Economic Implications of Chronic Diseases in India

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Introduction

Chronic diseases account for the greatest share of early death and disability worldwide. Recent projections by World Health Organisation (WHO) show that chronic diseases will be the biggest contributor to mortality in low-income countries before 2015 and in terms of disability of life years (DALYs) before 2030 (Suhrcke et al 2006). The share of chronic conditions is predicted to rise to 65% by 2030 (Mathers and Loncar 2005). The Global Burden of Disease (GBD) project (2005) estimated that, as of 2002, chronic or non-communicable conditions accounted for 54% of deaths in low- and middle-income countries, compared with 36% attributed to communicable (i.e. infectious) diseases, maternal and perinatal conditions and nutritional deficiencies (Suhrcke et al 2006). Chronic diseases, mainly cardiovascular disease, cancer, chronic respiratory diseases, and diabetes, were estimated to cause more than 60% (35 million) of all deaths in 2005; more than 80% of these deaths occurred in low-income and middle-income countries (WHO 2005).

The aim of this fact sheet is to examine the economic implications of chronic diseases with specific reference to India. This fact sheet is divided into 4 main sections:

- Section 1 deals with myths and realities, prevalence and the economic impacts of chronic diseases.
- Section 2, examines the distribution of Chronic Diseases in India.
- Section 3 deals with the economic impact of chronic diseases and discusses various methods of assessing the economic impacts including cost of illness, micro and macro economic impacts. It also presents available empirical evidences on the economic impacts of chronic diseases in India.
- The last section concludes with the identification of various research gaps on the economic implications of chronic diseases in India.

1. Distribution of Chronic disease: Myths and Realities of Chronic Diseases

Two fundamental notions have characterized the common perception of chronic diseases: that they are concentrated among the rich and among the elderly (Suhrcke et al 2006).

If chronic diseases are 'diseases of affluence', indicating wealth rather than poverty, there is limited motivation, from an equity standpoint for economic policy to confront the problem.

If chronic diseases strike only towards or after the end of working age and, hence, after a lifetime of productive contribution to the economy, then early death or disability due to chronic disease may not be considered to represent a significant economic loss.

Several misunderstandings have contributed to the neglect of chronic disease. With a strong evidence base, the WHO global report (2005) on "Preventing Chronic Diseases- A Vital Investment" attempted to dispel the notions that chronic diseases are a distant threat and are less important and serious than some infectious diseases. The report lists 10 common conceptions and realities presented below:

Myths and realities of chronic diseases

Myths	Realities
1. Chronic diseases mainly affect high income countries	Four out of five chronic disease deaths are in low and middle income countries (LMICs).
2. LMICs should control infectious diseases before chronic diseases.	LMICs are at the centre of both old and new public health challenges.
3. Chronic diseases mainly affect rich people	Both rich and poor are likely to develop chronic diseases, and everywhere are more likely to die as a result.
4. Chronic diseases primarily affect old people.	Almost half of chronic disease deaths occur prematurely, in people under 70 years of age and one quarter of all chronic disease deaths occur in people under 60 years of age.
5. Chronic diseases mainly affect men	Chronic diseases, including heart disease, affect women and men almost equally.
6. Chronic diseases are the result of unhealthy 'life styles'	Individual responsibility can have its full effect only where individuals have equitable access to a healthy life, and are supported to make healthy choices.
7. Chronic diseases cannot be prevented	The major causes of chronic diseases are known, and if these risk factors were eliminated, at least 80% of all heart disease, stroke and type2 diabetes and more than 40% of cancer would be prevented
8. Chronic diseases prevention and control is too expensive	A full range of chronic disease interventions are very cost effective for all regions of the world.
9. "My grandfather smoked and was overweight – and he lived to 96"	In any population, there will be a certain number of people who do not demonstrate the typical patterns seen in the vast majority.
10. Everyone has to die of something	But death does not need to be slow, painful, or premature

Suhrcke et al (2006) highlighted that chronic diseases and related risk factors impose a significant burden on both the poor, across countries and within countries; and those of working age. Furthermore, the

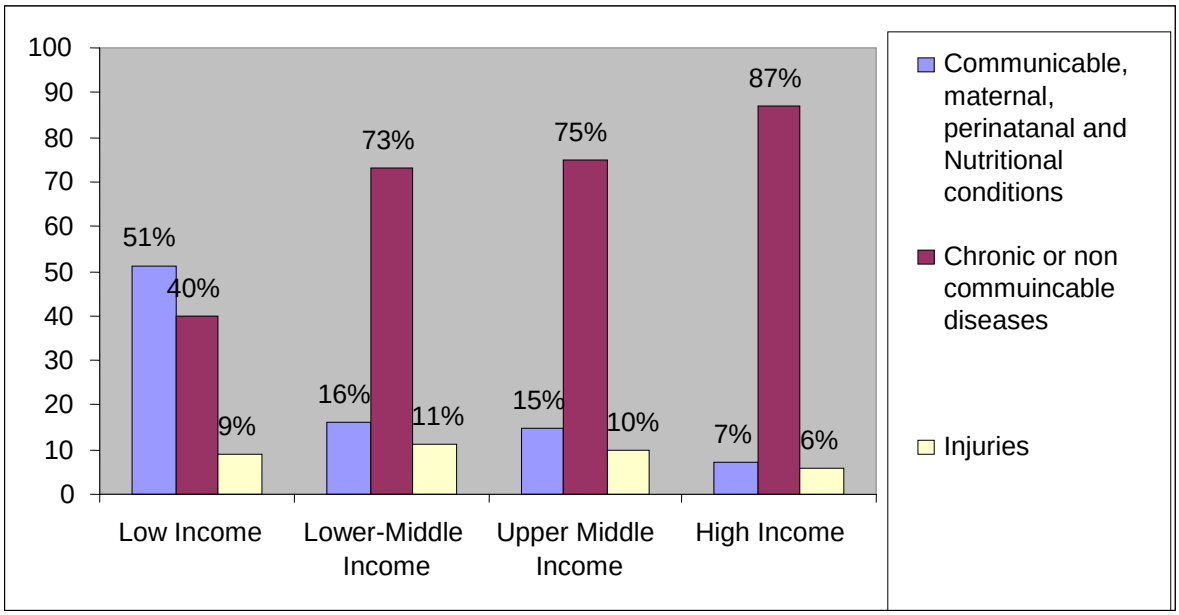
report also cited that, contrary to widespread belief, a substantial share of the chronic disease burden rests on the shoulders of working-age populations (even when 'working age' is conservatively defined as 60 years or younger), and particularly in developing countries. Approximately 80% of all DALYs are lost due to chronic disease before age 60 in low- and middle-income countries (Suhrcke et al 2006). There are two possible methods to establish whether chronic diseases affect the poor and/or developing countries:

1) By examining the overall burden (the number of deaths due to a particular cause and or DALYs) of disease across countries or regions,

2) By examining the prevalence of risk factors, such as smoking and body mass index (BMI), in relation to wealth.

Using the first method, the GBD project (2005) aggregated regional data on causes of death into four groups according to the income categories used by the World Bank: low, lower-middle, upper-middle and high income. It established that economic growth and prevalence of chronic diseases are related, as shown in figure 1 below. One of the reasons for the higher prevalence of chronic diseases in high income countries is that the economic growth also contributes to risk factors of chronic diseases. However, caution must be taken not to generalize this data because the sample of countries the WHO used may not be representative for any global or regional pattern.

Figure 1: Worldwide share of deaths by causes and World Bank Income Category 2002 (Mathers et al 2003)



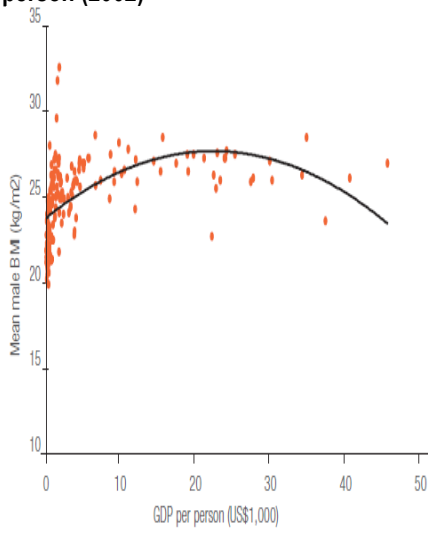
Using the second method, figure 2 illustrates that economic growth leads to growth of risk factors of chronic diseases such as BMI, blood pressure and smoking. For instance, figure 2.1 indicates that when Gross Domestic Product (GDP) increases, an indicator of economic growth, so does BMI, suggesting a positive relationship between income and BMI. The theoretical base for such an empirical outcome could be the increased intake of the energy-dense foods, that tend to be high in fat (e.g. butter, oils, fried foods),

sugars or starch and are not only highly processed but also micronutrient-poor, further diminishing their nutritional value, in high-income countries (WHO 2010). Moreover, higher income can lead to a trend towards decreased physical activity due to the increasingly sedentary nature of many forms of work, less physical exercise, changing modes of transportation, and increasing urbanization (WHO 2010).

Though figures 2.1-2.3 indicate a positive relationship between higher income and prevalence of risk factors, we can also observe that income beyond a certain level results in the reduction of the risk factors as well. For instance, we can see from figure 2.3 that smoking prevalence among men declined to zero when the per capita GDP reached to US$42. This may be due to the fact that higher income also leads to the creation of higher levels of awareness about the risk factors.

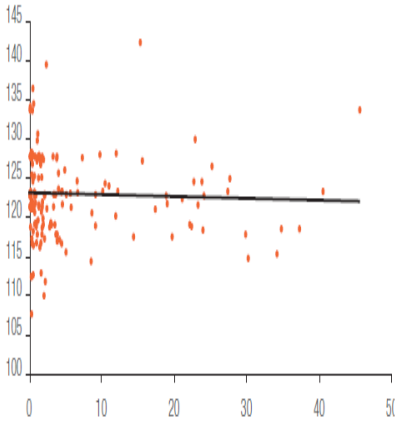
Figure 2.1-2.3: Economic growth and select risk factors of chronic diseases

Figure 2.1 Mean Body Mass Index (BMI) Versus Gross Domestic Product per person (2002)



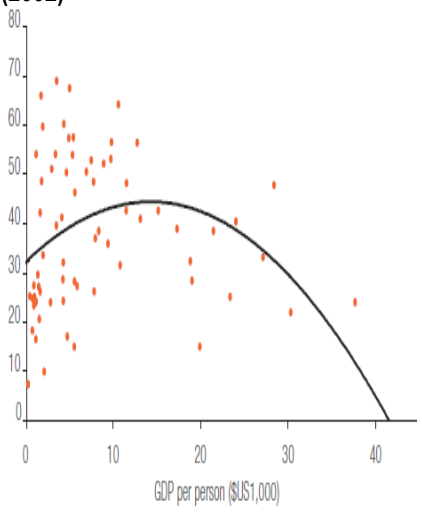
Source WHO Global InfoBase
(http://www.who.int/ncd_surveillance/infobase; accessed 14 July 2006)
Note The sample comprises 170 countries and the robust regression results are:
Male BMI = 23.7 + 0.35 GDPpc - 0.0078 $(GDPpc)^2$ (R^2=0.29).
The coefficients are significant at the 1% level.

Figure 2.2 Mean systolic blood pressure for females (age>14) versus GDP per person (2002)



Source WHO Global InfoBase
(http://www.who.int/ncd_surveillance/infobase; accessed 14 July 2006).
Note The sample comprises 170 countries and the robust regression results are:
Female blood pressure = 123.1 - 0.025 GDPpc (R^2=0.0019).
The linear coefficient is statistically insignificant.

Figure 2.3 Smoking prevalence among men (age>14) versus GDP per person (2002)



Source WHO World Health Statistics 2006
(http://www.who.int/whosis/whostat2006/en/index.html; accessed 16 September 2006)
Note The sample comprises 69 countries and the robust regression results are:
Male smoking prevalence = 31.8 + 1.72 GDPpc - 0.060 $(GDPpc)^2$ (R^2=0.11).
The coefficients are significant at the 1% level.

Since the above figures are a reflection of the macro scenario at the national level rather than at a household level, it can also be inferred that the governments of the developed countries are more aggressive in reducing the risk factors through legislation and policies which may include reduction in fat content in foods, higher taxes for tobacco and alcohol and creating awareness among its citizens.

Some studies have examined the within-country distribution of chronic diseases or their risk factors over a worldwide set of countries. Evidence from Europe indicates that the poor carry a higher chronic disease burden than the rich (Mackenbach 2005, Avendano M et al. 2006, Suhrcke et al 2006) and though there is

limited empirical evidence available in developing countries, this phenomena is similarly observed in LMIC countries. This is further compounded with the poor- rich differences being greater in low-income compared with the high-income countries.

For example, the World Bank extensively documented that in the majority of LMIC, smoking prevalence is higher among the poor. (Jha et al. 1999, Bobak et al. 2000) This finding was confirmed by the World Health Survey (WHS 2003) - a global multi-country survey programme implemented in 70 countries by the WHO to collect high quality baseline data on three major areas of health (levels of health of the population and risks to health; the responsiveness of the health system to peoples' expectations; and the expenditure that people incur on health). The Indian component of the WHS, which was conducted in 2003 in six states of India[1] (Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal) found that tobacco use is nearly three times higher (42 %) among lowest income quintile (the poorest) compared to the upper income quintile respondents (16%).

2. Distribution of Chronic Diseases in India

Several reports and studies have documented the prevalence of chronic diseases in India. (WHO 2004, Registrar General of India 2008, NSSO 2004, Mahal et al 2010) The WHO (2004) projected that over the next 10 years in India:

1. Over 60 million people will die from chronic diseases.

2. Deaths from infectious diseases, maternal and perinatal conditions, and nutritional deficiencies combined will decrease by 15%.

3. Deaths from chronic diseases will increase by 18%, most markedly; deaths from diabetes will increase by 35%.

4. The total foregone national income (estimated income loss) by 2015 as a result of the impact of heart diseases, stroke and diabetes on labour supplies and savings is estimated to be US $54 billion. Further, the accumulated income losses during the period of 2005 and 2015 will be US $233.6 billion (in 2005 values) for India.

Similarly, the Special Survey of Deaths (SSD), undertaken in 2001-2003 (Registrar General of India, 2008) and which covered over 6,645 small areas (sample units) in all the States and Union Territories found that:

1. Non-communicable diseases are the leading causes of death in the country, constituting 42% of all deaths. Communicable, maternal, perinatal and nutritional conditions constitute another 38% of deaths, injuries and ill-defined causes each constitute 10% of deaths. It is suggested that the majority of ill-defined

[1] The WHS in India covered a combined random sample of 10, 279 households and 9,994 adults in ages 18+ with nearly equal proportion of male and female respondents. The overall prevalence in India of daily tobacco use – smoking, chewing, and sniffing is estimated to be 30 % among adults age 18 +. This increases to 44 % among the elderly population of age 65 and above. Nearly 60 % of the elderly males use tobacco. Tobacco use is greater among rural adults (31 %) compared among urban adults (22%).

causes are for older people (70 or higher years) and most of the ill-defined deaths are likely to be from non-communicable diseases. (Registrar General of India. 2008)

2. Rural areas report more deaths due to communicable, maternal, perinatal and nutritional conditions (41%) compared to urban areas. The proportion of deaths due to non-communicable diseases is less in rural areas (40%) than in the urban areas (56%). Injuries constitute about the same proportion in both rural and urban areas; however, the specific causes of injury vary.

3. The leading cause of death is cardiovascular disease (CVD) (19%), followed by respiratory diseases (9%), diarrhoeal diseases (8%), perinatal conditions (6.3%), respiratory infections such as acute pneumonia (6.2%), tuberculosis (6%), malignant and other neoplasms (5.7%), senility (5.1% of which is concentrated at ages 70 and higher), unintentional injuries: other (4.9%), and symptoms, signs and ill defined conditions (4.8%). Among the age group of 25-69, CVD caused 25% of the total deaths. Furthermore, CVD is the leading cause of death among both males and females.

4. There is a marked regional variation in India in the distribution of leading cause of deaths. For example, the highest proportion of deaths from CVD are in the South (25%) and the lowest in the central regions (12%) of India.

Based on the data collected from National Sample Survey Organisation (NSSO) in 2004, Mahal et al. (2010) for the World Bank was able to calculate the prevalence of various chronic diseases in India. In contrast to the WHO definition of non communicable diseases, Mahal included injuries to estimate that in 2004, 8.08% of the Indian populations over the age of 35 years suffered from chronic diseases. (Mahal et al. 2010)

Tables 1-3 present further estimates on the prevalence of chronic diseases in India across various income quintiles distinguishing between rural and urban locations. In particular, table1 indicates that the prevalence of chronic disease is highest among the most affluent sections of the population compared to the lowest income groups, indicating that income and prevalence of chronic disease have a positive association in India. For instance, the prevalence of chronic disease is 4.46% among the bottom of the Income Quintile where as the prevalence is 13.91% among the richest 20% of the Income Quintile. In consonance with the fact that the prevalence of both non-communicable and communicable diseases is a positive function of income (when income increases, the prevalence also increases), there is a significant percentage point difference in the prevalence between both types of diseases across various income groups. For instance, the percentage point difference between the richest 20% Income Quintile and the bottom 20% Income Quintile is 9.45 in chronic diseases whereas the percentage point difference is only 2.42 in communicable diseases.

Table 1. Prevalence (per 100) of selected Chronic Diseases Ailments, in the Indian Population 35 years and above (15-day reference period). (Mahal et al. (2010), based on NSSO data 2004)

Income Quintile	CVD	Respiratory Conditions (incl. asthma)	Diabetes	Accidents & Injuries	Cancer	All NCDs	Non-NCDs
Bottom 20%	0.85	1.16	0.36	0.40	0.10	4.46	7.97
II	1.33	1.59	0.55	0.32	0.08	6.07	7.87
Middle 20%	1.80	1.48	0.75	0.41	0.10	7.11	8.74
IV	2.70	2.19	1.23	0.36	0.12	9.13	8.99
Richest 20%	4.70	2.24	2.46	0.46	0.23	13.91	10.39
All Groups	**2.25**	**1.71**	**1.06**	**0.39**	**0.13**	**8.08**	**8.78**

Tables 2 and 3 below, illustrate the prevalence of both types of communicable and non-communicable diseases between rural and urban across various income groups. Overall, the prevalence of chronic disease is higher among the urban population (11.58%) compared with the prevalence among the rural population (6.79%). Furthermore, the percentage point difference of prevalence of chronic disease between the richest 20% Income Quintile and the bottom 20% Income Quintile is 9.18 among the rural population and 10.13 among the urban population, in accordance with the fact that prevalence of chronic diseases and income has a positive association. However, this association is not consistent between various income groups in the case of communicable diseases, especially among the urban population where the poor have higher prevalence rate than the rich.

One possible explanation for the lower prevalence of communicable diseases among the urban richest population could be that the richer sections of the society are able to take more precautions in preventing communicable diseases than the poor people; through better awareness, better living conditions including access safe drinking water, sanitation, improved environment, and better access to healthcare including immunization and vaccination (Subramanian S.V et al. 2009, Sen 2002, Chen & Murray 1992, Mahal et al 2010).

Though the exact reasons for such a higher prevalence of chronic diseases among the richest sections of society in India is yet not fully established, the possible explanations would include being more likely to be diagnosed compared with the poor, increased intake of energy-dense foods that are high in fat and sugars and further fuelled by a trend of decreased physical activity due to the increasingly sedentary nature of many forms of work, less physical exercise, changing modes of transportation, and increasing urbanization (Ebrahim, S et al. 2010, Reddy KS et al 2005, WHO 2005, 2010).

Table 2. Prevalence (per 100) of selected Chronic Disease Ailments, in the Rural Indian Population 35 years and above (15-day reference period). (Mahal et al. (2010), based on NSSO data 2004)

Income Quintile	CVD	Respiratory Conditions (incl. asthma)	Diabetes	Accidents & Injuries	Cancer	All NCDs	Non-NCDs
Bottom 20%	0.44	1.04	0.17	0.34	0.08	3.52	7.91
II	0.78	1.43	0.29	0.26	0.04	4.75	7.94
Middle 20%	1.00	1.55	0.32	0.43	0.11	5.74	9.42
IV	1.54	2.27	0.69	0.35	0.12	7.38	9.43
Richest 20%	3.71	2.43	1.84	0.53	0.22	12.70	11.37
All Groups	**1.49**	**1.73**	**0.66**	**0.39**	**0.11**	**6.79**	**9.22**

Table 3. Prevalence (per 100) of selected Chronic Disease Ailments, in the Urban Indian Population 35 years and above (15-day reference period). (Mahal et al. (2010), based on NSSO data 2004)

Income Quintile	CVD	Respiratory Conditions (incl. asthma)	Diabetes	Accidents & Injuries	Cancer	All NCDs	Non-NCDs
Bottom 20%	1.96	1.48	0.89	0.54	0.15	7.05	8.13
II	2.64	1.97	1.18	0.44	0.18	9.23	7.69
Middle 20%	3.89	1.30	1.89	0.34	0.10	10.72	6.98
IV	6.61	1.95	3.05	0.39	0.12	15.04	7.50
Richest 20%	7.35	1.71	4.14	0.29	0.25	17.18	7.76
All Groups	**4.32**	**1.67**	**2.05**	**0.40**	**0.16**	**11.58**	**7.61**

3. Economic Impacts of Chronic Diseases in India

There exists much evidence to suggest that chronic diseases and related risk factors adversely affect not only individuals and households but also the economy at large through changes in consumption and saving decisions, labour market performance, and human-capital accumulation (Suhrcke et al 2006). Several studies and reports have assessed the economic impacts of chronic diseases in India and found that they impose huge welfare losses for both households and the general economy (Mahal et al 2010, WHO 2004, WHS 2003, Registrar General of India 2008, Shobana et al 2000, 2002, Gupta et al 2006, Popkin et al 2001). In general, three types of methodologies are applied for measuring the economic impact of chronic diseases: they include cost of illness, micro and macro economic impacts.

3.1. Cost-of-illness

Cost-of-illness studies measure the economic burden of a disease and estimate the maximum amount that could potentially be saved or gained if a disease were to be eradicated (Segel 2006). The cost of illness (COI) is measured in terms of direct and indirect costs of chronic diseases. Direct costs measure the opportunity cost of resources used for treating a particular illness, whereas indirect costs measure the value of resources lost due to a particular illness. (Kirschstein 2005).

Direct medical costs include costs incurred during hospitalisation or as outpatient e.g. emergency department care, nursing home care, hospice care, rehabilitation care, specialists' and other health professionals' care, diagnostic tests, prescription drugs and drug sundries, and medical supplies. Nonmedical direct costs include transportation costs to health care providers; relocation expenses; and costs of making changes to one's diet, house, car, or related items (Hodgson and Meiners, 1982, Kirschstein, 2005, Rice 1999, Segel 2006). When measuring direct costs, studies often measure total direct costs (i.e. the costs of resources used) rather than net direct costs, which subtracts future medical costs avoided because of the death of a patient, from total costs (Hodgson and Meiners, 1982).

Indirect costs include the loss of resources due to morbidity and mortality, which inherently place a monetary value on the value of life. (Kirschstein, 2005, Mart et al 2001) Indirect costs represent the other portion of estimated costs. There are three primary approaches to estimate indirect costs: the human capital method, the friction cost method, and the willingness to pay method.

1. The human capital method measures the lost production, in terms of lost earnings, of a patient or caregiver. (Hodgson and Meiners 1982, Hodgson 1983, Rice 1967) For mortality or permanent disability costs, the approach multiplies the earnings lost at each age by the probability of living to that age.

2. The friction cost method, measures only the production losses during the time it takes to replace a worker (Koopmanschap 1992, Koopmanschap et al. 1995, Johannesson and Karlsson, 1996). This approach assumes that short-term work losses can be made up by an employee and the loss of an employee only results in costs in the time it takes for a new employee to be hired and trained, known as the friction period.

3. The willingness to pay approach measures the amount an individual would pay to reduce the probability of illness or mortality (Segel. 2006, Hodgson. 1983). The methods to determine an

individual's willingness to pay includes surveys, an examination of additional wages for employment with high risks, an examination of the demand for products that lead to greater health or safety. (Rice et al. 1989, Hirth et al. 2000).

The Indian context:

There are a number of Indian studies, which have estimated the direct and indirect cost of specific chronic diseases. (Table 4) For example, Shobhana et al (2000) calculated the costs of diabetes among the sample population of Chennai and found that out-of-pocket-spending due to diabetes during hospitalization was INR 5,300 per event. Further, Murthy and Sastry (2005a) estimated that the direct and indirect costs of treatment of COPD in Hyderabad district of Andhra Pradesh found that treatment costs for a patient with severe COPD was nearly INR 33,000 in 2001. Apart from these, the annual income losses to households affected by CVDs in India in 2004 were 144-158 billion INR, which occupied more than one-third of all income losses out of all chronic diseases. (Mahal et al 2010)

3.2. Microeconomic consequences of chronic disease

This methodology measures the effects of chronic diseases on consumption and saving. (Suhrcke et al 2006). Consumption, savings and investments can be affected by the disease condition itself, as well as by the behaviours that give rise to the disease. (Suhrcke et al 2006) Chronic diseases and related risk factors may affect labour productivity and labour supply, which have important consequences for individuals and households. (Suhrcke et al 2006)

A concept that has been increasingly applied in the literature is that of 'catastrophic expenditures' for health care, sometimes also called 'impoverishing medical expenditures'. Expenditures for medical care are defined as financially catastrophic when they endanger a household's ability to maintain its customary standard of living. Catastrophic expenditures are not always synonymous with high healthcare costs. (Xu et al. 2003, Doorslaer et al. 2006) A large bill for surgery, for example, might not be catastrophic if a household does not bear the full cost because the service is provided free or at a subsidised price, or is covered by third-party insurance (Wyszewianski 1986). Even small costs for common illnesses can be financially catastrophic for poor households with no insurance cover. (Xu et al.2003) The threshold at which a level of expenditure becomes financially catastrophic relative to a household's 'capacity to pay' (the income that remains after basic consumption needs have been met) has typically been set between 5% and 20% of total household income. (Wyszewianski 1986, Berki SE 1986).

Using a threshold of 40% of capacity to pay Xu et al. 2003 found that the share of households with catastrophic health expenditures in 59 developed and developing countries varied between 0.01% (France) and 10.45% (Vietnam). As expected, the risk of catastrophic expenditures in any given country increases with the share of total health spending that is paid out of pocket.

The Indian context: Mahal et al (2010) used a threshold of 30% by applying the following formula: $Dj = Hj/_{Ej - NjP}$, where *Hj* is the combined health spending on all hospitalizations for household *"j"*, *Ej* is total household consumption spending, *Nj* is the size of household *"j"*, and *P* is the poverty line level of spending (catastrophic spending is said to occur whenever *j D* exceeds 0.3). Even at this lower threshold, the results indicated that the odds of incurring catastrophic hospitalization expenditures are 160 % higher with cancer compared with the odds of incurring catastrophic spending when hospitalization due to a communicable condition. The odds of incurring catastrophic hospital spending due to CVD or injuries were in contrast 30% greater that hospitalisation due for communicable conditions. (Mahal et al. 2010)

3.3. Macroeconomic consequences of chronic disease

Health in general, measured as life expectancy or adult mortality, is considered to be a robust and strong predictor of economic growth (Barro 1991, 1996; Barro and Lee 1994; Barro 1995; Sachs and Warner 1995). Since chronic disease constitutes a major part of the global health burden and accounts for a major part of reduced life expectancy and adult mortality, it would be expected to have a negative impact upon economic growth.

The WHO (2004) estimated that the estimated losses in national income in 2005 from CVD and diabetes would be US$ 9 billion for India. However the actual loss in GDP due to chronic conditions was US$1.35 billion in 2006 and it is estimated to be amount cumulatively to a total of US$17 billion by the year 2015. (Abegunde et al. 2007)

Table 4 presents some of the evidence available on the economic impact of CVD, diabetes and Cancer for India. It illustrates that chronic diseases, especially CVD, Diabetes, Cancer imposes considerable financial burden through out of pocket spending, reduction in consumption and saving, and loss of national income. For example, the cost of diabetes is about 2.1 percent of GDP (The Economist Intelligence Unit, 2007). Further, evidences suggest that the economic cost due to CVD could amount to as much as 20 percent of its state domestic product in Kerala(Gupta et al. 2006) and CVD-related losses of US $30 billion per year is occurring in the country (Leeder et al. 2004).

More recent evidence has estimated that the total income losses due to chronic diseases in India to be between US$1,094 - 1,113 billion. (Table 5) Of this, loss due to hypertension was the highest, i.e. US$ 199 billion and the next CVD with an income loss of US$144-158 billion.

Table 4: Economic Impacts of CVD, Diabetes and Cancer

Study	Diseases	Study sample and methods	Impact
Mahal et al. 2010 India	All major chronic diseases and specifically for CVD and Cancer	Based on NSSO data 2004 and data from Registrar General India.	The odds of incurring catastrophic hospitalization expenditures are nearly 160 percent higher with cancer and 30 percent greater with CVD as compared to communicable conditions that result in hospital stays. **CVD:** Though additional health care expenses due to CVD (in current INR) more than doubled over the period from 1995-96 to 2004, and inpatient lengths of stay declined. The impacts on catastrophic spending appear not to have changed much over the two periods.In contrast, the average treatment effect of CVD on poverty increased quite sharply from 1995-96 to 2004, despite rising incomes and lowered overall poverty rates. **Cancer:** individuals with cancer report greater use of health services, higher levels of out of pocket health spending and greater rates of catastrophic spending and impoverishment in their households in comparison to those who do not report cancer.
Leeder et al. 2004 India	CVD	WHO burden of disease data on DALYs lost on account of CVD, in conjunction with an estimate of US$1,000 per DALY lost.	CVD-related losses of US $30 billion per year
Popkin et al. 2001 India	CVD, Diabetes and Cancer	Combined costs of healthcare as well as lost incomes from ill-health for cancers, diabetes and CVD using a mix of data from the 1995-96 health care utilization and expenditure survey of the NSSO.	Healthcare costs (both out-of-pocket and government spending) associated with just these three conditions amounted to US$13.9 billion in 1995-96, or about 0.4 percent of GDP. The estimated lost incomes due to these three disease in 1995-96 are roughly US$2.25 billion.
Abegunde et al. 2007 India	CVD, diabetes, cancers and respiratory conditions	Impact of CVD, diabetes, cancers and respiratory conditions on current and future national output. Compared GDP levels under business-as-usual scenarios with GDP levels that could be achieved if deaths from chronic disease were to be eliminated completely. Data source: mortality (by cause) statistics from the Registrar General of India and projections made by Mathers and Loncar (2006).	Found that the loss in GDP due to chronic conditions to be of the order of US$1.35 billion in 2006 and amounting cumulatively to a total of US$17 billion by the year 2015.
Gupta et al. 2006 Kerala, India	CVD	Primary data among urban workers in a firm in Kerala	Economic cost could amount to as much as 20 percent of its state domestic product. Further, 25 percent of all deaths in the 25-70 year age group to be due to CVD
The Economist Intelligence Unit (EIU) 2007, India	Diabetes	Estimated the economic costs by assessing direct medical care costs, lost productivity as a result of mortality, morbidity and disability associated with diabetes.	The costs for India are about 2.1 percent of GDP.
Shobhana et al. 2000 Chennai-Tamil	Diabetes	Out-of-pocket spending by a sample of about 600 diabetic in-patients in hospitals.	Average expenditure during hospitalization is INR 5,300. Diabetic patients with a longer history of diabetes (5 years or more) spent 70 percent more

Nadu, India			during their hospitalization than those with a recent history of diabetes.
Shobhana et al. 2002 Chennai-Tamil Nadu, India	Diabetes	Out of pocket expenditures incurred on 209 diabetes Type 1 cases	Expenses ranging from INR 2,050 to INR 87,150, with a median of INR 14,000. Poor families were spending much greater proportions of their income, some as much as 60 percent of their household income for medical care
Grover, et al., 2005, India	Diabetes	Costs of treatment in a sample of 50 diabetes patients in a North Indian hospital.	Costs of treatment are roughly INR 10,000, and another INR 4000 as losses on account of morbidity.
(Murthy and Sastry (a) 2005 Hyderabad, India	COPD (chronic bronchitis and emphysema), and asthma	Estimated the direct and indirect costs of treatment of COPD of individuals over the age of 30 years.	Treatment costs for a patient with severe COPD was nearly INR 33,000.

US= United States; INR = Indian Rupee

Table 5: Annual Income Losses to Households Affected by NCDs in India, 2004 (Mahal et al. 2010)

Health Condition	Income Losses (in Billions of INR) due to			
	Illness	Care-giving	Premature death	Total
CVD (excl. hypertension)	83.9	43.0	16.7-30.7	144-158
Hypertension	131.9	66.1	1.2-1.4	199
Respiratory Conditions	48.5	38.4	0.5-5.2	87-92
Asthma	66.3	35.4	0.5-5.2	102-107
Disorders of Joints/Pain	116.2	59.2	0.1-0.3	175
Disease of kidney/urinary system	26.6	14.6	2.3-4.8	44-46
Neurological Disorders	37.9	21.4	2.0-2.8	61-62
Psychiatric Disorders	12.9	7.0	0.1-0.7	20-21
Diabetes	106.6	53.7	2.2-2.3	163
Accidents & Injuries	36.3	22.2	5.3-20.3	64-79
Cancers & Other Tumors	12.7	6.7	3.0-8.0	22-27
All NCD	***679.8***	***367.8***	***46.3-65.5***	***1,094-1,113***
NCD (excluding injuries)	***643.5***	***345.6***	***41.0-45.2***	***1,030-1,034***

Based on data from the 60th round (2004) of the National Sample Survey Organization that surveyed nearly 80 thousand households on health care utilization, expenditure and other information; combined with mortality data from the Medical Certification of Causes of Death (MCCD) of the Registrar General of India and the Burden of Disease statistics of the WHO

4. Concluding Remarks

The prevalence of chronic diseases is increasing not only worldwide but also in India. The myths that chronic diseases only affect the rich and elderly have been dispelled by the empirical evidence that it also affects the poor and young in India. Furthermore, chronic diseases incur huge welfare losses, both at the individual and national level; through cost of illness, reduction in consumption and impoverishment and loss of national production. Thus, chronic diseases have considerable impact on the national economy level which merits policy attention.

With regard to the available evidence, there remain gaps in research on the burden and cost of chronic diseases in India. The evidence is largely based on studies with small sample size and without the application of rigorous methodology. The applications of randomized control trial methods on measuring the impacts of chronic diseases would give more robust results. Furthermore, there is limited documented evidence on how individuals and households cope and smooth their consumption and saving when they are affected with chronic diseases. The existing research evidence suggests that chronic diseases affect households adversely and leads to impoverishment. However, the robustness of these findings may be doubtful.

To date, in India, routine and complete data on chronic disease is not formally collected. Though there is research evidence on the impact of single risk factors on morbidity as well as the economic impact of single illness on households and national economies, there is little information on the impacts of co-risk factors and co-morbidities. There is also a dearth of evidence on the cost effectiveness of various interventions to reduce the burden of chronic illness in India. Since resources are limited but have multiple uses and prevalence of chronic diseases are increasing, it is necessary to consider the need for rigorous cost effective and cost benefit studies in this regard to assist the policy makers and other stakeholders to make context specific and effective interventions to reduce the burden of chronic diseases.

References:

Abegunde, C. Mathers, T. Adam, M. Ortegon, K. Strong. 2007. "The burden and costs of chronic diseases in low-income and middle-income countries" *The Lancet* 370(December 8):1929-38.

Avendano, A E Kunst, M Huisman, F V Lenthe, M Bopp, E Regidor, M Glickman, G Costa, T Spadea, P Deboosere, C Borrell, T Valkonen, R Gisser, J-K Borgan, S Gadeyne, and J P Mackenbach (2006). Socio-economic status and ischaemic heart disease mortality in 10 western European populations during the 1990s. Heart. 92(4): 461–467

Barro Robert J., (1991), "Economic Growth in a Cross Section of Countries", The Quarterly Journal of Economics, Vol. 106, No. 2. (May, 1991), pp. 407-443

Barro, Robert J., and Jong-Hwa Lee. 1994. "Sources of Economic Growth," Carnegie-Rochester Conference Series on Public Policy, 1-46

Chen L, Murray C. Understanding morbidity change. Population and Development Review 1992; 18(Sep): 481-504

Doorslaer. E, O. O'Donnell, R. Rannan-Eliya, A. Somanathan, S. Adhikari, C. Garg, et al. 2006."Effect of payments for health care on poverty estimates in 11 countries in Asia: An analysis of household survey data." *The Lancet* 368(October 4):1357-64

Economic Intelligence Unit. 2007. *The Silent Epidemic: An Economic Study of Diabetes in Developed and Developing Countries*. London, United Kingdom: The Economist, Economic Intelligence Unit.

Grover, A. Avasthi, A. Bhansali, S. Chakrabarti, P. Kulhara. 2005. Cost of ambulatory care of Diabetes Mellitus: A study from North India *Postgraduate Medical Journal* 81(956):391-5.

Gupta, S. Kandamuthan, D. Upadhyaya. 2006. "Economic impact of cardiovascular diseases in India" unpublished. New Delhi, India: Institute of Economic Growth, University of Delhi.

Hirth RA, Chernew ME, Miller E, Fendrick AM, and Weissert WG, Willingness to Pay for a Quality-Adjusted Life Year: in Search of a Standard. Medical Decision Making 2000, 20(3): 332-342.

Hodgson TA and Meiners MR, Cost of Illness Methodology: A Guide to Current Practices and Procedures. Milbank Memorial Fund Quarterly 1982, 60 (3): 429-462.
Hodgson TA, The State of the Art of Cost-of-Illness Studies. Advances in Health Economics and Health Services Research 1983, 4: 129-164.

Johannesson M and Karlsson G, Journal of Health Economics 1996, 16: 249-255

Jha, B. Jacob, V. Gajalakshmi et al. 2008. "A nationally representative case control study of smoking and death in India." *The New England Journal of Medicine* 358:1137-47.

Kirschstein R, Disease-Specific Estimates of Direct and Indirect Costs of Illness and NIH Support: Fiscal Year 2000 Update. http://ospp.od.nih.gov/ecostudies/COIreportweb.htm Accessed 8 December 2005.

Koopmanschap MA and van Ineveld BM, Towards a New Approach for Estimating Indirect Costs of Disease. Social Science and Medicine 1992, 34 (9): 1005-1010.

Koopmanschap MA, Rutten FFH, van Ineveld BM, and van Roijen L, The Friction Cost Method for Measuring Indirect Costs of Disease. Journal of Health Economics 1995, 14:

Leeder Stephen, Susan Raymond, Henry Greenberg, Hui Liu, Kathy Esson. 2004. *A Race against Time: The Challenge of Cardiovascular Disease in Developing Countries*. New York, NY: Columbia University Press

Mackenbach JP, 2005. 'Health inequalities: Europe in profile. An independent expert report commissioned by and published under the auspices of the United Kingdom Presidency of the European Union', October.

Mahal Ajay, Anup Karan, Michael Engelgau (2010): The Economic Implications of Non-Communicable Disease for India, Health, Nutrition and Population (HNP) Discussion Paper, the World Bank.

Mark TL, Woody GE, Juday T, and Kleber HD, The Economic Costs of Heroin Addiction in the United States. Drug and Alcohol Dependence 2001, 61: 195-206.
171-189.

Mathers, D. Loncar. 2006. "Projections of global mortality and burden of disease from 2002 to 2030" *PloS Medicine* 3:e442

Mathers CD, C Bernard, KM Iburg, M Inoue, D Ma Fat, K Shibuya, C Stein and N Tomijima, 2003. 'The Global Burden of Disease in 2002: data sources, methods and results'. GPE Discussion Paper No. 54. Geneva: World Health Organization. Available at http://www.who.int/evidence.

Murthy, J. Sastry. 2005a. "Economic burden of chronic obstructive pulmonary disease," In *Background papers: The Burden of Disease*. New Delhi: Ministry of Health and Family Welfare, National Commission on Macroeconomics and Health, pp. 265-74.

Popkin BM, Horton S, Kim S, Mahal A, Shuigao J. Trends in diet, nutritional status, and diet-related noncommunicable diseases in China and India: the economic costs of the nutrition transition. *Nutr Rev*. 2001; 59: 379–390.

Reddy Srinath, Bela Shah,Cherian Varghese,Anbumani Ramadoss (2005). Responding to the threat of chronic diseases in India *The Lancet* - 12 November 2005 (Vol. 366, Issue 9498, Pages 1744 - 1749) DOI: 10.1016/S0140-6736(05)67343-6

Registrar General of India. 2007. Medical Certification of Cause of Death 2001. New Delhi, India: Ministry of Home Affairs, Office of the Registrar General of India.

Registrar General of India. 2008. Summary statistics of causes of death India. New Delhi, India: Ministry of Home Affairs, Office of the Registrar General of India.

Robert J. Barro and Xavier Sala-i-Martin (1995). Economic growth, New York, McGraw-Hill.

Rice D, The Economic Burden of Musculoskeletal Conditions, US, 1995. In: Praemer A, Furner S, and Rice DP editors, Musculoskeletal Conditions in the US. Rosemont, IL: American Academy of Orthopedic Surgeons: 1999.

Rice D, Estimating the Cost of Illness. American Journal of Public Health 1967, 57 (3): 424-440.

Rice DP, MacKenzie EJ, and Associates, Cost of Injury in the United States: A Report to Congress. San Francisco, CA: Institute for Health and Aging, University of California and Injury Prevention Center, Johns Hopkins University, 1989.

Sachs, J.D. and A.M. Warner. "Economic Reform and the Process of Global Integration," Brookings. Papers on Economic Activity, 1995:1, pp. 1-118.Washington DC; Brookings Institution.

Sachs, Jeffrey D & Warner, Andrew M, 1997. "Sources of Slow Growth in African Economies," Journal of African Economies, Oxford University Press, 6 (3): 335-76.

Segel J.E (2006). Cost-of-Illness Studies—A Primer, RTI International RTI-UNC Center of Excellence in Health Promotion Economics

Sen, A. (2002). Health: perception versus observation. BMJ, 324(7342), 860–861.

Shobhana, P. Rama Rao, A. Lavanya, R. Williams, V. Vijay, A. Ramachandran. 2000. "Expenditure on healthcare incurred by diabetic subjects in a developing country – a study from southern India." *Diabetes Research and Clinical Practice* 48(1):37-42.

Shobhana, P. Rama Rao, A. Lavanya, R. Williams, C. Padma, V. Vijay, A. Ramachandran. 2002. "Costs incurred by families having type-1 diabetes in a developing country – a study from southern India." *Diabetes Research and Clinical Practice* 55(1):45-8.

Suhrcke M. Nugent R A, Stuckler D, Rocco L. Chronic disease: an economic perspective. London: The Oxford Health Alliance, 2006.

Subranmanian S.V., Subramanyam M.A., Selvaraj S., Kawachi I. Are self-reports of health and morbidities in developing countries misleading? Evidence from India (2009) Social Science and Medicine, 68 (2), pp. 260-265.

WHO & IIPS (2004) WHO Health System Performance Assessment, World Health Survey 2003

WHO (2010). Population nutrient intake goals for preventing diet-related chronic diseases. Accessed Online as on July 2010. Web Link http://www.who.int/nutrition/topics/5_population_nutrient/en/print.html

World Health Organization (2008): The global burden of disease: 2004 update.

WHO (2005). Preventing chronic diseases: a vital investment: WHO global report. Geneva: World Health Organization, 2005.

Xu, D. Evans, K. Kawabata, R. Zeramdini, J. Klavus, C. Murray. 2003. "Household catastrophic health expenditure: A multi-country analysis" *The Lancet* 362(July 12):111-117.