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

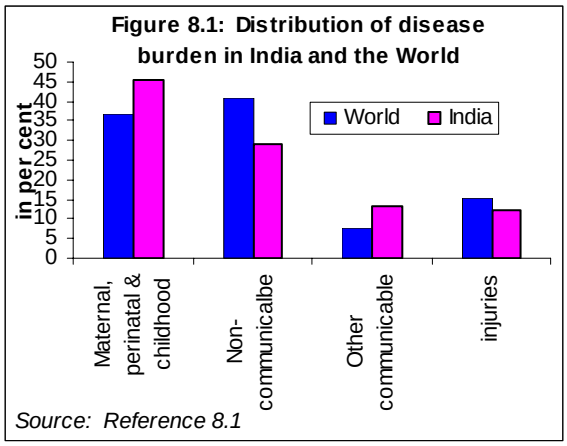
Differences in the ongoing epidemiological transition have resulted in wide variation rates of communicable and non-communicable diseases not only between countries but also between different states in

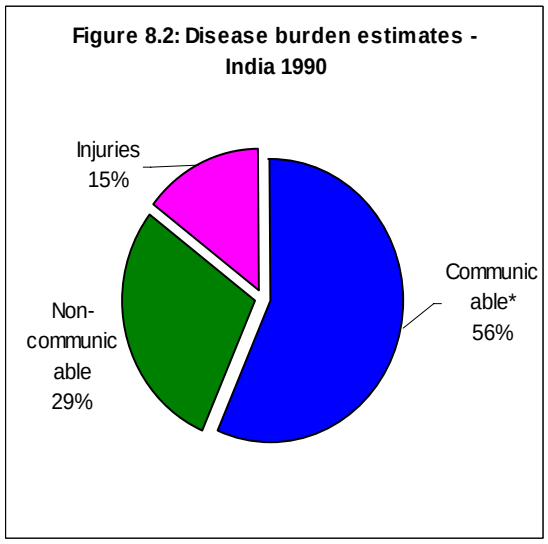
Table 8.1 - Burden for five major diseases (Millions of DALYs)

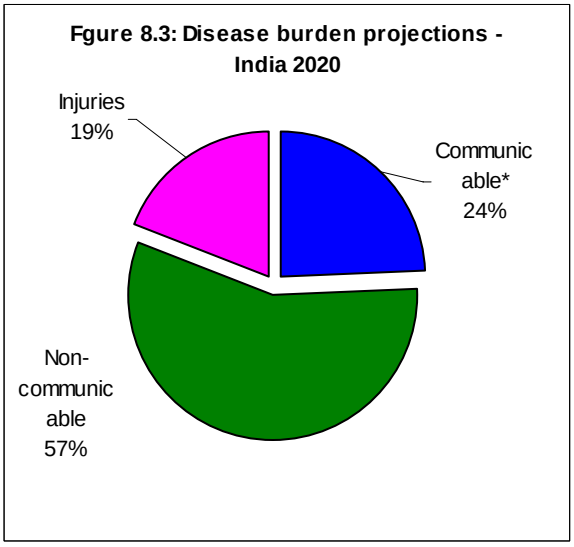
Disease & sex	Age (years)					
	0-4	5-14	15-44	45-59	60 +	Total
Diarrhea						
Male	42.1	4.6	2.8	0.4	0.2	50.2
Female	40.7	4.8	2.8	0.4	0.3	48.9
Worm infection						
Male	0.2	10.6	1.6	0.5	0.1	13.1
Female	0.1	9.2	0.9	0.5	0.1	10.9
Tuberculosis						
Male	1.2	3.1	13.4	6.2	2.6	26.5
Female	1.3	3.8	10.9	2.8	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

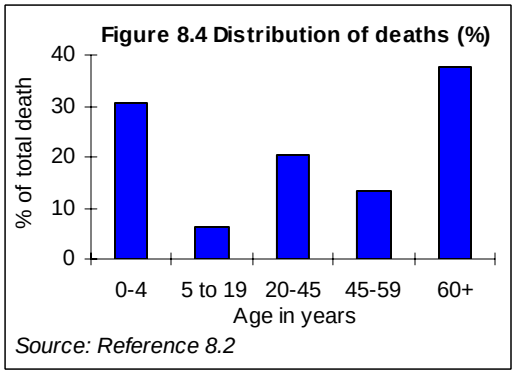
large countries like India. World Health Organization has been using Disability Adjusted Life Years (DALY), which takes into account morbidity and mortality as well as the age at which the problem occurred as the parameter for estimating disease burden for making global/local comparisons with respect 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.







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). 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

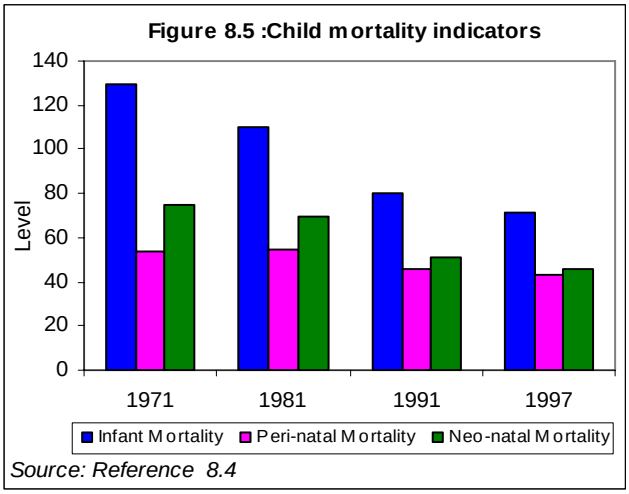
Improvement in the health and nutritional status of the population has been one of the major thrust areas for the social development programmes of the country. This was to be achieved through improving the access to and utilization of Health, Family Welfare and Nutrition services with special focus on 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).

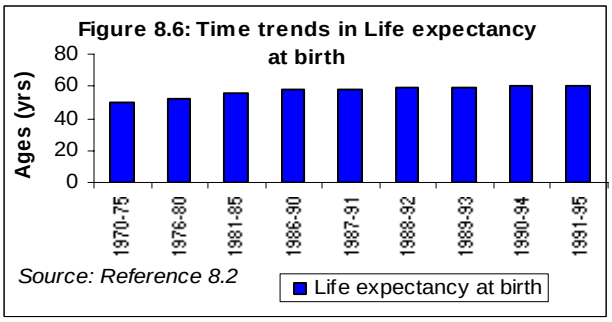
Table 8.2: Time Trends (1951-2000) in Health Care

	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).





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.

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)

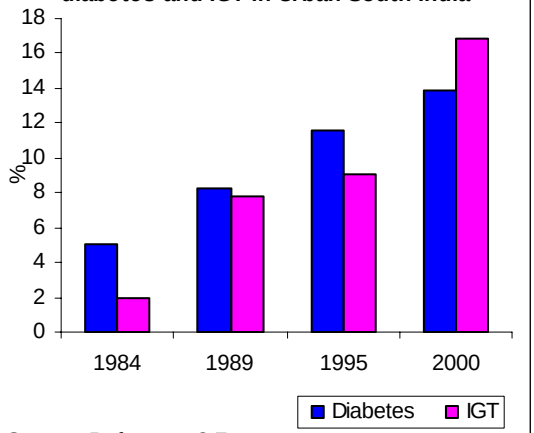
Community based studies on prevalence of diabetes in urban and rural areas have been conducted in all regions of the country (Table 8.3); all these studies show that over the last three decades there has been progressive increase in prevalence of diabetes both in urban and rural areas.

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

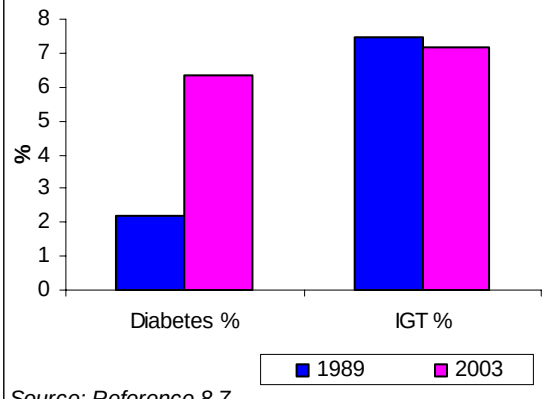
Data from Chennai on time trends in prevalence of diabetes and impaired glucose tolerance (IGT) in urban and rural urban population (Figure 8.7, 8.8) show that over the last two decades there has been a progressive steep increase in prevalence of diabetes and IGT

Figure 8.7: Increasing prevalence of diabetes and IGT in Urban South India



Source: Reference 8.7

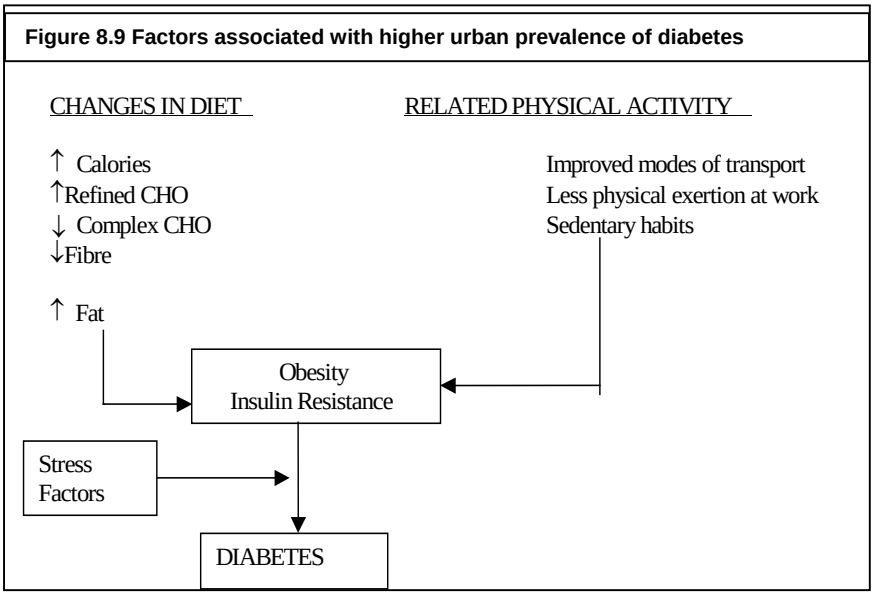
Figure 8.8:Temporal Changes in prevalence of diabetes and IGT in rural South India



Source: Reference 8.7

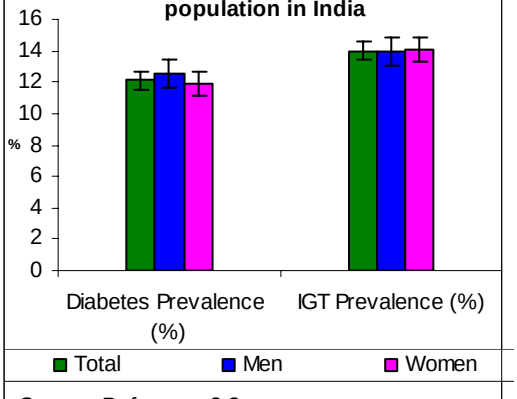
in urban and rural areas. Prevalence is higher in urban areas. Potential factors associated with higher urban prevalence of diabetes are shown in Figure 8.9

Figure 8.9 Factors associated with higher urban prevalence of diabetes



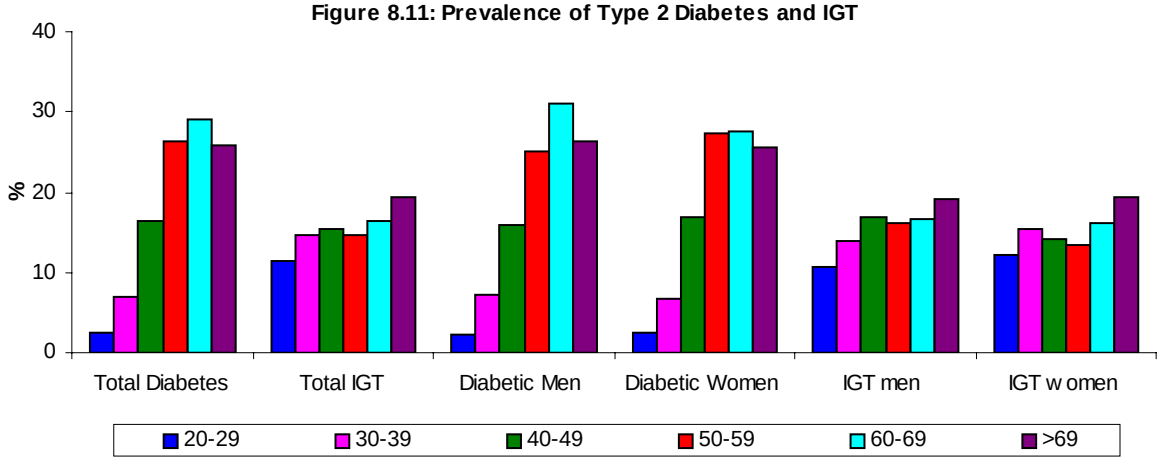
In 2000 Diabetes Epidemiology Study Group in India initiated a multicentre community based study using stratified random sampling method in Bangalore, Chennai, Mumbai, Delhi, Kolkata and Hyderabad to assess the prevalence of diabetes and IGT. Oral Glucose Tolerance Test (OGTT) was done in 11216 (5288 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

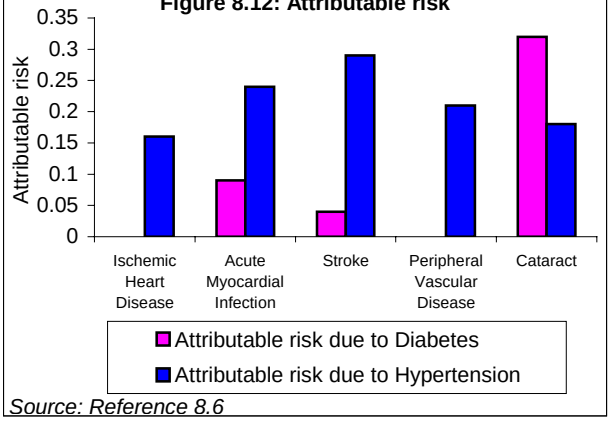
Year	Author	Age gp (yrs)	PR/ 1000	
			Urban	Rural
1995	Gupta et al	20+	109.1	273.0
1995	Beegom et al	25-64	184.0	
1998	Chadha et al	25-69	115.9	35.8
1999	Thakur et al	30-80	131.1	
2001	Misra et al	18+	116.0	
2001	Mohan et al	20-75	140.0	
2002	Swami et al	65+	580.0	
2002	Ahlawat et al	35+	449.0	
2002	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

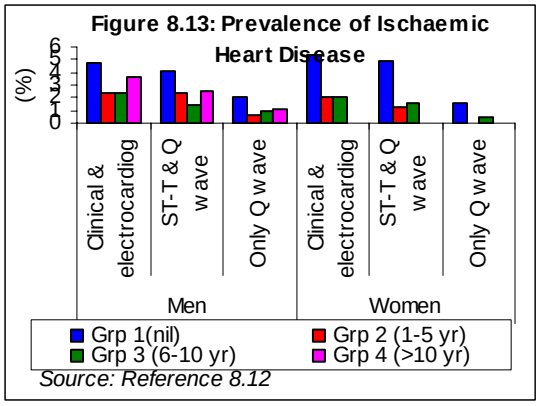
	Ischaemic Heart Disease	
	Urban	Rural
Prevalence rate / 1000	64.4	25.3
Death rate/1000	0.8	0.4
YLL per 100,000	728.7	351.5
DALY per 100,000	2703.4	986.2

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



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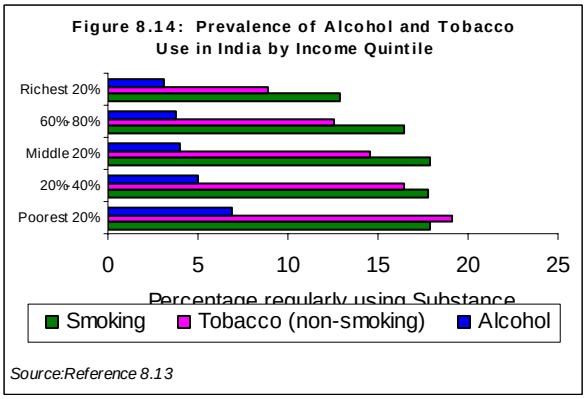


Source:Reference 8.13

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.

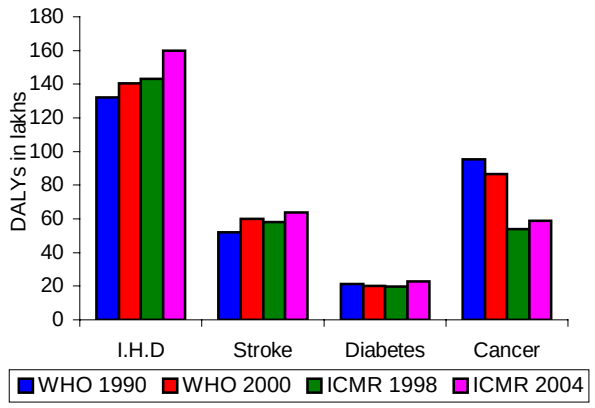
Bombay cancer registry has population-based data on incidence of cancer from sixties. Analysis of time trends from sixties till 1999 confirm that though there have been massive changes in prevalence of some cancers (reduction in cancer cervix, increase in cancer breast) there has been no increase in 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

Figure 8.15: WHO and ICMR estimates/projections of Burden of Disease



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.

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

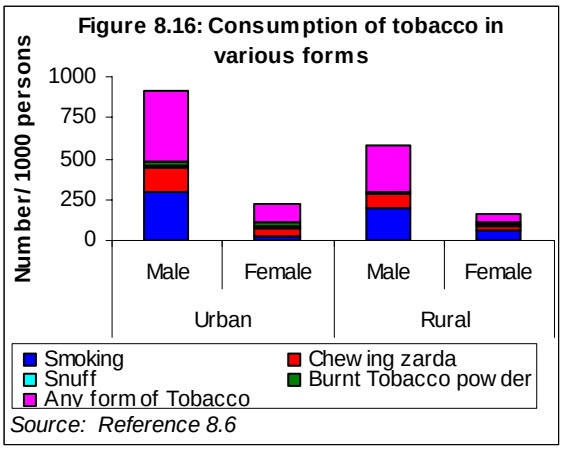
	Male	Female
1. Rate/100,000 by National Cancer Registry Programme		
Banglore	19.0	17.4
Barshi	34.4	32.2
Bhopal	12.1	8.3
Chennai	47.9	42.2
Delhi	16.2	14.8
Mumbai	35.0	37.9
All registries	25.19	23.5
2. Medical Certification of Cause of Death (MCCD)		
Cancer death rate/100,000	32.2	30.0
Cancer deaths as % 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

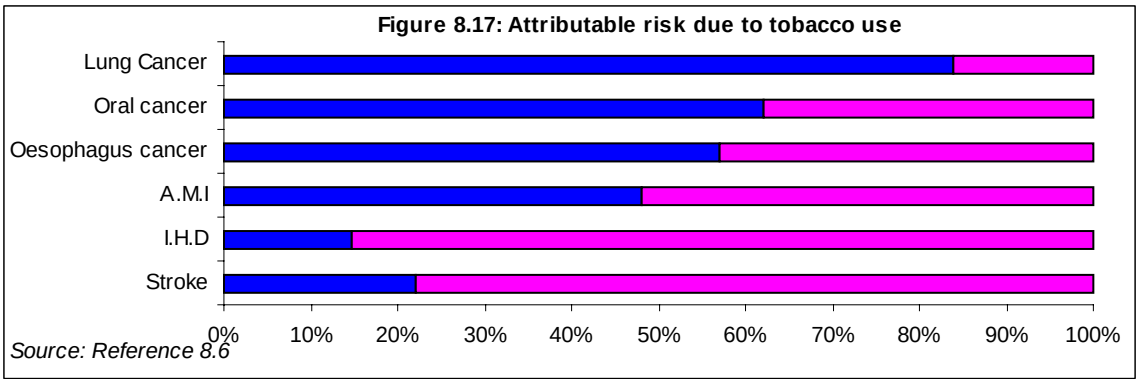
Tobacco as a risk factor for NCD in India

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%.



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.



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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