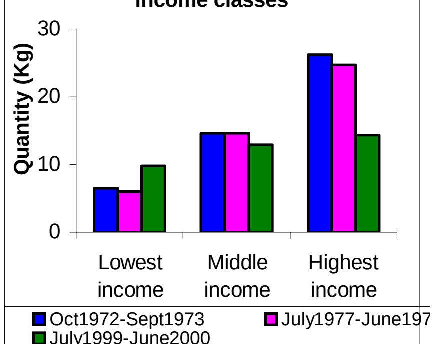
In India, NSSO computes consumption pattern of foodstuffs at national, state and household level from the data on expenditure on food and local cost of food. Data on consumption pattern of foodstuffs in the most recent quinquennial survey is presented here below.

In 2004-05, cereals formed the largest component of the diet. Consumption of pulses was very low; this is may be due to increasing prices of pulses. Consumption of milk, fruits and vegetables, and animal food continue to be quite low (Figure 6.12). Consumption of all foodstuffs increases with increasing income. This is especially true for sugar, oil, milk and animal products. Data from NNMB also indicate that energy consumption in highest income group is higher than the lower income groups. The higher energy intake combined with lower energy expenditure in these income groups accounts for the observed increase in overweight and obesity especially in affluent segments of population.

Interstate differences

The interstate differences in consumption pattern of various foodstuffs in 2004-05 are given in (Annexure 6.1 and 6.2). Cereal forms the main portion of the diet in both urban and rural areas followed by milk and fruits. There are huge urban rural and interstate differences in the monthly per capita consumption even in cereals. Some of these differences are due to access to other foods for eg. Fish consumption in Lakshadweep, Andaman and Nicobar Islands, Goa; and others are related to percapita income such as higher consumption of milk and fruit intake in Punjab. However some urban rural differences such as cereal consumption in urban and rural UP (5kg vs. 8 kg) are difficult to explain either on the basis of percapita income or on the basis of food availability. The reason for very low vegetable consumption in semi tropical rural India producing plenty of vegetables and fruits is another poorly understood phenomenon.

Figure 6.13: Quantity of Cereals (Kg) consumed amongst rural income classes



Source: Reference 6.3

Cereals

Analysis of data in time trends in consumption of cereal by lowest, middle and higher income groups shows that quantity (in kg) of cereals consumed by lowest income group has increased inspite of reduction in the proportion of expenditure on cereals (Figure 6.13), because over the years there has been a reduction in relative cost of cereals especially that supplied through the Public Distribution System (PDS). Data on time trends in cereal intake from NNMB surveys confirm that there has been a reduction in the percentage of individuals consuming less than 70% of RDI for cereals. NSSO surveys showed that there has been a small decline in the household consumption of cereals in middle-income groups. The reported per capita "consumption" of cereals in high-income households in rural area was 26.2 kg (about 1kg/day). This has declined to 14.4kg in 1999-2000. Data from diet surveys conducted by NNMB have shown that average dietary intake of cereals even in the highest income group never exceeded 400g/day.

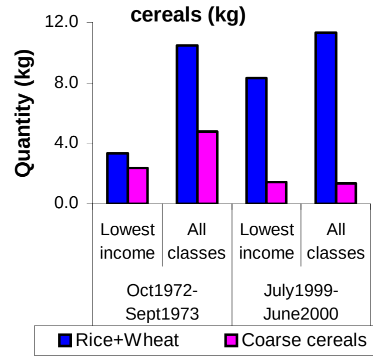
Table 6.3: Changes in per capita cereal consumption in quantity terms over the last decade in different percentile classes of population ranked by MPCE

Year	Rural					
	0-5 p	**5-10 p**	**10-20 p**	**20-30 p**	**30-40 p**	**40-50 p**
1993-94	9.68	11.29	12.03	12.63	13.19	13.33
1999-2000	9.78	11.15	11.64	12.27	12.56	12.89
2004-05	9.88	10.87	11.33	11.70	11.98	12.16
	50-60 p	**60-70 p**	**70-80 p**	**80-90 p**	**90-95 p**	**95-100 p**
1993-94	13.72	14.07	14.41	14.59	14.98	15.78
1999-2000	13.03	13.36	13.45	13.67	13.73	14.19
2004-05	12.37	12.61	12.77	12.72	12.77	13.50
Year	**Urban**					
	0-5 p	**5-10 p**	**10-20 p**	**20-30 p**	**30-40 p**	**40-50 p**
1993-94	8.91	10.11	10.61	10.75	10.89	10.99
1999-2000	8.99	10.15	10.25	10.75	10.61	10.8
2004-05	9.25	10.04	10.09	10.24	10.12	10.25
	50-60 p	**60-70 p**	**70-80 p**	**80-90 p**	**90-95 p**	**95-100 p**
1993-94	10.91	10.95	10.73	10.68	10.19	10.29
1999-2000	10.69	10.66	10.50	10.52	9.94	9.72
2004-05	10.08	10.09	9.97	9.63	9.50	9.10

Source: Reference 6.3

It would therefore appear that reported high cereal consumption among highest income group households, especially, in rural areas might be due to food sharing with guests, relatives and servants. The change in life style over the last two decades may perhaps account for the steep reduction in "consumption" of cereals in high-income group households. Analysis of NSSO data on cereal consumption by different income groups in urban and rural areas are from the last three surveys (1993-94 – 2004-2005) is given in Table 6.3. There has not been much change in per capita cereal consumption in the last ten years in both urban and rural areas. Average quantity of cereals consumed per person per month in 2004-05 was 12.1 kg in rural areas and 9.9 kg in urban areas. The cereal consumption remained high in middle and high income groups in rural area as compared to low income group, this may be due to sharing of food is still prevalent in the rural areas of the country. However, in urban areas there is not much difference in consumption of cereals in terms of quantity across the income levels (Table 6.3).

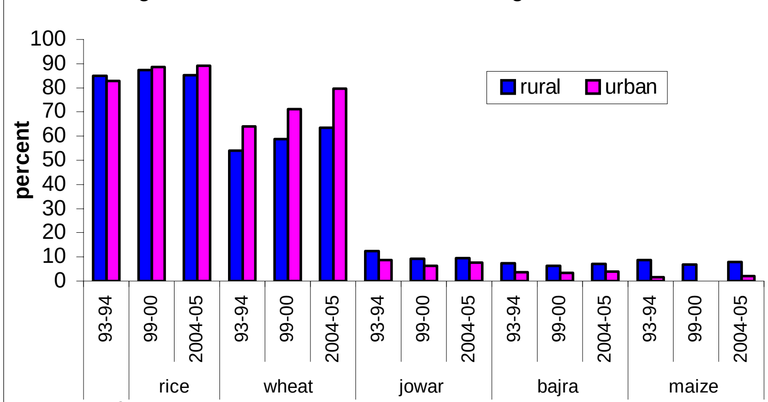
Figure 6.14: Pattern of consumption of different cereals (kg)



Source: Reference 6.3

There has been a change in the type of cereals consumed among the lowest income group. With the availability of wheat and rice through PDS the poorer segments of population have changed over to rice and wheat as staple cereals. Coarse cereals such as bajra, ragi, maize and jowar, which are rich in micronutrients and minerals, are no longer being consumed in substantial quantity by the lowest income group (Figure 6.14). Data from last three NSSO surveys show over the last decade there has been a progressive increase in wheat consumption and reduction in consumption of coarse cereals (Figures 6.14 and 6.15). It was seen that cereal consumption per person per month has declined from 13.4 kg to 12.1 kg (by nearly 10%) between 1993-94 and 2004-05 in rural India and from 10.6 kg to 9.9 kg in urban India (by 6-7%). Though rice and wheat, individually, experienced a fall in consumption per capita since 1993-94, the decline was less marked than for cereals as a whole. On the other hand, consumption of *jowar* and its products appears to have dropped by over 40% in both rural and urban areas. In rural areas, consumption of *bajra* and its products, too, has fallen since 1993-94, the absolute fall in monthly per capita consumption being of the order of 0.1 kg (Figure 6.15).

Figure 6.15: % of households consuming different cereals

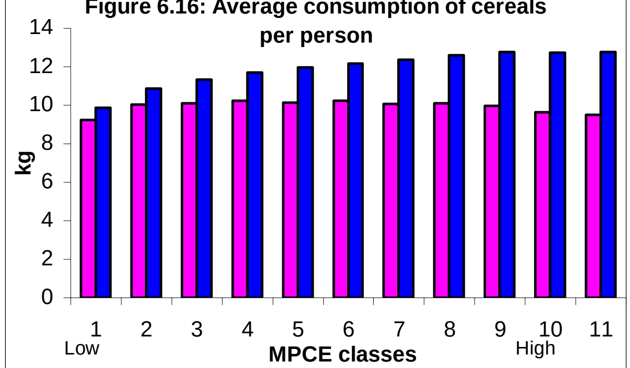


Source: Reference 6.3

Data from NSSO 61st round showed that even in 2004-05 urban populations consumed less cereal than rural population (Figure 6.16). In rural areas, amount of cereals consumed increased with increase in income. In addition to higher consumption by the household members it is possible that higher "consumption" may be due to guests and servants sharing the food prepared at home in rural high income group families. Coarse cereals traditionally used in different regions can be provided to the BPL families at a subsidised cost through TPDS. This will encourage local production, procurement and distribution right in rural areas.

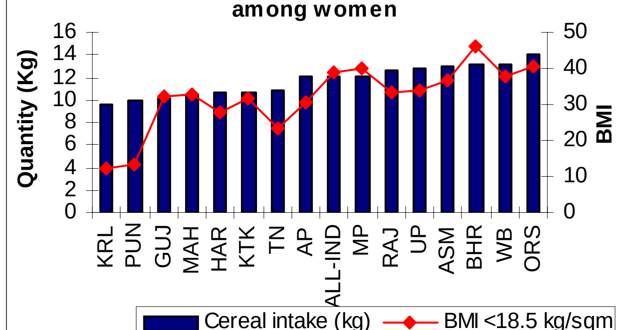
This may substantially bring down subsidy cost without any reduction in the calories provided. This will also improve targeting, as only the most needy are likely to buy these coarse grains. Millets are rich in micronutrients and hence their increased consumption will improve the micronutrient intake among the poorest segments of the population.

Figure 6.16: Average consumption of cereals per person



Source: Reference 6.3

Figure 6.17: Cereal intake and undernutrition among women



Source: Reference 6.3

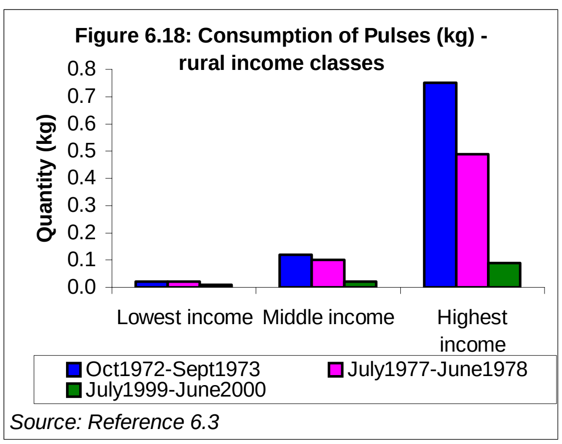
Interstate differences

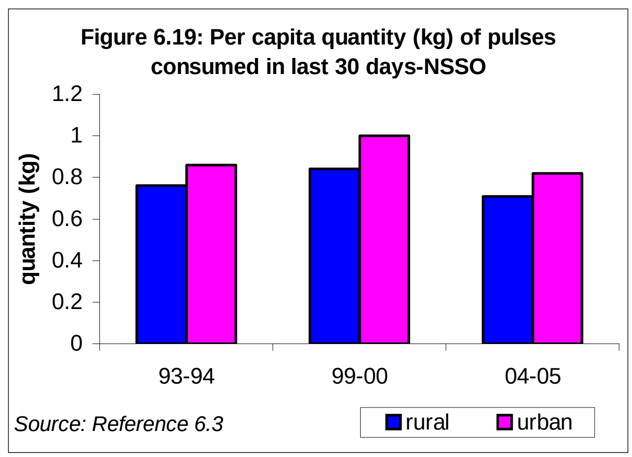
NSSO provides data on state wise consumption expenditure on foodstuffs (Annexure 6.3 and 6.4). Cereals remain to be the major sources of energy in adults both in urban and rural areas. The average per capita cereal consumption has decreased in all the states over the last ten years in both urban and rural areas (Annexure 6.5 & 6.6).

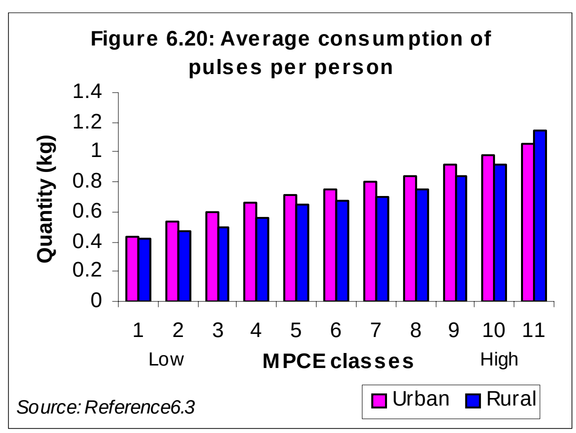
Cereal consumption as assessed by NSSO-2004-05 in different states along with data on undernutrition in women (by NFHS-III) is shown in (Figure 6.17). It is obvious that in states like Kerala with low cereal consumption and relatively low energy intake, under-nutrition rates are very low. In states like MP and Orissa, cereal consumption and intake of energy is high but undernutrition rates are also high. This is perhaps due to high-energy expenditure among poor in these states among manual labour.

Pulses

Pulses are the major source of protein in the Indian diet especially in the lowest income group Inspite of increased expenditure on pulses, there is a decline in household "consumption" of pulses in all the income groups both in the urban and rural areas (Figure 6.18 and 6.19). There was nearly a three-fold difference in pulses consumption between income groups both in urban and rural areas in 2004-05 (Figure 6.20). In the lowest income group, this might be attributable to the steep increase in prices of pulses over the years. Data from NNMB survey also indicates that the pulse consumption, which has always been far below the RDI, has further declined over the years. In order to ensure adequate protein intake in this group, it is essential to invest in steps to increase cultivation of a wide variety of pulses, which could be made







available at an affordable cost to the poorer segments of population, perhaps through PDS.

Milk and milk products

Table 6.4: Per capita consumption of live stock products

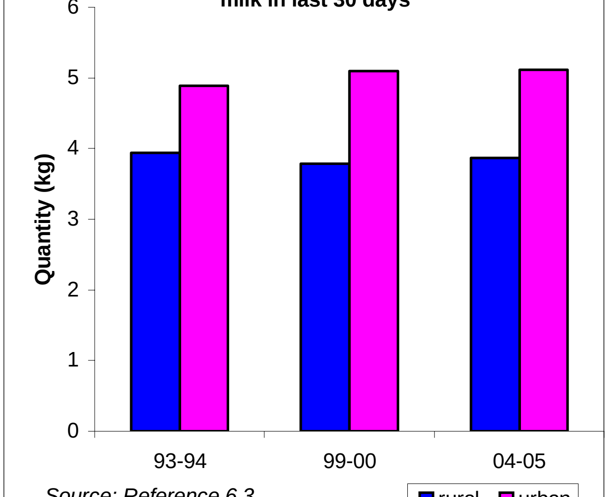
Region	Meat (kg per year)			Milk (kg per year)		
	1964-66	1997-99	2030	1964-66	1997-99	2030
World	24.2	36.4	45.3	73.9	78.1	89.5
Developing countries	10.2	25.5	38.7	28	44.6	65.8
Near East & North Africa	11.9	21.2	35	68.6	72.3	89.9
Sub-Saharan Africa	9.9	9.4	13.4	28.5	29.1	33.8
Latin America & the Carribean	31.7	53.8	76.6	80.1	110.2	139.8
East Asia	8.7	37.7	58.5	36	100	17.8
South Asia	3.9	5.3	11.7	37	67.5	106.9
Industrialized countries	61.5	88.2	100.1	185.5	212.2	221
Transition countries	42.5	46.2	60.7	156.6	159.1	178.7

Source: Reference 6.4

In developed countries milk and meat consumption has been high. In developing countries milk and meat intake is low; Table 6.4. There has been an increase in milk and meat consumption between 1964-1999 in all the countries and FAO's projections suggests that the increase will continue in all countries till 2010.

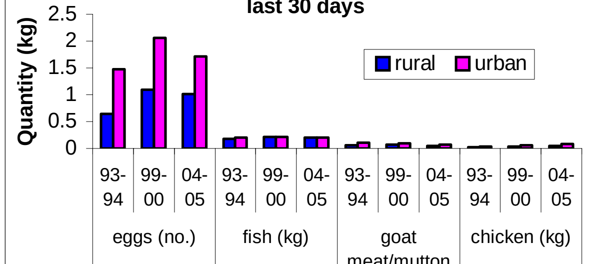
In India there was no change in per capita consumption of milk and milk products in the last ten years in both urban and rural areas (Figure 6.21). However, the percentage of households reporting milk consumption has grown in both rural and urban areas between 1993-94 and 2004-05 by 5 percentage points – 66% to 71% in rural areas and 80% to 85% in urban areas.

Figure 6.21: Percapita quantity consumed of milk in last 30 days



Source: Reference 6.3

Figure 6.22: Percapita quantity consumed in last 30 days



Source: Reference 6.3

Poultry, Fish and meat

The consumption of eggs, fish, meat/mutton and chicken is higher in urban areas as compared to rural areas. The consumption of eggs has increased in the last ten years. Per capita egg consumption in rural India – about 1 egg per month in 2004-05 – has increased by nearly 60% since 1993-94 (Figure 6.22).

Edible oil

Globally there has been a progressive increase in the consumption of fat between 1967-69 and 1997-99 and this change has occurred in all countries of the world. North America, Europe and Oceana had high fat consumption right from 1967 till 1999. China, which had low fat intake earlier, has shown a steep increase of 55gms between 1966-1999. In South Asia fat intake was low 29 g/day in 1967 and the increase over the period was only 16g/day. In 1999 South Asia and Sub Saharan Africa are the two regions with lowest fat consumption in the world. Table 6.5

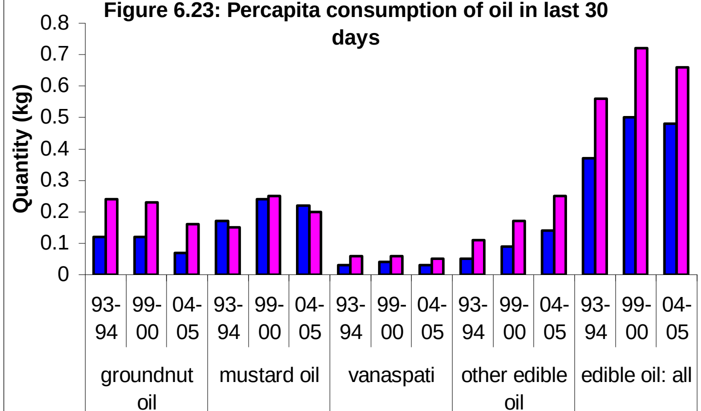
Table 6.5 Trends in the dietary supply of fat

Region	Supply of fat (g/capita/day)				
	1967-69	1977-79	1987-89	1997-99	Change between 1967-1969 and 1997-1999
World	53	57	67	73	20
North Africa	44	58	65	64	20
Sub-Saharan Africa	41	43	41	45	4
North America	117	125	138	143	26
Latin America and the Caribbean	54	65	73	79	25
China	24	27	48	79	55
East and South East Asia	28	32	44	52	24
South Asia	29	32	39	45	16
European Community	117	128	143	148	31
Eastern Europe	90	111	116	104	14
Near East	51	62	73	70	19
Oceania	102	102	113	113	11

Source: Reference 6.4

India has shared the rise in oil consumption. Per capita consumption of edible oil has risen over the last eleven years by as much as 30% in rural India and about 18% in urban India. In both rural and urban India, per capita consumption of oil other than groundnut oil, mustard oil, *vanaspati* and coconut oil has more than doubled. The newer oils such as sunflower oil, soybean oil, other vegetable oil and rice bran oil are used along with traditionally used sesame, mustard, groundnut and coconut oil. The percentage of urban households using groundnut oil dropped in 2004-05 to 21%, one-half of what it was in 1993-94 (40%). Among rural households the percentage in 2004-05 fell to 14% from a 1993-94 level of 30% (Figure 6.23).

Figure 6.23: Percapita consumption of oil in last 30 days

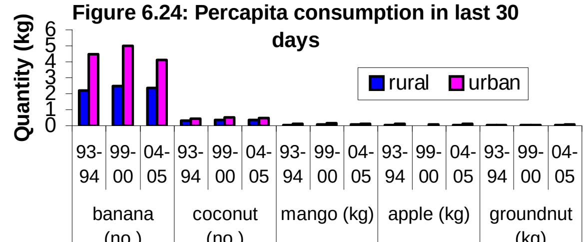


Source: Reference 6.3

Fruits and nuts

There is no change in consumption of fruits in last 10 years in both urban and rural areas. The consumption of fruits is

Figure 6.24: Percapita consumption in last 30 days



Source: Reference 6.3

much higher in urban areas as compared to rural areas (Figure 6.24).

Vegetables

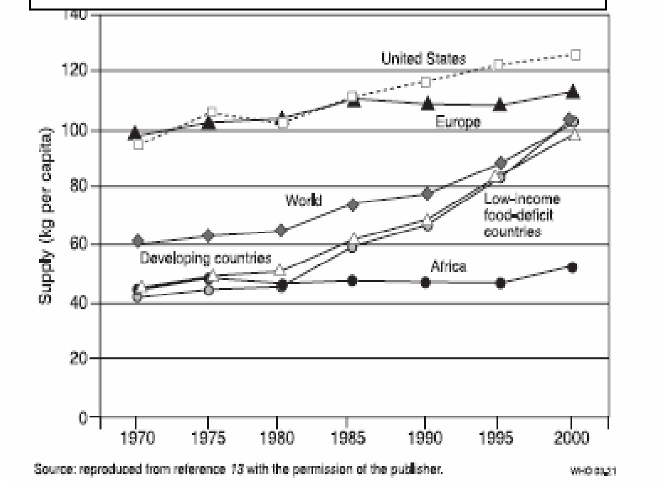
Table 6.6:Supply of vegetables per capita, by region, 1979 and 2000(kg per capita per year)

Region	1979	2000
World	68.1	101.9
Developed countries	107.4	112.8
Developing countries	51.1	98.8
Africa	45.4	52.1
North and Central America	88.7	98.3
South America	43.2	47.8
Asia	56.6	116.2
Europe	110.9	112.5
Oceania	71.8	98.7

Source: Reference 6.4

Table 6.6: There has not been any change in the supply of vegetables between 1979 and 2000 in developed countries. However the vegetable consumption has nearly doubled in developing countries- especially Asia.

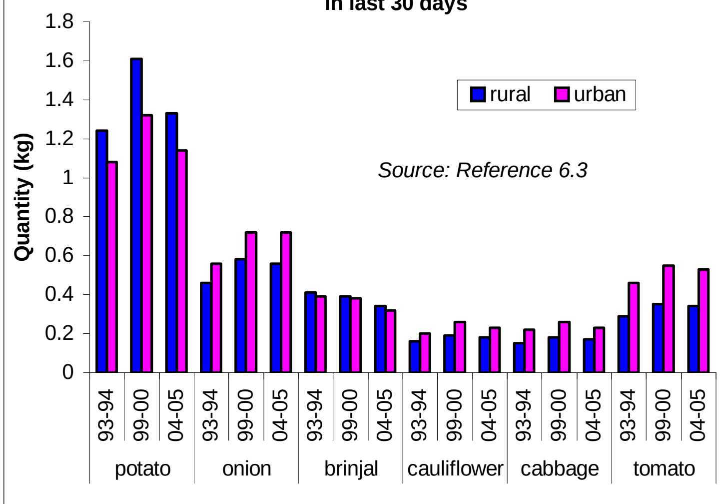
Figure 6.25: Trends in supply of vegetables per capita, by region, 1970-2000



Source: Reference 6.4

Trends in vegetable supply per capita are shown in Figure 6.25. There has been an increase in vegetable intake in US from mid eighties. All developing countries except African countries have shown a steep increase in vegetable intake in the last four decades Vegetable consumption in India has shown some improvement over the last decade. The consumption of potatoes is much higher than any other vegetables; consumption of potato is higher in rural areas. Potato consumption in urban and rural areas declined in 2004-05 as compared to 1999-2000. All other vegetables are consumed more in urban areas; there is not much change in the vegetable consumption in last 10 years. The percentage of households consuming a particular vegetable in a 30-day period has however improved in the eleven years after 1993-94 by 3-6 percentage points for potatoes, onions and brinjal, 8-10 percentage points for cabbages

Figure 6.26: Percapita consumption of various vegetables in last 30 days



and nearly 12 percentage points for cauliflowers and tomatoes in urban areas, and 15 percentage points for tomatoes in rural areas (Figure 6.26).

Time trends in energy intake

Table 6.7:Vegetable and animal sources of energy in the diet (kcal per capita per day)

Region	1967-1969			1977-1979			1987-1989			1997-1999		
	T	V	A	T	V	A	T	V	A	T	V	A
Developing countries	2059	1898	161	2254	2070	184	2490	2248	242	2681	2344	337
Transition countries	3287	2507	780	3400	2507	893	3396	2455	941	2906	2235	671
Industrialized countries	3003	2132	871	3112	2206	906	3283	2333	950	3380	2437	943

T-total kcal; V-kcal of vegetable origin; A- kcal of animal origin (including fish products)

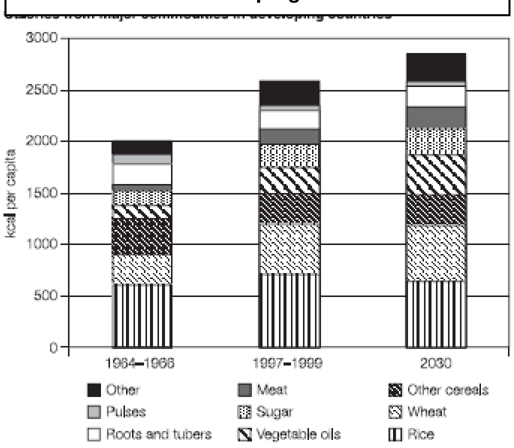
Source: Reference 6.4

Total energy intake is higher in industrialized countries. Dietary energy from animal sources is high where it forms nearly a third of the total intake. Animal sources of energy in transition economies are also high though there has been a decline in energy from animal in 1997-99. in contrast energy from both total energy intake and energy intake from animal sources have remained low in developing countries.

In developing countries energy consumption from major foodstuffs has increased from 2000 k cal in 1964-65 to 2500 k cal in 1997-99. According to FAO projections by 2030 there will be a further increase to about 2750 k cal.

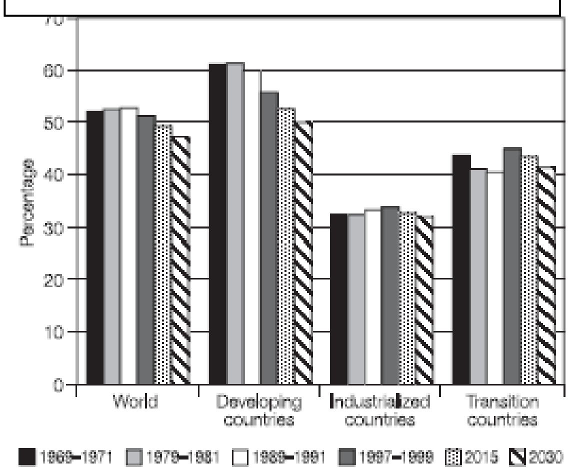
In industrialized countries less than a third of the energy comes from cereals. In

Figure 6.27: Calories from major commodities in developing countries



Source: Reference 6.4

Figure 6.28: The share of dietary energy derived from cereals



Source: Reference 6.4

contrast, in the developing countries cereals provide 50-60% of the energy intake. Over the last four decades there has been a decline in the energy from cereal intake in developing countries from over 60% to about 55% 1998-99. FAO projections indicate that by 2030, they will come down to 50%.

Nutrient intake computed from NSSO surveys

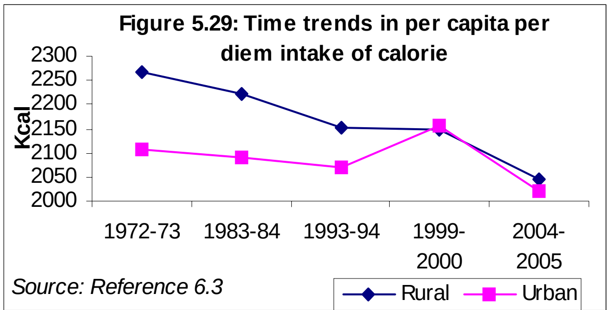


Figure 5.29: Time trends in per capita per diem intake of calorie

Source: Reference 6.3

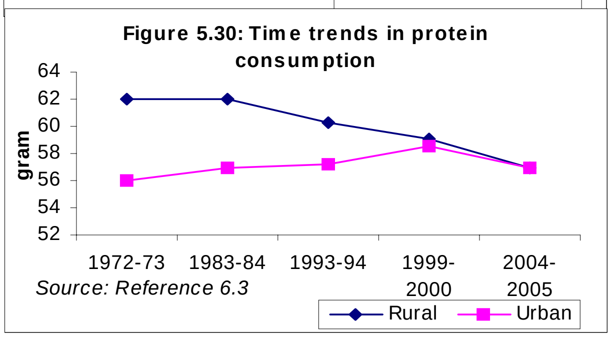


Figure 5.30: Time trends in protein consumption

Source: Reference 6.3

Poverty and lack of purchasing power have been identified as the two major factors responsible for the low dietary intake in India. The concern over the economic factors resulting in chronic under-nutrition led to the use of calorie intake as the basis of estimating poverty. Data from NSSO surveys (Figure 6.29, 6.30 and 6.31) indicate that over the last three decades the overall calorie and protein intake in rural areas has shown a small decline; dietary intake in urban areas has remained unaltered. However, when the data is analysed by income (Figure 6.32), the calorie intake has shown a small increase in both urban and rural poor and a decline among the urban and rural rich. In the urban areas, the variation in intake over the years is much smaller.

Interstate and urban rural differences in percapita calorie, protein and fat intake is given in Annexure 6.7 – 6.10. In spite of the fact that calorie intake has not increased, there is a rise in overnutrition; this is mainly because of changes in life style and consequent reduction in energy expenditure. Over the last three decades, there has been a substantial increase in the fat intake in both rural and urban areas. In view of adverse nutrition (obesity) and health (non communicable diseases) implications of increased fat intake especially among the affluent group, this has to be curtailed through appropriate nutrition education. In view of the known massive interstate differences in the dietary intake and nutritional status, it is important to analyze the state-wise data on intake and

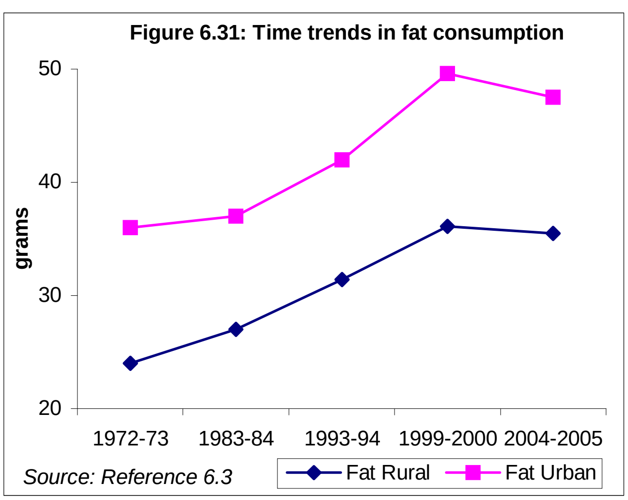


Figure 6.31: Time trends in fat consumption

Source: Reference 6.3

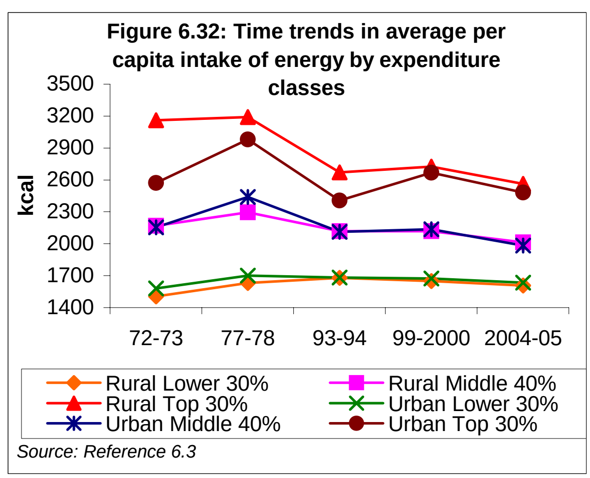


Figure 6.32: Time trends in average per capita intake of energy by expenditure classes

Source: Reference 6.3

nutritional status and modify the interventions programmes to cope with the problems.

Table 6.8:Ranges of population nutrient intake

Dietary factor	Goal (% of total energy, unless otherwise stated)
Total fat	15-30%
Saturated fatty acids	<10%
Polyunsaturated fatty acids (PUFAs)	6-10%
n-6 polyunsaturated fatty acids (PUFAs)	5-8%
n-3 polyunsaturated fatty acids (PUFAs)	1-2%
Trans fatty acids	<1%
Monounsaturated fatty acids (MUFAs)	By difference
Total carbohydrate	55-75%
Free sugars	<10%
Protein	10-15%
Cholesterol	<300 mg per day
Sodium chloride (sodium)	<5 g per day (<2g per day)
Fruits and vegetables	≥400 g per day
Total dietary fibre	From foods
Non-starch polysaccharides (NSP)	From foods

Source: Reference 6.4

Ample data exist to indicate that positive energy balance (energy intake over and above energy expenditure0 is the major factor responsible for emerging problem of over-nutrition and associated risk of non-communicable diseases in developing countries like India. Apart from positive energy balance, the source of energy may also have some impact on the risk of noncommunicable disease risk. Over years there has been a growing concern about potential adverse consequences of high fat and even high protein intake and low vegetable and fruit intake on health status of the population. The current recommendations regarding consumption of different nutrients as percentage of total energy intake is given in Table 6.8.

References

6.1 National Accounts Statistics, CSO: http://mospi.nic.in/mospi_cso_rept_pubn.htm; last accessed on 24/09/07

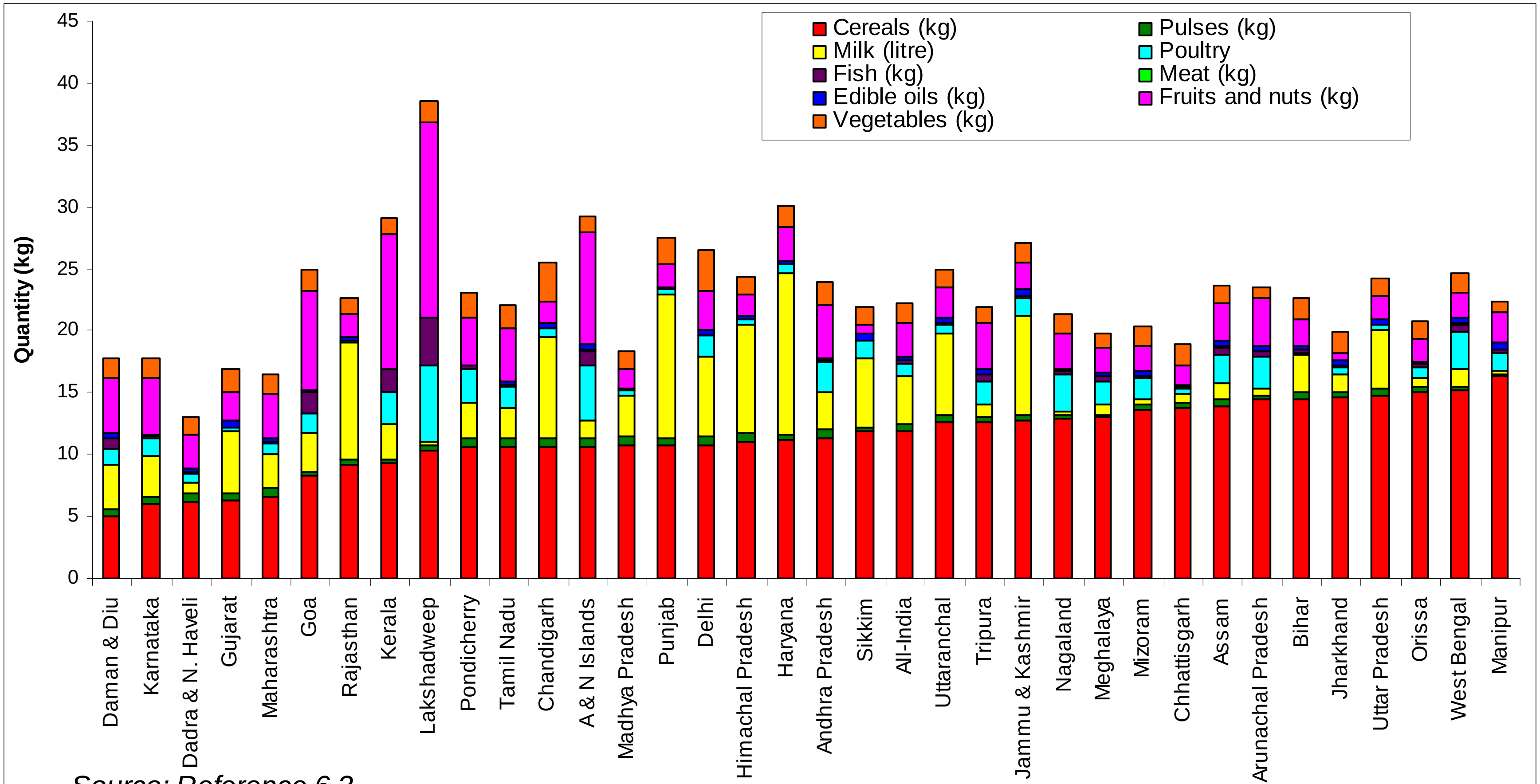
6.2 National Family Health Survey (NFHS-3): http://mohfw.nic.in/nfhsfactsheet.htm; last accessed on 24/09/07

6.3 National Sample Survey Organisation: http://mospi.nic.in/mospi_nsso_rept_pubn.htm; last accessed on 24/09/07

6.4 FAO State of World Food Security, FAO Rome -2007

Annexure 6.1

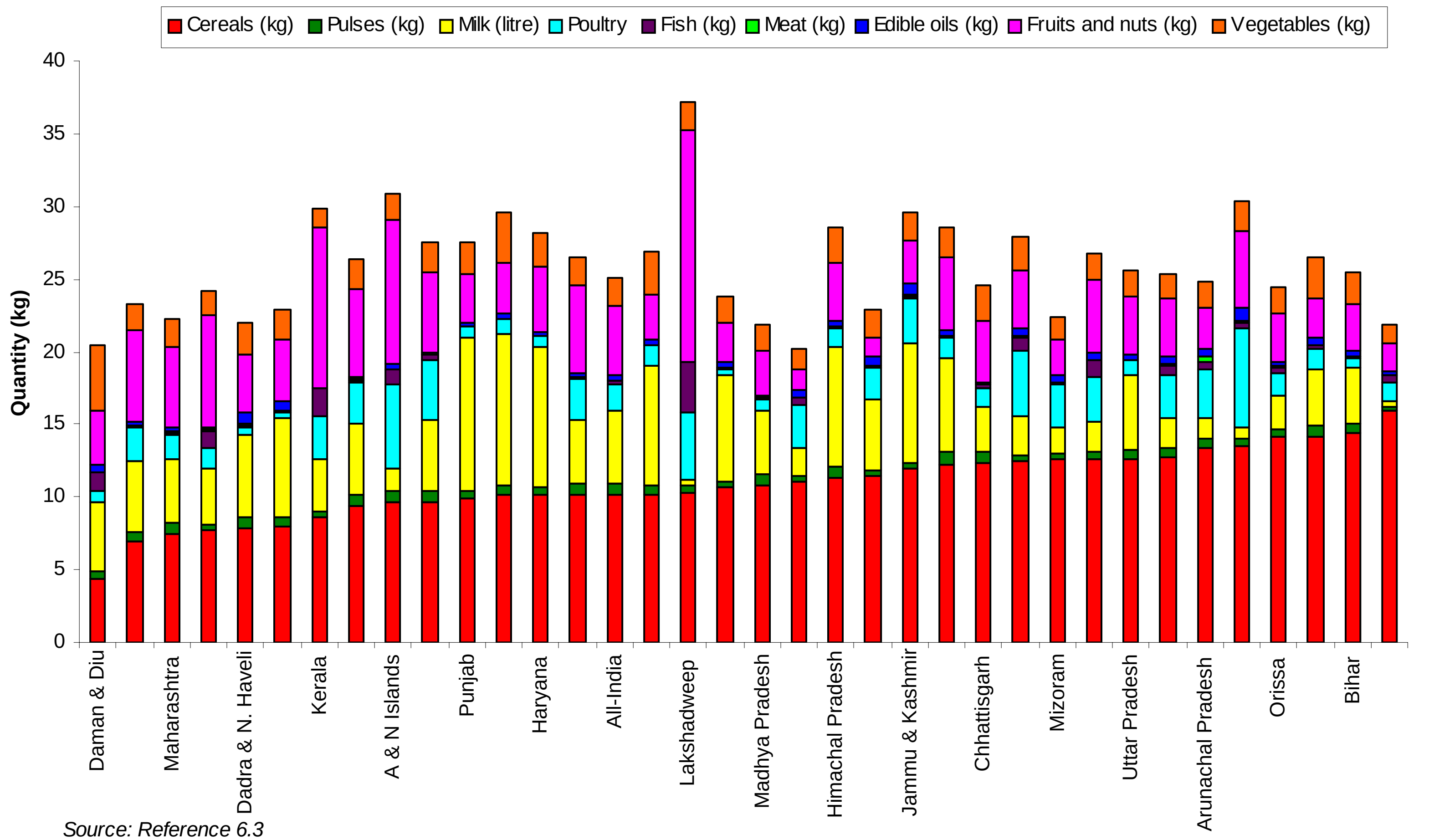
Monthly per capita quantity of consumption (kg) of selected commodities in rural areas



Source: Reference 6.3

Annexure 6.2

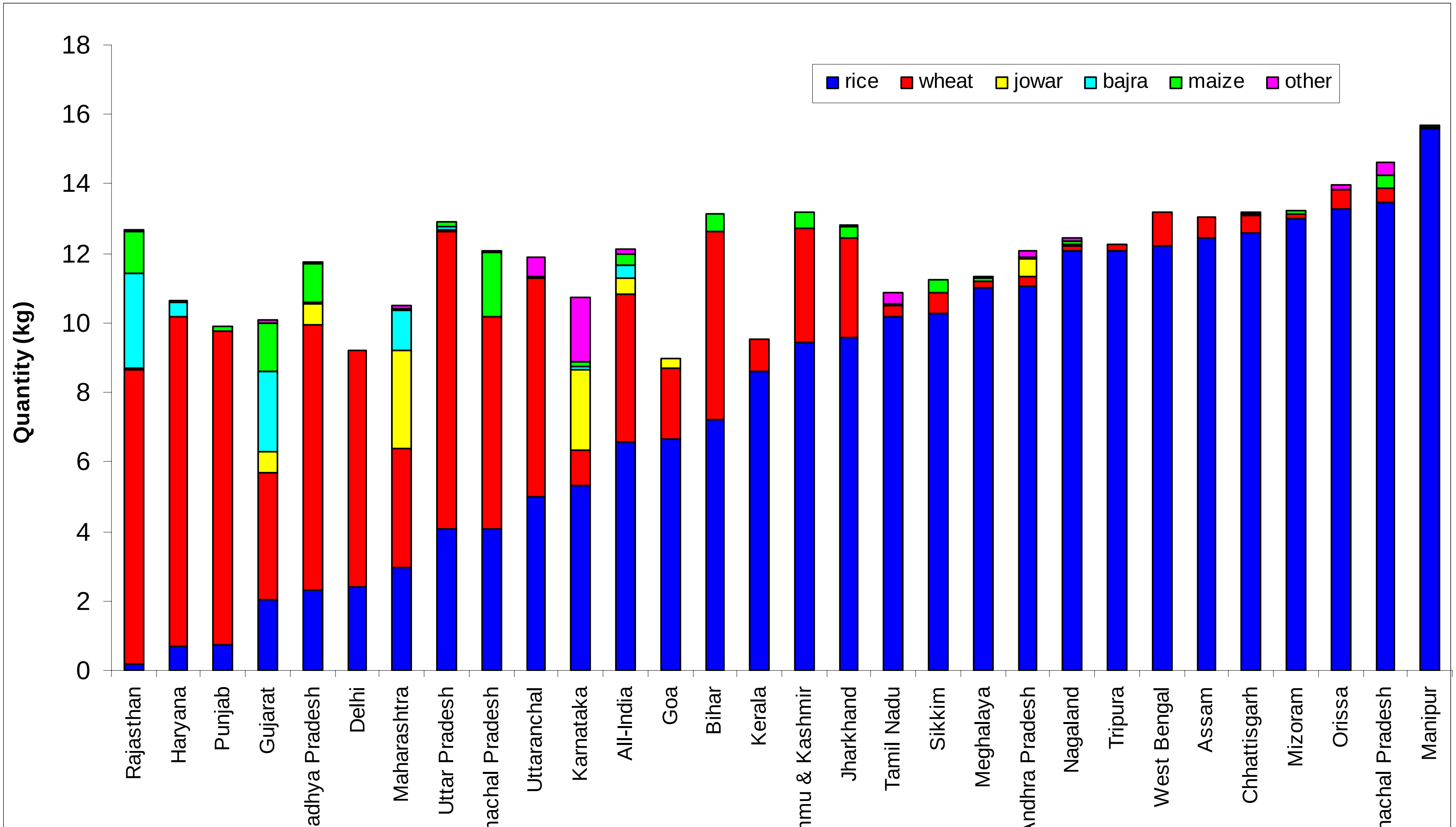
Monthly per capita consumption (kg) of selected commodities in urban areas



Source: Reference 6.3

Annexure 6.3

Interstate differences in average quantity of cereal consumption per person in rural areas



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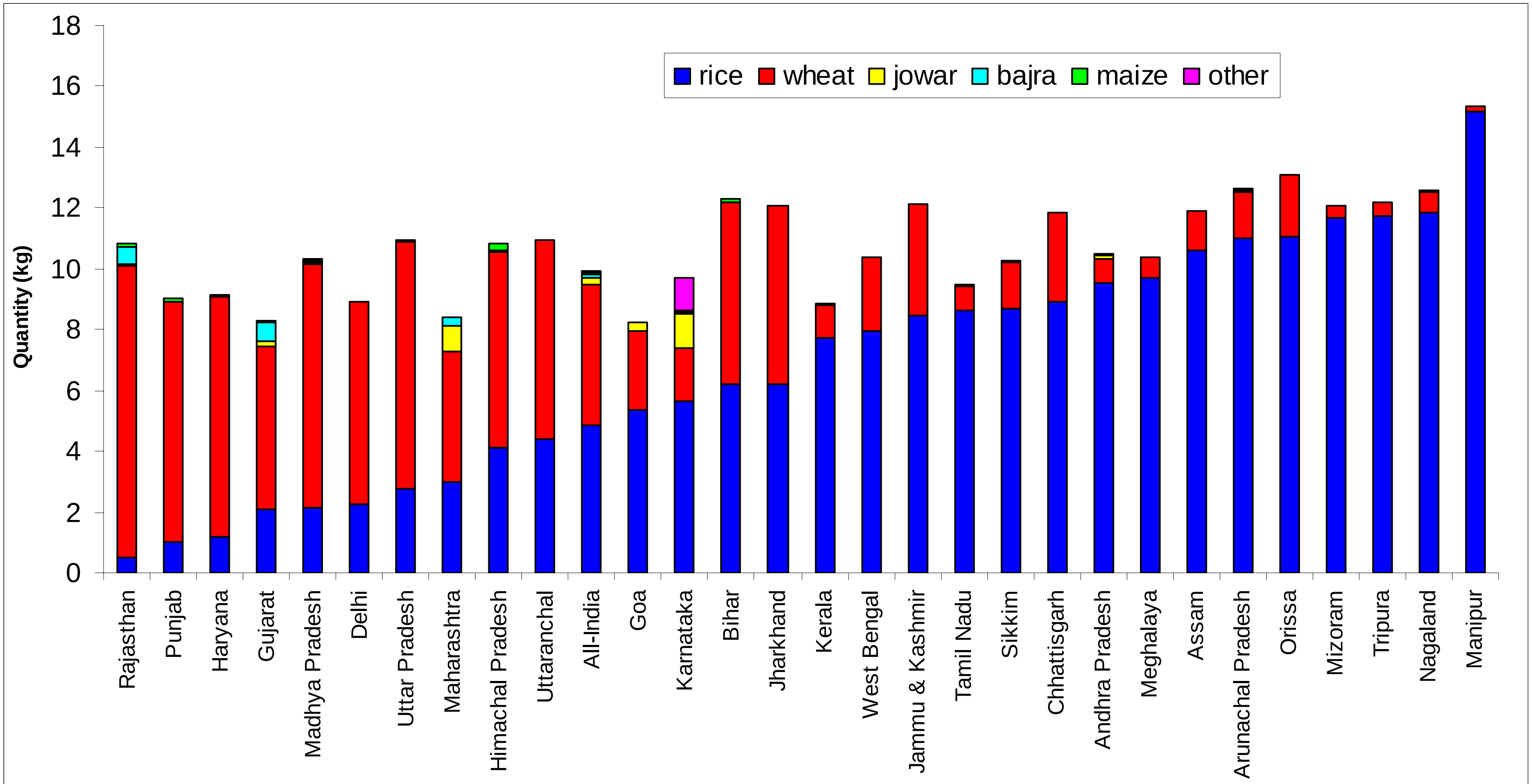
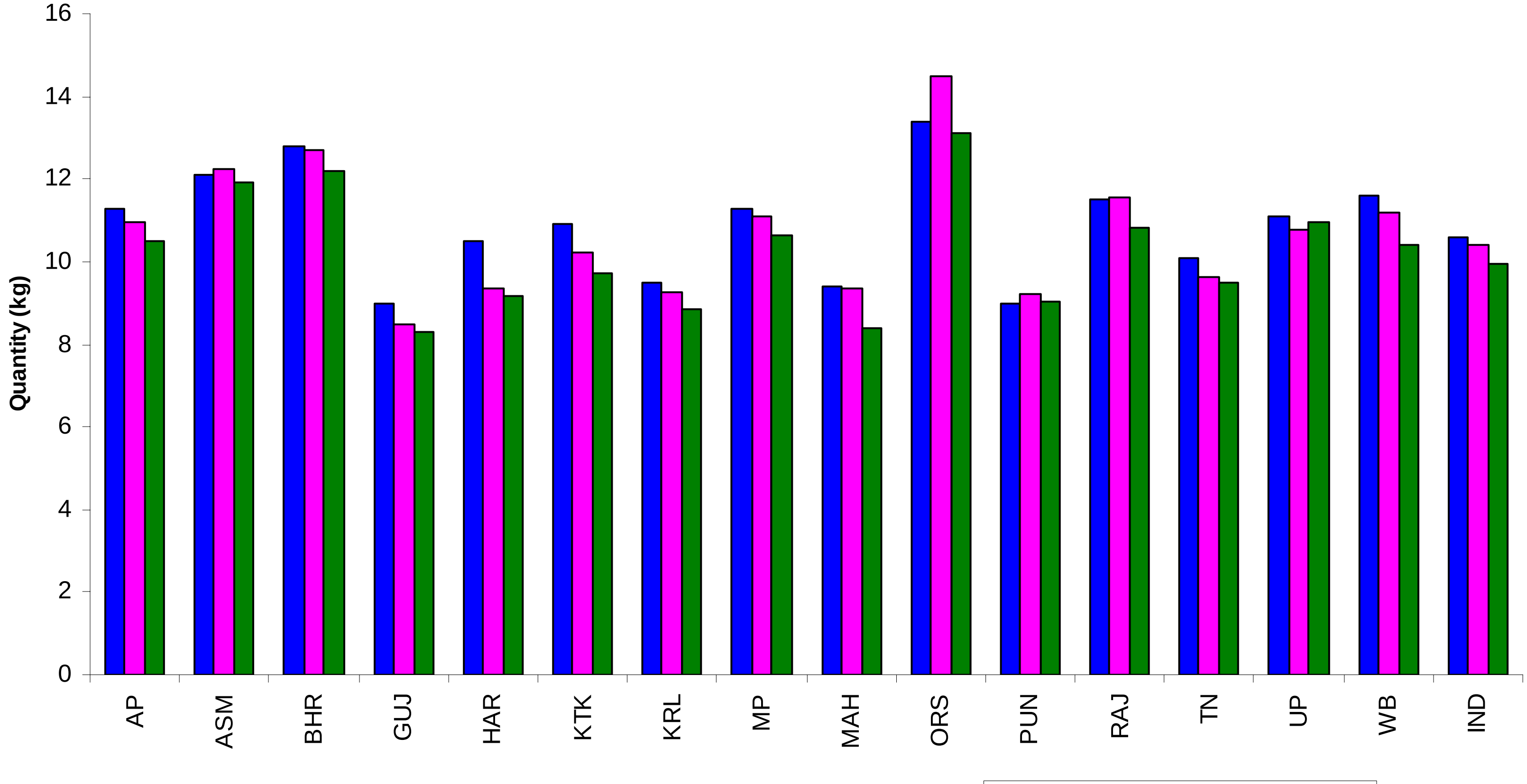
Interstate differences in average consumption of cereals in urban areas



Source: Reference 6.3

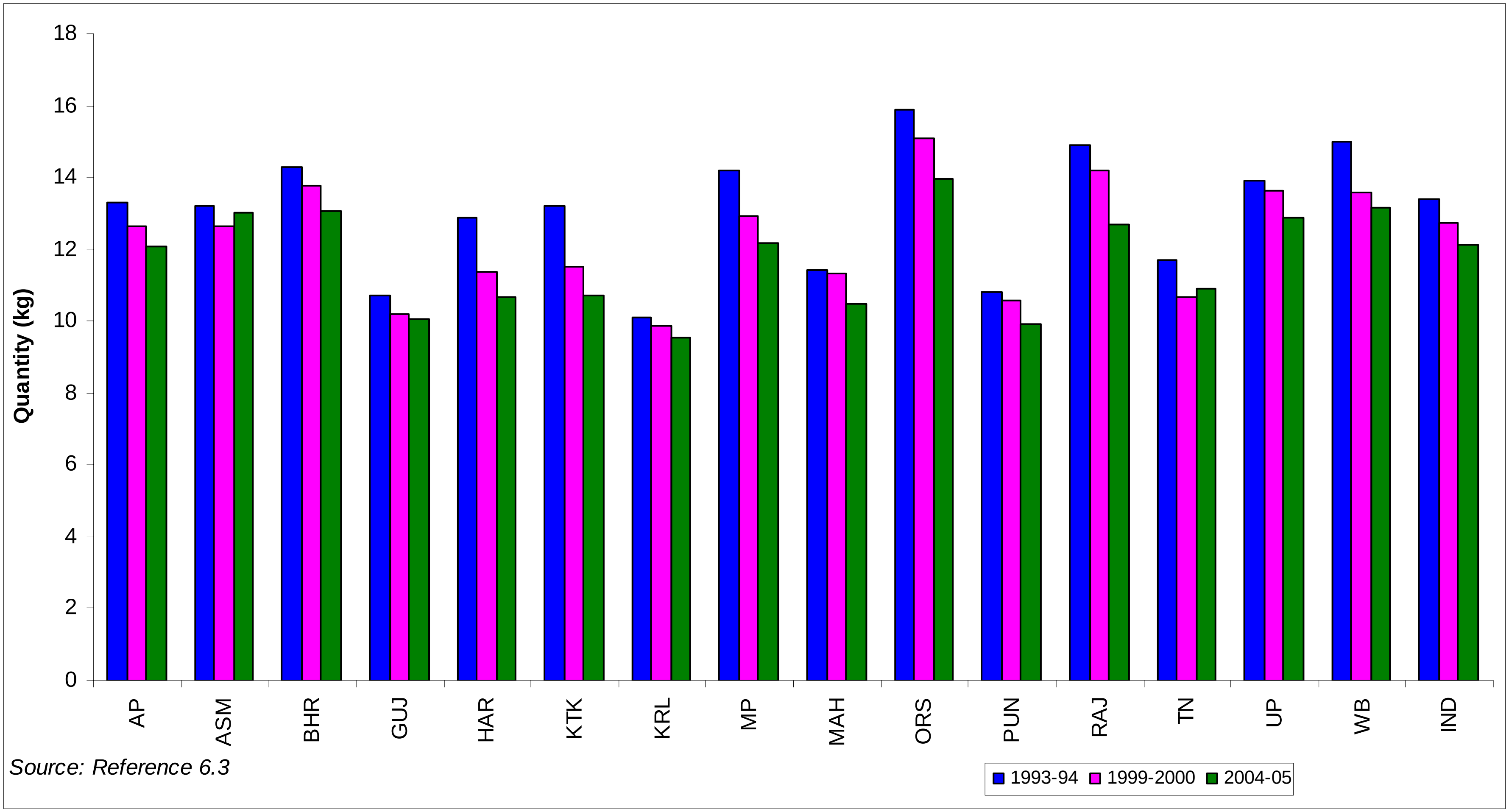
Interstate differences in average per capita cereal consumption in urban areas



Source: Reference 6.3

Annexure 6.6

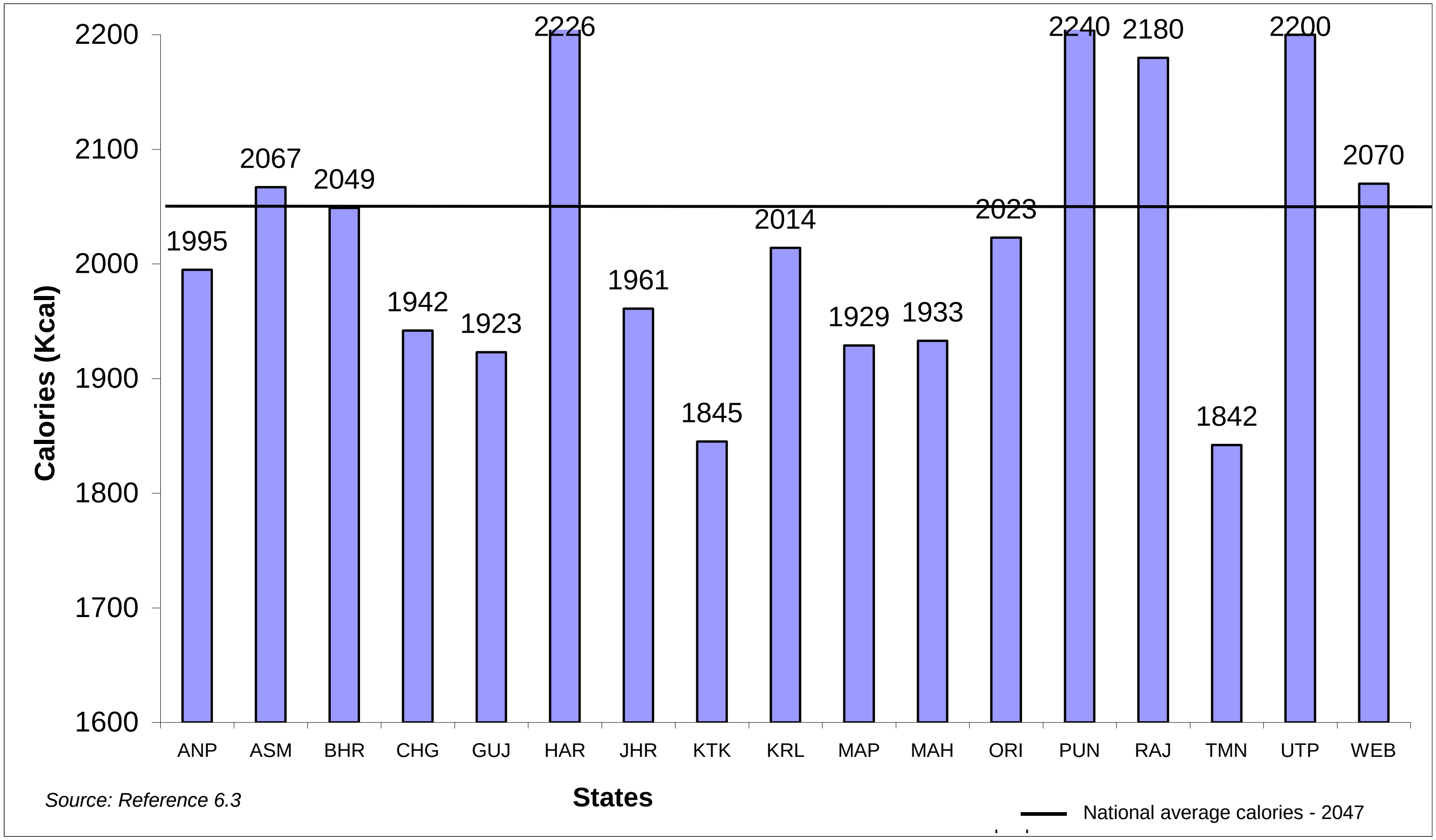
Interstate differences in average per capita cereal consumption in rural areas



Source: Reference 6.3

Annexure 6.7

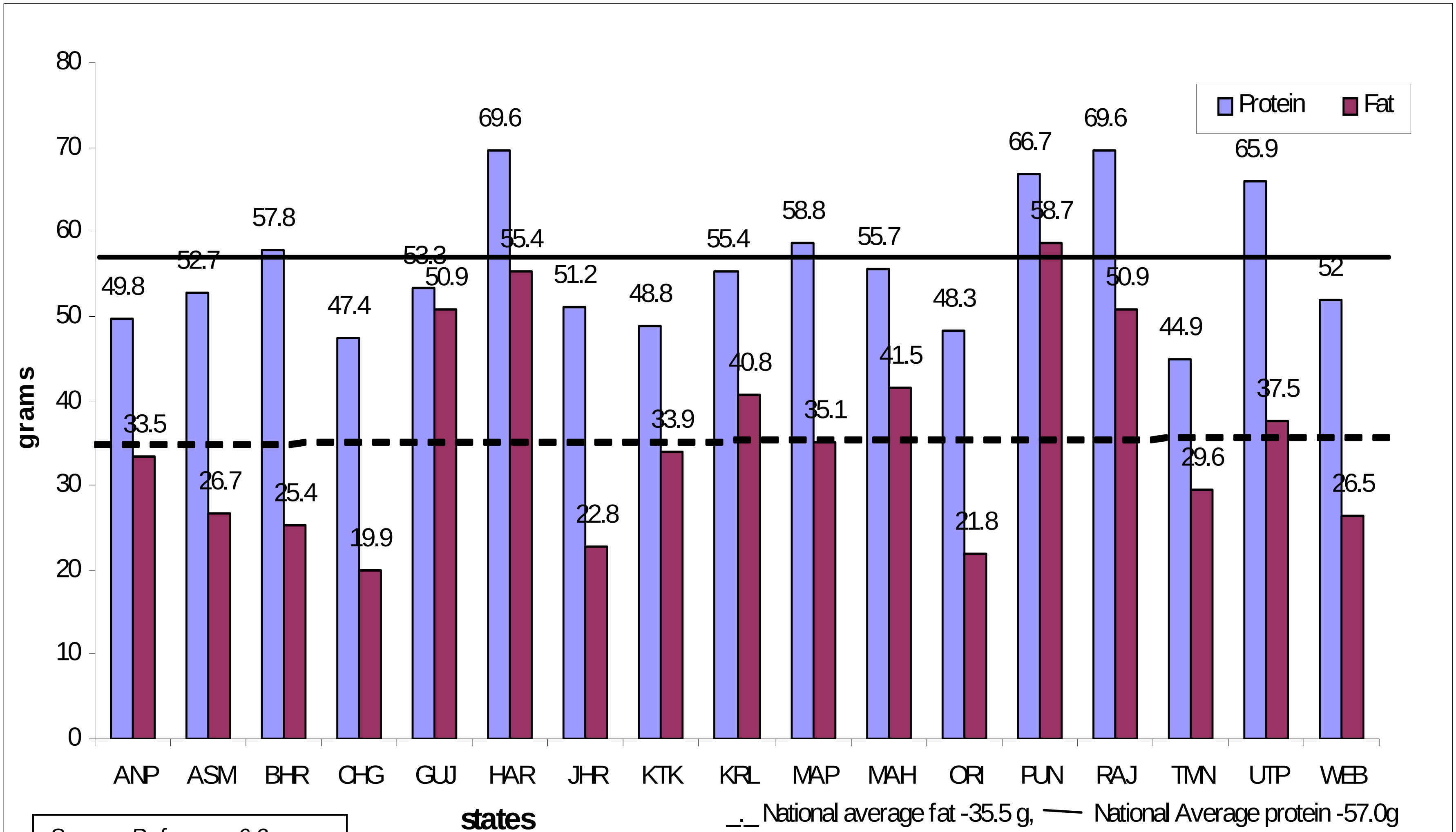
Interstate difference in average per capita intake of calories in rural area



Source: Reference 6.3

Annexure 6.8

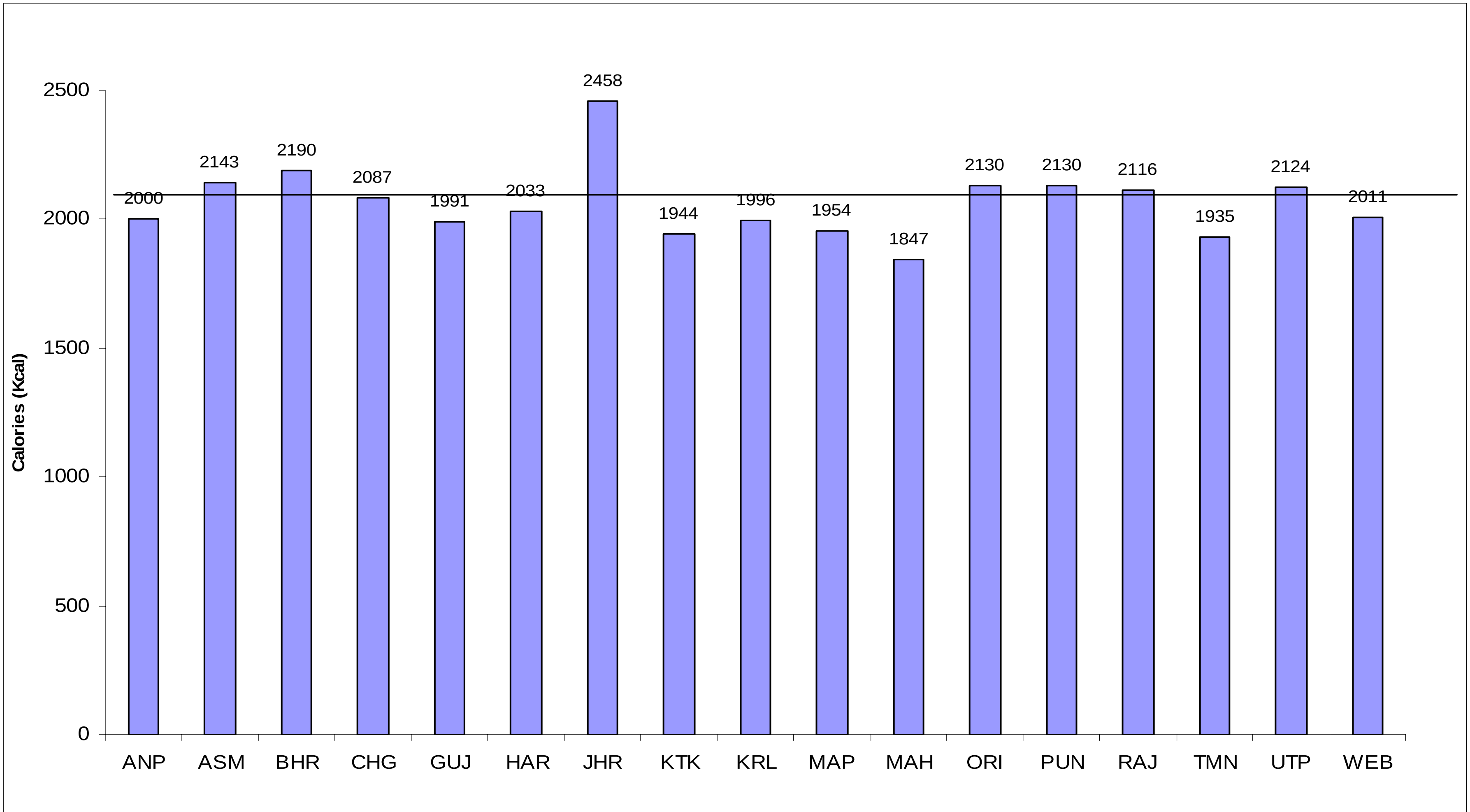
Interstate difference in average Per-Capita intake of protein and fat in rural area



Source: Reference 6.3

Annexure 6.9

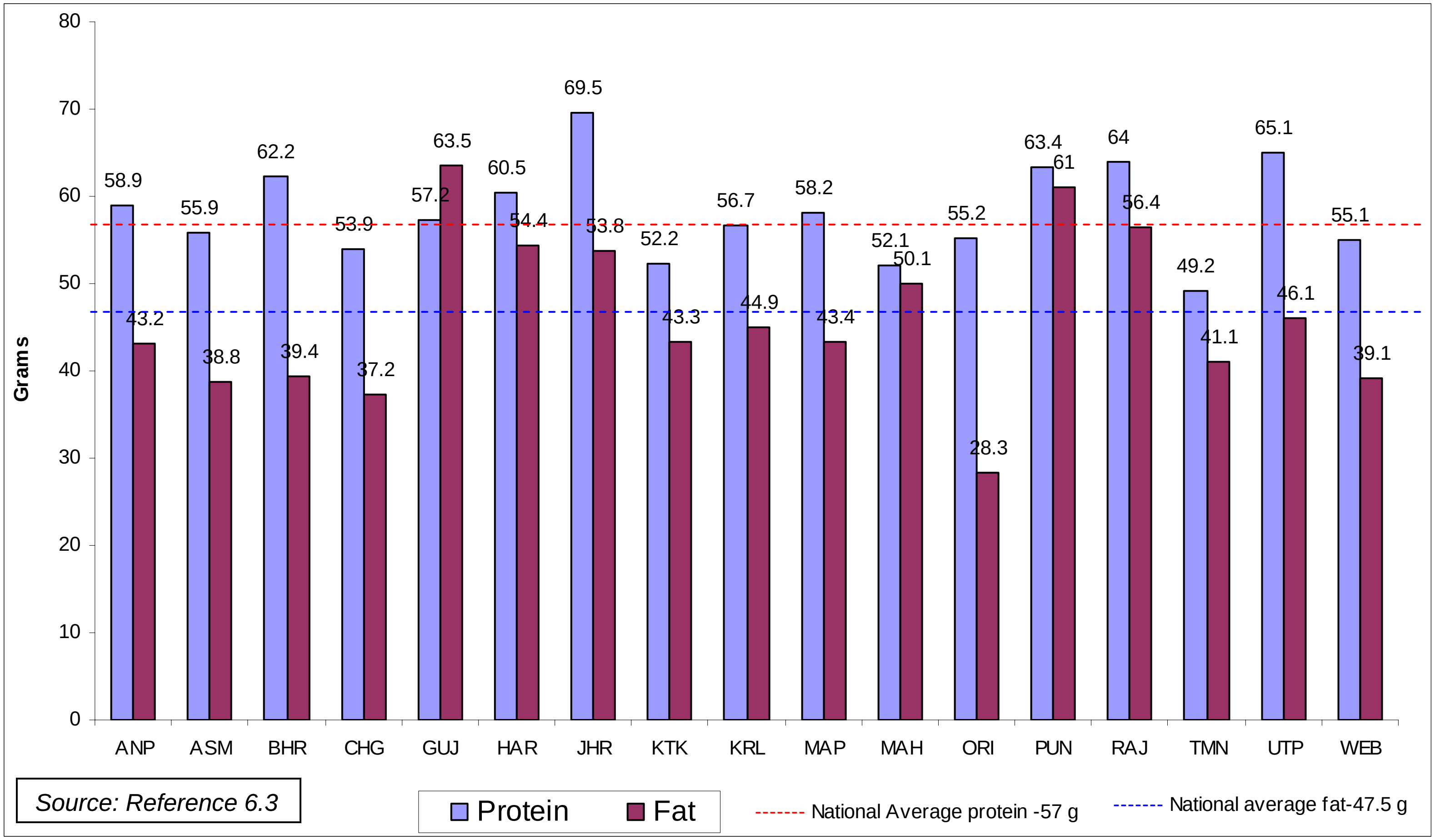
Interstate difference in average per capita intake of calories in urban areas



Source: Reference 6.3

Annexure 6.10

Interstate difference in average per capita intake of protein and fat in urban areas



7. NUTRITION TRANSITION

7.1 NUTRITION SURVEYS IN INDIA

Surveys to assess dietary intake and nutritional status of the population are essential to monitor ongoing nutrition transition and initiate appropriate interventions. In India, routine reporting of nutritional status by the health and social welfare functionaries is suboptimal. India has therefore invested heavily in periodic surveys to obtain data on nutrition transition. Given its size and variation it is important that at least state level data are available. In view of the known interdistrict variations in the same state and the current emphasis on decentralised district based planning, implementation and monitoring of intervention programmes, efforts are currently under way to collect and report district specific data where ever possible. A brief summary of agencies collecting and reporting data on dietary intake and nutritional status in India is given in the following pages.

National Nutrition Monitoring Bureau (NNMB)

Recognizing the need for good quality data for monitoring nutritional status, ICMR in 1972 established the National Nutrition Monitoring Bureau (NNMB) in the National Institute of Nutrition (NIN), Hyderabad. Since 1973, surveys carried out by the NNMB have been a major source of data on diet and nutritional status of the Indian population.

The objectives of NNMB are:

- To collect data on dietary intake and nutritional status of the population in the states of India on a continuous basis
- To monitor the ongoing national nutrition programmes and to recommend mid course corrections to improve their effectiveness

Initially, NNMB units were established in nine States- Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, West Bengal, Maharashtra, Uttar Pradesh and Madhya Pradesh. In 1976, another unit was established in Orissa. In each state there is a unit with a medical officer, nutritionist and supporting staff. The Central Reference Laboratory located at National Institute of Nutrition is responsible for preparation of the survey protocol, sampling, and training of the field staff, quality control, data analysis and report writing.

From 1974 to 1981 annual surveys were carried out in each of the 10 states on a probability sample of a total of about 500 households each year (rural and urban). The households were selected from four representative districts. Villages were selected in proportion to the population; households were selected to represent different socio economic categories in each village. In 1983, NNMB linked its sampling frame to that of the National Sample Survey Organization (NSSO) because the NSSO sampling frame was more representative. In subsequent years a sample of about 750 households in rural areas and 250 households in the urban areas of each of the ten states have been surveyed. Data on dietary intake are collected on 80% of the rural sample of households

Table 7.1.1: Particulars of coverage of repeat rural surveys							
	No. of villages surveyed			Households *			Nutrition assessment
State	75-79	88-90	96-97	75-79	88-90	96-90	96-97
Kerala	106	91	119	979	835	1180	8,864
Tamilnadu	110	96	54	978	865	530	5,813
Karnataka	167	126	112	999	783	1020	12,606
AP	136	119	115	1071	908	1142	9,545
Maharashtra	126	128	85	615	837	824	6,883
Gujarat	120	116	83	697	711	791	4,866
MP	55	50	36	234	255	-	-
Orissa	98	156	109	524	824	1064	12,024
Pooled	918	882	713	6497	6018	6,551	60,601

* *Covered for diet survey*
Source: Reference 7.1.7

using one-day weighment method on the day of survey. In the remaining 20% of households individual dietary intakes are assessed using a single 24-hour recall for estimating intra-familial distribution of food. NNMB had carried out surveys in 1975-79, 1980-85, 1988-90, 1996-97, 2000-01 and 2004-05 in rural areas and in 1975-79 and 1993-94 in urban areas.

In order to get time trends in dietary intake and nutritional status in rural population, the NNMB carried out two repeat surveys in 1988-90 and in 1996-97, of the rural areas surveyed in 1975-79. Over 100 villages in each state were covered in all the three surveys with sixty villages being common between repeat surveys. Table 7.1.1 gives the coverage under the two rural repeat surveys carried out by NNMB. In 2000, using data from the above surveys, NNMB produced separate reports on dietary intake and nutritional status of adolescents (10 to 17 years of age) and elderly (60+ years).

India has a large tribal population and hence a special tribal survey has been carried out by NNMB during the years 1985-87 and the first repeat survey of this sample was done in 1998-99. In India, droughts continue to be a problem in several drought prone districts. NNMB has carried out surveys in drought-affected areas over years. The most recent one was a survey in nine states affected by drought in the current decade. The drought surveys provide information on impact of drought and the relief operation on nutritional status of the population.

India Nutrition Profile (INP) Survey

Food & Nutrition Bureau in the Department of Women & Child Development of

Table 7.1.2: States and UTs covered in the survey	
Region	States / UTs
Northern	Haryana*, Himachal Pradesh*, Punjab*, Rajasthan, Chandigarh, Delhi
Eastern	Bihar, Sikkim.
North Eastern	Arunachal*, Assam*, Manipur, Meghalaya, Mizoram, Nagaland*, Tripura
Western	Dadra & Nagar Haveli*, Daman & Diu*, Goa,

* *In these States/UTs only rural areas were covered*

the Ministry of Human Resource Development of the Government of India organized a survey in 1995-96 to obtain a reliable nutrition profile of all districts (India nutrition profile INP) in 18 States and Union Territories in which NNMB was not conducting nutrition surveys (Table 7.1.2). The INP survey used sampling design and survey methodologies similar to NNMB. Overall 187 districts were covered in 18 states and UTs. INP provides data on dietary intake and nutritional status of all age groups, in all states of the country, in urban and rural areas in mid nineties.

Both NNMB and INP surveys have used 24-hour dietary recall for assessment of dietary intake. The amounts consumed were compared with the Recommended Dietary Allowance (RDA) for Indians drawn up by the Indian Council of Medical Research (ICMR) published in 1989 (ICMR 1989). Household food intake obtained by 24-hour dietary recall is used to compute the average intake of the household members expressed per consumption unit (CU) per day (NNMB 1981). The Consumption Unit for different age and sex groups were worked out on the basis of the energy requirements by taking the energy consumption of an average adult male doing sedentary work as one consumption unit (Text Box 7.1.1).

Computation of nutrient intake

Nutrient intake is computed using Nutritive Value of Indian Foods (NIN, 2004), which was first, published in 1971. Since then it has undergone many reprints. Analysis of iron content of Indian food stuffs by newer techniques have shown that the available iron is only about 50 percent of the earlier values reported and hence in the latest edition values for iron content have been revised.

Assessment of nutritional status

Both these surveys report data on prevalence of chronic energy deficiency in all age groups. For children, the data is reported using the following three classifications:

Text Box 7.1.1: Consumption Unit

Adult male (Sedentary worker)	1.0
Adult male (Moderate worker)	1.2
Adult male (Heavy worker)	1.6
Adult female (Sedentary)	0.8
Adult female (Moderate)	0.9
Adult female (Heavy)	1.2
Adolescent – 12 to 21 years	1.0
Children – 9 to 12 years	0.8
Children – 7 to 9 years	0.7
Children – 5 to 7 years	0.6
Children – 3 to 5 years	0.5
Children – 1 to 3 years	0.4

Source: Reference 7.1.7

Table 7.1.3: z score and percentile classification system

Nutritional status	z-scores	Percentiles
Normal	-1 and +1 SD Median	15^{th} to 85^{th} percentile 50^{th} percentile
Mild	≥ -2 and <-1 SD; or >+1 and +2 SD -1 SD and +1 SD	3^{rd} to 15^{th} or 85^{th} to 97^{th} percentile 3^{rd} and 85^{th} percentiles
Moderate	≥-3 and <-2 SD; or >+2 and +3 SD -2 SD and +2 SD	< 3^{rd} or >97^{th} percentiles 3^{rd} and 97^{th} percentiles
Severe	< -3 or > + 3 SD -3 SD and +3 SD	

Source: Reference 7.1.10

Table 7.1.4: IAP system of classification	
Grades of undernutrition	**Value**
Normal	≥ 80 % median
Mild UN (Gr I)	Between 80 % & 70 % of med.
Moderate UN (Gr II)	Between 70 % & 60 % of med.
Severe UN (Gr III)	Between 60 % & 50 % of med.
Very severe UN (Gr IV)	Less than 50 % of med.
Source: Reference 7.1.7	

Table 7.1.5: Gomez Classification	
Weight for age (% of NCHS standard)	**Nutritional Grade**
>= 90	Normal
75-89.9	Grade I (mild UN)
60-74.9	Grade II (moderate UN)
< 60	Grade III (severe UN)

- Standard Deviation (SD) Classification (to enable international comparison) (Table 7.1.3)
- Indian Academy of Paediatrics (IAP) Classification (to compare the data with the Integrated Child Development Scheme – (ICDS), reported data on under nutrition) (Table 7.1.4)
- Gomez Classification (to enable comparison with data pertaining to seventies and early eighties) (Table 7.1.5)

In April 2006, WHO came up with the growth norms for preschool children based on multicentre global data from breastfed infants and recommended that assessment of nutritional status of the preschool children. The WHO standards give BMI-for-age, which is useful for detecting both undernutrition and obesity, thus addressing the double burden of malnutrition.

National Family Health Survey (NFHS)

Three National Family Health Surveys NFHS-1 conducted in 1992–93, NFHS-2 conducted in 1998–99 and NFHS-3 conducted in 2004-05 provide national and state-level information on fertility, family planning, infant and child mortality, reproductive health, child health, nutrition of women and children, and the quality of health and family welfare services. These surveys also provides estimates at the regional level for four states (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) and estimates for three metro cities (Calcutta, Chennai, and Mumbai), as well as slum areas in Mumbai. The NFHS-2 sample covers more than 99 percent of India's population living in all 26 states. It does not cover the union territories. NFHS-2 is a household survey with an overall target sample size of approximately 90,000 ever-married women in the age group 15–49. Data on nutritional status of women and children from NHFS 1, 2 and 3 provide information on time trends in prevalence of undernutrition in the last 15 years. In addition, NFHS -2 provides information on dietary diversity among the women surveyed.

District Level Household Survey

This survey is conducted by the Department of Family Welfare to assess performance under the Reproductive and Child Health programme. The first round was conducted in 1998-99 and the second round of the survey was conducted between 2002 and 2004. The survey used a systematic multi-stage stratified sampling; stages of selection are districts, primary sampling units (PSUs) and households; 1000 representative households were identified for the survey using appropriate sampling procedure from each district. Thirty percent of the sample was from urban areas and were based on NSSO urban sampling frame. The survey provides district level information on prevalence of undernutrition (weight for age using the SD classification) in children in the age group 0-72 months, prevalence of anaemia (Hb estimation by cyanmethaemoglobin method) in children (0-72 months), adolescent girls (10-19yrs) and pregnant women, household availability of iodised salt and coverage under the massive dose vitamin A programme.

Micronutrients Surveys

NNMB and ICMR have conducted micronutrient surveys at subnational level during the last few years. In addition, NFHS and DLHS provide information on the household availability of iodised salt and coverage under massive dose vitamin A programme. NHFS-2 and 3 undertook haemoglobin estimation in women and children but the method used (haemocue) has been shown to overestimate haemoglobin and consequently underestimate the prevalence of anaemia.

References

7.1.1 District Level Household Survey http://www.rchindia.org/dlhs_india.htm; last accessed on 24/09/07

7.1.2 Department of Women and Child Development. 1995-96. *Indian Nutrition Profile*. Government of India, New Delhi

7.1.3 Indian Council of Medical Research. 1989. *Nutrient Requirements and Recommended Dietary allowances for Indians.* New Delhi

7.1.4 National Family Health Survey (NFHS-1): http://www.nfhsindia.org/india1.html; last accessed on 24/09/07

7.1.5 National Family Health Survey (NFHS-2): http://www.nfhsindia.org/india2.html; last accessed on 24/09/07

7.1.6 National Family Health Survey (NFHS-3): http://mohfw.nic.in/nfhsfactsheet.htm; last accessed on 24/09/07

7.1.7 NNMB National Nutrition Monitoring Bureau. 1979-2002. *NNMB Reports:* National Institute Of Nutrition, Hyderabad

7.1.8 National Institute of Nutrition. 2004. *Nutritive Value of Indian Foods.* Hyderabad.

7.1.9 National Sample Survey Organization NSSO. 1975-2000.; http://mospi.nic.in/mospi_nsso_rept_pubn.htm; last accessed on 24/09/07

7.1.10 WHO child growth standards, 2006: http://www.who.int/childgrowth/en/ : last accessed on 24/09/07

7.2 DIETARY INTAKES AND NUTRITIONAL STATUS

NNMB surveys provide data on time trends in dietary intake (by 24 hours dietary recall) and nutritional status of the population in eight states from 1975 to 2005. The NNMB and INP surveys provide information on dietary intake and nutritional status of all major states in India in mid nineties.

Time Trends in dietary intake

Data on time trends in dietary intake in rural areas (Annexure 7.2.1) and urban slums in nine states was available from surveys conducted by the NNMB (Table 7.2.1). Data from NNMB surveys shows that over the last decade there has been some decline in cereal intake both in urban and rural areas. Over this period there has been a substantial decline in the cost of cereals and improvement in availability of and access to cereals. The decline is therefore not due to economic constraints. Over the same period there has been a decline in the dietary intake of pulses, which are a major source of protein in Indian diets. This is partly attributable to the soaring cost of pulses and inability of the poor to purchase adequate quantity inspite of higher expenditure on pulses. In spite of massive increase in milk out put in the country, improvement in per capita intake of milk over years has been small. Intake of vegetables and fruits also continues to be very low. In rural areas there has not been any significant increase in per-capita intake of fats/oils and sugar/jaggery. Data from NNMB rural surveys suggest that dietary intake has not undergone any major shift towards increase in intake of fat/oils, sugar and processed food in rural population. However in urban slum dwellers there has been an increase in oil intake and some increase in sugar intake.

Intake of cereals and leafy vegetables are lower in urban areas; however intake of pulses, milk and milk products, fruits and fat and oils are higher in urban areas (Table 7.2.1). There are no urban rural differences in sugar and other vegetable intake. Data from NNMB and INP surveys (using 24 hour dietary recall method) show that in the mid nineties average intake of cereals were near RDA; intake of pulses, vegetables and fruits were low (Table 7.2.1, Annexure 7.2.1, 7.2.2, 7.2.4).

Table 7.2.1: Dietary Intake in Rural and Urban areas (g/intake unit /day)

	NNMB							INP (1995-96)		RDA
	Rural					Urban Slums		Rural	Urban	
	75-79	88-90	96-97	00-01	04-05	75-79	93-94			
Cereals & Millets	505	490	450	457	396	416	380	488	420	460
Dairy products	116	92	85	85	116.6	42	75	126	143	150
Pulses & Legumes	34	32	29	34	28	33	27	33	55	40
Vegetables										
Green leafy	8	9	15	18	16	11	16	32	23	40
Others(includes tubers)	54	49	47	57	109	40	47	70	75	60
Fruits	13	23	24	25	27	26	26	15	37	50
Fats & oil	14	13	12	14	14	13	17	14	21	20
Sugar & jaggery	23	29	21	23	14	20	22	20	22	30

Source: Reference 7.2.1 & 7.2.2

Interstate differences in dietary intake

NNMB

Cereals and millets formed the bulk of dietaries in all states. The intake of cereals was adequate to meet the RDA in most of the states. Cereal intake was lowest in Kerala and intake of cereal and millets was highest in Orissa. Cereal and millet intake was lower in the 1996-97 surveys than that in the previous two surveys in almost all the States, with Karnataka showing the steepest fall. Intake of pulses was less than the RDA in all states, with intake in Kerala being less than 50% of the RDA. With the exception of Kerala and Gujarat, in all other states the intake of pulses has gone down between 1975-79 and 1996-97. The intake of green leafy vegetables (GLV's) is considerably lower than the RDA in all states with the exception of Orissa. Although there was an increase intake of GLV's (except in the state of Maharashtra) between 1975-79 and 1996-97, the increase was marginal. Dietary intake of GLV's is still way below the RDA in all states except Orissa where the intake met the RDA in 1996-97. The intake of other vegetables is below the RDA in almost all the states (except Kerala and Orissa), with intake in Karnataka and Andhra Pradesh being less than half the RDA. In 1996-97, a steep fall in vegetable intake was observed in Kerala and Tamil Nadu, as compared to the intake in 1975-79. Intake of roots and tubers was lowest in Andhra. Roots and tuber intake was highest in Kerala and Orissa. The intake of milk was less than the recommended level of 150 ml in all states except Gujarat. Intake of milk and milk products were highest in Gujarat and lowest in Orissa. In none of the States, the intakes of fats and oils were adequate. A marginal increase was however observed in the intake of fats and oils in 1996-97 as compared to 1975-79 (Annexure 7.2.1).

INP

The state wise data on average intake of foodstuff under INP survey is given in Annexure 7.2.2. Intake of cereals and roots and tubers, which constitute the major bulk of Indian diet, was adequate in most states and UT's. The exceptions were Chandigarh, Delhi, Arunachal Pradesh, Meghalaya, Mizoram, Goa, Maharashtra, Daman and Diu and Dadra and Nagar Haveli for cereals and Goa for roots and tubers. Average intake of pulses was inadequate in most of the states except Chandigarh, Delhi, Mizoram, Tripura, Dadra and Nagar Haveli. Average intake of green leafy vegetables was markedly below their RDAs in most of the states except in those in hill states of northeastern region (except Meghalaya) Himachal Pradesh, Sikkim and Daman and Diu. The intake of other vegetables was adequate in most of the states except in Haryana, Himachal Pradesh, Punjab, Rajasthan and Nagaland. Intake of milk and its products and fats and oils was inadequate in almost all the districts of India excepting those belonging to northern region, Haryana, Himachal Pradesh, Punjab, Rajasthan, Chandigarh and Delhi. Intake of fats and oils was adequate in Mizoram and Daman and Diu.

There were significant differences in dietary intake between NNMB states and states covered under INP surveys (Annexure 7.2.1, 7.2.2). The dietary intake of all foodstuffs is lower in all age groups NNMB states (Annexure 7.2.3) as compared to INP states (Annexure 7.2.4); this is attributable to higher dietary intake especially cereals and pulses in the non-NNMB states, which were covered in the INP. Dietary intake was higher in some states with high per capita income (Punjab) but not in others (Maharashtra) suggesting that greater per-capita income is not always associated with higher dietary intake. Both NNMB and INP data showed that cereal intake was higher in some of the poor states (Orissa in NNMB, Uttar Pradesh in INP survey); this is perhaps because majority of the population are working as manual labourers and require high cereal intake to meet their energy requirements. NNMB surveys in 2004 indicated that as compared to 1975-80 there has been a reduction in cereal intake; pulse intake, vegetable and fruit intake remained unchanged (Annexure 7.2.3) in all age groups.

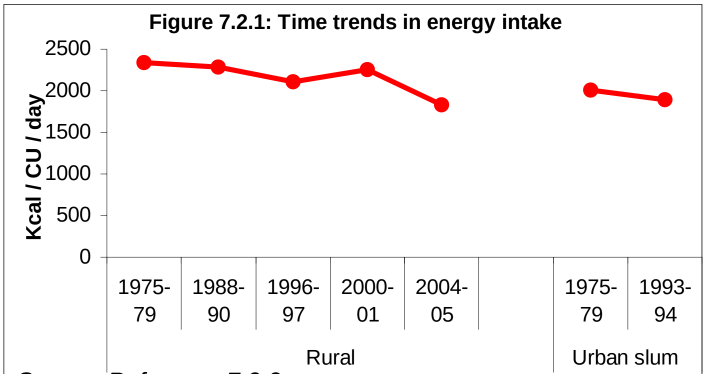
Time trends in of nutrient intake

Data on time trends in nutrient intake is available from surveys conducted by the NNMB (Table 7.2.2 & Annexure 7.2.5). Data from NNMB surveys show that over the last decade there has been a small decline in energy intake (Figure 7.2.1). There has been some decline in intake of most of the nutrients both in urban and rural areas over the last three decades. Over the past three decades there have been a reduction in percent of total energy intake from carbohydrates and some increase in percent dietary energy from fats (Figure 7.2.2). In spite of this, the proportion of dietary energy from fat remains lower than 15 %. However, these aggregate measures mask large disparities between intakes of urban and rural populations, different states and different socio-economic groups. Dietary intake of iron from Indian dietaries has always been low**.** The steep decline reported in iron intake in the last two NNMB surveys can be attributed to different estimation methods; newer methods showed that absorbable iron was only 50% of earlier values.

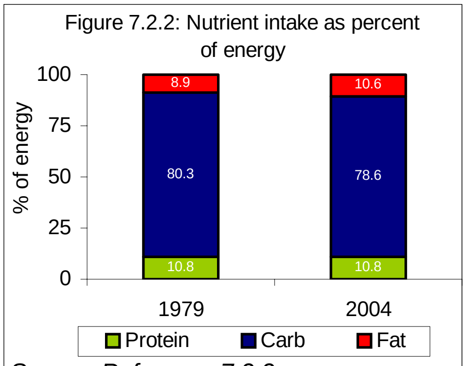
Table 7.2.2: Nutrient Intake in Rural and Urban (CU/day)

	NNMB							INP (1995-96)	
	Rural					Urban Slums		Rural	Urban
	1975-79	1988-90	1996-97	2000-01	2004-05	1975-79	1993-94		
Energy (Kcal)	2340	2283	2108	2255	1834	2008	1896	2321	2259
Protein (g)	62.9	61.8	53.7	58.7	49.4	53.4	46.75	70	70
Calcium (mg)	590	556	521	523	439	492	*	631	673.4
Iron (mg)	30.2	28.4	24.9	17.5@	14.8	24.9	18.96	23.2	22.3
Vitamin A	257	294	300	242	257	248	352.5	355	356.0
Thiamin	1.6	1.5	1.2	1.4	1.2	1.27	*	1.9	1.9
Riboflavin	0.9	0.9	0.9	0.8	0.6	0.81	0.79	1.0	1.0
Niacin	15.7	15.5	12.7	17.1	14.7	14.6	*	19.7	18.8
Vitamin C	37	37	40	51	44	40	42	55.2	62.4
Folic acid	*	*	153	62	52.3	*	*	*	*

Source: Reference 7.2.1 & 7.2.2



Source: Reference 7.2.2



Source: Reference 7.2.2

Energy intake is lower in urban areas in spite of higher intake of fats and oils because of lower cereal intake (Table 7.2.2). Data from NNMB suggests that the intake of all nutrients is lower in urban slums as compared to rural areas.

INP survey, which covered most of the major states not covered by NNMB surveys, did not show any significant difference in nutrient intake between urban and rural areas (Annexure 7.2.6). Interstate differences in nutrient intake and the fact that NNMB survey data was available only from urban slums are some of the factors that might account for the apparent differences between NNMB and the INP survey data.

Interstate Differences in nutrient intake

NNMB

Time trends in nutrient intake in different NNMB states are given in Annexure 7.2.5. The trends in nutrient intakes in states are similar to overall trends even though there are substantial inter state differences. There was a reduction in energy, protein, iron and calcium intakes, between 1975-79 and 1996-97. Although intake of vitamin A was higher 1988-90 and 1996-97 as compared to 1975-79, but was still way below RDA. There has been a gradual increase in the intake of riboflavin between 1975-79 and 1996-97. Thiamin intake showed a decline over the same period. Intake of protein, energy, vitamin A and riboflavin were less than the RDA in almost all States. Calcium intakes were above the RDA (400 mg) in all the States except in Orissa. Iron intake (as per the revised nutritive values for Indian foods) is low. Bioavailability of iron from Indian diets is very low. Low dietary intake coupled with poor absorption is the major reason for widespread prevalence of anaemia. For the first time, NNMB computed folate content of the diets in 1997-97, the intake of which was less than RDA of 200 μg in all the States, except Gujarat. Inspite of low nutrient intake, Kerala, has lowest prevalence of undernutrition and nutritional deficiency signs. This can be attributed to a relatively more egalitarian society with equitable distribution of food based on needs and ready access to health services; high literacy rate and consequent awareness about importance of health, hygiene and sanitation and ability to access services may also have played an important role. Orissa has the highest dietary intakes of nutrients but this high intake does not lead to a better nutritional status perhaps due to inequitable distribution of food within the state, districts, different income groups and within the family. Poor access to health care might be another factor that aggravates under-nutrition.

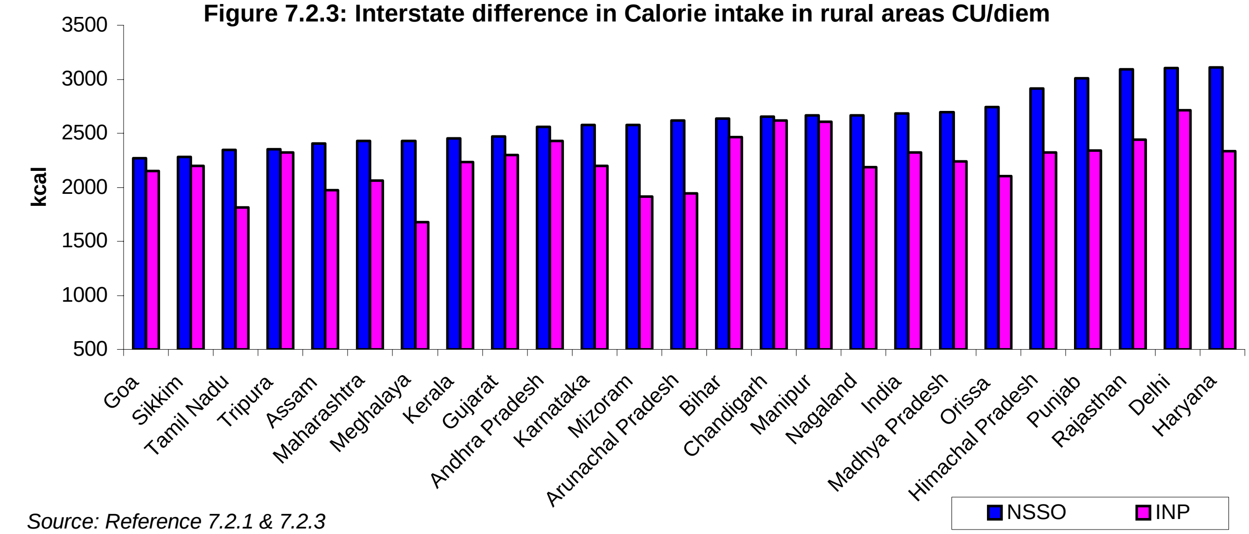
INP

India Nutrition Profile (INP) provides data on nutrient intake in all non-NNMB states of the country in urban and rural areas. The reported nutrient intake in most of the states is higher in INP as compared to National Nutrition Monitoring Bureau (NNMB). At the aggregate national level, total energy intake was less than 2,300 kcal/ cu/ day, even in the mid-nineties (Annexure 7.2.6).

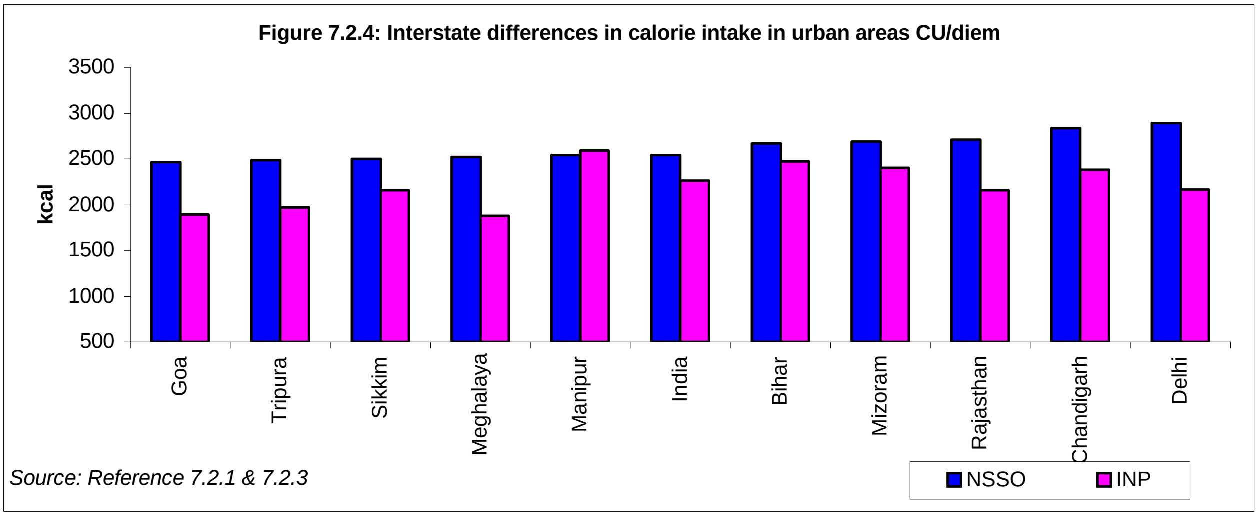
Average intake of nutrients (cu/day) for all the states covered in INP is shown in Annexure 7.2.6. The total energy intake did not meet requirements in the states except in Chandigarh, Bihar, Manipur and Daman and Diu. Intake of protein was marginally higher than NNMB states in almost all INP states. Iron intake met around or more than 70% of the recommended level, though, it was inadequate in Assam, Mizoram and Goa. However, the NIN has revised iron content of foodstuffs in the Nutritive Value of Indian; if this correction is applied to INP states iron intake is low in all the states. The poor dietary intake and low bioavailability of iron mostly from vegetable based diet are the major factors responsible for high prevalence of anaemia. Average calcium, thiamin, niacin and vitamin C intake were adequate in almost all the states surveyed; vitamin A intake was inadequate in most of the states except Arunachal Pradesh, Mizoram and Nagaland.

Data on energy consumption per consumption unit in different states computed from NSSO consumer expenditure survey in 1993-94 were compared with energy intake per consumption unit per day computed from NNMB survey1996-97 and INP 1995-96 using 24 hour dietary recall method (Figure 7.2.3, 7.2.4, and 7.2.5). In all the states energy

Figure 7.2.3: Interstate difference in Calorie intake in rural areas CU/diem



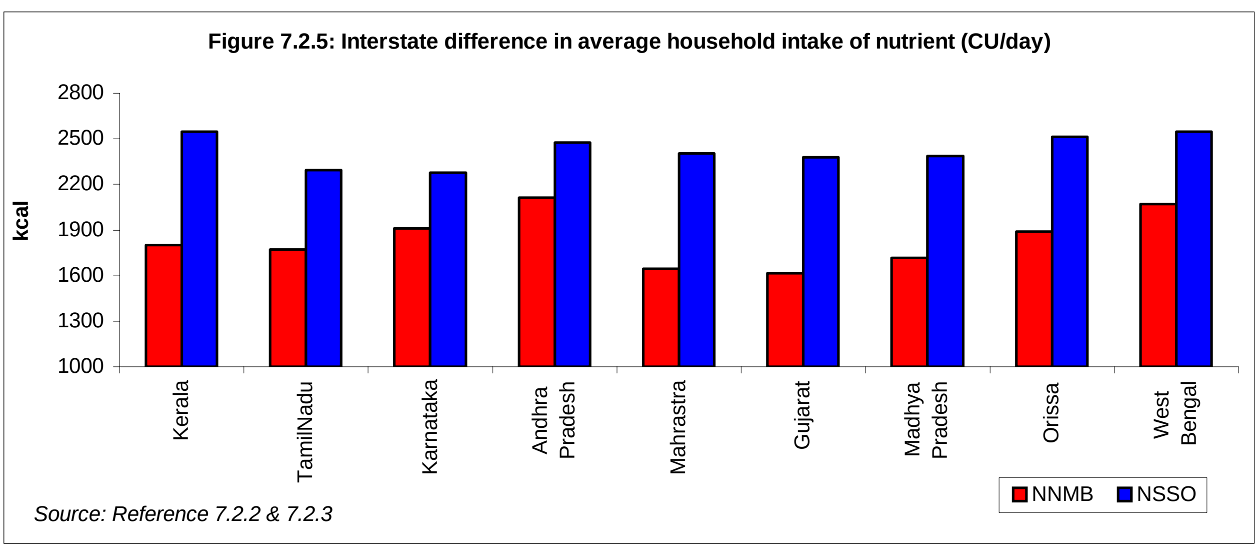
Source: Reference 7.2.1 & 7.2.3



intake computed from NSSO was higher than energy intake computed from NNMB/INP survey. The magnitude of difference is relatively low in Goa, Sikkim, Kerala, Andhra, Bihar, Chandigarh, and Manipur. The difference in energy intake between NSSO urban and INP urban survey were relatively small. The higher energy consumption in NSSO rural surveys might be attributable to the fact that NSSO surveys take into account the total household expenditure on food for computing consumption; food sharing between family, guests or servants will therefore not be taken into account in NSSO surveys, but will be taken into account while computing household dietary intake in NNMB/INP surveys.

Source of dietary energy

Data on time trends in total energy intake, % of energy intake from fat, carbohydrate and protein from NNMB (9 states) and data on in total energy intake, % of energy intake from fat, carbohydrate and protein from all the major states from INP in different age groups is given in Annexure 7.2.7. Carbohydrates remain the major source of energy in Indian dietaries. There has been no major change in % of total energy intake from



carbohydrates and protein and some increase in % dietary energy from fats over the past three decades at the aggregate level. Even now the proportion of dietary energy from fat is far lower than 15% (Figure 7.2.2).

Data from diet surveys suggest that dietary intake has not under gone any major shift towards increase in intake of fat/oils, sugar and processed food. There has not been any increase in energy intake in any age group (Annexure 7.2.8 and 7.2.9). The undernutrition appears to be mainly due to improved access to health care. The reported improvement in child problem of overnutrition in adults and health hazards associated with it appears to be attributable mainly to reduction in physical activity.

Effect of family income on dietary and nutrient intake

Data on dietary and nutrient intake from the pooled data of NNMB survey 1996-97 was analysed with respect to per capita monthly income to assess the effect of income on these parameters (Table 7.2.3 and 7.3.4). The intake of cereals and millets was highest in the lowest socioeconomic group; however, their diet lacked diversity. With increasing incomes, the intake of cereals decreased but dietary diversification increased

It is noteworthy that the intake of protein, energy, total fat and riboflavin increased with increase in income but iron and vitamin A intakes remained lower than the RDA in all income groups. It is therefore not surprising that over 85 % of Indians are anaemic and anaemia remains the most common micronutrient deficiency in the country.

Dietary diversity

National Family Health Survey-2 (NFHS-2, IIPS, 1998-99) collected data on frequency of intake of various types of foods (other than cereals which are consumed everyday by everyone) from women (daily, weekly or occasionally) to assess dietary diversity among 90,000 ever-married women in the age group 15–49 living in 26 states; however details regarding quantity of intake were not obtained from these women. Data from the survey are presented in Annexure 7.2.10 and 7.2.11. All adult women in India consume cereals every day; their diets tend to be monotonous and there is very little dietary diversity. Fruits are eaten daily by only 8 % of women and only one-third of women eat fruits at least once a week. Almost one-third of women in India never eat chicken, meat, or fish

Table 7.2.3:Intake of foodstuffs according to per capita monthly income (g/Cu/Day) NNMB 1996-97

Intake of foods (CU/day) based on Per Capita Monthly Income (Rs.)						
	<30	30-60	60-150	155-300	>300	RDA
Cereals and Millets	505	484	443	407	381	460
Pulses and Legumes	33	30	36	32	39	40
Green leafy veg.	19	13	11	10	6	40
Milk and milk products	51	69	103	184	284	150
Fats and oils	9	12	14	18	24	20
Sugar and Jaggery	13	21	29	30	36	40
Source: Reference 7.2.2						

Table 7.2.4: Intake of nutrients according to per capita monthly income (g/Cu/Day) NNMB 1996-97						
Intake of nutrients (CU/day) as per Per Capita Monthly Income (Rs.)						
Nutrients	**<30**	**30-60**	**60-150**	**155-300**	**>300**	**RDA**
Proteins	53	54	57	59	65	60
Energy	2134	2145	2210	2283	2428	2425
Total fat	20	25	35	51	66	40
Iron	26.6	25.8	25.6	24.9	25.2	28
Vitamin A	330	257	290	306	327	600
Riboflavin	0.7	0.8	0.8	0.9	1.1	1.4

Source: Reference 7.2.2

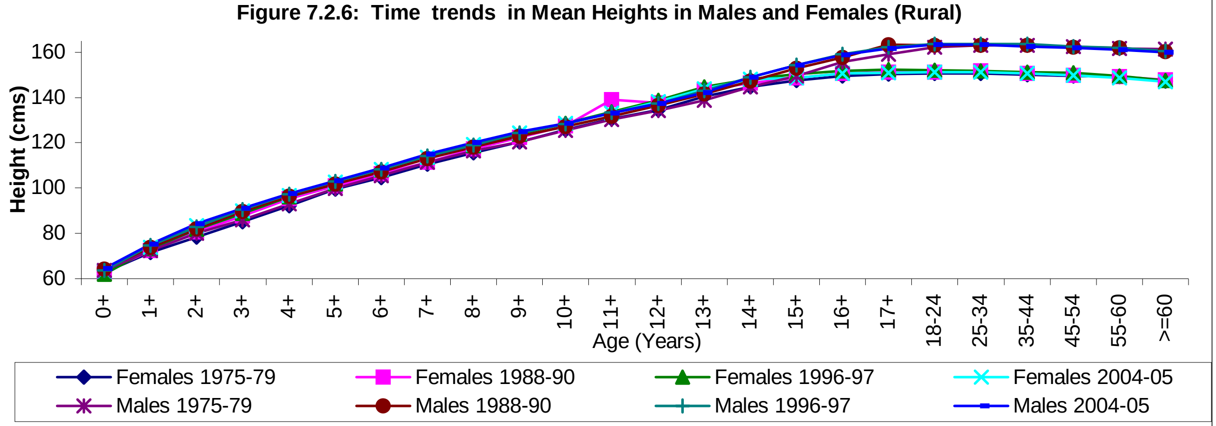
and very few women (only 6 %) eat chicken, meat, or fish every day. Eggs are consumed less often than chicken, meat, or fish.

There were substantial differentials in food intake patterns by selected background characteristics. Poverty has a strong negative effect on dietary diversity. Women in households belonging to low socio-economic group are less likely than other women to eat items from each type of food group listed, and their diet is particularly deficient in fruits and milk or curd. Age does not play an important role in women's intake patterns. Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly fruits and milk or curd. Illiterate women have less varied diets than literate women, and seldom eat fruits. There are substantial inter state differences in intake of different types of food.

Time trends in nutritional status

Data NNMB rural surveys on time trends in weight, mid-arm circumference and triceps fat fold thickness in all age groups is shown in Figures 7.2.6, 7.2.7, 7.2.8 and 7.2.9 respectively. Even in rural population there is an increase of about four cms in adult height; the increase in body weight over the period is greater. This is mainly due to fat deposition as shown by progressive increase in the fat fold thickness over this period.

Figure 7.2.6: Time trends in Mean Heights in Males and Females (Rural)



Source: Reference 7.2.2

Figure 7.2.7: Time trends in Mean Weights in Males and Females (Rural)

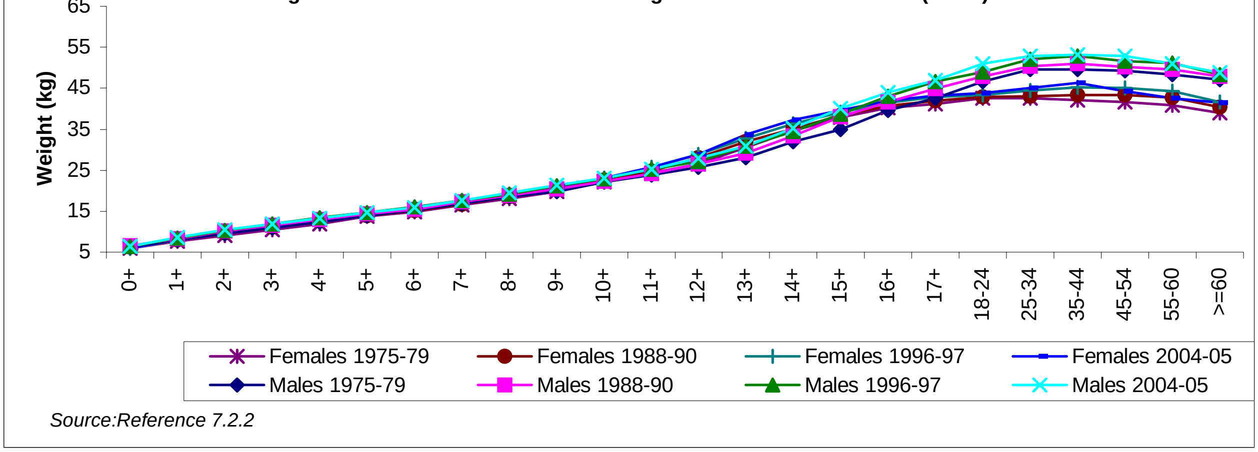


Figure 7.2.8: Time trends in Mean Arm circumferences of Males and Females (Rural)

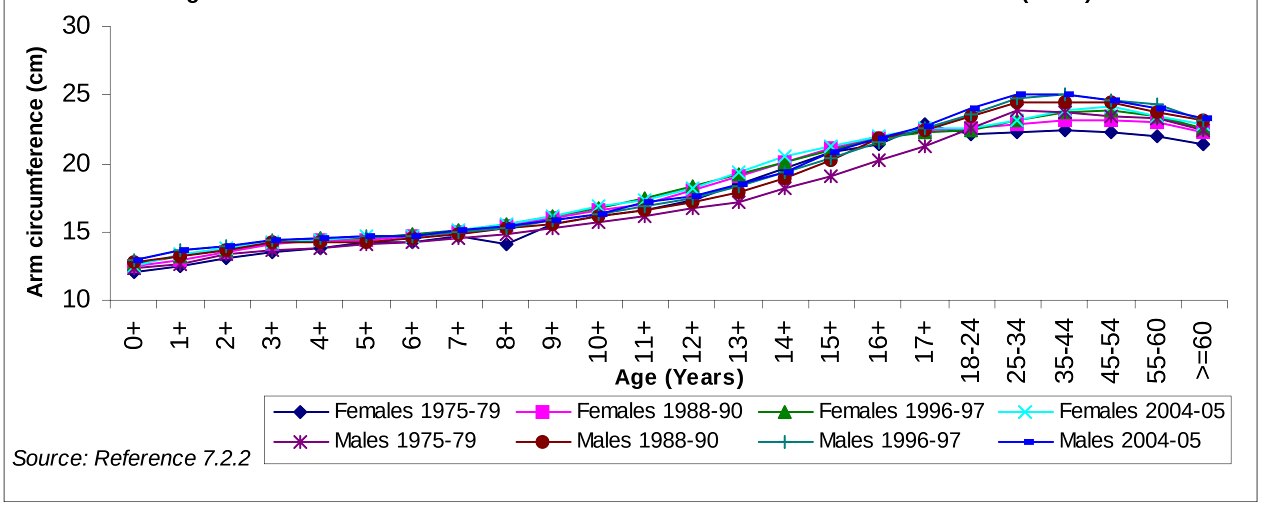
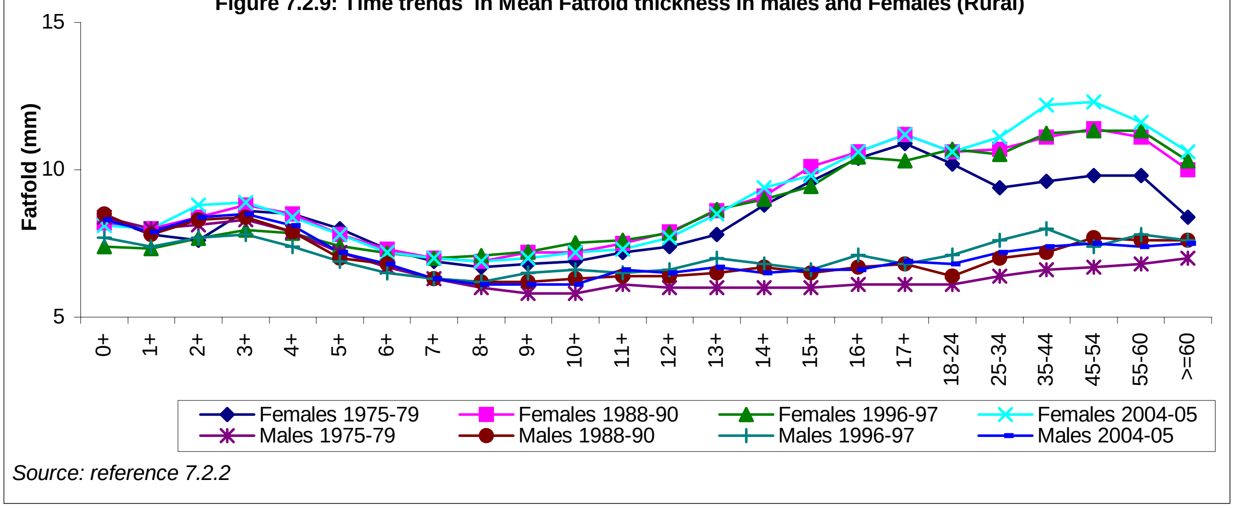


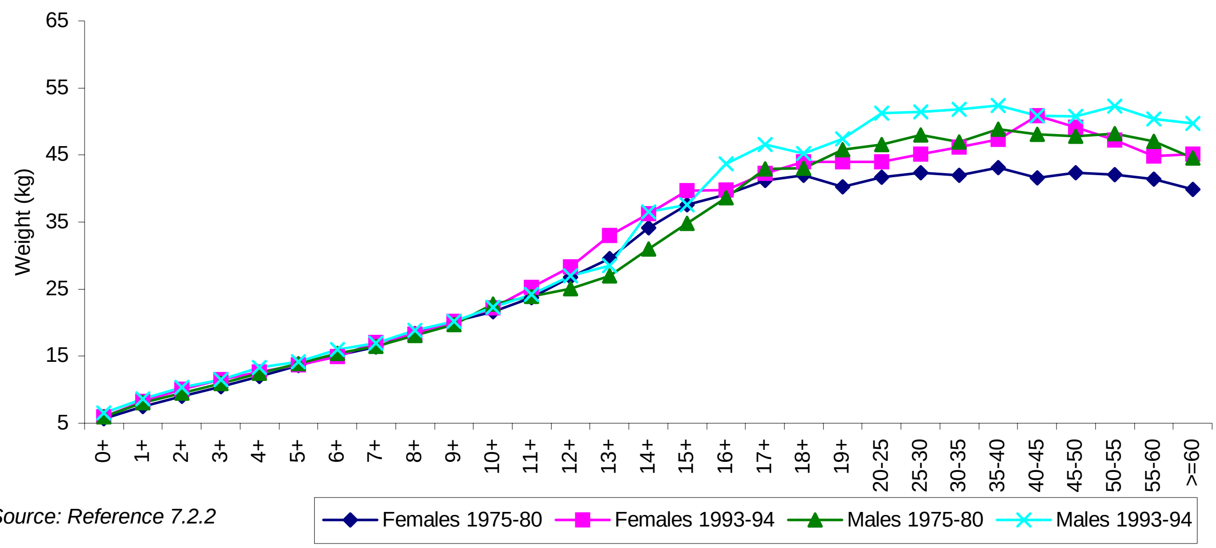
Figure 7.2.9: Time trends in Mean Fatfold thickness in males and Females (Rural)



The increase in fat fold thickness over the last three decades begins in childhood and increases with age in both males and females. The increase is more in women.

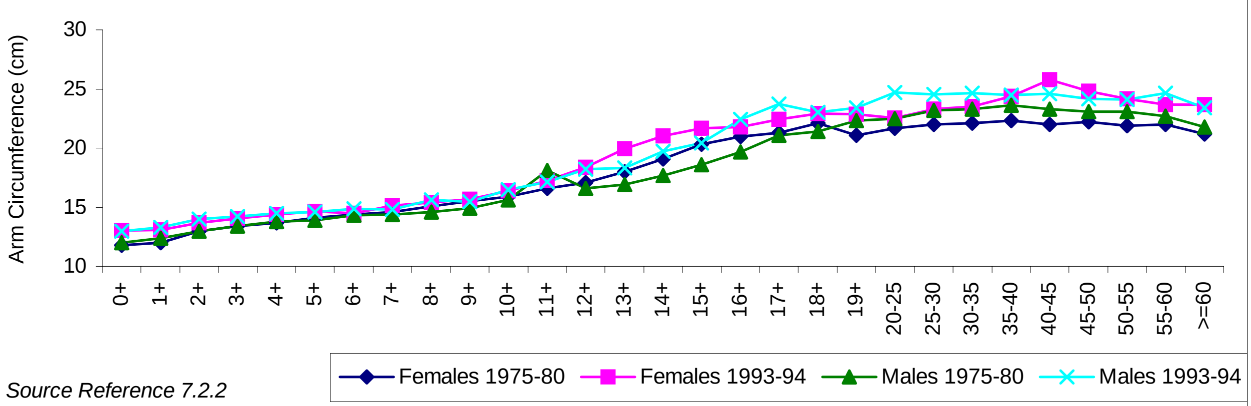
Data from NNMB surveys in urban slums on time trends in weight; mid-upper arm circumference and fat fold thickness at triceps are shown in Figure 7.2.10, 7.2.11, 7.2.12 and 7.2.13. Mean body weight, mid upper arm circumference and fat fold thickness at triceps are higher in all age groups in 1993 - 94. The increase in body weight is mainly due to increase fat as shown by rising fat fold thickness. Data from NNMB reports shows that both in men and women over years, there have been an increase in body weight and fat fold thickness. The increase in body weight and fat fold is greater in urban slum dwellers.

Figure 7.2.10: Time trends in weights of males and females (Urban)

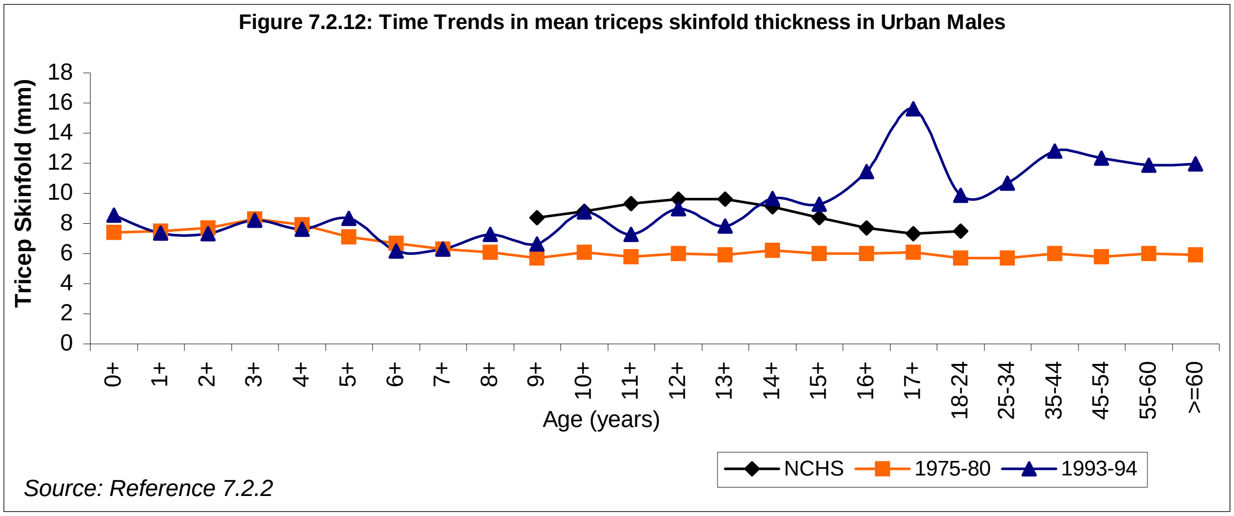


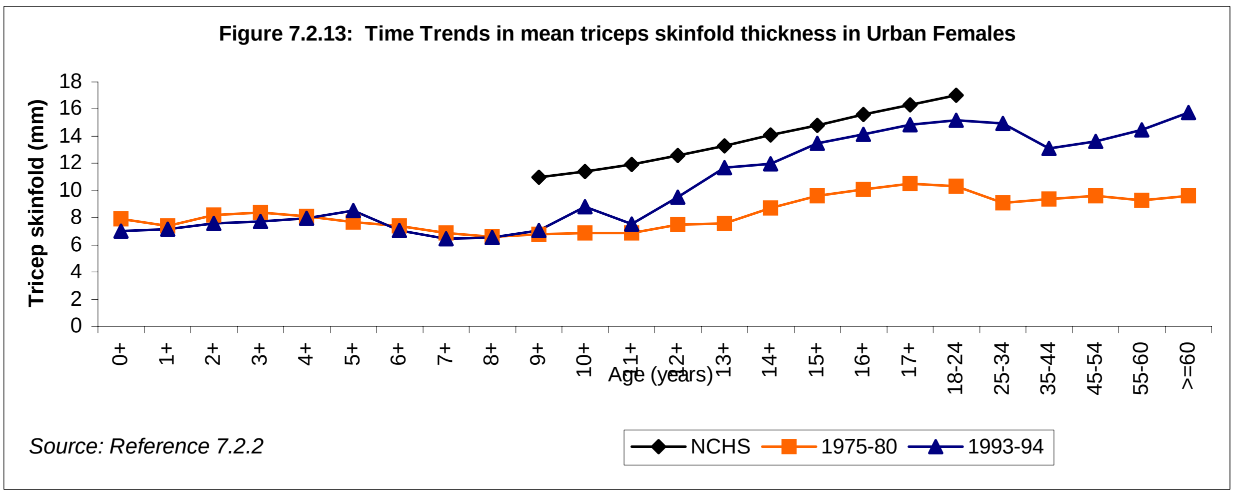
Source: Reference 7.2.2

Figure 7.2.11: Time Trends in Mean Arm Circumference of Males and Females (Urban slum)



Source Reference 7.2.2





To sum up data from NNMB surveys indicate that during the past three decades diets continue to be cereal based and monotonous; among poorer segments fruit, vegetable and animal food intake continues to be low. There has been

- a progressive reduction in already low pulse intake
- small increase in fats and oil intake in urban slums
- increase in dietary diversity among rural high income group

There has been reduction in energy and protein intake except among the poor; over all there has been a small decrease in total energy and protein intake in both urban and rural areas.

- some increase in dietary energy derived from fat and a reciprocal reduction in %age of dietary energy derived from carbohydrate.

Intakes of most micronutrients continue to be low. Iron intake is low; this coupled with poor bio-availability of iron from Indian diets is responsible for high prevalence of anaemia. There has been:

- small 2-4 cm increase in height over three decades both in urban and rural areas
- there has been a greater increase in weight, more in the urban than in rural areas

The weight gain appears to be mainly due to increase in body fat-the increase in fat fold thickness is more in urban areas

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7.2.2 National Nutrition Monitoring Bureau (NNMB). 1979-2002. *NNMB Reports:* National Institute Of Nutrition, Hyderabad

7.2.3 National Sample Survey Organization (NSSO). 1975-2000.; http://mospi.nic.in/mospi_nsso_rept_pubn.htm; last accessed on 24/09/07

7.2.4 National Family Health Survey (NFHS-2): http://www.nfhsindia.org/india2.html; last accessed on 24/09/07

7.2.5 National Family Health Survey (NFHS-3): http://mohfw.nic.in/nfhsfactsheet.htm; last accessed on 24/09/07

Annexure 7.2.1

Time trends and interstate differences in dietary intake- NNMB

	Year	Kerala	Tamilnadu	Karnataka	Andhra Pradesh	Maharashtra	Gujarat	Orissa	Pooled	*RDA*
Cereals & Millets	1975-79	341	490	682	568	502	452	* -	505	
	1988-90	369	406	548	534	463	493	540	469	**460**
	1996-97	352	407	458	496	443	431	538	450	
	2004-05	320	386	429	449	329	333	444	396	
Pulses	1975-79	14	32	60	31	37	30	-	34	
	1988-90	18	27	50	28	36	32	32	32	**40**
	1996-97	17	28	41	30	33	34	21	27	
	2004-05	23	37	37	30	33	20	29	28	
Green Leafy Veg.	1975-79	4	9	6	6	15	8	-	8	
	1988-90	9	12	10	7	13	4	25	9	**40**
	1996-97	10	10	8	9	9	7	47	15	
	2004-05	7	10	8	6	10	9	43	16	
Other vegetables	1975-79	81	63	33	39	50	58	-	54	
	1988-90	65	53	22	40	55	60	69	49	**60**
	1996-97	63	41	27	28	52	53	64	47	
	2004-05	56	46	23	38	26	78	73	49	
Roots & Tubers	1975-79	135	58	26	25	20	37	-	56	
	1988-90	63	40	31	29	32	52	68	41	**50**
	1996-97	60	48	31	21	29	44	71	44	
	2004-05	53	41	40	34	20	53	99	60	
Milk & Milk Products	1975-79	47	79	78	98	92	180	-	116	
	1988-90	87	69	91	82	85	139	38	92	**150**
	1996-97	122	88	83	76	75	157	12	86	
	2004-05	66	102	84	112	77	170	14	82	
Fats & oils	1975-79	4	12	7	13	13	17	-	14	
	1988-90	14	9	8	12	15	21	7	13	**20**
	1996-97	9	10	10	9	16	19	8	12	
	2004-05	6	12	9	18	22	21	10	14	
Sugar & Jaggery	1975-79	19	20	31	21	31	29	-	23	
	1988-90	32	24	30	10	33	35	5	29	
	1996-97	26	20	29		30	30	6	21	**30**
	2004-05	18	11	19	10	29	11	7	14	

Annexure 7.2.2

State wise average dietary intake (g/cu/day) - INP survey												
States	**Area**	**Cereals**	**Pulses & legumes**	**GLV**	**Roots & tubers**	**Other Veg.**	**Fruits**	**Condi. Spices**	**All flesh food**	**Milk & its prod.**	**Fats & Oils**	**Sugar**
RDA		**460**	**40**	**40**	**50**	**60**				**150**	**20**	**30**
Haryana	R	433	26	21	56	38	13	5	0	344	22	43
Himachal Pr.	R	470	52	47	67	43	7	2	6	187	20	24
Punjab	R	447	35	27	74	47	7	<1	2	303	7	57
Rajasthan	C	483.6	29.1	24.2	79.2	45.3	24.8	16	5.9	197.7	22.3	25.3
	R	503.8	26.7	23.5	78.6	45	19.8	15.9	4.8	201.4	21	25.4
	U	396.2	39.5	27.3	81.6	46.5	30.4	16.3	10.6	181.7	28.1	24.7
Chandigarh	C	346.3	72.9	19.4	102.3	52.2	70.1	8	9.3	310.5	33.5	44.7
	R	416.7	61.5	5.7	97.8	39.5	16.5	13.2	3.3	259.9	43.9	49.3
	U	335.4	74.7	21.5	103	54.2	78.4	7.2	10.2	318.3	31.9	44
Delhi	C	366	66.6	17.5	125	63.9	49.3	12.6	16.7	169.3	24.1	25.9
	R	484.3	86.6	6.1	163.2	7.3	55.3	11.2	0.9	115	43.9	17.6
	U	361.4	65.9	18	123.5	66.1	49	12.6	17.3	171.4	23.3	26.2
Bihar	C	541.7	37.7	18.3	154.9	106.7	17.8	12.4	8.1	44	12.5	7.4
	R	542.7	36.2	18.7	151.4	106.1	16.7	12.3	7.4	39.4	12.1	6.6
	U	536.7	45	16	172.1	110	22.9	13.2	11.9	66.3	14.5	11.2
Sikkim	C	465.9	39.3	49.1	106.6	62.7	1.6	5.3	40.6	105	12.7	5.7
	R	474.2	36.3	51.3	108.1	60.6	0.8	5.4	39.1	97.3	12.2	4.4
	U	416.8	57	36.5	97.7	75.6	5.9	4.6	49.4	150.5	15.7	13.2
Arunachal Pr	R	377.5	29.4	108.8	111.4	85.4	44.1	7.4	192.6	33.4	3.2	3.3
Assam	R	450	23	25	72	62	8	13	38	34	10	16
Manipur	C	631.2	22.2	84.9	60.9	69.6	0.3	16	75.5	19.7	5.6	5.2
	R	633	23.8	79.7	62	72.7	0.2	16.9	74.2	19.3	5.7	4.7
	U	623.8	15.8	105.6	56.9	57.2	0.9	12.8	80.8	21.2	5.6	7.1
Meghalaya	C	269	17.2	29.2	68.4	66.3	9.1	15.3	102.4	117.9	16.3	23.9
	R	290.3	16.8	28.8	65.8	66.7	10	14.3	102.9	122	15.9	24
	U	338	20.1	32.1	87.6	63.3	2.5	22.7	98.4	87.3	19.4	23
Mizoram	C	332.6	46.6	137.6	71.2	64.8	10.3	5.2	59.6	82.9	21.1	27.2
	R	315.1	41.4	130	64.3	59.8	8.2	4.2	51.9	65.6	19.4	27.7
	U	400.1	66.6	167.2	97.7	84.1	18.1	9	89.4	149.4	28	25.1
Nagaland	R	468.8	15.5	116.5	40.8	29.5	0.2	34.8	114.9	73.2	14	10.9
Tripura	C	470.1	56.2	51.9	62.6	99.5	34.1	4.6	90	54.7	12.7	8.9
	R	473.2	56.2	53.4	63.2	96.8	35.5	4.8	92.2	55	12.4	8.8
	U	396.4	56.8	15	48.2	165.6	0	0	38.9	46.2	19.4	12.8
Daman & Diu	R	391.1	55.3	41.8	44.1	66.2	6.8	30	93.6	107.2	49.4	37.7
D & N Haveli	R	369	85	26	45.2	62.5	2.9	36	14.4	14.4	16.6	10.5
Goa	C	408.5	10.5	27.2	15.3	49	14.1	13	77.1	59.8	14.6	39.4
	R	422.5	10.5	25.6	17.7	51.9	14.7	11	75.1	57.2	15	40.2
	U	357.2	10.5	33	6.5	38.4	11.7	20.4	84.6	69.3	13.3	36.5
C= Combined, R= Rural, U=Urban												
Source India Nutrition Profile 1996-97												

Age wise distribution of average intake of nutrients-NNMB											
			Cereals & Millets	Pulses & Legumes	Milk & Milk Products	GLV's	Roots & tubers	Other vegetables	Fruits	Fats & Oil	Sugar & Jaggery
12-13	**Boys**	**1975-79**	340	27	47	9	43	41	10	7	14
		1996-97	371	26	66	15	39	35	20	11	19
		2000-01	329	21	48	15	51	37	15	9	14
		2004-05	308	23	64	15	47	36	21	12	12
	Girls	**1975-79**	328	24	45	8	40	43	10	7	14
		1996-97	348	25	53	14	41	38	22	9	19
		2000-01	325	23	47	14	45	33	17	8	14
		2004-05	303	23	54	13	49	34	21	10	10
13-15	**Boys**	**1975-79**	378	26	51	12	51	51	10	9	15
		1996-97	428	28	65	12	49	47	35	11	19
		2000-01	402	25	58	15	60	44	16	11	16
		2004-05	362	25	64	14	50	39	22	12	12
	Girls	**1975-79**	367	25	49	8	50	40	9	7	16
		1996-97	399	26	56	16	54	44	16	10	18
		2000-01	369	24	50	16	55	41	17	10	14
		2004-05	341	24	63	15	49	40	23	11	13
16-17	**Boys**	**1975-79**	463	35	54	10	61	48	10	10	16
		1996-97	515	32	68	23	53	58	24	13	19
		2000-01	472	29	51	16	62	49	16	11	15
		2004-05	426	29	79	14	59	50	25	14	12
	Girls	**1975-79**	384	28	53	10	58	55	15	9	15
		1996-97	443	27	71	14	57	50	22	11	19
		2000-01	402	25	53	17	62	43	16	10	15
		2004-05	354	24	71	15	48	41	26	12	13
Men		**1975-79**	495	37	66	13	59	55	14	11	18
		1996-97	541	35	74	17	56	54	31	15	21
		2000-01	457	34	85	18	75	57	28	14	17
		2004-05	418	31	94	17	68	63	27	16	15
NPNL women		**1975-79**	386	31	56	11	51	47	11	9	16
		1996-97	434	29	72	16	53	49	24	13	21
		2000-01	389	26	67	18	69	50	20	12	16
		2004-05	365	27	80	18	63	52	26	13	14
Pregnant Women		**1975-79**	359	34	75	12	58	44	11	12	19
		1996-97	463	29	70	17	34	42	26	12	15
		2000-01	408	28	77	15	69	44	21	12	17
		2004-05	362	27	87	16	55	49	25	14	14
Lactating Women		**1975-79**	436	30	58	15	48	45	13	10	16
		1996-97	518	34	67	11	43	42	34	13	19
		2000-01	442	28	65	18	69	54	24	13	13
		2004-05	406	30	80	17	63	56	24	14	13

Annexure 7.2.4

Age and sex wise dietary intake – INP survey											
Age group/sex	**Cereals**	**Pulses**	**GLV**	**Roots & Tubers**	**Other veg.**	**Fruits**	**Condi-ments**	**Flesh foods**	**Milk & prod.**	**Fats & oils**	**Sugar**
1-3 years											
Boys	182.9	14.5	17.2	41.4	29	10.1	4.5	20.6	97.4	6.5	12.7
Girls	185.2	14.5	19	40	29.3	10.6	4.3	24.1	92.5	6.2	12
RDA	120	30	50	50	50	100			500	20	25
4-6 years											
Boys	265.2	20.2	21.9	62.3	40.7	13.8	6.2	20.5	93.8	9.2	13.2
Girls	269.7	20.1	24.3	59.7	40	11.8	6.4	23	85.9	8.5	13.6
RDA	210	45	50	100	50	100			500	25	30
7-9 years											
Boys	327.9	23.9	22.6	72.4	50.6	12.9	7.3	22.4	92.9	10	14.7
Girls	321.4	24.2	28.2	69.3	49.7	11.8	7.1	23	90.5	9.8	14.1
RDA	270	60	100	100	100	100			500	25	30
10-12 years											
Boys	384.9	28.8	28.8	84.3	57.1	15.6	8.8	20.9	96.7	11	15.9
RDA	330	60	100	100	100	100			500	25	35
Girls	373.8	26.7	27.3	80.3	53.8	15.4	8.9	22.2	94.2	11	15.4
RDA	270	60	100	100	100	100			500	25	30
13-15 years											
Boys	453.2	32.6	33.4	93.6	67	16.4	10.1	27	108	13	17.4
RDA	420	60	100	100	100	100			500	25	35
Girls	437.6	32	38	88.2	60.8	15.5	9.5	33.9	100	14	16.5
RDA	300	60	100	100	100	100			500	25	30
16-17years											
Boys	530.1	38	45.4	98	78.9	19.1	11.2	46.9	113	14	18.3
RDA	420	60	100	100	100	100			500	25	35
Girls	484.7	34.8	43	84.2	66.3	19.2	12.4	49.1	125	14	19.6
RDA	300	60	100	100	100	100			500	25	30
>18 years											
Male	543.2	40.9	41	112	81.4	20.1	12.7	36.4	119	17	19
RDA	420	60	100	100	100	100			500	25	35
Female	467.9	37.3	36.6	101	72.2	18.8	11.7	33.5	113	26	18.4
RDA	270	60	100	100	100	100			500	25	30

Annexure 7.2.5

Time trends and interstate differences in average nutrient intake in different states -NNMB										
Food stuffs	**Year**	**Kerala**	**Tamilnadu**	**Karnataka**	**Andhra Pradesh**	**Maharashtra**	**Gujarat**	**Orissa**	**Pooled**	**RDA**
Protein (g)	1975-79	46.4	54.8	79.3	59.8	64.5	64.2	-	61.5	**60**
	1988-90	52.9	45.6	65.4	55.7	61.7	69.3	52.4	58.4	
	1996-97	56.4	46.4	53.3	51.6	56.1	61.5	49.2	53.7	
	2004-05	49.1	43.3	49.8	50.1	49	53.5	45.3	49.4	
Energy **(Kcal)**	1975-79	1978	2275	2932	2447	2300	2162	-	2349	**2425**
	1988-90	2140	1871	2431	2340	2211	2375	2285	2283	
	1996-97	2106	1896	2108	2161	2089	2105	2177	2108	
	2004-05	1799	1772	1912	2113	1647	1614	1888	1834	
Calcium (mg)	1975-79	507	552	946	565	512	551	-	606	**400**
	1988-90	608	472	869	432	461	550	346	565	
	1996-97	728	451	764	418	555	530	313	521	
	2004-05	477	393	569	414	384	526	377	439	
Iron (mg)	1975-79	20.8	26.6	46.3	27.8	33.5	25.9	-	30.2	**28**
	1988-90	22	21.4	35.6	25.8	29.6	29	26.1	27.2	
	1996-97	22.1	20.4	28.2	23.4	26.9	23.6	26.9	24.9	
		-12.8	-9	-17.3	-10.4	-17.6	-22.5	-10.2	-14.2	
	2004-05	12.5	10.2	13.9	9.2	17.3	24.6	14.7	14.8	
Vitamin A (ug)	1975-79	176	211	242	264	313	272	-	246	**600**
	1988-90	297	240	269	286	311	286	417	282	
	1996-97	274	250	229	278	220	277	526	300	
	2004-05	162	199	178	245	198	207	523	257	
Thiamin (mg)	1975-79	0.72	0.89	2.42	1.06	1.77	1.9	-	1.46	**1.2**
	1988-90	0.72	0.7	1.86	0.98	1.67	2.08	0.8	1.33	
	1996-97	0.9	0.8	1.5	0.9	1.6	1.7	0.9	1.2	
	2004-05	1.0	1.2	1.2	0.7	1.4	1.6	1.3	1.2	
Riboflavin (mg)	1975-79	0.72	0.79	1.19	0.79	0.98	1.08	-	0.81	**1.4**
	1988-90	0.74	0.6	1.01	0.72	0.94	1.22	0.6	0.87	
	1996-97	1	0.8	1	0.9	0.9	1.2	0.8	0.9	
	2004-05	0.6	0.6	0.7	0.6	0.7	0.9	0.5	0.6	
Niacin (mg)	1975-79	11.5	12.5	17.8	14.5	16.8	15.3	-	14.7	**16**
	1988-90	11.8	10.5	14.6	14.4	16.3	17.3	13.3	14.2	
	1996-97	12.1	10.5	11.5	12.8	15.3	13.1	13.1	12.7	
	2004-05	14.2	16.2	11.7	11.9	13.1	12.3	19.0	14.7	
Vitamin C (mg)	1975-79	67	42	23	29	36	35	-	39	**40**
	1988-90	47	39	26	36	37	36	56	37	
	1996-97	52	37	25	33	32	33	66	40	
	2004-05	41	45	28	35	22	43	76	44	
Folic acid (ug)*	1996-97	136	125	155	129	166	211	156	153	**200**
	2004-05	50.4	58.2	47.4	43.6	50.9	68.2	55.5	52.3	

Annexure 7.2.6

State wise average intake of nutrients (per intake unit/day) -INP survey												
		Energy	Protein	Fats	Calcium	Phos.	Iron	Thiamin	Ribo.	Niacin	Vit.C	Vit.A
State/UT	Area	Kcal	g.	g.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	ug
RDA		2425	60		400		28	1.2	1.2	16	40	600
Haryana	R	2336	72	49	886		26	2.4	1.1	20	38	415
Himachal Pr.	R	2323	74	41	640		23	2.1	0.9	16	55	481
Punjab	R	2341	77	34	966		28	2.5	1.2	21	38	448
Rajasthan	C	2386	77	47	734	2130	31	2.6	1.2	21	46	400
	R	2439	78	46	735	2192	32	2.7	1.3	22	45	395
	U	2157	68	49	728	1861	25	2.2	1.1	19	51	423
Chandigarh	C	2412	73	63	997	1844	22	2.1	1.1	17	52	391
	R	2617	73	69	883	1851	23	2.1	1.1	18	39	257
	U	2381	73	62	1014	1842	22	2.1	1.1	17	54	411
Delhi	C	2183	69	44	715	1685	21	1.9	1	17	57	386
	R	2713	87	62	647	2251	32	3	1.2	25	54	486
	U	2162	69	43	718	1663	21	1.9	0.9	17	57	382
Bihar	C	2464	70	24	433	1757	22	1.9	0.9	20	60	263
	R	2463	69	24	420	1749	22	1.9	0.9	20	58	267
	U	2470	72	28	497	1798	23	2	1	21	69	243
Sikkim	C	2191	65	26	565	1353	21	1.6	1.3	24	66	368
	R	2197	64	25	566	1343	21	1.5	1.3	24	65	376
	U	2157	70	31	561	1414	22	1.7	1.3	23	75	322
Arunachal Pr	R	1946	91	20	1020	1544	21	1.7	1.3	26	131	698
Assam	R	1975	51	17	364		12	0.7	0.6	12	47	235
Manipur	C	2604	77	19	683	1628	27	1.8	1.5	30	103	357
	R	2608	77	18	671	1624	27	1.8	1.5	30	98	347
	U	2589	78	20	728	1642	26	1.7	1.6	30	124	395
Meghalaya	C	1702	61	30	758	1112	20	1.1	1	18	50	296
	R	1677	60	30	750	1104	20	1.1	1	17	50	297
	U	1880	65	33	822	1177	25	1.2	1	19	52	285
Mizoram	C	2017	65	41	1006	1254	19	1.3	1.6	18	126	855
	R	1916	61	38	1047	1211	18	1.2	1.6	17	118	802
	U	2404	81	50	1138	1419	24	1.6	1.8	21	158	1062
Nagaland	R	2189	76	30	878	1455	23	1.7	1.5	25	108	702
Tripura	C	2306	86	25	1208	1598	26	1.5	1.3	24	69	431
	R	2320	87	25	1235	1614	26	1.6	1.3	24	71	441
	U	1968	60	28	563	1197	21	1.3	1	19	29	173
Daman & Diu	R	2470	71	67	781	1434	23	1.2	1.1	18	84	552
D & N Haveli	R	1934	58	25	506	1220	23	1.3	0.9	15	64	340
Goa	C	2095	59	40	630	1249	19	1.1	0.9	19	46	198
	R	2149	60	41	627	1267	19	1.1	1	19	44	205
	U	1895	56	39	641	1183	19	1	0.8	17	53	172

C= Combined, R= Rural, U=Urban

Source India Nutrition Profile 1998

Annexure 7.2.7

Age wise distribution of average intake of nutrients-NNMB

			Protein (g)	Tot Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit A (ug)	Thiamin (mg)	Ribo (mg)	Niacin (mg)	Vit. C (mg)
		1975-79	39.50	14.00	1438.80	270.50	19	101	1.00	0.60	10	22
		1996-97	43.10	19.30	1719.10	319.95	20	131	0.90	0.70	10	24
		2000-01	40.4	19.9	1524	326	12.2	168	1.0	0.5	11.9	33
	Boys	**2004-05**	39.2	16.2	1423	330	12	221	0.9	0.5	11.4	35
		1975-79	39.10	13.90	1393.50	268.20	18	105	0.90	0.6	9	20
		1996-97	40.45	17.85	1613.95	312.70	19	111	0.80	0.7	9	24
		2000-01	39.4	18.9	1500	304	12.1	174	1.0	0.5	11.7	32
10-12	**Girls**	**2004-05**	37.8	14.8	1389	307	11.5	205	0.9	0.5	11.1	33
		1975-79	43.30	16.70	1618.45	304.45	21	114	1.00	0.60	10	24
		1996-97	48.85	21.95	1899.10	367.55	21	138	1.00	0.80	12	27
		2000-01	48.8	24.7	1856	407	15.4	196	1.3	0.7	14.4	40
	Boys	**2004-05**	44.6	18.3	1645	363	13.3	215	1.1	0.6	13.3	37
		1975-79	41.25	15.90	1565.55	299.40	20	103	1.00	0.60	10	22
		1996-97	44.40	19.50	1811.80	324.20	21	133	0.90	0.70	11	28
		2000-01	43.7	21	1689	355	12.9	180	1.1	0.6	13	36
13-15	**Girls**	**2004-05**	42	17.8	1566	341	13	251	1.0	0.5	12.7	37
		1975-79	54.80	17.10	1926.50	327.70	25	120	1.30	0.80	14	24
		1996-97	58.10	26.40	2275.80	437.60	26	184	1.10	1.00	14	37
		2000-01	54.7	25.6	2114	437	16.7	183	1.4	0.7	16.2	37
	Boys	**2004-05**	53	21	1913	433	16.4	241	1.3	0.7	15.6	42
		1975-79	44.00	16.70	1704.30	317.30	22	115	1.00	0.60	11	26
		1996-97	50.10	23.70	2018.80	361.30	22	145	0.90	0.80	12	32
		2000-01	49.1	24.2	1856	415	15.3	213	1.2	0.6	14.4	40
16-17	**Girls**	**2004-05**	43.9	19.1	1630	373	13.5	261	1.1	0.6	12.8	38
		1975-79	55.70	20.30	2065.00	98.00	26	142	1.30	0.80	13	28
		1996-97	60.10	27.40	2418.00	421.00	27	172	1.10	1.00	14	36
		2000-01	58.7	34.4	2225	523	17.5	242	1.4	0.8	17.1	51
Adult Males		**2004-05**	54.8	26.9	2000	511	16.9	267	1.3	0.7	16.1	50
		1975-79	45.40	17.10	1698.00	330.00	21	118	1.00	0.70	11	24
		1996-97	49.90	24.50	1983.00	382.00	22	148	0.90	0.80	12	32
		2000-01	48.2	27.6	1878	445	14.1	219.8	1.2	0.6	14.9	44.7
Adult Females (NPNL)		**2004-05**	46.5	21.8	1738	443	13.8	254	1.1	0.6	14.2	47
		1975-79	40.80	18.80	1597.00	390.00	20	160	1.00	0.60	10	21
		1996-97	47.20	21.50	1994.00	339.00	23	142	0.90	0.80	11	28
		2000-01	49.7	25.9	1933	463	14	227	1.2	0.7	15.1	45
Pregnant Women		**2004-05**	46.8	22.5	1726	456	14	261	1.1	0.6	13.7	42
		1975-79	47.60	18.30	1797.00	358.00	23	133	1.10	0.70	12	23
		1996-97	56.50	24.60	2243.00	373.00	23	162	1.10	0.90	14	29
		2000-01	50.3	25.9	2028	408	14.6	212	1.3	0.6	16.3	48
Lactating Women		**2004-05**	49.6	22.1	1878	447	14.7	249	1.2	0.6	15.5	46

Annexure 7.2.8

Age and sex wise nutrient -INP survey										
Age group/ sex	Protein gm	Fats gm	Energy Kcal	Calcium mg	Iron mg	Thiamin mg	Riboflavin mg	Niacin mg	Vit. C mg	Vit. A µg
1-3 years										
Boys	30.1	16.3	918	415	8.9	0.69	0.5	7.4	28.5	196
Girls	30.5	15.6	926	395	9.2	0.7	0.5	7.9	30.1	201
RDA	22	25	1240	400	12	0.6	0.7	8	40	400
4-6 years										
Boys	40.6	20.3	1300	433	13	1.03	0.62	11.1	37.4	250
Girls	41.2	19.1	1299	440	11.3	1.03	0.63	11.3	38.9	241
RDA	30	25	1690	400	18	0.8	1	11	40	400
7-9 years										
Boys	50	21.6	1570	468	20	1.37	0.72	13.5	41.5	258
Girls	49.7	23.5	1520	472	18.3	1.12	0.8	15.8	43.3	247
RDA	30	25	1950	400	26	1	1.2	13	40	600
10-12 years										
Boys	56.8	24.9	1847	522	18.7	1.52	0.83	16.2	50	307
RDA	54	22	2190	600	34	1.1	1.3	15	40	600
Girls	45.7	20.3	1482	426	15.1	1.23	0.68	13	39.6	310
RDA	57	22	1970	600	19	1	1.2	13	40	600
13-15 years										
Boys	67.1	28.8	2185	612	22.1	1.82	1	19.6	57.4	356
RDA	70	22	2450	600	41	1.2	1.5	16	40	600
Girls	65.6	28.4	2097	615	21.4	1.71	0.98	18.7	60.1	369
RDA	65	22	2060	600	28	1	1.2	14	40	600
16-17years										
Boys	79.2	31.6	2514	752	25.7	2.03	1.2	22.7	71.1	416
RDA	78	22	2640	500	50	1.3	1.6	17	40	600
Girls	74.2	31.7	2327	702	23.9	1.87	1.17	21.9	67.5	397
RDA	63	22	2060	500	30	1	1.2	14	40	600
>18 years										
Boys	79.7	35.2	2592	716	26.1	2.12	1.18	22.6	66.8	397
RDA	60	20	2425	400	20	1.2	1.4	16	40	600
Girls	70.8	32.1	2293	659	23	1.84	1.04	20.3	62.6	376
RDA	50	20	1875	400	30	0.9	1.1	12	40	600

Source of dietary intake													
			Male and Female			Male				Female			
	Surveys	Years	1-3	4-6	7-9**	10-12	13-15	16-17	<18#	10-12	13-15	16-17	<18#
Total Dietary Energy Intake (Kcals)	**NNMB**	**'79**	834	1118		1439	1618	1926	2065	1394	1566	1704	1698
		'96	807	1213	1467	1738	2004	2369	2488	1635	1848	2030	2106
		'01	706	1029	1251	1524	1856	2114	2225	1500	1689	1856	1878
		'05	719	1020	1230	1423	1645	1913	2000	1389	1566	1630	1738
	INP	**'96**	926	1299	1520	1847	2185	2514	2592	1482	2097	2327	2293
% Dietary energy from fat	**NNMB**	**'79**	14.8	12.9		8.8	9.3	8	8.9	9	9.1	8.8	9.1
		'96	14.3	13.6	12.3	12.7	12.4	12.6	12.4	12.2	11.7	12.9	13.9
		'01	12.1	10.8	10.1	11.8	11.9	11	13.9	11.3	11.2	11.7	13.9
		'05	13.4	11.2	10.5	10.2	10	9.9	12.1	9.6	10.2	10.5	11.3
	INP	**'96**	15.1	13.2	13.9	12.1	11.9	11.3	12.2	12.3	12.2	12.3	12.6
% Dietary energy from protein	**NNMB**	**'79**	10.9	10.8		10.9	10.7	10.4	10.8	11.2	10.5	10.3	10.7
		'96	10.4	10.3	10.6	10.5	10.5	10.4	10.2	10.4	10.4	10.2	9.9
		'01	10.1	10.2	10.1	10.6	10.5	10.4	10.6	10.5	10.3	10.1	10.6
		'05	11.2	11.3	11	11	10.8	11.1	11	10.9	10.7	10.8	10.7
	INP	**'96**	13.2	12.7	13.1	12.3	12.3	12.6	12.3	12.3	12.5	12.8	12.4
% Dietary energy from Carbohydrates	**NNMB**	**'79**	74.3	76.3		80.3	80	81.6	80.3	79.8	80.4	80.9	80.2
		'96	75.3	76.4	77.1	76.7	77.1	77	74.8	77.4	77.9	76.6	76.2
		'01	77.7	79.1	79.8	77.6	77.6	78.7	75.5	78.1	78.5	77.7	75.5
		'05	75.4	77.5	78.5	78.7	79.1	79	76.9	79.5	79	78.7	78
	INP	**'96**	71.7	74.1	73.1	75.6	75.8	76.1	75.5	75.4	75.3	74.9	75

**, No sex wise dis-aggregation of data age wise upto 10 years of age; **, Data not available; #, No dis-aggregation of data age-wise after 18 years of age Source: National Nutrition Monitoring Bureau, 1979, 2002; India Nutrition Profile, 1996. Survey Population: Rural (NNMB), Rural & Urban (INP) Sample size: NNMB, 33048 (1975-79), 14391 (1996-97), 22945 (2000-01); INP (46457)*

Annexure 7.2.10

Women's food intake by background characteristics								
	Type of food							
Background characteristic	Milk or curd	P ulses or beans	Green leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat or fish	Number of women
Age								
15-24	53.3	88.1	85.5	92.7	30.8	28.2	31.3	24,571
25-34	55.4	87.7	85.5	93.2	34.0	28.6	32.5	32,839
35-49	55.8	87.6	84.8	93.3	33.7	26.7	31.8	31,789
Residence								
Urban	65.3	92.8	88.4	95.0	53.9	39.7	41.7	23,370
Rural	51.3	86.0	84.1	92.4	25.6	23.6	28.5	65,829
Education								
Illiterate	46.5	85.0	83.8	91.6	20.8	22.5	25.9	51,871
Literate,< middle school complete	57.3	90.1	85.6	94.5	37.6	34.4	41.2	17,270
Middle school complete	65.4	91.8	87.8	95.3	47.5	35.9	41.5	7,328
High school complete & above	80.2	93.8	89.3	96.3	68.4	36.1	38.5	12,719
Religion								
Hindu	55.7	88.5	85.1	93.0	31.9	24.9	27.5	72,903
Muslim	46.8	83.7	85.8	93.8	32.9	44.1	55.7	11,190
Christian	53.7	78.2	76.5	93.6	53.0	49.7	70.1	2,263
Sikh	91.0	98.7	97.3	97.9	48.2	11.8	5.1	1,427
Jain	82.3	94.7	88.2	87.9	70.9	2.3	2.3	331
Buddhist/Neo-Buddhist	43.4	92.1	93.4	88.9	41.0	48.1	51.2	676
Other	23.3	74.0	91.6	87.4	27.8	31.7	43.8	285
No religion	31.3	67.0	94.5	87.9	40.7	32.7	64.3	44
Caste/tribe								
Scheduled caste	44.9	85.6	84.5	93.2	24.5	27.5	32.6	16,301
Scheduled tribe	34.4	80.6	81.5	87.6	20.9	21.9	25.7	7,750
Other backwars class	57.8	89.4	84.7	93.9	33.5	29.8	31.8	29,383
Other	62.1	89.0	86.9	93.6	39.7	27.8	33.4	34,904
Standard of living index								
Low	35.0	81.4	82.1	91.6	17.0	23.8	29.1	29,033
Medium	58.1	89.4	85.3	93.1	31.5	28.6	33.1	41,289
High	80.0	94.3	90.0	95.7	62.0	32.3	33.6	17,845
Total	55.0	87.8	85.2	93.1	33.0	27.8	31.9	89,199

Annexure 7. 2.11

Women's food intake by state

%age of ever-married women consuming specific foods at least once a week by state, India, 1998-99

State	Type of food						
	Milk or curd	Pulses or beans	GLVs	Other vegetables	Fruits	Eggs	Chicken,meat or fish
India	55.0	87.8	85.2	93.1	33	27.8	31.9
North							
Delhi	73.3	91.2	86.8	92.8	57.8	21.2	15.1
Haryana	93.2	99.3	99.2	99.2	54.8	7.7	3.8
Himachal Pradesh	87.0	99.1	94.3	98.8	71.7	14.7	6.2
Jammu & Kashmir	72.1	68.5	85.5	88.3	44.0	14.2	31.1
Punjab	91.1	99.2	99.1	99.5	50.7	10.8	3.6
Rajasthan	70.7	81.4	77.8	78.9	20.5	6.1	7.8
Central							
Madhya Pradesh	32.5	79.9	80.9	86.1	22.7	11.7	11.2
Uttar Pradesh	57.2	88.0	90.0	90.7	19	9.9	8.7
East							
Bihar	46.7	88.7	96.0	96.1	18.3	22.1	21.5
Orissa	20.7	80.7	90.9	95.8	14.4	15.6	28.2
West Bengal	25.0	76.3	91.4	98.7	15.0	43.5	69.0
Northeast							
Arunchal Pradesh	19.9	51.2	95.6	72.7	28.9	33.5	57.4
Assam	41.7	85.3	87.6	94.9	33.3	58.4	57.7
Manipur	15.3	37.3	96.9	93.2	34.3	14.8	47.4
Meghalaya	23.7	61.5	88.9	91.8	40.3	32.6	61.8
Mizoram	22.9	64.5	99.2	87.1	61.6	42.5	59.3
Nagaland	82.7	59.6	96.3	80.6	40.9	30.2	72.3
Sikkim	72.4	82.9	94.9	87.5	28.8	26.8	57.1
West							
Goa	65.0	76.5	74.6	82.5	65.8	36.6	89.0
Gujarat	80.0	97.0	74.1	99.2	44.4	14.0	12.4
Maharashtra	47.3	94.5	87.9	91.1	44.7	34.4	38.2
South							
Andhra Pradesh	72.0	92.3	72.7	95.7	47.6	59.7	56.7
Karnataka	75.5	98.6	93.3	91.8	53.7	39.9	33.9
Kerala	45.3	69.8	54.8	90.9	56.5	27.3	82.8
Tamil Nadu	66.5	94.6	77.6	98.7	46.2	52.7	52.6

7.3 NUTRITION IN PREGNANCY AND LACTATION

From time immemorial it has been recognized that women especially pregnant and lactating women form one of the most vulnerable segments of the population from nutritional point of view. Numerous studies in India and elsewhere have shown that in chronically undernourished women subsisting on unchanged dietary intake, pregnancy and lactation have an adverse effect on maternal nutritional status. Maternal undernutrition is associated with low birth weight and all its attendant adverse consequences. Epidemiological studies from India documented the magnitude and adverse consequences of chronic energy deficiency (CED) on the mother child dyad and paved way for effective intervention programmes to address undernutrition during pregnancy and lactation. Over 75 % of pregnant women in India are anaemic and anaemia remains to be a major factor responsible for maternal morbidity, mortality and low birth weight. Too early, too close, too many and too late pregnancies adversely affect nutrition and health status of the mother child dyad; timely contraceptive care has become an indirect effective intervention to prevent deterioration in maternal and child nutrition. Yet another important indirect cause of undernutrition continues to be infections; undernutrition increases the susceptibility for infections; infections aggravate undernutrition. With the advent of HIV epidemic, it is inevitable that over the next decade there will be an increase in undernutrition in women due to HIV infection.

While undernutrition continues to be major problem as in the earlier decades, the current decade has witnessed the progressive rise of overnutrition in women during reproductive age especially among the affluent segments of population both in urban and in rural areas. It has become imperative to assess the nutritional status of pregnant women and give them appropriate advice and care.

Time trends in dietary intake in pregnant women

Data from NNMB and INP surveys (using 24 hour dietary recall method) show that between 1975 and 1995 there has been some increase in dietary intake. By the mid nineties average intake of cereals almost met the RDA. Since then there has been a reduction in cereal intake inspite of the fact that food is available, accessible and affordable. There has been a progressive reduction in the pulse intake, which might be related to the rise in the cost of pulses. Intake of vegetables and fruits continue to be low (Table 7.3.1). Dietary intake of pregnant and lactating women is not different from that of the non-pregnant and non-lactating women.

Table 7.3.1: Time trends in dietary intake (g/day) in pregnant and lactating women										
Groups	Year	Cereals & Millets	Pulses & Legumes	Milk & Milk Products	GLV's	Roots & tubers	Other vegetables	Fruits	Fats & Oil	Sugar & Jaggery
NPNL Women	**1975-79**	386	31	56	11	51	47	11	9	16
	1996-97	434	29	72	16	53	49	24	13	21
	2000-01	389	26	67	18	69	50	20	12	16
	2005-06	365	27	80	18	63	52	26	13	14
Pregnant Women	**1975-79**	359	34	75	12	58	44	11	12	19
	1996-97	463	29	70	17	34	42	26	12	15
	2000-01	408	28	77	15	69	44	21	12	17
	2005-06	362	27	87	16	55	49	25	14	14
Lactating Women	**1975-79**	436	30	58	15	48	45	13	10	16
	1996-97	518	34	67	11	43	42	34	13	19
	2000-01	442	28	65	18	69	54	24	13	13
	2005-06	406	30	80	17	63	56	24	14	13
Source: Reference 7.3.2										

Nutrient intake in pregnant and lactating women over the last three decades is given in Table 7.3.2. Between 1975 and 1996 there was increase in the total energy, protein and fat intake. However over the last decade there has been a reduction in the energy and fat intake. This might be due to the increasingly sedentary lifestyle in majority of the population and consequent reduction in energy intake. Calcium and micronutrient intake has been low through out the period. In all periods of time there is no difference in nutrient intake of pregnant and lactating women and NPNL. All these data clearly indicate that in India women do not consume more food during pregnancy and lactation.

Studies carried out by National Institute of Nutrition (NIN) during the seventies and early eighties confirmed that among urban and rural low income group

Table 7.3.2 Time trends in nutrient intake in pregnant and lactating women											
Groups	Years	Protein (g)	Total Fat (g)	Energy (kcal)	Calcium (mg)	Iron (mg)	Vit A (µg)	Thiamin (mg)	Ribo. (mg)	Niacin (mg)	Vit. C (mg)
NPNL Women	**1975-79**	45.4	17.1	1698	330	21.0	118.0	1.00	0.70	11.0	24
	1996-97	49.9	24.5	1983	382	22.0	148.0	0.90	0.80	12.0	32
	2000-01	48.2	27.6	1878	445	14.1	219.8	1.20	0.60	14.9	45
	2005-06	46.5	21.8	1738	443	13.8	254.0	1.10	0.60	14.2	47
Pregnant Women	**1975-79**	40.8	18.8	1597	390	20.0	160.0	1.00	0.60	10.0	21
	1996-97	47.2	21.5	1994	339	23.0	142.0	0.90	0.80	11.0	28
	2000-01	49.7	25.9	1933	463	14.0	227.0	1.20	0.70	15.1	45
	2005-06	46.8	22.5	1726	456	14.0	261.0	1.10	0.60	13.7	42
Lactating Women	**1975-79**	47.6	18.3	1797	358	23.0	133.0	1.10	0.70	12.0	23
	1996-97	56.5	24.6	2243	373	23.0	162.0	1.10	0.90	14.0	29
	2000-01	50.3	25.9	2028	408	14.6	212.0	1.30	0.60	16.3	48
	2005-06	49.6	22.1	1878	447	14.7	249.0	1.20	0.60	15.5	46
Source: Reference 7.3.2											

population in Hyderabad there was no increase in dietary intake during pregnancy and lactation.

Table 7.3.3:Changes in anthropometric indices during pregnancy			
	Weight (kg)	Arm circumference (cm)	FFT (mm)
NPNL	42.3	22.5	10.5
1st trimester	41.5	22.2	9.6
2nd trimester	44.6	22.1	9.7
3rd trimester	46	21.7	9.2

Source: Reference 7.3.1

Dietary intake ranged from 1200-1800 kcal per day. Pregnant women continued to look after the household and other activities and remain moderately active throughout pregnancy. These women weighed an average 43 kg prior to pregnancy and gained 6 kg during pregnancy. There was however a reduction in fat fold thickness during pregnancy suggesting that the fat was getting mobilised to meet the gaps in energy requirement (Table 7.3.3). There is no obvious deterioration in the maternal nutritional status during pregnancy or following repeated pregnancies provided the interbirth interval is longer than 24 months. The mean birthweight in this population was 2.7 kg and the low birth weight rate about 33%.

Studies carried out at NIN Hyderabad in late seventies showed that there was a socioeconomic gradient in dietary intake but in majority of women in all the three groups dietary intake was not higher in pregnant women as compared to non-pregnant women from some income group. The low income group women weigh ten kg less than high income group of women and birthweight of the offspring was only 2.7 kg (Table 7.3.4). Women from the upper income group consumed 2000 to 2500 kcal per day during pregnancy. In middle and high income groups, pregnant women do not perform hard physical labour during pregnancy and there is a reduction in physical activity during pregnancy. The pre-pregnancy weight in this population group ranges between 45-55 kg and pregnancy weight gain was 11 kg. The mean birth weight of infants is 3.1 kg (Table 7.3.4). These data suggest that among habitually well-nourished women who eat to appetite, there is no increase in dietary intake during pregnancy; unchanged dietary intake did not have any adverse effect either on their own nutritional status or on the course and outcome of pregnancy.

Studies undertaken during the 1980s have shown that there are adaptive changes during pregnancy. There is a reduction in BMR and physical activity and there might be some improvement in the as yet unmeasured efficiency of energy utilisation. The energy and nutrients saved due to these processes are sufficient to meet the increased requirements for nutrients during pregnancy. So long as

Table 7.3.4: Birth Weight and socioeconomic Status							
	No. (N)	Age (yrs.)	Parity	Height (cms.)	Weight (kg.)	Hb (g/dl)	Birth wt. (kg.)
Low Income	1468	24.1	2.41	151.5	45.7	10.9	2.7
Middle Income	108	24.3	1.61	156.3	49.9	11.1	2.9
High Income	63	27.8	1.61	156.3	56.2	12.4	3.13

Source: Reference 7.3.1

there is no reduction in the habitual dietary intake, there is no deterioration in the maternal nutritional status either during pregnancy or during lactation. In well-nourished individuals, additional intake during pregnancy and lactation can result in excessive weight gain and this may lead to overnutrition later in life.

However, there are limits to adaptations under lower dietary intake during pregnancy. Studies from NIN and also from other developing countries have shown that reduction in dietary intake below habitual levels, or increased workload above the habitual levels is associated with deterioration in maternal nutritional status and reduction in birth weight. Some readily identifiable situations associated with deterioration in maternal nutritional status and reduction in birth weight is:

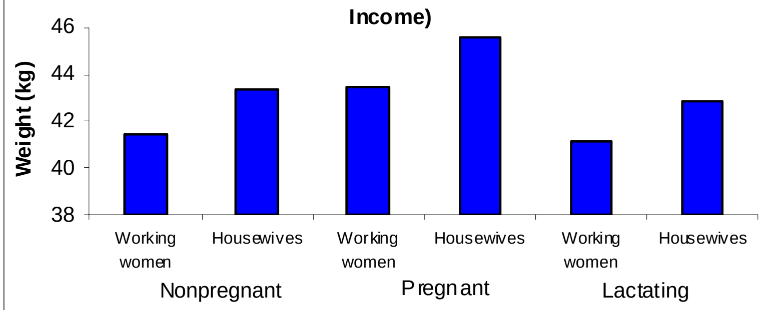
- reduction in habitual dietary intake (during drought and the pre-harvest season)
- increase in work (e.g., newly inducted manual laborers)
- combination of both the above (food for work programmes) during drought
- adolescent pregnancy;

There is a progressive increase in women's participation in labour force partly due to economic reasons. The economic returns are some times essential for improving the dietary intake of the family but dual burden of work at home and at the work place has resulted in some deterioration in maternal nutrition status (Figure 7.3.1).

Yet another important indirect cause of under nutrition continues to be infections. Obstetricians and pediatricians continue to tackle the increased morbidity in anaemic women. With the advent of HIV epidemic in India in the eighties, it is inevitable that over the next decade there will be an increase in the maternal undernutrition associated with HIV in pregnancy and adverse impact of maternal HIV infection on the foetus. Screening for these infections and their management has to become a part of antenatal care.

Maternal nutrition during lactation

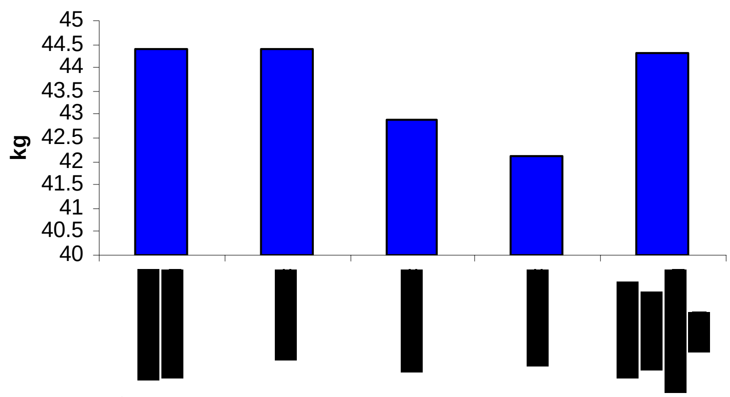
Figure 7.3.1: Nutritional Status of Rural Women (Low Income)



Source:Reference 7.3.1

The importance of breast-feeding in infant nutrition and survival has long been recognized. In the last three decades there has been a growing recognition that lactation may have profound effects on the maternal nutritional status and some effect on the maternal return of fertility after delivery. The advent of the next pregnancy,

Figure 7.3.2: Effect of lactation on nutritional status



Source: Reference 7.3.1

or contraceptive measures used to avoid this, may have an effect on lactation and maternal nutritional status.

Studies carried out at the National Institute of Nutrition have shown that among low income group population there was no increase in dietary intake during lactation. Lactating women continue to undertake habitual work. Lactation involves considerable nutrient expenditure for the mother; the estimated calorie expenditure varies between 400-700 kcal/day. Studies on anthropometric indices in lactating women indicate that the mean body weight, mid-arm circumference and skin-fold thickness at triceps showed a progressive fall with increasing duration of lactation until 18 months in women whose infants were mainly on breast milk. However, with the introduction .of supplements to the breast-fed infant there was some improvement in the maternal nutritional status even though her dietary intake remained unaltered. The mean body weight of women whose infants were mainly on solid food but who received two or three breast-feeds a day was higher than that of women whose infants were mainly breastfed. If there was no intervening pregnancy these women regained their body weight once lactation waned (Table 7.3.5 and Figure 7.3.2). Obviously, there are some exquisitely sensitive but ill-understood changes which bring about energy balance and ensure maintenance of maternal nutrition and satisfactory lactation in spite of widely varying habitual dietary intakes well below the RDA.

Table 7.3.5: Changes in anthropometric indices during lactation

Duration of lactation	No. (N)	Height (cm)	Weight(kg)	Mid-arm circumference (cm)	Fat fold thickness at triceps (mm)
Non-pregnant non-lactating	1025	150.0 ± 5.2	44.4 ± 8.16	23.3 ± 2.59	14.1 ± 5.12
<6months	860	150.2 ± 5.20	44.4 ± 7.25	23.1 ± 2.62	13.2 ± 5.03
7-12 months	609	149.0 ± 7.12	42.9 ± 6.72	22.3 ± 2.63	12.4 ± 6.59
>12 months mainly breast fed	280	150.0 ± 6.25	42.1 ± 6.95	21.8 ± 2.52	11.9 ± 6.21
>12 months mainly on supplementary food	384	150.1 ± 5.7	44.3 ± 6.13	22.8 ± 2.07	13.0 ± 6.15

Source: Reference 7.3.1

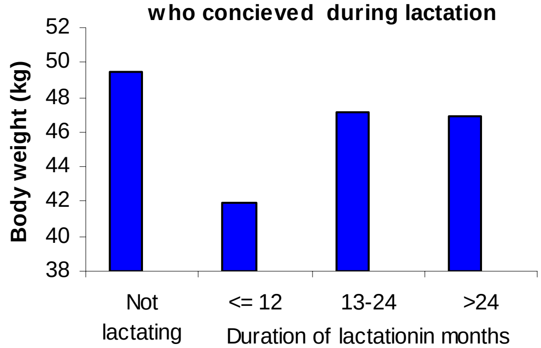
Effect of conception during lactation on mother child dyad

Data from NFHS -1, 2 and 3 indicate that the mean duration of lactation in India is about 24 months. Available data suggest that conception during the first year of lactation is relatively uncommon; they usually occurs in women who introduce supplements to the infant early, i.e. before six months of age; majority of the conceptions in lactating women occur during the second and third year of lactation. Studies on dietary intake of women who had conceived during lactation have shown that their dietary intake is essentially similar to the dietary intake of nonpregnant women from similar income groups. The average calorie intake is no more than 1200-1800 kcal/day; the diet is inadequate with respect to all nutrients. Obviously the dual stress of pregnancy and lactation may be expected to widen the already existing gap between dietary intakes and nutrient requirements. Investigations undertaken by the National Institute of Nutrition, Hyderabad, indicate that irrespective of the duration of lactation, women who conceived during lactation weighed less in all the trimesters of pregnancy than those who conceived after lactation. The difference in body weight was more marked in the third trimester, especially in the small group of women who had conceived during the first six months of lactation (Figure 7.3.3). Birth weight of neonates born to women who conceived during lactation or conceived within first 12 months after delivery was also lower (Figure 7.3.4). Too close and too many pregnancies have adverse nutrition and health consequences on the mother child dyad; contraceptive care at appropriate time is an indirect but effective intervention to prevent deterioration in maternal nutritional status.

Interventions to improve dietary intake and nutritional status

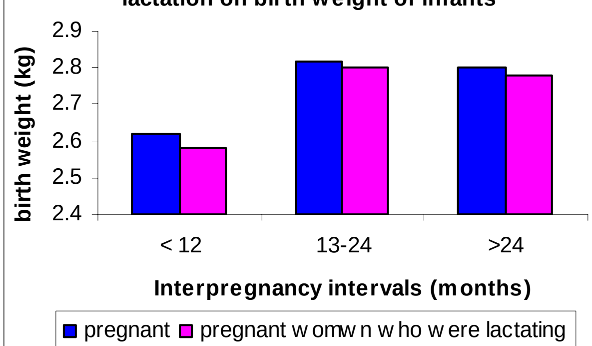
Research studies in India and elsewhere have shown if pregnant women in whom there has been a reduction in habitual dietary intake or excess energy expenditure or whose body weight is less than 40 kg are identified and given adequate continuous food supplementation and antenatal care there is substantial improvement in outcome of pregnancy, birth weight and neonatal mortality. Encouraged by such data, India has included food supplementation for pregnant and lactating women under ICDS programme. Under the ICDS programme, food supplements are being provided to pregnant and lactating

Figure 7.3.3: Weight of pregnant women who concieved during lactation



Source:Reference 7.3.1

Figure 7.3.4: Effect of conception during lactation on birth weight of infants



Source: Reference 7.3.1

women who come to anganwadis. The reported coverage is between 15 and 20% in most blocks. ICDS programme does not screen pregnant women for undernutrition or provide adequate, continuous supplements to those with energy gap or those with moderate/severe undernutrition. When food supplements are provided to pregnant and lactating women without screening, identifying undernourished women, ensuring continued supplementation, monitoring compliance and improvement in nutritional status its impact on maternal nutrition and birth weight, is very limited.

One of the major problems is to reach food supplements to the undernourished women. Even when the logistics of reaching the food to women is meticulously worked out and efficiently carried out, food sharing patterns within the family results in the `target' women not getting the supplements in significant quantities. Obviously this is another important factor responsible for the demonstrated lack of beneficial effect. The lack of adequate antenatal care and continued physical work during pregnancy are two other factors responsible for the lack of impact.

The Tenth Plan envisaged that efforts will be made to weigh all women as early in pregnancy as possible and to monitor their weight gain. Well nourished women will be advised not to increase their dietary intake to prevent overnutrition and obesity. Women who weigh less than 40 kg will be identified and

- given food supplements consistently throughout pregnancy;
- given adequate antenatal care;
- monitored for weight gain during pregnancy.
- If weight gain is sub-optimal, efforts are to be made to identify the causes and attempt remedial measures

Effective intersectoral coordination between auxiliary nurse midwives (ANMs) and anganwadi workers will enable the identification of undernourished pregnant and lactating women and provision of appropriate care to them. The *panchayti raj institutions* (PRIs) can play an important role by ensuring that these women receive food supplement throughout pregnancy.

The National Rural Health Mission (NRHM) envisages that there will be village health and nutrition days where in the ANM and AWW will work together and provide the needed health and nutrition care. As a part of this weighing of pregnant women is to be carried out , those with body weight less than 45 kg can be identified and given food supplementation on priority and monitored for weight gain during pregnancy. Prevention, detection and management of anaemia will also receive the attention it deserves.

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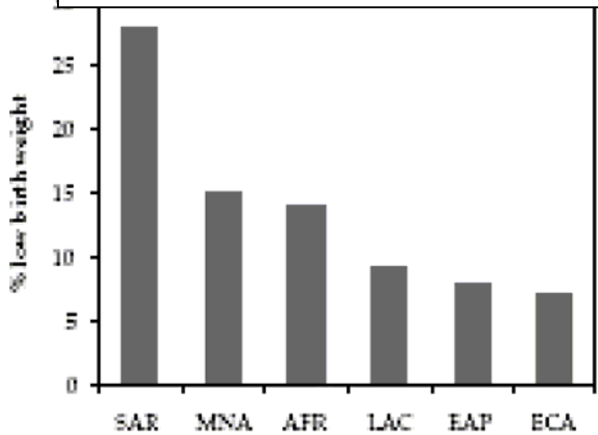
7.4 LOW BIRTH WEIGHT AND ITS CONSEQUENCES

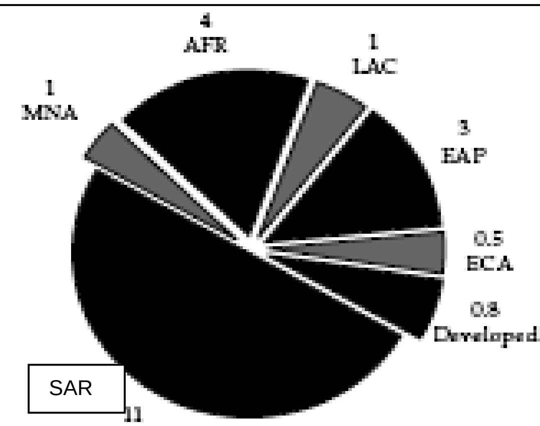
Figure 7.4.1 Prevalence of low birth weight



Source: Reference 7.4.14

Low birth weight is associated with high neonatal and infant mortality, lower trajectory of growth during childhood and adolescence, and increased risk of non-communicable diseases during adult life. Global data on low birth weight indicate that

Figure: 7.4.2 Burden of LBW in regions



Source: Reference 7.4.14

The prevalence of low birth weight is highest in the South Asian region (Figure 7.4.1). As the region is populous nearly half of global low birth weight infants are born in this region (Figure 7.4.2). Inspite of ongoing efforts to reduce low birth weight there has not been a substantial reduction in low birth weight rate in any country in the last three decades (Table 7.4.1)

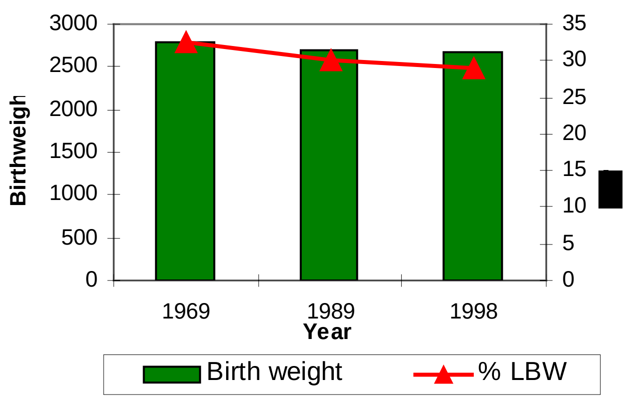
Table 7.4.1 % Low birth weight in 1984-2007

Countries	% Low birth weight	
	1984	2007
France	5.6	7
Swedon	4	4
U.k	7	8
Brazil	9	8
Guatemala	17.9	12
Mexico	11.7	8
Egypt	7	12
Tunisia	7.3	7
China	6	4
India	30	30
Indonesia	14	9
Japan	5.2	8

Source: Reference 7.4.13

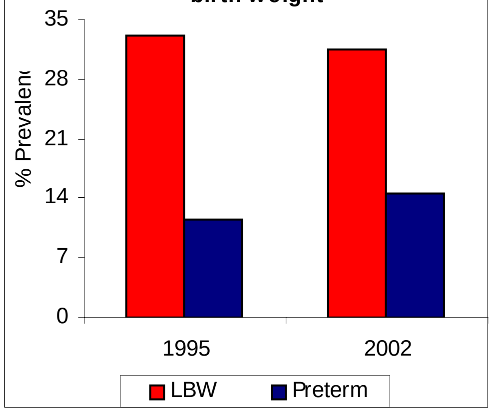
India, the most populous country in South Asia shares a very high prevalence of low birth weight (LBW). Currently nation-wide data on birth weight in different states and districts is not available because a majority of births occur at home and these infants are not weighed soon after and these infants are not weighed soon after birth. Estimates based on available data from institutional deliveries and smaller community- based studies suggest that nearly one-third of all Indian

Figure 7.4.3: Time trends in birth weight



Source: Reference: 7.5.7

Figure 7.4.4: Prevalence of low birth weight



Source: Reference: 7.5.6

infants weigh less than 2.5 kg at birth (Figure 7.4.3 and 7.4.4). There has hardly been any change in birth weight trends in the past three decades. There are differences in birth weight between economic groups; with incidence of low birthrate is highest in the low income groups (Table 7.4.2). A gender difference has been noted in mean birth weights, with female infants tending to weigh less than male infants.

Birth weight is influenced by the nutritional and health status of the mother. Numerous studies have clearly established that there is a good correlation between birth weights and maternal weight; poor pregnancy weight gain and maternal undernutrition are associated with low birth weight (Table 7.4.3).

Table 7.4.2: Birth Weight and Socio-economic Status

	Poor Income	Middle Income	High Income
Age (years)	24.1	24.3	27.8
Parity	2.41	1.96	1.61
Height (cm)	151.5	154.2	156.3
Weight (kg)	45.7	49.9	56.2
Hb (g/dl)	10.9	11.1	12.4
Birth weight (kg)	2.70	2.90	3.13

Source: Reference 7.5.8

Table 7.4.3 Effect of maternal body weight on birth weight

Mother weight (kgs)	No.	Mean birth weight (gm)
< 45	128	2639.6
45-54	251	2779.1
>=55	96	3009.41
Total	475	2788.0

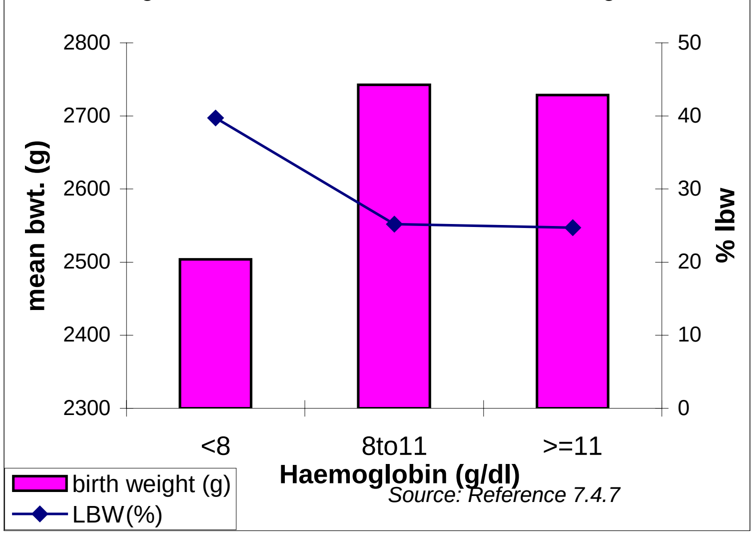
Source: Reference: 7.4.8

Text Box no. 7.4.1

- During the last three decades there has not been any major reduction in the proportion of low birth weight babies.
- In most states there has been substantial reduction in IMR even though there is no change in birth weight.
- Reduction in low birth weight is not an essential prerequisite for reduction in IMR

A significant reduction in birth weight has been reported in anaemic women; low birth weight rate doubles when Hb levels fall below 8 g/dl (Figures 7.4.5). This is perhaps partly due to anemia per se and partly due to poor maternal nutrition and antenatal care in anemic women. There has not been any substantial decline in LBW deliveries over the last three decades. Some factors, which have significant influence on birth weight, such as the parents' build, are not amenable to short term corrective interventions. On the other hand, factors like anaemia, pregnancy induced hypertension and low maternal weight gain during pregnancy can be corrected; effective management of these problems could result in substantial reduction both in pre-term births and birth of small for date neonates. The National Rural Health Mission attempts to improve the coverage, content and quality of antenatal care and bring about a convergence with the efforts of the ICDS system to provide food supplements to improve maternal nutrition. Effective implementation of these interventions could result in some reduction in low birth weight rates.

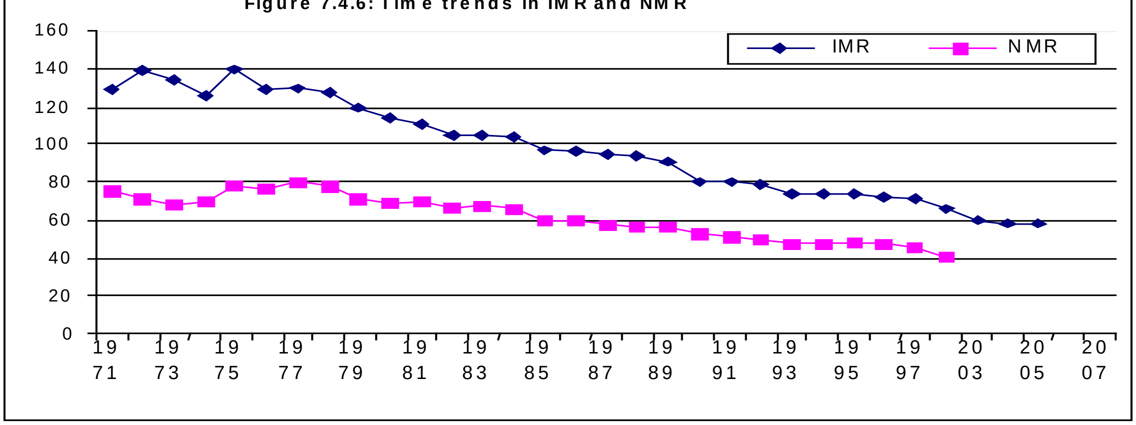
Figure 7..4.5: Effect of maternal Hb on birth weight



Source: Reference 7.4.7

Studies on effect of birth weight on neonatal mortality carried out by Ghosh et al showed that majority of LBW babies in India are born at term but have intra uterine growth retardation; their survival chances are much better than the pre-term babies with similar birth weight. The demonstration that most term IUGR babies will survive they are exclusively breast fed, kept warm and free from infection, paved way for efforts to provide essential newborn care in primary health care settings. Inspite of the fact that there has been no decline in the

Figure 7.4.6: Time trends in IMR and NMR



Source: Reference 7.4.9

Figure 7.4.7: Growth in relation to birth weight

Source: Reference 7.4.3

prevalence of low birth weight, the country has achieved substantial decline in IMR and some reduction in NMR (Figure 7.4.6). In Kerala where nearly all deliveries occur in hospitals providing essential intrapartum and neonatal care, neonatal mortality rates are comparable to the developed countries inspite of the fact that over 20% of neonates are of low birth weight.

Under NRHM efforts are being made to:

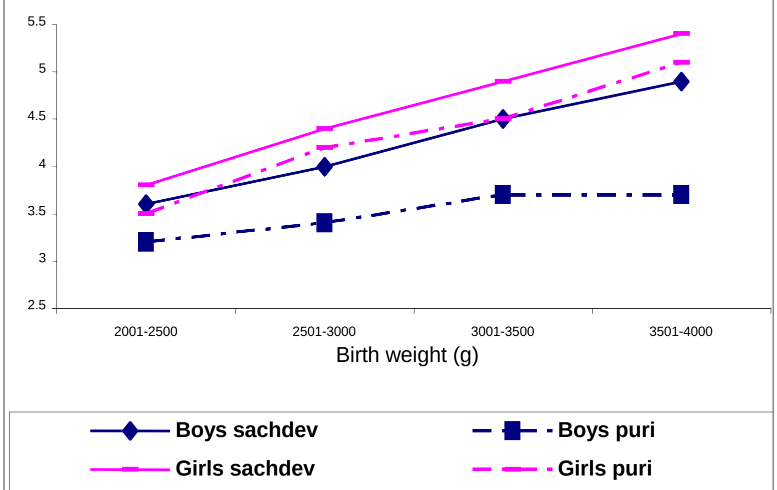
- screen all pregnant women for undernutrition and anaemia and provide appropriate interventions so that LBW associated with these problems can be reduced ;
- advise at-risk individuals to have delivery in institutions, which can provide optimal intrapartum and neonatal care and improve neonatal survival even among low birth weight neonates ;
- have the anganwadi worker check the birth weight of babies as soon after delivery as possible in all home deliveries and refer those neonates with birth weight less than 2.2 kg to hospitals where there is a pediatrician available. So that these high-risk neonates get adequate care and there is reduction in neonatal mortality.

If these interventions are fully operationalised it will be possible to achieve some reduction in low birth weight and substantial reduction in the neonatal mortality rate within a short period.

With improving survival, the issues pertaining to nutritional and health status of surviving children are becoming major concerns. Studies carried out by Ghosh and co-workers in the seventies and later confirmed by other investigators have shown that LBW children have a low trajectory for growth in infancy and childhood (Figure 7.4 7). The high low birth-weight rate in India is at least part responsible for the undernutrition in childhood and adolescence.

It is however important to remember that the seeds for obesity in adult life might also be sown during the intrauterine period. Studies on anthropometric parameters of neonates in a Delhi hospital showed that over the last two decades the birth weight of neonates had remained unaltered but there was an increase in fat fold thickness in all gestational age and birth weight categories (Figure 7.4.8). The implications of these findings are not clear; an increase in adiposity in neonates is a matter of concern and these children should be carefully followed up.

Figure7.4.8: Time trends in subscapular skinfold thickness (mm)



Source: Reference 7.4.11

Long-term consequences of low birth weight

It is possible that the risk factors of obesity in adult life might be present decades earlier. The thrifty gene hypothesis proposes that populations who had faced energy scarcity over millennia may evolve so that majority have thrifty gene, which conserves energy. If this population gets adequate or excess energy intake, they lay down fat, develop abdominal obesity, insulin resistance, which may progress to diabetes, and incur risk of hypertension and CVD. Barker's thrifty phenotype hypothesis shifts the evolution of thriftiness to intrauterine period. If this hypothesis of foetal origin of adult NCD is correct; Indians with one-third low birth weight rate may be at higher risk of metabolic syndrome because one third of them are born with LBW. Over the last decade several investigators have explored these possibilities.

Gupta et al showed that both the low birth weight neonates with intrauterine growth retardation and the high birth weight neonates (many of whom are born to mothers with IGT or gestational diabetes) may develop insulin resistance and are at risk of developing metabolic syndrome at later life.

Table 7.4.4: Birth weight, plasma glucose and insulin concentrations in 4-year old urban children			
Birth weight (kg)	Number of children	Plasma glucose (mmol/l) at 30 min	Plasma insulin (pmol/l) at 30 min
=< 2.4	36	8.1	321
-2.6	36	8.3	337
-2.8	44	7.8	309
-3.0	42	7.9	298
=>3.0	43	7.5	289
All	201	7.9	310
P for trend		0.01	0.04
Source: Reference 7.4.12			

Yajnik and co-workers in Pune explored the relationship between low birth weight and glucose. Insulin metabolism using oral glucose tolerance test (OGTT) in 477 children born in KEM hospital, Pune. They found that Indian neonates were small because they had poor muscles and small abdominal viscera. These neonates however had conserved their subcutaneous fat. At 4 years of age plasma glucose and insulin concentrations 30 minutes after glucose load were inversely related to birth weight (Table 7.4.4) but directly related to current weight and fatfold thicknesses. The relationship between glucose / insulin and birth weight was independent of current weight. Thus poor intra-uterine growth, but relatively excess growth later (‘obesity’) was associated with metabolic endocrine abnormalities, which could lead to diabetes in adult life. Adolescent obesity is a well-documented entity in both urban and rural areas and may form the stepping-stone for adult obesity and increase risk of noncommunicable disease risk.

Bhargava and co-workers have shown the adverse effect of life styles of urban Delhites in the nineties which rendered even low middle-income adults who were undernourished in infancy, childhood and adolescence, one to develop obesity- both general and abdominal hypertension and diabetes by the time they are thirty (Table 7.4.5). The study demonstrated the potential adverse consequences of rapid change in the dietary habits and life style of urban population in Delhi in the last decade.

These data suggest that the possibility that low birth weight and undernutrition in childhood may predispose to overnutrition and NCD in adult life, providing yet another rationale for energetic interventions to reduce low birth weight and undernutrition in childhood. Early detection and correction of undernutrition until children attain appropriate weight for their height is essential to promote optimal growth, nutrition and health.

Table 7.4.5: Time Trends in nutritional status of Delhi cohort				
	Male		Female	
Age	No.	Weight (Kg)	No.	Weight (Kg)
At birth	803	2.89±0.44	561	2.79±0.38
2 yrs	834	10.3±1.3	609	9.8±1.2
12 yrs	867	30.9±5.9	625	32.2±6.7
30 yrs	886	71.8±14.0	640	59.2±13.4
Source: Reference 7.4.2				

Table 7.4.6: Current Status of Delhi cohort				
Characteristic	Men		Women	
	No.	Value	No.	Value
Weight (Kg.)	886	71.8±14.0	640	59.2±13.4
Height (m)	886	1.70±0.06	638	1.55±0.06
BMI	886	24.9±4.3	638	24.6±5.1
Waist:Hip ratio	886	0.92±0.06	639	0.82±0.07
BMI>_25	886	47.4	638	45.5
BMI>_23	886	66.0	638	61.8
Central Obesity (%)	886	65.5	639	31
Impaired GTT	849	16	539	14
Source: Reference 7.4.2				

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7.4.13 ***World Health*** **Statistics** ***Quarterly 1984 & State of World Children UNICEF 2006***

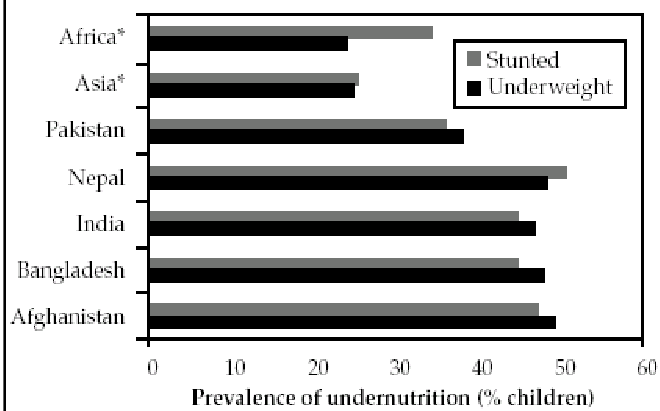
7.4.14 UNICEF State of World Children 2006

7.4.15 NFI ongoing study.

7.5 NUTRITIONAL STATUS IN INFANCY AND EARLY CHILDHOOD

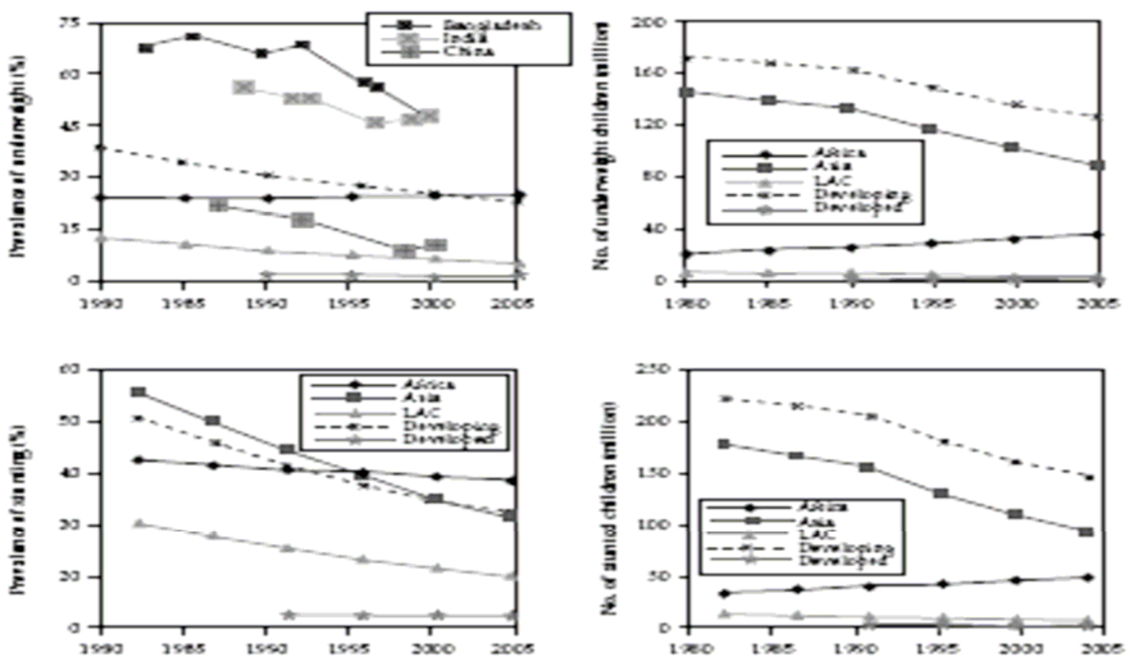
Preschool children are one of the most nutritionally vulnerable segments of the population. Nutrition during the first five years has an impact not only on growth and morbidity during childhood, but also acts as a determinant of nutritional status in adolescent and adult life. Global comparative data indicate that contrary to common perception, prevalence of underweight and stunting is highest in South Asian children (Figure 7.5.1,Annexure 7.5.1). Time trends in undernutrition in under five children in different regions/ countries is shown in Figure 7.5.2

Figure 7.5.1: Undernutrition prevalence in South Asian countries is much higher than in Africa



Source: Reference 7.5.12

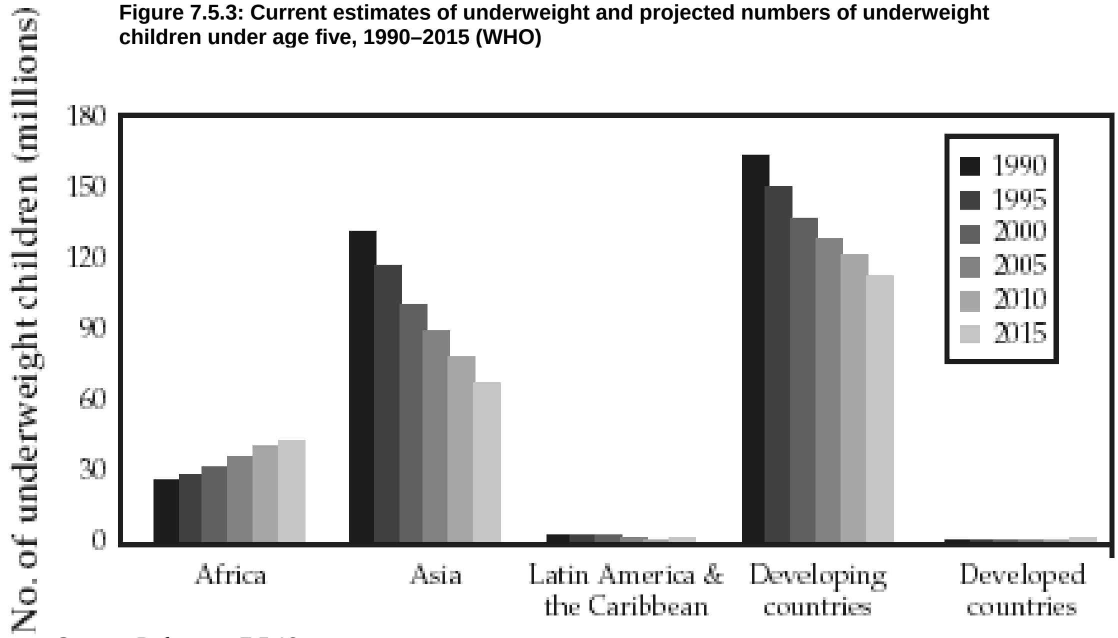
Figure 7.5.2 Prevalence of under nutrition in under five children



Source: Reference 7.5.12

India is home to the largest number of underweight and stunted children in the world. Projected trends in number of underweight under five children is given in Figure 7.5.3. In South Asia, especially India there will be a substantial reduction in undernutrition rates; but Asia and India will continue to have by far the largest

Figure 7.5.3: Current estimates of underweight and projected numbers of underweight children under age five, 1990–2015 (WHO)



Source: Reference 7.5.12

number of underweight children in the world in 2015. Time trends in poverty, undernutrition and mortality in developing countries is shown in Table 7.5.1. Over the last four decades there has been a progressive reduction in poverty, increase in energy intake and undernutrition and infant and under five mortality in the developing countries.,

Table 7.5.1: Time trends in poverty, undernutrition and mortality in developing countries.

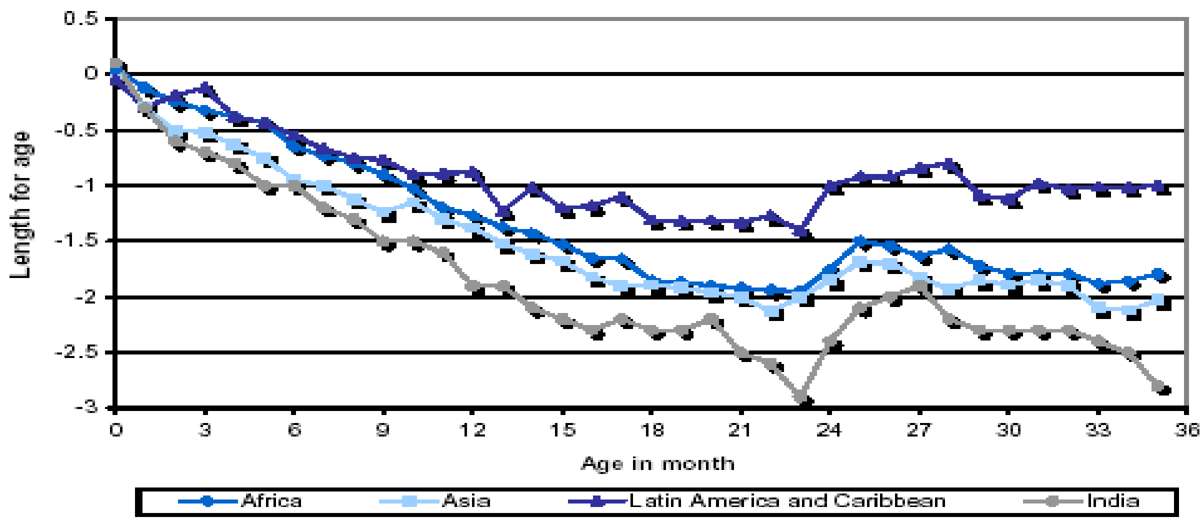
	1970	1975	1980	1981	1984	1985	1987	1990	1993	1995	1996	1999	2000	2001	2002	2003	2005	ARC
IMR (/1000)	108		88					71		67			62			60		-1.8
U5MR (/1000)	167		133					105		98			91			87		-1.99
Energy availability (Cal)	2110	2146	2308			2444		2520		2602			2654					0.83
Underweight (%)			37.6			33.9		30.1		27.3			244				22.7	-2.99
Stunting (%)			48.6			43.2		37.9		33.5			29.6				26.5	-2.03
Poverty headcount (%)				40.4	32.8		28.4	27.9	26.3		22.8	21.8		21.1				-2.45

Source: Reference 7.5.12

Note: ARC : Annual rate of change ; per capita energy availability is an average of three years

Global pattern of undernutrition in relation to age in preschool children is shown in Figure 7.5.4. Approximately 30% of children in India are born with low birth weight; and the rest of the damage happens during the first two years of life. By the age of two years most growth retardation has already taken place and the linear growth retardation appears to be irreversible.

Figure 7.5.4: Nutritional Status in relation to ages



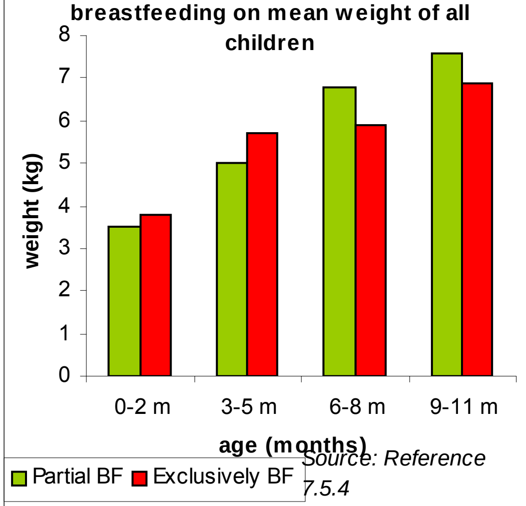
Source: Reference 7.5.2

Infant feeding and infant nutrition

Factors affecting infant nutrition

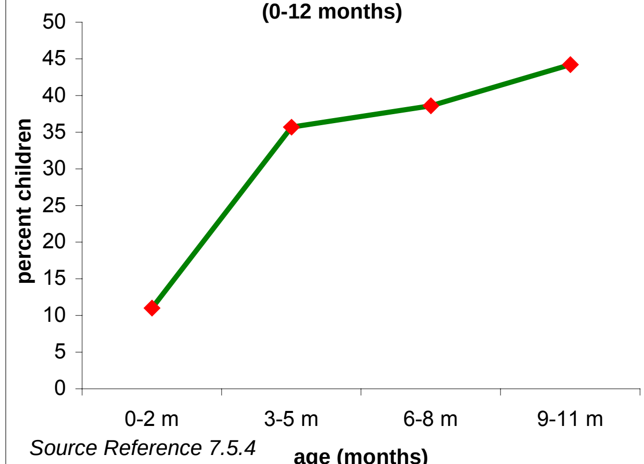
Growth during infancy and childhood depends on birth weight, adequacy of infant feeding and absence of infection. Available data from studies, over the last five decades clearly indicate that in India exclusively breast-fed infants thrive normally during the first six months of

Figure 7.5.5: Effect of exclusive breastfeeding on mean weight of all children



Source: Reference 7.5.4

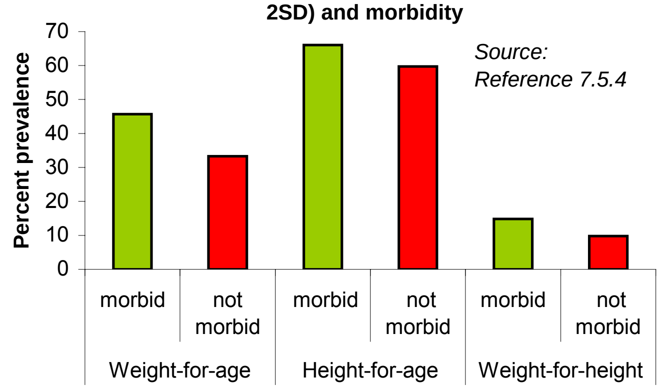
Figure 7.5.6: Prevalence of morbidity in children (0-12 months)



Source Reference 7.5.4

life; however continued exclusive breast-feeding beyond six months is associated with poor growth (Figure 7.5.5) There is a progressive increase in morbidity due to infections with increasing age and introduction of milk and semisolid food to breast fed infants (Figure 7.5.6). Prevalence of undernutrition is higher in infants who had morbidity during the last fortnight (Figure 7.5.7).

Fig 7.5.7: Percent prevalence of undernutrition (<-2SD) and morbidity



Time trends in infant feeding and infant nutrition

All major nutritional surveys in India have focused on dietary intake and nutritional status of preschool children. Data on infant and young child feeding practices and nutritional status of children under 6 years are available from NNMB, NFHS, DLHS. NFHS and DLHS provide data at national and state level; in addition DLHS provides district wise data which may help in decentralized district based planning, monitoring and evaluation. All these surveys have shown that in India, steps taken for the protection and promotion of breast-feeding have been effective and breast-feeding is almost universal; mean duration of lactation is over 2 years. However, the message that exclusive breast-feeding up to six months and gradual introduction of semisolids from six months are critical for the prevention of undernutrition in infancy has not been as effectively communicated. Exclusive breast-feeding among infants in the age group of 0-6 months continues to be low. NFHS-3 shows that inspite of the all IEC efforts on the need for timely introduction of complementary food, only about half the children in the age group

Figure 7.5.8: Infant feeding practices & prevalence of undernutrition- NFHS-3

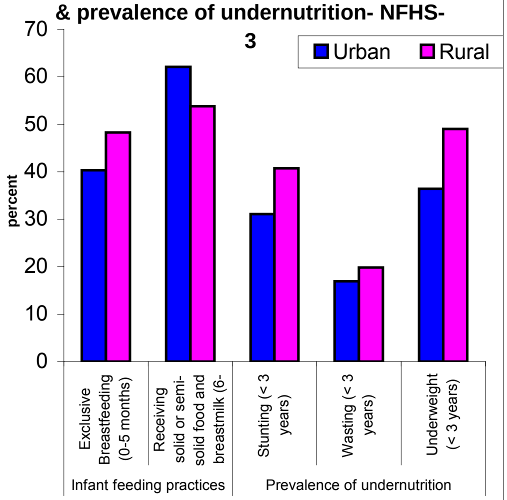
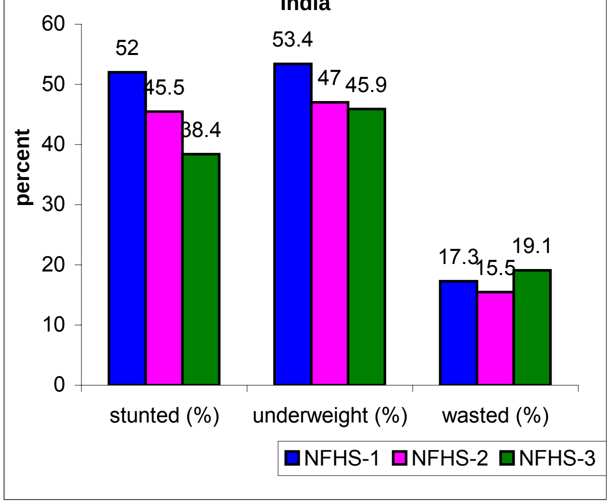


Figure 7.5.9: Nutritional status of children in India



of 6-9 months receive semisolid food. As a result undernutrition rates continue to be high in the 0-3 year age group (Figure 7.5.8). There has been some reduction in underweight rates between NFHS 1 and 2 but not much change between NFHS 2 and 3. There were small but not consistent differences in the stunting and wasting rates between the three surveys. Inappropriate infant and young child feeding and caring appears to be responsible for the relatively slow reduction in undernutrition rates between the three NFHS surveys (Figure 7.5.9). As a result of the faulty infant and young child feeding practices, there is a steep increase in the prevalence of undernutrition from 15.4 % at less than 6 months to 52.6 % in the 12- 23 months age group (Figure 7.5.10). Correction of these faulty infant feeding practices through nutrition education will prevent the steep increase in undernutrition in the critical 6-24 months age group.

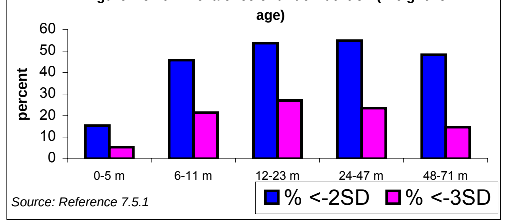
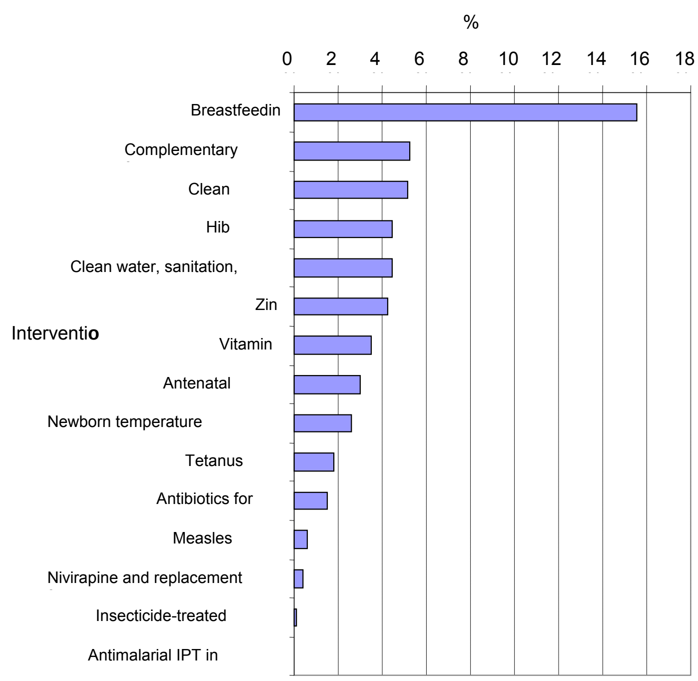


Figure 7.5.10 : Prevalence of undernutrition (Weight-for-age)

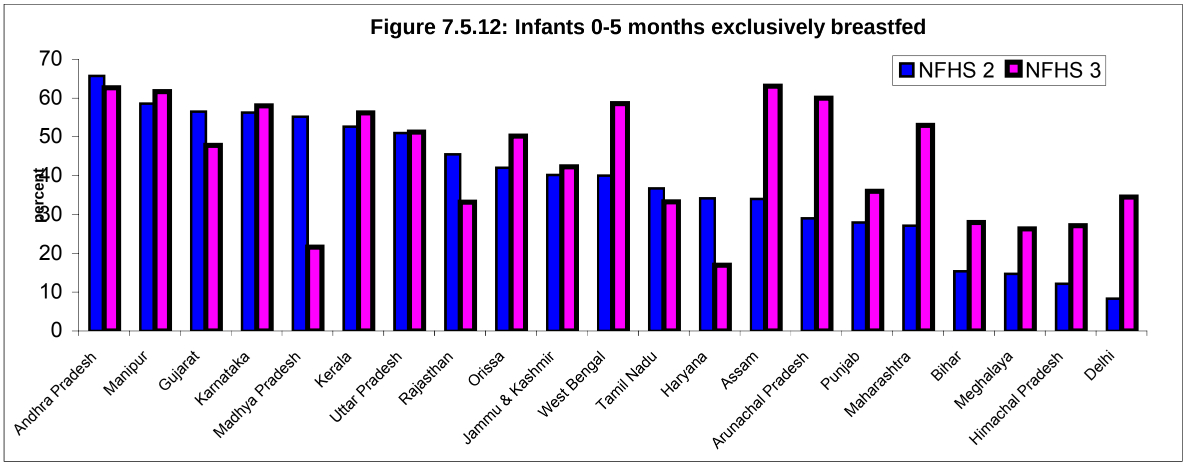
Too early introduction of milk substitutes and too late introduction of complementary food are associated with increased risk of infection. If infections are not detected and treated effectively in the primary health care settings, they will result in undernutrition; severe infection may lead to death. It is computed that exclusive breast-feeding and appropriate complementary feeding will lead to a 20% reduction in IMR (Figure 7.5.11). Improvement in IYCF through coordinated efforts of ICDS and NRHM can thus result in substantial improvement in nutrition and health status and survival during the critical first year of life.

Figure 7.5.11: Under-5 deaths preventable through universal coverage with individual interventions (2000)

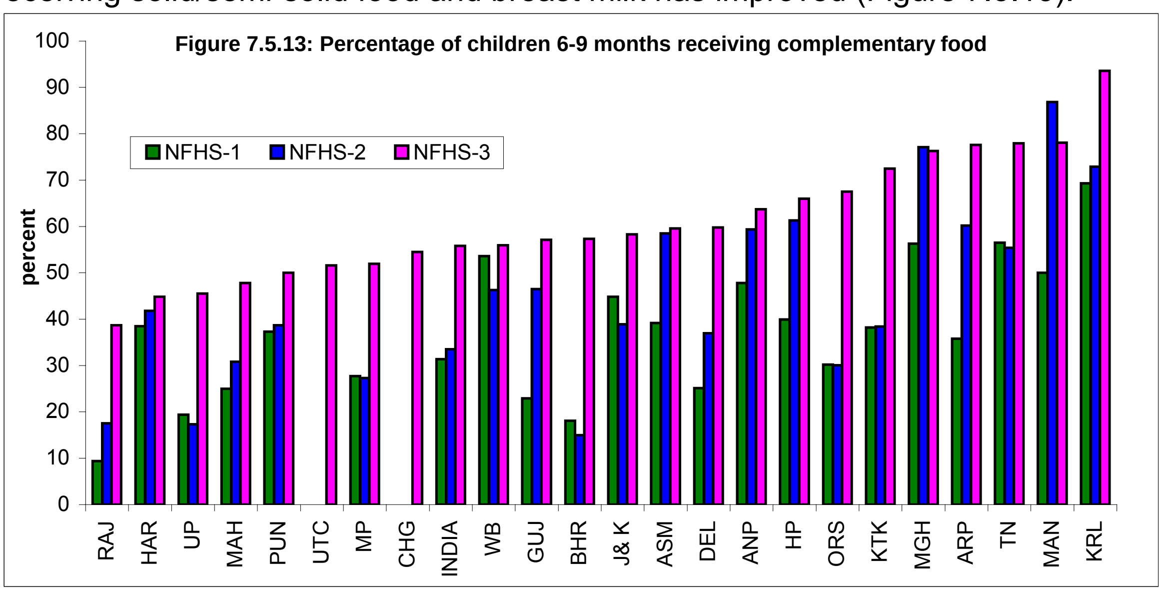


Interstate differences in infant feeding

NFHS 1, 2 & 3 show that the substantial inter-state differences in exclusive breastfeeding and timely introduction of semi-solid foods still persist. Andhra Pradesh and Kerala fare well in terms of appropriate infant feeding practices. Too early introduction of supplements is a major problem in states like Delhi, Himachal Pradesh and Punjab and too late introduction of supplements is the problem in Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, and Orissa Figure 7.5.12 & 7.5.13. Both these faulty feeding practices are associated with increased risk of undernutrition and infection. Comparison of data from NFHS-2

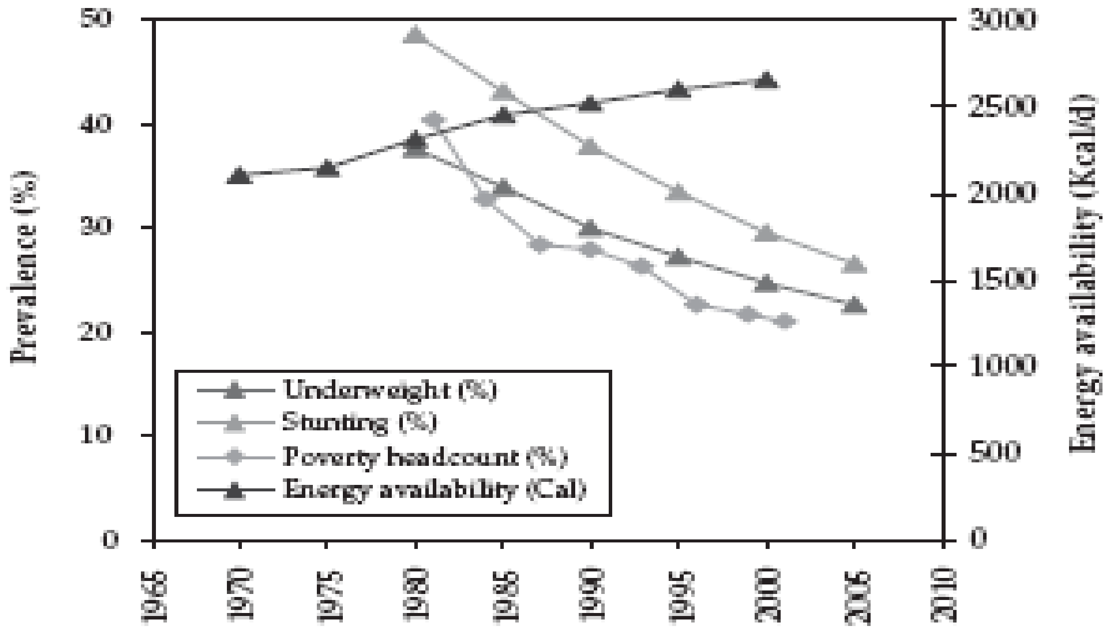


and NFHS-3 shows that exclusive breastfeeding has significantly decreased in states like Madhya Pradesh and Haryana (Figure 7.5.12). West Bengal, Assam, Maharashtra, Himachal Pradesh and Delhi, have shown improvement in exclusive breast-feeding rates. In states like Karnataka, Orissa, Madhya Pradesh, Rajasthan and Uttar Pradesh, the percent of infants (6-9 months) receiving solid/semi-solid food and breast milk has improved (Figure 7.5.13).



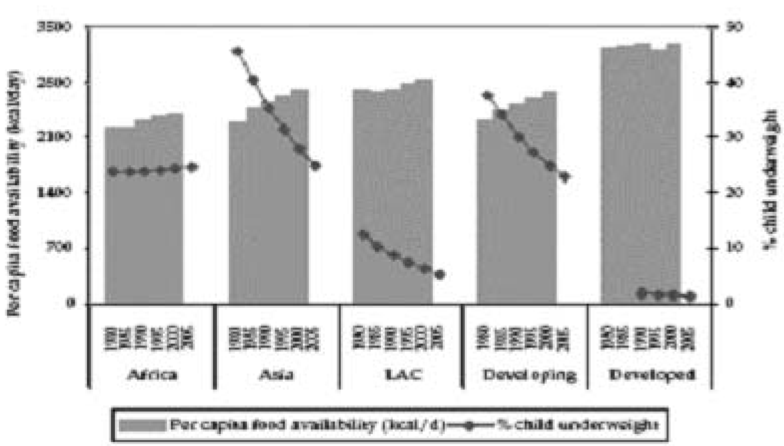
Dietary intake in preschool children

Figure 7.5.14 Time trends in poverty, energy availability& undernutrition rates in developing countries



Time trends in poverty, energy availability and under weight and stunting rates in developing countries is shown in Figure 7.5.14. There has been a relatively steady but slow decline in poverty, improvement in food availability and reduction in underweight and stunting over the last five decades. There are substantial differences in energy intake and undernutrition in preschool children in developing countries in different regions. Energy availability in developing countries is lower in developing countries. Energy availability and undernutrition rates have remained unchanged in Africa; Asia showed the steepest increase in energy availability and undernutrition rates (Figure 7.5.15).

Figure 7.5.15 Energy availability& undernutrition



Source: Reference 7.5.12

Dietary intake in Indian preschool children

Table 7.5.2 Average nutrient intakes among pre-school children										
Age	**1-3 years**					**4-6 years**				
Year	75-79	88-90	96-97	00-01	05-06	75-79	88-90	96-97	00-01	05-06
Protein (g)	22.8	23.7	20.9	19.5	20.2	30.2	33.9	31.2	28.2	28.7
Energy (Kcal)	834	908	807	729	719	1118	1260	1213	1066	1020
Vitamin A (μg)	136	117	133	106	126	159	153	205	127	166
Thiamin (mg)	0.5	0.52	0.4	0.4	0.5	0.76	0.83	0.7	0.7	0.7
Riboflavin (mg)	0.38	0.37	0.4	0.3	0.3	0.48	0.52	0.6	0.6	0.4
Niacin (mg)	5.08	5.56	4.6	5.1	5.2	7.09	8.4	7.4	8.1	7.9
Vitamin C (mg)	15	14	15	17	17	20	23	25	24	25

Source: Reference 7.5.8

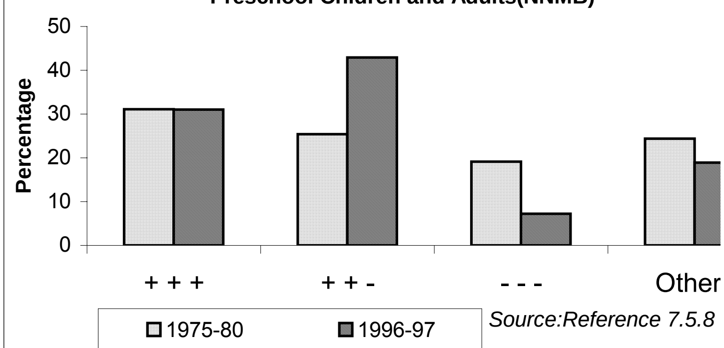
Data from surveys carried out by National Nutrition Monitoring Bureau (NNMB) on dietary intake in preschool children between 1975 and 2005 are given Table 7.5.2. There has not been a substantial improvement in their dietary intake over the last two decades.

Table 7.5.3: Mean Energy Consumption- Children / Adolescents and Adults											
Gender	Boy and Girl			Male				Female			
Years	1-3	4-6	7-9	10-12	13-15	16-17	≥18	10-12	13-15	16-17	≥18
Kcals	719	1020	1230	1423	1645	1913	2000	1389	1566	1630	1738
RDA	1240	1690	1950	2190	2450	2640	2425	1970	2060	2060	1875
% RDA	58.0	60.4	63.1	65.0	67.1	72.5	82.5	70.5	76.0	79.1	92.7

Source: Reference 7.5.8

Data on energy intake in children, adolescents and adults in the same families from NNMB survey done in 2005-06 is shown in Table 7.5.3**.** Mean energy consumption, as %age of RDA is the least among the preschool children; inspite of the fact that their requirement is the lowest. The gap between RDA and actual intake is widest in preschool children. It would appear that the problems in feeding a young child with predominantly adult food with low energy and

Figure 7.5.16: Comparison of Energy Adequate Status of Preschool Chidren and Adults(NNMB)



Source:Reference 7.5.8

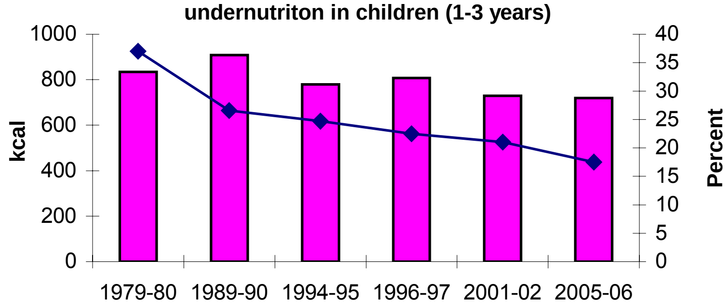
Dietary Intake	Adult Male	Adult Female	Preschool Children
+ + +	Adequate	Adequate	Adequate
+ + -	Adequate	Adequate	Inadequate
- - -	Inadequate	Inadequate	Inadequate

nutrient density rather than poverty is the major factor responsible for low dietary intake in preschool children.

Time trends in intra familial distribution of food (Figure 7.5.16) indicate that while the proportion of families where both the adults and preschool children have adequate food has remained at about 30% over the last 20 years, the proportion of families with inadequate intake has come down substantially. However, the proportion of families where the preschool children receive inadequate intake while adults have adequate intake has nearly doubled. This is in spite of the fact that the RDA for preschool children forms a very small proportion (on an average 1300 kcal/day) of the family's total intake of around 11000 kcal/day (assuming a family size of 5). These data confirm that in the last decade more than poverty, poor young child feeding and caring practices are responsible for inadequate dietary intake in preschool children.

Nutritional status of preschool children

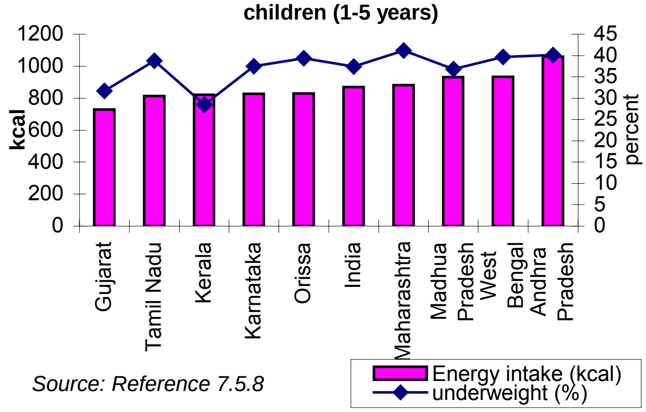
Figure 7.5.17: Time trends in energy intake and severe undernutriton in children (1-3 years)



Source: Reference 7.5.8

Data from NNMB surveys on energy intake and prevalence of undernutrition in under three children shows that there has been a steady decline in severe undernutrition in children even though the dietary energy intake has not shown a major change over years (Figure 7.5.17). The decline in severe undernutrition is most probably attributable to the better access to health care and effective management of infections. There were not marked differences either in dietary intake or nutritional status between children in the NNMB states (Figure 7.5.18).

Figure 7.5.18: Energy intake and underweight in children (1-5 years)



Source: Reference 7.5.8

Data from NNMB surveys have shown that over the last three decades there has been a steep decline in the prevalence of moderate and severe undernutrition as assessed by weight for age and height for age. Inspite of the steep decline in the prevalence of stunting over the last three decades, the change in the mean height of children is very small. There has

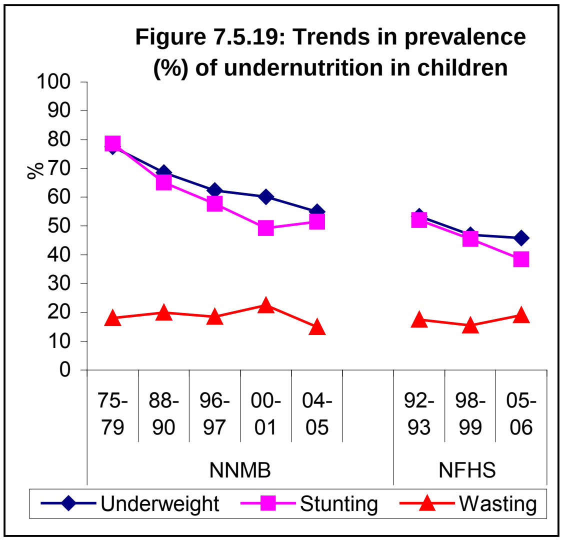


Figure 7.5.19: Trends in prevalence (%) of undernutrition in children

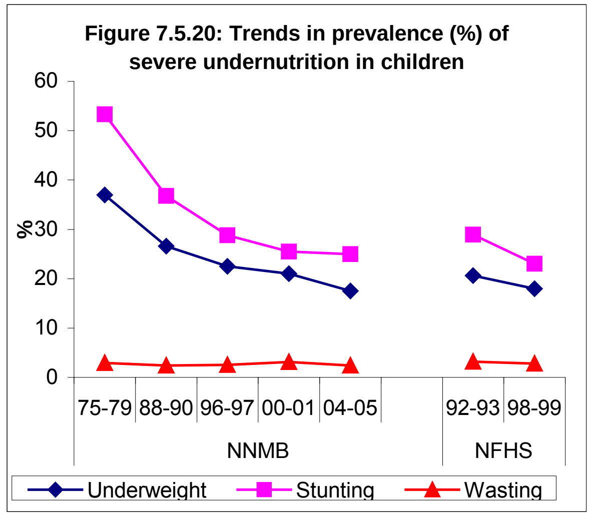
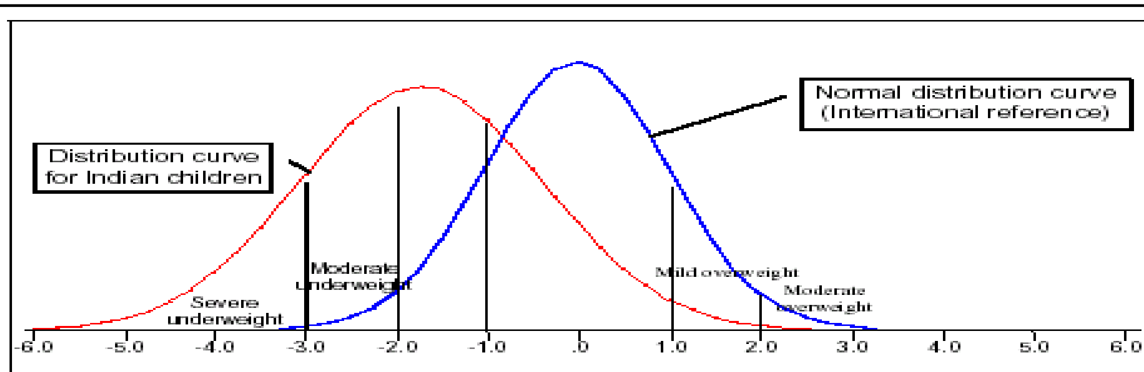


Figure 7.5.20: Trends in prevalence (%) of severe undernutrition in children

been a decline in underweight children but even now nearly 50% of the children are underweight as compared to the NCHS norms. There has been some reduction in stunting rates similar to the reduction in underweight rates. Wasting rates are much lower than the underweight and stunting rates. It is noteworthy that there has been no change in wasting rates over the same period. It is not clear how much of this is attributable to the fact that Indian children are shorter as compared to NCHS norms and will therefore weigh less, even though their body weight is appropriate for their current height (Figure 7.5.19 and 7.5.20).

Plotting frequency distributions of weight-for-age of Indian preschool children from NFHS -2 against the corresponding NCHS standards clearly indicate that the distribution in Indian children is skewed to the left (Figure 7.5.21). Comparison of the national level data from NFHS 1 and 2 (Figure 7.5.19 and 20)

Figure 7.5.21: Weight-for-age distribution: children under three in India compared to the global reference population



Source: Reference 7.5.2

suggests that there has been some reduction in prevalence of undernutrition in the nineties. If the criteria of weight-for-age, height-for-age are used, nearly half of the children are still undernourished. In contrast only 15.5 % are wasted (low weight for height). The figure may be even lower if the criterion of BMI for age is used. It is noteworthy that NNMB and NFHS data indicate that unlike underweight, stunting there has been no reduction in wasting rates over the last three decades.

New WHO Growth standards (2006)

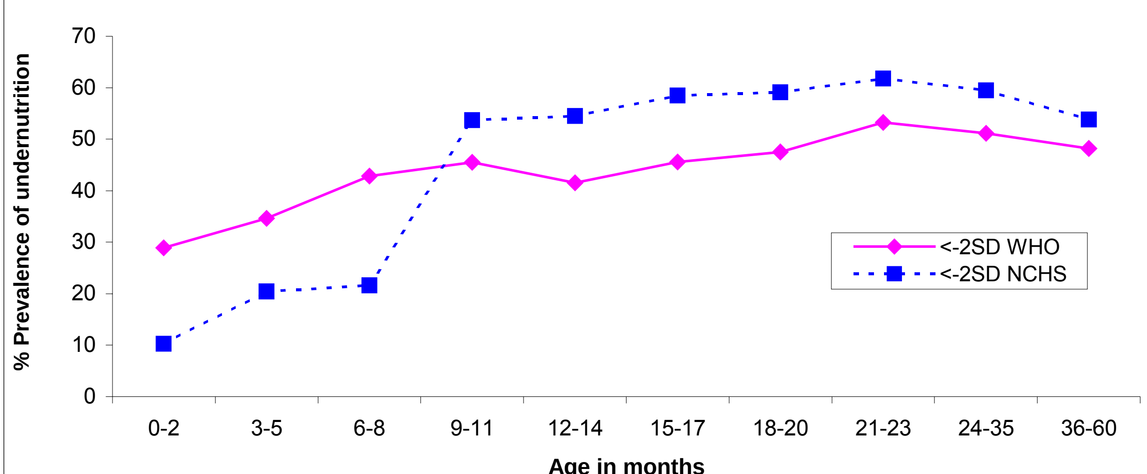
During the nineties, a WHO Working Group analysed available data on growth of infants who were breast-fed in the first year of life and found that the growth curve of breast-fed infants differed significantly from the NCHS standards. In order to derive appropriate global standards for growth of breast-fed infants during early childhood, WHO conducted a multi-centre study in Brazil, Ghana, India, Norway, Oman, and United States. Weight-for-age, height-for-age and weight-for-height and BMI for age standards for preschool children were computed from this study. In April 2006, WHO released the new growth standards for preschool children based on this study and recommended that instead of the NCHS growth standards, member states may use new standards in view of:

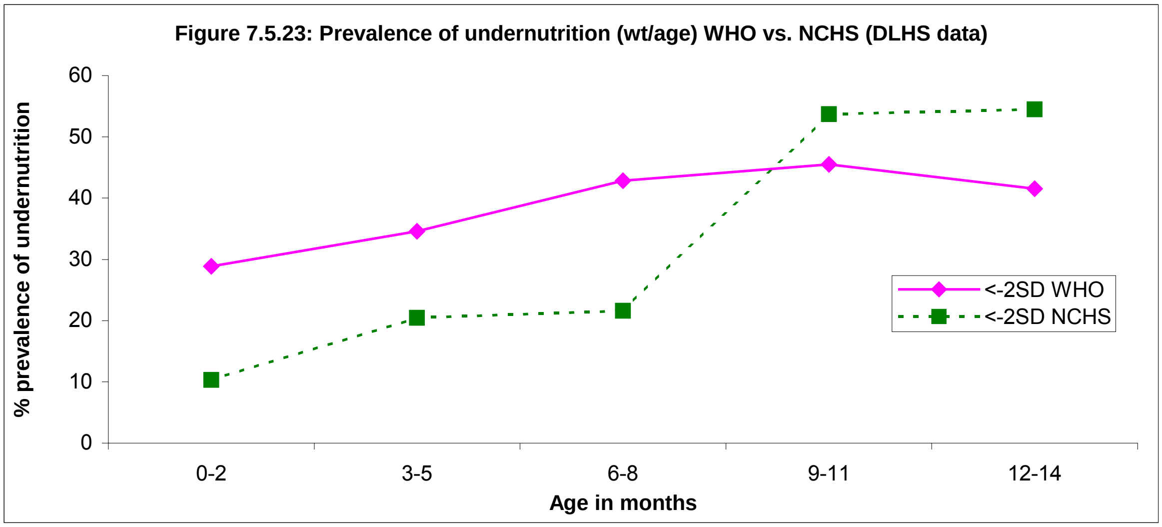
- The WHO policy on promoting breast feeding and
- The urgent need to use the standards for BMI for age for early detection and correction of under and over nutrition in preschool children.

Underweight rates: comparison between NCHS and WHO (2006) standards

Important to assess whether changing over to WHO (2006) standards will lead to changes in prevalence of undernutrition and if so the magnitude of change in different age groups. Analysis of data on weight-for-age of 2.4 lakh preschool children from the District Level Household Survey showed that there were substantial differences in prevalence of undernutrition (weight-for-age) as assessed by NCHS and WHO standards (Figure 7.5.22 and 7.5.23). The maximum difference in underweight rates is in the critical first year of life.

Figure 7.5.22: Prevalence of undernutrition (wt/age) WHO vs NCHS (DLHS data)





Computed underweight rates using WHO (2006) standards are higher as compared to the computed underweight rates using NCHS standards in the first six months. This should be viewed as a correction of a historical fallacy of using NCHS standards based on formula fed infants and not as alarming rise in underweight rates in the 0-6 age group. After first year the prevalence of underweight rates computed from the WHO standards is lower than the underweight rates computed using the NCHS standards. This should not be interpreted as a fall in undernutrition rates and lead to a sense of complacency that undernutrition rates are falling.

Clinical and programme implications adoption of WHO (2006) standards

Review of the data on undernutrition rates in different age groups from the DLHS database computed on the basis of NCHS and WHO standards provides fascinating information. The reported undernutrition rates in the 0-3 month age group as assessed by the NCHS norms (10%) is unrealistically low when one takes into account the 30% low birth-weight rate in the country. If the WHO (2006) standards are used prevalence of under-nutrition in the first three months is about 30%; this suggests that exclusive breast feeding followed by majority of mothers in this period protects the infant from further deterioration in nutritional status. A small rise in the prevalence of undernutrition between three and six months is seen if the WHO standards are used; this is likely to be due to too early introduction of milk substitutes and higher morbidity in this period. A further rise in the undernutrition rate between six and twelve months seen with the WHO standards is likely to be due to too late introduction or inadequate amount of complementary feeds to children in this age group as well as increase in morbidity and inadequate care during infections. Prevalence of undernutrition based on WHO standards clearly brings out the importance of too early introduction of breast milk substitutes, too late introduction of complementary feeds and poor care during morbidity as major factors associated with rising prevalence of undernutrition in infant. This data can serve as a very useful tool for advocacy and awareness building so that there is focused attention on two critical interventions to improve young child nutrition namely nutrition education to ensure appropriate infant and child feeding and health education to improve timely access to health care.

There is a second peak in undernutrition rates around two years of age when the child shifts totally to adult food; this is perhaps related to inadequate intake of food because of poor child feeding practices. Nutrition education that young children have small stomach capacity and therefore should be fed 5-6 times in order to receive adequate quantity of food may help in improving the dietary intake and nutritional status of children in this age group. Thus use of WHO (2006) growth standards can make an important contribution in clearly bringing into focus the importance of increasing investment in nutrition and health education and healthcare to improve infant and young child feeding and caring practices in the critical period of 0-36 months and can result in substantial reduction in undernutrition rates in preschool children.

Disparities in underweight, by location, wealth quintile, gender and caste

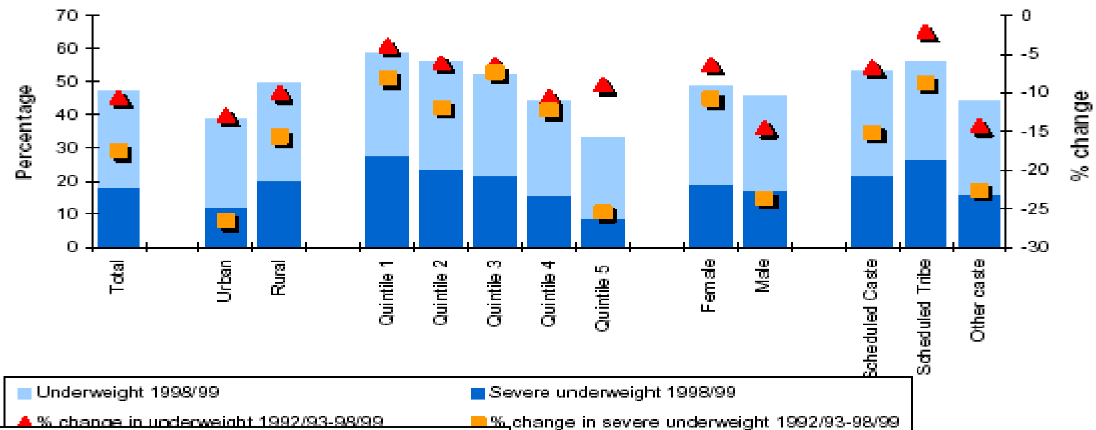
Data from NFHS 1 & 2 on nutritional status of children in some sub-groups are indicated in Table 7.5.4. The prevalence of underweight among children under three years of age and recent trends in underweight vary substantially across different subgroups of the Indian population. Desegregation of the national averages from NFHS 1 & 2 for children under 3 in relation to location, socio-economic status, caste and sex is given in Figure 7.5.24. The rural underweight prevalence exceeds that of urban areas. Rural areas bear a particularly large share of the total *severe* underweight prevalence. As expected, both underweight and severe underweight prevalence increases as household wealth falls. Underweight prevalence is as high as 60% in the lowest quintile, but even in the wealthiest fifth of the population 33% of children are underweight and 8.5% are severely underweight. Underweight (and severe underweight) prevalence is

Table 7.5.4: Nutritional status of children

Age	Weight for age				Height for age				Weight for height			
	% <-3SD		% <-2SD		% <-3SD		% <-2SD		% <-3SD		% <-2SD	
In years	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
0-3 years	20.6	18	53.4	47	28.9	23	52	45.5	3.2	2.8	17.5	15.5
in months												
< 6months	2.8	2	15.6	11.9	5.7	4.2	15.7	15.4	2	1.9	9.5	9.3
6-11 months	14.1	11.8	43.3	37.5	14.3	11.3	34.3	30.9	2.9	2.8	15.7	13.2
12-23 months	26.3	23.1	63.4	58.5	30.7	29.8	56.6	57.5	5.6	4.1	28	21.9
24-35 months	25.9	24.1	62.2	58.4	34.6	32	60.2	56.5	2.5	1.9	16.6	13.2
Residence												
Urban	14.8	11.6	45.2	38.4	22	15.4	44.8	35.6	2.9	2.2	15.8	13.1
Rural	22.4	19.9	55.9	49.6	30.9	25.4	54.1	48.5	3.2	3	18	16.2

Source: Reference 7.5.5 & 7.5.6

Figure 7.5.24: Demographic and socioeconomic variation in the prevalence of underweight, among children under three, NFHS 1 and 2



Source: Reference 7.5.2

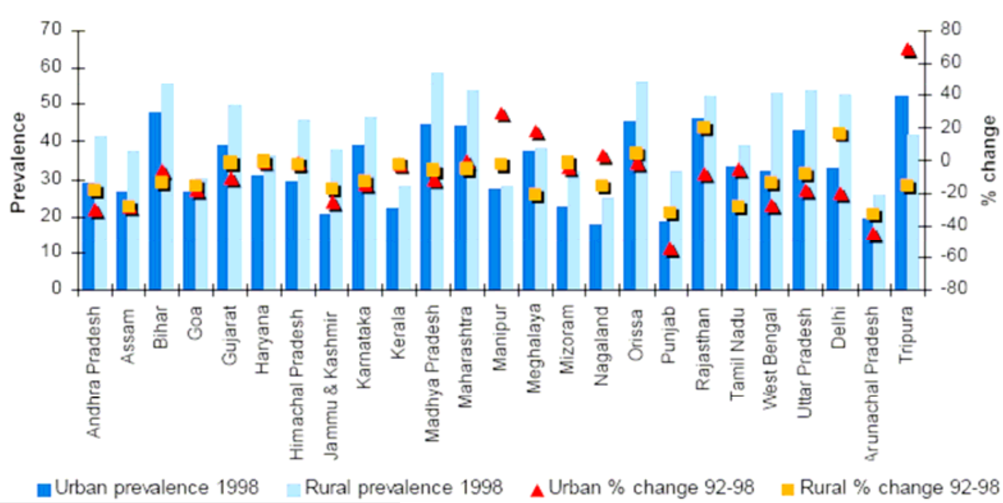
slightly higher among girls, 48.9% (18.9%), than among boys, 45.5% (16.9%). Both underweight (and severe underweight) prevalence is much higher among scheduled castes 53.2% (21.3%), and scheduled tribes 56.2% (26.3%) than among other castes, 44.1% (15.7%). Thus, most at risk for underweight are girls whose families are poor, belong to scheduled tribes or castes, and live in rural areas (India's undernourished children).

Interstate differences in undernutrition

Interstate urban rural difference

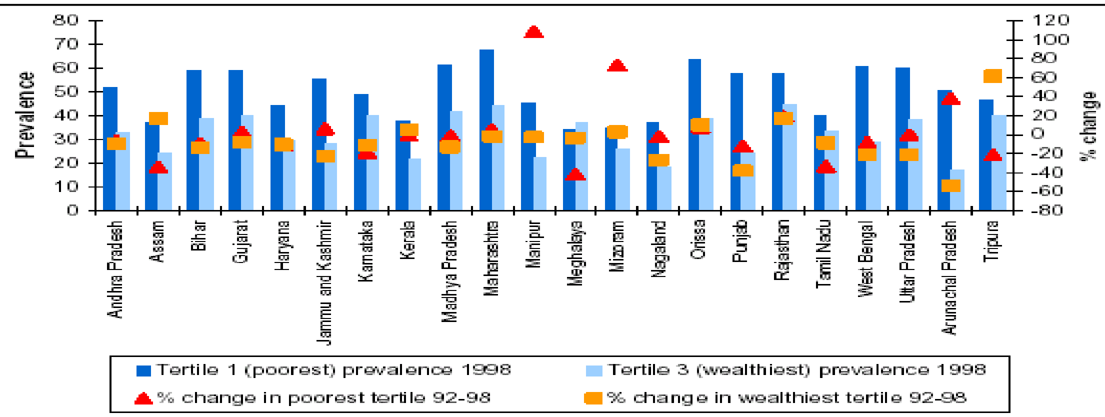
There are clear and consistent urban-rural disparities in underweight prevalence. In all states, except Tripura, the percentage of underweight children is higher in rural areas than in urban areas (Figure 7.5.25). The magnitude of these differentials varies by state. The largest differences are observed in Delhi, West Bengal, Punjab and Jammu and Kashmir where the prevalence of underweight children in rural areas is much higher than undernutrition in urban areas. Comparison of data between NFHS 1 and 2 showed that there was reduction in

Figure 7.5.25: Urban rural and interstate differences in nutritional status of under three children-NFHS 1 and 2



Source: Reference 7.5.2

Figure 7.5.26: Change in the prevalence of underweight, by wealth tertile and state, NFHS 1 and 2



Source: Reference 7.5.2

undernutrition rates in most of the states both in urban and rural areas. However, in Rajasthan, Orissa and Manipur there was an increase in underweight prevalence between 1992-1998; Delhi registered significant increases in rural undernutrition prevalence and the northeastern states of Meghalaya, Manipur, Nagaland and Tripura experienced increases in *urban* undernutrition. The reasons for these trends are not clear.

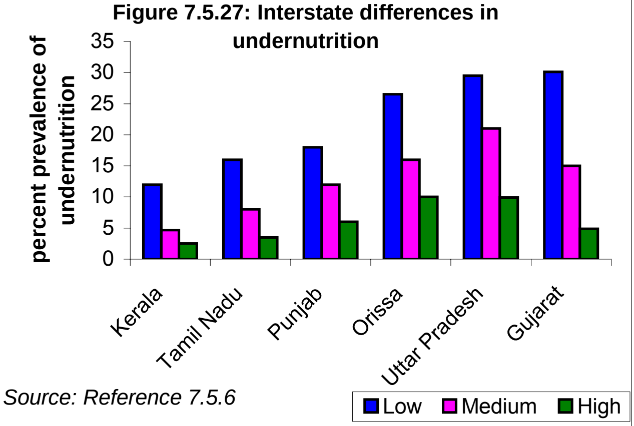
Socioeconomic status and undernutrition

Data on changes in prevalence of undernutrition rates in the children from poorest and richest tertile is shown in Figure 7.5.26. The data clearly indicates that undernutrition rates are higher in the poorer segments of the population. However, even among the high income group one third of the children are underweight. Data from NFHS-2 show that nutritional status of poor children in Kerala is similar to the nutritional status of the rich in Uttar Pradesh and Orissa (Figure 7.5.27). This is probably attributable to better access to health care and equitable distribution of food between members of the family in Kerala and lack of these in Uttar Pradesh. These data indicate that poverty is no longer the major determinant of undernutrition in preschool children; lack of access to nutrition and health care are becoming important determinants of undernutrition in preschool children.

Time trends in interstate differences in undernutrition

Interstate differences in undernutrition rates in under three children (weight-for-age,

Figure 7.5.27: Interstate differences in undernutrition



Source: Reference 7.5.6

Figure 7.5.28: Interstate time trends of percentage of underweight children under 3 years

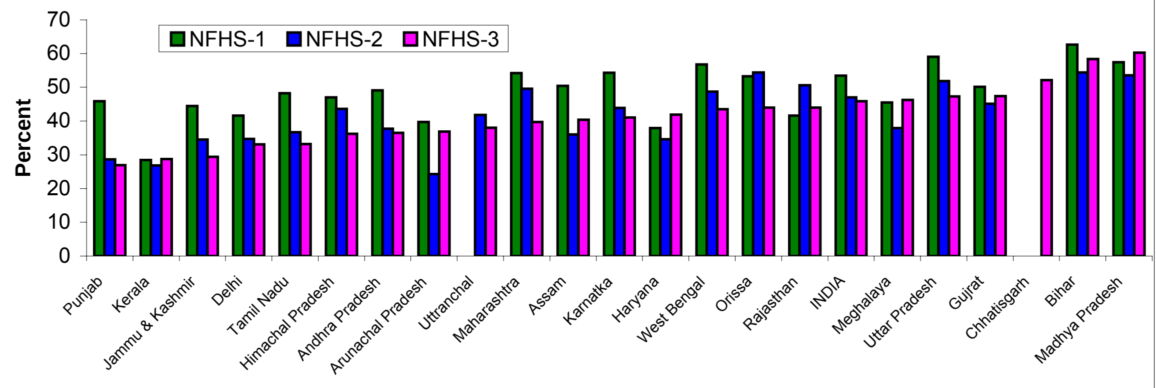
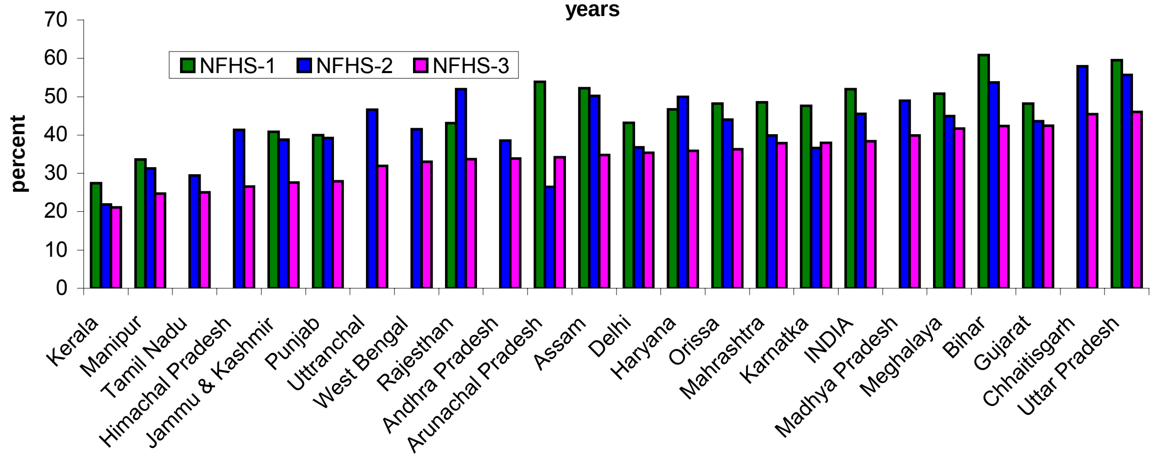


Figure 7.5.29: Interstate time trends in prevalence of stunting among children under 3 years



height-for-age, weight-for-height) are given in Annexure 7.5.3-7.5.5. Time trends in interstate differences in undernutrition in children between 1992-2005 are given in Figure 7.5.28, 7.5.29 and 7.5.30.Prevalence of underweight children is low in Punjab, Kerala, Delhi and high in MP, Bihar, UP and Gujarat. There has been reduction in underweight between 1992-1998 in Punjab, Tamil Nadu and UP but not much change in Kerala perhaps because undernutrition rates were low even in 1992. The reduction in underweight rates between NFHS 2 and 3 are

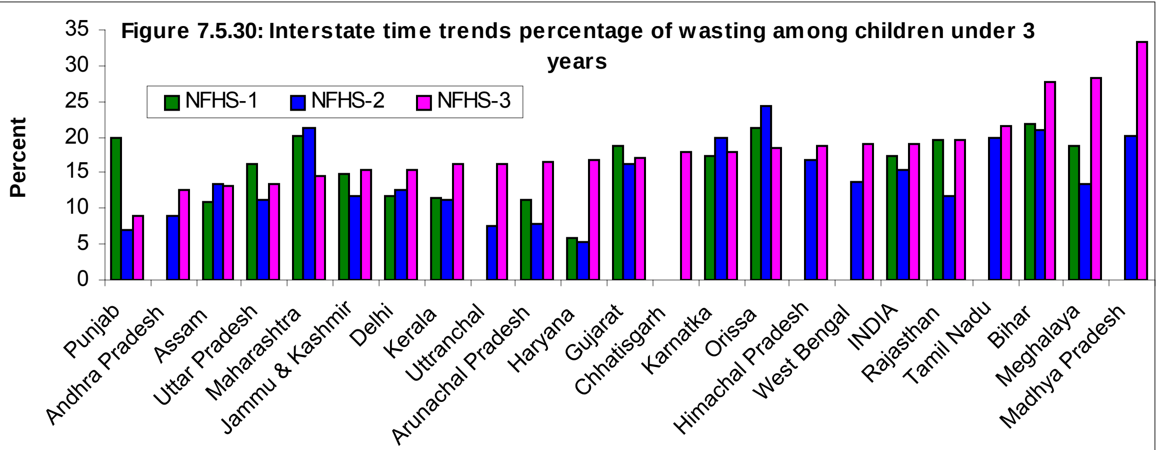


Figure 7.5.30: Interstate time trends percentage of wasting among children under 3 years

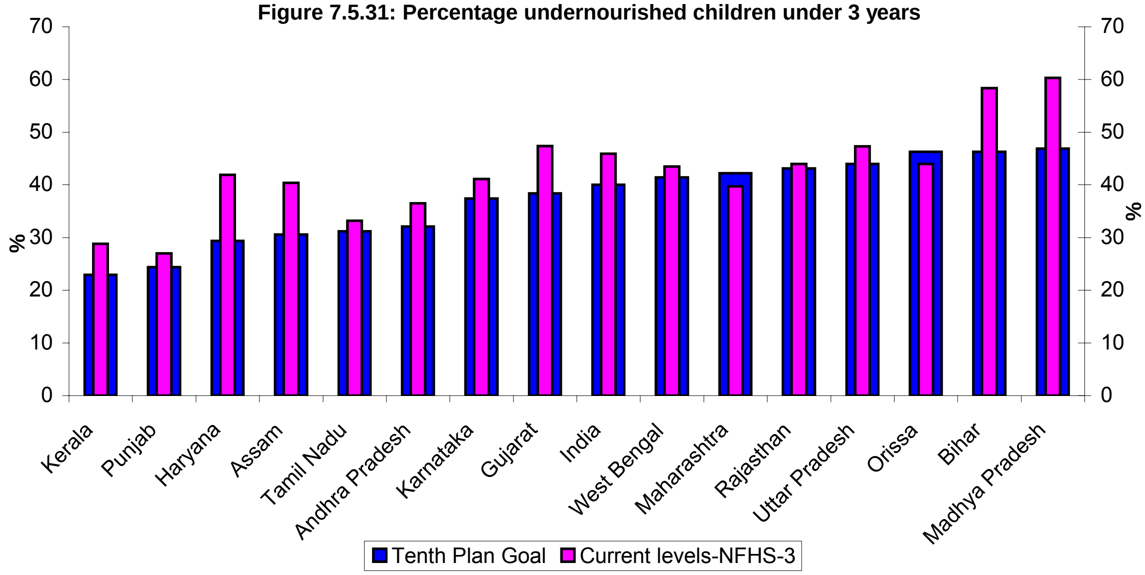
marginal in most states and also India as a whole.

At the national level there has been a sustained but slow reduction in prevalence rate of stunting. There are huge interstate differences in the prevalence of stunting among children under 3 years. States like Chattisgarh, UP, Rajasthan, Assam and Haryana showed the higher rates of stunting as compared to Kerala, Arunachal Pradesh, and Tamilnadu. Rajasthan, Assam, Himachal Pradesh, Uttranchal and Haryana showed the significant decline in stunting rates but the prevalence is still very high in all these states. Kerala showed lowest decline in prevalence rate of stunting. Orissa, Bihar, Maharashtra, Madhya Pradesh and Tamil Nadu had higher rates of wasting as compared to states like Haryana, Punjab Andhra Pradesh and Uttar Pradesh. The time trends in wasting rates between NFHS 1, 2 and 3 was varied and inconsistent. However India as well as majority of states reported an increase in wasting rates between NFHS 2 and 3. The exact significance of this finding is not clear.

It is obvious that in states with low per capita income and poor access to health and nutrition services (such as UP, Bihar and MP) undernutrition rates are high. At the other end of the spectrum states like Punjab, Delhi with high PCI, good access to services undernutrition rates is low. Undenutrition rates are relatively high in states with high per-capita income but where services are sub-optimal (like Haryana). Inspite of low per-capita income undernutrition rates in Kerala and Tamil Nadu are low because of good health and nutrition services.

Data on underweight rates in different states from NFHS-3 with the state specific goals for underweight rate set in the Tenth Five Year Plan is given in Figure 7.5.31. Orissa and Maharashtra have achieved the goals set. Rajasthan and Tamil Nadu are likely to achieve the goals. In Madhya Pradesh, Bihar, Gujarat, Haryana and Assam the decline in underweight children is very slow.

Figure 7.5.31: Percentage undernourished children under 3 years



Interdistrict variation in nutritional status

It is well known that there are substantial interdistrict variations in nutritional status in the same state. The District Level Household Survey provides district level information on prevalence of undernutrition in under six children (Annexure 7.5.9 and 7.5.10). These data will be useful in preparing appropriate district specific intervention programmes as well as provide information to monitor improvement in nutritional status.

Emergence of over nutrition

While undernutrition continues to be a major problem in all the developing countries, overnutrition is emerging as a public health problem even in preschool children in many developing counties (Table 7.5.5). In India also overnutrition in preschool children is reported especially among urban and affluent sections of the population. Currently overnutrition rates in preschool children in India are quite low. Efforts have to be directed to ensure that all preschool children are screened at last once in three months so that both under and overnutrition are detected early. Health and life style education on importance of physical activity will have to be the major plank for management of overnutrition in children. Healthy physically active life style established right in early childhood can go a long way in reducing overnutrition and associated health hazards even in adult life

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Table 7.5.5 Prevalence of under and overnutrition in different regions

Stunting	*1980*	*1985*	*1990*	*1995*	*2000*	*2005*
Africa	39.0	37.8	36.9	36.1	35.2	34.5
Asia	55.1	48.2	41.1	35.4	30.1	25.7
LAC	24.3	21.1	18.3	15.9	13.7	11.8
Developing	48.6	43.2	37.9	33.5	29.6	26.5
Developed			2.8	2.8	2.7	2.6
Global			33.5	29.9	26.7	24.1
Underweight	*1980*	*1985*	*1990*	*1995*	*2000*	*2005*
Africa	23.5	23.5	23.6	23.9	24.2	24.5
Asia	45.4	40.5	35.1	31.5	27.9	24.8
LAC	12.5	10.5	8.7	7.3	6.1	5.0
Developing	37.6	33.9	30.1	27.3	24.8	22.7
Developed			1.6	1.4	1.3	1.1
Global			26.5	24.3	22.2	20.6
Overweight	*1980*	*1985*	*1990*	*1995*	*2000*	*2005*
Africa				3.3	4.2	5.2
Asia				2.6	2.5	2.5
LAC				4.4	4.3	4.3
Developing				2.9	3.0	3.4

Source: Reference 7.5.12

Way forward

Poverty and poor access to health care were the major causes of undernutrition five decades ago. Currently there is universal access to ICDS services and essential primary health care; efforts are under way to improve content, coverage and quality of services available to the poorest and the marginalized segments. During the current decade, poor infant and young child feeding and poor utilization of health care are emerging as important determinants of undernutrition in children. Nutrition and health education and improved access to and utilization of health and nutrition care can be very effective interventions, which could result in substantial reduction in undernutrition in children over the next decade.

The Eleventh Plan sub group on ICDS and Nutrition has recommended that the core objective for ICDS in the 11th Plan should be "Universalisation with quality". This would involve ensuring that every hamlet has a functional Anganwadi. Each AWC should have the minimum infrastructure and equipment required for effective good quality services can be provided. These include weighing scales, storage arrangements, and drinking water, cooking utensils, medicine kits, child-friendly toilets, a kitchen shed and toys.

Early detection and effective management of maternal undernutrition will go a long way in reducing current high low birth weight rates. Nutritious take-home rations (THR) should be provided to pregnant and nursing mothers every month, on "health and nutrition day". Anganwadi workers should ensure that THRs also reach mothers who may have missed the "health and nutrition day". The "health and nutrition day" can also act as a meeting point for the Anganwadi worker, ASHA and ANM, and an entry point for the involvement of PRIs.

It is recommended that all children under six and all the eligible women have access to all ICDS services. There should be no eligibility criteria other than age (and especially no restriction of ICDS to "BPL" families), and no ceiling on the number of children to be enrolled in a particular Anganwadi. A major effort should be made to extend ICDS services to all children under the age of three years, involving giving much greater attention to "infant and young child feeding" and nutrition counselling. For children below the age of three years, nutritious and carefully designed take-home rations (THR) based on locally procured food should be provided every week. For children aged 3-6 years, the supplementary nutrition programme (SNP) should consist of a cooked meal prepared at the Anganwadi, based on local foods and with some variation in the menu on different days of the week Supplementary nutrition should always be combined with extensive nutrition counselling, nutrition and health education (NHE), and home-based interventions for both growth and development.

All children should be weighed at last once in three months and children with growth faltering and undernutrition should be identified. Those with grade one and two undernutrition should be counselled and provided with supplements regularly and monitored for improvement. Children with grade 3 and 4 undernutrition should be referred to PHC for care and counselling. Effective implementation of these recommendations and convergence between health and nutrition services will result in rapid reduction in undernutrition in children.

Available data from recent studies in India suggest that the possibility that undernutrition in childhood may predispose to overnutrition and NCD in adult life; these data provide yet another rationale for energetic interventions to reduce undernutrition in childhood. Prevalence of overnutrition in India except among urban high income group is relatively low. Health hazards associated with overnutrition in children are well understood; effective nutrition and health education targeted to preschool and school children might enable the country to prevent any escalation of the overnutrition rates in children. The current phase of dual nutrition burden should therefore be viewed as an opportunity window for effectively combating both under and over nutrition in children.

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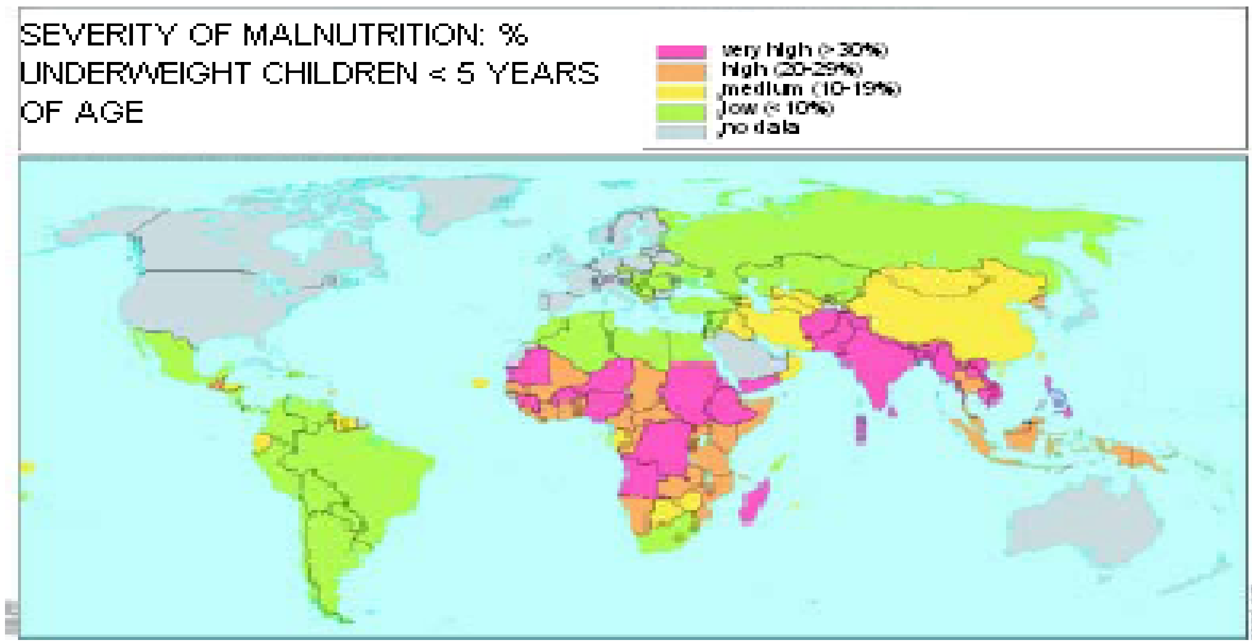
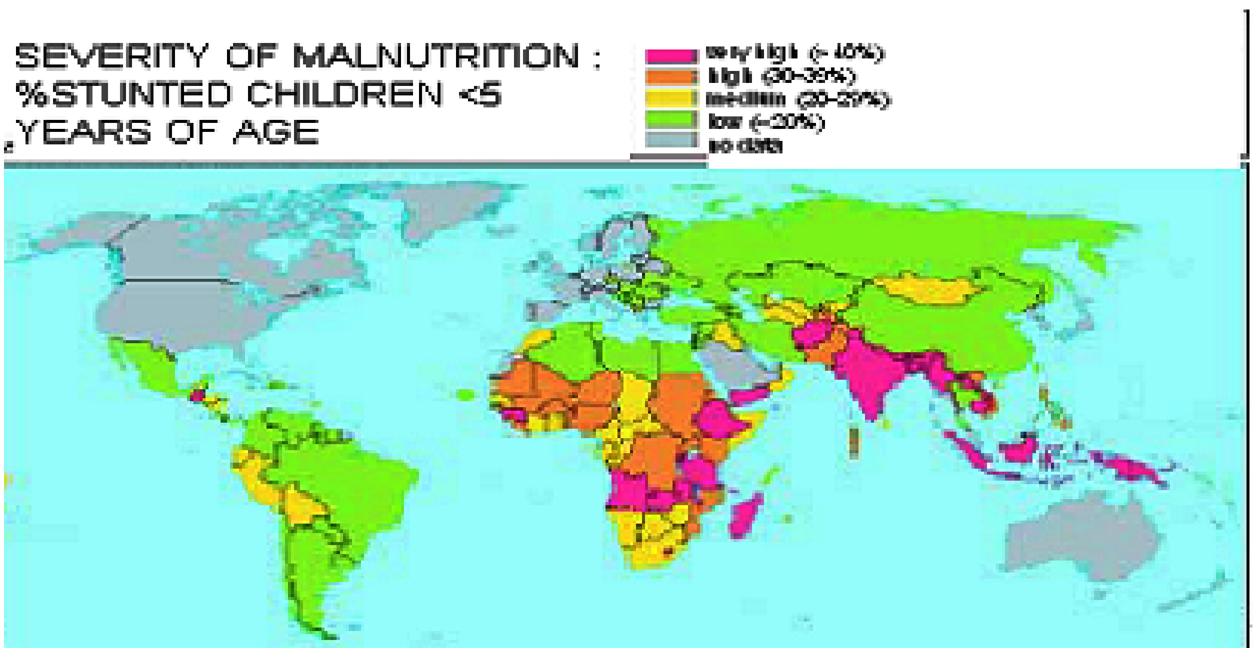
Annexure 7.5.1



Source :WHO Global database on Child Growth and Nutrition

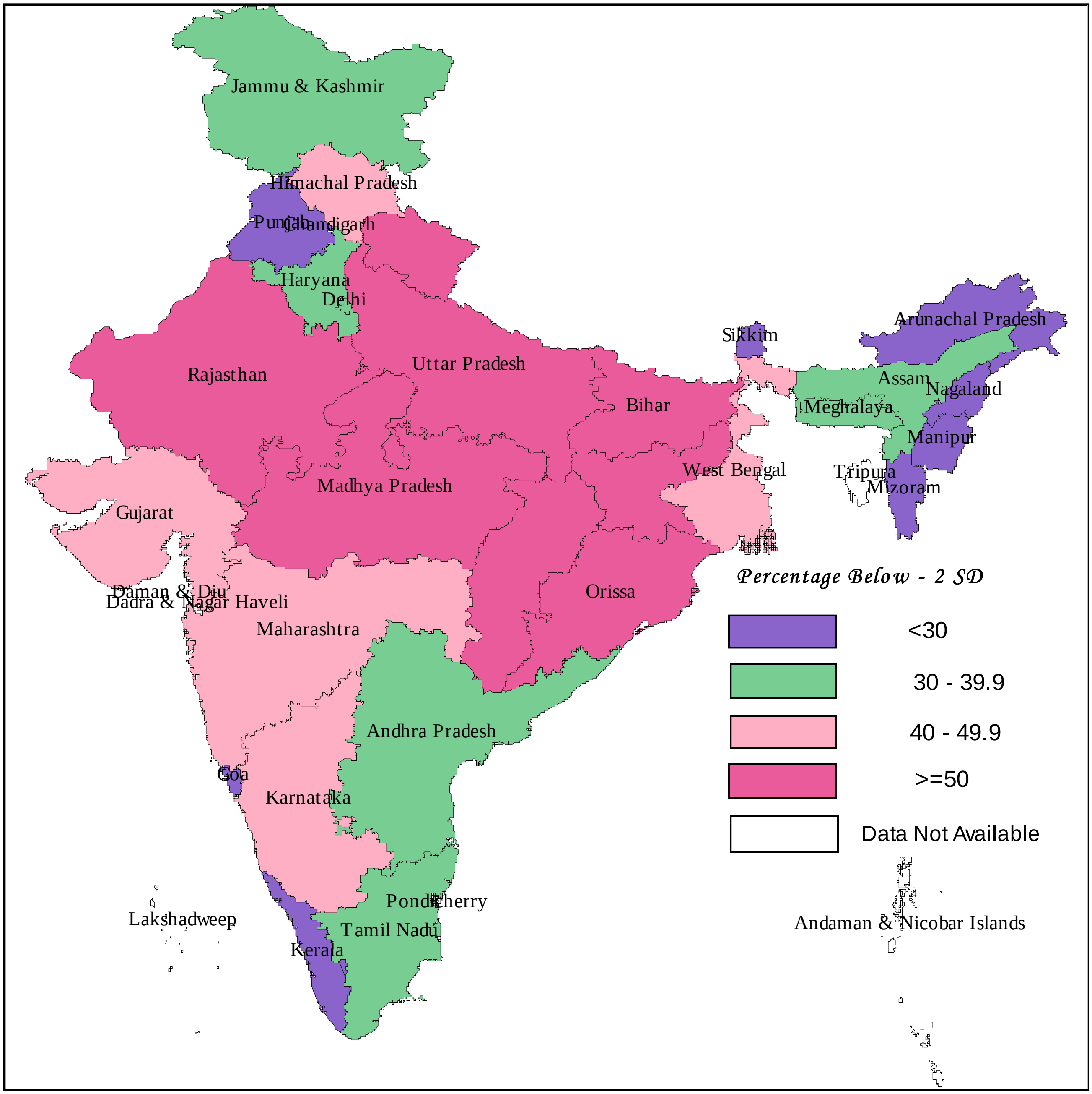
Annexure 7.5.2



Source: WHO Global Database on Child Growth and Nutrition

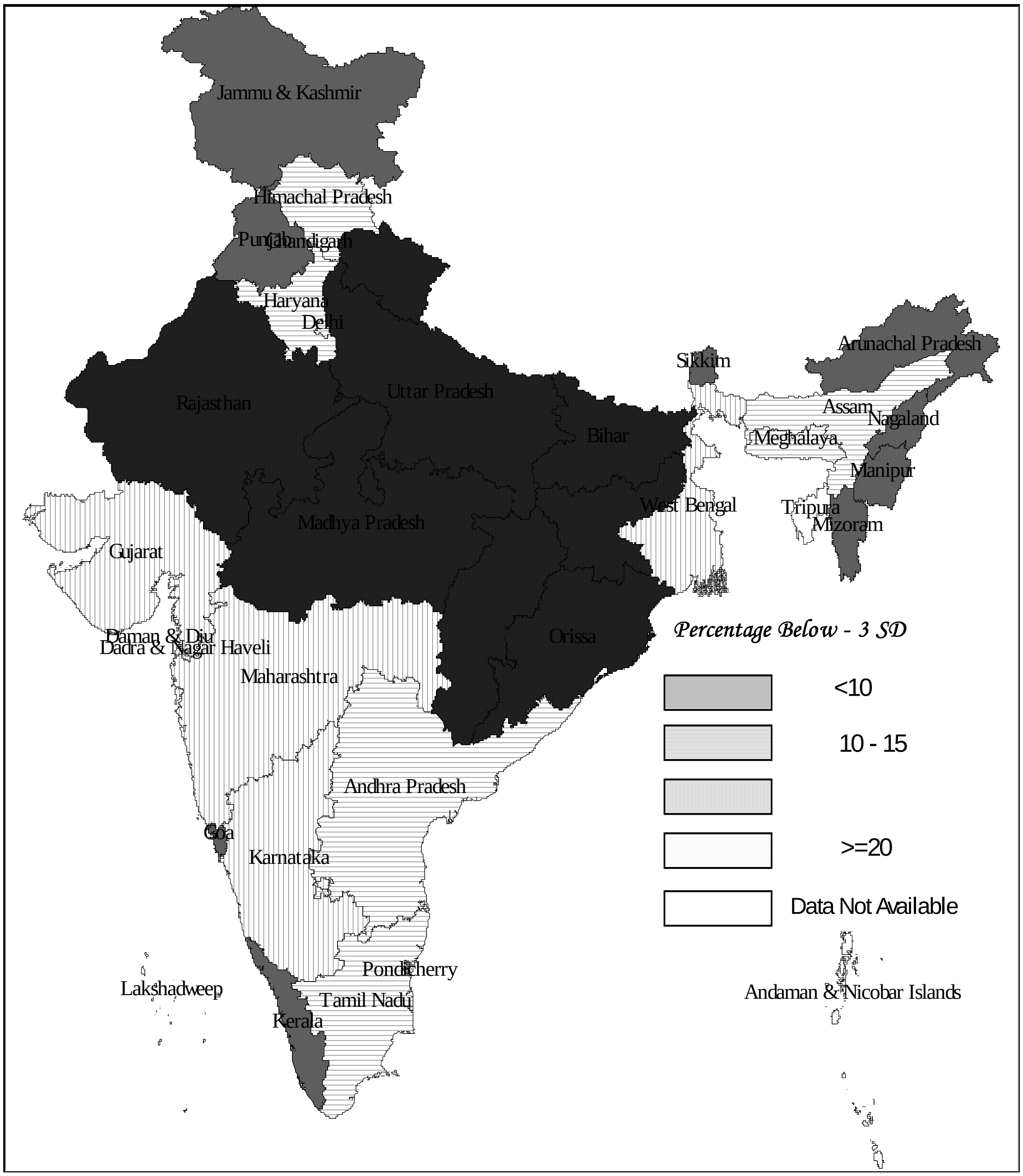
Annexure 7.5.3

Nutritional Status of Children by State %age below - 2 SD (Weight for Age)



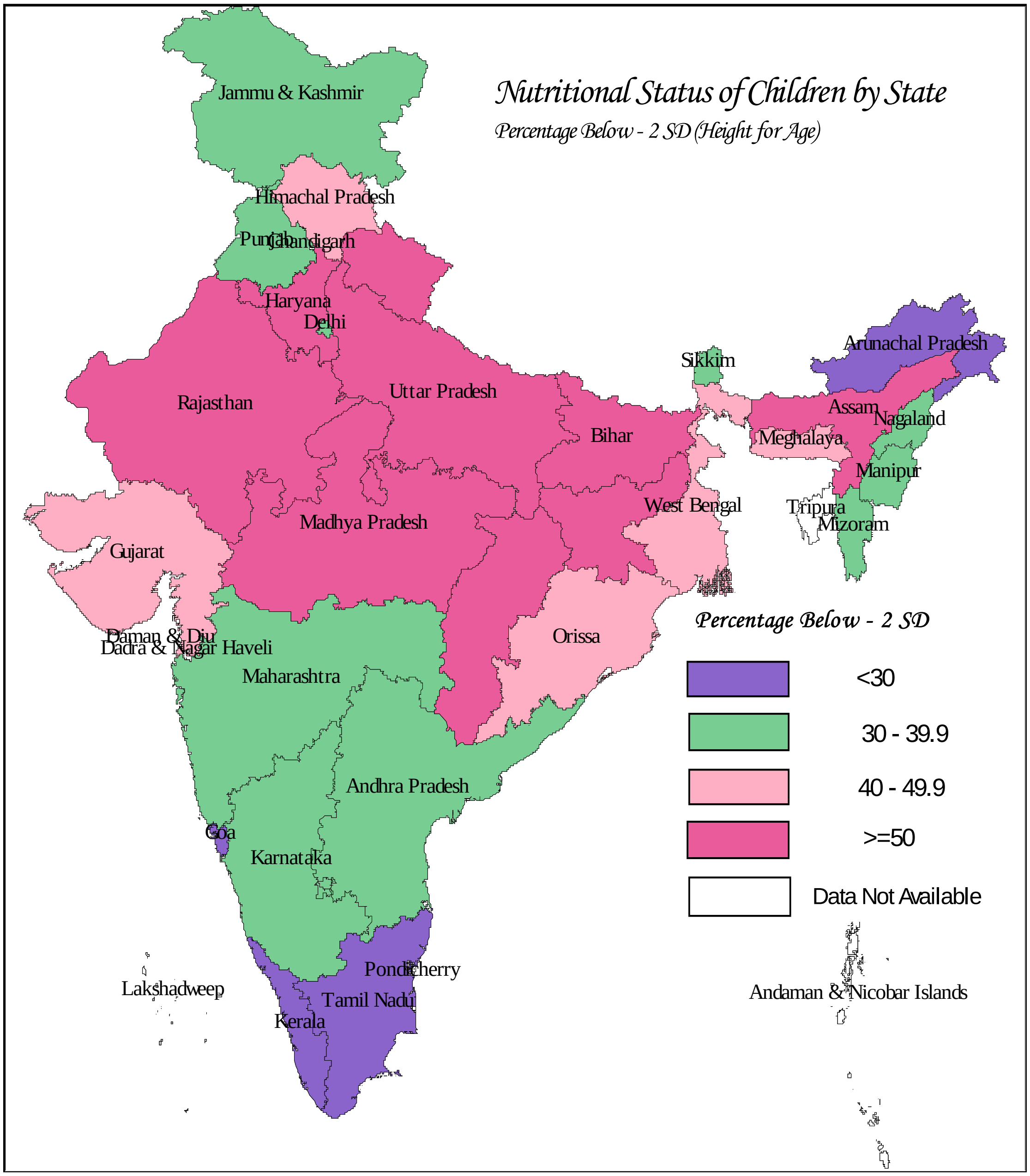
Annexure 7.5.4

Nutritional Status of Children by State %age Below - 3 SD (Weight for Age)



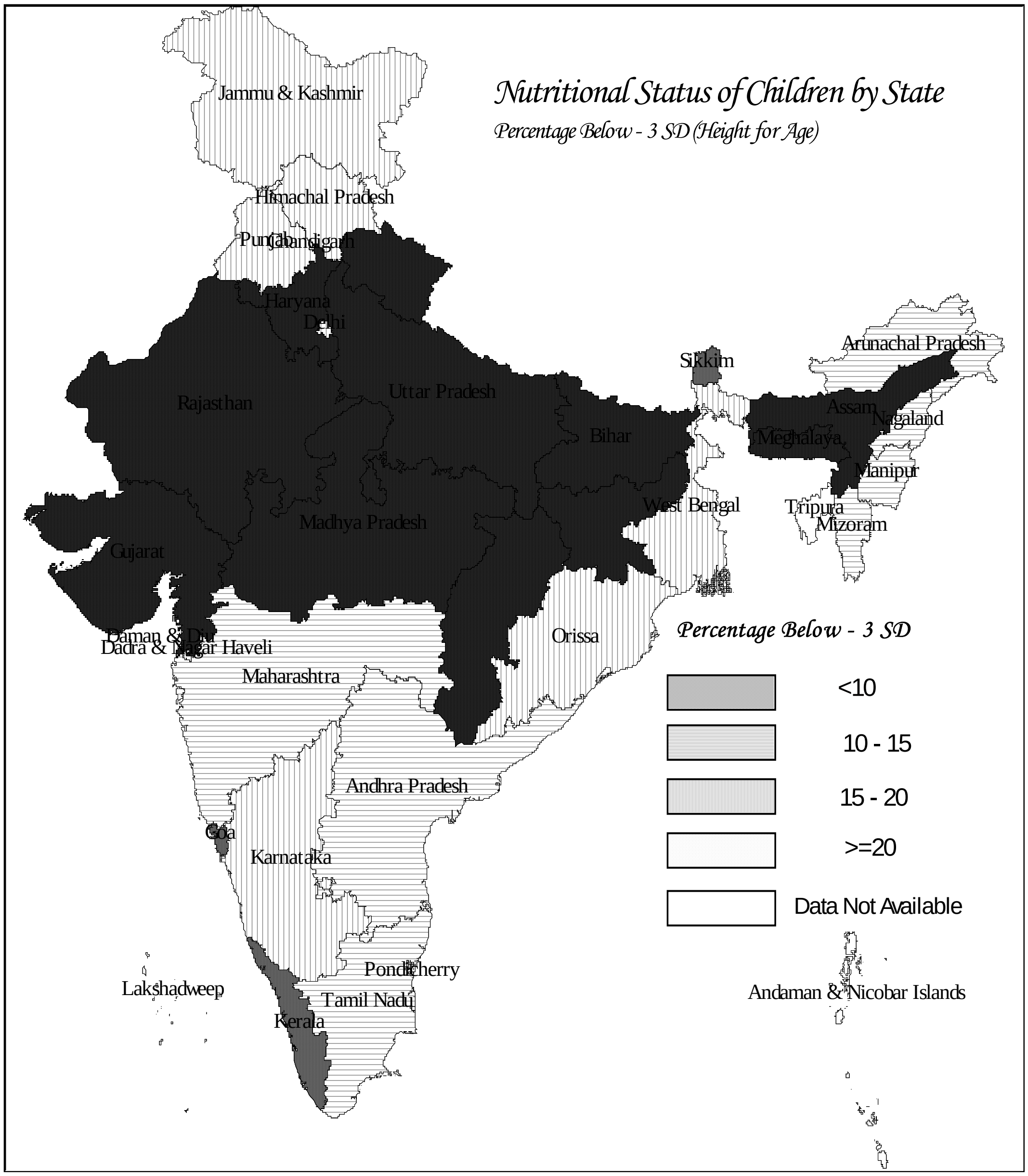
Annexure 7.5.5

Nutritional Status of Children by State %age Below - 2 SD (Height for Age)



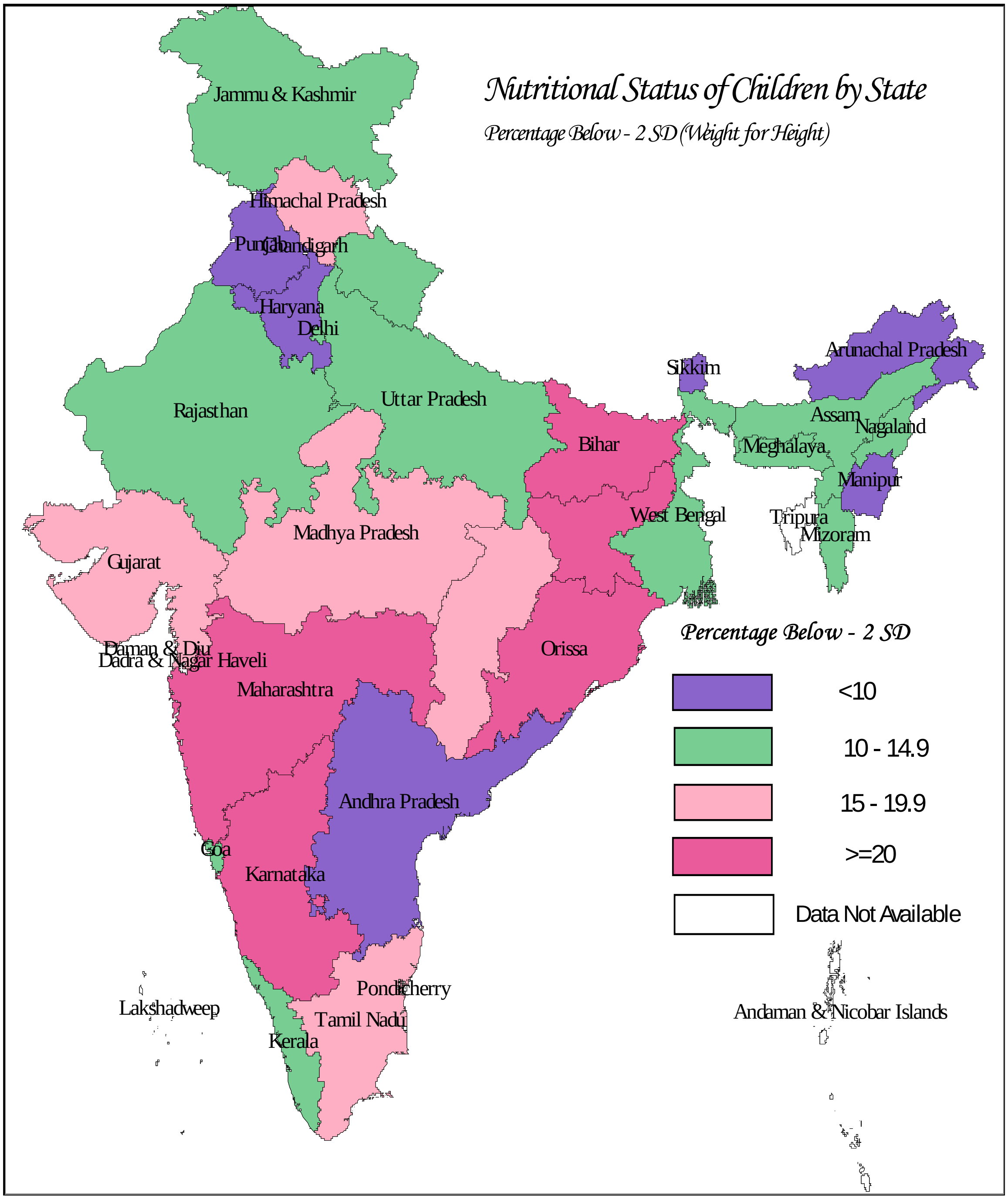
Annexure 7.5.6

Nutritional Status of Children by State %age Below - 3 SD (Height for Age)



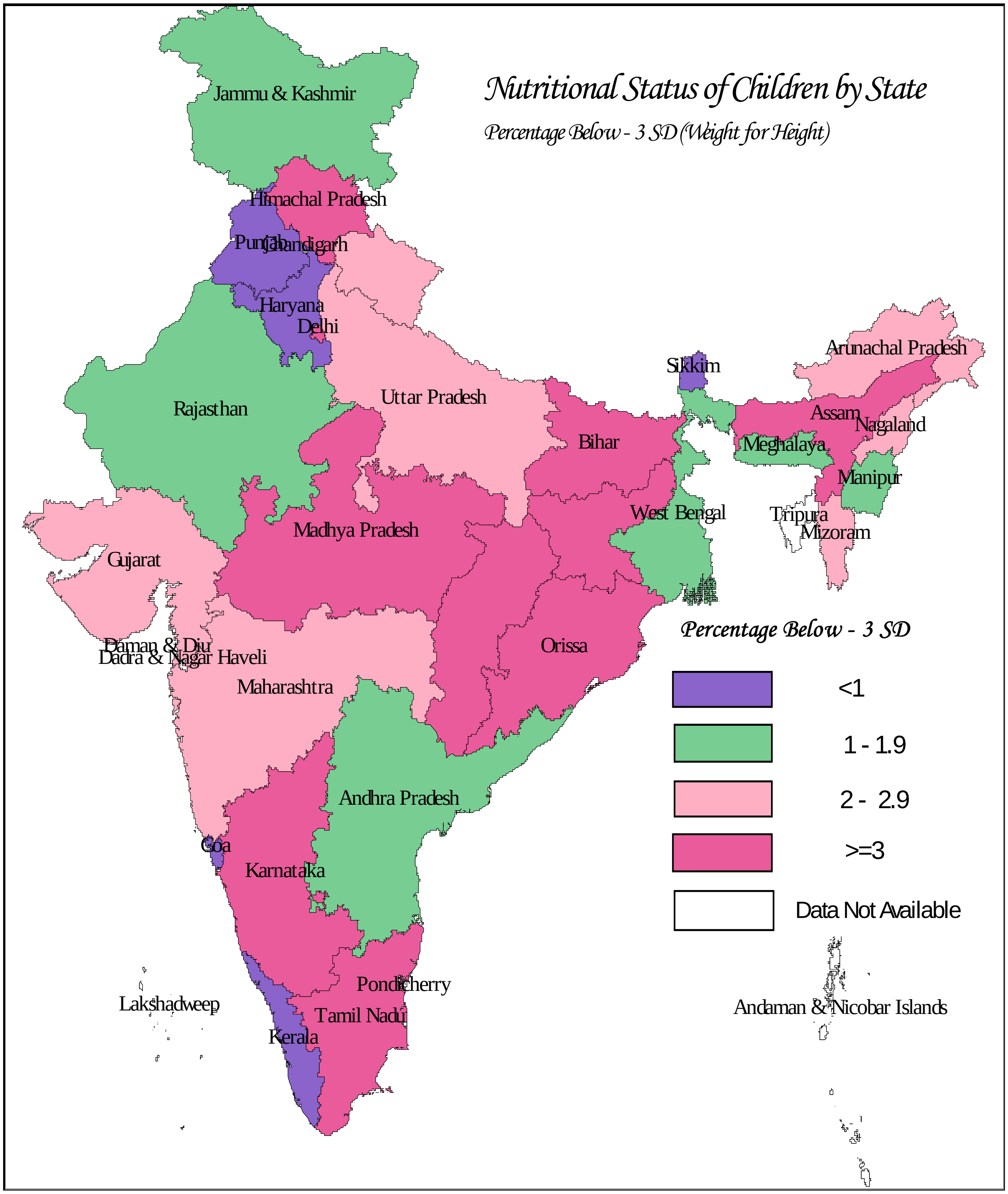
Annexure 7.5.7

Nutritional Status of Children by State %age Below - 2 SD (Weight for Height)



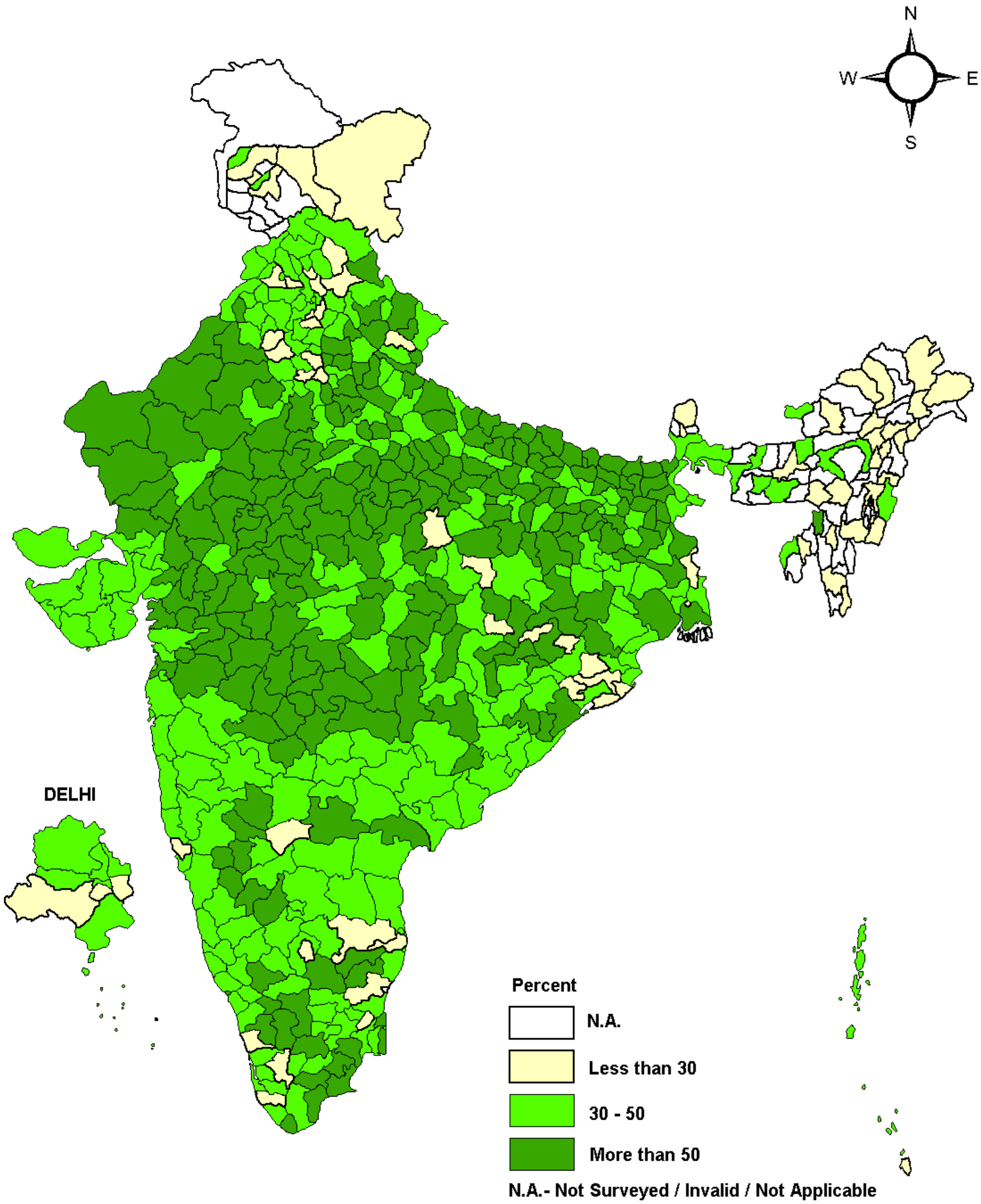
Annexure 7.5.8

Nutritional Status of Children by State %age Below - 3 SD (Weight for Height)



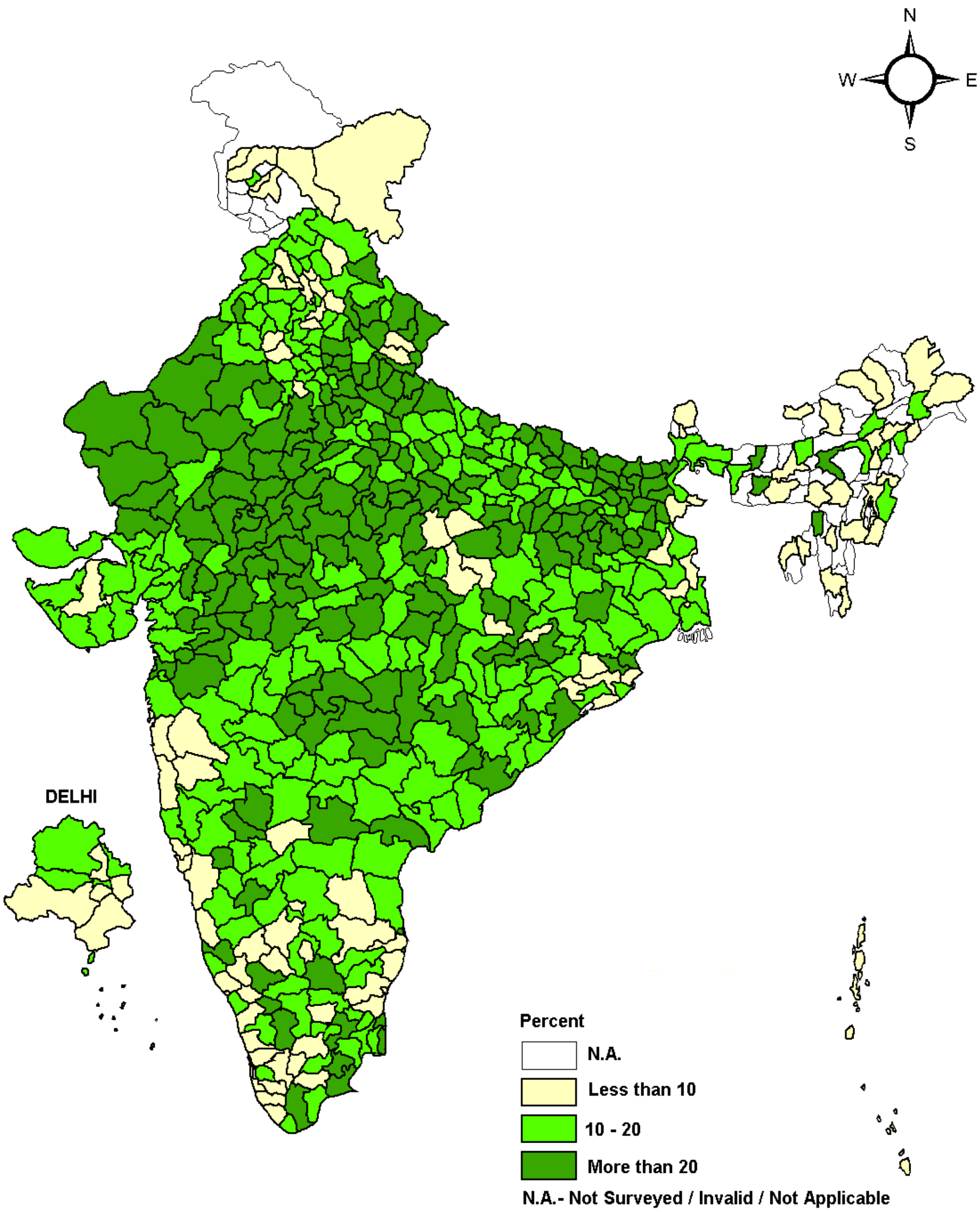
Annexure 7.5.9

%age of underweight children by District, DLHS 2004



Annexure 7.5.10

%age of severely underweight children by District, DLHS 2004



7.6 EARLY SCHOOL YEARS AND ADOLESCENCE

School age group (5-18 yrs) spans the period between preschool years and adult life. Census 2001 (Figure 7.6.1) has shown this age group forms a very large proportion of the population. Population projections (Figures 7.6.2 & 7.6.3) indicate that over the next decade this age group will show by far the largest increase in numbers but subsequently there will be a relatively sharp reduction in both numbers and proportion of the 5-18 year olds. It is therefore essential that over the decade efforts be focused on improving health and nutritional status of school age children, irrespective of the fact whether they are studying in school or school dropouts so that they reach adult life with optimal nutrition and health status.

Figure 7.6.1: Projected population (India 2001)

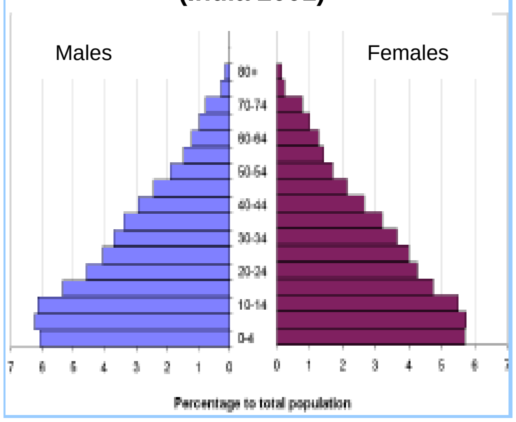
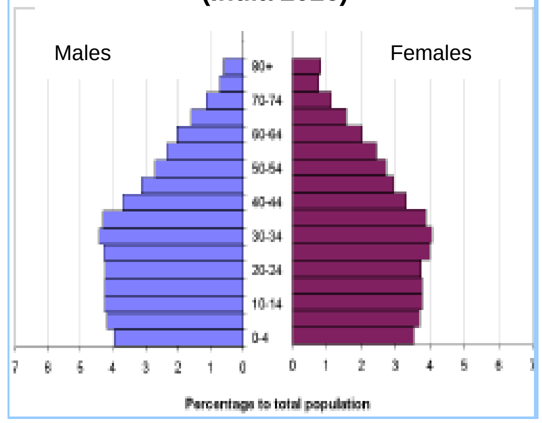


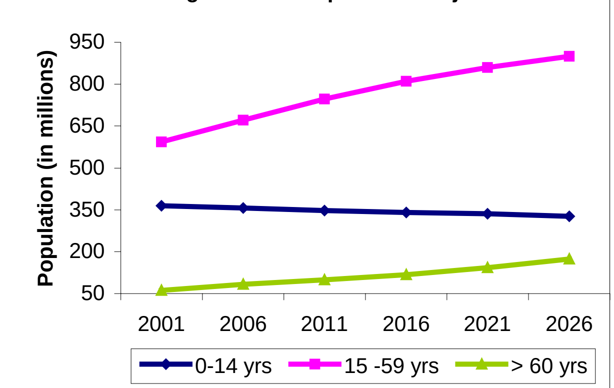
Figure 7.6.2: Projected population (India 2026)



Source: Reference 7.6.1

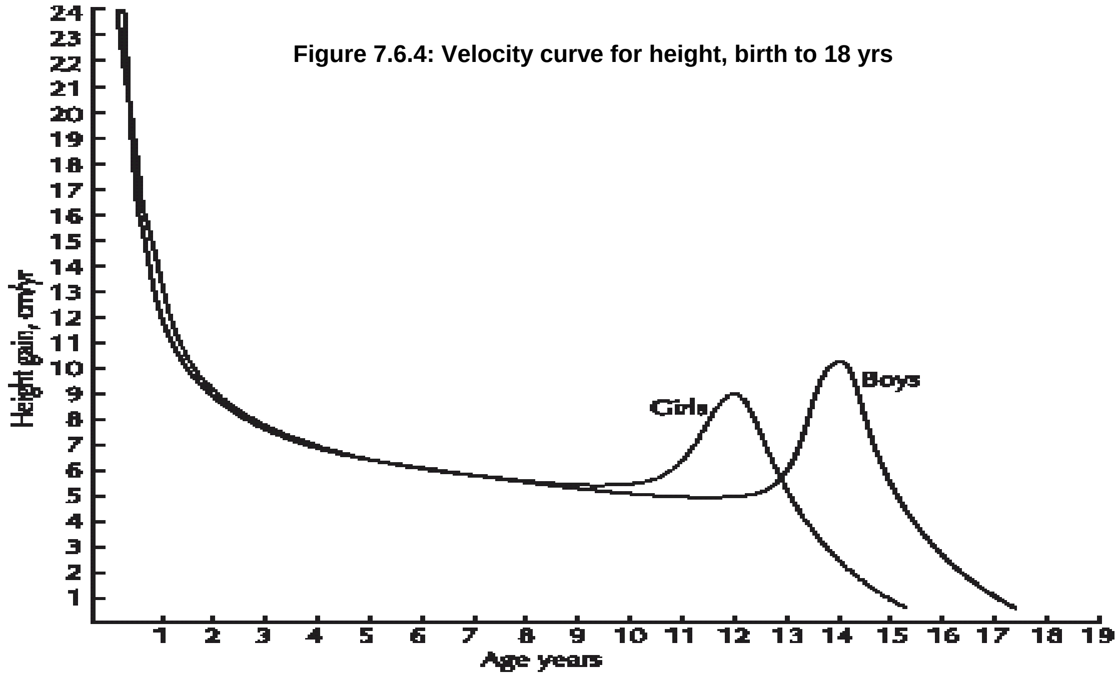
School age is a period of rapid growth with a growth spurt in peri-pubertal years (Figure 7.6.4). The growth velocity is slower during the early school years (5-9 yrs), 80% of adolescent growth is completed in early adolescence (10-15 years); there is marked deceleration in weight and height velocity in the post-pubertal phase. Adolescent growth spurt in girls begins about 10 years and peak velocity is at about 12 years. This age of adolescent growth spurt varies from country to country, being lowest in developed countries and highest in poorest countries. The adolescent growth spurt in boys begins 2-3 years later than girls and peaks by 16-17 years.

Figure 7.6.3: Population Projections



Source: Reference 7.6.1

Figure 7.6.4: Velocity curve for height, birth to 18 yrs



Source: Reference 7.6.2

Table 7.6.1: Time trends in energy intake of early school children and adolescents

Ages	Total Dietary Energy Intake (Kcals)				
	NNMB				INP
	'79	'96	'01	'05	'96
Males					
4-6	1015*	1154*	1066	1020	1300
7-9	1240*	1417*	1294	1230	1550
10-12	1439	1738	1524	1423	1847
13-15	1618	2004	1856	1645	2185
16-17	1926	2369	2114	1913	2514
<18#	2065	2488	2225	2000	2592
Females					
10-12	1394	1635	1500	1389	1482
13-15	1566	1848	1689	1566	2097
16-17	1704	2030	1856	1630	2327
<18#	1698	2106	1878	1738	2293

**Median values*
Source: Reference7.6.3

Dietary Intake

Data from NNMB surveys have shown that energy intake in children and adolescents improved till nineties and then showed a decline. Energy gap in school age children is lower than the gap in preschool children but larger than the gap in adults from the same households. Their protein and micronutrient intakes continue to be low (Table 7.6.1) (Annexure 7.6.1 & 7.6.2). There are large interstate variations in energy intake both in boys and girls (Figure 7.6.5 & 7.6.6). Energy intakes are lowest in Gujarat and higher in West Bengal and Andhra Pradesh.

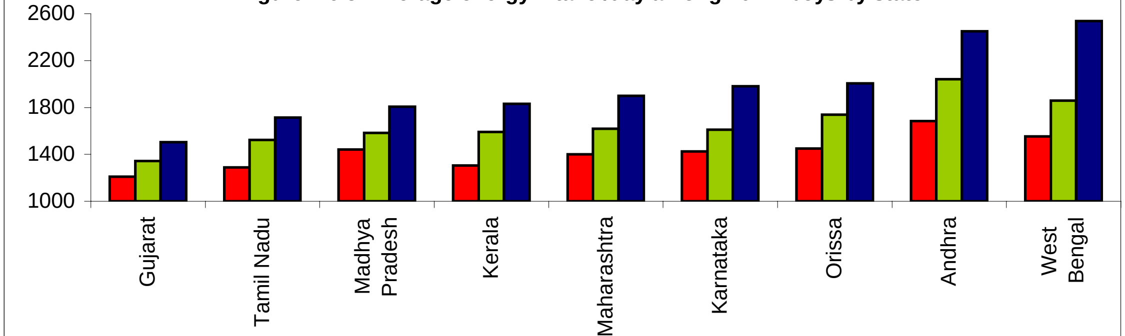


Figure 7.6.5: Average energy intake /day among 10-17 boys by state

Source: Reference 7.6.3

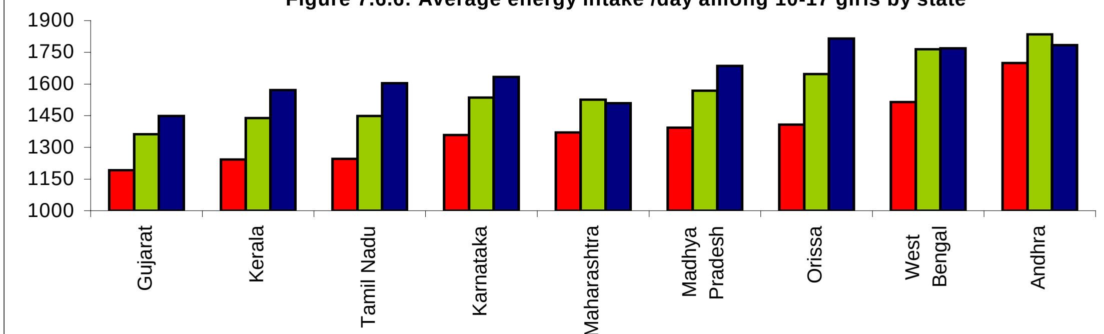


Figure 7.6.6: Average energy intake /day among 10-17 girls by state

Source: Reference 7.6.3

Nutritional Status

Time trends

Data from the NNMB survey showed that though there has not been any substantial increase in the dietary intake of children and adolescents, there has been some improvement in height (2.5-6 cms), weight (2-6 kg) and BMI between 1975-79 and 2005-06 (Figures 7.6.7-7.6.10). Data from NNMB also shows that over this period there has been some increase in overnutrition among children and adolescents. Though there has been improvement in the height and weight over the past 25 yrs, stunting and underweight are common in rural children even in year 2005.

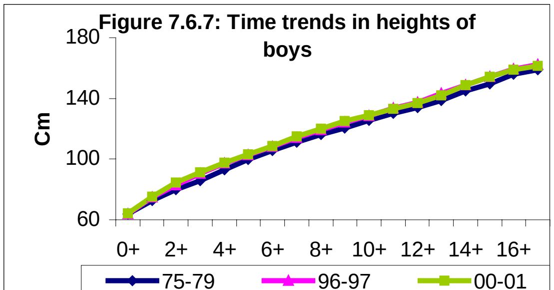


Figure 7.6.7: Time trends in heights of boys

Source: Reference 7.6.3

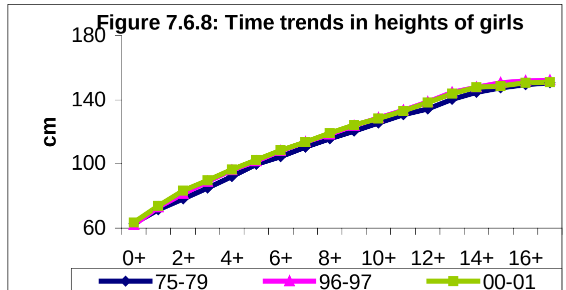
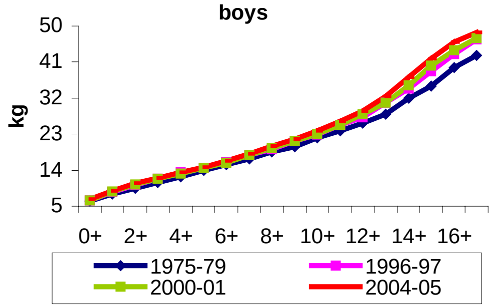


Figure 7.6.8: Time trends in heights of girls

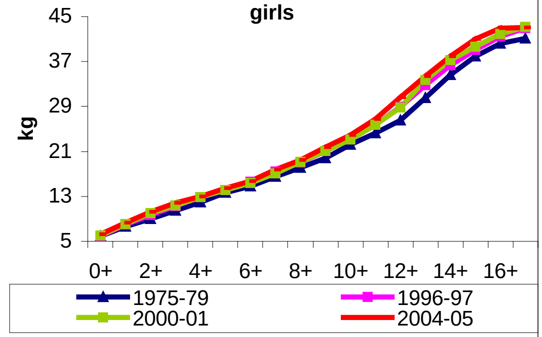
Source: Reference 7.6.3

Figure 7.6.9: Time trends in weights of boys



Source: Ref erence 7 .6.3

Figure 7.6.10: Time trends in weights of girls

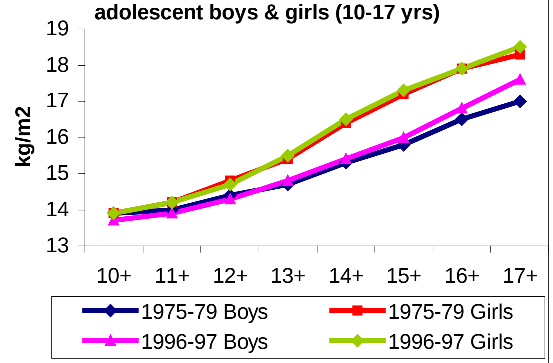


Source: Reference 7.6.3

Interstate differences

Data from NNMB showed that there are substantial interstate differences in underweight and stunting among rural girls and boys even in 2005 (Annexure 7.6.3 & 7.6.4).

Figure 7.6.11: Time trends in BMI of adolescent boys & girls (10-17 yrs)

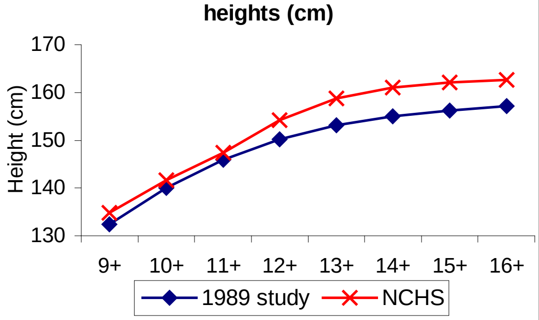


Source: Reference 7.6.3

In 1989 NFI carried out a study to assess growth patterns of girls in urban areas from affluent families in Delhi, Bombay, Calcutta, and Coimbatore. Mean weight and height of these affluent girls were lower than the mean weight and height of the NCHS standards (Figure 7.6.12 & 7.6.13). Delhi girls were taller and heavier than girls from Coimbatore and Calcutta.

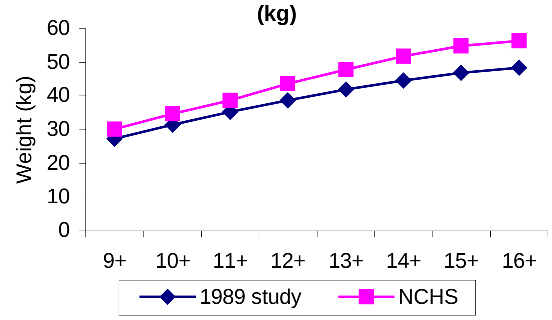
During the last decade, there had been numerous reports on the emerging problem of overnutrition among affluent urban children and adolescents. During the last four years NFI has carried out a cross sectional study in Delhi school children studying in government schools (predominantly low income group LIG) and public schools (predominantly high income group HIG) to assess prevalence of undernutrition and overnutrition. LIG children were shorter and weighed less as compared to HIG children and also the CDC standards (Figures 7.6.14 -17).

Figure 7.6.12: Comparison of girls' heights (cm)



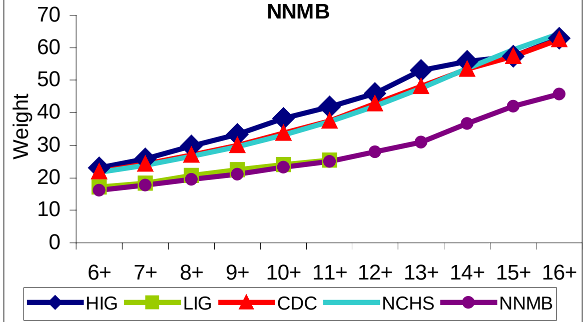
Source:Reference 7.6.4

Figure 7.6.13: Comparison of girls' weights (kg)



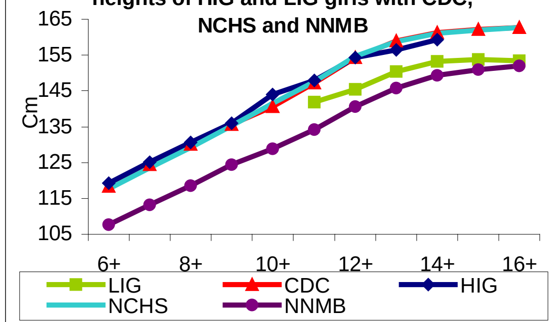
Source: Reference 7.6.4

Figure 7.6.14: Comparison of median weights of HIG and LIG boys with CDC, NCHS and NNMB



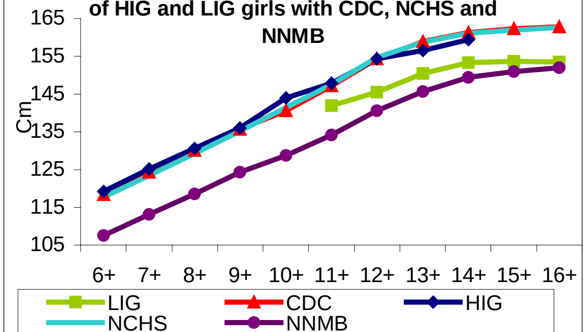
Source: NFI, 2006

Figure 7.6.15: Comparison of median heights of HIG and LIG girls with CDC, NCHS and NNMB



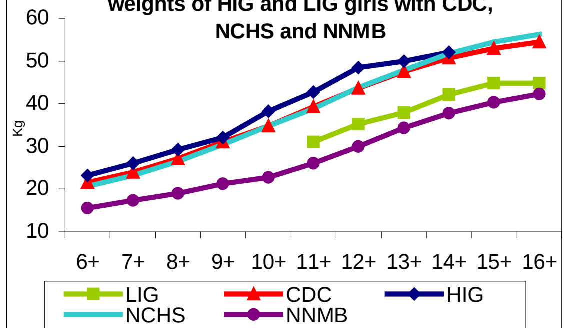
Source: NFI, 2006

Figure 7.6.16: Comparison of median heights of HIG and LIG girls with CDC, NCHS and NNMB



Source: NFI, 2006

Figures 7.6.17: Comparison of median weights of HIG and LIG girls with CDC, NCHS and NNMB



Source: NFI, 2006

Prevalence of undernutrition (< mean-2SD of weight, height and BMI CDC standards) was higher in LIG children as compared to HIG children. Prevalence of overnutrition (> mean+2 SD of weight and BMI CDC standards) was higher in HIG children (Figure 7.6.18-7.6.23).

Figure 7.6.18 : Prevalence of stunting in boys

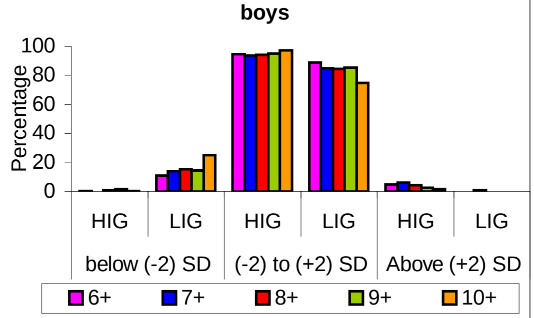


Figure 7.6.19: Prevalence of stunting in girls

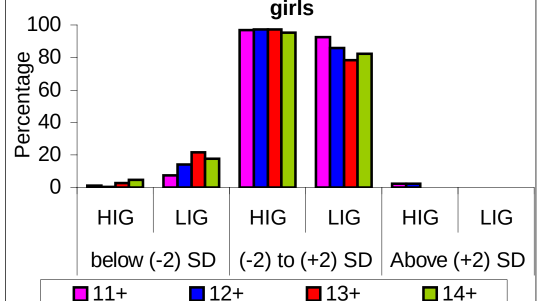


Figure 7.6.20: Prevalence of underweight and overweight in boys

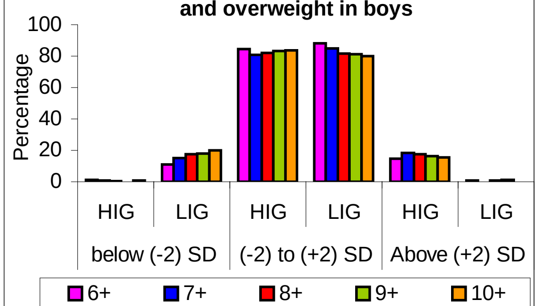


Figure 7.6.21: Prevalence of underweight & overweight in girls

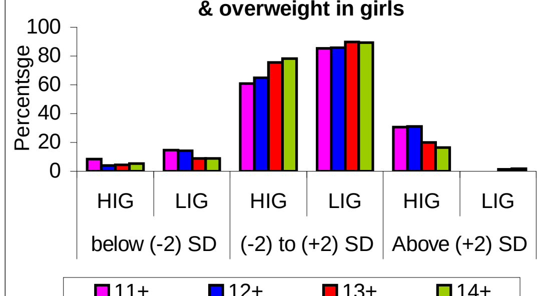


Figure 7.6.22: Prevalence of under & overnutrition in boys using BMI

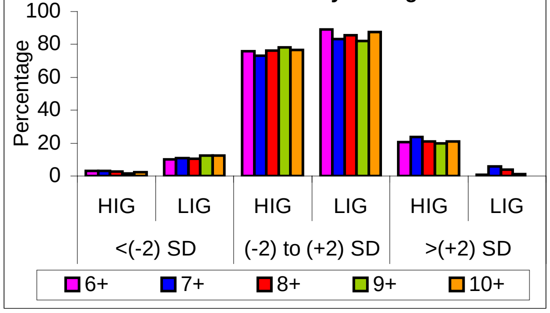
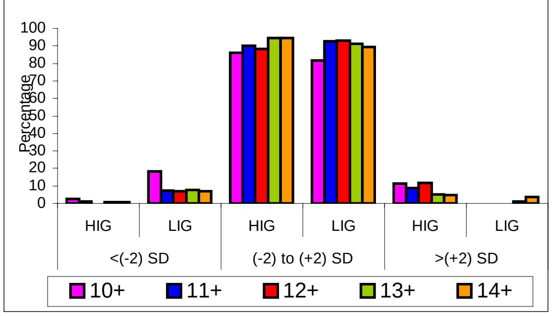


Figure 7.6.23: Prevalence of under & overnutrition in girls using BMI



Data from the study also showed that HIG children had higher body fat as compared to the US standards (Figures 7.6.24-27). Numerous studies across the country have shown that the emerging problems of overnutrition among children are mainly due to changing lifestyle and substantial reduction in physical activity.

Problems faced by adolescents

In the current phase of demographic transition in SE Asia, adolescents constitute about 18-25% of the total population. In all countries boys outnumber girls, though the magnitude of difference is low in Myanmar, Thailand and Sri Lanka

Figure 7.6.24: Comparison of fat percentiles of HIG boys with NHESIII using fatfold data

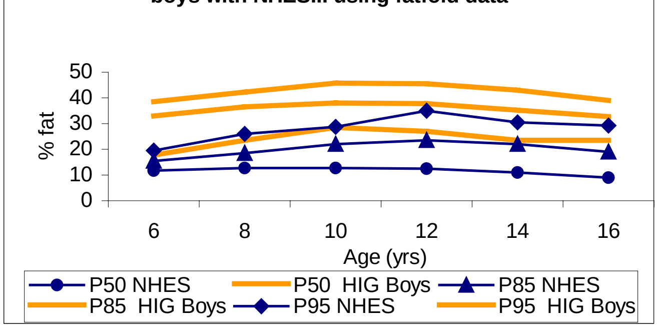


Figure 7.6.26: Percent fat for boys estimated using bioelectrical impedance

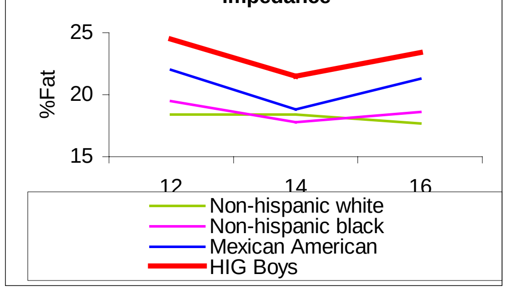


Figure 7.6.25: Comparison of fat percentiles of HIG girls with NHESIII using fatfold data

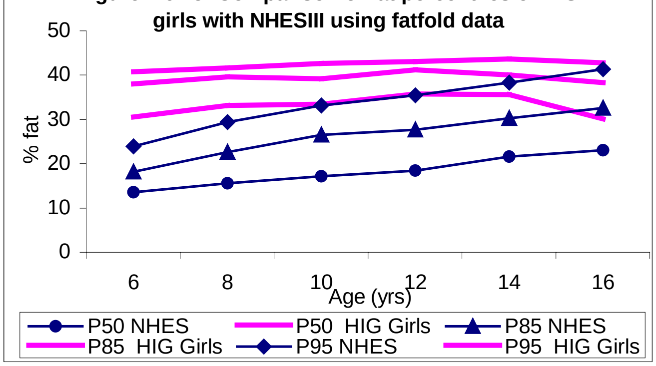
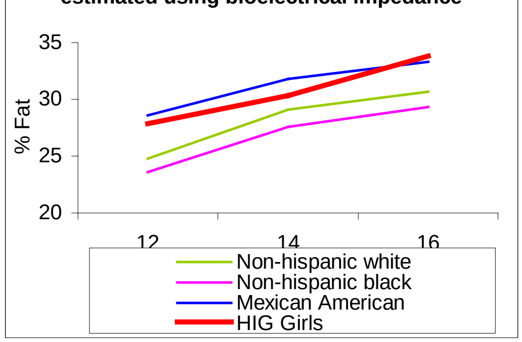


Figure 7.6.27: Percent fat for girls estimated using bioelectrical impedance

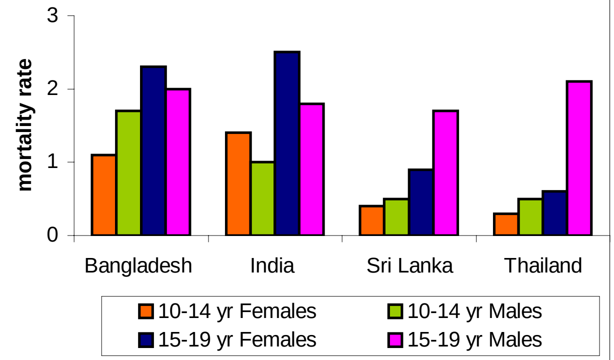


(Table 7.6.2).

Table 7.6.2: Adolescent population (%) in South-East Asia Region				
SEAR	10-14 yrs		15-19 yrs	
	M	F	M	F
Bangladesh	6.0	5.8	5.5	5.2
Bhutan	6.2	6.0	5.7	5.5
India	5.4	5.1	5.2	4.8
Indonesia	4.9	4.7	4.9	4.7
Maldives	6.2	5.9	5.9	5.6
Myanmar	5.3	5.2	4.9	4.9
Nepal	6.2	5.8	5.5	5.1
Srilanka	4.2	4.1	4.4	4.2
Thailand	4.2	4.1	4.3	4.2

Source: Reference 7.6.5

Figure 7.6.28: Age specific mortaliy rates of adolescents by sex & age group

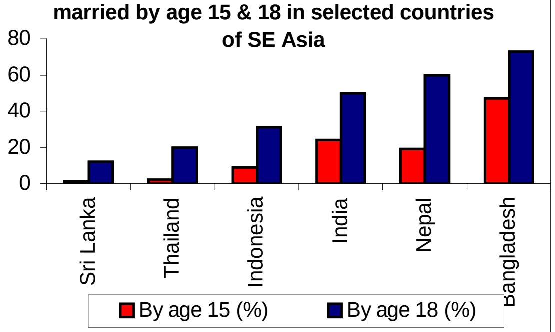


Source: Reference 7.6.5

Data on mortality rates of adolescents by sex and age group for four SEAR countries (Bangladesh, India, Sri Lanka and Thailand) is given in Figure 7.6.28. Over decades adolescents have not received the attention that they deserve because of the relatively low mortality rate during this period-especially among boys. In Bangladesh and India, mortality rates for females were higher than males in the older age group perhaps due to early marriage and pregnancy related deaths in adolescent girls (Figures 7.6.29 & 7.6.30).

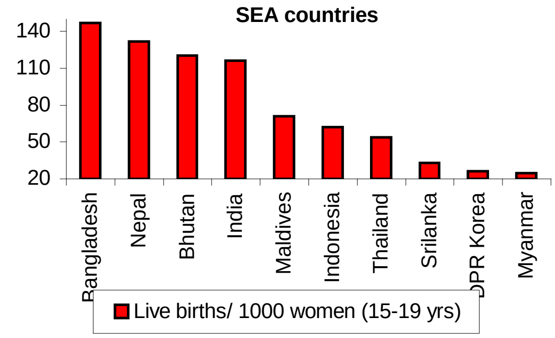
In India, about one sixth of adolescent girls have conceived / delivered during adolescence. There are substantial interstate differences in the age at marriage and first pregnancy. About one fourth of adolescent girls have already conceived / delivered in West Bengal and Bihar. At the other end of the spectrum are states like Kerala, Tamil Nadu, Punjab, Himachal and Delhi where adolescent marriage and conception are relatively uncommon (Annexure 7.6.5). Data from NFHS also indicates that there has been some decline at the all India level in percentage of adolescents getting married before the legal age of marriage (Annexure 7.6.5). Data from District Level Household Survey indicates that even within states there are large inter-district variations in adolescent marriage below the legal age of marriages (Annexure 7.6.6). Adolescent pregnancies have adverse effects both on maternal nutrition and on birth weight of the offspring. It is therefore essential

Figure 7.6.29: % of women aged 20-24 married by age 15 & 18 in selected countries of SE Asia



Source: Reference 7.6.5

Figure 7.6.30: Adolescent child bearing in SEA countries



Source: Reference 7.6.5

to effectively implement interventions aimed at postponing age at marriage and age at first conception in order to reduce adverse consequences of adolescent pregnancy.

The importance of nutrition and health education to adolescents is well recognized. After extensive work in rural areas of Rajasthan, Madhya Pradesh and Uttar Pradesh, Nutrition Foundation of India developed two modules for education for adolescent girls, which has been widely distributed (Reference 7.6.6 and 7.6.7).

At the other end of the spectrum are the urban affluent adolescents among whom overnutrition has steeply increased because of sedentary life style and increasing intake of energy dense junk food. In view of the fact that overnutrition in childhood and adolescence is associated with increased risk of CVD in adult life, it is essential to improve physical activity and promote balanced food intake in school children.

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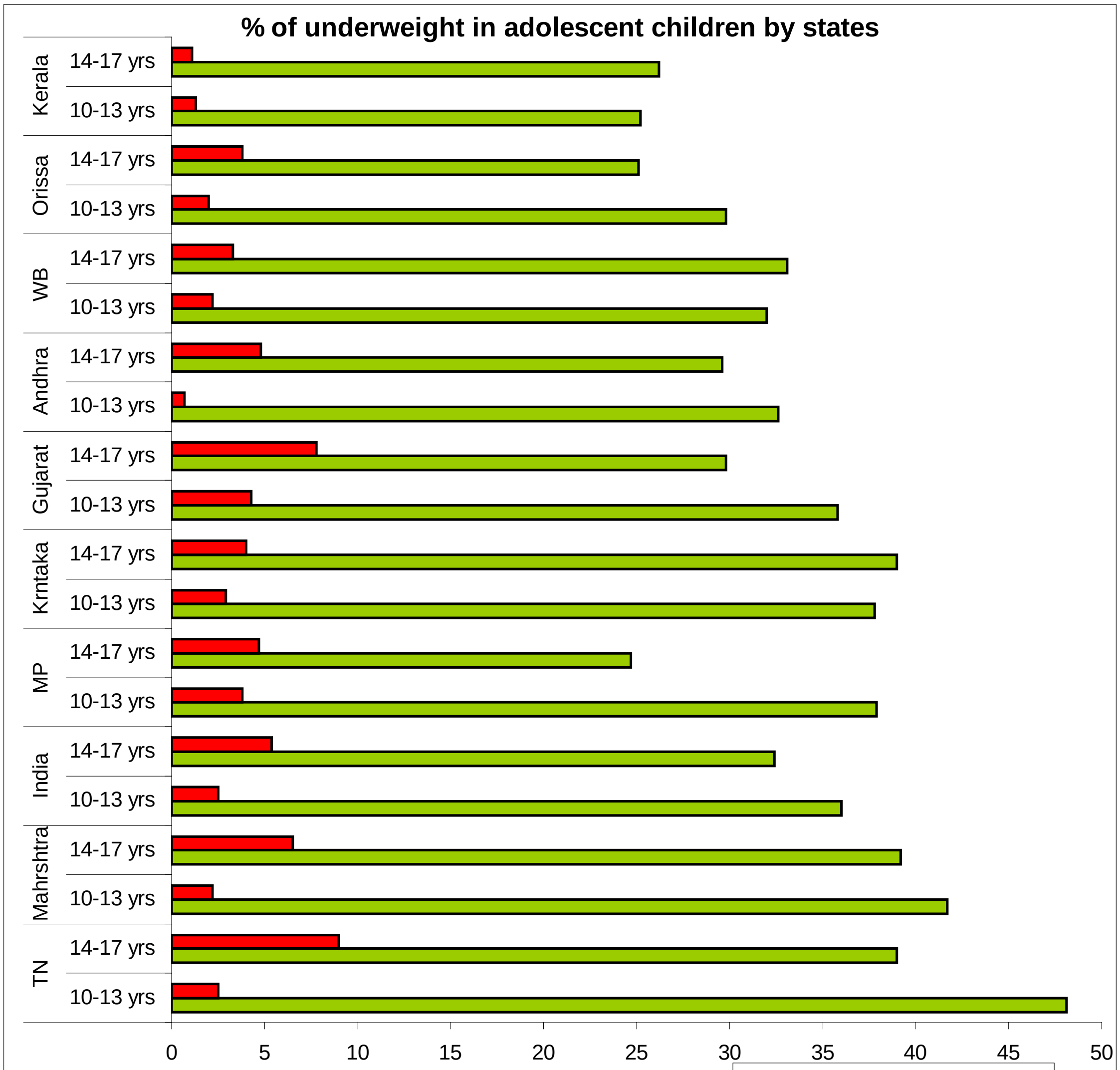
Annexure 7.6.1

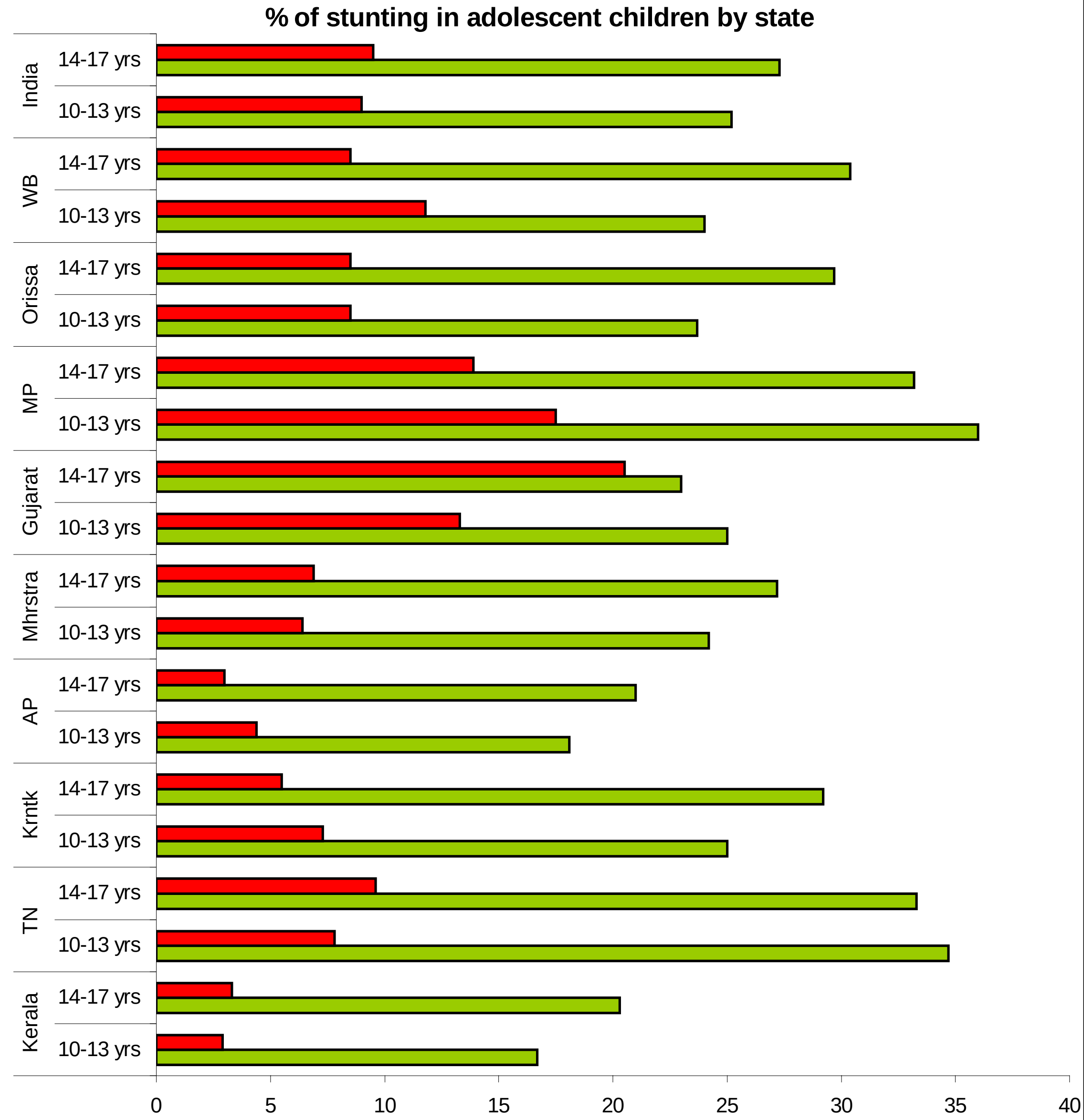
Age wise distribution of average intake of nutrients-NNMB												
			Protein (g)	**Tot Fat (g)**	**Energy (Kcal)**	**Calcium (mg)**	**Iron (mg)**	**Vit A (ug)**	**Thiamin (mg)**	**Ribo (mg)**	**Niacin (mg)**	**Vit. C (mg)**
4-6	**Children**	**1975-79**	28.4	10.7	1015	223	13	82	0.6	0.4	6.5	14.4
		1996-97	29.4	13.9	1154	224	12.9	96.5	0.6	0.5	6.6	17.5
		2000-01	28.2	15	1066	239	8.1	127	0.7	0.4	8.1	24
		2004-05	28.7	12.7	1020	272	8.6	166	0.7	0.4	7.9	25
7-9	**Children**	**1975-79**	33.6	12.2	1240	240.7	15.5	90	0.5	7.9	17.5	20.4
		1996-97	36.2	15.1	1417	261.5	16.4	107.5	0.7	0.6	8.4	20.4
		2000-01	34	16.9	1294	278	10.3	148	0.9	0.4	10.0	28
		2004-05	33.8	14.4	1230	291	10.2	199	0.8	0.4	9.7	29
10-12	**Boys**	**1975-79**	39.50	14.00	1438.80	270.50	19	101	1.00	0.60	10	22
		1996-97	43.10	19.30	1719.10	319.95	20	131	0.90	0.70	10	24
		2000-01	40.4	19.9	1524	326	12.2	168	1.0	0.5	11.9	33
		2004-05	39.2	16.2	1423	330	12	221	0.9	0.5	11.4	35
	Girls	**1975-79**	39.10	13.90	1393.50	268.20	18	105	0.90	0.6	9	20
		1996-97	40.45	17.85	1613.95	312.70	19	111	0.80	0.7	9	24
		2000-01	39.4	18.9	1500	304	12.1	174	1.0	0.5	11.7	32
		2004-05	37.8	14.8	1389	307	11.5	205	0.9	0.5	11.1	33
13-15	**Boys**	**1975-79**	43.30	16.70	1618.45	304.45	21	114	1.00	0.60	10	24
		1996-97	48.85	21.95	1899.10	367.55	21	138	1.00	0.80	12	27
		2000-01	48.8	24.7	1856	407	15.4	196	1.3	0.7	14.4	40
		2004-05	44.6	18.3	1645	363	13.3	215	1.1	0.6	13.3	37
	Girls	**1975-79**	41.25	15.90	1565.55	299.40	20	103	1.00	0.60	10	22
		1996-97	44.40	19.50	1811.80	324.20	21	133	0.90	0.70	11	28
		2000-01	43.7	21	1689	355	12.9	180	1.1	0.6	13	36
		2004-05	42	17.8	1566	341	13	251	1.0	0.5	12.7	37
16-17	**Boys**	**1975-79**	54.80	17.10	1926.50	327.70	25	120	1.30	0.80	14	24
		1996-97	58.10	26.40	2275.80	437.60	26	184	1.10	1.00	14	37
		2000-01	54.7	25.6	2114	437	16.7	183	1.4	0.7	16.2	37
		2004-05	53	21	1913	433	16.4	241	1.3	0.7	15.6	42
	Girls	**1975-79**	44.00	16.70	1704.30	317.30	22	115	1.00	0.60	11	26
		1996-97	50.10	23.70	2018.80	361.30	22	145	0.90	0.80	12	32
		2000-01	49.1	24.2	1856	415	15.3	213	1.2	0.6	14.4	40
		2004-05	43.9	19.1	1630	373	13.5	261	1.1	0.6	12.8	38

Annexure 7.6.2

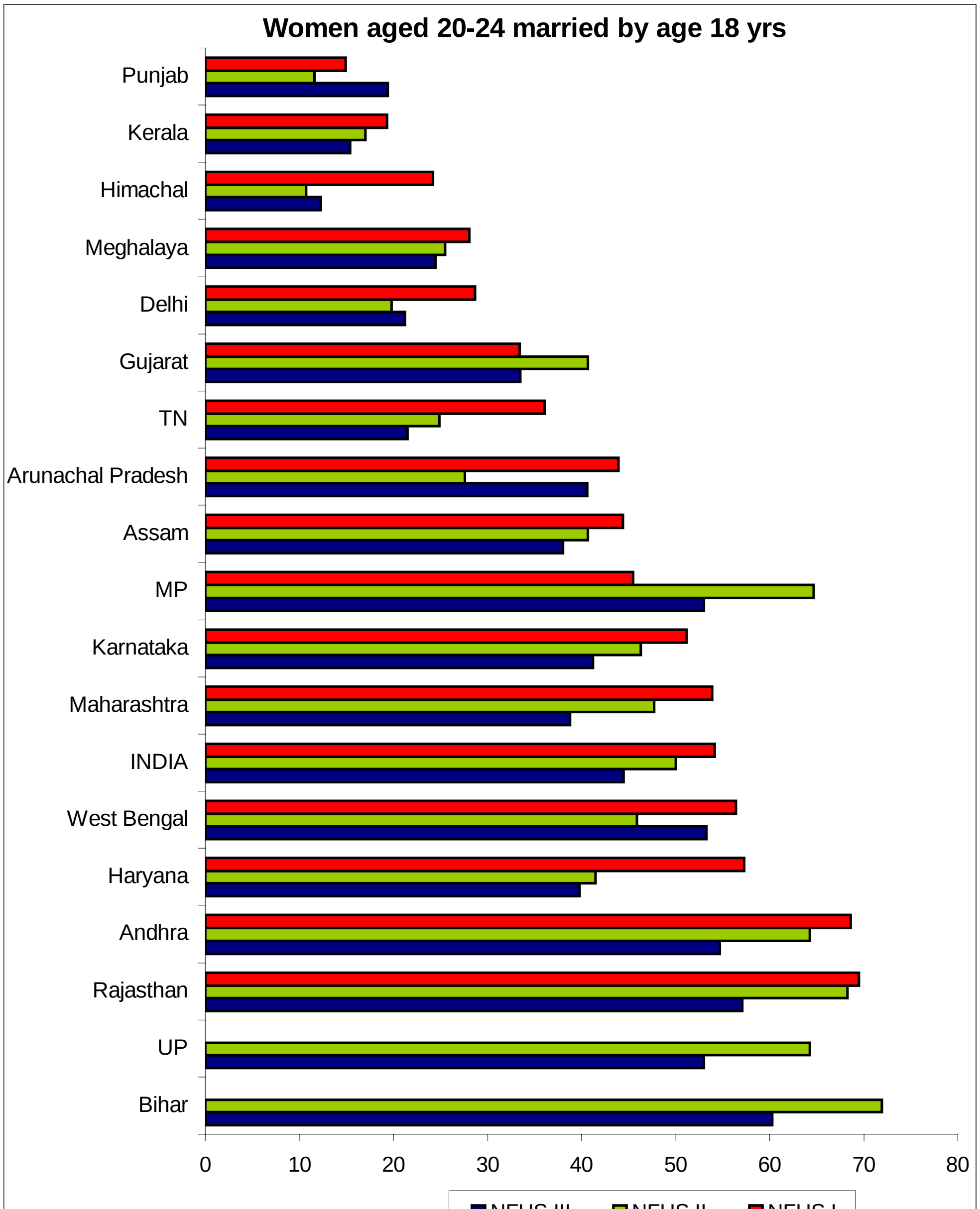
Average intake of nutrients -INP survey										
Age group/ sex	Protein gm	Fats gm	Energy Kcal	Calcium mg	Iron mg	Thiamin mg	Riboflavin mg	Niacin mg	Vit. C mg	Vit. A μg
4-6 years										
Boys	40.6	20.3	1300	433	13	1.03	0.62	11.1	37.4	250
Girls	41.2	19.1	1299	440	11.3	1.03	0.63	11.3	38.9	241
RDA	30	25	1690	400	18	0.8	1	11	40	400
7-9 years										
Boys	50	21.6	1570	468	20	1.37	0.72	13.5	41.5	258
Girls	49.7	23.5	1520	472	18.3	1.12	0.8	15.8	43.3	247
RDA	30	25	1950	400	26	1	1.2	13	40	600
10-12 years										
Boys	56.8	24.9	1847	522	18.7	1.52	0.83	16.2	50	307
RDA	54	22	2190	600	34	1.1	1.3	15	40	600
Girls	45.7	20.3	1482	426	15.1	1.23	0.68	13	39.6	310
RDA	57	22	1970	600	19	1	1.2	13	40	600
13-15 years										
Boys	67.1	28.8	2185	612	22.1	1.82	1	19.6	57.4	356
RDA	70	22	2450	600	41	1.2	1.5	16	40	600
Girls	65.6	28.4	2097	615	21.4	1.71	0.98	18.7	60.1	369
RDA	65	22	2060	600	28	1	1.2	14	40	600
16-17years										
Boys	79.2	31.6	2514	752	25.7	2.03	1.2	22.7	71.1	416
RDA	78	22	2640	500	50	1.3	1.6	17	40	600
Girls	74.2	31.7	2327	702	23.9	1.87	1.17	21.9	67.5	397
RDA	63	22	2060	500	30	1	1.2	14	40	600
>18 years										
Boys	79.7	35.2	2592	716	26.1	2.12	1.18	22.6	66.8	397
RDA	60	20	2425	400	20	1.2	1.4	16	40	600
Girls	70.8	32.1	2293	659	23	1.84	1.04	20.3	62.6	376
RDA	50	20	1875	400	30	0.9	1.1	12	40	600



Source: NNMB, 2006



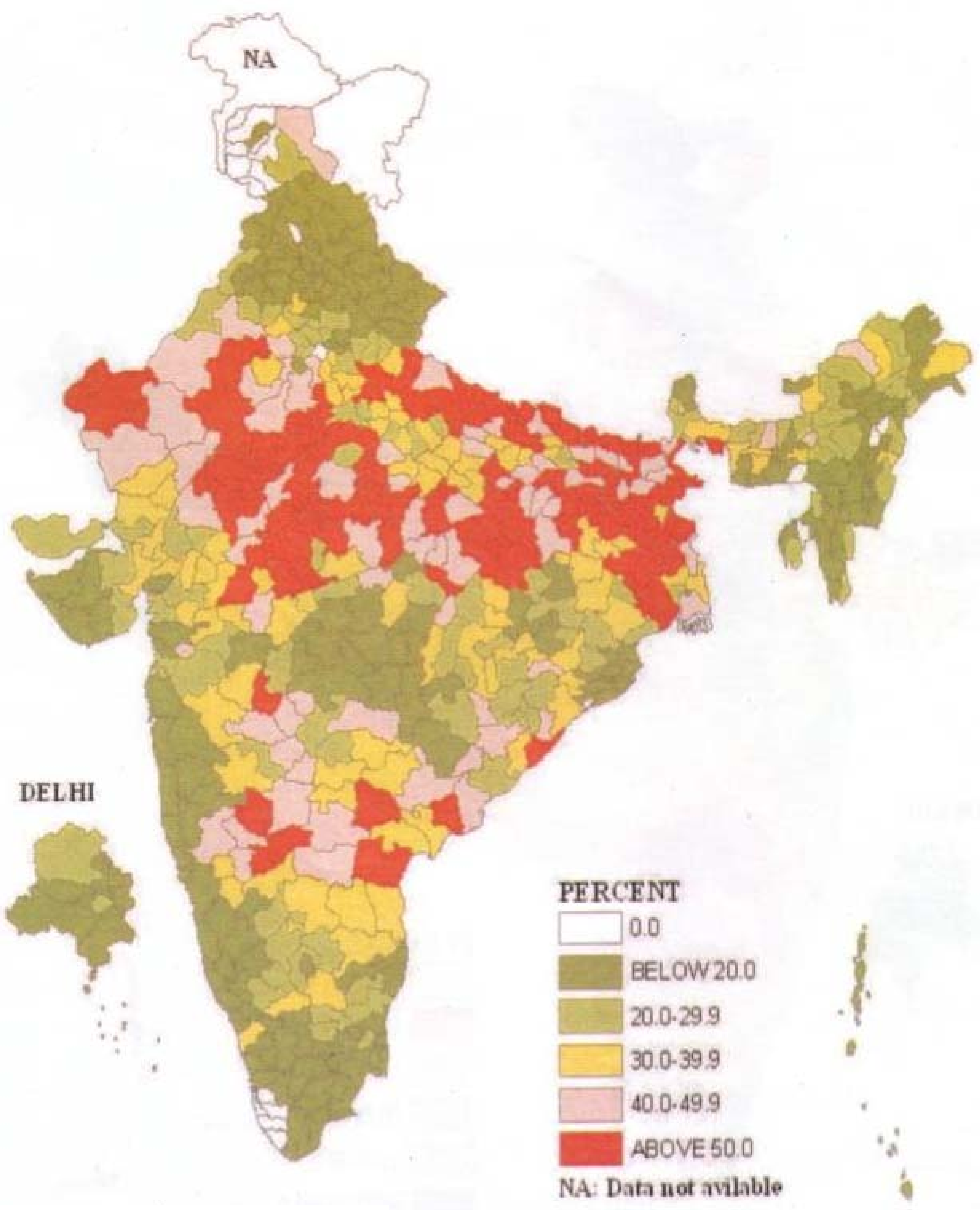
Source: NNMB, 2006



Source: NFHS I, II, III

Annexure 7.6.6

Percentage of girls marrying below legal age at marriage



Source: DLHS-RCH 2002-04

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).

Table 7.7.1: Average Intake of food among adult men and women (g /day)

			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

Figure 7.7.1: Time trends in energy intake

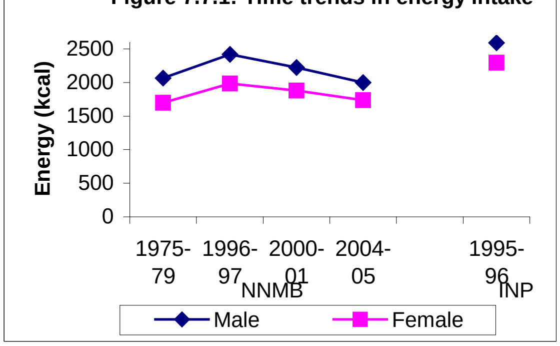


Table 7.7.2: Average intake of nutrients-NNMB & INP												
			Protein (g)	Total Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit A (ug)	Thiamin (mg)	Ribo (mg)	Niacin (mg)	Vit. C (mg)
NNMB	Adult Men	1975-79	55.7	20.3	2065	98	26	142	1.3	0.8	13	28
		1996-97	60.1	27.4	2418	421	27	172	1.1	1	14	36
		2000-01	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
	Adult Women (NPNL)	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
INP	Men	1995-96	79.7	35.2	2592	716	26.1	397	2.12	1.2	22.6	66.8
	Women	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. Inspite 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

Table 7.7.3: Source of dietary intake				
	Survey	**Year**	**Men**	**Women**
			>18#	
Total Dietary Energy Intake (Kcals)	NNMB	**1975-79**	2065	1698
		1996-97	2488	2106
		2000-01	2225	1878
		2004-05	2000	1738
	INP	**1995-96**	2592	2293
% Dietary energy from fat	NNMB	**1975-79**	8.9	9.1
		1996-97	12.4	13.9
		2000-01	13.9	13.9
		2004-05	12.1	11.3
	INP	**1995-96**	12.2	12.6
% Dietary energy from protein	NNMB	**1975-79**	10.8	10.7
		1996-97	10.2	9.9
		2000-01	10.6	10.6
		2004-05	11	10.7
	INP	**1995-96**	12.3	12.4
% Dietary energy from Carbohydrates	NNMB	**1975-79**	80.3	80.2
		1996-97	74.8	76.2
		2000-01	75.5	75.5
		2004-05	76.9	78
	INP	**1995-96**	75.5	75

#, 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

Table 7.7.4: Prevalence of Undernutrition and overnutrition among adults

				Rural	Urban	Men	Women
Undernutrition	**NNMB**	**Rural**	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
		Urban slum	1993-94		20.3	22.2	19.4
	INP	**U+R**	1995-96	34.6	27.7	28.6	36.3
	NFHS-3	**Men**	2005-06	33.1	17.5	28.1	
	NFHS-2	**Women**	1998-99	40.6	22.6		35.8
	NFHS-3		2005-06	38.8	19.8		33
Overnutrition	**NNMB**	**Rural**	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
		Urban	1993-94		8.8	5	10.6
	INP	**U+R**	1995-96	4.1	6	4.3	4.6
	NFHS-3	**Men**	2005-06	7.3	22.2	12.1	
	NFHS-2	**Women**	1998-99	5.9	23.5		10.6
	NFHS-3		2005-06	8.6	28.9		14.8

Source: National Nutrition Monitoring Bureau1988-90, 1996-97, 2000-01; India Nutrition Profile, 1995-96; National family Health Survey, 2005-06. Survey Population: NNMB Rural (1975-79, 1988-90, 195-96, 2000-01) &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)

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.

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
Women			
Age (Years)			
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)

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. Inspite 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)

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 Mahrashtra. Overnutrition rates have increased in Punjab, Kerala, Goa, Tamilnadu, Jammu and Kashmir, Haryana and Gujarat. West Bengal and Mahrashtra showed a reduction in overnutrition rates but concomitant increase in undernutrition rates.

Figure 7.7.2: Trends in nutritional status of men

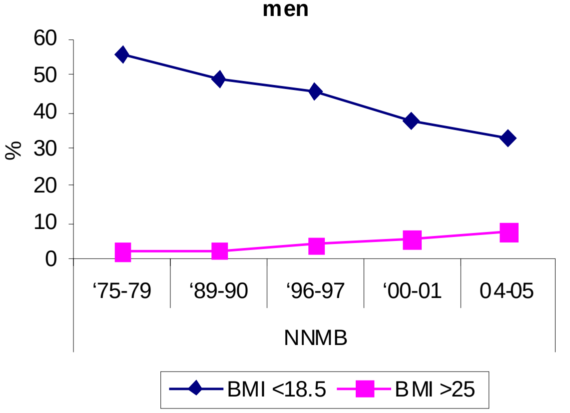
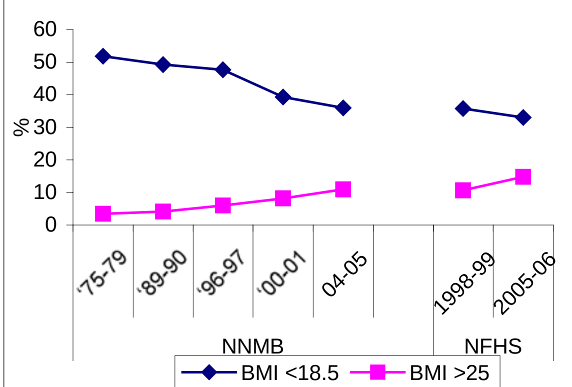
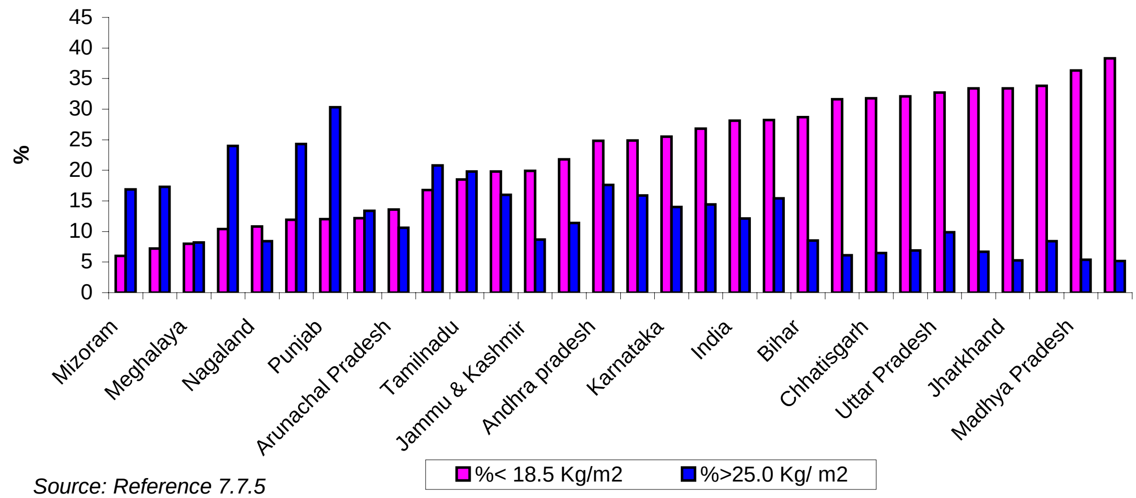


Figure 7.7.3: Trends in nutritional status of women



Interstate differences in adult nutritional status

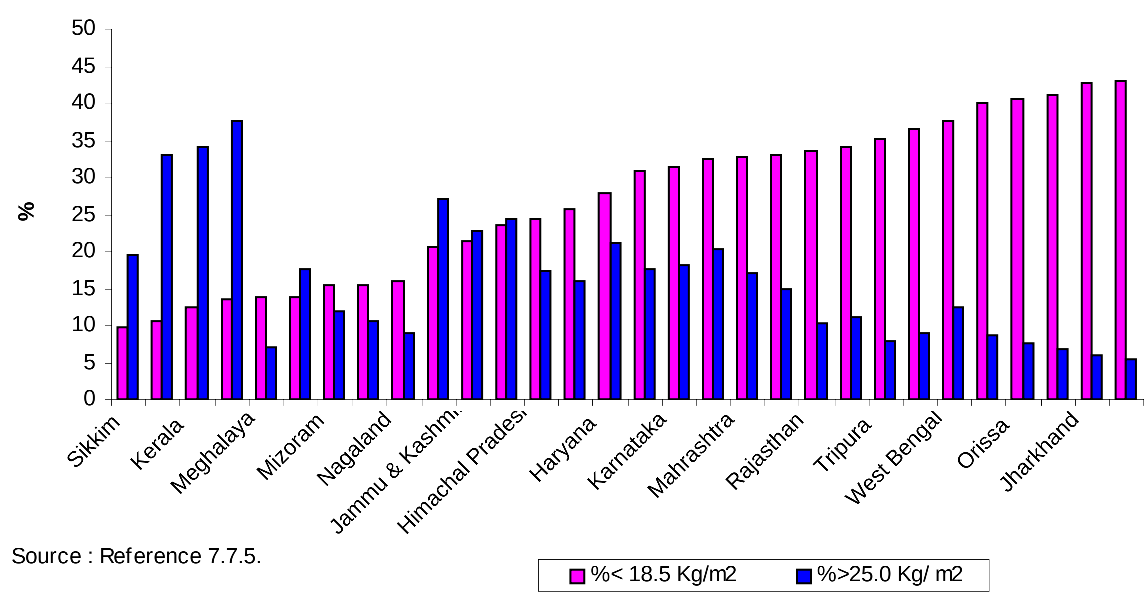
Figure 7.7.4: Nutritional status of Men-NFHS-3



Source: Reference 7.7.5

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.

Figure 7.7.5: Nutritional Status of Women NFHS-3



Source : Reference 7.7.5.

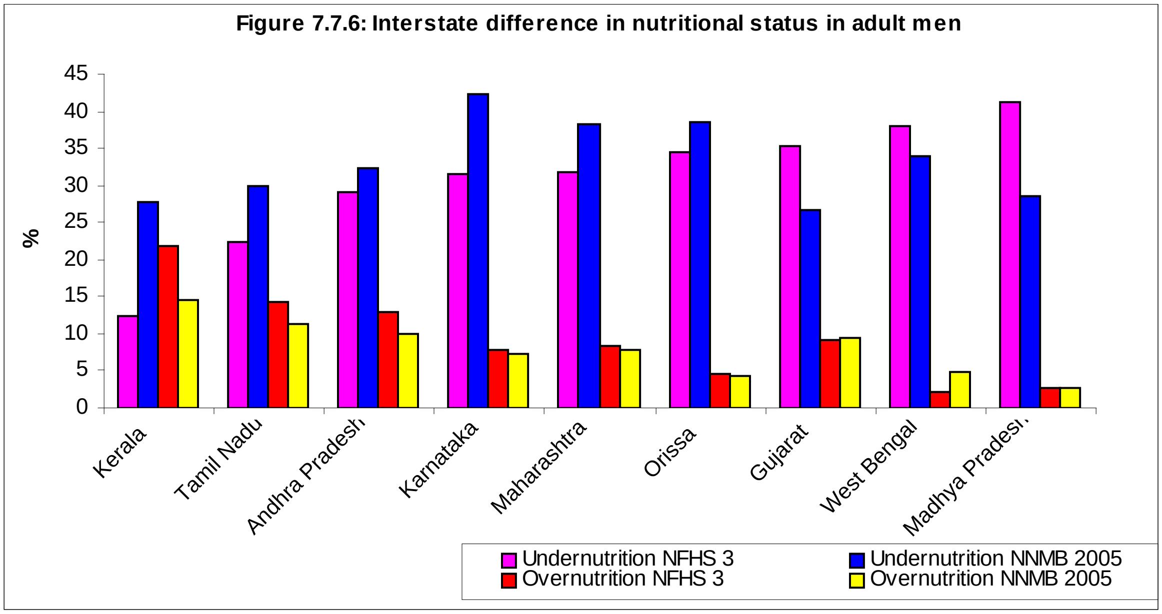


Figure 7.7.6: Interstate difference in nutritional status in adult men

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

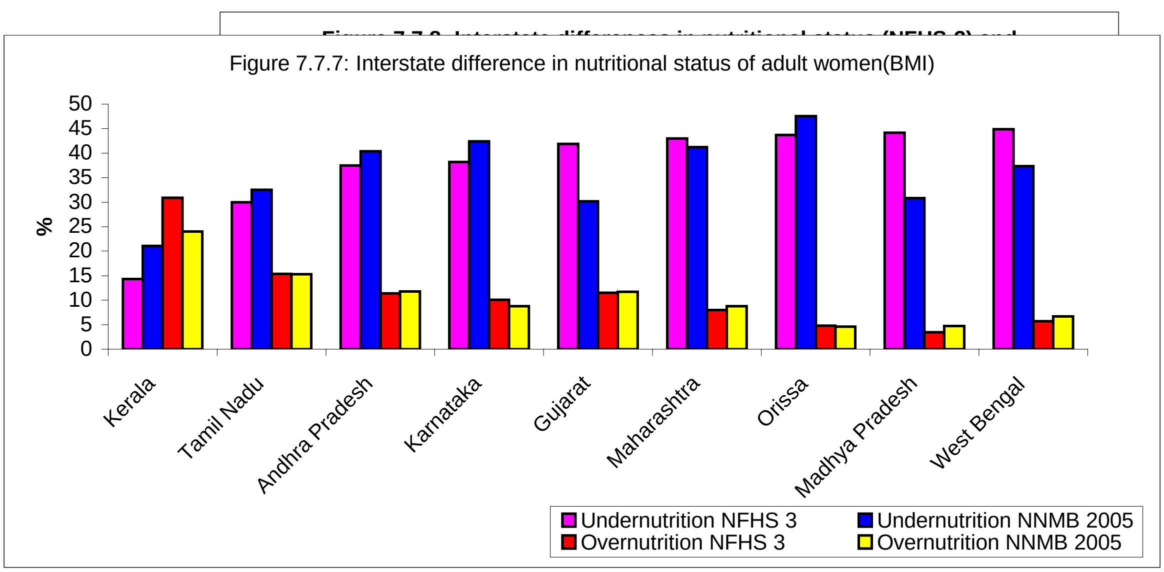


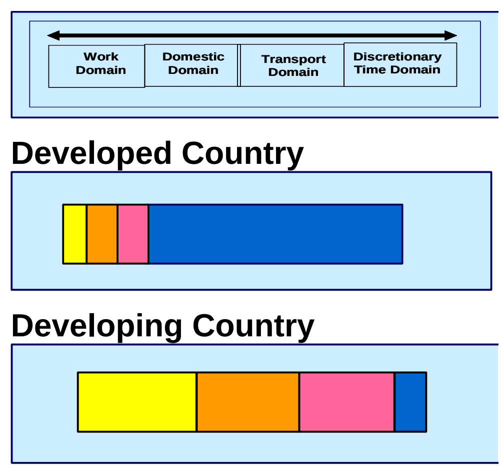
Figure 7.7.7: Interstate difference in nutritional status of adult women(BMI)

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

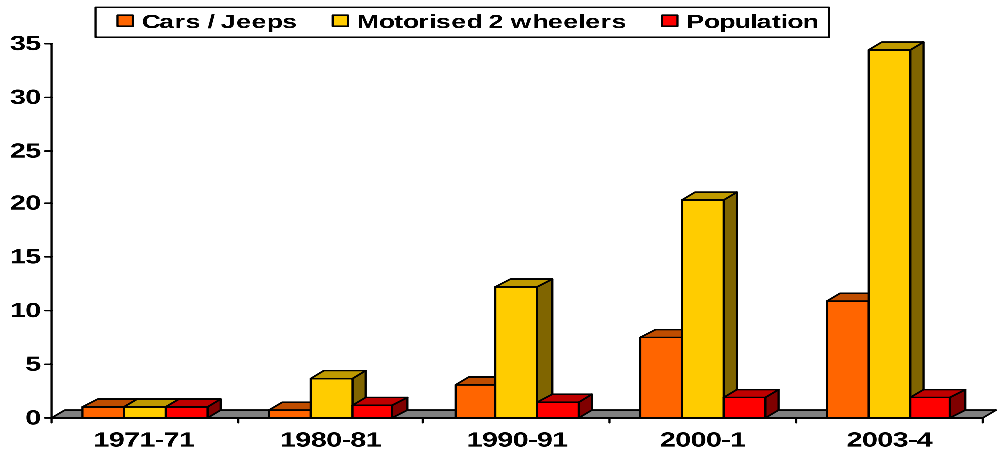
Physical activity is one of the major determinants of energy requirement. Physiologists recognize four domain of physical activity; work, domestic, transport and discretionary time. Until two decades ago in most developing countries including India, physical activity in work, domestic and transport domains 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).

Figure 7.7.9: Physical Activity: Domain



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)

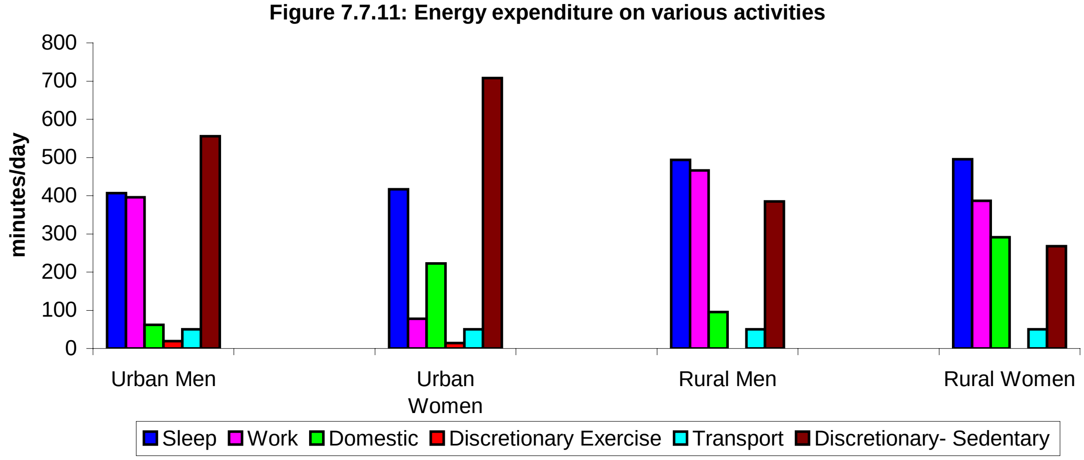


Source: Reference 7.7.1

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

Table 7.7.6: Level of mechanization in urban and rural populations (% household ownership)		
	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		

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.

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

Table 7.7.7: Energy intake and expenditure in urban affluent housewives

Groups	Weight (Kg)	BMI (kg/m^2)	BF%	TDEI (kcal)	TDEE (Kcal/day)	Energy Balance (Kcal)	Measured RMR (kcal/day)	PAR_{RMR} (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

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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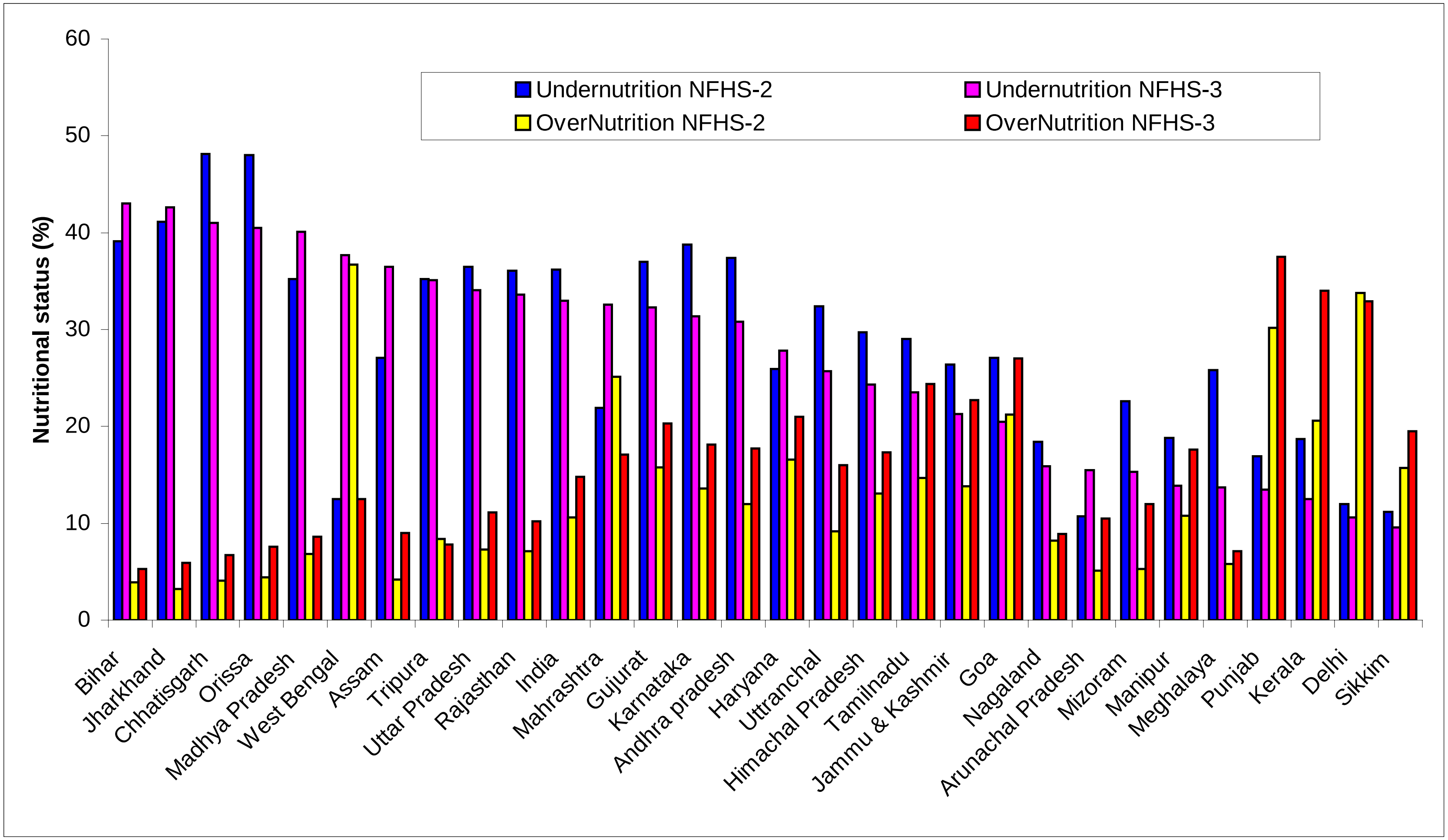
Annexure 7.7.1

Nutritional Status of men and women by state (BMI)- in different surveys

State	INP (1995-96)			NNMB (2004-05)						NFHS (2005-06)			
	Adult (Men and Women)			Men			Women			Men		Women	
	%<18.5	%>25.0	%>30.0	%< 18.5	%>25.0	%>30.0	%< 18.5	%>25.0	%>30.0	%< 18.5	%>25.0	%< 18.5	%>25.0
	kg/m^2	Kg/ m^2	Kg/ m^2	kg/m^2	Kg/ m^2	Kg/ m^2	kg/m^2	Kg/ m^2	Kg/ m^2	Kg/m^2	Kg/ m^2	Kg/m^2	Kg/ m^2
India	**32.9**	**3.8**	**0.7**	**-**	**-**	**-**	**-**	**-**	**-**	**28.1**	**12.1**	**33**	**14.8**
Meghalaya	13.1	1.3	0.1	-	-	-	-	-	-	8	8.2	13.7	7.1
Delhi	13.5	13.8	3.4	-	-	-	-	-	-	10.4	24	10.6	32.9
Kerala	33.2*	9.2*	1.1*	27.7	13.1	1.4	21.1	20.4	3.6	11.9	24.3	12.5	34
Punjab	23	12.2	2.6	-	-	-	-	-	-	12	30.3	13.5	37.5
Manipur	13.3	3.6	0.3	-	-	-	-	-	-	12.2	13.4	13.9	17.6
Arunachal Pradesh	7.6	29.9	7.2	-	-	-	-	-	-	13.6	10.6	15.5	10.5
Tamilnadu	37.3*	8.8*	0.8*	29.8	10.6	0.6	32.5	12.2	3.1	18.5	19.8	23.5	24.4
Himachal Pradesh	38.9	3.3	0.5	-	-	-	-	-	-	19.8	16	24.3	17.3
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	19.9	8.7	21.3	22.7
Uttranchal				-	-	-	-	-	-	21.8	11.4	25.7	16
Andhra pradesh	49.4*	3.9*	0.3*	32.3	8.3	1.7	40.4	9.6	2.2	24.8	17.6	30.8	17.7
Mahrashtra	51.0*	4.0*	0.4*	38.2	6.8	1	41.2	7.3	1.5	24.9	15.9	32.6	17.1
Karnataka	53.8*	3.7*	0.6*	42.4	6.8	0.5	42.4	7.5	1.3	25.5	14	31.4	18.1
Haryana	25.9	4	0.4	-	-	-	-	-	-	26.8	14.4	27.8	21
Gujurat	53.1*	4.0*	0.8*	26.8	8.7	0.8	30.2	9.7	2	28.2	15.4	32.3	20.3
Bihar	50.3	1.5	0	-	-	-	-	-	-	28.7	8.5	43	5.3
West Bengal	-	-	-	34	4.8	0.1	37.4	6	0.7	31.6	6.1	37.7	12.5
Chhatisgarh				-	-	-	-	-	-	31.8	6.5	41	6.7
Orissa	57.3*	1.5*	0.1*	38.4	3.6	0.6	47.6	3.9	0.7	32.1	6.9	40.5	7.6
Uttar Pradesh	-	-	-	-	-	-	-	-	-	32.7	9.9	34.1	11.1
Assam	17.1	2.3	0.1	-	-	-	-	-	-	33.4	6.7	36.5	9
Rajasthan	45.3	2.3	0	-	-	-	-	-	-	33.8	8.4	33.6	10.2
Madhya Pradesh	53.3*	0.7*	0.0*	28.6	2.5	0.3	30.8	3.9	0.8	36.3	5.4	40.1	8.6
Mizoram	15.7	4.1	0.1							6	16.9	15.3	12
Nagaland	10.5	5.4	0.4							10.8	8.4	15.9	8.9
Sikkim	11.9	7.4	0.8							7.2	17.3	9.6	19.5
Goa	34.8	5.9	0.3							16.8	20.8	20.5	27
Jharkhand										33.4	5.3	42.6	5.9
Tripura										38.3	5.2	35.1	7.8

Annexure 7.7.2

Nutritional Status of women (NFHS 2 and 3)



7.8 NUTRITIONAL STATUS OF THE ELDERLY

With increasing longevity, the proportion and number of persons in the age group of 60 years and beyond is increasing; women out numbering men in this age group. The population of elderly has been projected to double from 6.23 crore in 1996 to 11.29 crore in 2016. With increasing age, there are metabolic changes and also reduction in physical activity and, as a result, energy requirement in elderly is substantially lower than younger adults.

Diet surveys carried out by NNMB indicate that as in other age groups, cereals and millets form the bulk of dietary of the elderly. Mean intakes of cereals and millet together are more than the RDA (males 445g and females 357g). Mean intakes of pulses are low both in males and females (31g and 27g respectively). The dietary intake of pulses and green leafy vegetables was less than RDI in all age groups in both sexes. Intake of other vegetables, though better than green leafy vegetables was still lower than the RDI in both sexes (Figure 7.8.1). Elderly individuals also face problems in ensuring appropriate dietary intake because of alteration in taste with increasing age and loss of teeth.

Figure 7.8.1: Mean daily intake of foods

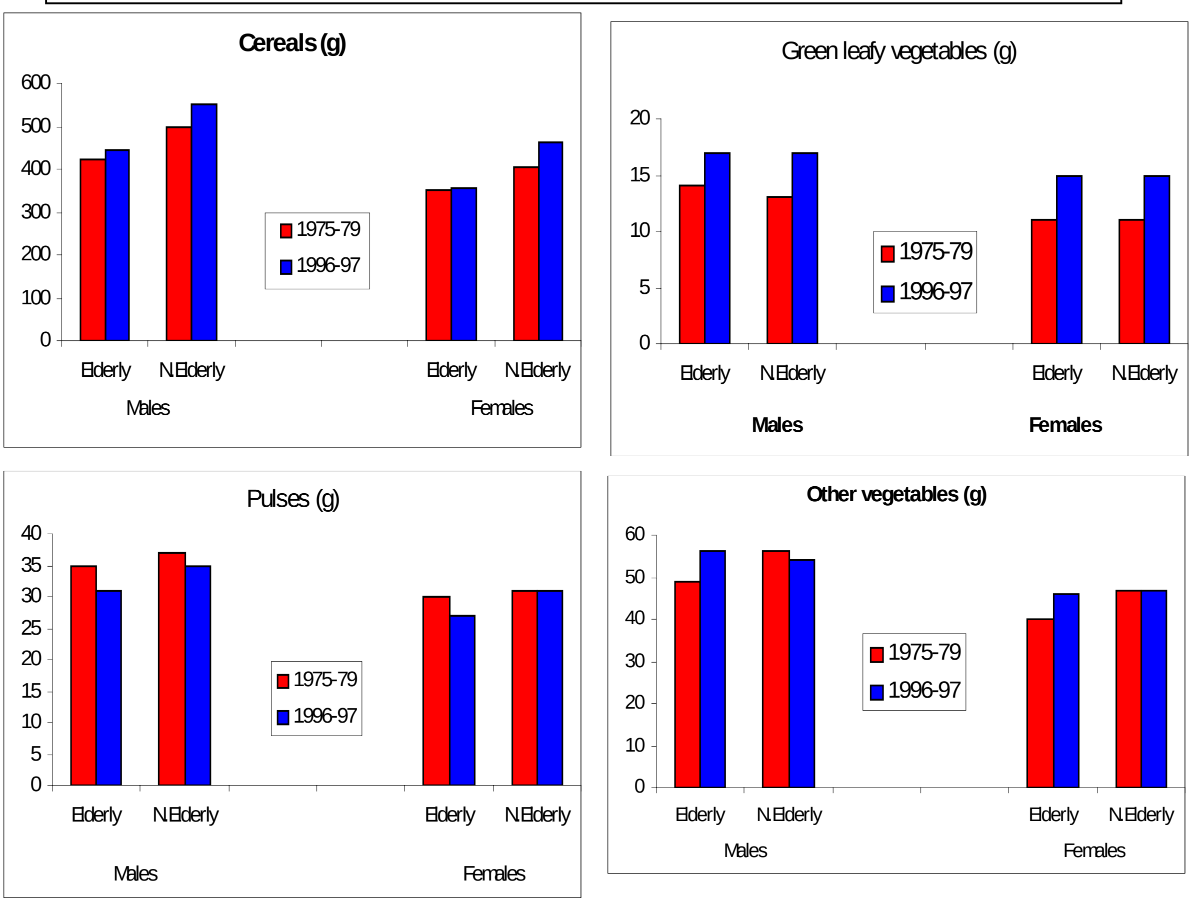
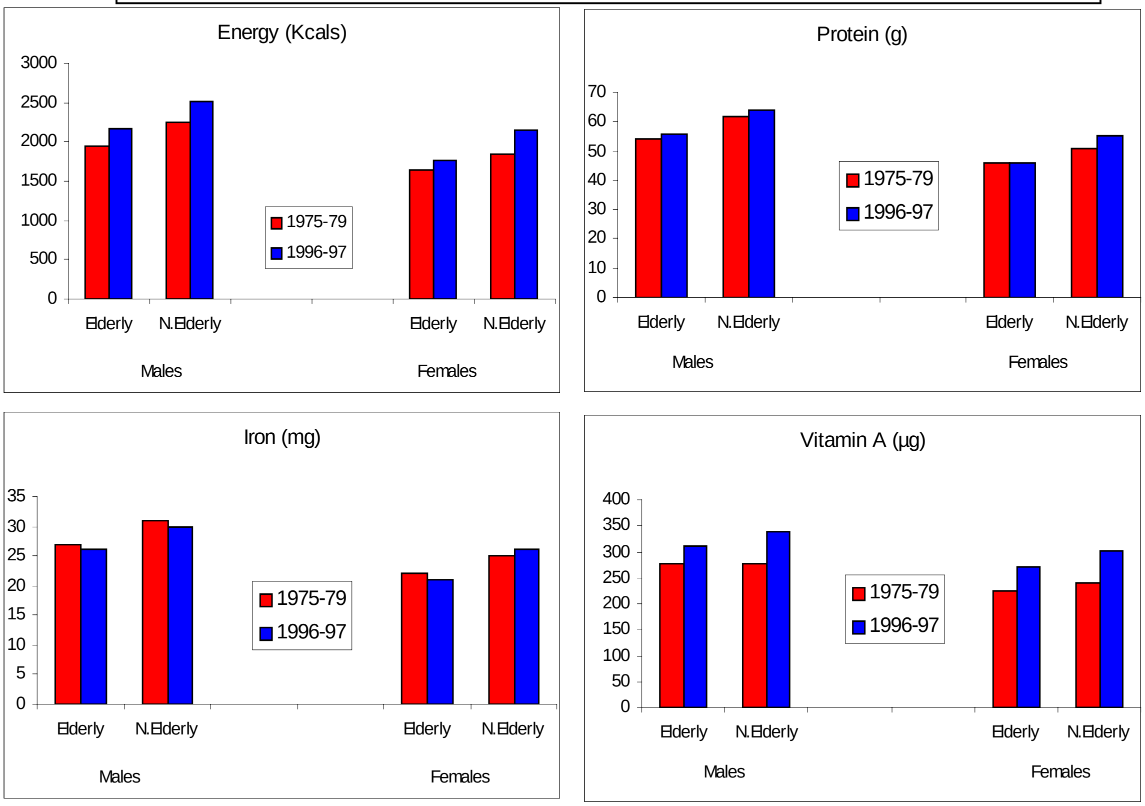


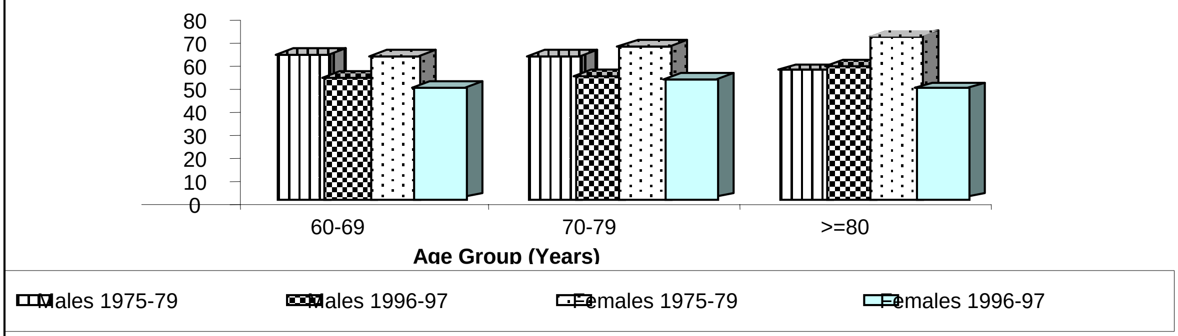
Figure 7.8.2: Mean daily intake of nutrients



The mean and median intakes of nutrients by elderly men and women are presented in Figure. 7.8.2. The mean intake of protein was slightly less than the RDI in both the sexes. The intakes among non-elderly adults were higher than the elderly adults. The mean intakes of energy decreased with age. The intakes of iron, vitamin A, and riboflavin were less among elderly as compared to non – elderly. Due to low intake of vegetables, food rich in micronutrients and increased susceptibility to infection, anaemia and Vitamin B complex deficiency may be more common in the elderly.

Calcium intake is low across ages in Indian dietaries. Adequate dietary calcium intake from birth to 30 years is critical for the development of peak bone mass which in turn is critical for reduction in age related decline in bone mass and osteoporosis in elderly. With changing lifestyles; outdoor activities and exposure to sun is decreasing. As a result the vitamin D status of all segments of the population is compromised. This renders the elderly more prone to osteoporosis. Osteoporosis occurs more commonly in women than in men as bone loss occurs earlier and more rapidly in women as compared to men. With increasing longevity, it is expected that there will be an increase in the number of persons with osteoporosis. There is currently very little data on the incidence of

Figure 7.8.3: Prevalence (%) of Chronic Energy Deficiency (CED) among Elderly by Age



osteoporosis and osteoporotic fractures. In view of the increasing proportion and number of elderly efforts will have to be made to ensure adequate calcium / vitamin D status in all segments especially among the elderly.

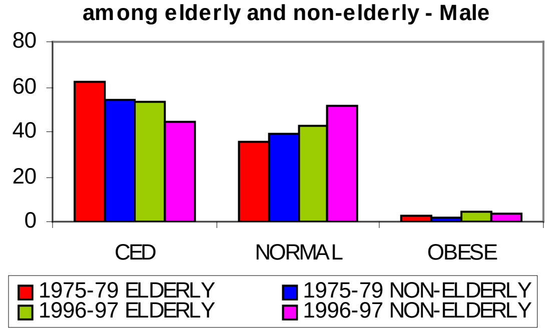
The prevalence of chronic energy deficiency (CED) as assessed by BMI < 18.5 was relatively more among males (53.5%) than in females (49.4%). Over the two decades there is a reduction in the prevalence of CED both in men and women but the reduction is more in women (Figure 7.8.3).

The prevalence of overnutrition was higher in elderly men as compared to elderly women (Figures 7.8.4 & 7.8.5).

Lack of social support, breaking up of the joint family system, changing lifestyles all aggravates the health and nutritional problems of the elderly. Available data from nutrition surveys indicate that from now on the dual problem of chronic energy and micronutrient deficiency on the one hand and obesity among the elderly has to be addressed.

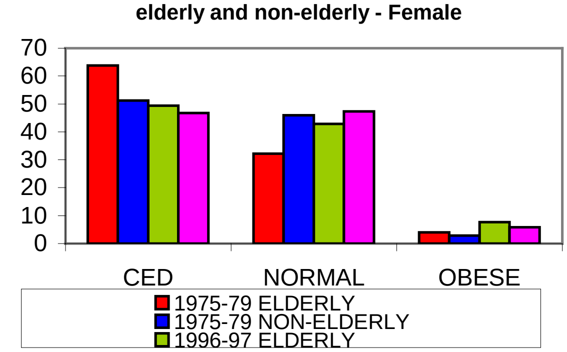
Innovative efforts to provide societal support, health care and nutrition services to the elderly are currently being taken up by several agencies. Simultaneously, there are efforts to improve family and societal support to elderly within the existing cultural ethos in different regions. Successful models for improving quality of life of elderly will have to be replicated.

Figure 7.8.4: Distribution (%) of BMI among elderly and non-elderly - Male



Source: Reference 7.8.1

Figure 7.8.5: Distribution (%) of BMI among elderly and non-elderly - Female



Source:Reference 7.8.1

In many states elderly persons who are without any financial support get old age pension. The amount as well as coverage varies between states but, on the whole, the amount provided is too low to meet the nutritional and health care needs of the elderly persons. Following reports of severe under-nutrition among the elderly and destitute persons in several states, the central and the state governments initiated steps to improve the access of these segments to food-grains. The National Policy on Older Persons announced in January 1999 provides a framework for welfare of the elderly persons including improved financial security and increased access to health and nutrition services. It is envisaged that National Plan of Action for the implementation of the policy will be drawn up. The policy also recommends research to expand the knowledge base on nutritional needs of the elderly.

References

7.8.1 NNMB National Nutrition Monitoring Bureau. 1979-2002. *NNMB Reports:* National Institute Of Nutrition, Hyderabad

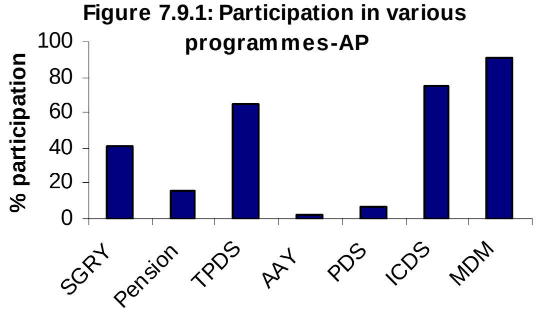
7.9 MANAGEMENT OF FOOD SCARCITY DURING DROUGHT

In the vast Indian subcontinent natural calamities like drought / floods occur in one or the other region every year. Programmes to combat the immediate impact of drought or floods are relatively easier to implement as compared to the long term measures to combat the adverse effects these have on agricultural production, agro based industrial production, rural unemployment, migration to urban areas, decrease in purchasing power, reduced household food security and increase in the prevalence of undernutrition, morbidity and mortality in the community.

During the first three years of the new millennium, different states had experienced recurrent drought due to delay in the onset of monsoon, or inadequate rainfall. In 2002 due to failure of Southwest monsoon nine States i.e. Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, Madhya Pradesh, Chattisgarh, Gujarat, Rajasthan and Orissa were declared as drought affected by the Government of India. The National Institute of Nutrition, Hyderabad carried out a rapid survey in two drought-affected districts in each of the nine states in May and June 2003, to assess the impact of drought. Data from the survey showed that in all the affected districts there was deficient rainfall, reduction in the area under cultivation, reduction in the yield of all agricultural produce. All the districts had received additional inputs under food for work programme and additional rations through PDS; wherever required efforts were made to supply cattle feed, drinking water and essential medicines.

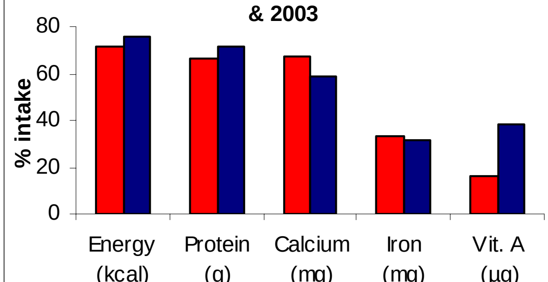
Coping strategy of households include use of savings, selling assets, borrowing, seeking employment under the food for work programme, improved utilisation of PDS, increasing consumption of low cost foods, increasing participating in the supplementary feeding programme under ICDS and mid day meal. Data from the NNMB drought surveys indicate that none of the families surveyed had consumed less than 500 calories / day (indicating acute starvation). However drought conditions resulted in some reduction in dietary intake especially of pulses and vegetables in the worst affected districts. In most of the districts there was some increase in the prevalence of undernutrition especially among the under privileged segment of population and landless labourers. Data from

Figure 7.9.1: Participation in various programmes-AP



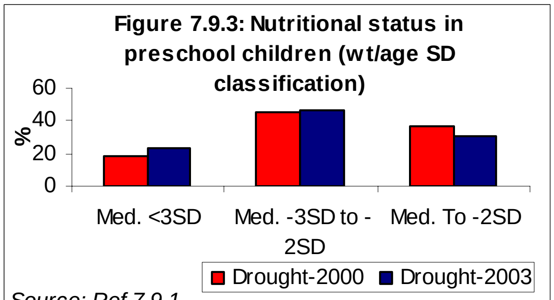
Source: Ref 7.9.1

Figure 7.9.2: Dietary intake in Years 2000 & 2003



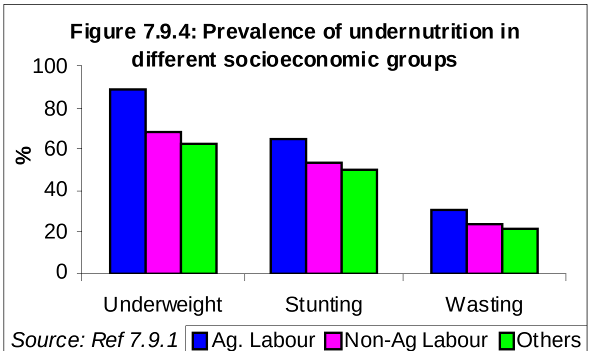
Source: Ref 7.9.1

Andhra Pradesh which had suffered drought in three consecutive years is shown in Figures 7.9.1-7.9.4. These data suggest that the system for early recognition of drought and initiation of effective measures to counteract its adverse consequences, prevent acute and severe undernutrition; but they are not very effective in preventing aggravation of pre existing undernutrition during drought.



Source: Ref 7.9.1

The Tenth Plan envisaged that efforts should be made to monitor rainfall data to provide early warning of drought. Monitoring agricultural production should provide information about impending food insecurity. In drought-prone areas intensive monitoring of the nutritional status of pre-school children based on ICDS reporting system can help to assess the severity of the problem at block level. Timely relief measures can be organised based on these data. Apart from other process indicators for monitoring the relief operations, monitoring the nutritional status of pre-school children through the ICDS system can be used for assessing the out reach, adequacy and impact of relief measures.



Source: Ref 7.9.1

During the Eleventh Plan period, it might be possible to fine tune action plans to meet the food and nutrition needs during drought / floods and natural calamities taking into account the lessons learnt from past experience.

References

7.9.1 NNMB National Nutrition Monitoring Bureau. 2000-2003. *NNMB Reports:* National Institute Of Nutrition, Hyderabad

7.10. NUTRITIONAL STATUS OF TRIBAL POPULATION

The tribal populations are is recognised as socially and economically vulnerable. Their lifestyles and food habits are different from that of their rural neighbours. They depend on minor forest produce and manual labour for livelihood. They may not have adequate income. Their food consumption pattern is dependent on the vagaries of nature and varies from extreme deprivation (in the lean seasons) to high intakes (in the post-harvest period).

Higher prevalence of undernutrition in tribal population is due to

- poverty and consequent undernutrition
- lack of awareness about, access to and utilisation of the available nutrition supplementation programmes;
- social barriers preventing the utilisation of available nutrition supplementation programme and services.
- poor environmental sanitation and lack of safe drinking water, leading to increased morbidity from water-borne infections;
- environmental conditions that favour vector-borne diseases;
- lack of access to health care facilities resulting in increased severity and /or duration of illnesses.

NNMB surveys in integrated tribal development blocks

Several focused interventions for tribal development and improvement in health and nutritional status of tribal population have been initiated in the last three decades. In order to assess the impact of these, the National Nutrition Monitoring Bureau (NNMB) carried out a repeat diet and nutrition surveys of the tribal populations living in the Integrated Tribal Development Project (ITDP) areas in 1998-99 in Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Orissa and West Bengal, where the NNMB had carried out an earlier survey in 1985-87.

Table 7.10.1: Inter-State Differences in Nutrient Intake

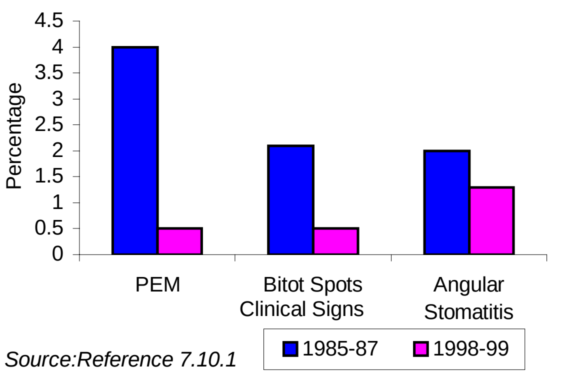
	State with	
Nutrient Intake	Lowest	Highest
1-3 age-group		
Protein	12.9g	25.5g
Energy	508 k cal	1047 k cal
Vit. A	81 µ g	629 µ g
4-6 age-group		
Protein	22.2 g	37.2 g
Energy	842 k cal	1590 k cal
Vit. A	98 µ g	915 µ g
>16 years males		
Protein	45.6 g	67.7g
Energy	1830k cal	2941k cal
Vit. A	141µ g	1075µ g

Source: Reference 7.10.1

Comparison of data of the two surveys showed that there has not been any improvement in the food and nutrient intake. There were substantial differences in the food and nutrient intake and nutritional status between tribal populations living in different states (Table 7.10.1). In some population groups, there was adequate intake of minerals and some micronutrients even though the diet was inadequate in terms of meeting energy and protein needs.

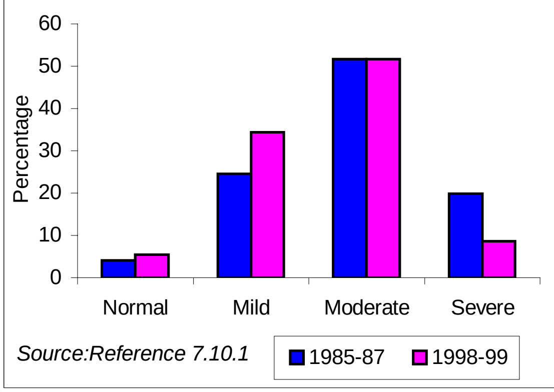
There has been some reduction in the prevalence of severe forms of under-nutrition and in nutritional deficiency signs in preschool children (Figure 7.10.1 and 7.10.2). The adult tribal population is more undernourished than their rural counterparts (Figure 7.10.3 and 7.10.4). Overnutrition is very rare among tribal population.

Figure 7.10.1: Prevalence of Nutritional Deficiency signs in Preschool Children



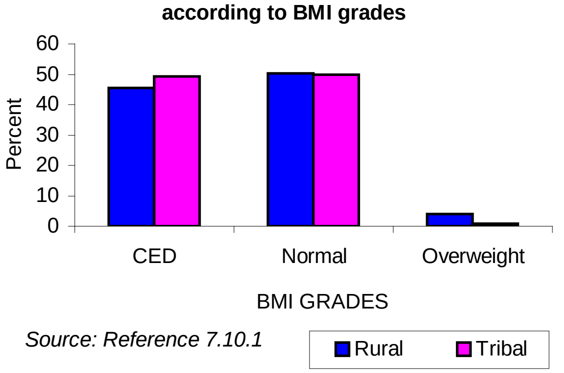
Source:Reference 7.10.1

Figure 7.10.2: Prevalence of (%) under nutrition (1-5 yrs) Gomez classification



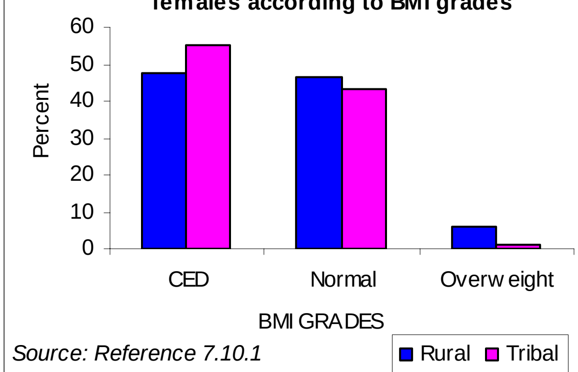
Source:Reference 7.10.1

Figure 7.10.3: Nutritional status of adult male according to BMI grades



Source: Reference 7.10.1

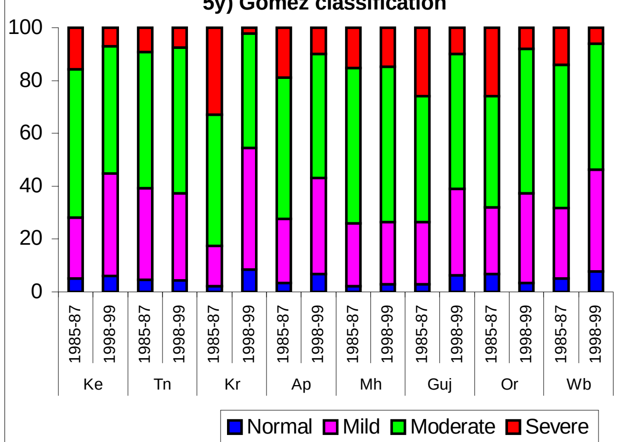
Figure 7.10.4: Nutritional status of adult females according to BMI grades



Source: Reference 7.10.1

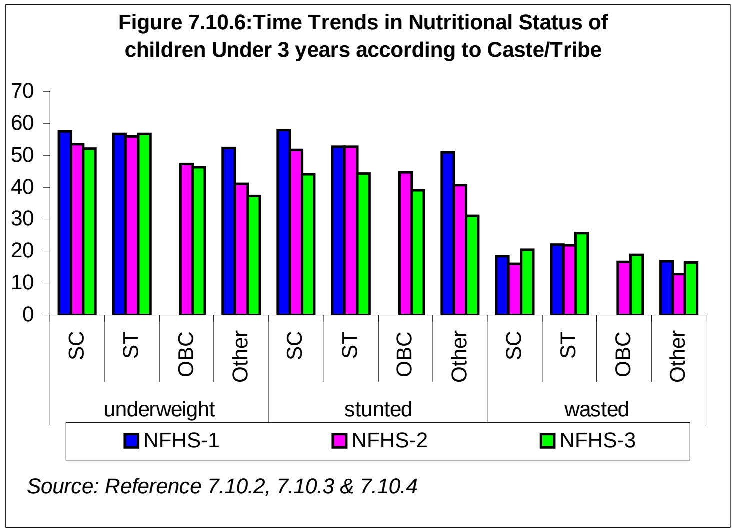
Time trends in prevalence of undernutrition in tribal population in eight states is available from NNMB repeated survey 2000 (Figure 7.10.5). Data indicated that Karnataka has shown the steepest decline in undernutrition especially severe undernutrition. Substantial decline in severe undernutrition is reported from Kerala, Andhra Pradesh, Gujarat, Orissa and West Bengal. However, it is a matter of concern that there has not been any decline in undernutrition rate in Tamil Nadu and Maharashtra.

Figure 7.10.5: Time trends of % undernutrition (1-5y) Gomez classification



Source: Reference 7.10.1

NFHS surveys



NFHS surveys provide information on nutritional status of women and children in relation to the caste / tribe. Data on nutritional status of children from SC, ST, OBC and others from NFHS 1, 2 & 3 is given in Figure 7.10.6. Undernutrition rates are higher in ST and SC as compared to OBC and others in all these three surveys. There are substantial interstate differences in stunting; underweight and wasting rates in preschool children; however in all states undernutrition rates are high in SC/ ST children (Annexure 7.10.1). There is a small but sustained reduction in undernutrition as estimated by prevalence of underweight and stunting over these 15 years. However it is a matter of concern that there is small increase in wasting rates between NFHS 2 and NFHS 3 in all the four categories.

India has a large and diverse tribal population. There are wide variations among the groups in nutritional status and access to and utilization of nutrition and health services. The tribal populations in the northeastern states have high literacy levels; they access available facilities, and hence nutritional and health status of women and children in these states is better than the national averages (Table 7.10.2). On the other hand, primitive tribes such as the Onges in the Andaman have very little awareness or access to either nutrition or health care. Differential area-specific need assessment, strategies and programmes to improve access and utilisation of nutrition services have to be developed for each of the tribal areas.

DLHS survey

Table 7.10.2: Nutritional Status in North Eastern States

State	% Tribal population as per 1991 Census	Weight-for-age (% below–3SD) in children <3yrs	% Ever married women with		
			Height below 145 cm	BMI< 18.5 kg/m^2	BMI >25 kg/m^2
Arunachal Pradesh	63.7	7.8	11.9	10.7	5.1
Meghalaya	85.5	11.3	10.3	18.8	10.8
Mizoram	94.8	5.0	21.1	25.8	5.8
Nagaland	87.7	7.4	10.7	22.6	5.3
All-India	8.1	18.0	13.2	20.3	10.6

Source: Reference 7.10.3

Data on interstate difference in nutritional status as assessed by weight for age indices from District Level Household Survey (DLHS 2002-04) is given in Annexure 7.10.2. In all states, prevalence of undernutrition is higher in SC and ST as compared to OBC and others. Over all undernutrition rates are high in Orissa, Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan. These states with high tribal population and high undernutrition rates should receive priority attention in improving access to nutrition and health care.

These data clearly indicates the need for continuous monitoring nutritional status of the tribal population. Monitoring of the ICDS reporting can provide early warning of any deterioration in the nutritional status in pre-school children so that appropriate intervention can be initiated. Research studies on dietary habits that contribute to good nutritional status as well as those that make the tribal population vulnerable to nutritional deficiencies should receive attention. Based on these data, specific intervention programmes can be taken up to improve nutritional status.

References

7.10.1 National Nutrition Monitoring Bureau (NNMB). 1985-2000. *NNMB Reports:* National Institute Of Nutrition, Hyderabad

7.10.2 National Family Health Survey (NFHS-1): http://www.nfhsindia.org/india1.html; last accessed on 24/09/07

7.10.3 National Family Health Survey (NFHS-2): http://www.nfhsindia.org/india2.html; last accessed on 24/09/07

7.10.4 National Family Health Survey (NFHS-3): http://mohfw.nic.in/nfhsfactsheet.htm; last accessed on 24/09/07

7.10.5 District Level Household Survey (DLHS) http://www.rchindia.org/dlhs_india.htm; last accessed on 24/09/07

Interstate differences in nutritional Status of Children															
State		**NFHS-1 (1992-93)**						**NFHS-2 (1998-99)**							
		SC		**ST**		**Others**		**SC**		**ST**		**OBC**		**Others**	
		-3SD	**-2SD**	**-3SD**	**-2SD**	**-3SD**	**-3SD**	**-3SD**	**-2SD**	**-3SD**	**-2SD**	**-3SD**	**-3SD**	**-3SD**	**-3SD**
Delhi	W/A	22.2	52.2			11.2	40.8	13.1	41.3			20.7	44.7	5.3	28.8
	H/A	25.6	53.3			18.8	42.4	23.7	47.7			22.4	46.3	14.7	30.1
	W/H	1.1	15.6			2.7	11.6	1.6	11.5			8.1	20.7	3.4	9.4
Andhra Pradesh	W/A	15.6	50.6	18.4	54.4	15.4	48.3	14.2	43.4	7.5	45.9	12.5	39.1	4.8	29.7
	H/A							18.4	42.7	12.9	44.2	15.1	39.8	10.1	32.3
	W/H							1.1	9.5	0	7.5	2.7	10.4	8.7	7.1
Assam	W/A	17.1	54.5	14.2	38	19.7	53	5.1	32.4	7.7	18.8	11.4	20.6	15.8	43.8
	H/A	27.2	49.7	22.5	45.6	27.1	53.7	29.7	45.1	27.2	42.6	24	31.7	37.6	55.6
	W/H		8.5	1.2	7.7	1.9	11.6	2	8.4	1.8	8.2	2.9	15.1	4	15.1
Chhatisgarh	W/A							36.5	68	32.4	68.7	21	58.7		
	H/A							45.4	61.2	40	64.8	30.3	55.5		
	W/H							2.4	18.2	30.3	55.5	3.4	14.3		
Gujarat	W/A	23.2	59.4	25	54.2	12.3	41	17.7	45.4	24.1	56.6	18.8	49	9.7	36.3
	H/A	26.1	60.9	25	47.5	20.6	41.7	29	48.9	29.2	46.9	26.4	46.5	15.9	37.8
	W/H	4.3	17.4	5.9	28	2.9	17.1	3.1	12.3	3.4	21.7	2.5	18.8	1.5	13.4
Himachal Pradesh	W/A	17.6	53.4	29.6	56.4	9.8	43.9	17.4	52.2	16.9	59.2	8.5	34.7		
	H/A							23.7	54.9	14.5	42.4	17.5	35.7		
	W/H							3.8	18.2	5.1	25.8	2.5	13.5		
Haryana	W/A	11.3	45.5			8	34.7	12.8	40.3			11.5	42.8	8.2	28
	H/A	22.9	57.1			17.7	42.2	29.6	56.3			28.3	55.3	19.9	44.6
	W/H	0.7	7.3			0.6	5.3	0.5	3.9			0.4	5.8	1.1	5.7
J&K	W/A	17.4	52.9			12.2	40.3	4	21.1	0	38.8	9.2	49.3	8	28
	H/A	21.6	46.4			17.3	37.8	7.8	23.8	13.9	39.7	22.9	50.6	16.7	36.8
	W/H	5.3	18.2			2.6	13.2	0.9	9.5	0	18.3	3.6	12.4	0.6	9.4
Karnataka	W/A	22.6	60.1	26.4	66.7	18.6	52.8	23	52.8	28.7	55.7	12.2	40	15.6	41.3
	H/A	24.5	54.8	26.4	56.9	22.3	46.1	17.9	43.7	22.1	41.2	12.7	34.4	17	35
	W/H	1.9	15.4	6.9	26.4	2.5	17.2	6.8	27.9	1.6	21	2.5	15.1	4.2	20.5
Kerala	W/A	12	32	28	60	5.6	27.9	12.4	43			5.2	30.6	2.3	20.1
	H/A	4	32	32	60	8.7	26.7	17.8	38.2			9	23.4	4.4	17.7
	W/H		16		28	1.3	11.2	0	12.3			0.7	12.5	0.4	9.2
Maharashtra	W/A	25.8	56.7	28.3	63	18.7	50.9	15.1	51.4	35.4	65.2	13.9	48.4	15.7	46.3
	H/A	26.8	53.6	28.9	54.3	20.6	44.3	15.5	43.7	19	57.1	11	40.3	14	35
	W/H	6.2	28.9	2.3	26	4.2	18.7	0.8	15.6	8.1	31	2.8	20.9	1	20.7
Madhya Pradesh	W/A	22	56.6	25.4	61.5	21	55.7	30	57.5	31.4	64.5	22.4	55.4	14.5	40.5
	H/A							32.2	52.7	33.6	59.9	28.1	51.5	18.5	37.2
	W/H							4.7	19.9	4.9	24.7	4.2	18.7	3.2	16.3
Orrissa	W/A	24.1	60.7	29.8	60.5	20.4	50	24.2	59.4	26.5	59	20.7	56.3	12.2	43
	H/A	26.9	50.6	27	52.4	24.4	46.6	22.8	50.7	19.9	49.4	18.3	44.2	9.8	32.4
	W/H	2.3	21.4	5.1	25.2	3.3	20.2	3	22.8	22.8	5	4.5	24.6	2.3	19.7
Punjab	W/A	21.7	55.3			11.4	42.4	11.5	38.8			11.4	35	5.4	17.9
	H/A	23	46.3			13	37.6	25.4	49.6			17.9	43.1	10.1	28.7

	W/H	2.9	22			2.7	19.1	1.4	9.9			1.5	6.7	0	49
Rajasthan	W/A	18.7	45.5	25.8	45.1	17.5	39.1	26.1	56.3	27.6	59.3	19.2	51.1	17	45
	H/A	29.6	47	25.5	41.8	25.8	42.1	35.5	55	38.4	60.4	27.1	51.4	24.1	48.3
	W/H	6.2	19.7	6.5	23.9	4.5	18.2	1.7	11	4.8	17.6	1.1	12.7	1.3	9.6
Tamil Nadu	W/A	18.3	53			11.4	45.1	14.9	48.1			9.1	32.8		
	H/A							16.8	41.2			10.1	25.1		
	W/H							3.2	21.6			4	19.3		
Uttaranchal	W/A							12.3	61.6					15.3	38
	H/A							18.5	66.3					24	40.8
	W/H							0	5.3					1.5	9.4
Uttar Pradesh	W/A	22	52	17.6	39.6	18.7	49.5	24.1	60.3	33.5	59.4	25.6	52.3	17.6	75.9
	H/A	26.3	50.6	25.6	47	27.9	48.9	36.3	63.1	40.4	69.3	32.9	2.7	26.6	50.3
	W/H	3.3	17.7	2.3	16	2.4	15.9	2.8	11.5	3.2	13.7	5.7	13.6	1.4	9.3
West Bengal	W/A	26.9	60.7	19.5	65.3	17.3	55.8	20.5	56.7	22.7	57.4	17.6	36.1	14	45.8
	H/A							21	45.6	22.4	46.6	10	27	18.6	40.1
	W/H							2.5	18.1	1.7	17.7	0	13.7	2.3	11.5
Sikkim	W/A							2.2	29.1	3.2	15.1	3.3	16.9	6.3	25.4
	H/A							12.9	38.4	7.5	31.2	9.7	26.9	10.3	34.6
	W/H							0	5	1.2	4.6	0.8	2.6	0.8	6.9
Bihar	W/A	37.2	66.1	32	61.8	30.3	62.3	28.3	58.5	36.1	59.7	25.5	55.8	18.5	43.1
	H/A	50.6	66.9	35.3	63	38.6	60	36.2	57.6	36.4	56.4	34.9	54.7	25.6	45.1
	W/H	3	23.7	4	24.4	4.2	21.3	5.5	23.1	7.7	33.5	5.3	19.7	5	18.3
Goa	W/A	12.5	37.5	21.9	46.9	8.3	34.3	14.1	25.2					4.1	28.1
	H/A	18.8	40.6	25	56.3	10.2	30.3	3.7	17.2					5.4	17.9
	W/H		18.8	6.3	18.8	2.3	15.1	0	21.4					0.8	12.5

Annexure 7.10.2

District Level Household Survey (2002-04)										
Percentage of children (age 0-71 months) classified as undernourished by weight for age according to Caste/ tribe# 2002-04										
States	**SC**		**ST**		**OBC**		**Others**		**Total**	
	< – 3 SD	**< – 2 SD**	**< – 3 SD**	**< – 2 SD**	**< – 3 SD**	**< – 2 SD**	**< – 3 SD**	**< – 2 SD**	**< – 3 SD**	**< – 2 SD**
Arunachal Pradesh	2	20.5	3.5	20.8	2.5	20.6	1.7	17.7	2.9	20.3
Andhra Pradesh	20.1	45.5	27.3	48.6	16.6	43.4	14	36.5	17.3	42.3
Assam	9.1	28.1	11.3	21.5	12.7	27.4	18.6	38.1	33.2	26.4
Gujarat	19.2	51.7	23.7	58.6	16.1	47.3	8.5	35.5	15.4	46
Haryana	14.4	36.8	16	43.9	14.7	38.1	11.5	32.6	13.3	35.6
Himachal Pradesh	12.2	35.9	14.7	35.4	19.6	53.7	10.9	33.1	12.4	36.4
Jammu & Kashmir	(7.3)	(19.5)	0	6.3	7.1	18.6	7.6	24.7	7	22.3
Jharkhand	22	56.8	23.4	55.1	21.2	52.8	12.9	40.5	20.7	52.2
Karnataka	15	45.9	18.5	47.2	13.1	42.8	15.7	46.7	14.6	44.8
Kerala	15.8	43.9	14.1	44.4	8.6	35.4	7.6	31.7	9.3	35.8
Madhya Pradesh	26.1	58.3	29.4	60.6	23.1	54.8	17.8	47.2	24.1	55.4
Maharashtra	17	50.8	23.7	59	14	48.3	10.8	40.9	15	47.7
Bihar	28.4	60.6	26.2	60	23.9	55.9	17.1	44.1	23.5	54.6
Chattisgarh	16.9	44.6	21.6	48.3	20.2	50	11.7	38.1	19.2	47.4
Delhi	12.9	42.4	(4.7)	(23.3)	10.6	35.3	10	32	10.8	35.3
Goa	0	0	0	0	3.1	22	6.6	28.3	6.5	30
Manipur	2.2	4.4	3.7	16	0.1	5.9	0.5	13.1	2.3	12.6
Meghalaya	0	0	11.6	34.9	0	0	0	0	11.6	34.9
Mizoram	1.9	16.4	0.7	14.6	0	0	0	0	0.8	15.2
Nagaland	0	0	7.9	19.6	0	0	0	0	8.2	21.4
Orissa	17	45.5	19.9	50.3	13.8	40.6	9.8	34.3	15.2	42.8
Punjab	17.6	44.6	13.6	33.1	13.4	43.1	10.4	34.2	13.9	40
Rajasthan	31	61.7	27.5	58	28.4	57.9	26.7	55.3	28.4	58.1
Sikkim	(2)	(23.5)	1.4	14.9	0.3	9.6	0.9	6.3	0.8	9.7
Tamil Nadu	18.2	41.5	17.7	41.5	15.9	36.9	16	38.2	16.6	38.3
Tripura	2.7	23.9	6.6	41.4	7.6	29.1	6.9	27.9	5.9	30.2
Uttar Pradesh	26	59	27.6	61.1	23.2	56.1	19.6	49.7	23.1	55.3
Uttaranchal	26.7	53.2	21.8	47.8	27.3	53.2	25.1	52.5	25.8	52.6
West Bengal	14.9	47.4	16.1	50.3	8.2	43.1	12.2	43.2	13.1	44.9
Andaman & Nicobar Island	12	31.1	4.8	26.9	6.4	40.1	5.7	31.3	5.8	29.7
Chandigarh	(7.1)	(38.1)	0	0	0	0	12.3	35.2	10.3	35.4
Daman & Diu	19.3	55.1	17.5	63.6	13.1	42.7	10.7	35.1	13.2	43.8
Dadar & Nagar Haveli	(24)	(40)	21.2	55.6	(2.3)	(37.2)	5.3	37.3	16.1	49.1
Lakshadweep	0	0	14	42.6	0	0	0	0	13.8	42.2
Pondicherry	7.7	29.5	0	0	7.9	25.6	0	0	8.2	26.8
India	21.6	52.4	23.2	53.5	20	50.3	15.4	43.2	19.4	49.2
Source: DLHS 20003-04 # Total of this group does not add up to total sample size due to don't know and missing case; () Based on less than 50 unweighed cases										

7.11. MICRONUTRIENT DEFICIENCIES

Introduction

Goitre due to iodine deficiency, blindness due to Vitamin A deficiency, dry and wet beriberi and pellagra were the major public health problems in pre-independent India. Sustained dietary changes of the population resulted in the elimination of beriberi and pellagra. Keratomalacia due to severe Vitamin A deficiency is no longer a public health problem. However, there has not been any decline in the prevalence of anaemia due to iron and folic acid deficiency; the decline in Vitamin A deficiency and iodine deficiency disorders has been very slow.

In the last five years several major surveys (NNMB, NFHS and DLHS) have been done to obtain data on prevalence of micronutrient deficiencies in India. NNMB carried out a micronutrient survey on preschool children, adolescent girls, pregnant and lacating women in the rural communities in 9 states (2003). Data regarding prevalence of anaemia in adult men is available from the 2006 NNMB survey conducted in rural areas. ICMR carried out a task force study on micronutrient deficiency disorders including anaemia in pregnant women and adolescent girls 16 districts of India (2001). District Level Household Survey (DLHS) carried out haemoglobin estimation in preschool children, adolescent girls and pregnant women in 548 districts in all states. All these surveys had used cyanmethaemoglobin method for haemoglobin estimation. NFHS 2 and 3 also undertook haemoglobin estimation in women in reproductive age group and preschool children using haemocue and improved hemocue methods respectively. Studies from India had shown that hemocue method overestimates Hb and under estimates the prevalence of anaemia. All the surveys also provide information on coverage under IFA supplementation.

All these surveys also provide information on coverage under massive dose vitamin A administration. NNMB surveys provide information on prevalence of Bitot's spots in preschool children and goitre in 6-12 year old children. NIN has undertaken vitamin A estimation in a sub sample of children in NNMB states to compute the prevalence of subclinical vitamin A deficiency.

All these surveys provide data on household access to iodised salt. NNMB surveys provide data on goitre prevalence in school children. There are small-scale studies on IDD using urinary excretion of iodine and IQ in children. These provided indepth information on impact of IDD in different time periods.

7.11.1 ANAEMIA

Prevalence of anaemia

India is among the countries with highest prevalence of anaemia in the world (Figure 7.11.1.1). As India is a population billionaire, the country accounts for the largest number of anaemic persons in the world (Table 7.11.1.1). The magnitude of reduction in the prevalence of anaemia during nineties in India is lower than that in neighbouring South and South East Asian countries.

Table 7.11.1.1: Prevalence of Iron Deficiency Anaemia in South Asia (%)

	Children < 5yrs	Women 15-49 yrs	Pregnant women	Maternal deaths from anaemia/yr
Afghanistan	65	61	-	-
Bangladesh	55	36	74	2800
Bhutan	81	55	68	< 100
INDIA	**75**	**51**	**87**	**22000**
Nepal	65	62	63	760
Pakistan	56	59	-	-
S.A region total				25,560
World total				50,000

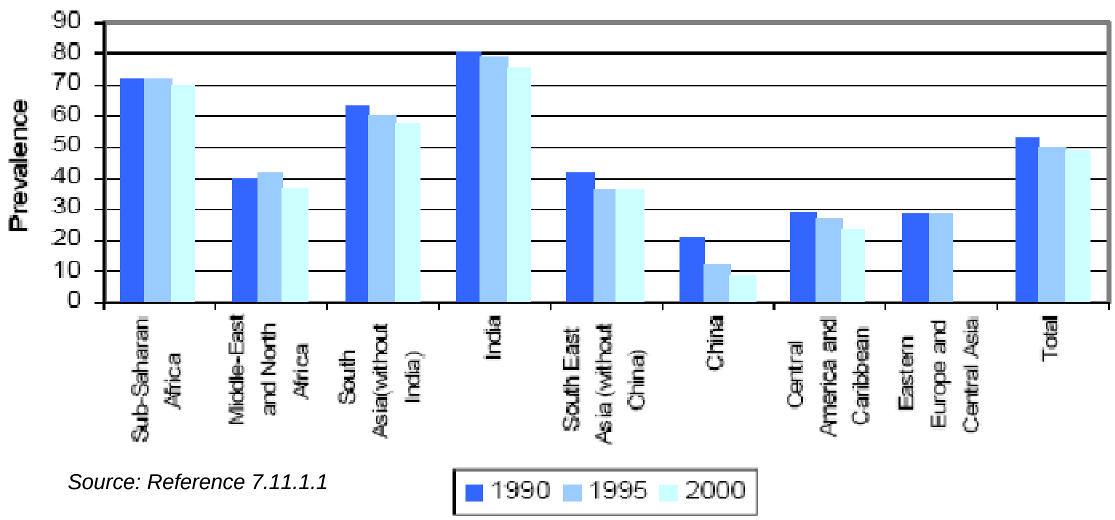
Source: Reference 7.11.1.1

It is estimated that about 20%-40% of maternal deaths in India are due to anaemia; India contributes to about 50% of global maternal deaths due to anaemia (Table 7.11.1.1).

In India, the prevalence of anaemia is high because of

- ∗ low dietary intake, poor iron (less than 20 mg /day) and folic acid intake (less than 70 micrograms/day);
- ∗ poor bio-availability of iron (3-4 percent only) in phytate fibre-rich Indian diet; and
- ∗ chronic blood loss due to infection such as malaria and hookworm infestations

Figure 7.11.1.1: Prevalence of iron deficiency in preschool children, 1990-2000



Source: Reference 7.11.1.1

Table 7.11.1.2: Time trends and interstate differences in intake of iron, folic acid and vitamin C in rural and urban areas (c/day)- NNMB & INP								
	NNMB							INP (1995-96)
	Rural					Urban Slums		Rural	Urban
	1975-79	1988-90	1996-97	2000-01	2004-05	1975-79	1993-94		
Iron (mg)	30.2	28.4	24.9	17.5@	14.8	24.9	18.96	23.2	22.3
Vitamin C	37	37	40	51	44	40	42	55.2	62.4
Folic acid	*	*	153	62	52.3	*	*	*	*

*Source: Reference 7.11.1.2, 7.11.1.5. @ Method of estimation different *data not available*
Survey Population: Rural & urban
Sample Size: Rural, 33048 (1975-79), 14391 (1996-97), 30968 (2000-01), 32500 (1975-80), 5447 (1993-94), INP (46457)

Data from NNMB surveys and INP survey show that iron and folic acid intake in all the states of the country is very low (Table 7.11.1.2 - 7.11.1.4). There has not been any increase in iron intake over the last three decades in any group. The apparent reduction in iron intake in the NNMB surveys 2000-01 and beyond is due to the finding that only 50% of the iron is absorbable. Interstate differences in iron intake are of small magnitude. The low dietary intake of iron and folic acid coupled with poor bioavailability of iron is the major factor responsible for very high prevalence of anaemia in the country.

Criteria used for assessing anaemia are given in Table 7.11.1.5. Data from NNMB, ICMR and DLHS surveys have shown that prevalence of

Table 7.11.1.3: Time trends in intake of iron (mg / day) in different groups

Age group		1975-79	1996-97	2000-01	2004-05
10-12	B	19	20	12.2	12
	G	18	19	12.1	11.5
13-15	B	21	21	15.4	13.3
	G	20	21	12.9	13
16-17	B	25	26	16.7	16.4
	G	22	22	15.3	13.5
Adult males		26	27	17.5	16.9
Adult females (NPNL)		21	22	14.1	13.8
Pregnant women		20	23	14	14
Lactating women		23	23	14.6	14.7

Source: Reference 7.11.1.2

Table 7.11.1..4: State wise average intake of nutrients (per consumption unit/day)

States	Iron (mg)			Vitamin C (mg)		
	R	U	C	R	U	C
RDA			28			40
Haryana	26			38		
Himachal	23			55		
Punjab	28			38		
Rajasthan	32	25	31	45	51	46
Chandigarh	23	22	22	39	54	52
Delhi	32	21	21	54	57	57
Bihar	22	23	22	58	69	60
Sikkim	21	22	21	65	75	66
Arunachal	21			131		
Assam	12			47		
Manipur	27	26	27	98	124	103
Meghalaya	20	25	20	50	52	50
Mizoram	18	24	19	118	158	126
Nagaland	23			108		
Tripura	26	21	26	71	29	69
Daman & Diu	23			84		
D & N Haveli	23			64		
Goa	19	19	19	44	53	46

C=Combined; R=Rural; U=Urban;
Source Reference 7.11.1.5

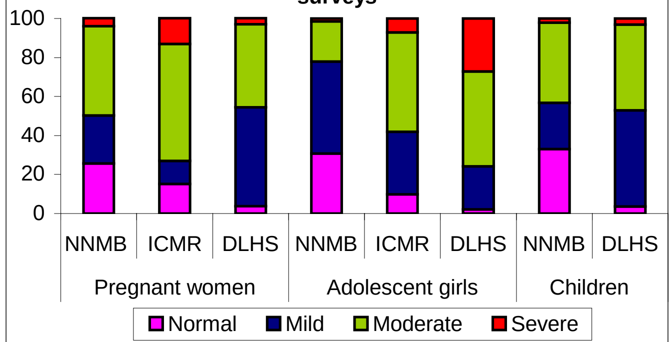
Table 7.11.1.5: Criteria used for anaemia in DLHS survey

Group		Anaemia (g/dl)		
	Norm	Mild	Mod.	Sev
Preg women Preschooler	≥11	8.0-10.9	5.0-7.9	≤5
Adol girls	≥12	10.0-11.9	8.0-9.9	≤8

Source Reference 7.11.1.6

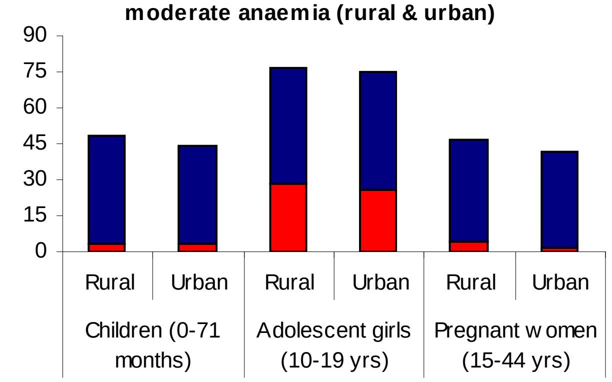
anaemia is very high (ranging between 80->90%) in preschool children, pregnant and lactating women and adolescent girls (Figure 7.11.1.2 & 7.11.1.3). Moderate and severe anaemia is seen even among educated families and the higher income group (Figure 7.11.1.4 & 7.11.1.5). NNMB survey in 2006 showed that 55% of the adult men also suffer from anaemia (Figure 7.11.1.6). Interstate differences in prevalence of anaemia in children, pregnant women and adolescent girls from DLHS survey are presented in Annexure 7.11.1.1, 7.11.1.2 and 7.11.1.3. Prevalence of anaemia is high in all the states; however, there are considerable variations between states in prevalence of moderate and severe anaemia.

Figure 7.11.1.2: Prevalence of anaemia in children, adolescent girls and pregnant women from 3 surveys



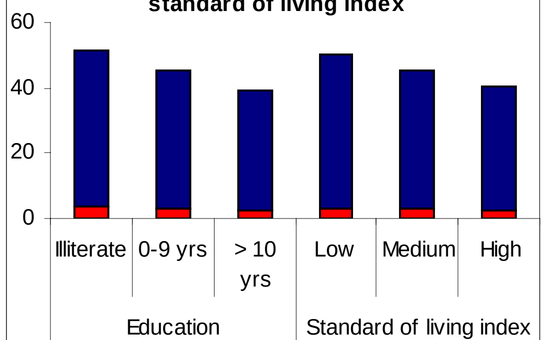
Source: Reference7.11.1.3, 7.11.1.4, 7.11.1.6

Figure 7.11.1.3: Percentage of severe and moderate anaemia (rural & urban)



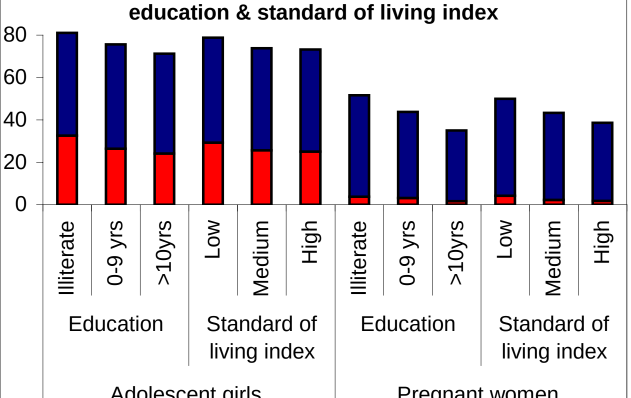
Source Ref 7.11.1.6

Figure 7.11.1.4: Prevalence of anaemia in children by mothers education & standard of living index



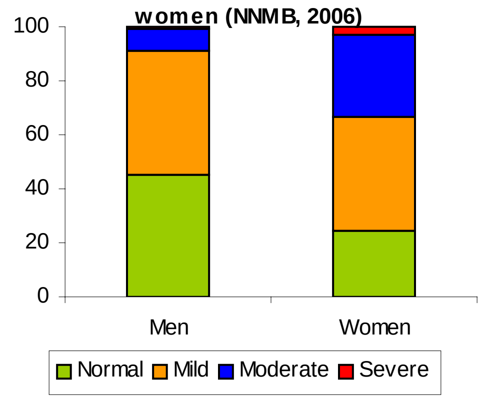
Source: Ref 7.11.1.6

Figure 7.11.1.5: Prevalence of anaemia in adolescent girls & pregnant women by education & standard of living index



Source: Ref 7.11.1.6

Figure 7.11.1.6: Prevalence of anaemia among adult men & women (NNMB, 2006)



Source: Ref 7.11.1.2

Adverse consequences of Adverse health consequences of anaemia

Anaemia is associated with increased susceptibility to infections, reduction in work capacity and poor concentration. Anaemia remains to be major cause of maternal mortality and low birth weight in India. Pregnant women with Hb less than 8 g/dl show functional decompensation and constitute a high-risk group (Table 7.11.1.6).

Table 7.11.1.6: Effect of maternal haemoglobin level on birth weight and perinatal mortality

Effects on	Haemoglobin gm/decilitre (g/dl)			
	<5	5 - 7.9	8 - 10.9	11.0
Mean birth weight (g)	2,400	2,530	2,660	2,710
Perinatal mortality rate/1000	500	174	76	55
Number of observations	312	362	1015	1456

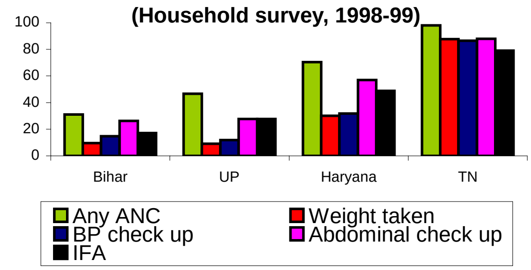
Source: Reference 7.11.1.7

National Anaemia Prophylaxis Programme (NAPP)

India was the first developing country to take up a National Nutritional Anaemia Prophylaxis Programme of iron folic acid supplementation to all pregnant women and children to prevent anaemia among pregnant women and children. Screening for anaemia and iron-folate therapy in appropriate doses and route of administration for the prevention and management of anaemia in these vulnerable groups have been incorporated as an essential component of antenatal care and paediatric practice. In spite of all these efforts anaemia continues to be a major problem affecting all segments of the population and there has not been any substantial decline in the adverse consequences of anaemia.

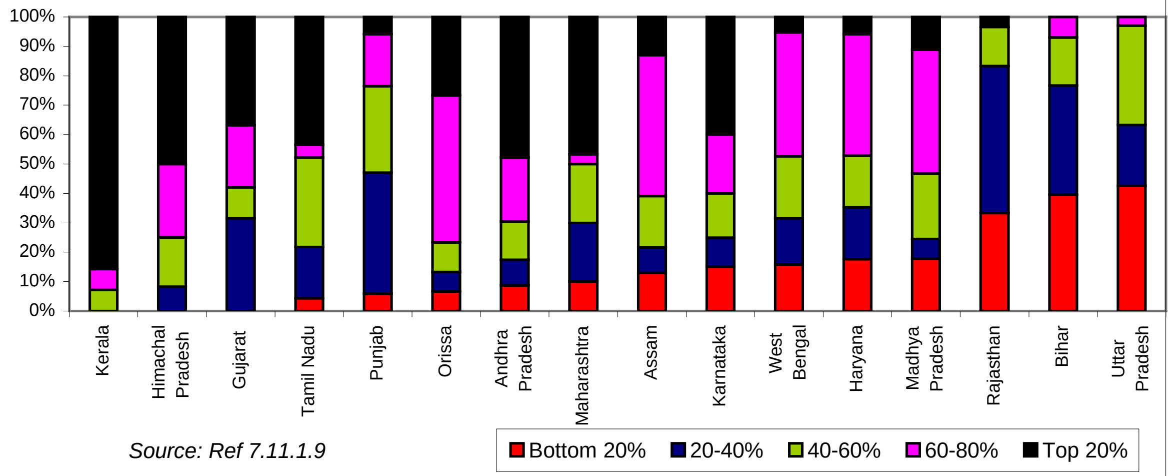
The NAPP was revamped in the nineties and named as National Anaemia Control Programme (NACP). The NACP envisaged screening of all pregnant women for anaemia and providing appropriate doses of iron folate therapy to anaemic pregnant women. RCH survey (1998-99) showed that screening for anaemia has not been operationalised as a part of the RCH programme (Figure 7.11.1.7). RCH and NNMB surveys have shown that coverage under IFA supplementation was low (Figure 7.11.1.8)(Annexure 7.11.1.4). Data from smaller indepth studies showed that even among those who received the tablets, only one-third took them regularly. Data from ICMR evaluation of NNAP showed that majority of pregnant women did not receive IFA tablets. Among those who received IFA tablets less than 10% took more than 90 tablets of IFA during pregnancy. Mean Hb even in the small group of women who took 90 tablets was only

Figure 7.11.1.7: Quality of antenatal survey (Household survey, 1998-99)



Source: Reference 7.11.1.9

Figure 7.11.1.8: Distribution of Districts as per 1 or 2 IFA Tablets regularly-Major States



Source: Ref 7.11.1.9

9.1 g/dl (Table 7.11.1.7). These data clearly indicate the need for screening all pregnant women for anaemia and provide appropriate doses of IFA to non-anaemic and mildly anaemic women. Unlike the situation elsewhere in the world, oral iron therapy is not effective in correction of moderate or severe anaemia in Indian pregnant women, within the short time available because of the poor bioavailability of iron in the Indian diet. Women with moderate anaemia respond well to IM iron therapy.

Anaemia in children

Data from DLHS indicates that the prevalence of anaemia in preschool continues to be very high in all states but there are substantial differences in the prevalence of moderate and severe anaemia between states (Annexure 7.11.1.3). Anaemia contributes to poor scholastic performance and increased susceptibility to infection. Pre-school children were one of the target groups to receive IFA tablets under the National Nutritional Anaemia Prophylaxis Programme. But both access to and intake of IFA tablets by children have been very poor; as a result there has been very little impact in terms of reduction in anaemia in childhood. Neither the RCH nor the school-based programmes have operationalised the programmes for detection and treatment of anaemia in children in the country.

Table 7.11.1.7: Mean Hb in Pregnant women taking Iron Supplementation

No of tablets ingested	No.	Hb (g/dl) Mean	Hb (g/dl) S.D
1-15	310	8.8	1.7
16-30	251	9.2	1.5
31-60	196	9.3	1.8
61-90	99	9.2	1.6
>90	74	9.1	2.1
Total who had IFA	930	9.1	2.2
B. Not known	16	9.1	2.6
C. Not had IFA	3829	9.1	3.8
A+B+C	4775	9.1	3.5

Source: Ref 7.11.1.8

The major intervention strategies envisaged in the Tenth Five Year plan for prevention and management of anaemia are:

∗ improve dietary intake to meet RDA for all macro and micronutrients;

* dietary diversification ensuring inclusion of iron folate rich foods as well as food items that promote iron absorption;
* food fortification, especially introduction of iron and iodine-fortified salt
* health and nutrition education to improve over all dietary intakes and promote consumption of iron and folate-rich foodstuffs; and
* screening for early detection of anaemia among vulnerable groups (such as pregnant women).
* appropriate management of anaemia depending upon its severity, chronicity, physiological status of the individual and the time available for correction of anaemia

Tenth Plan goals were: -

* Screening of children for anaemia wherever required and appropriate treatment of those found anaemic.
* Universal screening of pregnant women for anaemia and appropriate treatment
* Reducing the prevalence of anaemia by 25 per cent in children, pregnant and lactating women and adolescents.

Some of the strategies suggested in the Tenth Five Year Plan have been operationalised in some institutions (screening for anaemia during pregnancy- Delhi) and states (double fortified salt supply through PDS- Chattisgarh and DFS in ICDS food supplementation in Uttarakhand). However, the integrated package of all interventions has not been operationalised in any state. As a result, goals set have not been achieved. It is hoped that the package of interventions will be fully operationalised in the Eleventh Plan so that the goals set in Tenth plan could be achieved by 2012.

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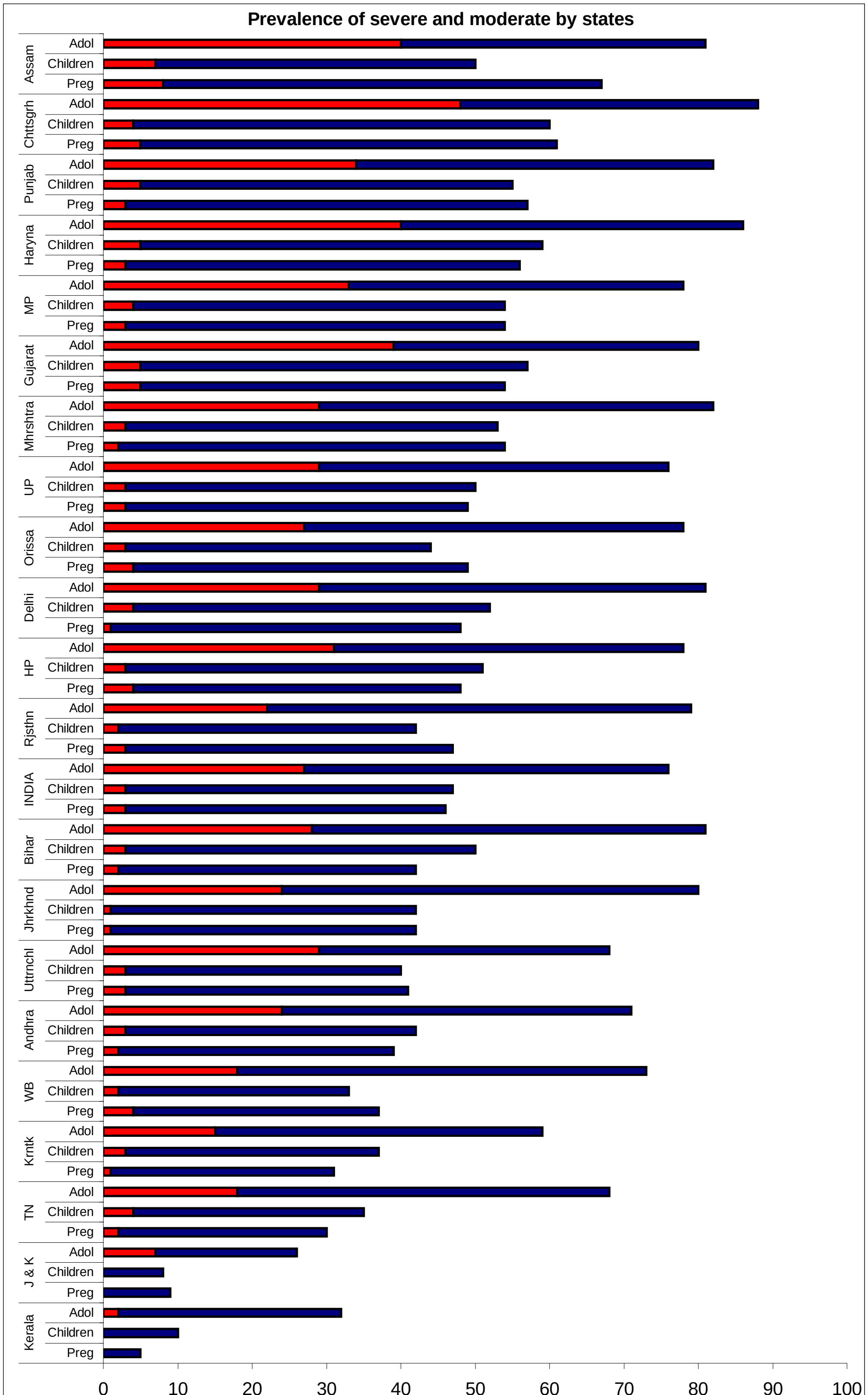
Annexure 7.11.1.1

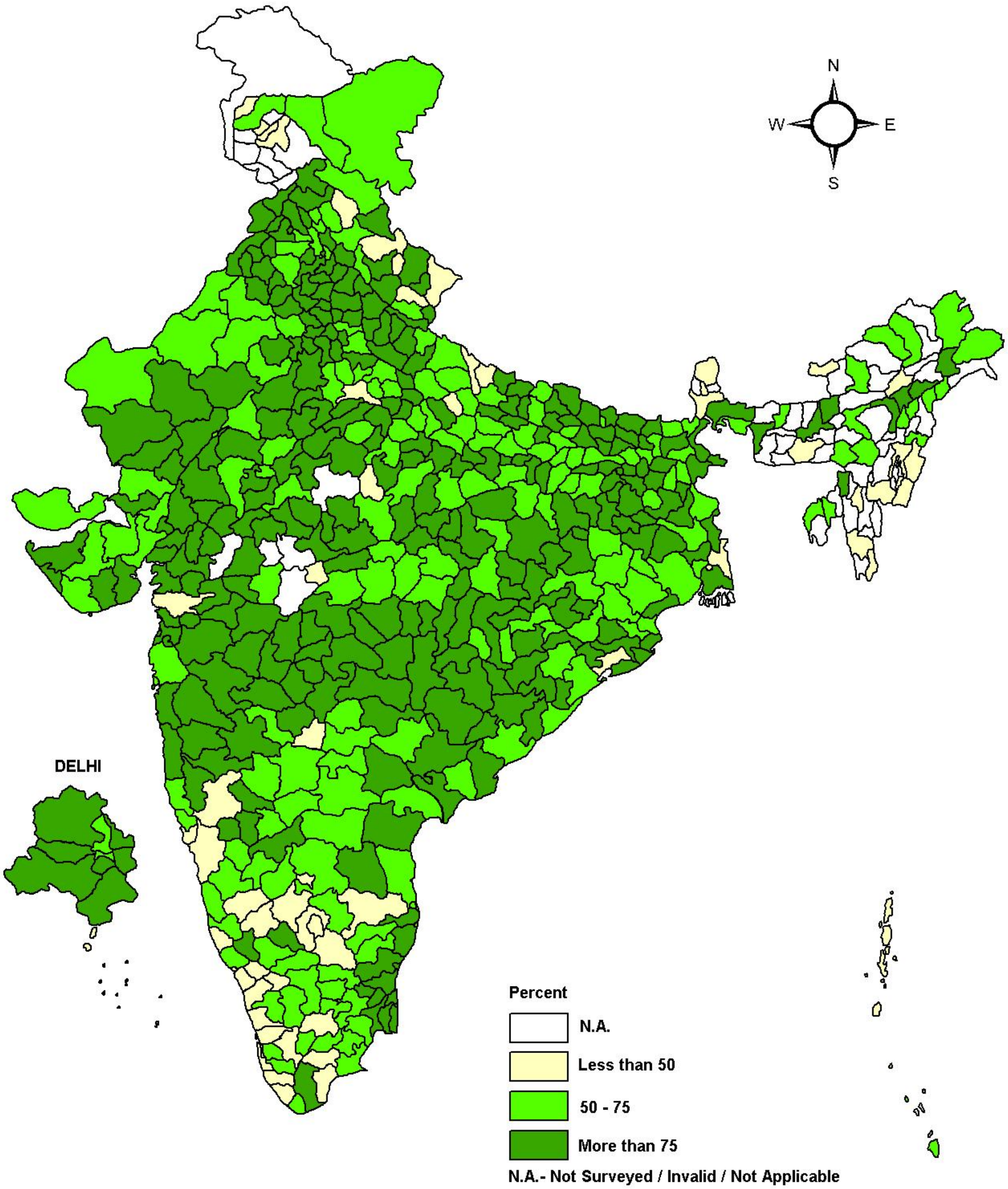
District Level Household Survey, RCH survey 1, *2000,* Mumbai



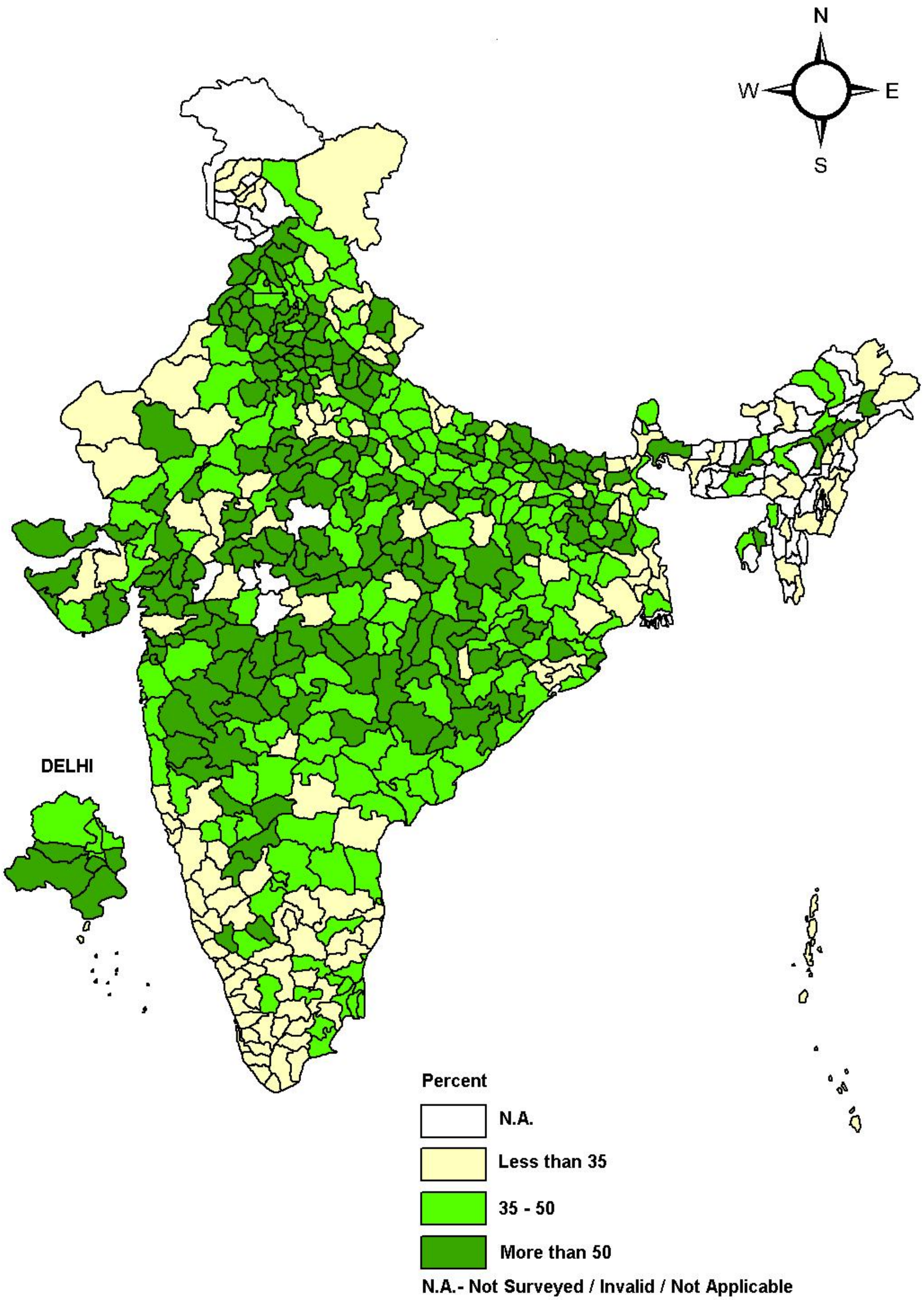
Source: DLHS-RCH, 2002-04

Annexure 7.11.1.2

Percentage of adolescent girls with moderate and severe anaemia by District, 2002-04



Percentage of children with moderate and severe anaemia by District, 2002-04



Annexure 7.11.1.4

NNMB 2002 Distribution (%) of pregnant women according to receipt of IFA tablets

Particulars	States								
	Kerala	**Tamil Nadu**	**Karnataka**	**Andhra Pradesh**	**Mahara-shtra**	**Madhya Pradesh**	**Orissa**	**West Bengal**	**Pooled**
N	143	258	284	330	299	212	269	187	**1982**
Received IFA tablet	38.5	62.4	68	48.5	77.3	54.2	72.9	70.6	**62.7**
IFA tablets distributed by									
AWW	3.5	1.6	3.2	6.4	2	9.9	24.9	4.8	**7.2**
MPHW (F)	5.6	41.5	29.6	38.5	60.9	41.5	43.1	20.9	**37.9**
MPHS (F)	0	2.3	24.6	1.8	1.7	2.4	0	43.3	**8.7**
MO-PHC	21	8.9	9.5	1.5	8.4	0.5	4.1	1.1	**6.3**
Others	8.4	8.1	1.1	0.3	4.3	0	0.7	0.5	**2.7**
Place of distribution of IFA Tablets									
Home	3.5	5	27.5	13.9	10.4	6.6	26	2.7	**13.2**
AWC	1.4	7.8	9.2	12.4	20.1	32.5	16	4.3	**13.6**
Sub-Centre	2.8	31	11.6	13.6	22.1	11.8	13	62.6	**20.4**
PHC	21.7	10.9	17.6	7.3	19.4	1.9	11.2	0.5	**11.4**
Others	9.1	7.8	2.1	1.2	5.3	1.4	6.7	0.5	**4.1**
Frequency of supply of IFA tablets									
Weekly	1.4	1.6	1.1	2.1	1	0	0.4	0	**1.1**
Fortnightly	0.7	1.6	1.8	2.7	6.7	0	0.4	1.6	**2.2**
Monthly	21.7	34.9	46.8	30.6	37.5	26.4	12.6	68.4	**34.6**
At a time	7	24	12.7	12.1	23.7	26.4	58.7	0.5	**21.9**
Irregular	7.7	0.4	5.6	0.9	8.4	1.4	0.7	0	**3.1**
No. of IFA Tablets received each time									
10	1.4	2.3	1.1	1.8	1	0	0.4	0	**1.1**
20	0	1.9	2.1	2.4	3.7	0.5	0.4	1.6	**1.8**
30-60	22.4	41.1	48.6	32.4	51.7	30.7	21.5	68.4	**40**
61-90	7	16.3	10.6	10	14.7	18.4	48	0.5	**16.6**
>90	7.7	0.8	5.7	0.9	3.4	4.7	2.6	0	**3**
Total number of IFA Tablets received									
10-30	1.4	5.5	1.5	4.2	2.7	0.5	0.8	1.1	2.5
30-59	10.5	24.1	11.4	13.6	23.8	14.3	17.5	27.8	17.9
60-89	8.4	10.9	15.3	16.1	16.4	7.1	3.7	24.1	13.0
>90	18.2	22.1	40.2	14.5	34.1	34.5	50.9	17.6	29.8

7.11.2 VITAMIN A DEFICIENCY

Vitamin A is an important micronutrient for maintaining normal growth, regulating cellular proliferation and differentiation, controlling development, and maintaining visual and reproductive functions. Diet surveys have shown that the intake of Vitamin A is significantly lower than the recommended daily allowance in young children, adolescent girls and pregnant women. In these vulnerable sub-groups multiple nutritional problems such as inadequate intake of energy and micronutrients other than Vitamin A coexist. Inspite of the fact that there has not been any significant improvement in the dietary intake of Vitamin A and coverage under Massive Dose Vitamin A programme has been low; there is a decline in clinical Vitamin A deficiency in under-five children in the country. This could perhaps be due to increase in access to health care, consequent reduction in severity and duration of common childhood morbidity due to infections. However, biochemical deficiency continues to be common.

Table 7.11.2.1: Prevalence of vitamin A deficiency in South Asia (%)

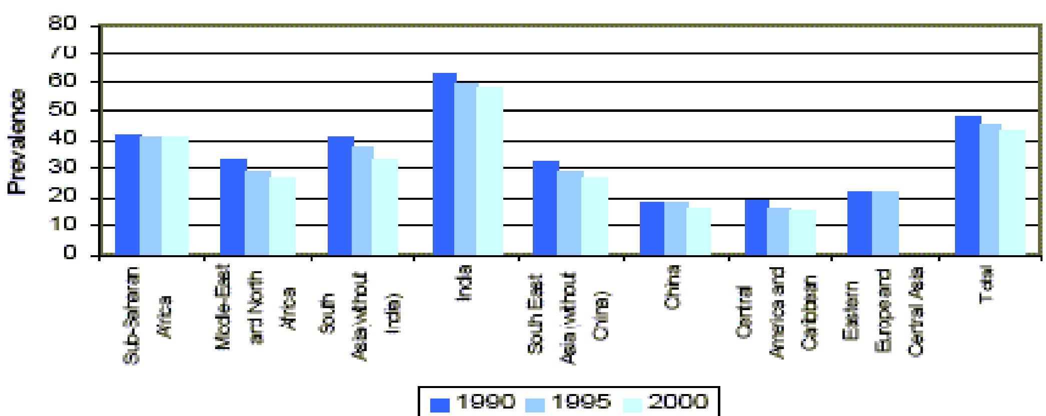
Country	Children		
	Deaths prcptd (no.)	<6 w / sub clinical VAD (%)	<6 w / clinical VAD (%)
Afghanistan	50000	53	-
Bangladesh	28000	28	0.7
Bhutan	600	32	0.7
INDIA	330000	57	0.7
Nepal	6900	33	1
Pakistan	56000	35	-
S.A region	471500	-	-
World total	1150000	-	-

Source: Reference 7.11.2.1

Prevalence of vitamin A deficiency (VAD)

Prevalence of clinical and sub clinical vitamin A deficiency in India is among the highest in the world (Table 7.11.2.1 and Figure 7.11.2.1, Annexure 7.11.2.1). Though prevalence of clinical vitamin A deficiency is less than 1% in India, biochemical subclinical deficiency is quite high; the decline in subclinical vitamin A deficiency over the last decade has been quite to small. India remains to be the home of more than a quarter of the world's

Figure 7.11.2.1: Trends in prevalence of subclinical vitamin A deficiency among children under 6, by region, 1990-2000



Source: Reference 7.11.2.1

preschool children suffering from subclinical VAD and a third of the preschool children with xerophthalmia. Clinical symptom of VAD such as night blindness is seen among women of reproductive age and in pregnant women.

Dietary intake of vitamin A

NNMB provides time trends in dietary intake of vitamin A. It is obvious that vitamin A intake continues to be substantially lower than the RDA in all age groups (Table 7.11.2.2). Vitamin A intake has not increased over the last three decades either in urban or rural areas (Table 7.11.2.3). Vitamin A intake is higher in INP states (northern and eastern states) as compared to NNMB states (mainly peninsular states) (Table 7.11.2.4 & 7.11.2.5).

Table 7.11.2.2: Time trends in age wise average intake of vitamin A

Age group		75-79	96-97	00-01	04-05
10-12	B	101	131	169	221
	G	105	111	174	205
13-15	B	114	138	196	215
	G	103	133	180	251
16-17	B	120	184	183	241
	G	115	145	213	261
Adult	M	142	172	242	267
Adult NPNL	F	118	148	219	254
Preg		160	142	227	261
Lact		133	162	212	249

Source: Reference 7.11.2.2

Table 7.11.2.3: Time trends in intake of vitamin A in rural and urban areas (c/day)- NNMB & INP

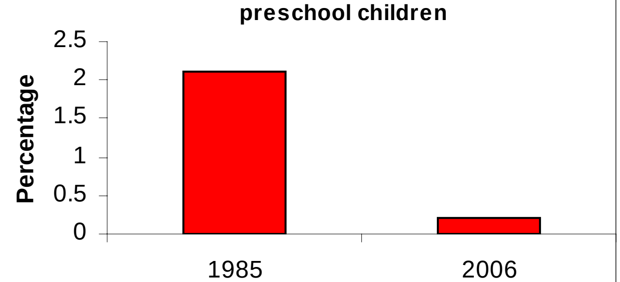
Nutrient	NNMB							INP (1995-96)	
	Rural					Urban Slums		Rural	Urban
	1975-79	1988-90	1996-97	2000-01	2004-05	1975-79	1993-94		
Vitamin A	257	294	300	242	257	248	352.5	355	356.0

Source: Reference 7.11.2.2 and 7.11.2.5
Survey Population: Rural & urban; Sample Size: Rural, 33048 (1975-79), 14391 (1996-97), 30968 (2000-01), 32500 (1975-80), 5447 (1993-94), INP (46457)

Table 7.11.2.4: State wise average intake of vitamin A (per CU/day)

States	Vitamin A (μg) R	U	C
Haryana	415		
Himachal	481		
Punjab	448		
Rajasthan	395	423	400
Chandigarh	257	411	391
Delhi	486	382	386
Bihar	267	243	263
Sikkim	376	322	368
Arunachal	698		
Assam	235		
Manipur	347	395	357
Meghalaya	297	285	296
Mizoram	802	1062	855
Nagaland	702		
Tripura	441	173	431
Daman & Diu	552		
D & N Haveli	340		
Goa	205	12	198

Combined; R=Rural; U=Urban;
Source Reference 7.11.2.5



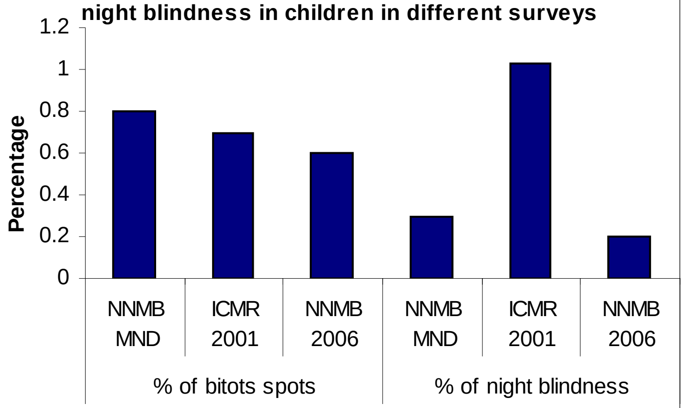
Source: Reference 7.11.2.2

Table 7.11.2.5: Time trends and interstate differences in average vitamin A intake in different states -NNMB

Food stuffs	Year	Ker	TN	Kar	AP	Mah	Guj	Ori	Pooled	RDA
Vit A (ug)	75-79	176	211	242	264	313	272	-	246	600
	88-90	297	240	269	286	311	286	417	282	
	96-97	274	250	229	278	220	277	526	300	
	04-05	162	199	178	245	198	207	523	257	

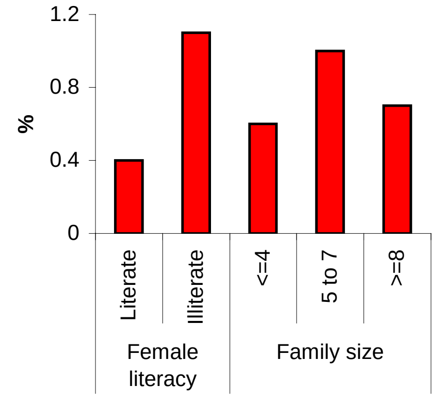
Prevalence of clinical signs of vitamin A deficiency

Figure 7.11.2.3: Prevalence of Bitot's spots & night blindness in children in different surveys



Source: Reference 7.11.2.2, 7.11.2.3 and 7.11.2.4

Figure 7.11.2.4: Prevalence of Bitot's spots in 1-<5yr



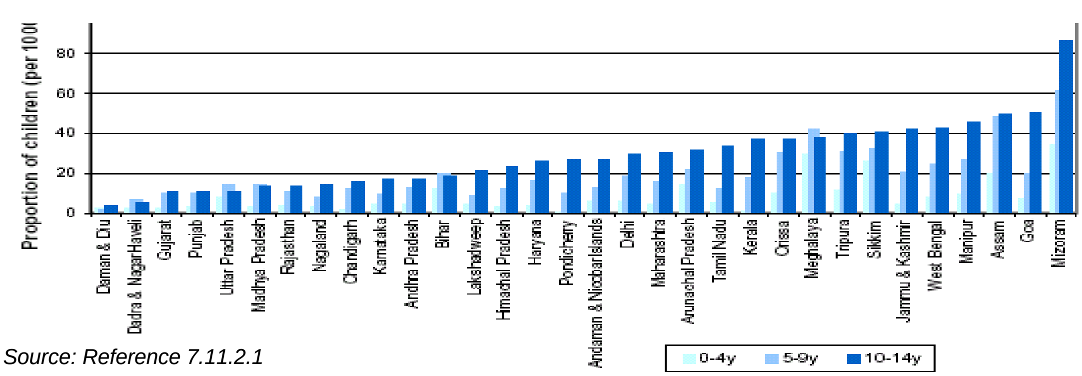
Source: Reference 7.11.2.2

Data from NNMB surveys show that there has been substantial decline in prevalence of Bitot's's spots (Figure 7.11.2.2). The NNMB micronutrient survey indicates that currently prevalence of Bitot's spots in preschool children is only 0.7%; prevalence of night blindness is less than 0.5 % in NNMB surveys.

A comparison of the prevalence of Bitot's spots and night blindness between 1985 and 2006 NNMB surveys is shown in Figure 7.11.2.3. Data from NNMB and ICMR surveys indicate that prevalence of Bitot's's spots is less than 1%. Data from NNMB survey showed that prevalence of Bitot's spots is higher in children of illiterate mothers; prevalence of Bitot's spots is lowest in children from small families (Figure 7.11.2.4).

There are large interstate variations in the prevalence of VAD among children. In the 1950s, prevalence of night blindness and Bitot's spots in pre-school children ranged between 5 per cent and 10 per cent in most states. The number of children with vision problems has fallen below 10 per 1,000 children in states such as Gujarat and Punjab but in many North-East states, such as Tripura,

Figure 7.11.2.5: Proportion of children (per 1000) experiencing day & nighttime vision difficulties



Source: Reference 7.11.2.1

Sikkim, Manipur, Assam, and Mizoram, as well as Jammu and Kashmir, West Bengal, and Goa prevalence is more than 30 per 1,000 children (Figure 7.11.2.5). The prevalence of different signs and symptoms of VAD among 1-<5 yr old children in the different states of NNMB is shown in Figure 7.11.2.6.

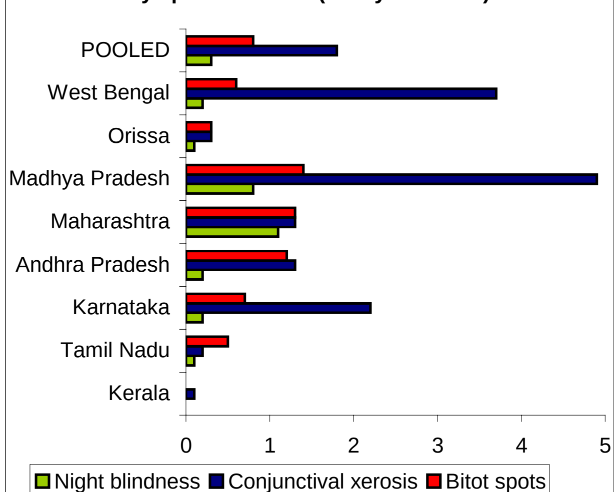
National Prophylaxis Programme Against Nutritional Blindness

In the fifties and sixties many of the states reported that blindness due to Vitamin A deficiency was one of the major causes of blindness in children below five years. A five-year long field trial conducted by NIN showed that if massive dose Vitamin A (200,000 units) was administered once in six months to children between one and three years of age, the incidence of corneal xerophthalmia is reduced by about 80 per cent. In view of the serious nature of the problem of blindness due to Vitamin A deficiency, it was felt that urgent remedial measures in the form of massive dose Vitamin A supplementation covering the entire population of susceptible children should be undertaken. In 1970, the National Prophylaxis Programme Against Nutritional Blindness was initiated as a centrally sponsored scheme. Under this scheme, all children between ages of one and three years were to be administered 200,000 IU of Vitamin A orally once in six months.

This programme had been implemented in all the states and union territories during the last thirty-five years. The major bottleneck during the 1970s was lack of infrastructure at the peripheral level to ensure timely administration of the dose. In the 1980s there was considerable improvement in the infrastructure. The lack of adequate supply of Vitamin A, which came in the way of improved coverage, was also corrected. Data on coverage under massive dose Vitamin A programme in different states reported in different surveys are shown in Annexure 7.11.2.2. While coverage in a few states was satisfactory, coverage in majority of states was low. Data from NNMB shows a similar trend in the nine states covered by NNMB (Annexure 7.11.2.3).

In an attempt to improve the coverage, especially of the first two doses, it was decided to link Vitamin A administration to the ongoing immunization programme during the Eighth Plan period. Under the revised regimen a dose of 100,000 IU of Vitamin A was administered to all infants at nine months along with measles vaccine and a second dose of 200,000 IU was administered at 18 months of age along with booster dose of DPT and OPV. Subsequently, the children were to receive three

Figure 7.11.2.6: Prevalence (%) of signs & symptoms of VAD (1-<5 yr children)



Source: Reference 7.11.2.3

doses of 200,000 IU of Vitamin A every six months until 36 months of age. The reported coverage figures under the modified regimen indicate that there has been some improvement in coverage with the first dose (50 –75 per cent). However, the coverage for subsequent doses is low.

In an attempt to improve the coverage, some states like Orissa linked administration of Vitamin A with the pulse polio immunization campaign. It is reported that the state took precautions to prevent overdosing by stopping Vitamin A administration in the preceding six months. The state reported improved coverage. Following this report several states embarked on a similar exercise. Planning Commission, the Department of Family Welfare and the Indian Academy of Pediatrics stated that this strategy is inappropriate.

During the campaign mode administration of Vitamin A, along with pulse polio, in Assam in November 2001, deaths among children who were administered massive dose Vitamin A were reported. Some of these deaths could be coincidental where Vitamin A had been administered to ill children, but the possibility that some of the deaths could have been due to Vitamin A toxicity (either due to administration of higher dose or a massive dose Vitamin A administration earlier) cannot be ruled out.

The Tenth Five Year plan recommended that the second and subsequent doses of massive dose vitamin A may be administered biannually in the pre summer (April-May) and pre winter (Sept-Oct) period. This strategy was operationalised successfully in states like U.P with UNICEF assistance and resulted in improved coverage for all the doses. In 2006-07, a policy decision has been taken to cover all children in the 9 month to 6 yr age group under the massive dose vitamin A programme. Clinical Vitamin A deficiency often coexists with other micronutrient deficiencies and hence, there is a need for broad-based dietary diversification programmes aimed at improving the overall micronutrient nutritional status of children.

Vitamin A deficiency during pregnancy and lactation

It is estimated that the prevalence of Vitamin A deficiency during pregnancy and lactation range between 1 and 5 per cent. Small-scale studies have reported large inter state and inter district variation in prevalence of clinical symptoms of VAD. However, nation-wide comparable data is not available. There are reports of night blindness occurring during pregnancy and disappearing after delivery without any treatment. Sub-clinical Vitamin A deficiency might perhaps be more widespread. It may not be feasible to undertake large-scale studies to estimate prevalence of sub clinical Vitamin A deficiency. There is very little data on the prevalence of Vitamin A deficiency during lactation. In spite of continued secretion in breast milk, available limited data does not suggest increased prevalence of Vitamin A deficiency during lactation. Unlike anaemia, Vitamin A deficiency in pregnant and lactating women is not associated with any increase in morbidity and mortality. There is no ongoing programme for the prevention, detection and treatment of Vitamin A deficiency in pregnant and lactating women.

Detection and management of clinical Vitamin A deficiency in pregnant women has been included as a component of antenatal care under RCH programme. Night blindness and Bitot's's spot are readily identifiable clinical entities. Women with these symptoms / signs will be identified by the ANM and 10,000 IU of Vitamin A administered daily for four weeks. Efforts to promote cultivation and consumption of micronutrient rich vegetables for prevention of clinical deficiency have to continue.

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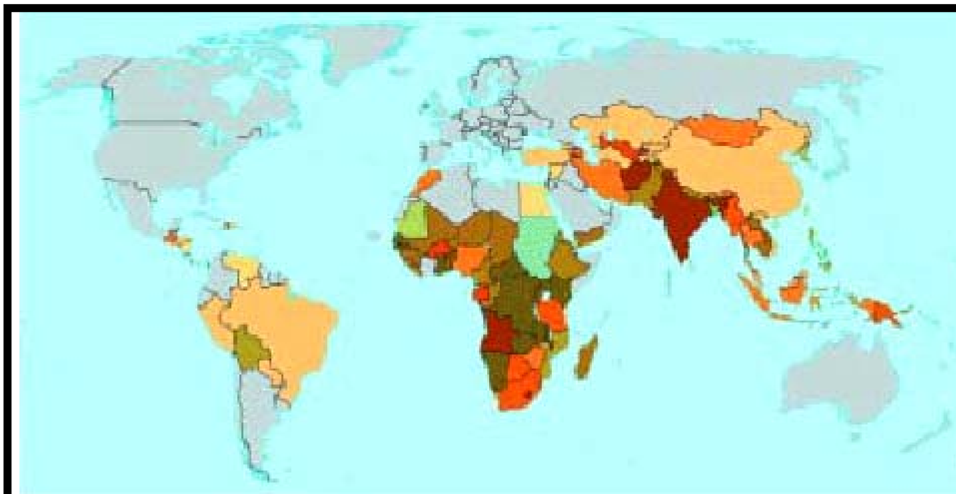
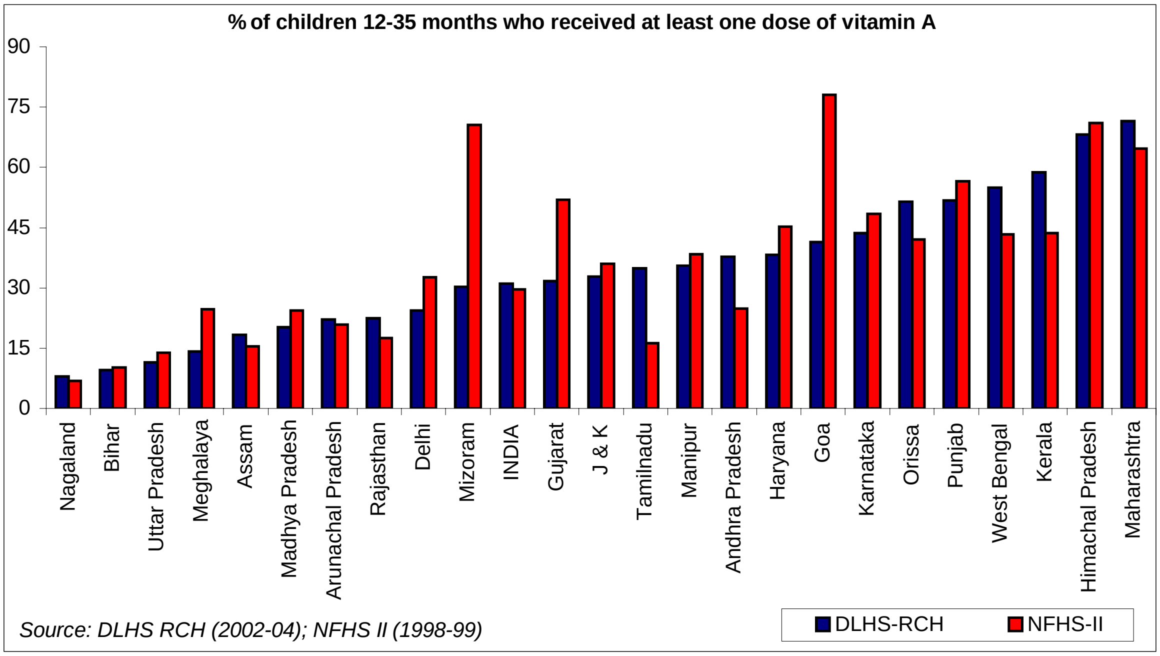
Vitamin A deficiency and supplementation coverage
(estimated % of < 6yr with sub clinical vitamin A deficiency)



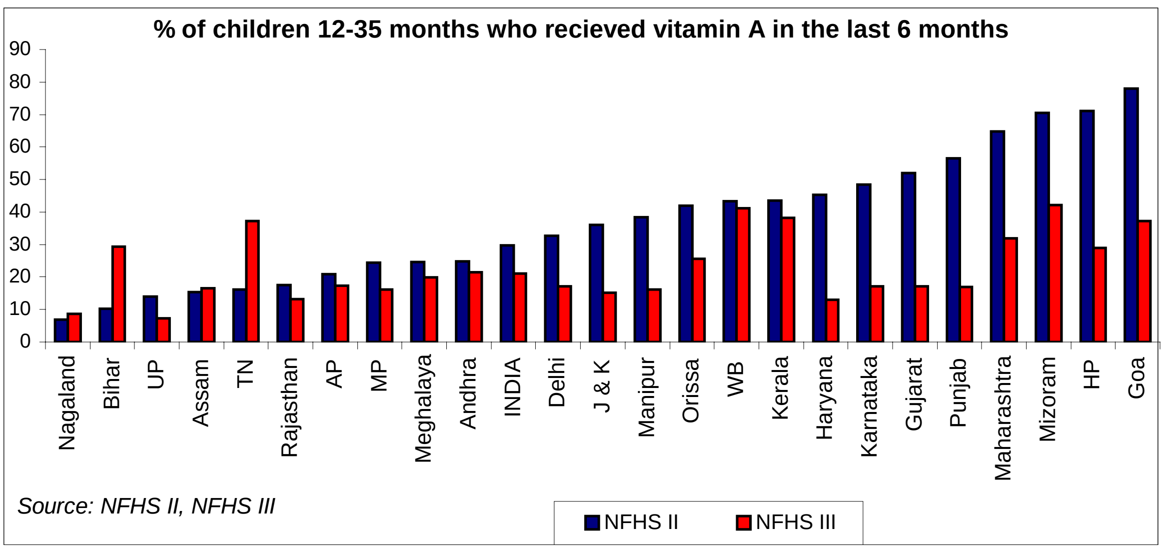
Source: Reference 7.11.2.1

10-15 %   0-9 %   No data   Supplementation coverage

40-50%   30-39%   20-29%   > 50%



% of children 12-35 months who received at least one dose of vitamin A
90
75
60
45
30
15
0
Nagaland
Bihar
Uttar Pradesh
Meghalaya
Assam
Madhya Pradesh
Arunachal Pradesh
Rajasthan
Delhi
Mizoram
INDIA
Gujarat
J & K
Tamilnadu
Manipur
Andhra Pradesh
Haryana
Goa
Karnataka
Orissa
Punjab
West Bengal
Kerala
Himachal Pradesh
Maharashtra
Source: DLHS RCH (2002-04); NFHS II (1998-99)
DLHS-RCH
NFHS-II



% of children 12-35 months who recieved vitamin A in the last 6 months
90
80
70
60
50
40
30
20
10
0
Nagaland
Bihar
UP
Assam
TN
Rajasthan
AP
MP
Meghalaya
Andhra
INDIA
Delhi
J & K
Manipur
Orissa
WB
Kerala
Haryana
Karnataka
Gujarat
Punjab
Maharashtra
Mizoram
HP
Goa
Source: NFHS II, NFHS III
NFHS II
NFHS III

Distribution (%) of Index children according to particulars of receipt of massive dose vitamin A during the previous one year

Particulars	States								
	Kerala	Tamil Nadu	Karnataka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	**Pooled**
N	148	322	337	402	295	284	410	391	**2589**
Received massive dose vitamin A during previous one year									
Yes	43.9	63	55.8	50.7	52.2	52.8	80	51.9	**57.7**
No	39.2	24.8	38.9	36.1	35.6	43	13.9	46.8	**34**
Do not know	16.9	12.1	5.3	13.2	12.2	4.2	6.1	1.3	**8.2**
Total number of doses received									
One dose	28.4	20	41.8	14.2	29.5	20.4	38.8	46.8	**30.6**
Two doses	10.1	30.4	13.9	35.1	22.4	32	41.2	3.8	**24.8**
Do not know	5.4	12.4	0	1.5	0.3	0.4	0	1.3	**2.4**
Time of receipt of last dose									
<6 mths ago	11.5	43.8	25.8	18.4	40	30.3	69.3	34.3	**36.3**
6-11 mths ago	12.8	5.6	30	30.1	11.5	19.4	10.5	15.6	**17.5**
Do not know	14.2	1.2	0	0.7	0.3	2.8	0.2	0.8	**1.6**
Place of administration of massive dose of vitamin A									
Home	0	16.1	7.4	2.7	4.1	5.3	15.9	2	**7.3**
AWC	11.5	30.4	30	21.9	22	41.9	31.5	1.8	**24.1**
Sub-centre	5.4	2.2	5.3	17.7	13.6	1.1	10.2	46	**14.3**
PHC	7.4	0.3	11.6	4.2	10.2	0.4	6.6	0	**4.9**
Others	0	0.3	1.5	2	1.7	1.1	15.6	0	**3.3**
Massive dose of vitamin A administered by									
AWW	5.4	31.4	4.5	1.5	2.4	11.6	32.9	2.3	**12.1**
MPHW (F)	7.4	14.9	25.5	42.3	48.5	33.8	43.7	21.7	**31.6**
MPHS (F)	1.4	3.1	25.8	3.7	0.3	3.2	2	25.8	**9**
Others	0	0	0	0.7	0.3	0	1.2	0	**0.3**
Do not know	10.1	0	0	0.2	0	1.1	0	0	**0.7**

7.11.3 IODINE DEFICIENCY DISORDERS

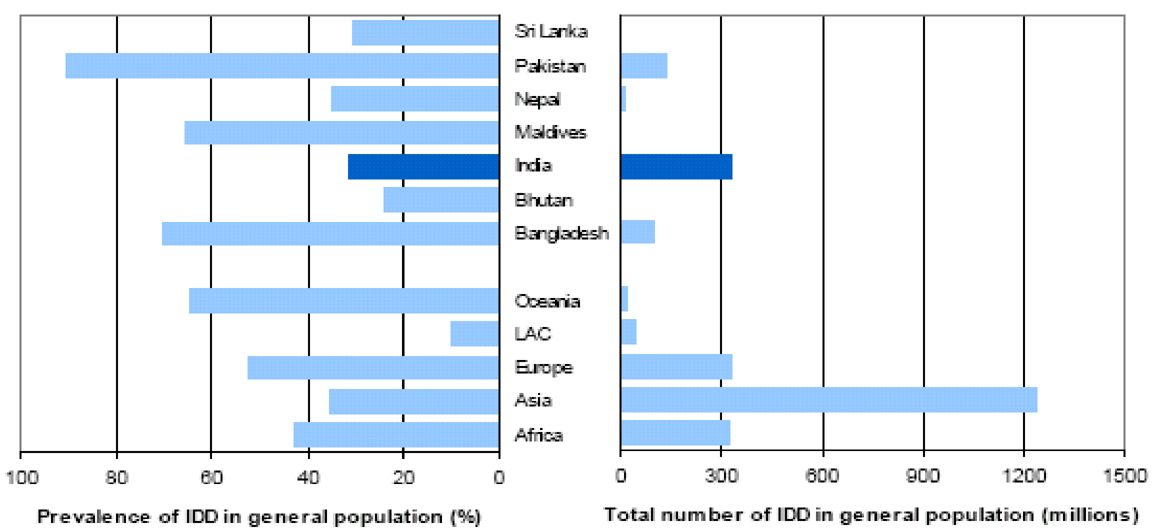
Table 7.11.3.1: IDD Prevalence indicators and Criteria for classifying IDD as a significant public health problem			
Indicator	Severity of Public Health Problem		
	Mild	Moderate	Severe
Goitre grade > 0	5.0-19.9%	20-29.9%	>=30%
Median UIE (ug/l)	50-99	20-49	<20
Source: Reference 7.11.3.1			

Iodine Deficiency Disorders (IDD) have been recognized as a major public health problem in India. Unlike other micronutrient deficiencies, IDD is due to deficiency of iodine in water, soil and foodstuffs and affects all socioeconomic groups living in defined geographic areas. The WHO/UNICEF/ICCIDD has defined indicators for IDD prevalence and criteria for classifying IDD as a significant public health problem (Table 7.11.3.1).

Prevalence of iodine deficiency disorders (IDD)

Prevalence of IDD and population at risk of IDD globally and in South East Asia is shown in Figure 7.11.3.1. Although the prevalence of iodine deficiency disorders (IDD) in India is lower than in most South Asian countries, the problem is ubiquitous and affects millions of people. ACC/SCN 2004 estimates that a third of India's population (a sixth of the total global population) is at risk of IDD.

Figure 7.11.3.1: Prevalence and number of IDD in the general population by region and country



Source Reference 7.11.3.2

The estimated prevalence of IDD in children in South Asia is shown in Table 7.11.3.2. Total goitre rates and goitre rates in school children in India is high. The number of children born mentally impaired due to IDD is highest in India. Infact, a third of all children born with IDD-related mental damage live in India.

Table 7.11.3.2: Prevalence of Iodine deficiency in South Asia

	Children born mentally impaired (no.)	Total Goitre Rate (TGR%)	TGR in school children (%)
Afghanistan	535000	48	-
Bangladesh	750000	18	50
Bhutan	-	-	14
India	**6600000**	**26**	**19**
Nepal	200000	24	40
Pakistan	2100000	38	-
South Asia	10185000	-	-
World Total	19000000	-	-

Source: Reference 7.11.3.3

Surveys carried out by Central and State Health Directorates, Indian Council of Medical Research and various Medical Colleges have shown that no State or Union Territory is free from the problem of Iodine Deficiency Disorders (IDD). Out of 586 districts in the country, 281 districts have been surveyed for IDD and 41 districts have been found to be endemic (Annexure7.11.3.2). Universal use of iodized salt is a simple, inexpensive method of preventing IDD.

IDD in newborn and children

A study conducted in 22,000 newborns from different parts of India to determine the incidence of neonatal chemical hypothyroidism (NCH) as diagnosed by cord blood thyroxine level of less than 3 microgram percent and TSH of more than 50 MU/Ml showed that the incidence of NCH was a hundred fold more in iodine deficient endemic districts of Terai regions of UP as compared to non-endemic areas like Delhi and Kerala (Table 7.11.3.3). Subsequent studies in an endemic village of the region to determine the prevalence of known thyroxine deficiency related neurological deficits showed that a significant proportion of the village population had objective evidence of compromised brain development in the form of shift to left in IQ score distribution among school children from iodine deficient areas when compared to non-iodine deficient areas, 20 % prevalence of nerve deafness and 3-5 % prevalence of cretinism.

Table 7.11.3.3: Prevalence of Neonatal Chemical Hypothyroidism

Area	Goitre	Cretinism	Incidence of NCH
	Prev. (%)	Prev. (%)	(per '000 births)
Deoria (UP)	80	3-5	133
Gorakhpur (UP)	70	0-4	85
Gonda (UP)	60	0-4	75
Delhi	29	Nil	6
Kerala (coastal) *	1.3	Nil	1

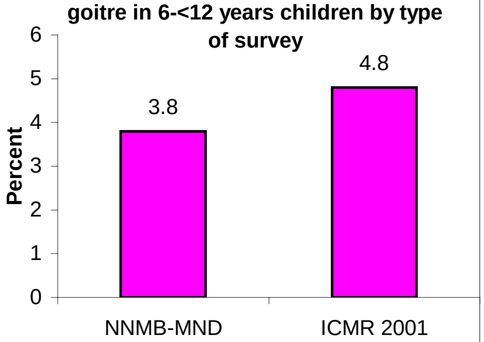
Source Reference 7.11.3.4

** : No prevalence of endemic goitre or iodine deficiency*

Goitre rates in children

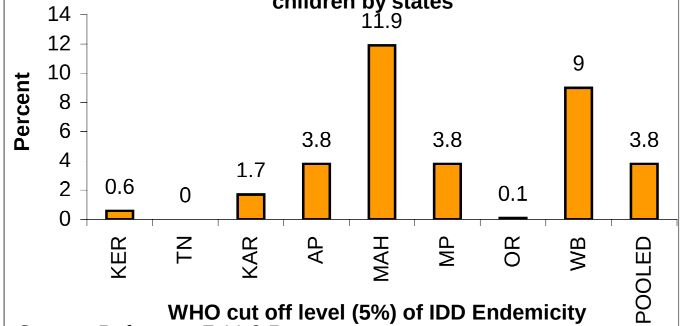
Data on prevalence of goitre in 6-12 year old children from NNMB/ICMR surveys is shown in Figure 7.11.3.2. The overall prevalence of goitre both in NNMB and ICMR surveys are below 5%.

Figure 7.11.3.2: Prevelence (%) of goitre in 6-<12 years children by type of survey



Source: Reference 7.11.3.5

Figure 7.11.3.3: Prevalence of goitre in 6- <12 years children by states



Source: Reference 7.11.3.5

The prevalence of goitre in 6-12 years children in the 8 NNMB states in 2003 is given in Figure 7.11.3.3. The relatively high prevalence of goitre in coastal states of Maharashtra and West Bengal is a source of concern.

Interventions to reduce IDD

National Goitre Control Programme

Following the successful trial of iodized salt in the Kangra Valley, Himachal Pradesh, the National Goitre Control Programme (NGCP) was launched by the Government of India in 1962. Initially the programme aimed at providing iodized salt to the population living in the well-recognized sub-Himalayan 'goitre' belt. However availability of salt was erratic. There was no substantial reduction in IDD because of continued use of cheaper non-iodized salt and due to lack of awareness regarding need to use iodized salt.

NFI carried out an evaluation of the ongoing Goitre Control Programme in 1980 to:

- assess reasons for failure of control programmes so far
- identify newly emerging dimensions of this problem and
- set out practical recommendations for future action, based on detailed consideration of causes of earlier failures.

The study showed that the existing salt iodisation facilities were inadequate to meet the country's needs and even they were working far below their installed capacity. Quality control at the production site was inadequate and iodine loss during transport and storage was very high. Awareness about the need to use iodised salt was low even among the population groups with high IDD prevalence.

NFI made the following recommendations for ensuring universal access to iodised salt:

- opening up iodisation of salt to private sector to ensure adequate production to meet national needs
- ensuring quality control at production site
- packing salt in poly packs to reduce iodine loss during transport and storage
- testing iodine content of salt at consumer level
- improving awareness about the need to consume only iodised salt.

Over the next two decades many of these recommendations have been implemented.

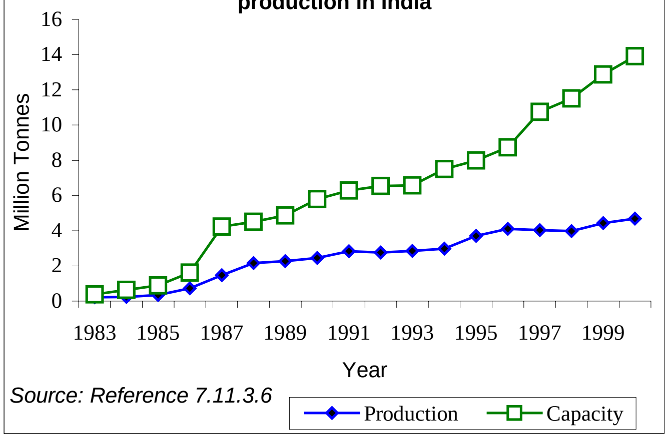
In the eighties the data from DGHS/ICMR surveys indicated that IDD is not a problem confined to the sub-Himalayan regions; there are also pockets of iodine deficiency in all the States. Therefore, a decision was taken for universal iodization of salt for human consumption, which was implemented in a phased manner from 1986. The progress in implementation of this programme was tardy because during eighties, production and availability of iodized salt was a fraction of what was required.

National Iodine Deficiency Disorders Control Programme (NIDDCP)

In 1992, the Central Council of Health, took a policy decision to iodize the entire edible salt in the country by the year 1992. In August 1992, the NGCP was renamed as National Iodine Deficiency Disorders Control Programme (NIDDCP) taking into its ambit control of the wide spectrum of IDD like mental and physical handicap and reproductive wastage. The Goal of the NIDDCP is to reduce the prevalence of IDD below 10% in endemic districts of the country.

During nineties there was a steady increase in the production of iodized salt (Figure 7.11.3.4 and Table 7.11.3.4, Salt Department, 2003-04). The year wise number of iodization units, capacity and supplies of iodized salt is given in Table 4. India has become the second largest producer of iodized salt in the world today after China. In 1988, the Prevention of Food Adulteration Act was amended to fix the minimum iodine content of salt at30 parts per million (ppm) at the manufacturing level and 15 ppm at the consumer level (MOHFW, 1994). Quality control at the production level is being done by the Salt Department. However, there was no quality control testing at retail and household level.

Figure 7.11.3.4: Progress of iodised salt production in India



Source: Reference 7.11.3.6

Table 7.11.3.4: Iodized salt production and supply (Salt Department)							
Year		(in lakh tonnes)					
	No. of Iodisation Units	Capacity	Requirements	Production	Supplies	State/UT banned	
						Full	Partial
1983	13	3.86	9.16	2.13	1.41	7	4
1986	115	16.08	11.27	7.27	5.98	10	6
1989	353	48.71	27.24	22.74	21.34	17	6
1992	529	65.33	29.62	27.13	26.87	22	6
1993	519	65.67	33.31	28.23	27.23	24	5
1994	572	75.04	35.84	29.45	28.01	25	4
1995	657	82.33	42.81	36.96	34.88	27	2
1996	699	87.28	51.70	40.95	40.92	27	2
1997	784	107.50	52.00	40.41	39.07	29	2
1998	809*	115.21*	52.00	39.70	37.42	29	2
2000	926	143.48		46.89			
As on 31st March, 1998							
Source Reference 7.11.3.7							

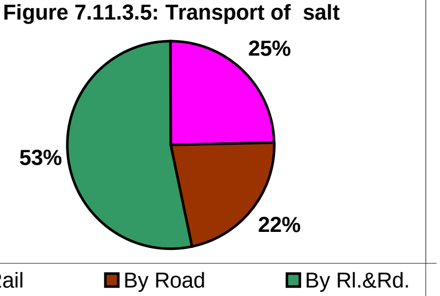
Available data on iodized salt transport showed that most of the manufacturers transported salt both by rail and road; 24.7% of the manufacturers dispatched salt exclusively by rail and 22% exclusively by road (Figure 7.11.3.5). Salt transported by road, especially if it is transported for short distances (<250 kms) was not tested for iodization. This is one of the major factors responsible for the relatively poor household availability of iodized salt in coastal salt producing states.

Wholesalers received iodized salt directly from manufacturers both by road (43%) and rail (50%). They had adequate storage space; majority stored iodized salt in covered godown (Figure 7.11.3.6). Most of the wholesalers (69%) did not repack the iodized salt while distributing it in retail (Figure 7.11.3.7).

Ban on sale of non-iodized salt for human consumption

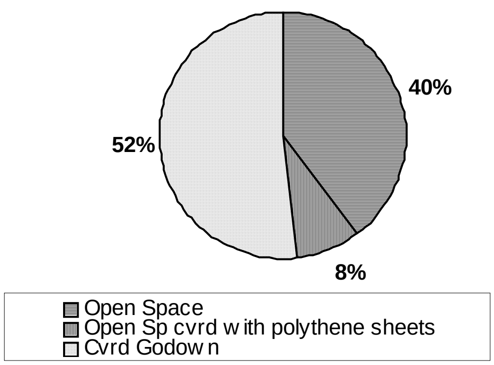
Concerned with the low use of iodized salt at household level, Government of India in 1997 imposed ban on the storage and sale of the non-iodized salt. By 2000 all the UTs and states except Kerala had banned the storage and sale of non-iodized salt; in Andhra Pradesh and Maharashtra, the ban was partial.

Figure 7.11.3.5: Transport of salt



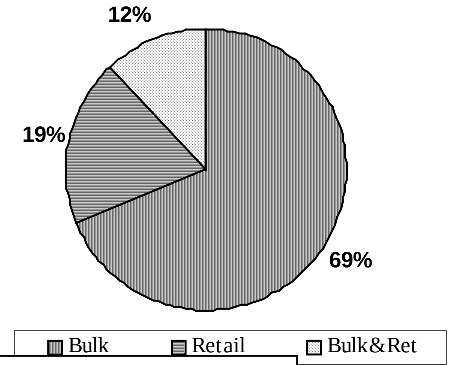
Source: Reference 7.11.3.7

Figure 7.3.6: Storage of salt



Source Reference 7.11.3.7

Figure 7.3.7: Distribution of salt

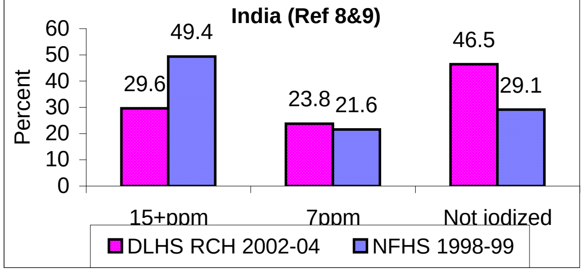


Source Reference 7.11.3.7

Medical professionals from non-endemic states, especially, from Kerala protested against the ban because they felt that there could be potential adverse effects of use of iodized salt. Between April 1999 and mid 2000 several consultations were held to discuss the scientific and epidemiological evidence on benefits and safety of iodized salt for prevention and control of IDD; the consensus statement from the consultations was that under the existing conditions in India universal iodization of salt for human consumption was safe and was needed to combat IDD. Inspite of unanimous technical advice that the ban on non-iodized salt should not be removed, the central government lifted the ban on sale of non-iodized salt for human consumption in October 2000 because "matters of public health should be left to informed choice and not enforced". However, the state level ban was lifted only by Gujarat and Arunachal Pradesh; Orissa lifted the ban initially but reimposed it later.

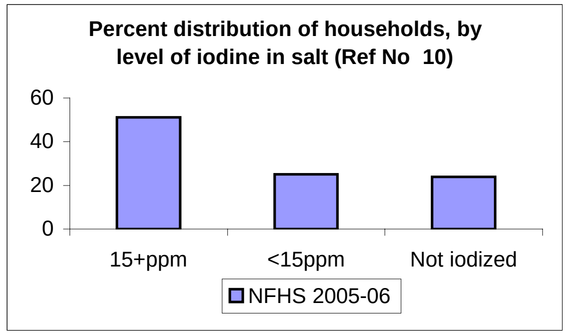
Reports in the first two years of the present decade from several states suggested that though the state level ban remained, it was not effectively implemented. Non-iodized salt was freely available in Gujarat. Increase in rail tariff for transporting salt from 2002 led to increased movement of salt by road especially from Rajasthan; there was no mechanism in place to monitor the quality of iodized salt transported by road. States reported that there was some decline in the consumption of iodized salt after the lifting of the national ban on use of non-iodized salt. With the disappearance of severe forms of goiter many people even in the goiter belt became complacent and did not ensure that they continue to consume only iodized salt. The people in the coastal non-endemic regions were not aware of the adverse effects of IDD and tended to use cheaper non-iodized salt.

Figure 7.11.3.8: Percent distribution of households by degree of iodization of salt in India (Ref 8&9)



Progress in availability and consumption of iodized salt at household level

Data from various surveys indicated that there was substantial improvement in household availability of salt in the erstwhile “goiter belt” However the National Family Health Survey 2 (NFHS 2) showed that only about half the households use adequately iodized salt; one fourth used salt with inadequate iodine content and one fourth used non-iodized salt (Figure 7.11.3.8).



Percent distribution of households, by level of iodine in salt (Ref No 10)

Findings from NFHS 2 also showed that differentials in salt iodization by place of residence were pronounced. Use of non-iodized salt was high in rural areas as compared to urban areas due to better transport facility in urban areas. The widest differentials were observed for standard of living index; use of adequately iodized salt was high in households with high standard of living compared to households with a low standard of living (Figure 7.11.3.9).

State-wise use of iodized salt from NFHS 1998-99 is indicated in Annexure 7.11.3.3. The data shows that in most of the northern states the household use of iodized salt was more than 90% as people were aware regarding the ill effects of iodine deficiency and the need to use iodized salt. On the other hand in coastal states like Tamil Nadu, Andhra Pradesh, Kerala, households consuming adequate iodized salt was low. In these non-endemic areas people tended to use cheap locally readily available non-iodized salt because they were not convinced of the health benefits of costlier iodized salt.

Data from District Level Household Survey (DLHS-RCH 2002-04) survey confirmed that as compared to NFHS 2 (1998-99) there was some decline in the household availability of iodized salt after the lifting of the national ban; only 30% of households in India used salt that contained a minimum recommended 15 ppm or higher level of iodine content, 46% of households used salts that are not iodized at all and another 24 percent used salt, which is inadequately iodized.

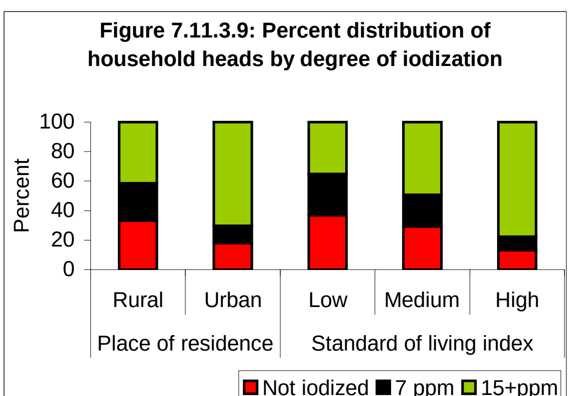


Figure 7.11.3.9: Percent distribution of household heads by degree of iodization

Source: Reference 7.11.3.9

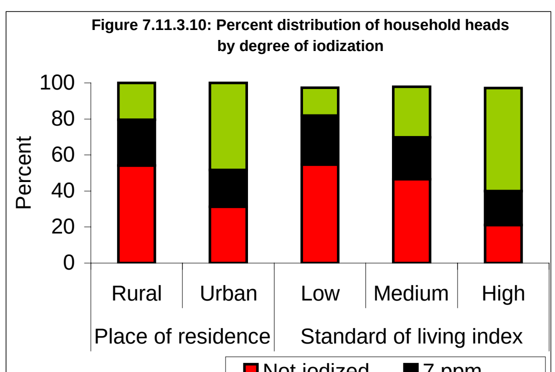
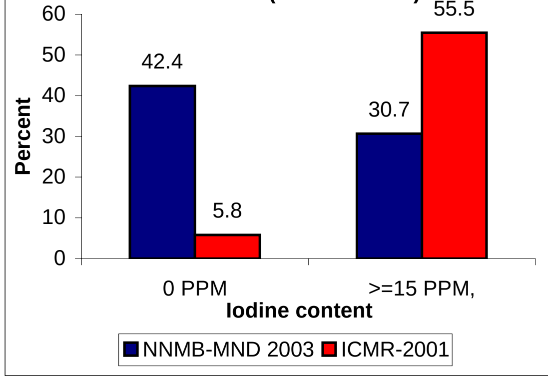


Figure 7.11.3.10: Percent distribution of household heads by degree of iodization

Source: Reference 7.11.3.8

DLHS survey also shows that there was no change in the extent of salt iodization at household level with respect to place of residence and standard of living. Use of non-iodized salt was high in rural areas as compared to urban areas; use of adequately iodized salt was high in households with high standard of living compared to households with a low standard of living (Figure 7.11.3.10).

Fig 7.11.3.11: (%) of HHs by iodine (>=15 PPM in salt (Ref No 5 & 11)



The state-wise and district-wise use of iodized salt from DLHS-RCH (2002-04) is indicated in Annexure 7.11.3.4 & 7.11.3.5.

Data from NNMB micronutrient survey (2003) also confirmed the relatively low iodized salt use in the southern states as compared to the northern states where ICMR survey was done in 2001 (Figure 7.11.3.11).

Concerned about the relatively sharp decline in the use of iodized salt in the early years of this decade, health professionals sought reimposition of the ban. On June 25, 2005 the Union Minister for Health and Family Welfare announced the decision of the Government of India to reimpose the ban on sale of non-iodized salt for human consumption. He also stated that the Government would shortly bring the legislation for compulsory double (iron and iodine) fortification of salt and that soon the double fortified salt will be used in midday meal and Integrated Child Development Services (ICDS) programmes. Ban on sale of non-iodized salt was reimposed in May 2006. The country has ample capacity to produce adequate quantity of good quality iodized salt. IEC efforts focusing on generation of demand for good quality iodized salt are underway. Some states like Chhatisgarh reduced price differentials between iodized and non-iodized salt and provided ready access to iodized salt through TPDS. Monitoring of the quality of iodized salt at production, distribution and household level can readily be undertaken. It is expected that during the Eleventh plan there will be redoubled efforts by all the stake holders to vigorously implement the programme of universal access to iodized salt so that the time lost since 2000 is made up and the country achieves universal access to adequately iodised salt and reduction in the prevalence of IDD in the country to less than 10 per cent by 2010.

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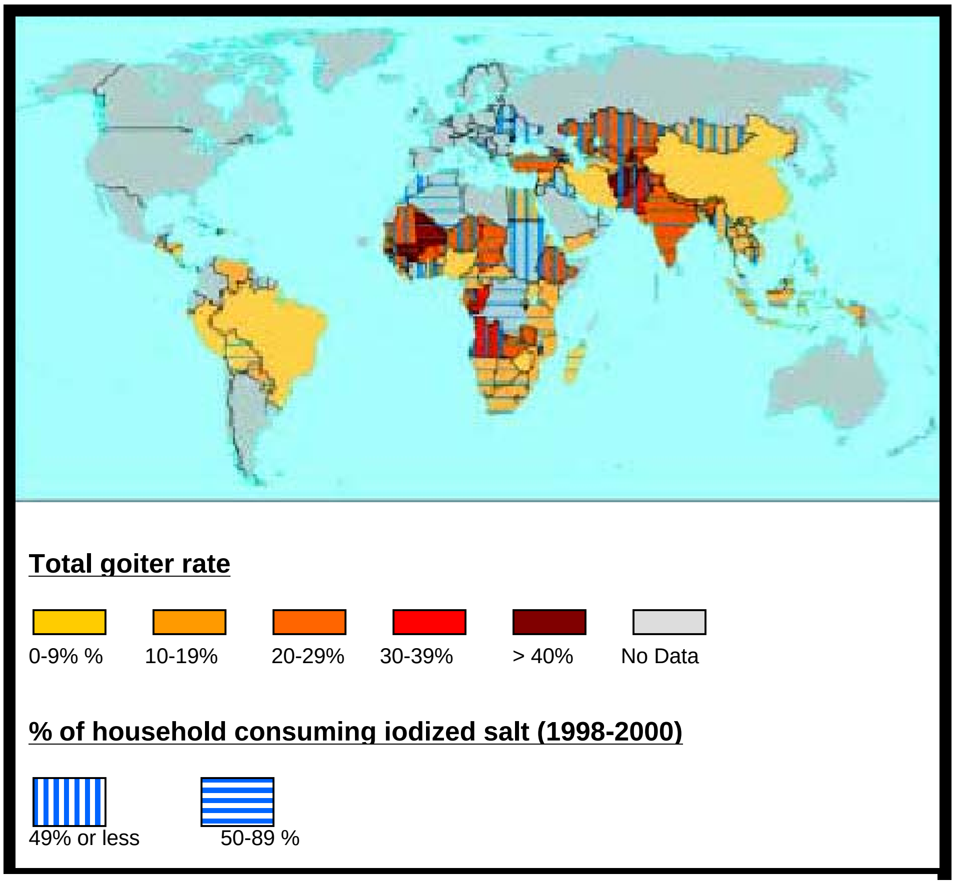
Iodine deficiency disorders and iodised salt consumption rates



Source: Reference 7.11.3.12

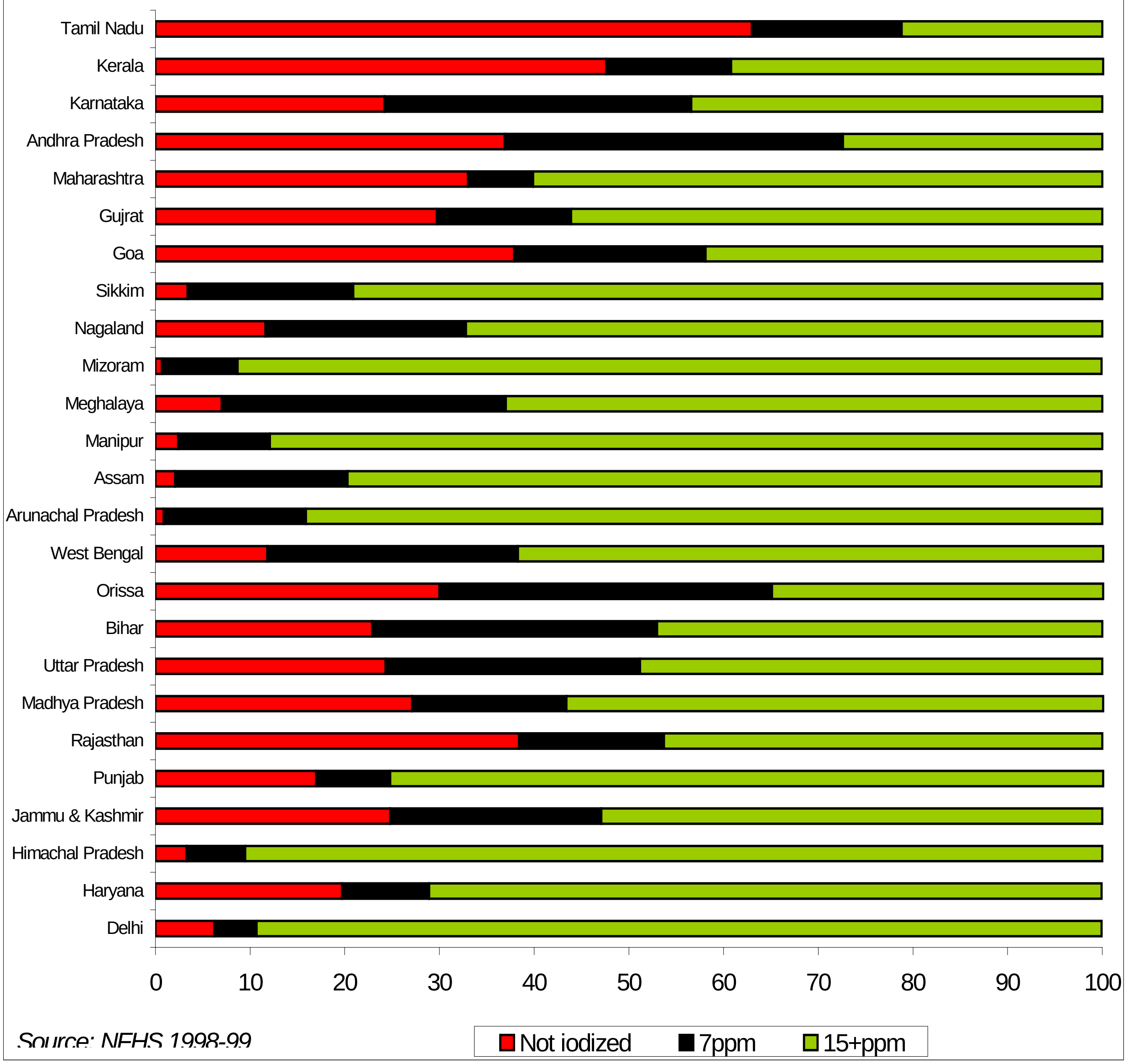
Annexure 7.11.3.2

Prevalence of Iodine Deficiency Disorders & Status of National Iodine Deficiency Disorders Programme in different States/UTs of India

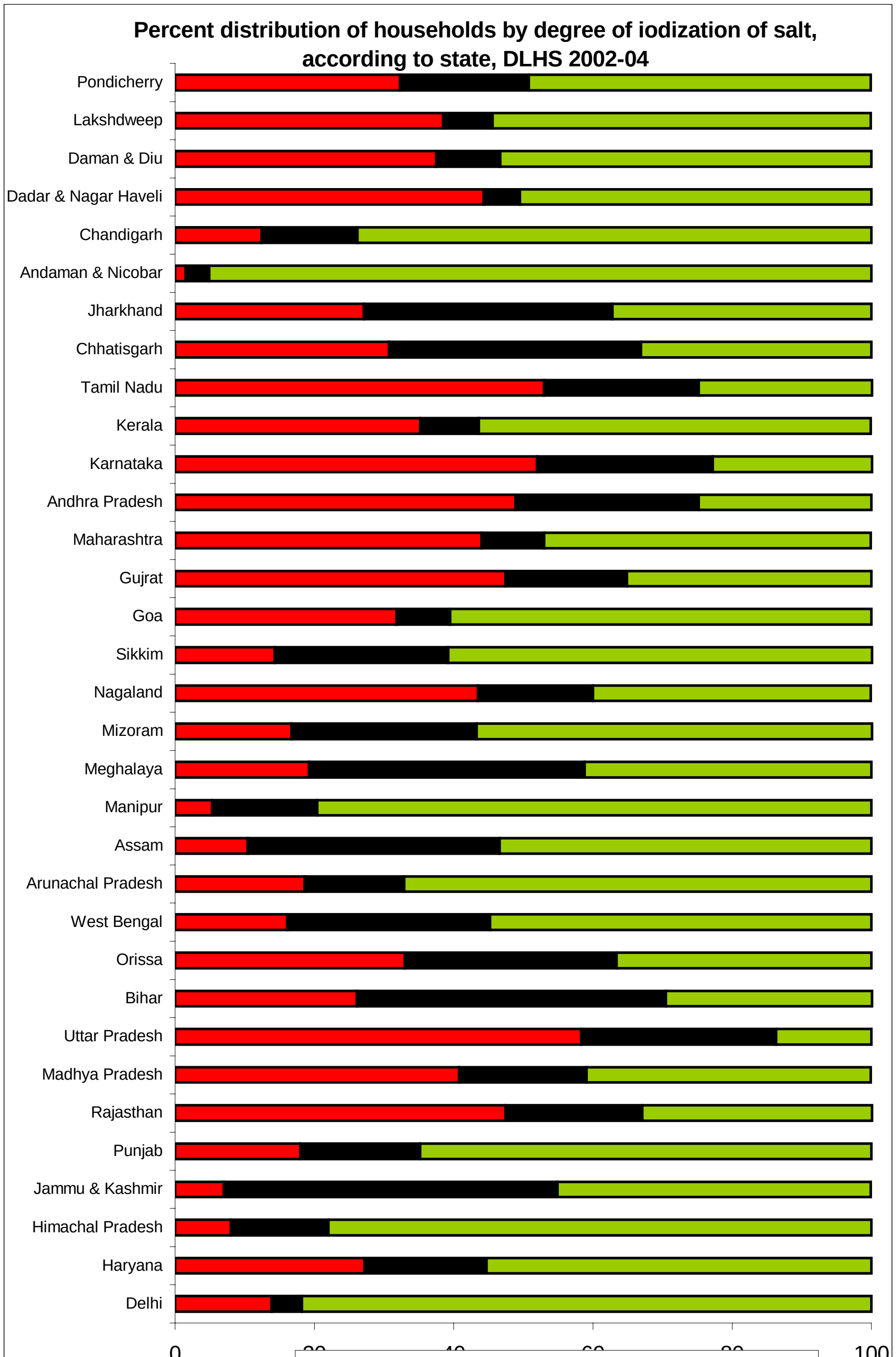
Sl.No.	State	Total No. of dist.	No. of dist. Surveyed	No. of dist. endemic	Ban notific-ation issued	IDD Cell
1.	Andhra Pradesh	23	10	9	Partial	
2.	Arunachal Pradesh	10	10	10	Complete	Yes
3.	Assam	23	18	18	Complete	Yes
4.	Bihar	55	22	21	Complete	Yes
5.	Goa	2	2	2	Complete	Yes
6.	Gujarat	25	16	8	Complete	Yes
7.	Haryana	19	9	8	Complete	Yes
8.	Himachal Pradesh	12	10	10	Complete	No
9.	Jammu & Kashmir	15	14	11	Complete	No
10.	Karnataka	27	17	6	Complete	Yes
11.	Kerala	20	14	11	No Ban	Yes
12.	Madhya pradesh	61	16	16	Complete	Yes
13.	Maharashtra	35	29	21	Partial	Yes
14.	Mizoram	8	4	4	Complete	Yes
15.	Manipur	9	8	8	Complete	Yes
16.	Meghalaya	7	2	2	Complete	Yes
17.	Nagaland	8	7	7	Complete	Yes
18.	Orissa	30	4	4	Complete	Yes
19.	Punjab	17	3	3	Complete	Yes
20.	Rajasthan	31	3	3	Complete	Yes
21.	Sikkim	4	4	4	Complete	Yes
22.	Tamil Nadu	29	12	12	Complete	Yes
23.	Tripura	4	3	3	Complete	Yes
24.	Uttar Pradesh	83	34	29	Complete	Yes
25.	West Bengal	18	5	5	Complete	Yes
26.	Andaman & Nicobar Islands	2	2	2	Complete	Yes
27.	Chandigarh	1	1	1	Complete	Yes
28.	D & N Haveli	1	1	1	Complete	Yes
29.	Delhi	1		1	Complete	Yes
30.	Daman & Diu	1	1	1	Complete	Yes
31.	Lakshadweep	1			Complete	No
32.	Pondicherry	4			Complete	No
	Total No. of dist.	586	281	241		

Source: Surveys carried out by Central and State Health Dte.s,ICMR and various Medical Colleges

Percent distribution of households by degree of iodization of salt, according to state, NFHS 1998-99

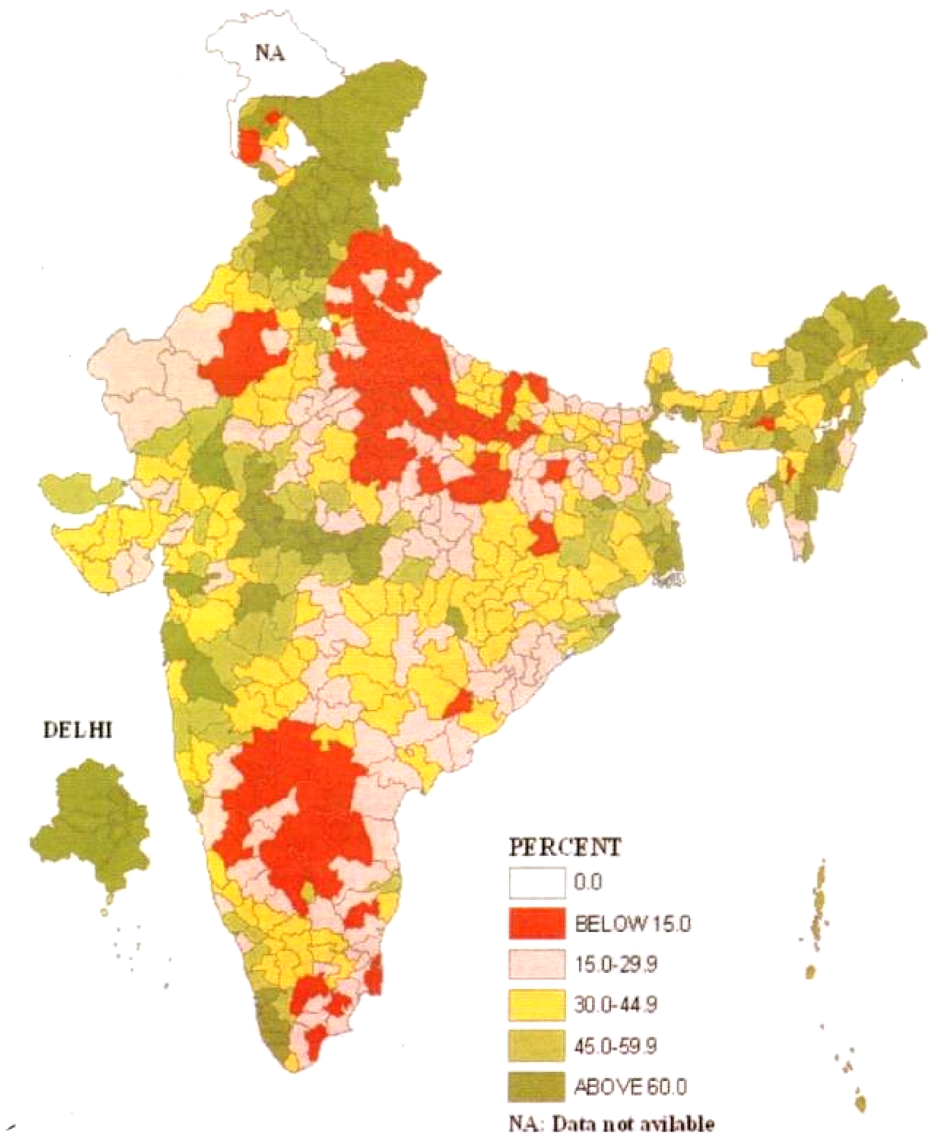


Source: NFHS 1998-99

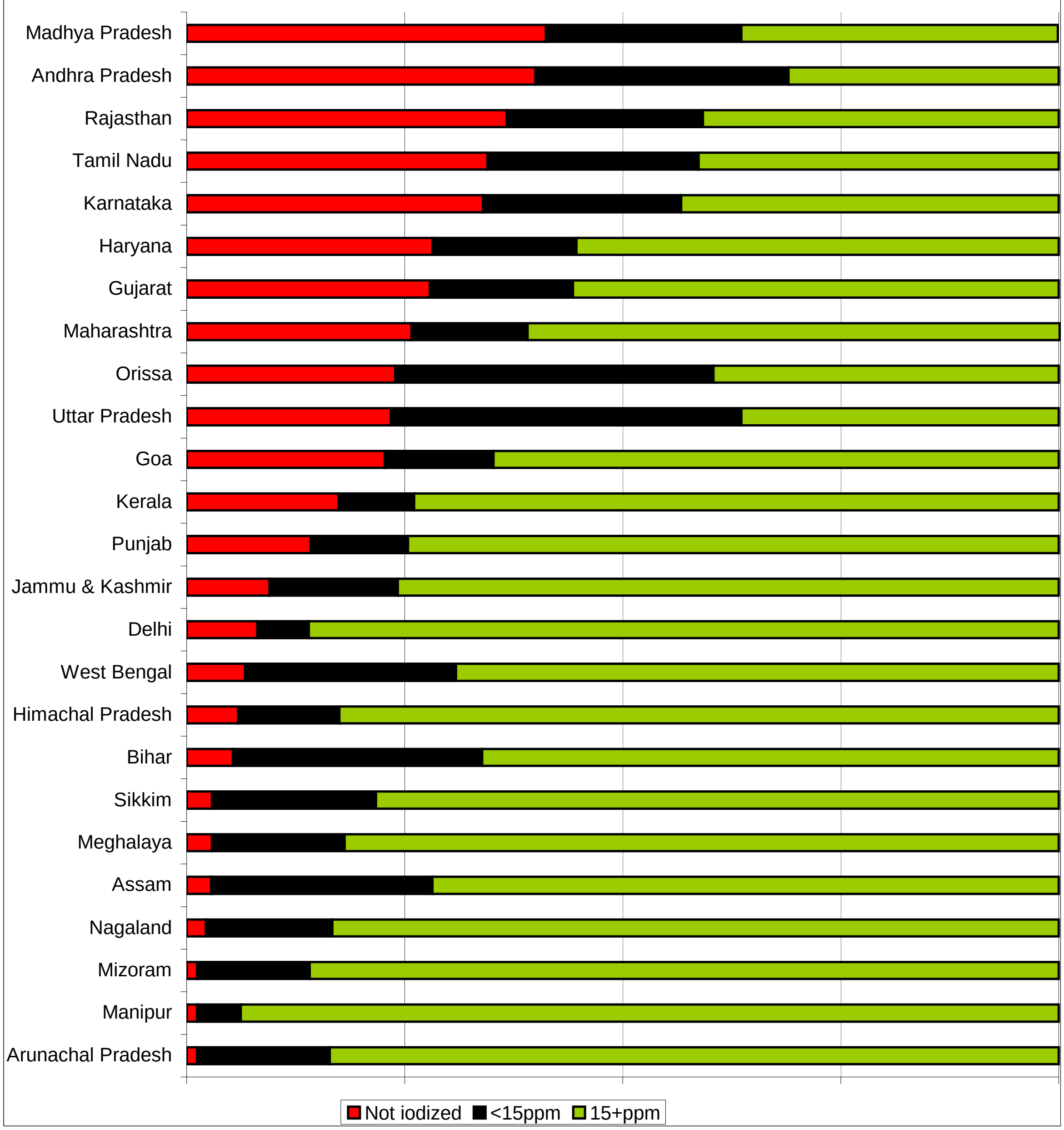


Source: Ref 7.11.3.1

Percentage of Households using Salt that Contains 15 ppm Level of Iodine



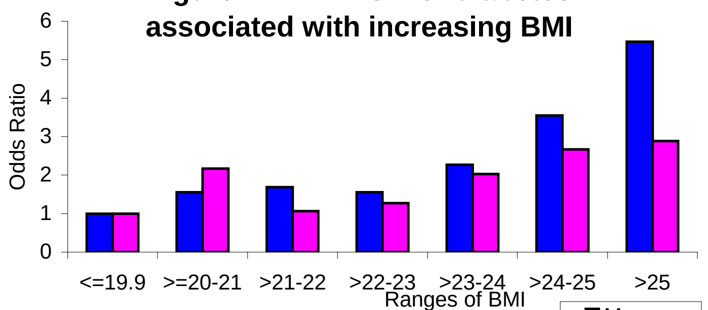
Presence of iodized salt in household by state



7.12. OVER NUTRITION NCD LINKAGES

Linkages between over nutrition and diabetes

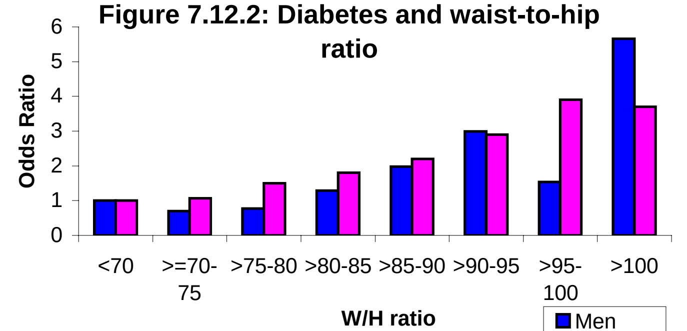
Figure 7.12.1: Risk for diabetes associated with increasing BMI



Source: Reference 7.12.1

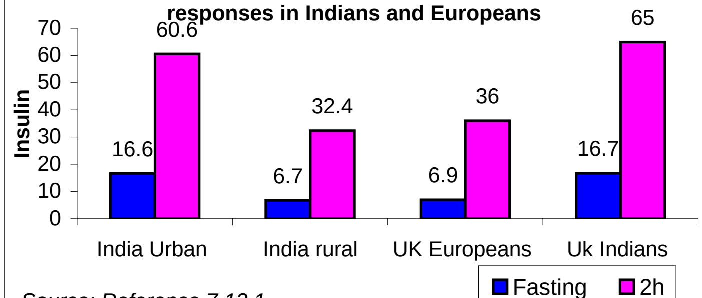
Studies from Chennai have shown that with increasing BMI there is increase in risk of diabetes both in men and women. There is a steep increase in risk of diabetes when BMI increase beyond 23 (Figure 7.12.1). There was a progressive increase in prevalence of diabetes with increasing waist-hip-ratio both in men and women (Figure 7.12.2). Association between abdominal obesity and the metabolic syndrome of hypertension, dislipedemia, insulin resistance and diabetes have been well documented. Comparison of insulin resistance and insulin response between Indians and UK citizens showed that both fasting and 2 hour insulin levels are lower in Indians in rural areas and Europeans in UK; urban Indians and Indians residing UK have substantially higher fasting and 2 hour insulin levels indicating insulin resistance (Figure 7.12.3).

Figure 7.12.2: Diabetes and waist-to-hip ratio



Source: Reference 7.2.1

Figure 7.12.3: Insulin resistance -serum insulin responses in Indians and Europeans

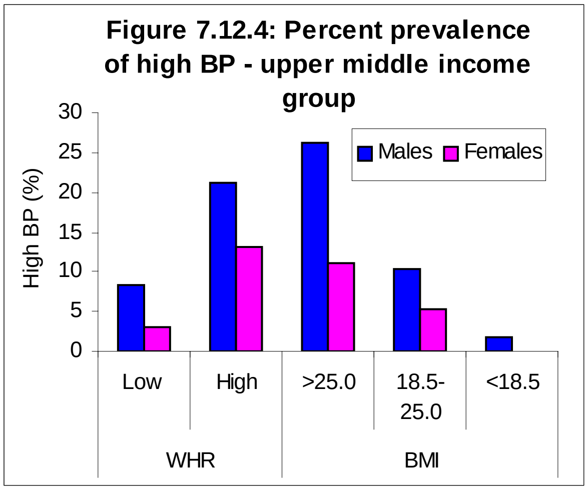


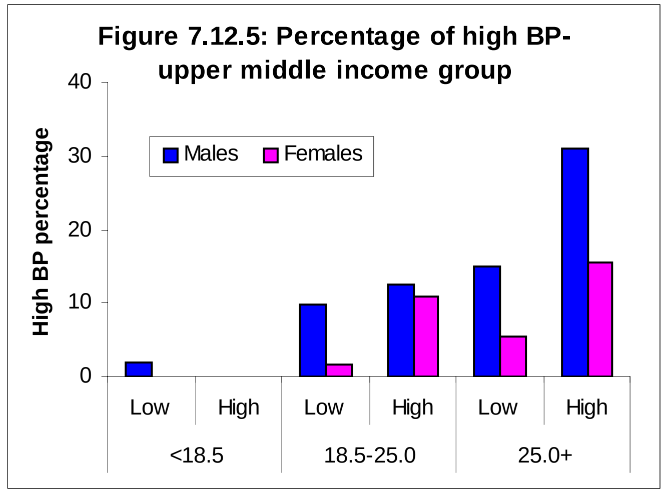
Source: Reference 7.12.1

Data from urban affluent population show that prevalence of insulin resistance is high not only in adults but also in children and young adults (Yajnik et al, 2002).

Linkages between over-nutrition and hypertension

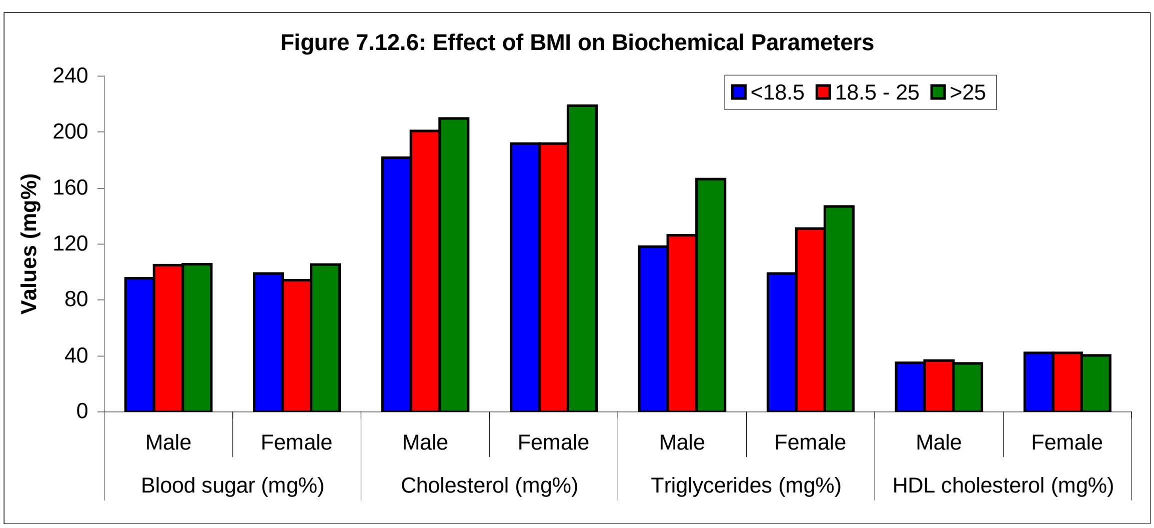
Nutrition Foundation of India carried out studies exploring relationship between over nutrition and cardiovascular diseases in persons belonging to different





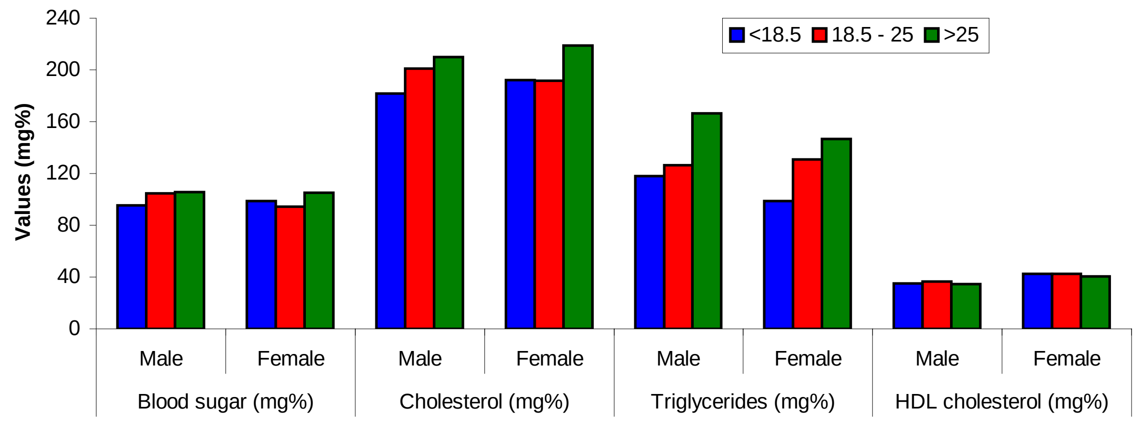
Source: Reference 7.12.4

income groups working in a government institution. In this group prevalence of abdominal obesity (higher waist hip ratio) was higher (50.3%) as compared to overnutrition (BMI > 25; 30.8%). Higher the BMI and WHR the higher were the prevalence rates of hypertension both in men and women (Figure 7.12.4 and 7.12.5). The prevalence of high blood pressure in the normal and overweight subjects was higher when WHR was high. Overweight/obese subjects of both sexes with abdominal adiposity had higher systolic and diastolic blood pressure. Serum cholesterol and triglycerides in men were significantly higher in subjects with BMI>25. There was a trend of increase in blood sugar in those with abdominal obesity as compared to those without abdominal obesity (Figure 7.12.5). Serum cholesterol and triglycerides in men were significantly higher in subjects with BMI>25. There was a trend of increase in blood sugar with increasing values of BMI both in men and women. Serum cholesterol and triglycerides increased significantly with increasing BMI and WHR both in men and women. A similar trend was seen in the ratio of total cholesterol and HDL cholesterol (Figure 7.12.6). Cholesterol levels greater than 180 mg % and blood



sugar levels of 140 mg % were mostly seen in subjects with high BMI, and those with greater WHR (Figure 7.12.7).

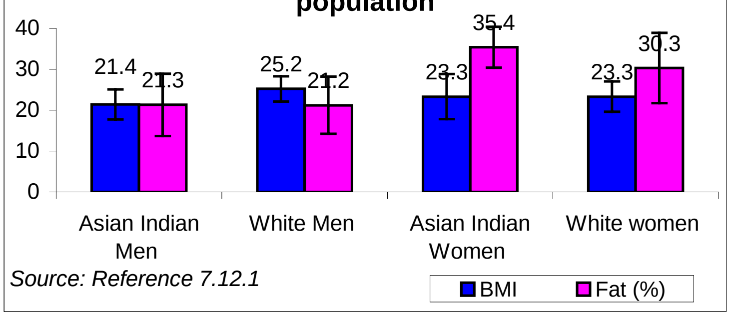
Figure 7.12.7: Effect of BMI on Biochemical Parameters



Linkages between obesity, diabetes and cardiovascular diseases

Indians have higher body fat for any BMI as compared to Caucasians (Figure 7.12.8). The susceptibility of the urban Indians to central adiposity has been highlighted by all studies. All studies in India have shown that abdominal obesity was more strongly associated with glucose intolerance than generalized obesity.

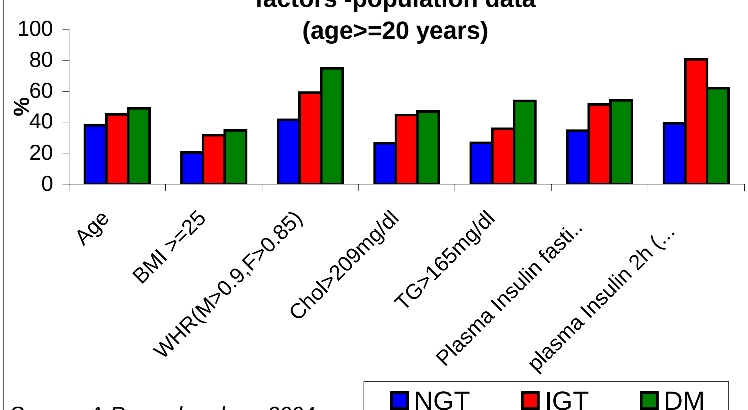
Figure 7.12.8: Comparision of body fat(%) and BMI(Kg/m2) in Indians and in White population



Source: Reference 7.12.1

The cluster of risk factors shown to be associated with central obesity including glucose intolerance, obesity, hyperinsulinameia, hypertriglyceridaemia, and hypertension, are all-important risk factors for ischaemic heart disease. Recent studies comparing body fat topography in migrant Asian subjects with those of white Caucasians have also reported a higher waist-hip ratio with hyperglycemia, elevated plasma

Figure 7.12.9: Glucose intolerance and CVD risk factors -population data (age>=20 years)



Source: A Ramachandran, 2004

insulin concentrations, altered blood lipids and increased risk of coronary heart disease in Indians. Indians are at higher risk of metabolic syndrome with Type 2 diabetes, dyslipidemia, hypertension and cardiovascular disease (Figure 7.12.9). Risk of glucose intolerance, insulin resistance and hypertension increases with age, BMI. Waist-to-hip ratio, blood cholesterol (> 209mg/dl) and triglyceride level (>165 mg/dl).

Comparison of newly diagnosed non-insulin dependent diabetes mellitus (NIDDM) patients in KEM hospital, Pune compared with migrant Indian and white Caucasian NIDDM patients in UK showed that

- At diagnosis diabetic patients in India are about a decade younger (20% < 35 years, and 50% <40 years of age).
- Obesity (using body mass index, as criterion) is less common, but central obesity (increased waist-hip ratio, WHR) is a very striking feature in Indian patients. Highest glucose concentration was found in subjects who were thin but centrally obese.
- Hypercholesterolemia is uncommon (5%), but plasma triglycerides and non-esterified fatty acids (NEFA) are significantly elevated in both IGT and diabetic Indian patients, compared to those with normal glucose tolerance (NGT).
- Both IGT and diabetic patients show fasting hyperinsulinameia compared to NGT subjects but post-glucose plasma immunoreactive insulin (IRI) concentrations are diminished in diabetic patients. Plasma IRI concentrations show an inverted U-shaped distribution in relation to plasma glucose concentration suggesting that insulin resistance and compensatory hyperinsulinaemia precede diabetes. Even NGT Indians are substantially more hyperinsulinaemic and insulin resistant than white Caucasians.

In Indians the cardio vascular risk factors (obesity, central obesity, hypertension, high plasma triglycerides and elevated NEFAs) are increased not only in diabetic patients but also in those with IGT, a stage, which precedes diabetes by many years. Electrocardiographic changes suggestive of CHD were associated with older age, higher blood pressure, higher plasma triglycerides and immuno reactive insulin (IRI) concentrations. Cardio-vascular risk factors were all related to plasma insulin levels and can be thought of as occurring as a part of the complex metabolic profile called the ‘insulin resistance syndrome’, metabolic syndrome or Syndrome X.

Indians appear to have a predisposition for adiposity especially abdominal, insulin resistance and diabetes, hyper-triglyceridaemia and cardiovascular diseases. This predisposition could be genetic or environmental; it can manifest itself at birth, in childhood, during adolescence and in adult life. Prevention of intrauterine growth retardation through antenatal care, early detection and correction of under-nutrition so that children attain appropriate weight for their height are essential to promote linear growth; this can be achieved through effective implementation of ongoing intervention programmes utilizing the available infrastructure. It is never too early for Indians to start practicing healthy lifestyle and dietary habits.

Reduction of physical activity is the major factor behind the progressive increase in over-nutrition. In the urban affluent segments there has been an increase in energy intake form fats, refined cereals and sugar; there has been a simultaneous reduction in physical activity .As a result they have high prevalence of obesity and associated health hazards. Nutrition education that children, adolescents and adults should eat balanced diet with just adequate energy intake and lots of vegetables and health education that exercise has to become a part of daily routine to promote muscle and bone health as well as prevent development of adiposity in all age groups have to be beamed regularly through all channels of communication. As this segment accesses information and services readily, they can be persuaded to change their life styles so that they regain their normal weight and health. The fact that they have changed could stimulate the other segments to follow suit.

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8. HEALTH TRANSITION

8. HEALTH TRANSITION

Disease burden estimates

Traditionally policy makers have used mortality statistics for identifying major public health problems and monitor ongoing interventions and Health transition. In India, reliable age specific mortality data are available through SRS; though there are lacunae in the system for ascertainment of causes of death, fairly reliable data are available on major causes of death. In addition to these data, country has undertaken surveys for estimating the prevalence of major public health problems such as morbidity in women and children, nutritional deficiencies and major communicable diseases. Estimated share of the India in some of the global health problems is shown in the Text box 8.1. In India reliable information on overall morbidity is not available. In the absence of reliable morbidity data, mortality statistics and available survey data have formed the basis on which health policy makers and programme managers evolved public health programmes and allocated funds. While this might have been the appropriate option in a situation where communicable diseases and maternal and child health problems predominate, appropriate modification will be required as the country undergoes demographic and epidemiological transition and non communicable diseases emerge as major public health problems. For instance, morbidity due to mental illnesses is estimated to account for about 15 per cent of the total morbidity but deaths due to psychiatric illnesses are usually less than 1 per cent of total deaths even in developed countries. In view of this there is a need to obtain data on not only mortality but also morbidity due to chronic illnesses and disabilities and take them into account while formulating public health programmes.

Text Box No. 8.1: India's share in global health problems

- 17 per cent of the population
- 17 per cent of the total deaths
- 23 per cent of child deaths
- 26 per cent of the childhood vaccine preventable deaths
- 20 per cent of maternal deaths
- 68% of leprosy cases
- 30% of tuberculosis cases
- 10% of HIV infected persons

Differences in the ongoing epidemiological transition have resulted in wide variation rates of communicable and non-communicable diseases not only between countries but also between different states in

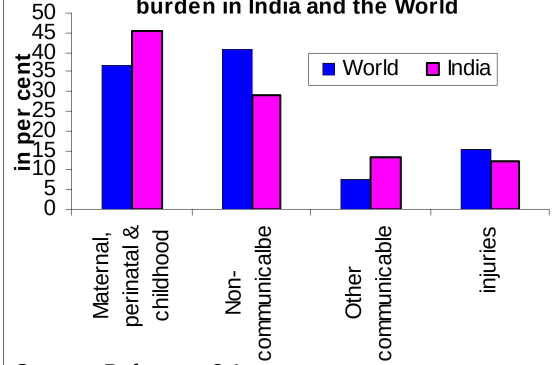
Table 8.1 - Burden for five major diseases (Millions of DALYs)

Disease & sex	Age (years) 0-4	5-14	15-44	45-59	60 +	Total
Diarrhea						
Male	42.1	4.6	2.8	0.4	0.2	50.2
Female	40.7	4.8	2.8	0.4	0.3	48.9
Worm infection						
Male	0.2	10.6	1.6	0.5	0.1	13.1
Female	0.1	9.2	0.9	0.5	0.1	10.9
Tuberculosis						
Male	1.2	3.1	13.4	6.2	2.6	26.5
Female	1.3	3.8	10.9	2.8	1.2	20
Ischemic heart disease						
Male	0.1	0.1	3.6	8.1	13.1	25
Female	**	**	1.2	3.2	13	17.5

*** Less than 0.05 million, DALY=disability adjusted life year.*
Source: Reference 8.1

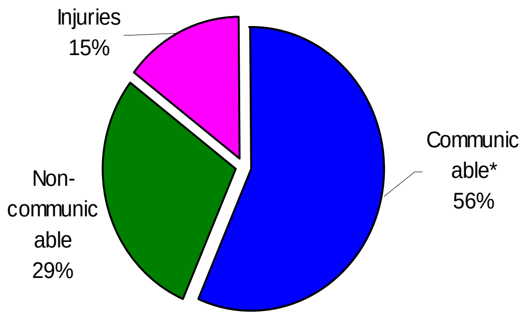
large countries like India. World Health Organization has been using Disability Adjusted Life Years (DALY), which takes into account morbidity and mortality as well as the age at which the problem occurred as the parameter for estimating disease burden for making global/local comparisons with respect to public health problems and investment in health care. The estimated disease burden in 1990 due to major categories of public health problems in the world and India is shown in Figure 8.1. Disease burden due to five major diseases in population with different age and sex was computed by WHO (Table 8.1). The fact that while estimates regarding mortality are reasonably adequate, the estimates of morbidity are based on the available data from the developing countries is often inadequate has to be kept in mind while interpreting these global data.

Figure 8.1: Distribution of disease burden in India and the World

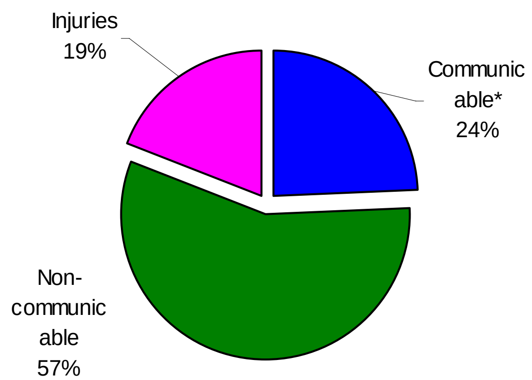


Source: Reference 8.1

Figure 8.2: Disease burden estimates - India 1990

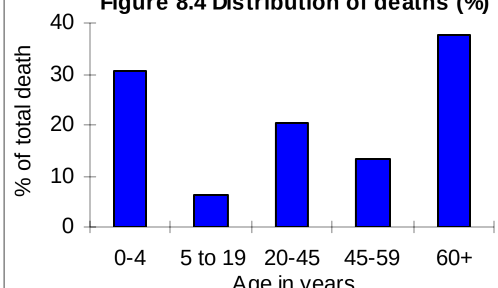


Fgure 8.3: Disease burden projections - India 2020



Using the 1990 database (Figure 8.2) and assuming that the trends in epidemiological transition achieved by countries during the previous two decades will occur in India, the changing pattern of disease burden for 2020 was also computed by WHO (Figure 8.3). However, data from National Family Health Survey (NFHS) suggest that during the 1990s, there has not been any significant decline in the infant mortality rate and the maternal mortality rate. Data from SRS do not show any major change in the age specific mortality rate

Figure 8.4 Distribution of deaths (%)



Source: Reference 8.2

(Figure 8.4). It would appear that the epidemiological transition is occurring at a slower pace than projected for the country. This is perhaps due to persistence maternal and child health problems and advent of HIV infection. However, there has been a sustained increase in mortality and morbidity due to non-communicable diseases, accidents and trauma in the last two decades.

Time trends in health indices

Improvement in the health and nutritional status of the population has been one of the major thrust areas for the social development programmes of the country. This was to be achieved through improving the access to and utilization of Health, Family Welfare and Nutrition services with special focus on underserved and underprivileged segments of the population. Over the last five decades, India has built up a vast health infrastructure and manpower at primary, secondary and tertiary care in government, voluntary and private sectors. These institutions are manned by professionals and paraprofessionals trained in the medical colleges in modern medicine and Indian Systems of Medicine & Homoeopathy (ISM&H) and paraprofessional training institutions. The population has become aware of the benefits of health related technologies for prevention, early diagnosis and effective treatment for a wide variety of illnesses and accessed available services. Technological advances and improvement in access to health care technologies, which were relatively inexpensive and easy to implement, had resulted in substantial improvement in health indices of the population and a steep decline in mortality (Table 8.2).

Table 8.2: Time Trends (1951-2000) in Health Care

	1951	1981	2000
SC/PHC/CHC	725	57,363	1,63,181(99-RHS)
Dispensaries & Hospitals (all)	9209	23,555	43,322 (95-96-CBHI)
Beds (Pvt. & Public)	117,198	569,495	8,70,161 (95-96-CBHI)
Doctors (Modern System)	18,054	1,43,887	7,37,000 (98-99- MCI)
Nursing Personnel	61,800	2,68,700	5,03,900 (99-INC)
Malaria (cases in million)	75	2.7	2.2
Leprosy (cases/ 10,000 population)	38.1	57.3	3.74
Small Pox (no. of cases)	>44,887	Eradicated	
Guineaworm (no. of cases)		>39,792	Eradicated
Polio (no. of cases)		29709	265
Life Expectancy (Years)	36.7	54	64.6 (RGI)
Crude Birth Rate	40.8	33.9 (SRS)	26.1 (99 SRS)
Crude Death Rate	25	12.5 (SRS)	8.7 (99 SRS)
IMR	146	110	70 (99 SRS)

Source: Reference 8.3

There has been a steady but slow reduction in birth rate, death rate, infant mortality rate and under five mortality rates over the last five decades. However the country still has high maternal, infant, perinatal and neonatal mortality (Figure 8.5). There has been steady but slow reduction in death rate and improvement in longevity (Figure 8.6).

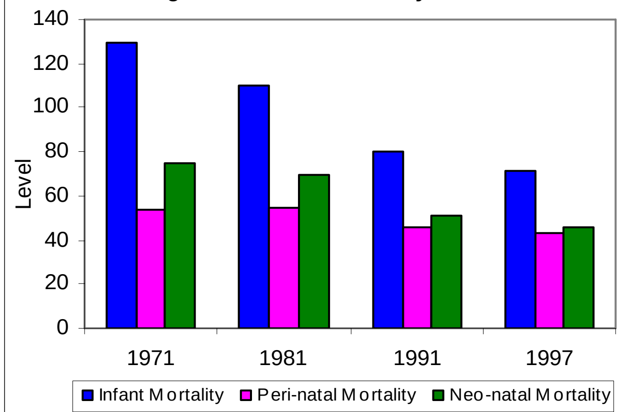


Figure 8.5 :Child mortality indicators

Source: Reference 8.4

During the 1990s, the mortality rates reached a plateau and the country entered an era of dual disease burden. Communicable diseases have become more difficult to combat because of development of insecticide resistant strains of vectors, antibiotics - resistant strains of bacteria and emergence of HIV infection for which there is no therapy. Longevity and changing life style have resulted in increasing prevalence of non-communicable diseases. Undernutrition, micronutrient deficiencies and associated health problems coexist with obesity and non-communicable diseases.

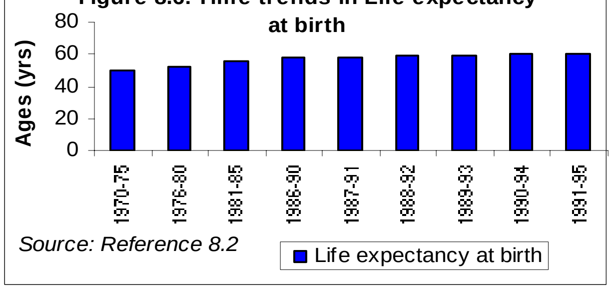


Figure 8.6: Time trends in Life expectancy at birth

Source: Reference 8.2

Establishment of integrated disease surveillance systems

There are wide inter-state differences health indices, morbidity rates, magnitude and rate of demographic and epidemiological transition. The extent of access to and utilization of health care varied substantially between states, districts and different segments of society; this to a large extent, is responsible for substantial differences between states in health indices of the population. Under these conditions, it is important to:

- ascertain and document morbidity and mortality due to major health problems in different states/ districts,
- evolve appropriate interventions programmes
- invest adequately in well targeted interventions
- implement them effectively by modifying the health care system and
- monitor the impact on the morbidity and mortality.

Such an effort would require a reliable sustainable database for mortality and morbidity. While mortality data can be obtained through strengthening of CRS/SRS and ascertainment of the cause of death, the database for morbidity can come only through a strengthened Health Management Information System (HMIS) supplemented by the data from disease surveillance. When sustained, these three systems will, over the next two decades, provide valuable insights regarding time trends in morbidity and mortality in different states/ districts. Development of this data base is critical for evolving appropriate health policies and strategies, identifying priority areas for investment of available funds and brings about modifications in the existing health system to ensure equitable, efficient and effective implementation of the programmes to tackle dual disease burden.

Soon after independence, India established systems for assessment of per-capita income, purchasing power, and poverty, under nutrition and micronutrient deficiencies and vital rates for monitoring health status of the population. Data from these were used to assess interstate differences and time trends in these indices. Reliable data regarding prevalence of communicable diseases were not available through service reporting or surveillance; however based on research studies and sentinel surveillance estimates on prevalence of major communicable disease were made and used for planning appropriate intervention program. System for tracking overnutrition and risk of non-communicable diseases (NCD) was initiated only in nineties; even now the coverage under these is not as extensive as the coverage under the nutrition surveys. For studying time trends in prevalence of non-communicable diseases related to overnutrition, the country has to depend on research studies carried out in different parts of the country. The differences in methodology of data collection, criteria used for case definition and parameters reported make the task of comparison between studies and drawing conclusions regarding time trends a rather difficult exercise. However from the existing data, it is clear that there has been an increase in prevalence of diabetes, hypertension and cardiovascular diseases over the last two decades especially in urban affluent segments of population. These diseases appear a decade earlier, often in association with abdominal obesity as a part of metabolic syndrome. Prevalence of these diseases is lower in poorer segments and in rural areas, but case fatality rates may be higher in them because of poor access to health care.

National Cancer Registry Programme (NCRP) established hospital based and population based cancer registries in mid eighties and has been generating data on time trends and regional differences in cancer incidence, prevalence and mortality. Data from NCRP shows that India has the lowest cancer rates in the world in spite of relatively high tobacco use (nearly half of the cancers in men are tobacco related). Inspite of the increasing longevity there has not been any increase in over all cancer incidences over the last two decades. However, there have been changes in incidence of cancers in different sites eg decrease in prevalence of cancer cervix and increase in cancer breast.

As NCDs are emerging as major public health problems in India, ICMR under took an assessment of disease burden due to NCD in 2004 using DISMODII model. The major data sources utilised for this exercise were

- medical certification of causes of disease (MCCD)
- survey of causes of death (rural)
- cancer registry data
- review of 180 published articles,10 published reports, five unpublished reports and one personal communication dealing with diabetes, hypertension, ischemic heart disease, stroke and cancers

This publication provides the national level estimates of disease burden due to NCD in the first five years of the new millennium. Available data on time trends in prevalence of hypertension, diabetes, ischemic heart disease, stroke and cancers over the last two decades, ICMR estimates of the diseases burden due to NCD and the relationship between nutritional status and NCD are reviewed in the following pages.

Diabetes and impaired glucose tolerance (IGT)

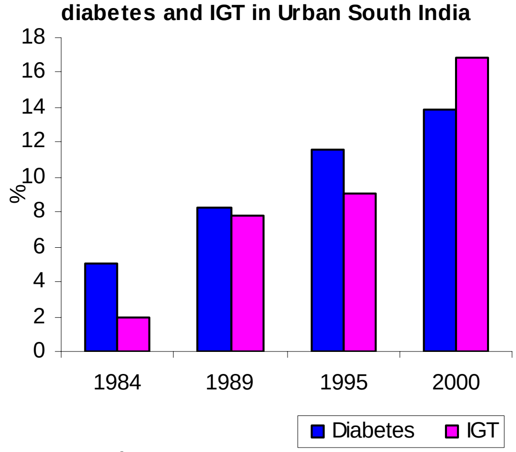
Community based studies on prevalence of diabetes in urban and rural areas have been conducted in all regions of the country (Table 8.3); all these studies show that over the last three decades there has been progressive increase in prevalence of diabetes both in urban and rural areas.

Table 8.3: Prevalence of Diabetes in India

Year	Author	Place	Prevalence (%)	
			Urban	Rural
1971	Tripathy et al	Cuttack	1.2	
1972	Ahuja et al	New Delhi	2.3	
1979	Johnson et al	Madurai	0.5	
1979	Gupta et al	Multicentre	3.0	1.3
1984	Murthy et al	Tenali	4.7	
1986	Patel	Bhadran		3.8
1988	Ramachandran	Kudremukh	5.0	
1989	Rao et al	Eluru		1.6
1989	Kodali et al	Gangavathi		2.2
1992	Ramachandran	Madras	8.2	2.4
1994	Rao et al	Multicentre		2.8
1995	Ramachandran	Madras	11.6	
1998	Yagnik	Pune		4.0

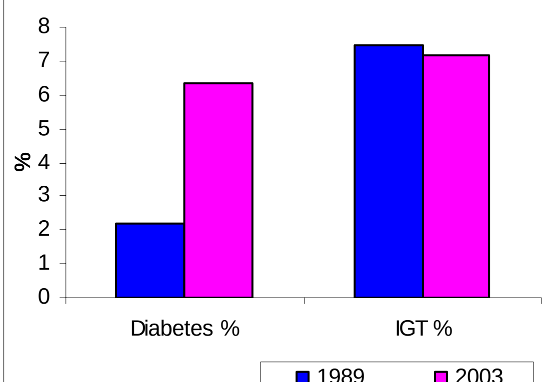
Data from Chennai on time trends in prevalence of diabetes and impaired glucose tolerance (IGT) in urban and rural urban population (Figure 8.7, 8.8) show that over the last two decades there has been a progressive steep increase in prevalence of diabetes and IGT

Figure 8.7: Increasing prevalence of diabetes and IGT in Urban South India



Source: Reference 8.7

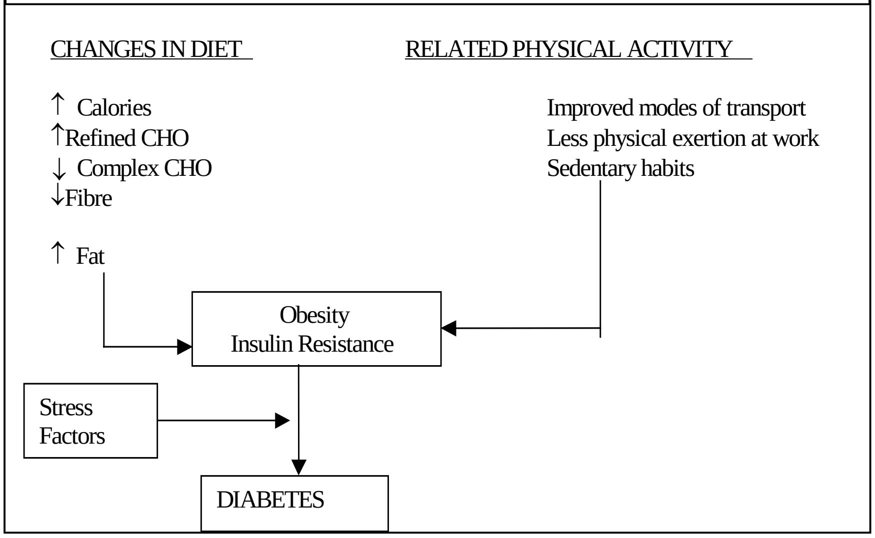
Figure 8.8:Temporal Changes in prevalence of diabetes and IGT in rural South India



Source: Reference 8.7

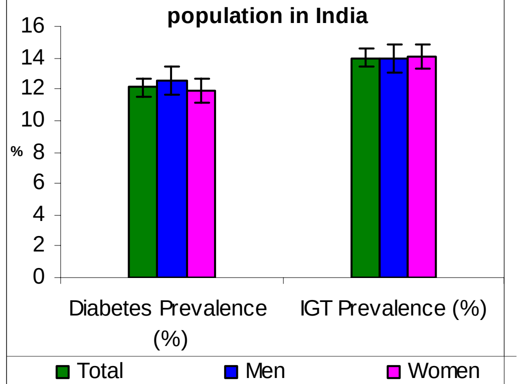
in urban and rural areas. Prevalence is higher in urban areas. Potential factors associated with higher urban prevalence of diabetes are shown in Figure 8.9

Figure 8.9 Factors associated with higher urban prevalence of diabetes



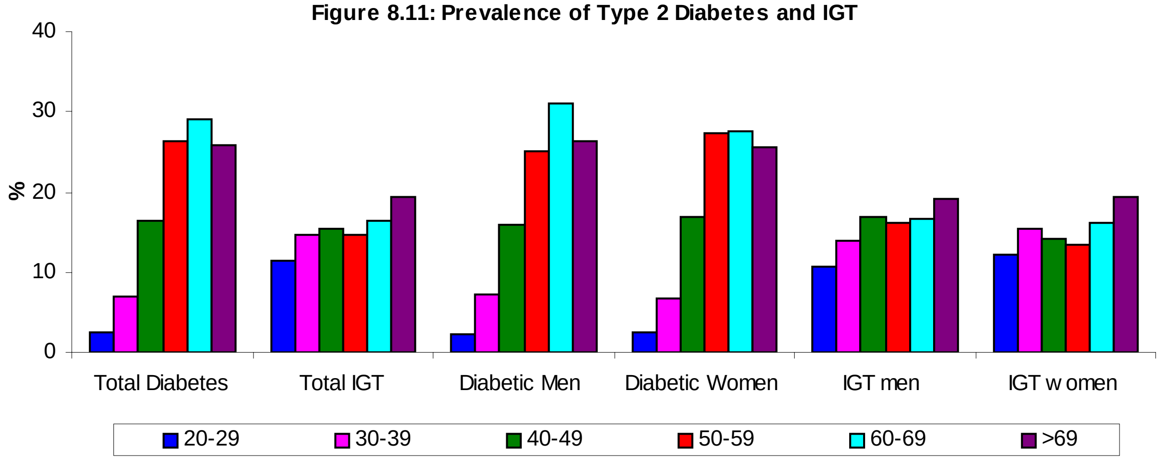
In 2000 Diabetes Epidemiology Study Group in India initiated a multicentre community based study using stratified random sampling method in Bangalore, Chennai, Mumbai, Delhi, Kolkata and Hyderabad to assess the prevalence of diabetes and IGT. Oral Glucose Tolerance Test (OGTT) was done in 11216 (5288 men; 5928 women) persons aged 20 years or above (representative sample drawn from all socio-economic strata). Information on socio-economic status, physical activity and anthropometric data were collected in all. Age-standardized prevalence of diabetes and impaired glucose tolerance is shown in Figure 8.10. There was progressive increase in prevalence of diabetes and IGT with age (Figure 8.11). Subjects under 40 years of age had a higher prevalence of impaired glucose tolerance than diabetes (12.8% vs 4.6%,

Figure 8.10: Prevalence (age-std) of diabetes and IGT in the urban population in India



Source: Reference 8.8

Figure 8.11: Prevalence of Type 2 Diabetes and IGT



Source: Reference 8.8

p<0.0001). In India diabetes is usually not listed as predisposing cause of death in death certificates; data from hospital-based studies suggest that major causes of death in patients with diabetes are infections, renal failure, IHD and stroke.

Summary results of ICMR's estimates of disease burden due to diabetes in 1998 and 2004 are presented in Table 8.4. ICMR estimates indicate that the number of cases will increase from 58.34 million in 1996 to 66.58 million in 2004 (37.73 million in urban and 28.85 million in rural). It is estimated that by 2004, diabetes accounts for 100 thousand deaths in a year; diabetes is responsible for 1.15 million Years of Life Lost (YLL) due to disease and 2.26 million Disability Adjusted Life Years (DALY). WHO burden of disease study (2000) estimated that DALY attributable to diabetes is 2.7 million; ICMR estimates for 2004 correspond closely to this estimate.

Table 8.5: Projections of disease burden due to diabetes

	1998			2004		
	Urban	Rural	Total	Urban	Rural	Total
Population (in000)	262,152	708,781	970,933	319,727	746,031	1,065,758
No. of cases of diabetes(000)	30,939	27,409,	58,348	37,734	28,849	66,583
No. of deaths due to diabetes	51,251	44,299	95,550	62,506	46,627	109,133
No. of YLL	529,959	484,983	1,014,942	646,351	510,471	1,156,822
No. of DALY	1,016,866	971,890	1,988,756	1,240,195	1,022,968	2,263,163

Source: Reference 8.6

Sequelae of diabetes

Diabetes is a risk factor for many non-communicable diseases. Odds ratio for some major NCD associated with diabetes is given in Table 8.5. ICMR has estimated that diabetes is directly responsible for 9% of acute myocardial infarctions, 4% of strokes, 2% neuropathies and 32 % of cataract cases. These figures represent independent contribution of diabetes to NCD. Since risk factors cluster together the contribution of diabetes in combination with other risk factors such as hypertension might be higher.

Hypertension

Hypertension is probably the most common non-communicable disease. It is the most common factor responsible for ischemic heart diseases (IHD) and cerebro-vascular accidents. In early seventies reported prevalence of hypertension was low-ranging between 2-5% of adult population. However over years reported hypertension rates have increased and currently in urban adults range between 5-15%. Yagnik et al have shown that even from early childhood some Indian children are prone to develop hypertension. Gopinath et al (1994) investigated in 10200 Delhi school children (male 5709 and female 4506) aged between 5-14 years and showed that hypertension existed even among them. Prevalence of

Table 8.4: Odds ratio/risk ratio associated with Diabetes and Hypertension as risk factor

		Diabetes		Hypertension	
Non Communicable disease	Author	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval
Ischemic Heart Disease	Gupta et al (1995)			2.19	1.4-3.4
Ischemic Heart Disease	Gupta et al (1997)			2.47	0.9-6.6
Cataract	Suresh et al (1998)	8.55	3.6-20.1	2.4	1.3-4.3
Peripheral Vascular Disease	Premlatha et al (2000)			2.7	0.9-7.3
Acute Myocardial Infection	Prem Pais et al (1996)	2.64		2.9	1.3-6.8
Stroke	Banerjee et al (2000)			3.6	3.2-4.
Stroke	Sridharan et al (1992)	1.7	1.1-2.6	3.9	2.5-6.2
Neuropathy	Ashok et al (2002)	1.4	1.2-6.4		

Source: Reference 8.6

hypertension increased with age, BMI, parental history of hypertension or diabetes. Community based study of hypertension (systolic BP >140 and diastolic BP more than 85) in 6543 persons in 15-25 age group in Delhi in 1985-

Table 8.6: Prevalence of Hypertension

			SBP>140/DBP>90 (%)				SBP>160/DBP>90 (%)			
Year	Author	Place	Urban		Rural		Urban		Rural	
			Males	Females	Males	Females	Males	Females	Males	Females
1959	Padmavathy et al	Delhi	2.0							
1990	Gopinath et al.	Delhi	11.7	13.7			11.7	13.7		
1992	Gopinath et al.	Delhi					7.7	4.1		
1993	Kutty et al.	Kerala			18.8				17.9	
1994	Gupta et al.	Rajasthan			24.0	17.0			8	6.0
1995	Gupta et al.	Rajasthan	30.0	34.0			11.0	12.0		
1995	Singh et al	Trivandrum					18.4			
1997	Gopinath et al.	Delhi					10.8	12.3	4.1	3.3
1997	Gupta et al.	Rajasthan					10.3	2.2	7.6	6.2
1998	Singh et al	Trivandrum, Bombay, Calcutta, Nagpur		25.6				14.8		
2000	Gupta et al.	Rajasthan	29.5	33.5	23.7	16.9				
2002	Gupta et al.	Rajasthan	36.4	37.5						
2004	Hazarika et al.	Assam			33.2	33.4				
2005	Prabhakaran et al	Delhi	30.0							

***Sample Size**: Padmavathy et al, 1959: 1642;Gopinath et al, 1990: 6372(Males), 7351 (Females); Gopinath et al, 1990: 610(Males), 707; Kutty et al, 1993: 1130; (Females); Gupta et al., 1994: 1982 (rural males), 1166(rural females); Gupta et al, 1995: 1415 (males) 797(females); Gopinath etal.5998 (Urban males), 7136 (Urban females), 616 (Rural males), 1116 (Rural females), Singh et al, 1995: 1497; Gupta et al., 1997: 1415(urban males), 797 (urban females); Singh et al, 1998: 3714; Gupta et al.,2000: 1415(urban males), 797 (urban females), 1982 (rural males), 1166(rural females). Gupta et al., 2002: 550 (urban males), 573 (urban females); Hazarika et al, 2004: 3180; Prabhakaran et al., 2005: 2122.*

87 showed over all prevalence of hypertension was 3.9/1000[7.7](Table 8.6).

Table 8.7: Age and sex-wise prevalence rate of hypertension /1000

	Male			Female			Total		
Age (in Yr)	No examined	Hypertensive	PR±SE	No examined	Hypertensive	PR±SE	No examined	Hypertensive	PR±SE
15-19	1744	47	26.9±4.0	1874	27	14.4±3.7	3618	74	20.5±2.0
20-24	1342	80	59.6±8.2	1583	48	30.3±6.7	2925	128	43.8±6.6
Total	3086	127	41.2±5.0	3457	75	21.7±4.0	6543	202	30.9±3.6

PR, Prévalence rate /1000, SE, Standard Error; Source: Référence 8.10
Survey: Urban Delhi; Sample Size: 6543

Some of the major community based studies on hypertension over the last two decades is shown in Table 8.7. It is obvious that over the past two decades there has been an increase in the prevalence of hypertension among men and women living in urban and rural areas. Prevalence in rural areas is lower than urban areas.

Burden of disease

ICMR undertook an assessment of burden of disease due to hypertension (systolic BP> 140mmHg and / or diastolic BP >90 mmHg) based on studies carried out between 1995 and 2002 in different regions in urban and rural areas (Table 8.8) Meta analysis of data indicated that for the country prevalence rate of hypertension was 157.4/1000.

Table 8.8: Prevalence of Hypertension

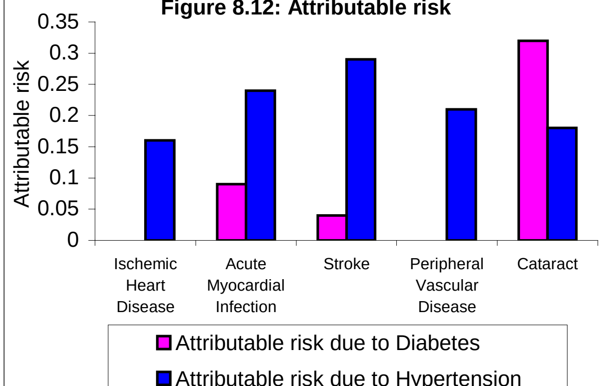
Year	Author	Age gp (yrs)	PR/ 1000 Urban	PR/ 1000 Rural
1995	Gupta et al	20+	109.1	273.0
1995	Beegom et al	25-64	184.0	
1998	Chadha et al	25-69	115.9	35.8
1999	Thakur et al	30-80	131.1	
2001	Misra et al	18+	116.0	
2001	Mohan et al	20-75	140.0	
2002	Swami et al	65+	580.0	
2002	Ahlawat et al	35+	449.0	
2002	Reddy et al	20+		280.0

Source: Reference 8.6
Sample Size: Gupta et al, 1995: 2212 (Urban), 1982 (Rural); Beegom et al, 1995: 1497; Chadha et al, 1998: 13134 (Urban), 1732 (Rural); Thakur et al, 1999: 1727; Misra et al, 2001: 532; Mohan et al, 2001: 1175; Swami et al, 2002: 362; Ahlawat et al, 2002: 937, Reddy et al, 2002: 3307

Health Consequences of Hypertension

ICMR estimated the data on odds ratio/risk ratio of NCDs associated with hypertension; 16% of ischaemic heart disease, 21% of peripheral vascular diseases, 24% of acute myocardial infarctions (AMI) and 29% strokes could be attributed to hypertension. ICMR computed population attributable risk due to diabetes and hypertension for a range of non-communicable diseases (Figure 8.12). Since both hypertension and diabetes often coexist the actual risk of various non-communicable diseases due to both these might be higher than the risk for either individually.

Figure 8.12: Attributable risk



Source: Reference 8.6

Ischaemic heart diseases

Ischaemic heart disease (IHD) is becoming an important cause of death in India. Some of the major studies on prevalence of IHD in urban and rural areas from different parts of India are shown in Table 8.9. Over the last three decades there has been a progressive increase in prevalence of IHD; the increase has been steeper during the last decade especially in urban areas. This has been mainly attributed to life style changes, which have affected people in urban areas more than in rural areas.

Table 8.9: Prevalence of IHD

Year	Author	State	Prevalence of CHD (%)	
			Rural	Urban
1959	Padmavathy et al	Delhi		1.0
1968	Sarvotham et al	Haryana		6.6
1975	Gupta et al	Haryana	2.0	4.5
1990	Chaddha et al	Delhi		9.7
1995	Begom et al	Kerala		13.9
1995	Gupta et al	Rajasthan	3.8	7.6
1998	Ramachandran et al	Tamil Nadu		14.3
2000	Mohan et al	Tamil Nadu		11.0
2002	Gupta et al	Rajasthan		8.2

Sample Size: Padmavathy et al, 1959: 1642; Sarvotham et al, 1968: 1331; Gupta et al,1975: 1504; Chaddha et al, 1990: 13,723; Begon et al, 1995: 460; Gupta et al, 1995: 2212; Ramachandran et al, 1998: 953; Mohan et al, 2000: 1175; Gupta et al, 2002: 1123.

The ICMR undertook a meta- analysis of the results of studies carried out in 1990s and upto 2000 in which IHD was diagnosed on the basis of

- history of documented angina or infarction and previous diagnosed CHD
- affirmative response to Rose Questionnaire,
- ECG changes namely Minnesota codes 1-1, 4-1, 5-9, 5-2 or 9-2. Data on prevalence rates for IHD from the studies used in the meta-analysis is given in Table 8.10

Table 810: Prevalence of Ischaemic heart disease in India

Year	Author	Age group (years)	PR/ 1000 (Urban)			PR/ 1000 (Rural)		
			Male	Female	Total	Male	Female	Total
1990	Chaddha et al	25-64	73.4	81.9	77.9	7.4	23.1	17.5
1989-94	ICMR, New Delhi	35-64	78.0	76.0	76.8	50.0	56.0	53.4
1989-94	ICMR, Vellore	30-60	37.4	42.0	40.1	15.1	15.2	15.1
1997	Gupta et al	20+				34.0	37.0	35.0
2001	Mohan et al	25-64	42.5	38.1	40.0			
2002	Gupta et al	20+	61.8	101.2	77.9			

Source: Reference 8.6
Sample Size: Chaddha et al, 1990: 13724; ICMR, New Delhi, 1989-94: 3019; ICMR, Vellore, 1989-94: 2649; Gupta et al, 1997: 3148; Mohan et al, 2001: 1175; Gupta et al, 2002: 1123

Age specific prevalence rates of IHD among males and females obtained by pooling the data of these five studies (separately for urban and rural areas) is given in the Table 811**.** There is a steep increase in prevalence of IHD in both sexes in forties. Prevalence rates in women are comparable to or higher than prevalence rates in men.

Table 811: Age specific prevalence rate derived from the studies selected for I.H.D

	Urban						Rural					
	Male			Female			Male			Female		
Age Group	Sample Size	No. of cases	PR/ 1000	Sample Size	No. of cases	PR /1000	Sample Size	No. of cases	PR/ 1000	Sample Size	No. of cases	PR/ 1000
20-24	125	1	8.0	147	1	6.8	285	5	17.5	191	2	10.5
25-29	1374	27	19.6	1677	44	26.2	512	7	13.7	624	9	14.4
30-34	1584	27	17.1	2091	48	22.9	888	11	12.4	1302	14	10.8
35-39	1459	63	43.2	1796	87	48.4	1011	19	18.8	1376	22	15.9
40-44	1418	67	47.3	1549	102	65.8	836	15	17.9	1033	24	23.2
45-49	1093	91	83.2	1234	130	105.4	724	15	20.7	954	37	38.8
50-54	1053	98	93.1	1162	130	111.9	675	21	31.11	722	36	49.9
55-59	985	160	162.4	1054	161	152.8	937	25	26.7	825	42	50.9
60+	835	145	173.6	941	165	175.4	591	42	71.1	519	35	67.4

Source: Reference: 8.6. PR/1000-Prevalence Rate per 1000

Indices of burden of diseases for IHD in India are presented in Table 8.12. Estimated prevalence rates were 64.4/1000 in urban and 25.3/1000 in rural population. The projections of burden of disease due to IHD in India for the years 1998 and 2004 are given in Table 813. Number of cases of IHD is estimated to increase from 34.78 million in 1998 to about 39.43 million (20.58 million cases in urban areas and 18.85 million in rural areas) by 2004. In 2004, the total number of DALYs attributable to IHD is estimated to be 16 million.

Table 812: Indices of Burden of Diseases for IHD

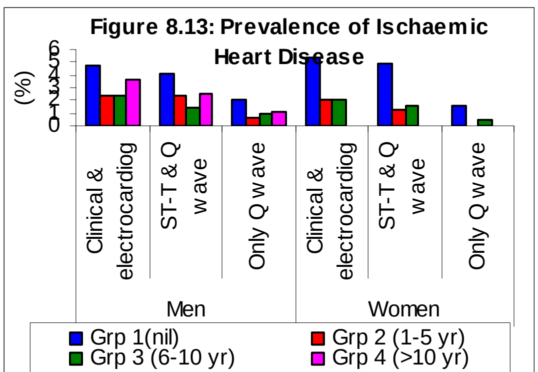
	Ischaemic Heart Disease	
	Urban	Rural
Prevalence rate / 1000	64.4	25.3
Death rate/1000	0.8	0.4
YLL per 100,000	728.7	351.5
DALY per 100,000	2703.4	986.2

Source: Reference 8.6

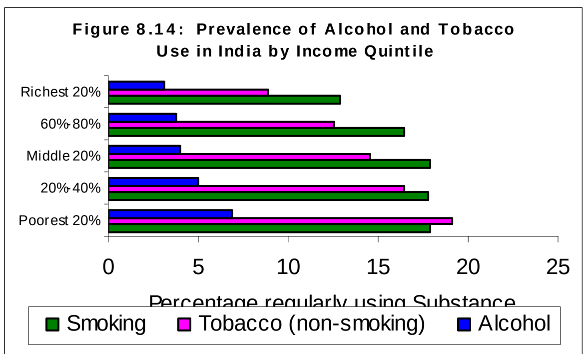
Table 813: Projections of disease burden due to I.H.D

	1998			2004		
	Urban	Rural	Total	Urban	Rural	Total
Population (in thousands)	262,152	708,781	970,933	319,727	746,031	1,065,758
No. of cases of diabetes	16,874,724	17,910,896	34,785,620	20,580,827	18,852,203	39,433,030
No. of deaths due to diabetes	207,548	256,014	463,562	255,782	298,412	554,194
No. of YLL	1,991,451	2,470,149,	4,461,600	2,329,851	2,622,299	4,952,150
No. of DALY	7,388,453	6,930,974	14,319,427	8,643,450	7,357,358	16,000,808

Source: Reference 8.6



Source: Reference 8.12



Source:Reference 8.13

It is often assumed that ischemic heart disease affects mainly the well to do. However several studies suggest that, poor is also vulnerable to IHD. A community based cross sectional survey looked at prevalence of coronary heart disease and coronary risk factors in Rajasthan in relation to educational level in 3148 residents aged over 20 (1982 men, 1166 women) residing in three villages.

The prevalence of coronary heart disease (diagnosed by electrocardiography) showed an inverse relation with education in both sexes (Figure 8.13) prevalence of coronary risk factors smoking and hypertension was higher among uneducated. NSSO surveys have documented higher prevalence of tobacco use among the poorer segments of the population (Figure8.14) lack of physical exercise and stress of life are common among the urban poor with sedentary jobs. It is therefore not surprising that there is a high prevalence of hypertension and IHD among poor also. Results of some of the studies carried out in Delhi also show that that prevalence of hypertension and IHD is high among poorer segments of population in urban areas. Some of the data indicate that prevalence of untreated / poorly controlled severe hypertension and IHD were higher among low income groups perhaps because of poor access to health care; some of the data also indicate that IHD associated with morality rates are higher among the poor (Srinath Reddy-personal communication). It is therefore important to recognize that in the Indian context it is not only the urban affluent who are at risk of hypertension, and IHD. Programmes aimed at life style modification of all segments of population are of critical importance for prevention of IHD. Simultaneously facilities for screening population groups for detection of IHD and for management of those with IHD have to be built up.

Stroke

WHO defined stroke as 'rapidly developed clinical signs of focal disturbances of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin'. The 24 hours threshold in the definition excludes transient ischaemic attacks (TIA). Stroke is the acute severe manifestation of cerebro- vascular disease and is one of the leading causes of mortality and morbidity in developed countries. ICMR under took a Meta analysis of stroke from well-designed studies with adequate sample size (Table8.14) Weighted average of stroke prevalence rate was 1.54/1000. Estimated prevalence of stroke is lower in India as compared to developed countries. However with increasing longevity it may increase proportionally .The prevalence rates, stroke specific mortality rates,

Table 8.14:Prevalence of Stroke

Year	Author	Age group (years)	PR/ 1000	
			Urban	Rural
1985	Kapoor et al	15+	1.62	
1987	Gauri Devi et al	20+	1.18	0.98
1989-90	Das et al	20+	2.68	
1990	Koul et al	15+	2.44	
1997	Dhamija et al	20+	0.92	
2001	Banerjee et al	All age	1.47	

Source: Reference 8.6 : Sample Size: Kapoor et al, 1985: 26450; Gauri Devi et al, 1987: 18618 (Urban), 8160 (Rural); Das et al, 1989-90: 17526; Koul et al, 1990: 37226; Dhamija et al, 1997: 24949; Banerjee et al, 2001: 50293 case fatality rates, all cause mortality rates, and age distribution of population (1998) were given as an input for DISMOD analysis of data for stroke. The figures for YLL per hundred thousand are 496.3, and DALY per hundred thousand is 597.6 (Table 8.15).

Table 8.15:Indices of Burden of Diseases for Stroke	
Prevalence rate/1000	1.54
Death rate/1000	0.6
YLL per 100,000	496.3
DALY per 100,000	597.6

Projections of burden of disease due to stroke in India for the years 1998 and 2004 are given in Table 8.16.The total number of stroke cases in India in year 2004 is expected to be 1.64 million. The total number of DALYs attributable to stroke are estimated to be 6.37 million for the year 2004 in India.

Table 8.16Projections of disease burden due to Stroke

	1998	2004
Population (in thousands)	970,933	1,065,758
No. of cases of diabetes	14,95,237	16,41,267
No.of deaths due to diabetes	5,93,362	6,39,455
No. of YLL	48,18,740	52,89,357
No. of DALY	58,02,295	63,68,970

Source: Reference 8.6

Cancers

National Cancer Registry Programme (NCRP) of India estimated that annually there are 7, 00,000 new cases of cancer and that there are about 2 million cases of cancer in the country. In India age adjusted cancer incidence varies between 91.9-120.9/ 100,000 in urban males and 108.7-134.8/100,000 in urban females. Cumulative incidence rate in selected population based cancer registries in India is given in Table 8.17.

Table 8.17:Cumulative incidence rate, cumulative risk and possibility of one in number of persons developing cancer of all sites (ICD9: 140-208); Calculation based on age specific rates from 0-64 and 0-74 years of age

Registry	Cumulative rate (%)		Cumulative risk (%)		Possibility of one in no. of persons developing cancer	
	Males	Females	Males	Females	Males	Females
0-64 yrs						
Bangalore	8.06	10.80	7.75	10.24	13	10
Barshi	4.05	5.04	3.97	4.91	25	20
Bhopal	10.49	10.80	9.96	10.24	10	10
Chennai	10.11	11.69	9.62	11.03	10	9
Delhi	10.45	12.21	9.92	11.49	10	9
Mumbai	9.37	11.17	8.94	10.57	11	9
0-74 yrs						
Bangalore	11.08	13.39	10.49	12.53	10	8
Barshi	5.10	5.86	4.97	5.69	20	18
Bhopal	15.34	12.50	14.22	11.75	7	9
Chennai	13.19	14.35	12.35	13.37	8	7
Delhi	13.97	15.23	13.04	14.13	8	7
Mumbai	13.98	14.82	13.04	13.77	8	7

Source: Reference 8.5

Cumulative incidence rates estimated from age specific rates for 5-year age groups for 0-74 years in selected countries is given in Table 8.18. Over all cancer incidences in India is among the lowest in the world. Incidence of cancers reported by the urban cancer registries are similar to cancer incidence among Indians in Singapore and are substantially lower than cancer rates reported in other countries. Cancer epidemiologists have been exploring the protective role of habitual Indian diet with high fiber, phytate and spices (including turmeric) in the observed low prevalence of malignancies in India. Cancer associated with tobacco use account for 36-55% of all of cancers in men and 10-16% of cancers in women. Anti tobacco education and reduction in tobacco use can result in further substantial reduction in cancer rates in India. Data on time trends in prevalence of cancers (all sites) from the six population based cancer registries is shown in Table 8.19. It is obvious that unlike CVD and diabetes, there has not been any increase in over all cancer

Table 8.18 Cumulative incidence rates in selected registries across the world

Registry	Cumulative incidence rate (0-74 yrs)	
	Males	Females
Singapore – Indians	10.43	15.40
US: SEER		
White	44.58	32.80
Black	61.33	31.63
Japan – Osaka	31.98	17.09
Canada	39.79	29.46
United Kingdom		
England	35.97	28.92
Scotland	44.92	35.69
Australia – Victoria	41.85	29.85

Source: Reference 8.5

Table 8.19 Time trends in prevalence of Cancer (all sites) age adjusted rates per 100,000

	Bangalore		Barshi		Bhopal		Chennai		Delhi		Mumbai	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1990	102.1	128.6	51.0	56.4	98.1	92.7	103.4	121.5	114.6	130.7	124.8	119.2
1991	103.9	133.5	48.0	63.3	101.4	92.2	105.7	116.9	125.7	137.5	115.8	121.1
1992	102.4	121.0	47.7	61.5	99.8	95.7	100.3	114.7	127.6	143.5	115.9	123.5
1993	105.8	132.6	51.8	55.1	100.3	93.5	103.7	111.3	127.0	135.5	115.6	121.0
1994	90.4	113.8	39.0	58.1	100.6	94.0	105.4	112.0	116.6	135.6	113.2	117.1
1995	95.2	119.5	44.6	56.8	100.1	88.8	103.1	115.4	122.7	128.1	110.7	116.1
1996	85.6	106.3	43.6	52.4	100.9	92.1	121.1	137.4	124.8	119.2	114.5	116.7
1997-98	91.9	114.8	43.9	51.7	116.7	109.0	111.3	125.2	120.9	134.8	117.3	127.9

Source: Reference 8.5

Table 8.20:Age specific, crude and age adjusted incidence rates per 100,000 person years by sex in Mumbai, for cancer at all sites

	Observation period				Prediction period		
	1968-72	1973-77	1978-82	1983-87	1988-92	1993-97	1999-2001
Male							
Crude rate	68.6	68.1	65.8	68.7	70.0	72.1	74.3
Age adjusted rate	140.1	131.5	119.0	119.8	113.8	109.4	107.2
Female							
Crude rate	65.7	69.9	68.1	79.2	74.3	77.9	83.9
Age adjusted rate	121.7	121.3	110.5	117.4	106.3	105.1	107.4

Source: Reference 8.14

prevalence over time.

Bombay cancer registry has population-based data on incidence of cancer from sixties. Analysis of time trends from sixties till 1999 confirm that though there have been massive changes in prevalence of some cancers (reduction in cancer cervix, increase in cancer breast) there has been no increase in overall prevalence of cancers over the last five decades (Table 8.20).

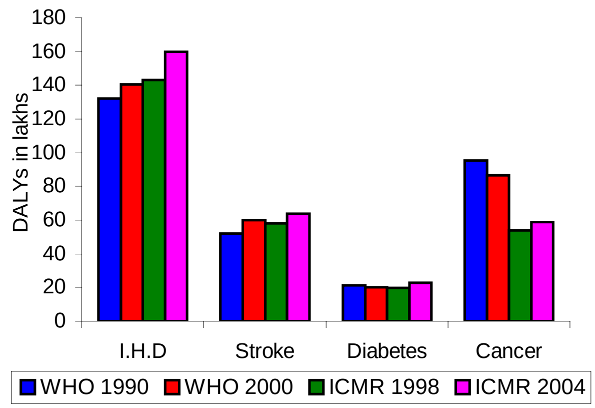
Table 8.21:Projection of Burden of disease due to Cancer in 2004

	Male	Female
Population (in thousands)	550,404	515,354
No. of cases of cancer	390,809	428,545
No. of death	138,622	121,192
No. of YLL	13,96,508	16,17,787
No. of DALY	25,48,392	33,48,444

Source: Reference 8.6

ICMR estimate of burden of disease due to cancer (all sites) based on data from population based cancer registries of NCRP are given in Table 8.21. The number of cases of cancer in 2004 is expected to be 820,000. The total number of DALYs due to cancer in India in the year 2004 is estimated as 5.9 million. This estimate is low as compared to the estimate of 8.6 million DALY reported by WHO burden of disease study (2000) (Figure 8.15). For obtaining cancer disease burden estimates ICMR has used the mortality rates obtained by pooling the data of all six population based registries. However, if cancer mortality rates reported by Chennai Registry (which are highest cancer mortality) were used the figures become comparable to the figures reported by WHO burden of disease study.

Figure 8.15: WHO and ICMR estimates/projections of Burden of Disease



Source: Reference 8.6

Cancer Mortality

The cancer mortality computed from data from six populations based cancer registries, Medical certification of causes of death and Survey of causes of death (rural) are shown in Table 8.22. Inspite of the differences in methodologies used the results are similar.

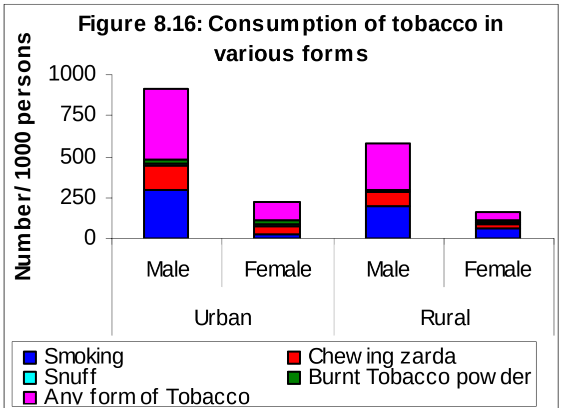
Table 8.22: Cancer mortality rates in 1998

	Male	Female
1. Rate/100,000 by National Cancer Registry Programme		
Banglore	19.0	17.4
Barshi	34.4	32.2
Bhopal	12.1	8.3
Chennai	47.9	42.2
Delhi	16.2	14.8
Mumbai	35.0	37.9
All registries	25.19	23.5
2. Medical Certification of Cause of Death (MCCD)		
Cancer death rate/100,000	32.2	30.0
Cancer deaths as % of total deaths	3.0	3.4
3. Survey of Cause of Death-rural data (1997)		
Cancer deaths as % of total deaths (Total)	4.3	

Source: Reference 8.6

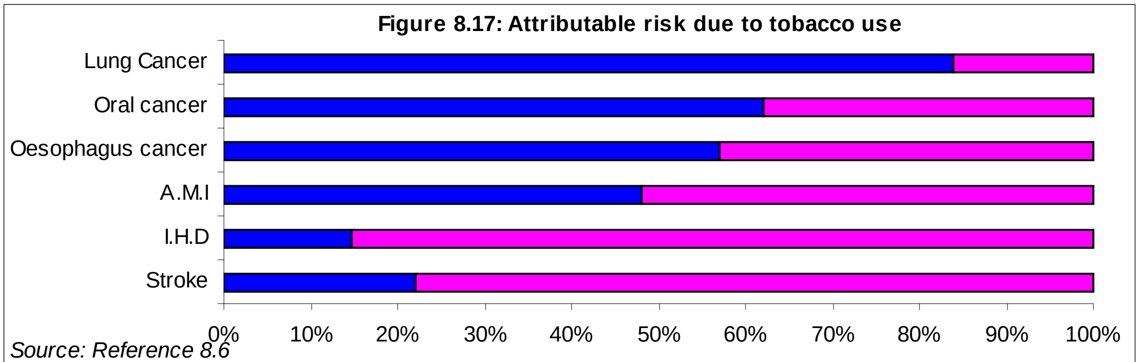
Tobacco as a risk factor for NCD in India

Data on Tobacco use in the country is available from 50th round NSSO survey is shown in Figure 8.16. Prevalence rates of tobacco use in urban areas are 43% among males and 7% among females. In rural areas the prevalence rates for tobacco use are 64.4% among males and 15.5% among females. The overall prevalence rates of tobacco use in the country (rural and urban) are 35.5%.



Source: Reference 8.6

Risk ratio associated with tobacco use for non-communicable diseases are presented in Figure 8.17; 15% of IHD cases, 48% of AMI, 22% of stroke cases, are attributable to use of tobacco. Tobacco use is the major factor responsible for lung cancer, oral cancers and cancer esophagus. Tobacco control strategies are therefore expected to result in significant reduction of these NCD.



Source: Reference 8.6

Interventions to improve health status

As the country undergoes demographic and epidemiological transition, it is likely that larger investments in health will be needed even to maintain the current health status because tackling resistant infections and non-communicable diseases will inevitably lead to escalating health care costs. Last two decades have witnessed explosive expansion in expensive health care related technologies, broadening diagnostic and therapeutic avenues. Increasing awareness and rising expectations to access these have widened the gap between what is possible and what is affordable for the individual or the country. Policy makers and programme managers realize that in order to address the increasingly complex situation regarding access to good quality care at affordable costs, it is essential to build up an integrated health system with appropriate screening, regulating access at different levels and efficient referral linkages. However, both health care providers and health care seekers still feel more comfortable with the one to one relationship with each other than with the health system approach.

Another problem is the popular perception that curative and preventive care competes for available resources, with the former getting preference in funding. Efforts to convince the public that preventive and curative care are both part of the entire spectrum of health care ranging from health promotion, specific protection, early diagnosis and prompt treatment, disability limitation and rehabilitation and that to improve the health status of the population both are equally essential have not been very successful. Traditionally health service (both government and private) was perceived as a social responsibility albeit a paid one. Growing commercialisation of health care and medical education over the last two decades has eroded this commitment, adversely affecting the quality of care, trust and the rapport between health care seekers and providers.

The existing health system suffers from inequitable distribution of institutions and manpower. Even though the country produces over 25,000 doctors in modern system of medicine and about 18,000 of ISM&H practitioners and paraprofessionals annually, there are huge gaps in critical manpower in institutions providing primary healthcare, especially in the remote rural and tribal areas where health care needs are the greatest. Some of the factors responsible for the poor functional status of the system are:

- mismatch between personnel and infrastructure;
- lack of Continuing Medical Education (CME) programmes for orientation and skill upgradation of the personnel;
- lack of appropriate functional referral system;
- absence of well established linkages between different components of the system.

In order to address these problems the centre and the states have embarked on structural and functional health sector reforms. However, the content and quality of reforms are sub-optimal and the pace of implementation is slow.

The focus during the Tenth Plan was on

- reorganisation and restructuring the existing government health care system including the ISM&H infrastructure at the primary, secondary and tertiary care levels with appropriate referral linkages. These institutions will have the responsibility of taking care of all the health problems (communicable, non-communicable diseases) and deliver reproductive and child health (RCH) services for people residing in a well-defined geographic urban and rural area;
- development of appropriate two-way referral systems utilising information technology (IT) tools to improve communication, consultation and referral right from primary care to tertiary care level;
- building up an efficient and effective logistics system for the supply of drugs, vaccines and consumables based on need and utilisation;

- horizontal integration of all aspects of the current vertical programmes including supplies, monitoring, information education communication and motivation (IECM), training, administrative arrangements and implementation so that they are integral components of health care; there will be progressive convergence of funding, implementation and monitoring of all health and family welfare programmes under a single field of administration beginning at and below district level;
- improvement in the quality of care at all levels and settings by evolving and implementing a whole range of comprehensive norms for service delivery, prescribing minimum requirements of qualified staff, conditions for carrying out specialised interventions and a set of established procedures for quality assurance;
- evolving treatment protocols for the management of common illnesses and diseases; promotion of the rational use of diagnostics and drugs;
- evolving, implementing and monitoring transparent norms for quality and cost of care in different health care settings;
- exploring alternative systems of health care financing including health insurance so that essential, need based and affordable health care is available to all;
- improving content and quality of education of health professionals and para professionals so all health personnel have the necessary knowledge, attitude, skills, programme and people orientation to effectively take care of the health problems, and improve the health status of the people;
- skill up gradation of all health care providers through CME and reorientation and if necessary redeployment of the existing health manpower, so that they can take care of the existing and emerging health problems at primary, secondary and tertiary care levels;
- research and development to solve major health problems confronting the country including basic and clinical research on drugs needed for the management of emerging diseases and operational research to improve efficiency of service delivery;
- building up a fully functional, accurate Health Management Information System (HMIS) utilising currently available IT tools; this real time communication link will send data on births, deaths, diseases, request for drugs, diagnostics and equipment and status of ongoing programmes through service channels within existing infrastructure and manpower and funding; it will also facilitate decentralized district based planning, implementation and monitoring;
- building up an effective system of disease surveillance and response at the district, state and national level as a part of existing health services;
- strengthening and sustaining Civil Registration, Sample Registration System; improving medical certification of death so that information on specific causes of death throughout the country are available; use these data in district based planning and monitoring; when sustained over the next two decades, this system will provide valuable insights into inter-district, inter-

state, regional variations and time trends so that district health system could be modified to cope with the changing disease burden;

- improving the efficiency of the existing health care system in the government, private and voluntary sectors and building up appropriate linkages between them;
- mainstreaming ISM&H practitioners, so that in addition to practising their system of care, they can help in improving the coverage of the National Disease Control Programmes and Family Welfare Programme;
- increasing the involvement of voluntary and private organisations, self-help groups and social marketing organisation in improving access to health care;
- improving inter sectoral coordination;
- devolution of responsibilities and funds to panchayati raj institutions (PRIs); besides participating in area-specific planning and monitoring, PRIs can help in improving the accountability of the public health care providers, sort out problems such as absenteeism, improve inter-sectoral co-ordination and convergence of services;
- strengthening programmes for the prevention, detection and management of health consequences of the continuing deterioration of the ecosystems; improving the linkage between data from ongoing environmental monitoring and that on health status of the people residing in the area; making health impact assessment a part of environmental impact assessment in developmental projects;
- improving the safety of the work environment in organized and unorganised industrial and agricultural sectors especially among vulnerable groups of the population;
- developing capabilities at all levels, for emergency and disaster prevention and management; evolving appropriate management systems for emergency, disaster, accident and trauma care at all levels of health care;
- effective implementation of the provisions for food and drug safety; strengthening the food and drug administration both at the centre and in the states;
- screening for common nutritional deficiencies especially in vulnerable groups and initiating appropriate remedial measures; evolving and effectively implementing programmes for improving nutritional status, including micronutrient nutritional status of the population.

Tenth Five Year Plan had indicated, “in view of the importance of health as a critical input for human development there will be continued commitment to provide:

- essential primary health care, emergency life saving services, services under the National Disease Control Programmes and the National Family Welfare Programme totally free of cost to all individuals and
- essential health care service to people below poverty line based on their need and not on their ability to pay for the services.

- appropriate interventions to ease the existing funding constraints at all levels of health system and to promote the complete and timely utilization of allocated funds.

Different models of health care financing at the individual, family, institution and state level will be evolved, implemented and evaluated. Models found most suitable for providing essential health care to all will be replicated.

Many of these activities have been taken up through the National Rural Health Mission/RCH2 programmes and the ongoing urban health initiatives. It is expected that the huge task during the Eleventh Plan will be to complete the unfinished agenda of the Tenth Five Year Plan /National Health Policy.

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9. NATIONAL RESPONSE TO NUTRITION PROBLEMS

9. NATIONAL RESPONSE TO NUTRITION PROBLEMS

In 1950 India faced two major nutritional problems. One was the threat of famine and the resultant acute starvation due to low agricultural production and the lack of an appropriate food distribution system. The other was chronic energy deficiency due to:

- low dietary intake because of poverty and low purchasing power;
- high prevalence of infection because of poor access to safe-drinking water, sanitation and health care;
- Poor utilization of available facilities due to low literacy and lack of awareness.

The country adopted multi-sectoral, multi-pronged strategy to combat these problems and to improve the nutritional status of the population. Article 47 of the Constitution of India states that, "the State shall regard raising the level of nutrition and standard of living of its people and improvement in public health among its primary duties". Successive Five-Year Plans laid down the policies and strategies for achieving these goals.

Progress achieved in seven five-year plan periods was reviewed in 1991-92. It was obvious that threat of famine has disappeared. There was a significant decline in severe forms of undernutrition. However mild and moderate undernutrition and micronutrient deficiencies were widely prevalent.

India prepared and adopted the National Nutrition Policy in 1993. The Policy advocated a comprehensive inter-sectoral strategy between 14 sectors (which directly or indirectly affect dietary intake and nutritional status of the population) for combating multi-faceted problem of undernutrition and improving nutritional status for all sections of the society. The Policy sought to strike a balance between the short-term direct nutrition interventions and long-term institutional/structural changes to create an enabling environment and necessary conditions for improving nutritional and health status. The Policy also set goals to be achieved by each sector by 2000. A National Plan of Action was drawn up and approved in 1995. In order to achieve inter-sectoral coordination at the highest level, National Nutrition Council was formed under the chairmanship of the Prime

Text Box 9.1: Initiatives to improve nutritional status of the population between 1950-1990 include:

- Increasing food production- building buffer stocks
- Improving food distribution- building up the Public Distribution System (PDS)
- Improving household food security through
  - Improving purchasing power
  - Food for work programme
  - Direct or indirect food subsidy
- Food supplementation to address special needs of the vulnerable groups-Integrated Child Development Services (ICDS), Mid-Day Meals
- Nutrition education especially through Food and Nutrition Board (FNB) and ICDS
- Efforts of the health sector to tackle
  - Adverse health consequences of undernutrition
  - Adverse effects of infection and unwanted fertility on the nutritional status
  - Micronutrient deficiencies and their health consequence

Source: Reference 9.5

Minister with Planning Commission as the secretariat for the Council. The Council was to act as the national forum for policy and strategy formulation, review of performance and mid course corrections. A similar set up was envisaged at the state level. Inter-departmental coordination committee under the Department of Women and Child Development was to coordinate and review the implementation of the nutrition programmes.

Review of the situation in 2000-01 prior to the formulation of the Tenth Five Year Plan showed that while under-nutrition and micronutrient deficiencies continued to be major public health problems, over nutrition and obesity are also emerging as a major problem in many states. Taking cognizance of this Tenth Plan envisaged a paradigm shift from:

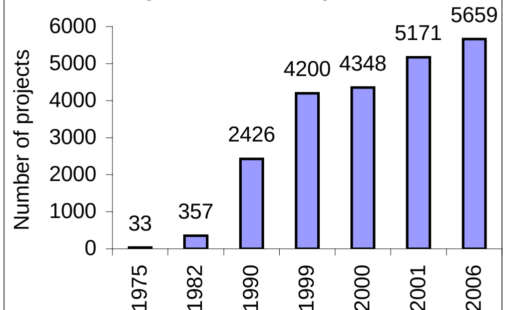
- household food security and freedom from hunger to nutrition security for the family and the individual;
- untargeted food supplementation to screening of all the persons from vulnerable groups, identification of those with various grades of under-nutrition and appropriate management;
- lack of focused interventions on the prevention of over-nutrition to the promotion of appropriate lifestyles and dietary intakes for the prevention and management of over-nutrition and obesity.

INTEGRATED CHILD DEVELOPMENT SERVICES (ICDS)

India, home to the largest child population in the world, formulated the National Policy on Children in August 1974 and in 1975 launched the Integrated Child Development Services (ICDS) with the following objectives:

- to improve the health and nutrition status of children in the 0-6 age group by providing supplementary food and coordinating with state health departments to ensure the delivery of the required health inputs;
- to provide conditions necessary for pre-school children's psychological and social development through early stimulation and education;
- to provide pregnant and lactating women with food supplements;
- to enhance the mother's ability to provide proper child care through health and nutrition education;
- to achieve effective coordination of policy and implementation among the various departments to promote child development.

Figure 9.1: ICDS Expansion



Source: Reference 9.5

ICDS is one of the most comprehensive programmes for providing integrated health, nutrition and education services; supplementary nutrition, non-formal pre-school education, immunization, health check-up, referral services, nutrition and health education. The initial

Table 9.1: Services provided and the target groups of the ICDS programme		
Services	Target Group	Services Provided By
Supplementary Nutrition	Children < 6 yrs Pregnant and lactating mothers	AWW & AWH
Immunization*	Children < 6 yrs Pregnant and lactating mothers	ANM / MO
Health Check-ups*	Children < 6 yrs Pregnant and lactating mothers	ANM / MO / AWW
Referral	Children < 6 yrs Pregnant and lactating mothers	AWW / ANM / MO
Pre-School Education	Children 3-6 years	AWW
Nutrition & Health Education	Women (15-45 years)	AWW / ANM / MO
AWW: Anganwadi worker; AWH: Anganwadi Helper; ANM: Auxiliary Nurse Midwife, MO: Medical Officer		

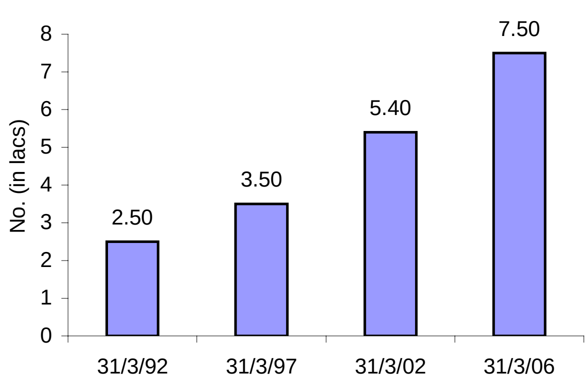
Geographic focus of was on drought-prone areas and blocks with a significant proportion of scheduled caste and scheduled tribe population. In 1975, 33 blocks were covered under ICDS and over the last two decades the ICDS coverage has progressively increased. 5659 projects have became operational as on 31.3.2006 (Figure 9.1)

Services (Table 9.1) are provided through community-based workers at the 'Anganwadi' (AW). One anganwadi centre has been catering to 1000 population in a rural / urban project and 700 population in tribal areas.

ICDS Expansion

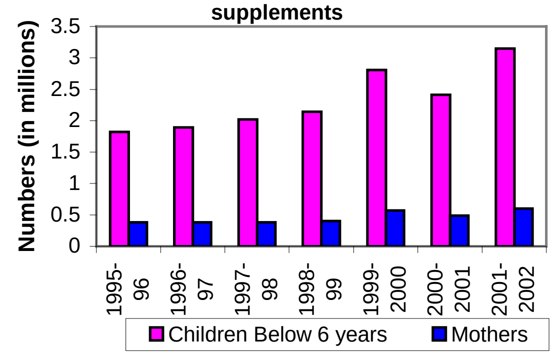
ICDS has expanded to cover nearly all the population in the country (Figure 9.2). During the last 15 years, there has been steep increase in number of AWC's, which have become operational during the period 2002-06; over 2.1 lakhs anganwadis have been operationalised. There has been progressive increase in the persons receiving supplements provided (Figure 9.3). Currently, services under the scheme are being provided to about 562.18 lakh persons, (467.18 lakh children 0-6 years and 95 lakh pregnant and lactating mothers through a network of about 7.48 lakh Anganwadi Centers *(Source: WG report)*. In ICDS programme, Centre was bearing the cost of maintaining the infrastructure, while the states provided for the food component. With increasing coverage, there has been increase in number of persons getting food supplements. The central expenditure on the scheme has increased from Rs.1.54 crore in 1975-76 to Rs. 1,000 crore in 2000-2001 (Figure 9.4). With the increase in coverage,

Figure 9.2: No. of operational AWC's



Source: Reference 9.5

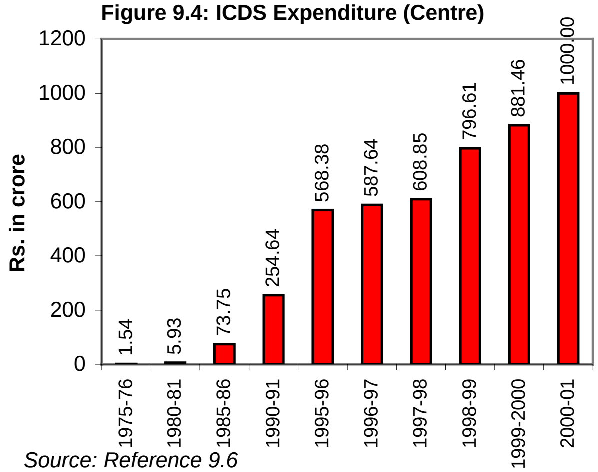
Figure 9.3: Persons receiving food supplements



Source: Reference 9.6

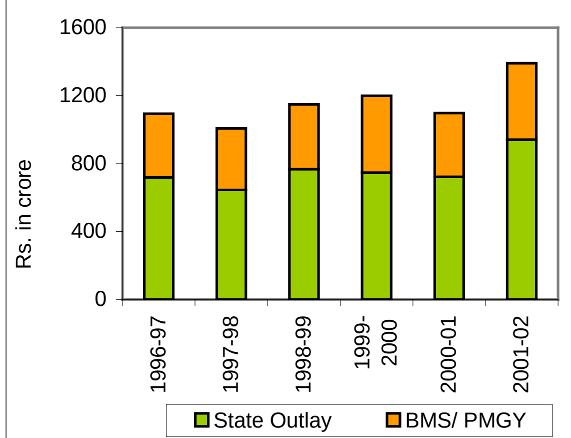
there was an increasing need for funds for the food supplements as well. The centre

Figure 9.4: ICDS Expenditure (Centre)



Source: Reference 9.6

Figure 9.5: Year wise outlays for nutrition



Source: Reference 9.7

provided funds for take home foods for 6-36 months during the 9th plan period under the *Pradhan Mantri Gram Yojna* (PMGY). Though the central expenditure has increased over the years, there has been no corresponding increase in the states' own plan expenditure on food supplements during the Ninth Plan period (Figure 9.5).

Nutrition component of ICDS

Nutrition component of ICDS aims to provide the following services

- nutrition education to mothers for improving dietary intake and dietary diversity
- nutrition education regarding appropriate infant and young child feeding
- growth monitoring and detection of growth faltering
- act as depot holder / assist in providing massive doses of vitamin A, ORS and IFA tablets.
- food supplementation to pre-school children between the age of six months to six years, pregnant and lactating mothers and selected adolescent girls

AWW is expected to survey all families in the community and identify all pregnant, lactating and preschool children, monitor growth of children and provide food supplements to the three groups as indicated in Table 9.2 for 300 days in a year. The type of food supplements provided varied widely, from food grains, take home foods, ready-to-eat food to foods cooked in the anganwadi.

Table 9.2: Average daily nutritional supple

Beneficiary	Calories	Proteins
Children < 3 years	300	8-10
Children 3-6 years	300	8-10
Preg & Lact (P&L)	500	20-25

Over years the Anganwadi has got identified mainly as a centre providing available food supplements to those who come to the Anganwadi. The other activities such as nutrition education, preschool education and growth monitoring have not received due attention and coverage.

The emphasis was initially on providing on-the-spot feeding in the anganwadi because it was believed that

* this would ensure that the targeted mothers and child would get food supplements, which would not be shared between other members of the family; and
* their coming to anganwadi centres for receiving food supplements would provide an opportunity for providing nutrition education to women on cooking and feeding young children.

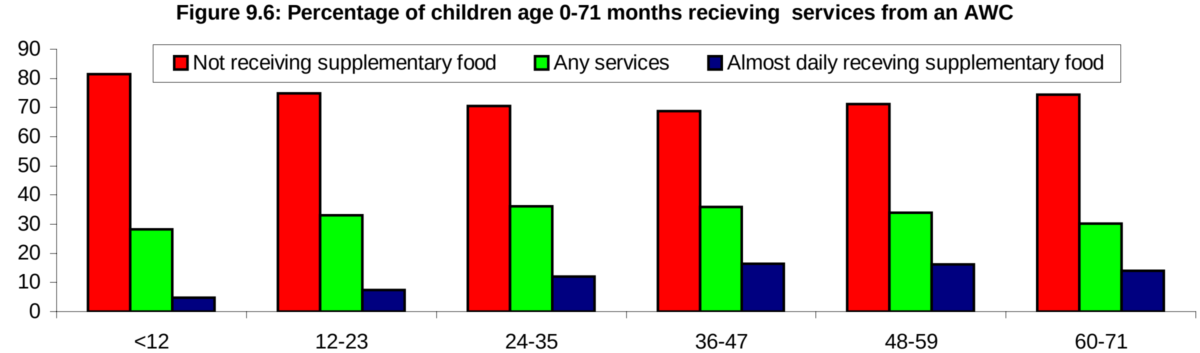
However, the on-the-spot cooked food feeding programme has several disadvantages as well. They are:

* children especially those in the age group of 6-36 months cannot consume the entire amount of food provided because of a smaller stomach capacity;
* even if older children do eat the food provided in the anganwadis, this acts mainly as a substitute, and not an addition, to home food;
* the most needy segments viz., children in the critical 6-36 month age group and women, may not be able to come to the anganwadi's and receive the food daily;
* cooking food, feeding the children and cleaning the vessels and the anganwadi take up most of the time of the anganwadi workers and helpers, leaving them little time for other important activities such as growth monitoring, nutrition education, or pre-school education;
* in any mass cooking and feeding programme, the monotony of the food provided and relatively poor quality of the preparations is a problem;
* cooking in poor hygienic conditions and keeping left-over food may result in bacterial contamination of food;
* undernourished children, even those in the 3-6 year age group, if given double rations, cannot consume all the food at one sitting in the anganwadi, and if cooked food is kept at home for feeding later, it may get contaminated and spoilt.

Current status

The National Family Health Survey 3 obtained information from all the households surveyed on the type of services availed by them from ICDS. NFHS provides for the first time nationwide data on utilization of services with reference to characteristics of the surveyed households and state specific data on services provided by ICDS systems.

Figure 9.6: Percentage of children age 0-71 months recieving services from an AWC



Source Reference 9.8

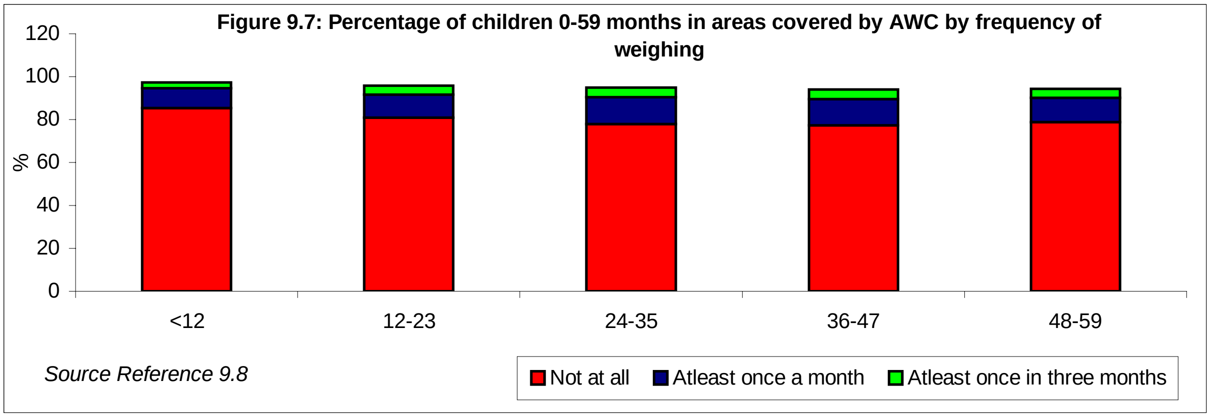


Figure 9.7: Percentage of children 0-59 months in areas covered by AWC by frequency of weighing

Source Reference 9.8

Inspite of guidelines specifying that monthly weighing of children should be done in the crucial 0-24 months age group, the percentage of 0-12 and 12-23 months old children who were weighed every month was negligible. Among the 2-6 years old children, less than 10% have been weighed once in three months. Though weighing for growth monitoring and detection of growth faltering has been conceptualized as one of the key components of ICDS programme, it has not been operationalised (Figure 9.6).

It is well recognized that the first 24 months are the opportunity window for preventing undernutrition in children. Data from NFHS 3 shows that during the first 2 years, less that a third received any services and the proportion receiving food and supplements were negligible. In the other age groups only one-fifth had received supplementary food (Figure 9.7).

There are huge interstate differences in services provided to lactating women, pregnant women and preschool children in the Anganwadi (Figures 9.8, 9.9 and 9.10). Coverage under services to pregnant women is low not only in poorly performing states like Bihar

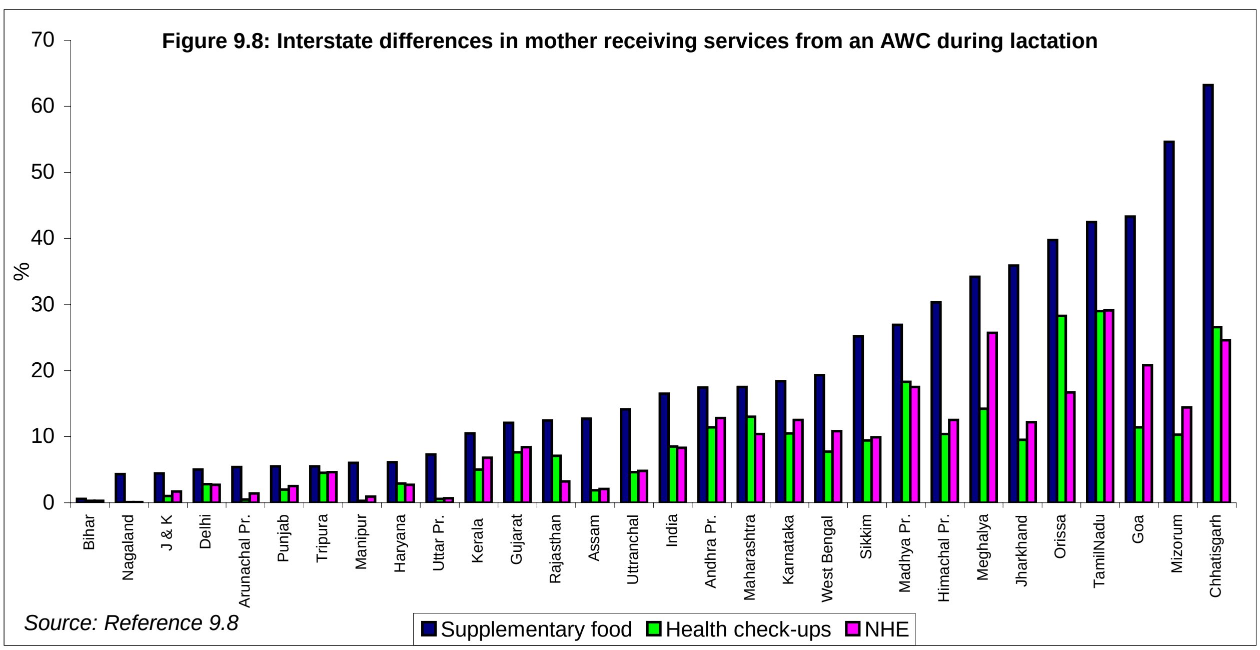
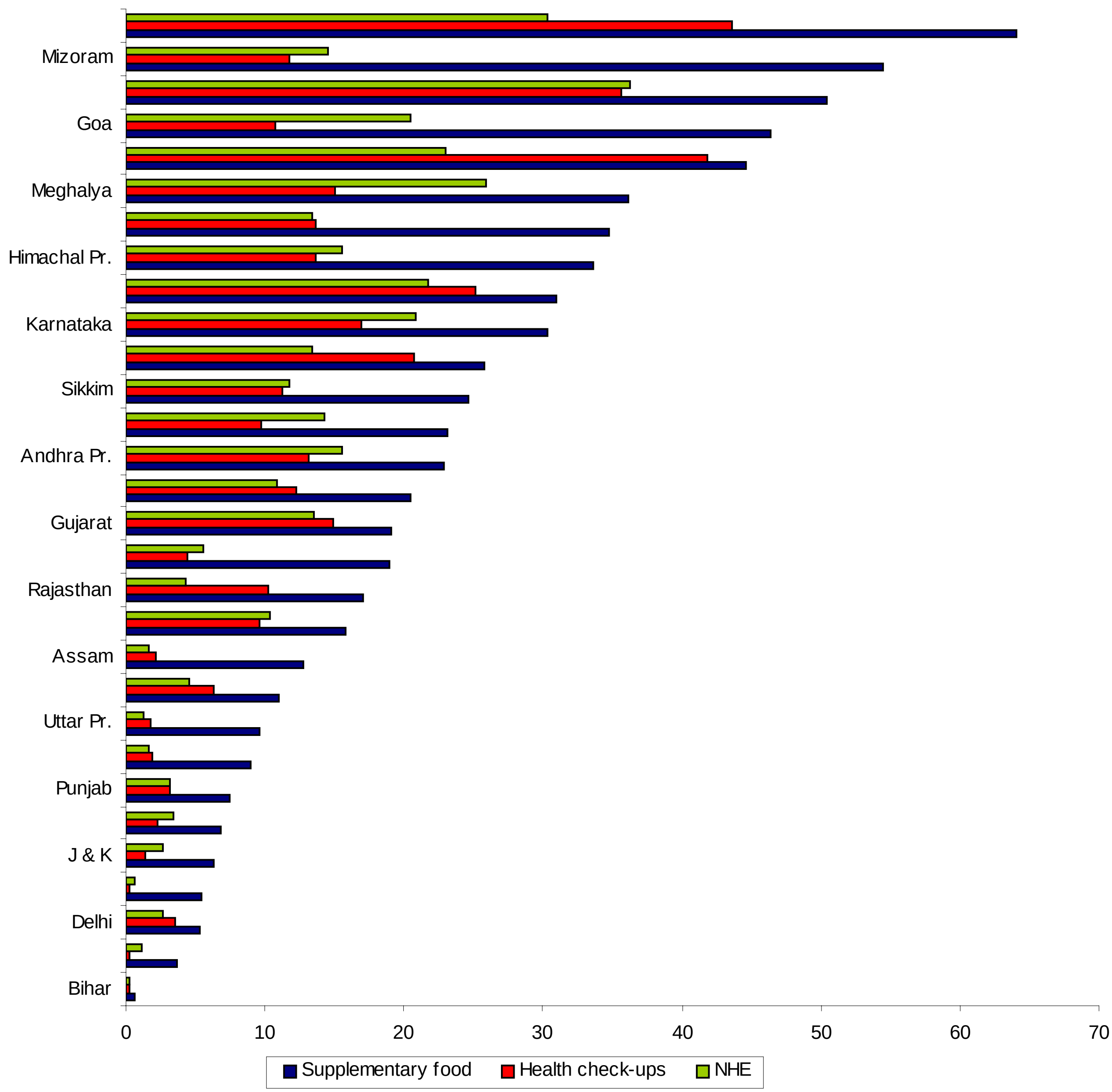


Figure 9.8: Interstate differences in mother receiving services from an AWC during lactation

Source: Reference 9.8

and UP but also in some better performing states like Delhi and Punjab. Amongst the three services, coverage under supplementary feeding is the highest in all states. Coverage ranges from 2% in Bihar to 60-70% reported by Mizoram and Chattisgarh. In some states like Chattisgargh and Orissa, antenatal coverage is higher while in states like Goa, Mizoram, Meghalaya and Himachal Pradesh, coverage under nutrition and health education is higher.

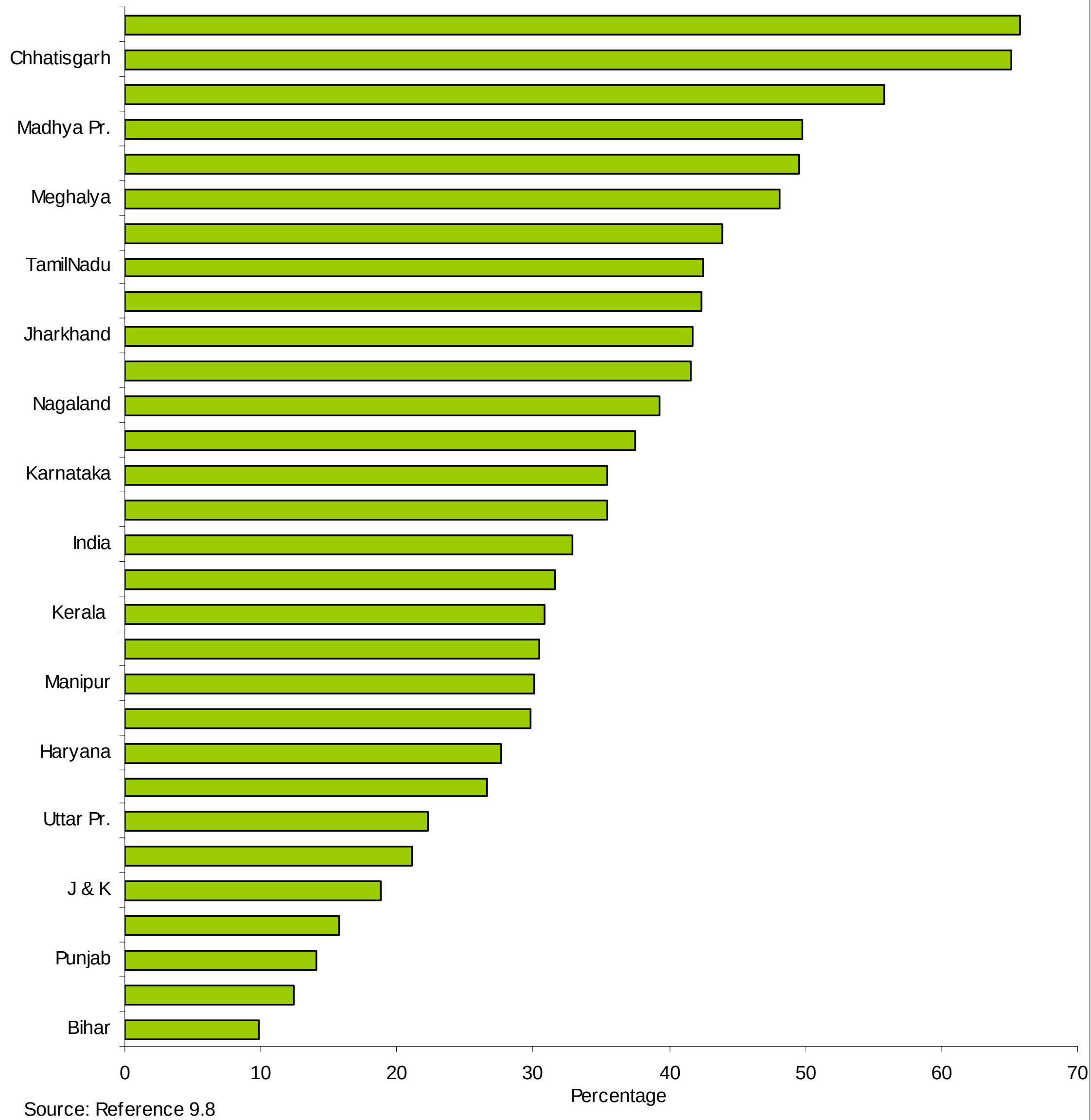
Figure 9.9: Interstate differences in services received during pregnancy



Source: Reference 9.8

It is obvious that in states which have high coverage rates; coverage is high for all the 3 components suggesting that functional status of Anganwadi is perhaps the most important aspect of coverage in different services. Similar interstate differences are seen in lactating women and preschool children.

Figure 9.10: Percentage of children 0-71 months receiving any services from an AWC



Source: Reference 9.8

It is noteworthy that percentage of children receiving any service in Delhi and Punjab (with high per capita income, good connectivity) is just higher than coverage in Bihar and lower than Uttar Pradesh and Rajasthan. On the other hand, Orissa, Chattisgarh, Mizoram, Madhya Pradesh and Maharashtra report high coverage levels. Inspite of high coverage levels, child undernutrition rates in Orissa, Chattisgarh, Madhya Pradesh and Maharashtra are high.

Evaluation of nutrition component of ICDS

The nutrition component of ICDS programme has been repeatedly evaluated. The Nutrition Foundation of India (NFI), Delhi was the first organization to carry out an evaluation of ICDS and recommend steps for improving the services delivered by the ICDS. Subsequently, National Institute of Public Cooperation and Child Development (NIPCCD), Delhi carried out an evaluation in 1992 and reported that the prevalence of underweight was lower among children in areas with the ICDS program in place than elsewhere, for both children under three and children aged 3 to 6. National Council of Applied Economic Research (NCAER), Delhi had focused their evaluation on the quality of infrastructure and inputs. In addition, there have been several small-scale evaluations.

The World Bank carried out the baseline and end line survey of the WB funded ICDS programme in five states. They found that ICDS is well-conceived and well-placed to address the major causes of child undernutrition in India; however in the programme, more focus has been given to increasing coverage than to improving the quality of service delivery and to distributing food rather than changing family-based feeding and caring behavior. As a result, impact in terms of reduction in undernutrition has been limited.

The key mismatches between the program's intentions and its actual implementation identified by the World Bank were:

- The dominant ***focus on food supplementation*** is to the detriment of other tasks envisaged in the program, which are for improving child nutritional outcomes. For example, not enough attention is given to improving child-care behaviors, and on educating parents how to improve nutrition using the family food budget;

- ***Service delivery is not focused on the youngest children*** (under three), who could potentially benefit most from ICDS interventions. ICDS is only partially succeeding in preferentially targeting girls and lower castes who are at higher risk of under-nutrition;

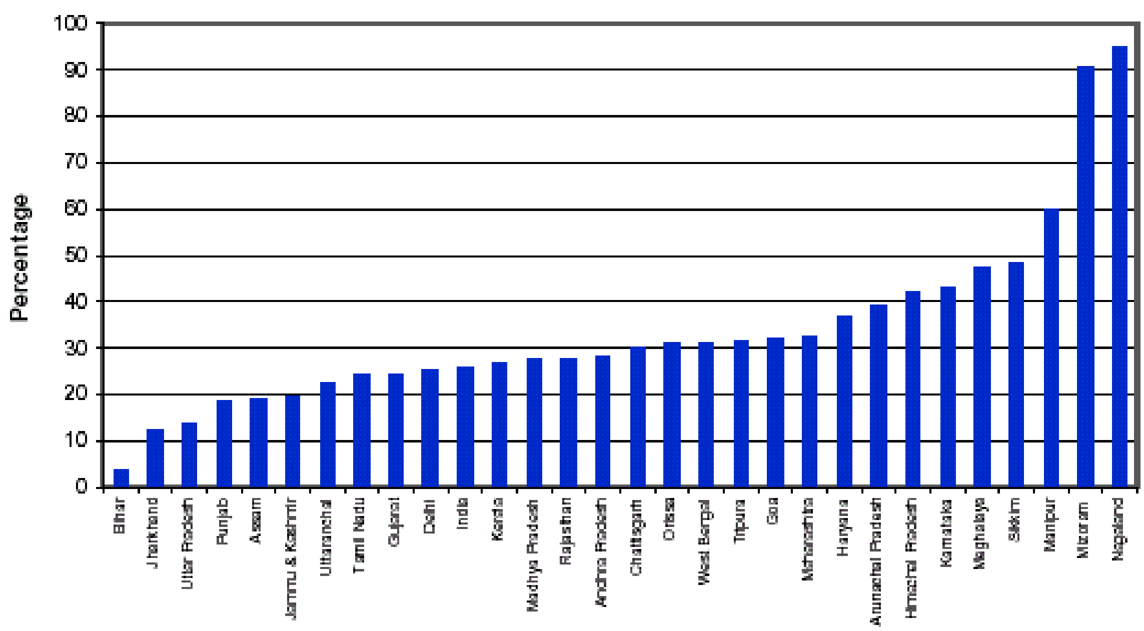
- Although program growth was greater in underserved than well-served areas during the 1990s, the ***poorest states and those with the highest levels of under-nutrition still have the lowest levels of program funding and coverage*** by ICDS activities.

Examples of successful interventions (Bellary district in Karnataka) and innovations/variations in ICDS from several states (the INHP II in nine states, the Dular scheme in Bihar and the TINP in Tamil Nadu) suggest that the potential for better implementation and for impact does exist. But the program faces substantial operational challenges inadequate worker skills, shortage of equipment, poor supervision and weak M&E in most states and consequent poor impact on undernutrition rates.

Recent studies estimate the association between having an *anganwadi* center in a village and the likelihood that a child is underweight, and found little or no association between the presence of an ICDS center and child nutritional status. Using multivariate analysis of the 1992/93 NFHS data, the World Bank (2004) estimated that, for boys, having a local ICDS center is associated with a 5% reduction in the likelihood of being underweight, but that there is no significant association for girls. Data from both the 1992/93 and 1998/99 NFHS when analysed using propensity score matching techniques, did not reveal any significant effect when children in ICDS villages were compared with children with similar demographic, household and village characteristics in non-ICDS villages.

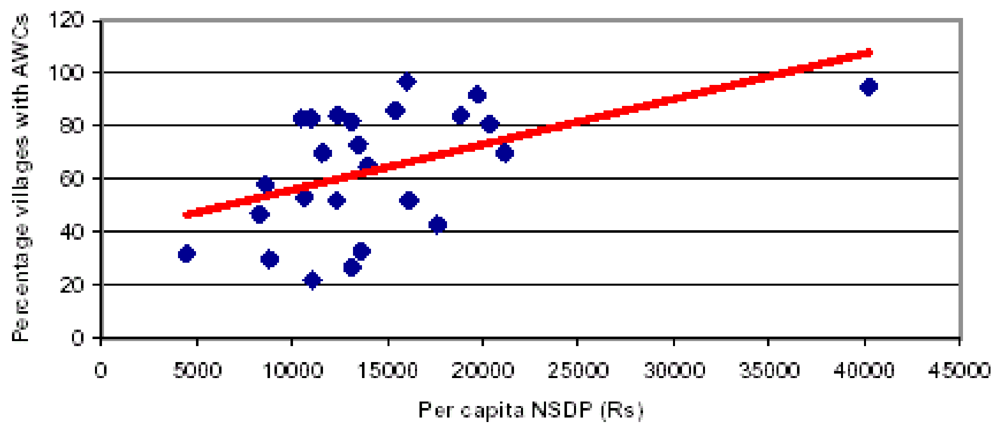
The percentage of administrative *blocks* covered by ICDS has reached almost 90%. However, the percentage of children who actually take up the services provided by the program is lower and varies considerably across states. By December 2002 only one quarter of children aged between 6 months and 6 yrs benefited from the SNP component of ICDS, on average, with this figure ranging from little more than 10% to over 90% across the states (Figure 9.11). Coverage is high in the northeastern states.

Figure 9.11: Inter state variation in the percentage of children enrolled in the SNP component, 2002



Source: Reference 9.9

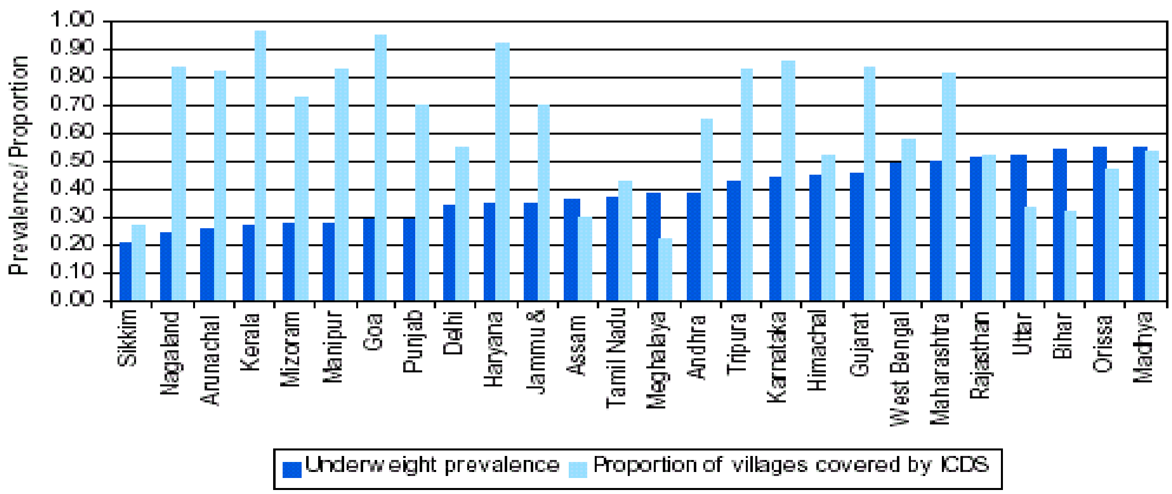
Figure 9.12: Relationship between per capita net state domestic product (NSDP) and ICDS coverage



Source: Reference 9.9

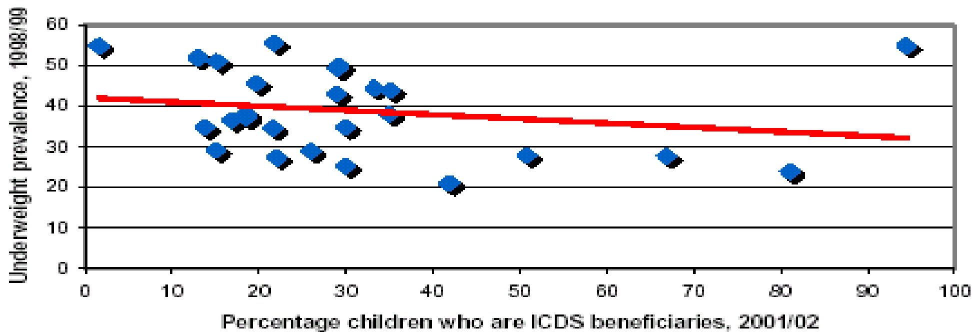
States with lower per capita Net State Domestic Product (NSDP) have a smaller percentage of villages covered by the ICDS program than those with higher NSDP (Figure 9.12). Many states in which the prevalence of underweight is high, the proportion of villages with AWC's is low. Five states with the highest underweight prevalence, namely Rajasthan, Uttar Pradesh, Bihar, Orissa and Madhya Pradesh, all rank in the bottom ten in terms of ICDS coverage (Figure 9.13).

Figure 9.13: Relationship between the proportion of villages covered by ICDS and underweight prevalence by state, 1998/99



Source: Reference 9.9

Figure 9.14: Inverse relationship between the percentage of underweight children and the percentage of children who are ICDS beneficiaries, by state

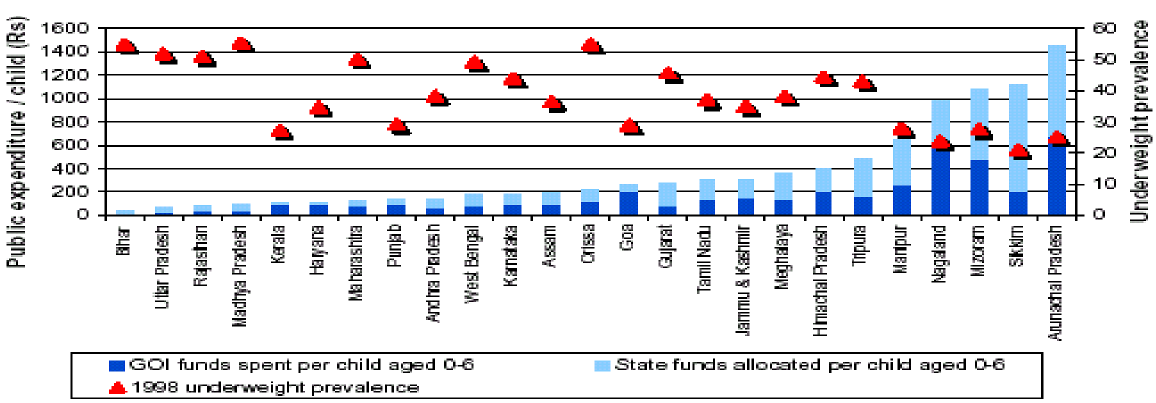


Source: Reference 9.9

States with a greater percentage of underweight children tend to have a smaller percentage of children enrolled in the ICDS program. Worst is Bihar where, despite an underweight prevalence of 55%, only 1.5% of children benefit from the ICDS program. At the other end of the spectrum, Manipur, Mizoram, Nagaland and Sikkim with low prevalence of underweight children (between 20% and 30%), yet are among the five states with the highest percentage of ICDS beneficiaries (Figure 9.14).

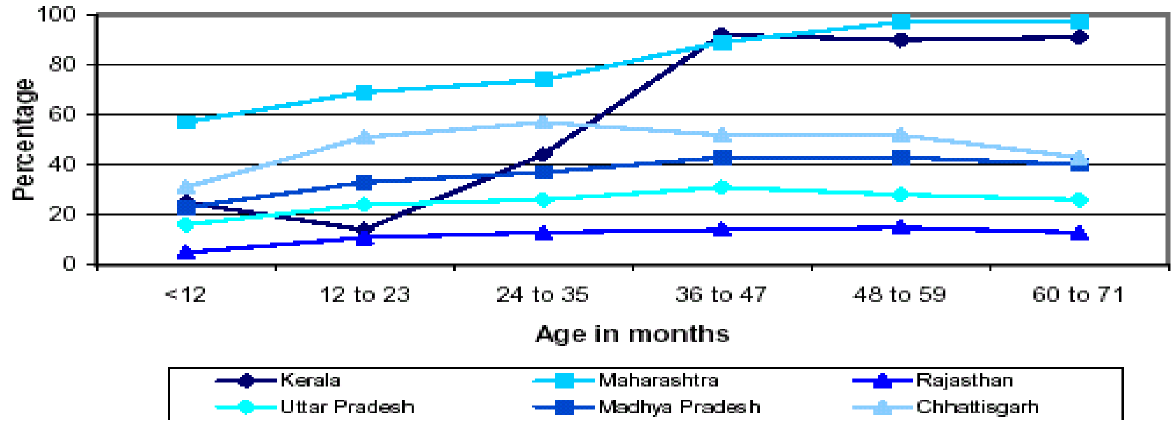
Public expenditure by state and national governments is very low in states in which prevalence of underweight is very high. Four of the states that rank in the top five for underweight prevalence (namely Bihar, Uttar Pradesh, Rajasthan and Madhya Pradesh) are also the four states that receive the least for ICDS, on a per child basis (Figure 9.15).

Figure 9.15: Relationship between state underweight prevalence and GOI and state public expenditure allocations, 1998/99



Source: Reference 9.9

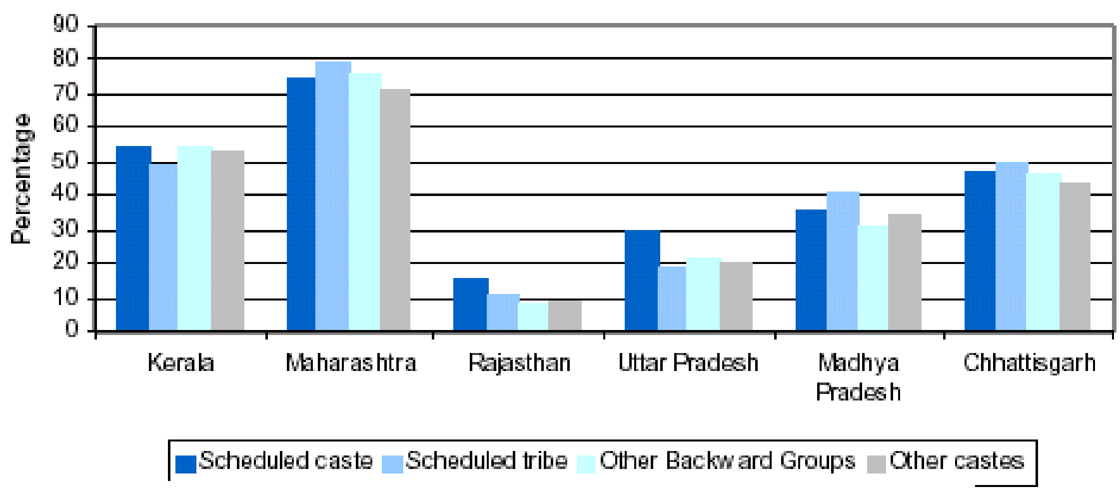
Figure 9.16: Percentage of children (of those living in villages with AWC's) who attend the AWC at least once a month, by age



Source: Reference 9.9

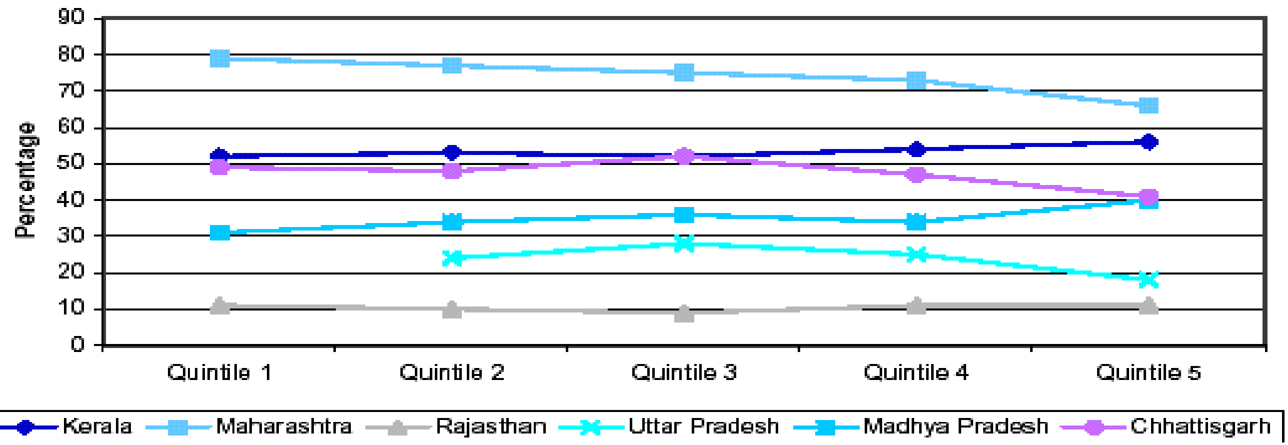
Review of the baseline and endline survey in ICDS III in six states carried out by World Bank revealed several interesting findings. Infants and children under three are least likely to attend the *anganwadi* center. The attendance steeply rose after two yrs of age in Kerala (Figure 9.16). In all states the attendance rates of scheduled caste and scheduled tribe children are in line with or slightly better than that of other castes (Figure 9.17).

Figure 9.17: Percentage of children (of those living in villages with AWC's) who attend the AWC at least once a month, by caste



Source: Reference 9.9

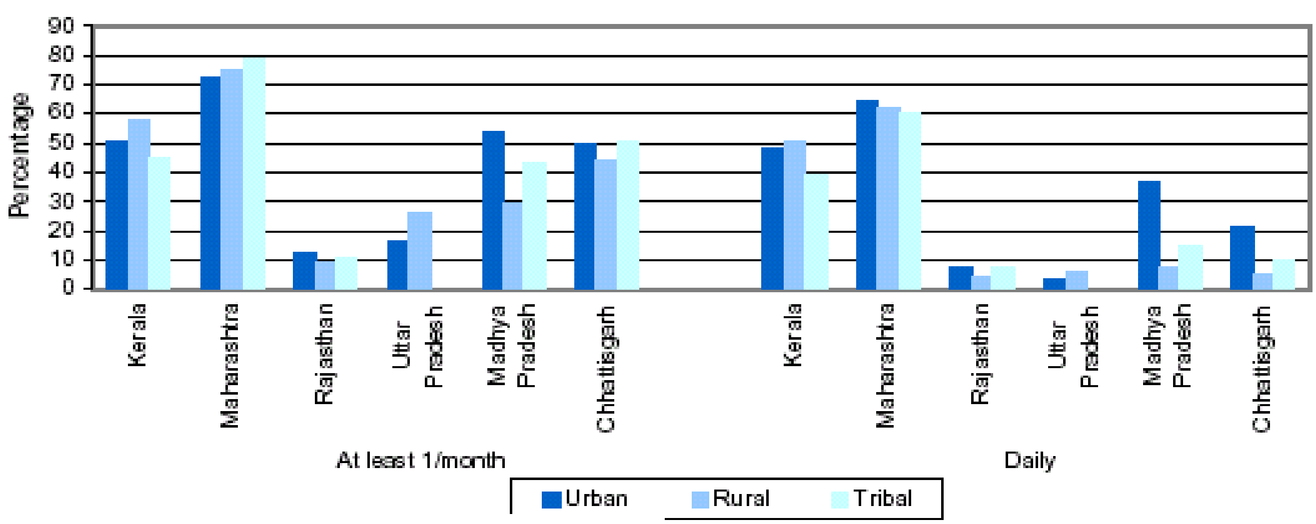
Figure 9.18: Percentage children (of those living in villages with AWC's) who attend the AWC at least once a month, by asset quintile)



Source: Reference 9.9

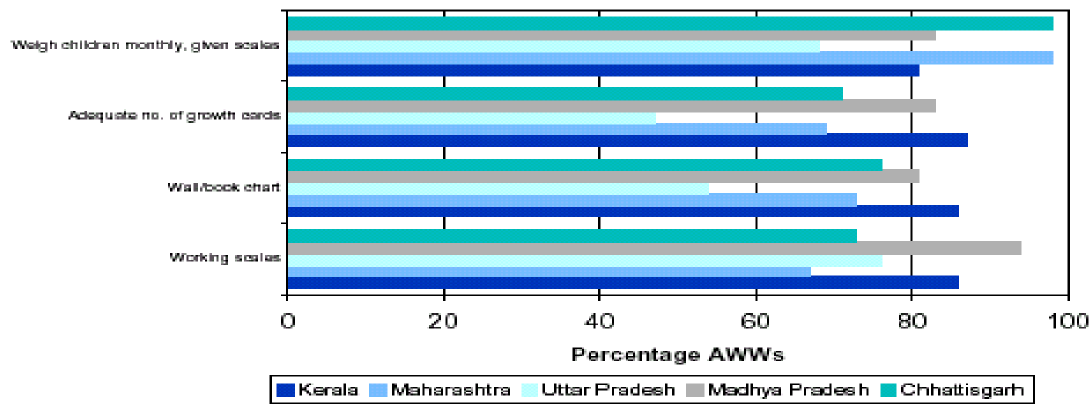
World Bank study also showed that the poorer segments of the population did not access Anganwadis more often that their better off counter parts. Among children living in villages with *anganwadi* centers, little variation is found in participation rates across wealth quintiles (Figure 9.18). However, the attendance at AWC's varies widely both across and within states as there is heterogeneity across states in the attendance rates of children living in urban, rural and tribal areas (Figure 9.19).

Figure 9.19: Percentage children (of those living in villages with AWC's) who attend the AWC at least once a month, by location



Source: Reference 9.9

Figure 9.20: Percentage of AWWs with growth monitoring equipment in place



Source: Reference 9.9

Percentage of AWC's with growth monitoring equipment in place is shown in Figure 9.20. AWCs in Kerala and Madhya Pradesh were better equipped than those in the other three states.

Table 9.3: Regularity of food supply to AWC's and the availability of the take-home food programme

	Kerala	Maharashtra	Uttar Pradesh	Madhya Pradesh	Chattisgarh
% AWC's with no recent irregularities in food supply	60%	41%	68%	27%	17%
% AWC's with a take home food programme	15%	28%	42%	95%	75%

Source: Reference 9.9

Table 9.4: *Anganwadi* centre infrastructure, by location

	Kerala			Maharashtra			Uttar Pradesh		Madhya Pradesh			Chhattisgarh		
	urban	rural	tribal	urban	rural	tribal	urban	rural	urban	rural	tribal	urban	Rural	tribal
Percentage of AWCs with drinking water that is from:														
Piped or pumped	69	44	50	21	44	41	54	70	100	58	83	73	83	72
Open well	27	41	17		20	34		8					4	
Other	4	15	33	79	36	25	46	22	0	42	17	27	13	28
Percentage of AWCs with toilets that are:														
Flush	27	15			2		8	7	50	19	14	36	13	16
Pit/latrine	20	26			13	10	29	10	8	15	7	9	9	4
None	53	59	100	100	85	90	63	84	42	65	79	55	78	80
% AWCs with rented building														
	64	41	50	96	19	41	92	15	92	46	21	82	17	44
No. of AWCs in sample														
	45	27	6	24	54	29	24	61	12	15	29	11	23	25

Source: Reference 9.9

Table 9.5: Comparison of immediate health outcomes and behaviors across children living in villages with and without an AWC

	In villages:	Kerala	Maharashtra	Rajasthan	Uttar Pradesh
Percentage over 6 mths receiving Vitamin A supplementation	Without AWCs	81.2	80.5	29.8	18.0
	With AWCs	78.3***	**88.5*****	22.5***	**21.0*****
Percentage older than 12 months ever dewormed	Without AWCs	61.1	34.3	3.7	17.7
	With AWCs	**66.3*****	**59.7*****	4.1	13.3***
Percentage over 6 mths consuming Vitamin A-rich food within previous 3 days	Without AWCs	78.1	78.1	27.6	36.0
	With AWCs	72.0***	**90.5*****	26.9	32.5***
Percentage breastfed within 1 hour of delivery	Without AWCs	85.6	54.4	9.4	6.1
	With AWCs	80.0***	41.2***	10.3	6.7
Percentage consuming colostrum	Without AWCs	98	18.9	74.1	53.4
	With AWCs	96.9***	**28.7*****	**80.4*****	37.3***
Percentage under 6 mths who are exclusively breastfed	Without AWCs	67.1	21.5	38.4	99.7
	With AWCs	58.2***	11.3***	**43.3***	84.6***
Percentage aged 6-9 mths consuming complementary food	Without AWCs	84.1	67.3	93.8	0.3
	With AWCs	87.7	**73.6**	93.7	**19.1*****
Mean duration of breastfeeding, among children who have been weaned	Without AWCs	13.4mths	16.3mths	8mths	23.7mths
	With AWCs	12.5mths***	17.4mths***	7.1mths***	22.8mths***

Source: Reference 9.9

In a multivariate model of cross-sectional data collected in Kerala, Rajasthan and Uttar Pradesh between 2000 and 2002, Bredenkamp and Akin (2004) found that children who live in villages with *anganwadi* centers are not significantly less likely to be underweight or ill than other children. When using data on actual attendance at *anganwadi* centers in six states, it is found that only in Kerala is this significantly associated with better nutritional status.

There is also not much evidence that ICDS has been successful in attaining its goal of improving the coverage of specific child health interventions such as de-worming and Vitamin A supplementation, and encouraging mothers to adopt appropriate child care and feeding behaviors (including practices related to breastfeeding, weaning and diet) that have the potential to improve child growth and health outcomes. Data from Kerala, Maharashtra, Rajasthan and Uttar Pradesh show no clear evidence that these behaviors were more common in ICDS areas, with the exception of Maharashtra (Bredenkamp and Akin, 2004) (Table 9.4, 9.5). Although communication for behavior change through the AWW is a crucial weapon against poor health and malnutrition, it appears that any information that the AWW is conveying to mothers is not being communicated effectively enough to impact positively on mothers' behavior.

Recommendations from WB baseline and end line survey

- Activities need to be refocused on the most important determinants of malnutrition. Programmatically, this means emphasizing disease control and prevention activities, education to improve domestic child-care and feeding practices, and micronutrient supplementation. Greater convergence with the health sector, and in particular the Reproductive and Child Health (RCH) program, would help tremendously in this regard;

- Activities need to be better targeted towards the most vulnerable age groups (children under three and pregnant women), while funds and new projects need to be redirected towards the states and districts with the highest prevalence of malnutrition;
- Supplementary feeding activities need to be better targeted towards those who need it most;
- Communities need to be involved in the implementation and monitoring of ICDS can be used to bring in additional resources into the *anganwadi* centers, improve quality of service delivery and increase accountability in the system;
- Monitoring and evaluation activities need strengthening through the collection of timely, relevant, accessible, high-quality information, and this information needs to be used to improve program functioning by shifting the focus from inputs to results, taking informed decisions and creating accountability for performance.

ICDS in the Eleventh plan

Even though ICDS is the oldest and the largest of the food supplementation programmes in the world for improving nutritional status of vulnerable groups, still the impact of this programme in terms of improvement in nutritional status of the vulnerable groups has been suboptimal. During the Eleventh Plan every effort will be made to enhance quality and impact of ICDS programme through

- improving infrastructure of anganwadi center so that the essential minimum equipment and supplies needed for good quality services are available;
- improving the knowledge and skills of the AWW through effective training
- creating nutrition awareness through IEC at all levels (community, women's group, village-level workers, PRIs, programme managers and policy makers at the state and central levels); and improving community ownership of the programme
- establishing effective supervision of the ICDS functioning
- ensuring inter-sectoral coordination and strengthening nutrition action by the health sector
- improving monitoring so that problems in implementation of the programme are identified and appropriate mid course correction

Improvement in maternal nutrition / nutrition in early infancy

Problem

Currently less than 20 % of the women avail the ICDS food supplements provided in the Anganwadi; many may not be undernourished; very few take the food supplements regularly.

The data from the Pilot project on food grain supplementation to pregnant and lactating women has shown that this strategy can be implemented effectively even in the poorly performing districts in all states and through this majority of the undernourished pregnant women can be provided with food grains. As they have to collect the food grains from the ration shop only once in the month the coverage is better and the intervention is cost effective.

Recommendations of the working group
Identify and weigh all pregnant women – provide 6 kg of food grains free of cost to those with weight less 45 kg for the remaining period of pregnancy; ensure that they get appropriate antenatal care

Identify and weigh all lactating women - provide 6 kg of food grains free of cost to those with weight less 40 kg for the first six months of lactation; ensure that their infants are exclusively breast fed for the first six months

Reduce IMR / improve nutritional status in infancy

Problem
Majority of births in populous states occur at home and absence of mechanism for recognition of at risk neonate contributes to high neonatal mortality. The Tenth Plan goals for early initiation of breast feeding, exclusive breast feeding and timely initiation of complementary feeding have not been achieved

Recommendations of the working group

- Provide a 10 kg tubular Salter balance to the AWW; ensure that she weighs all neonates born at home as early as possible after birth, identifies those weighing less than 2.2.kg and refers them to the nearest hospital with pediatrician
- BCC for exclusive breast feeding;
- Ensure timely immunization by ANM by ensuring that all infants do come to AW on the immunization day
- BCC for appropriate complementary feeding, ensuring timely initiation, appropriate quality, quantity and frequency of feeding
- Weigh all infants using the tubular Salter balance accurately at least once in three months; identify those with varying grades of under-nutrition and provide needed nutrition care
- BCC regarding appropriate feeding during illness and convalescence

Preschool children

Problem
The rate of reduction in under-nutrition in children is too slow; the goals for the Tenth Plan in terms of reduction in under-nutrition in children have not been achieved.

Recommendations of working group for universalization and improving quality of ICDS

- Ensure that all preschool children in the village/ urban block are identified in the survey and are registered with the AW.

- ➢ prevent under-nutrition by providing nutrition education through interpersonal communication (by ANM/AWW) to all families with preschool children to
  - promote appropriate intra-family distribution of food;
  - dietary diversification to meet the nutritional needs of the child
- ➢ Demonstrate how to cook low cost balanced tasty meals from locally available cereal, pulse and vegetables and feed the young children – demonstration can be done in the anganwadi on immunization, health and nutrition days
- ➢ Operationalise universal screening of all preschool children for under-nutrition, monitoring growth in individual child's card (cards should be made available) and identifying children with different grades of undernutrition.
- ➢ Operationalise nutrition interventions for the management of under-nutrition:
  - For children with mild undernutrition - teach the mothers on care of these children with home available food
  - Identify children with moderate and severe under nutrition and give appropriate nutrition and health care; take home food supplements may have to be given for the initial period and the children carefully monitored
  - Identify severely undernourished children who fail to improve under home management, those with infections and other complications and refer them to hospitals for care

Decentralized district based planning

Problem

Undernourished Children NFHS (1998-99)	Average	Best	Worst
Weight-for-age	**47.0**	20.6	55.7
Height-for-age	**45.5**	18.1	55.5
Weight-for-height	**15.5**	4.8	24.3

There are massive differences not only between states but also between districts in the same state. Some states and some districts in all states have achieved substantial improvement in health and nutrition indices while large populous states/ districts lag behind.

Recommendations of the working group

The district should be taken as a unit for planning, implementation and monitoring of the ICDS programme. District data on nutrition and health status of children from DLHS will have to be used for district based planning as well as assessing the impact of interventions through ICDS. Specific efforts should be made to provide adequate inputs based on the actual situation in the district and not have arbitrary uniform numbers for providing supplementary feeding in the anganwadi.

There is a need to address budgetary allocation for ICDS to improve quality of services. It is important to specify district wise the investments needed to operationalise interventions, provide the needed outlays, monitor nutrition outputs and outcomes

Intersectoral collaboration

Infections aggravate undernutrition. Interventions to reduce infections such as improved access to safe drinking water and sanitation and improved access to health care for early and effective treatment of infections should receive priority attention because they will result in improvement of nutritional status of the population. There is a need to ensure sytematic collaboration between the ICDS and NRHM/RCH such as the Health/Nutrition days which are operational in several states. It is essential to ensure active involvement of the PRI and the community in monitoring the activities and improving the functioning of the AWC.

Monitoring of ICDS programme

The ICDS reporting formats for should be reviewed, simplified, reduced, and made similar to RCH formats. Simplified and rapid reporting, supported by computerisation would be helpful. Some of the states like Orissa and West Bengal have utilised user friendly soft ware to graphically depict monthly progress so that these indices could be easily monitored . The fact that there is close monitoring will bring about accountability; also problems areas where implementation is faltering can be readily identified and corrective measures taken. Some of the key activities which need to be monitored closely and the AWW, supervisor, DM to improve accountability for poor performance at at village, block and district level respectively are :

- registration of pregnant women, births and deaths
- nutrition education, impact of counselling on infant feeding
- coverage under universal weighing to detect growth faltering, number of malnourished children and the care that they are receiving .
- immunization rate, ORT use and nutrition care during illness

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10. SUMMARY AND CONCLUSION

10. SUMMARY AND CONCLUSIONS

Over the last six decades India has undergone a slow but sustained demographic, social, economic, agricultural, nutrition and health transition. Over the last five decades there has been a steady if slow economic growth, which is accompanied by reduction in poverty. During the last decade the GDP growth rate has accelerated

The Green Revolution ensured that the increase in food production stayed ahead of the increase in population. The country has moved from chronic shortages to self-sufficiency and later surplus and export in most food items. Along with the steps to achieve adequate production, initiatives were taken to build up buffer stock of food grains. Public Distribution System (PDS) has ensured that foodstuffs of the right quality and quantity reach the right places and persons at the right time and at an affordable cost. The food for work programme addressed the needs of the vulnerable out-of-work persons.

The ICDS programme aimed at providing food supplementation for vulnerable groups such as pre-school children, pregnant and lactating women, nearly covers all blocks in the country. The Mid-day-meal programme aimed at improving the dietary intake of primary school children and reduction in the school drop out rates has been operationalised throughout the country. Over decades health infrastructure and manpower has been built up and there is universal access to essential primary health care. National programmes for tackling anaemia, iodine deficiency disorders and Vitamin-A deficiency are being implemented.

As a result of all these interventions, there has been a substantial reduction in severe grades of under-nutrition in children and some improvement in the nutritional status of all the segments of population. Kwashiorkor, marasmus, pellagra, beriberi and blindness due to severe Vitamin-A deficiency have become rare. However there are still many problems to be tackled and there is a need to accelerate the pace of improvement in nutrition and health status of the population.

Data reviewed so far suggest that in India there has not been much change in the predominantly cereal based dietary intakes over the last three decades except among affluent segments of population. In spite of increasing per capita income and reduction in poverty, dietary diversity is seen mainly among affluent. Though there has been reduction in poverty and improved access to food at subsidized cost under-nutrition rates continue to be high. The high under-nutrition rate begins in-utero, gets aggravated in infancy due to poor infant feeding practices and is perpetuated in childhood due to poor intra-family distribution of food and poor access to health care. The substantial reduction in severe under-nutrition in preschool children over the last three decades has occurred without any increase in dietary intake and appears to be mainly due to improved access to health care. As poverty and poor access to food are no longer the major barriers to improvement in dietary intake, the country can achieve substantial improvement in dietary intake through health and nutritional education; when coupled with improved access to health and nutrition services there will be acceleration in the pace of improvement in nutritional status of the population.

Prevention of intrauterine growth retardation through antenatal care, early detection and correction of under-nutrition in infancy and early childhood so that children attain appropriate weight for their height are essential to promote normal growth; this can be achieved through effective implementation of ongoing intervention programmes through convergence between health and ICDS programmes utilizing the available infrastructure and manpower .

Low intake of vegetables and fruits, poor bioavailability of iron, and lack of universal use of iodised salt are responsible for micronutrient deficiencies being major public health problems even to day. Dietary diversification, better coverage under the national anaemia control programme, massive dose vitamin A administration, universal access to iodised and later iron and iodine fortified salt are some of the interventions that could help the country to achieve rapid reduction in micronutrient deficiencies.

Over the last decade there has been a progressive increase in over-nutrition. Available data indicate that the dietary intake has remained essentially unaltered except among urban affluent segments of the population Reduction of physical activity is the major factor behind the progressive increase in over-nutrition. Currently overnutrition rates are low in rural population and among poorer segments of population in urban areas. In the urban affluent segments an increase in energy intake of fats, refined cereals and sugar and simultaneous reduction in physical activity have contributed to the rapid increase in over-nutrition in all age groups. Nutrition education that children, adolescents and adults should eat balanced diet with just adequate energy intake and lots of vegetables and health education that exercise has to become a part of daily routine to promote muscle and bone health as well as prevent development of adiposity in all age groups have to be beamed regularly through all channels of communication. As the urban affluent segments access information and services readily, they can be persuaded to change their life styles so that they regain their normal nutrition and health status. The fact that they have changed their lifestyle could stimulate the other segments to follow suit thereby combat the trend towards increasing overnutrition in the large low and middle income group population.

Indians appear to have a predisposition for adiposity especially abdominal, insulin resistance and diabetes, hyper-triglyceridaemia and cardiovascular diseases. This predisposition could be genetic or environmental; it can manifest itself at birth, in childhood, during adolescence and in adult life. The tendency for adiposity and altered metabolism has to be combated through efforts to ensure healthy dietary habits and lifestyle right from childhood in all segments of population. This is essential to prevent sharp escalation in the noncomunicable disease risk in the population and improve longevity. With the current economic growth, demographic opportunity window, increasing literacy and social transition, the country has an unparalleled opportunity to rapidly improve health and nutritional status of the population. The dual nutrition burden can be combated through efficient implementation of time tested; effective and inexpensive interventions and the country can achieve significant reduction in both over and under nutrition and their adverse health consequences within the next two decades.

During the last decade rate of economic growth has accelerated. The Eleventh Plan has inclusive growth has one of the major objectives and equitable access to essential services including access to education, nutrition and health care based on need and not the ability to pay. India has entered the most favorable phase of demographic transition when most of the increase in the population will be due to increase in 15-50 age groups. The rapid economic growth coupled with the low dependency ratio and growing numbers of the relatively better educated, better nourished and healthy 20 -50 age group population provides the country with an opportunity to rapidly improve the health and nutritional status of the citizens. If there is accelerating convergence among all these favorable inputs, it will be possible to sustain the economic growth through optimal utilization of the abundant human resources and improve the quality of life of the citizens .