Title: **Changing profile and the burden of treatment of cancer in India**

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1. Introduction

The world is witnessing a significant shift in the share of burden of diseases, with epidemiological transition taking place along with the demographic transition. While developed countries have been experiencing such shifts for a while now - with non-communicable diseases becoming increasingly the major cause of burden of disease - many developing countries are facing a dual burden arising from endemic communicable diseases along with the emergence of non-communicable diseases (NCD).

Non-communicable diseases comprise a heterogeneous group of chronic conditions that generally do not result from an acute infectious process and are not transmissible (Lester and Gale, 2006), though there are certain NCDs in which infectious agents play causal roles like liver, cervix, and stomach cancers (Dingli and Nowak, 2006). In any case, malignant neoplasms or cancer is a significant part of NCD, and are becoming a significant source of disease burden in many countries.

Cancer and cardiovascular diseases are the two leading causes of death in the world. According to WHO, lung, stomach, liver, colon and breast cancer cause the most cancer deaths each year, and tobacco use is the single most important risk factor for cancer (WHO 2009). Cancer costs more in productivity and life years lost than AIDS, malaria and other diseases that spread person-to-person (Farmer et al, 2010). While chronic diseases including cancer, heart disease and diabetes account for more than 60 percent of deaths worldwide, these garner less than 3 percent of public and private funding for global health (Beaulieu et al 2009; Stuckler et al, 2008).

Infectious diseases still contribute the major part of the burden of disease in developing countries; however, the presence of NCDs and the concomitant loss of resources due to high treatment costs and lost productivity have triggered some serious discussions and research around the impact of NCDs (Boutayeb, 2006; Anderson, 2009**)**. However, even in such discussions, the focus has mostly been on cardiovascular diseases (CVDs) and diabetes. Relatively much less attention has been focused on cancer, especially in developing countries

(WHO 2002; Seffrin et al 2009). One important reason may be the perception that such conditions are confined to the older ages that are not economically productive (Leeder et al, 2006).

The increasing number of cases of cancer at mainly public sector hospitals has prompted the Indian Council of Medical Research (ICMR) to gather data on the prevalence and incidence of cancer through site-specific cancer registries. While such data indicate rising trends of cancer among different demographic groups, there is much less information available on the socioeconomic determinants and implications of cancer. This paper uses survey data to understand and analyze whether there have been any change in self-reported cancer cases in India over the years, the correlates of such self-reporting and the determinants of expenditure on treatment. The paper does not attempt to estimate prevalence or incidence, but addresses the potential impact of a chronic disease such as cancer on households, by looking at the profile of who is reporting such illnesses and who might be impacted the most due to the burden of treatment costs.

Section 2 presents the evidence on Burden of Disease (BoD) and deaths in the world and India. It also discusses the specific case of cancer to indicate the current burden in the country as well as a brief review of literature on socioeconomic correlates of NCD in general and cancer in particular. Section 3 presents summary statistics of data from the three rounds of the nationally representative survey system in India, called the National Sample Survey (NSS). Section 4 analyzes the socioeconomic correlates of cancer and NCD as well as the burden of treatment expenditure on cancer and NCD. In Section 5 and 6 we present quantitative analysis of the secondary data to understand the determinants of self-reported cancer and variations in treatment expenditure. Finally, Section 7 presents summary, conclusions and recommendations of this exploratory study.

2. Burden of NCD and cancer in the world and in India

Non-communicable diseases or chronic diseases include cardiovascular diseases, diabetes, stroke, most forms of cancers and injuries. The factors that influence NCD include lifestyle changes & behavioural patterns like unhealthy diet, lack of physical activity and tobacco use, demographic profile, socio-cultural and technological advancements (Beaulieu, 2009).

Based on WHO's Disease Burden data, one finds that while communicable diseases contribute 30 percent of the total deaths in the world, this share is only 6.6 percent in high income countries (defined based on World Bank income classification). The share goes up for upper-middle income countries (14.7%) and lower-middle income countries (16.1%), but is very high at 51.7 percent for low-income countries (WHO 2004). However, while NCD deaths have the highest share in total deaths for all the income categories, especially countries with higher income, it is still a significant burden on low-income countries (39.5%). While the percentage is lowest for low income countries among all the groups, it is still considerable at 40 percent of the total deaths.

The Burden of Disease data also shows that CVDs and cancer contribute 43 and 31 percent of total NCD deaths respectively in high-income countries. For low income countries, CVDs and cancer comprise about 50 percent and 15 percent of total NCD deaths respectively. Clearly, while the burden of cancer deaths is lower in low-income countries, it is not an insignificant amount and cannot be ignored.

The higher burden from NCD in developing world is attributable to relative early manifestations of NCD at younger population due to exposure to risk factors, changing lifestyles and various environmental factors. The specific features that characterize NCD in India are – wide consumption of tobacco in various forms, indoor pollution due to use of wood and dung cakes for cooking, impaired fetal nutrition, high fat and low-fiber diet etc (Stein et al, 1996; Mishra, 2003; Yusuf et al, 2004, Goyal and Yusuf, 2006). In view of such issues, it is plausible to hypothesize that the socio-economic gradient in the prevalence of NCDs has altered significantly.

Table 1 shows share of diseases in lost Disability Adjusted Life Years (DALYs) in 2004 within NCDs in India.

Interestingly, the top contributor to total DALYs lost due to NCD is neuropsychiatric conditions, another somewhat neglected area in terms of research and policy. This is followed by CVD; cancer is in position 6, while diabetes in position 10.

This paper selects cancer for analysis over the other diseases (besides CVD and diabetes) primarily because it is caused often by life style changes, which can respond to early prevention, and also because cancer treatment is expensive and has the potential of imposing a high burden on households and individuals. Also, there is a lot of fear and anxiety around cancer, with lack of awareness about possible treatment options that make awareness generation a prime policy option.

(Insert table 1 here)

India has been a focus of research on various aspects for CVDs and diabetes (Chadha et al, 1997; Gopalan, 1997; Shetty, 2002; Mendis et al, 2005; Mehan et al.2006; Mohan et al, 2006; Aparajitha 2009; Prabhakaran et al 2009; Allender et al.2010; Thankappan et al 2010). However, most of the work relates either to establishing risk factors (behavioural and biochemical) or role of interventions to prevent NCDs. Relatively fewer studies have focused on economic analysis of NCDs in India. For example, a paper on factory workers on Kerala find high direct and indirect costs of CVD using a cost-of-illness approach (Gupta et al, 2006). Another more recent paper uses a matched case control methodology to understand the possible bias in estimates of impact of NCDs emanating from high indirect costs as well as high treatment costs including out-of-pocket expenditure (Mahal et al, 2009). The impact of food prices on nutritional intake has been analyzed using household survey data with the finding that changing relative prices may be impacting on dietary habits of Indians (Gaiha and Jha 2010).

Although there are studies linking the incidence of cancer to socioeconomic status (SES) of the population, these remain inconclusive (Link et al, 1975; Kingston and Smith, 1997). The common indicators for socioeconomic characteristics are income, occupation, education, wealth, poverty, insurance coverage, race, age, gender, place of living and employment status. These socioeconomic environments are reported to affect different types of cancer in different ways

(World Bank, 1999). For example, lung cancer is largely affected by tobacco use, exposure to smoke and soot due to indoor cooking and pollution levels in the air. Breast cancer is prevalent among the higher SES but the mortality is high in lower SES women (Singh et al, 2003).

The fundamental factors affecting the causation of diseases are multiple disease causing environments with high levels of pollution, risk factors and the access to resources that can be used to avoid cause and minimize the risk when impairment occurs (Phelan et al 2004). An epidemiological study conducted using the data from developed country confirms the facts that the association between SES and CVDs can partly be explained by known risk factor pathways; however, complete association can be explained using biological, behavioural and social risk differential across SES (Lynch et al, 1996). Another important factor that determines the relation between SES and prevalence of cancer is access to effective and timely screening. The opportunistic screening for cancer is found to be effective in management of cancer (Stoner et al 1998; Howe et al, 2005; Lui et al, 2007).

Understandably, there are serious limitations to studies that attempt to do economic analysis of NCDs, due to paucity of data and lack of information on confounding factors. Short of collecting longitudinal data in a predesigned survey that covers socioeconomic, demographic, behavioural and clinical parameters, it is difficult to analyse with any certainty the determinants and subsequent impact of NCDs including cancer. Thus, the present study is exploratory in nature, and its methodology and results are useful for researchers who are planning a more comprehensive scaled up study on the determinants and consequences of cancer.

3. Data and Summary statistics

The data used in this paper is based on three large-scale household surveys on morbidity and healthcare utilization undertaken by National Statistical Survey Organization (NSSO) pertaining to the periods 1986-87; 1995-96 and 2004-05 respectively. The NSSO is an organization under the Ministry of Statistics and Program Implementation that conducts nation-wide, large-scale surveys on the regular intervals on various social issues (like morbidity, migration, and employment), consumption expenditure, agriculture and industries. This paper uses data on morbidity and healthcare utilization, which was conducted over three successive periods, known as 'rounds'. The survey conducted in 1986-87 (42^{nd} round) was to make an assessment of

utilization of medical services. The survey done in 1995-96 (52nd round) was to study general health profile and curative aspects of health care systems of the country. Both these rounds were designed to collect information for one year to capture the seasonal effect in illness profile. The third successive survey (60th round) was carried out during January to June 2004 which collected information on morbidity, health care and the condition of the aged. Thus, the last round covers 6 months, rather than one full year and has a smaller sample size.

The survey tool was mostly comparable over the years, with some minor differences. For example, the analysis is based on essentially two sections: ambulatory care in the last 15 days for the last 2 rounds and last 30days for the first round, and hospitalization in the last 365 days[1]. Up to 5 episodes/visits have been included in the analysis based on frequency of visits, with total treatment costs in OPD given separately by episode in the first two rounds, and given for only one major episode in the last round.

The analysis uses the nature of illness reported by respondents as the main variable for classifying diseases. Thus, the analysis is on self-reported illness and conditions. As for the sample size, the percentage of self-reported cancer cases in OPD went up from 0.3 percent in the first round to 0.59 in the last round. During the same period, self reported hospitalized cancer cases went up from 1.06 to 2.28 percent.

The health data is supplemented with detailed demographic and socioeconomic information in each of the three rounds, enabling a quantitative analysis of reported cases. The analysis uses mostly hospitalization data due to the relatively larger sample size, though it also uses OPD data when analyzing the pooled sample.

Finally, household weights are given in the data set, calculated based on the sampling framework, and the entire analysis is done using these weights.

4. Cancer and selected NCDs: evidence from NSS

[1] Ambulatory care and hospitalization are called as visits to an out-patient department (OPD) and an in-patient department (IPD) respectively in the paper.

a. Cancer across socioeconomic categories

Table 2 presents reported occurrence of cancer, CVD and diabetes in the 3 rounds. As can be seen, CVD is the more frequently reported illness, followed by cancer. Self-reported cancer cases in all hospitalized cases more than doubled between the first two health rounds, and increased slightly between the second and third health rounds. Clearly, reported cases of other non-communicable diseases like CVD and diabetes went up much more relative to cancer between the last two rounds, and together the proportion of these three diseases comprised more than 11 percent of the total reported causes of hospitalization.

(insert table 2 here)

Table 3 below gives some summary statistics over the 3 rounds of the hospitalized cases of cancer.

The mean age for cancer reporting has come down somewhat between the first two rounds, and then stabilized at 41, indicating that cancer is now occurring among the most productive age groups, who would have at least 15-20 years of productive life remaining. As for the gender distribution, the bulk of the reported cases continue to occur in females, up slightly since the first health round. The education filter indicates that reported cases were higher among the illiterate respondents in the first round, but subsequently, this has come down to about 37 percent of all cases in 2004-05. The distribution now looks more even across different education classes - illiterates, those with completed primary education and those with completed higher secondary education. However, the social category[2] variable indicates that the bulk of the cancer cases continue to occur among the non-SC/ST/OBC respondents (76 percent in the last round). Interestingly, the distribution of cases among consumption quartiles also shows a similar trend as in education: initially, the lower quartiles seem to comprise at least one-fourth of the cases, which changed over the last two rounds and the distribution across the quartiles look more even now. However, the bulk of the cases (35 percent) continue to come from the highest consumption quartile.

(insert table 3 here)

[2] Scheduled castes and scheduled tribes are recognized by the Indian Constitution as vulnerable social groups requiring special focus.

While Table 3 gives the distribution of cancer cases across different socioeconomic variables, this does not indicate whether in each group there has been a change in the occurrence of the disease. In other words, to answer the question "who in India is reporting cancer?", it is more meaningful to look at the self-reported cases across categories of gender, education and social class. Tables 4, 5, 6 and 7 present the trend in cases reported across categories of gender, education and expenditure quartile.

(insert table 4 here)

Table 4 indicates that for women, self-reported illness has gone up slightly over the years for both OPD and hospitalization; however the increase is more than double for self-reported cancer cases. Clearly, since the first round, cancer cases went up significantly for women in the second round, and then seem to have stabilized. A similar analysis indicated that self reported cases more than doubled over the years for SC/ST group, though there was only a marginal increase in illness in this group.

(insert table 5 here)

From Table 5 one can see that reported cancer cases among people with all categories of education went up between the first and the third round. For example, cases among those with graduate degree and above increased more than fourfold from 1986-87 to 1995-96 but then declined and was at 2.5 percent in the third round.

Table 6 corroborates this finding and indicates that there has been an increasing trend of reported cancer cases among all the quartiles over the years.

(insert table 6 here)

These results indicate an increasing trend of cancer across all education categories, including those in the lower socioeconomic groups.

b. Expenditure on hospitalization due to cancer

High out-of-pocket spending (OOPS) on illness and hospitalization continues to be an important area of concern in India. There is already some cross-sectional evidence that OOPS is relatively

higher for NCDs like CVD, diabetes and cancer (Murthy and Sastry, 2005, 2001; Gupta, 2009; Mahal, 2009). Analysis of data from the 1995– 96 survey round of the NSS undertaken by the National Commission on Macroeconomics and Health (NCMH) suggests that OOPS on account hospitalization due to heart disease was roughly Rs 11,000 per person, or 120 percent of the average annual per capita expenditure of the households. Likewise, roughly Rs 32,000 is the annual cost of treatment for acute cases of chronic obstructive pulmonary disease (COPD) that involve hospitalization.

We present evidence from the last round on the magnitude and increase in OOPS for cancer in Table 7; the estimates from other rounds, not reported here, are very similar in magnitude. Since there is already evidence of the relatively higher expenditure on other NCDs like CVD and diabetes, we present estimates for both cancer and NCD including these other diseases.

(insert table 7 here)

The expenditure on NCD including cancer is always higher on an average compared to all other illnesses; the ratio is slightly less than 2 for NCD and about 2.6 times higher for cancer. When compared to annual household consumption expenditure, the burden of treatment comes out clearly; patients who are hospitalized due to an NCD spend about 39 percent of their household annual consumption expenditure on treatment, whereas others spend about 24.5 percent. For cancer patients, the percentage is much higher at about 66.5 percent. Finally, the last column on loss of household income while hospitalized again shows that households with cancer as well as NCD patients tend to lose a higher amount on an average than others.

5. Determinants of self-reported NCD and cancer: probit analysis

To understand the profile of those who report cancer in the three rounds, a probit equation was estimated using pooled (across rounds) data for inpatient (with reference period of 365 days), and pooled data for OPD and hospitalization combined.

The dependent variable is self-reported cancer, with the following independent variables: age and age squared, education of the individual (no education, education up to primary), gender (female, male), social group (SC & ST) to which the person belongs, place of residence (rural, urban), income. The inclusion of most of these variables is based on the discussion in the

previous section, with the variable on residence added since there are always important differences in outcomes between rural and urban areas in India. The regressions do not include children (below 15 years), though the summary statistics on reported cases include all ages. The omission of children is basically to make sense of the results where education is included as a determinant of the probability of reported cases. Finally, the time aspect is handled using dummies for rounds.

Before discussing the results, it is important to reiterate that this exercise is not an attempt to understand the epidemiology of cancer, but to understand the profile of those who are *reporting* a case of cancer. If, in fact, there is a significant number of ill individuals who are not seeking care, these results are going to be difficult to interpret. However, poor treatment-seeking behavior is based more on socioeconomic characteristics and much less on type of disease. If in fact, it is assumed that the distribution of those who did not seek care is not selective towards disease categories, these results would still be indicative of the determinants of self-reported cases of any disease.

(insert table 8 here)

The results (Table 8) indicate that age, rural residence, females, and those with higher consumption expenditure are more likely to report a cancer. The probability of reporting a cancer is 2.4 percent higher for females in the pooled data compared to males. Similarly, rural residents are 0.23 percent more likely to report a cancer case compared to their urban counterparts in the hospitalization data. Illiterates and primary educated individuals have a lower probability of reported cancer cases, compared to those with more than completed primary education.

The signs on the dummies for rounds 2 and 3 indicate that compared to round 1, cancer cases have gone up over the years.

While these results are not epidemiological findings, the fact that females, rural residents and higher income people are more likely to report a cancer open up interesting possibilities regarding the way cancer has spread in the country. The clearest result is for females. If women, in fact, have lower treatment-seeking behavior (West, 1991; Pandey, 2002; Ghosh, 2004), we

would have probably expected a reverse sign. The positive and significant sign for females clearly indicate the possibility of increased cancer cases among women. This is also borne out by BoD data for India (Shah et al 2006, ICMR, 2004), where the higher incidence of cancer among women in India is reported.

Next we will look at the 3 major NCDs – CVD, diabetes and cancer together – to see whether the results are very different from the probability of reporting cancer. Table 9 below presents the results for NCD for the pooled IPD and OPD data, as well as separately for IPD. Results indicate almost identical findings, except for the variable on residence; rural residents are less likely to report an NCD, both for overall data as well as for IPD separately. This is interesting, and at first puzzling if one recalls that the sign was opposite for cancer in the previous table. However, since the variable NCD includes CVD and diabetes – both increasing rapidly, especially in urban areas (Chadha et al, 1997), the probability of a reported NCD is higher in the urban areas, compared to rural areas. This makes the result on cancer even more important; it shows that rural residents are more likely to report a cancer relative to other NCDs.

(insert table 9 here)

6. Analysis of treatment expenditure on cancer and NCD: regression results

We examined the relationship between total (medical and non-medical) expenditures during hospitalization and various socioeconomic variables for cancer separately and selected NCDs. Since one could not control for possible selection bias due to lack of data in the three rounds on who seeks care, it was not possible to estimate these equations after correcting for selection bias. In the last round, in theory it is possible to use the correction for only OPD, but since there are relatively much fewer cancer cases in OPD, this was not attempted here.

Multiple regressions were run for the pooled data for two groups: hospitalization and hospitalization combined with OPD visits. The dependent variable for the analysis is self-reported expenditures summed over items like consultation, medicines, diagnostics etc. The independent variables include age, gender, level of education, social class, place of residence, monthly per capita household consumption expenditure and type of hospital (public/private)

visited. Cancer and NCD were introduced as dummies in the equation to see if there are independent effects of cancer/NCD on treatment expenditure, controlling for other socioeconomic characteristics. Instead of age, we used a dummy for the elderly (60 & above) to understand any differential outcomes between the elderly and the adults. As in the probit analysis, the regressions are restricted to adults including the elderly.

Table 10 and 11 present the results of the regression analysis for total expenditure, and expenditure on NCD which includes cancer, CVD and diabetes.

(insert table 10 here)

The results are similar for both hospitalization and hospitalization with OPD, and for cancer and NCD. The results indicate that the elderly, females, the less educated, SC\ST and those visiting public health facilities incur less expenditure compared to their reference groups. Also, individuals with higher consumption are likely to spend more on treatment. Cancer and NCD have a positive influence on expenditure, controlling for everything else. The coefficient for the round dummy indicates that treatment expenditure has gone up over time generally.

(insert table 11 here)

The most interesting result is for place of residency: rural residents incur higher expenditure controlling for consumption. One possible explanation is that availability of medical doctors in the public facilities is much lower and people incur OOPS on treatment, more than their urban counterparts. Also, individuals in rural areas may be spending out-of-pocket for other items which are not medical expenditure like transport cost for visiting facilities in urban centres and on other related non-medical items.

Admittedly, the results presented above could be different if one could correct for selection bias based on who seeks treatment; however, pooling 3 rounds of data may have taken care of the bias somewhat, especially if we believe that over the years there has been improvement in treatment-seeking behavior of vulnerable groups. Also, since the NSS by design is a random sample of households, there is no design difference in probabilities between selecting households that have an illness and have sought care, and those that have an illness and did not seek care.

Thus, there is no reason to believe that households in the NSS that reported a hospitalization and those that did not would be systematically different from households that were not sampled by the NSS.

7. Summary and conclusions

The paper was the first attempt in India to understand the changing patterns of self-reported cancer and other selected NCDs in India, using NSS household level data. The analysis indicated a clear increase in self-reported cases of cancer, diabetes and CVD in the country across the three rounds of the NSS.

The summary statistics and regressions on probability of reported cancer (and NCD) also indicated a clear rising trend of self-reported cancer among women and those with less education. The increase is across the board in all categories of income quartiles as well as social classes like SC/ST, indicating that cancer no longer qualifies as a disease confined to any particular income or social class. The results on NCD and cancer on the profile of who is reporting a sickness were also quite similar.

The analysis on treatment burden indicated relatively much higher expenditure on treatment of cancer and NCD, but especially cancer. Also, the regressions indicated that women, elderly, lower educated and SC/ST incur less expenditure on treatment generally, controlling for consumption expenditure. The presence of cancer causes treatment expenditure to increase, which is also positively related to consumption expenditure. Treatment expenditure is also relatively lower in public facilities. Treatment expenditure as a proportion of total annual consumption and income loss due to hospitalization for all the 3 NCDs are higher than for non-NCD cases.

Overall, the results clearly point to the potential loss of welfare emanating from high treatment burden on households of NCDs including cancer, and the possible under-expenditure on treatment for socio-economically vulnerable groups like women and less educated individuals. Health insurance, which is already sparse in the country, is in any case very tightly linked with occupation and employment, resulting in an inequitable access to health coverage. Clearly, the vulnerable sections of the society do not have the kind of health cover that can cater to treatment of cancers and other NCDs. The increase in prevalence of cancer and other NCDs among such

groups, who seem to be spending relatively less on treatment, is worrying on two accounts: it has the direct potential to worsen equity in health outcomes and it can increase poverty by forcing households to curtail necessary consumption, with further indirect impact on health outcomes.

According to WHO, about 30 percent of cancer deaths are preventable, and can be reduced and controlled by implementing evidence-based strategies for cancer prevention, early detection of cancer and management of patients with cancer. However, to do this, one has to know both epidemiological as well socioeconomic profile and impact of cancer (WHO 2009). The evidence presented here indicates that prevention has to be broadened so that individuals with varied backgrounds and characteristics can take advantage and become aware of availability and accessibility of cancer prevention and treatment options. At present most of the prevention messages are targeted at socioeconomically better-off individuals. The known causal factors of cancer like tobacco use and smoking are now documented among the poor and the vulnerable (ICM, 2004). Standard messages on, for example, non-smoking clearly do not reach these populations. Even messages to prevent diabetes and CVD are often such that only those in higher socioeconomic categories are able to absorb these messages (Goenka et al, 2009)

The study – while exploratory in nature – is not a substitute for a proper scientifically designed study on the epidemiology of cancer. The purpose was merely to bring forth additional evidence of the changing face of cancer and NCDs in the country and to point out the links between such diseases and welfare, to advocate for greater awareness among policymakers, practitioners and researchers, so that more studies and attention is focused on this cluster of diseases, but especially cancer, which so far has received very little attention from the non-medical world. It has been argued that countries need to produce a common agenda for action on NCDs—in the same way as has been done for communicable diseases—focused on their causes, prevention, and control within the context of the broader health care system (Ebrahim and Smeeth 2005). While not yet an epidemic, it is useful to borrow a term from the HIV & AIDS literature, which emphasizes that policymakers need to "know their epidemic" to be effective, which essentially means that it is critical to understand the context and profile of NCDs, but especially cancer – the less discussed among NCDs – so that governments can initiative effective prevention, control and treatment policies.

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Table 1: Disability-adjusted life years by major NCDs in India, 2004

RANK	*Name of the disease*	*Percent DALYs lost*
1	Neuropsychiatric conditions	27.4
2	Cardiovascular diseases	22.1
3	Sense organ diseases	14.6
4	Respiratory diseases	8.5
5	Digestive diseases	6.6
6	Malignant neoplasms	6.5
7	Congenital anomalies	4.4
8	Musculoskeletal diseases	3.5
9	Genitourinary diseases	2.2
10	Diabetes mellitus	2.1

***Source*: Data collected from DALY estimates for 2004 (WHO) by cause for India**

Table 2: Reported cause of illness (among hospitalized) during 3 health rounds of NSS

Year	*Various cause of illness*			
	Cancer	*CVD*	*Diabetes*	*Selected NCD*
1986-87	1.06	4.87	0.75	6.67
1995-96	2.18	5.69	0.97	8.83
2004-05	2.28	7.20	1.68	11.08

Table 3: Details of reported cancer cases (among hospitalized) during various NSS rounds

SNo.	*Attribute*	*1986-87*	*1995-96*	*2004-05*
1	Mean Age	45.3	41	41
2	Sex			
	a) Female	60.6	67.1	64.3
	b) Male	39.4	32.9	35.7
3	Education			
	a) Illiterate	57.60	45.13	37.38
	b) Up to Primary	28.86	19.37	26.15
	c) Up to Higher Secondary	11.32	25.15	27.53
	d) Higher Education (Graduate+)	2.22	10.35	9.0
4	Social group			
	a) SC/ST/OBC	17.26	21.69	23.48
	b) Others	82.74	78.31	76.52
5	Total household consumption expenditure			
	1. I Quartile	30.67	7.63	19.15
	2. II Quartile	23.02	15.8	19.98
	3. III Quartile	30.92	31.72	26.04
	4. IV Quartile	15.4	44.86	34.82

Table 4: Percentage of women reporting illness & cancer across three NSS rounds

Round	*Reporting an illness or cancer in OPD*		***Reporting an illness or cancer in hospitalization***	
	Illness	*Cancer*	*Illness*	***Cancer***
1986-87	48.53	0.31	43.63	**1.47**
1995-96	49.95	0.67	47.32	**3.09**
2004-05	**51.76**	**0.63**	**47.91**	**3.06**

Table 5: Percent hospitalized individuals reporting CANCER by education level

Round	*Up to primary*	*Up to higher secondary*	*Graduate & above*
1986-87	1.13	0.75	0.82
1995-96	1.94	2.53	4.47
2004-05	2.14	2.59	2.50

Table 6: Percent hospitalized individuals reporting CANCER by income quartiles

Round	*Q1*	*Q2*	*Q3*	*Q4*
1986-87	0.96	1.03	1.54	0.77
1995-96	1.13	1.71	2.49	2.16
2004-05	2.08	2.14	2.19	2.60

Table 7: Burden of treatment from hospitalization of NCD and cancer patients, 3rd round of NSS

Illness type	*Expenditure on hospitalization (in Rupees)*	*Expenditure on hospitalization to annual household per capita consumption expenditure (%)*	*Loss of household income (in Rupees)*
NCD	17312	38.9	726
Non-NCD	9316	24.5	914
Ratio of NCD to non-NCD	1.8	-	1.2
Cancer	25815	66.5	1587
Non-Cancer	9970	25.3	727
Ratio of cancer to other illnesses	2.6	-	2.2

Table 8: Probit analysis on the determinants of self-reported cancer cases

Cancer	*IPD+OPD*		*IPD*	
	Coefficient	*Std error*	*Coefficient*	*Std error*
Age	0.0032*	0.00002	0.0016*	0.000007
Age2	-0.000035*	0.00000	-0.000016*	0.000000
Rural	0.00029**	0.00012	0.0023*	0.000047
Female	0.024*	0.00011	0.0134*	0.000045
Illiterate	-0.0072*	0.00012	-0.0022*	0.000051
Educated up to primary	-0.0099*	0.00018	-0.0024*	0.000078
MPCE	0.0049*	0.00010	0.0058*	0.000040
Round3	0.0046*	0.00023	0.0037*	0.000083
Round2	0.026*	0.00032	0.0068*	0.000090
Log Likelihood	-1470023		-4229608.2	
Observed P	0.034		0.022	
Predicted P	0.029		0.019	
*** significant at 1 percent**				
**** significant at 5 percent**				

Table 9: Probit analysis on the determinants of reported NCD

NCD	*IPD+OPD*		*IPD*	
	Coefficient	*Std error*	*Coefficient*	*Std error*
Age	0.0090*	0.000008	0.01*	0.00001
Age2	-0.0001*	0.0000001	-0.00007*	0.0000001
Rural	-0.037*	0.00007	-0.02*	0.00011
Female	0.020*	0.00005	0.02*	0.00009
Illiterate	-0.046*	0.00006	-0.04*	0.00011
Educated up to primary	-0.0063*	0.00010	-0.007*	0.00017
MPCE	0.0570*	0.00005	0.03*	0.00009
Round3	-0.058*	0.00011	-0.02*	0.00017
Round2	-0.068*	0.00007	-0.02*	0.00015
Log Likelihood	-40558333		-13309301	
Pseudo R2	0.1463		0.0749	
Observed P	0.121		0. 108	
Predicted P	0.088		0 . 091	

*** significant at 1 percent**

Table 10: Determinants of expenditure on treatment, pooled data over 3 rounds

Expenditure on treatment	*IPD+OPD*		*IPD*	
	Coefficient	*Std error*	*Coefficient*	*Std Error*
Elderly	-0.02*	0.0007	-0.06*	0.0006
Female	-0.14*	0.0006	-0.15*	0.0005
Rural	0.20*	0.0006	0.16*	0.0006
MPCE	0.59*	0.0005	0.49*	0.0005
Illiterate	-0.08*	0.0006	-0.11*	0.0006
Educated up to primary	-0.12*	0.0013	-0.16*	0.0009
Public hospital	-1.04*	0.0006	-1.02*	0.0005
Round3	0.50*	0.0015	0.97*	0.0009
Round2	0.44*	0.0015	0.94*	0.0009
SC/ST	-0.15*	0.0007	-0.15*	0.0006
Cancer	0.90*	0.0017	0.91*	0.0016
Constant	4.09*	0.0033	4.16*	0.0027
R square	0.242	-	0.367	-

Table 11: Determinants of treatment expenditure for NCDs

Expenditure	*IPD+OPD*		*IPD*	
	Coefficient	*Std error*	*Coefficient*	*Std error*
Elderly	-0.07*	0.0007	-0.09*	0.0006
Female	-0.13*	0.0006	-0.14*	0.0005
Rural	0.21*	0.0006	0.17*	0.0006
MPCE	0.56*	0.0005	0.48*	0.0005
Illiterate	-0.07*	0.0006	-0.10*	0.0006
Educated up to primary	-0.13*	0.0013	-0.16*	0.0009
Public hospital	-1.03*	0.0006	-1.01*	0.0005
Round3	0.54*	0.0015	0.99*	0.0009
Round2	0.49*	0.0015	0.96*	0.0009
SC\ST	-0.15*	0.0007	-0.14*	0.0006
NCD	0.43*	0.0008	0.41*	0.0008
Constant	4.13*	0.0033	4.18*	0.0027
R squared	0.242	-	0.366	-