Measuring the economic and social consequences of CVDs and diabetes in India and Pakistan

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SUMMARY **In India and Pakistan, CVD and diabetes has assumed alarming levels. However, governments in these countries are ill-prepared for coping with this epidemic. This paper reviews the literature for those studies which have addressed the current and foreseen economic and social consequences of CVDs and diabetes in India and Pakistan. This review adopts a societal perspective by incorporating the impact on the individual, the household, and the health and economic sectors. The review finds that in both countries there has been a paucity of systematic efforts to measure the economic and social impact of CVDs and diabetes. Moreover, the review has found an absence of assessments of direct and indirect costs in the same study, inattention to the social consequences of these diseases and methodological inconsistencies which make comparative analyses restrictive.**

It is critically important that a research base of studies investigating the impact of the diseases in India and Pakistan be undertaken. Gathering these data is critical since both countries have many competing health priorities reflected in the intransigency of key health indicators and the data emerging from these countries suggests that the social gradient is reversing. Therefore, in the absence of hard evidence to these diseases are likely to remain outside of mainstream public health planning. With these data in hand, the choice for health planners with regard to important decisions may become clearer. Similarly, the implications for productivity and revenue earnings make a powerful argument in order to focus the attention of private sector employers on these issues.

Key Words: Cardiovascular diseases, diabetes, socio-economic impact, India, Pakistan

1. Introduction

Countries in South Asia, especially India and Pakistan in spite of impressive economic and political changes and notable gains in two important health indicators - life expectancy and infant mortality - continue to face severe challenges of social underdevelopment and ever-widening disparities between rich and poor. Although one out of every four people in the world live in South Asia, their annual contribution to global production is only 2% and almost 50% of them live below the poverty line with poor access to healthcare and other essential basic services (*1*).

Although infectious diseases remain a formidable enemy, chronic diseases, especially cardiovascular diseases (CVDs) and diabetes are increasing the health challenges facing India and Pakistan. In 2002, almost 75% of the 45 million adult deaths reported worldwide were attributable to non-communicable diseases (NCDs) (*2*). Of these, CVDs and diabetes, which fall under the rubric of NCDs, accounted for approximately 30% and 2%, respectively of all deaths.

In India, CVD-related deaths accounted for approximately 32% of all deaths in the year 1998 whereas in Pakistan estimates for the year 2001 indicate that they account for 25% of the total deaths within the country (*3*). In India, mortality arising from coronary heart disease (CHD) is expected to increase to 2.03

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million in 2010 (*4*). Diabetes mellitus, an important risk factor for CVDs, blindness, kidney failure, and lower-extremity amputations, has assumed alarming levels in South Asia. India, the "diabetic capital of the world" is estimated to have approximately 30 million people living with the disease (*5*). The picture in Pakistan is equally gloomy: 12% of the population, over the age of 25 suffers from diabetes and 10% have impaired glucose tolerance (IGT) (*6*). This figure is expected to escalate to 14.5 million people affected by the year 2025, only to be exceeded by India with approximately 57.2 million affected (*7*).

As stated by WHO (*2, p85*) "CVDs have not only emerged in all but the very poorest countries, but are already well advanced; this growing burden has real potential to hinder social and economic development". Despite the projections and the urgency in planning for the epidemic, many governments, particularly in the middle- and low-income countries are ill-prepared for coping with this epidemic.

Data that document and quantify the magnitude of the NCD problem in terms of prevalence and incidence of diseases and their underlying risk factors and determinants remains very inadequate, particularly in developing countries. However, in recent years measures have been taken to improve NCD surveillance systems and registries; in particular, progress has been made in developing and subsequently establishing within countries, a risk factor surveillance system, which is suited for application in low resource settings - the WHO STEPwise approach to surveillance (STEPS). However, on the other hand, inadequate attention has been paid to gathering evidence relating to the economic and social impact of NCDs. The WHO Commission on Macroeconomics and Health (CMH) addressed the impact of ill-health in terms of increasing health care costs and productivity losses, however omitted NCDs in the discussion.

This paper reviews the literature for published and unpublished studies, which have addressed the current and foreseen economic and social consequences faced by India and Pakistan in view of the significant CVD and diabetes burden. We also describe here a simple but logical approach for undertaking economic and social analysis of CVD and Diabetes in low resources settings.

2. Methods

2.1 *Review of literature*

The primary searches were conducted on the electronic databases Medline and Science Direct and the search was limited to English language articles published between 1985 and 2005. Specific key words included "diabetes mellitus", "cardiovascular diseases", "India", and "Pakistan" were used in combination with more general terms including "costs", "cost-of-illness studies", "economic impact", "social impact", "developing countries" and "South Asia". References from selected articles were also reviewed. Since research and published literature on CVDs and diabetes in India and Pakistan - especially that evaluating the economic and social impact - continues to lag behind that of other public health concerns (for instance infectious disease), it was considered necessary to consult the 'grey' literature for regional and country specific articles and reports. This was carried out in two ways: 1) through web searches (*e.g.* google scholar) which carry both published and unpublished resources and 2) contacting leading researchers working in the area of CVDs and diabetes in India and Pakistan.

The electronic search yielded 524 references and the inclusion criteria were relatively broadly specified to include 1) articles which have analyzed the economic and social consequences of diseases and conditions; and 2) articles which have addressed the economic and social impact of CVD and diabetes in India and Pakistan. On this basis, a total of 37 articles were retrieved and included in this review. Of these, the economic cost of CVD and diabetes in India and Pakistan is the primary focus which only 10 articles address.

2.2 *Framework for review and analysis*

For this review and analysis, we used a framework, which we found simple and appropriate, which we are describing here for the benefit of other researchers in this field. The assessment of the social and economic impact of CVD and diabetes is important on two accounts; firstly, because the age group at greatest risk includes adults in their most productive years and secondly, because management of these diseases often involves expensive health care. The economic and social impact will be experienced first by the affected individuals and their families, with the effects thereafter filtering to the health and social welfare system and other public and private sectors. The framework adopts a societal perspective by incorporating the impact on the individual, the household, the health and economic sectors.

Step1. The first step was to identify the factors influencing health seeking behaviour: socio-economic variables, such as income, educational level and place of residence; costs and types of services available including physical access and perceived quality of care; and type and severity of illness were considered (see Table 1 for steps 1, 2 and 3).

Step 2. We then went onto explore the coping strategies of households in the advent of illness: Here we looked at financial costs (using cash and mobilizing savings, deferring expenditures such as education, sales of assets, and borrowing loans); time costs (intra

Table 1. Social and economic impact on household

Variable of analysis	Factors
Social consequences	
Factors influencing health seeking behaviour	• *Socio-economic variables* (income, educational level, place of residence *etc*.) • *Costs and types of services available* (costs of services, physical access, perceived quality of care *etc*.) • *Type and severity of illness*
Coping strategies	• *Financial costs* (using cash and mobilizing savings, deferring expenditure (*e.g.* education), sales of assets, loans *etc*.) • *Time costs* (intra-household labour substitution, changing capital-labour mix of production, hiring labour, free community labour *etc*.) • *Precautionary Measures* (adapting diet and lifestyle to prevent CVD and diabetes)
Economic consequences	
Direct Costs of care	• Hospital, transport, drug costs *etc*.
Indirect Costs of care	• Lost earnings associated with morbidity, mortality and disability • Lost earnings on the part of care-givers

Table 2. Sector wide impact

Health sector impact	
Health care costs (direct costs)	• Costs of inpatient care • Costs of outpatient care (*e.g.* general practitioner, district hospital, pharmacy *etc*.) • Costs of long-term care in the case of disabilities
Economic sector impact	
Productivity losses (indirect costs)	• Costs due to absenteeism • Costs due to permanent disability • Costs due to mortality

household labour substitution, changing capital labour mix of production, hiring labour, free community labour *etc*.); and precautionary measures (adapting diet and lifestyle to prevent CVD and diabetes.

Step 3. This included an examination of the economic consequences of CVDs and diabetes and was limited to direct costs of care (hospital, transport, drug costs *etc*.) and indirect costs of care (lost earning associated with morbidity, mortality and disability and lost earnings on the part of care-givers.

Step 4. The final was to explore the 'sector wide impact' (see Table 2). This entailed a review of health sector impact (costs of inpatient care, costs of outpatient care and costs of long-term care in the case of disabilities) and impact on other economic sector impact (costs due to absenteeism, permanent disability and mortality).

3. Results

The review of 524 articles and reports found less than 20 articles studies which fulfilled the study objective. In the following sections we present the results of our review.

3.1 *Individual and household impact*

In developing countries, diabetes exhibits higher prevalence amongst the higher socio-economic groups (SES) than the lower SES (*8-10*). This pattern is evident in India where the more affluent had twice as high prevalence compared to the lower SES (*10*).

Ramachandran and colleagues (*11*) in a study of the impact of poverty on the prevalence of diabetes found that diabetic subjects from a lower SES have a higher prevalence of cardiac disease, neuropathy and cataract but a lower prevalence of retinopathy compared to those from higher SES. Moreover, risk factors including hyperglycaemia, dyslipidemia, hypertension, smoking and alcohol consumption were higher in the low SES group. Mohan *et al*. (*5, p31*) observe "Disparities in health by SES among people with diabetes could reflect the direct effects of deprivation on health or could result indirectly from the effects of unfavourable health behaviours linked to lower SES. Another potential reason could be the 'inverse care law' whereby access to and use of services is reduced, and the quality of care provided is substandard, for patients with the greatest need".

3.1.1 *Health seeking behaviour and coping strategies*

In the Urban District Diabetes study carried out in Bangalore, a large Indian city, it was found that there was a four-year delay in diagnosis of diabetes between the highest and lowest SES (*12*). Education was also found to be an important factor in explaining the time of diagnosis (*13*). The Cost of Diabetes in India (CODI) study undertaken by Kapur *et al*. (*13, p20*) found that delays in diagnosis were directly related to the level of education: "College-educated people were on average diagnosed 7 years before people with no literacy". Kapur further remarks that those with a college education despite having diabetes for a longer period of time, had lower rates of complications (55%) compared to those with little or no education (80%).

The National Diabetes Survey of Pakistan, conducted in the 1990's found that despite a high prevalence of diabetes and IGT in Pakistan, 36.3% were unaware of their condition (*14-16*). Although this data was not analyzed further by socio-economic status, education and other variables, looking at the trends in neighbouring India it is reasonable to assume that both the control and awareness rates would be even lower in the lower socio-economic groups (*16*).

The conclusion that can be drawn from this is obvious: the most socio-economically deprived groups of society are highest at risk for developing diabetes-related complications because of delays in diagnosis. As it has been well documented with respect to other

diseases and conditions, the costs of health care often carries dire consequences for the individual and the household.

What of the social consequences? As described earlier, the death of a household head on the household is quite profound, more especially in the poorer sections of society and carries with it significant inter-generational consequences. Leeder *et al*. (*17*) estimated that in India CVD deaths among those in the 35-64 age categories affect almost 5 million household members[1]. The significance of this is even more profound when one considers that almost 75% of the elderly in India and more especially 86% of urban elderly women are economically dependent on their children. This is likely to increase in the coming years as the population ages.

The gender dimensions of CVD and diabetes have not been sufficiently explored. As observed by Leeder *et al*. (*17, p34*) "The impact of CVD on women is both direct, when they experience the illness themselves, and indirect, when their educational and economic circumstances are affected by death or disability due to CVD of family members". MacKay and Mensah (*18, p42*) remarked that women are "…less likely to be referred to a heart specialist…. More likely to enter the health system with a diagnosis of a second heart attack … after a first stroke, women are more kept in hospital longer, and remain more disabled than men receiving similar care".

3.1.2 *Household costs*

Diabetes The CODI study based on a large community-based survey was designed to illicit the direct and indirect costs associated with diabetes (*19*). Table 3 indicates the average annual costs arising from diabetes in India. Indirect costs constitute 64% of cost followed by the annualized costs of hospitalization (12.2%). Generalizing these findings a crude estimate suggests that the economic cost of diabetes to India is about USD 444 million.

Kapur *et al*. (*13*) identify several factors as contributing to the costs of care. Late diagnosis of diabetes often results in as many as 50% of people developing complications (*e.g*. retinopathy, nephropathy *etc*.). These complications often require expensive therapies and prolonged hospitalizations, thereby contributing to increasing direct costs and indirect costs in terms of productivity loss and absenteeism. With 3 or more complications, the costs of care were almost 48% higher.

Of critical importance to this paper, is the question of how costs of care impact different socio-economic groups. A study in India revealed that those with high income spent 12% of their total income on treatment as compared to 59% by the low income group (*20*).

Cardiovascular diseases A study in Karachi, Pakistan showed an incidence of 1.66 per 1,000 per year for stroke (*21*). Khealani *et al*. evaluated the cost of acute stroke care and its determinants at the Aga Khan University Hospital (AKUH), a tertiary care hospital in Karachi through a retrospective review of medical and billing records of 443 patients with acute stroke between 1998 and 2001.

Table 4 below presents the total average costs and a breakdown by laboratory, pharmaceutical and radiology. Average total cost of the care was PKR 70,714 (USD 1,179), and more than a third (39%) was incurred by hospital bed/room charges, with pharmacy, radiological investigations and laboratory investigations accounting for 19%, 18% and 12% respectively. The average total cost was directly related to length of hospital stay and was largely driven by laboratory and pharmacy costs. It was also found that the cost was also related to the type of ward the patient was admitted to; the intensive care unit (PKR 155,010 ≈ USD 2,584) was 2.5 times more expensive than the general ward (PKR 60,574 ≈ USD 1,010). The significance of these costs which are borne entirely by the patient is important when considered against the fact that gross national income per capita is USD 690 (*22*). Similar data for inpatient care was not available for India.

We were able to locate only one article which examined the social and economic impact of NCDs as

Table 3. Direct and indirect annual patient costs from diabetes in India

Item	Costs (INR)	Percentage of Total Cost
Doctor visit	853	4.28
Monitoring and lab	1,609	8.08
Treatment	2,262	11.36
Hospitalization (annualized)	2,434	12.22
Mean total direct cost	7,158	35.94
Mean total indirect cost	12,756	64.06
Total estimated annual cost	19,914	100

Source: Kapur et al. 2004. Extracted from Table 1, p19.

Table 4. Direct patient cost of acute stroke care, Akuh, Pakistan (Cost in PKR, 2003, USD in Parenthesis)

Length of Stay (days)	Average laboratory cost	Average pharmacy cost	Average radiology cost	Average total cost
1	3,272 (USD 55)	1,743 (USD 29)	9,148 (USD 152)	19,597 (USD 326)
2 - 3	3,446 (USD 57)	2,134 (USD 36)	10,968 (USD 182)	25,568 (USD 426)
4 - 7	6,504 (USD 108)	11,732 (USD 196)	12,151 (USD 203)	49,705 (USD 828)
8 - 30	17,404 (USD 290)	32,258 (USD 538)	15,074 (USD 251)	153,586 (USD 2,559)
> 30	59,298 (USD 988)	160,291 (USD 2,672)	35,510 (USD 592)	588,239 (USD 9,804)

Source: Khealani et al. 2003. Extracted from Table 2, p553.

[1] The authors assumed an urban household size of 5.8 and a rural household size of 5.5.

a whole in comparison to communicable diseases in India and Pakistan. This study arose from a recently reported population-based cross-sectional survey conducted in Pakistan (*23*). The results showed that 37.4% of the households spend an average of PKR 405 (USD 6.77) on the treatment of communicable diseases whereas 45.2% of the households spend an average of PKR 3,935 (USD 65.80) on the treatment of NCDs. These data show that a significantly higher percentage of households spend more on treatment of non-communicable diseases compared with communicable diseases.

3.2 *Sector wide impact*

3.2.1 *Health system*

For this section we could find only one study where estimates were made for India and China for the economic costs of all NCDs. In this study, Popkin *et al*. (*24*) estimated that annual health care system costs in India arising from NCDs were USD 1.1 billion in 1995, of which 10% were state expenditures. Beyond these much aggregated estimates, there has been little inquiry to establish the direct costs (inpatient, outpatient and long term care) of CVDs and diabetes in India and Pakistan.

3.2.2 *Productive economic sectors*

Leeder *et al*. (*17*) estimated that India will experience a dramatic increase of 35% in CVD-related morality for those in the 35-64 age group between 2000-2030 based on WHO mortality rates (*25*) and World Bank population projections (*26*). They also estimated that the number of productive years of life lost to CVD would increase by 95% from 9,221,165 in 2000 to 17,937,070 in 2030. The most dramatic increase will be in the 45-54 age group, where there will almost be a doubling of the years of productive life lost.

Popkin *et al*. (*24*) estimated[2] for India the productivity costs arising from premature deaths to be USD 2.25 billion which was approximately 0.71% of GDP in 1995. They point out that these figures are an underestimate of the costs because they exclude productivity losses arising from morbidity and absenteeism and early retirement on account of disability.

4. Discussion and Conclusion

There is a considerable body of evidence supporting the findings that, in the event of catastrophic and chronic illness, poorer households who are often without private insurance, access care at considerable costs, often depleting savings, selling off assets, incurring debt and reallocating waged labour responsibilities within the household (*27-30*).

Ill-health, death or disability carry both direct and indirect costs. Death, especially of a parent often means a permanent loss of income and often displaces other consumption and investment activities of the household. For example, in order to supplement household income and reduce spending on other activities (*e.g*. educational expenses) children are often removed from school and engaged in productive labour.

At the macro-level, the impact of CVD and diabetes like other diseases and conditions will be felt on both the public and private sector. CVD and diabetes episodes of illness associated with these diseases, disability and death often imply increasing costs and productivity losses. The broader impact on economic growth will depend on the extent of the epidemic on savings and investment decisions and the impact on different socio-economic groups. In addition to health, other social sectors are also likely to be affected, the most obvious and immediate being education and social security.

Within the developing countries, as the burden from these two diseases grows, health expenditure will also rise. Evidence from developed countries point to the mounting costs of managing and treating CVD and diabetes, and their treatment is also likely to consume considerable resources in the developing countries. Inpatient costs tend to be largest single contributor to direct health care costs. Inpatient care of CVD and diabetes, in comparison to acute care, often entails lengthier stays and requires more expensive procedures and drugs.

The impact of these two diseases on productive sectors and of the economy at large depends on a range of factors. These include their prevalence, the groups at risk; the structure of the economy and the contributions of its key sectors (*e.g*. agriculture, industry *etc*.); and the size, structure and the skills profile of the labour force. Even at a cursory level, it can be said that CVD and diabetes have important consequences for productivity. Premature death, morbidity, and disability contribute to lower levels of productivity. Lost time due to illness often entails lost earnings, recruitment and training costs to replace workers, all of which contribute to revenues losses. In addition, considerations of impact of morbidity and mortality and on employee benefits[3] also needs to be taken into account.

In the developing world where the epidemic increasingly targets those in their most productive years, the worst-case scenario is that replacement of older and more experienced workers with less-experienced labour will entail reductions in labour productivity and has implications for competitiveness within the industry

[2] The costs of premature mortality from NCDs were estimated on the basis of the following assumptions: 1) average loss of 19 years of working life per death, 2) 60% labour force participation, 3) 3% real wage growth rate per annum and a discount rate of 12% per annum.

[3] Employee benefits include provision of medical services, health insurance, sick leave provision *etc*.

both domestically and internationally.

In both India and Pakistan, there has been a paucity of systematic efforts to measure the economic and social impact of CVDs and diabetes, despite there being a growing consensus and concern over the magnitude of the challenge that both diseases pose. Gathering these data is critical in both countries because of a number of reasons.

Firstly, both countries, which collectively house more than a fifth of the world's population, have many competing health priorities reflected in the intransigency of key health indicators; their meagre health allocations - less than 1% of GNP spent on health in both the countries - are challenged with many competing priorities. Therefore, in the absence of hard evidence to show the magnitude of economic and social impact that these diseases have, they are likely to remain outside of mainstream public health planning.

Secondly, it is widely perceived that CVDs in particular and NCDs in general, affect the affluent (*31*). This is wildly incorrect; both diseases manifest preferentially among the poor, both in the poorest nations and the poor in wealthy nations (*32*,*33*). This appears to be true for India and Pakistan as well.

However in the absence of documented evidence and/or gaps in translating evidence into effective communication and advocacy, these fail to receive due attention. In Pakistan, CVDs and diabetes are now part of the National Program for the Prevention and Control of Non-Communicable Diseases and Health Promotion; the program has been launched as the 8th public health programme and has admirably received budgetary support from public sector development budgets - a result of successful lobbying by the NGO Heartfile, which also has a lead role in the public-private partnership configuration of this programme (*34*). Notwithstanding, the programme is not part of the Poverty Reduction Strategy Framework of Pakistan, which currently guides priority public sector spending within the country. This example shows that even if these diseases are mainstreamed into public health planning, they may not appear as priority areas unless there is enough evidence to show that they have implications for the poor.

Poverty eradication has also assumed a centre stage position in the global development scenario. The current organization of aid and resource allocations from the developed to the less developed countries is being channelled with a greater-than-ever focus on poverty reduction. Poverty eradication is also central to the manner in which bilateral and multilateral international donor aid is being organized for the developing countries. It is therefore no wonder that cardiovascular diseases and diabetes receive negligible support from the donor and development community. Hence highlighting their magnitude of the impact on poverty - in terms of cost of care, lost productivity and the potential to perpetuate the chain of poverty and precipitate an acute poverty crisis - will also have implications for the manner in which donor resources flow to these countries.

Thirdly, it is important to generate locally relevant evidence - from applied, health systems and policy research perspectives - which shows that investments in cost-effective interventions can mitigate the risk of CVDs and diabetes and hence be contributory to saving costs, which incur in treating these ailments, if and when established. This is particularly relevant as the share of public contributions to health financing is dismally low in both the countries and patients, especially the poor, often have to shoulder the burden of health care. In the case of the aforementioned diseases, the prolonged costs of care can be prohibitive and pose access to care issues. In India, the number of the poor who did not seek treatment because of financial reasons increased from 15% to 24% in rural areas and doubled from 10% to 21% in urban areas between 1986 and 1996 (*37*). An analysis by the World Bank (*38*) concludes that "the hospitalized Indian spends more than half of his total annual expenditures on buying healthcare; more than 40% of hospitalized people borrow money or sell assets to cover expenses and 35% fall below the poverty line." The picture is likely to be the same for Pakistan.

Given these considerations, it is of critical importance that a research base of studies investigating the economic and social impact of CVDs and diabetes in India and Pakistan be undertaken as a first step in order to demonstrate the gravity of the epidemic to all stake-holders. With these data in hand, the choice for health planners with regard to important decisions such as including the provision of prevention and early detection services vis-à-vis care of established cases of CVDs and diabetes may become clearer. Similarly, the implications for productivity and revenue earnings make a powerful argument in order to focus the attention of private sector employers on these issues.

It is also important that the envisaged research base should pay close and careful attention to a number of parameters, where gaps have been identified based on the assessment of existing studies reviewed in this paper. These include the absence of assessments of direct and indirect costs in the same study; inattention to the social consequences of these diseases and methodological inconsistencies which make comparative analyses restrictive. In this regard, geographic, cultural and ethnic similarities between India and Pakistan make a strong case for collaborative efforts and capitalizing on sharing of experiences (*37*). It must be clearly recognized that the successful launching of such efforts at a policy and public health level hinges on the availability of appropriate evidence - we must commit ourselves to making that available and effectively communicated.

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