International Journal of Public Health and Epidemiology ISSN 2326-7291 Vol. 8 (3), pp. 001-009, March, 2019.
Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Socio-economic inequalities in the risk of diseases and associated risk factors in India

Mohammad Hifzur Rahman* and Abhishek Singh

International Institute for Population Sciences, Mumbai – 88, India.

Accepted 13 January, 2019

Extant literature is full of studies on socio-economic inequalities in maternal and child health in India but studies on inequalities in risk of diseases are limited. We use data from India Human Development Survey (IHDS) conducted in 2004-05 to test two hypotheses: first, diabetes and high blood pressure are associated with affluence; and second, tuberculosis and mental illness are associated with poverty. We use rich-poor ratio, concentration curves, adjusted concentration indices, dominance test, and binary logistic regression to test the aforementioned hypotheses. The findings suggest that diabetes and high blood pressure are indeed associated with affluence. But we could not find evidence to support our second hypothesis. Also, rich and poor were equally likely to get cancer or the heart diseases. Indeed, the risk factors were disproportionately distributed, particularly to the disadvantage of the poor.

Key words: Disease, affluence, poverty, concentration curves and indices, dominance.

INTRODUCTION

Because of the undergoing epidemiological transition, many countries of the world are observing increased burden of chronic, non-communicable and life-style related diseases. Though less people die, they are subject to longer years of suffering with such diseases. This has become an area of great concern among the researchers and policy makers. Recently, there is a spurt of studies dealing with socio-economic inequalities in chronic and life-style related diseases (Dalstra et al., 2005; Gnavi et al., 2008; Huisman et al., 2003; Kunst et al., 2005; Mackenbach et al., 2005; Mackenbach, 2006; Vukovic et al., 2008). These studies clearly highlight enormous socio-economic inequalities in health including mortality and morbidity.

Notably, non communicable diseases (NCD) were responsible for 35 million deaths (60% of all deaths) worldwide in 2005; 80% of these deaths occurred in low- and middle-income countries. Between 2006 and 2015, non communicable disease deaths are expected to increase by more than 20% in low-income countries, with the greatest increase in sub-Saharan Africa (WHO, 2009). Cardiovascular diseases, high blood pressure, diabetes, mental illness, cancer, tuberculosis (TB), etc., are some of the leading public health problems facing the world in general and the developing countries in parti-cular. These diseases are found to contribute significantly to disease burden as well as mortality burden (Blas and Kurup, 2010; Eaton et al., 2008; Lawes et al., 2008; Lopez et al., 2006; NCMH, 2005; WHO, 2006). Interestingly, diabetes (type 2 diabetes in particular) is often thought of as a disease of affluence, affecting rich countries more than poor, and within poor countries affecting the better-off sections of the population more than the less well off (Blas and Kurup, 2010). However, there is no systematic evidence to support this hypo-thesis. Similarly, tuberculosis (TB) is also sometimes considered a “disease of the poor and socially disadvantaged” (Blas and Kurup, 2010).

As like other countries, in 2004, deaths due to non-communicable diseases in India were twice those from communicable diseases. The four leading chronic diseases in India are cardiovascular diseases, diabetes, chronic obstructive pulmonary disease (COPD) and cancer (Taylor, 2010). The main risk factors for the non-

*Corresponding author. E-mail: mhifzurrahman@gmail.com.

communicable diseases include tobacco use, harmful use of alcohol, unhealthy diets and physical inactivity. There were approximately 23 million diabetics in India in the year 2000, and this burden is expected to rise to 57 million by 2025 (Sharma, 2008). In addition, India is expected to bear 60% of the world's heart disease burden in the next two years 2008 and 2010 (Xavier et al., 2008). Cancers are also not behind and account for about 3.3% of the disease burden and about 9% of all deaths. Fairly conservative assumptions show that the number of people living with cancers will rise by nearly one-quarter from 2001 to 2016 (NCMH, 2005). Studies on mental health suggest that at least 6.5% of the Indian population had some form of serious mental disorder, with no discernible rural–urban differences (NCMH, 2005). Further, an estimated 41.5 million people were suffering from hypertension in the year 2000 and the burden is projected to increase by another 5 million by the year 2025 (Sharma, 2008). With more than 400,000 dying each year (Tuberculosis Research Centre [TRC], 2004; Yajnik et al., 2002), TB is one of the important cause of death in India at present (Yajnik et al., 2002).

Limited small-scale studies have found enormous socio-economic inequalities in the prevalence of these diseases in India. For example, TB prevalence was significantly higher among people living below the poverty line compared with those above the poverty line. Poverty and inequality in occurrence of TB were closely linked (Muniyandi and Ramachandran, 2008). Socio-economic status and gender were independently associated with common mental disorders in the population of women (Shidhay and Patel, 2010). Cardiovascular diseases and diabetes were highly prevalent in urban areas. Recent case-control studies in India have reported that being illiterate or poor is an independent risk factor for acute myocardial infarction (Gupta and Gupta, 2009).

Earlier studies have either presented fragmented evidence on the socio-economic inequality in occurrence of these diseases or the studies were based on small area. Moreover, none of these studies used the inequality measures to understand the socio-economic inequality in the risk of these diseases. Most literature on equity and the social determinants of health is based on data that are from high-income countries and focus more on possible causal relationships (Blas and Kurup, 2010). However, there are only limited studies that address health disparities in India particularly in terms of the risk of diseases. This study is, therefore, an attempt to quantify the socio-economic inequalities in risk of selected diseases and the associated risk factors. We also hypothesize that diabetes and high blood pressure are associated with affluence. On the other hand, TB and mental illnesses are associated with poverty. The risk of cancer and heart disease is same for both rich and the poor. Further, the risk factors for the selected diseases are disproportionately concentrated among the poor.

MATERIALS AND METHODS

The present study uses data from the Indian Human Development Survey (IHDS) conducted by the National Council of applied Economic Research (NCAER) during 2004-2005. The survey involved face-to-face interviews with members of 41,554 households located in every part of India and was designed to provide a nationally representative sample. The response rate was 92% for the total sample. The survey collected information on five thematic areas. These are income and employment, education and health, well-being of vulnerable populations, social development, and policy changes and response (Desai et al., 2010).

The survey asked to the eligible women (15 to 49) whether anybody in the household had ever been diagnosed by a physician for any of the long–term illness. Reference period for long term illness was one year. This analysis is restricted to six important diseases namely TB, cancer, mental illness, diabetes, heart disease, and high BP for obvious reasons mentioned in the earlier sections. The survey instrument also collected information on certain risk factors like frequency of smoking, drinking, and chewing tobacco. We also analyzed socio-economic inequality in the above three risk factors. In addition, we analyzed such inequalities in household crowding which we define as number of persons per room. If the number of persons per room is higher than two then we call it as crowding otherwise not.

The present study had measured six outcome variables namely risk of TB, mental illness, cancer, diabetes, high blood pressure and heart disease. Those who were suffering from the selected disease at the time of survey and those who were cured were combined together and were considered as having the selected disease. The other outcome variables include the presence of selected risk factors. Each risk factor was treated as a separate outcome variable.

The study included a list of theoretically pertinent socioeconomic and demographic predictors in the analysis, such as age (0 to 5; 6 to 14; 15 to 59; 60+), sex, schooling (no schooling; up to primary; above primary to matriculation; above matriculation), caste (SC; ST; OBC; others), religion (Hindu; Muslim; others), place of residence (rural; urban) and wealth quintile (lowest; 2^{nd}; 3^{rd}; 4^{th}; topmost). Wealth quintile is an indicator of the level of wealth that is consis-tent with expenditure and income measure, and widely tested in a large number of developing countries to examine economic inequalities in household income, including India (IIPS and Macro International, 2007; Rutstein, 1999).

Cross tabulation was done for each dependent variable with wealth quintile and this provided the prevalence of diseases and their risk factors by wealth status. In the second stage, rich-poor ratios were calculated separately for each of the selected diseases and their risk factors. A rich-poor ratio greater than 1 will suggest that the disease is more prevalent among the rich population and vice-versa. Concentration curves (CC) and concentration indices (CI) were estimated in the third stage to depict the inequalities in distribution of outcome variable by economic status (Kakwani, 1977; Kakwani et al., 1997; O"Donnell et al., 2008; Wagstaff et al., 1991). A concentration index is a measure of socioeconomic inequality and is defined as twice the area between concentration curve and diagonal, and it varies between -1 to 1. The closer the value to 1 (absolute), the more unequal is the distribution of outcome variable and the closer the value to 0, more equal is the distribution of outcome variable.

Since concentration indices are estimated from the survey data, they are subject to sampling variability. Although visual inspection of a concentration curve in comparison with the 45° line may give an impression of whether there is dominance, obviously, this inspection is not sufficient to conclude whether or not dominance is statistically significant. To make inferences about the dominance,

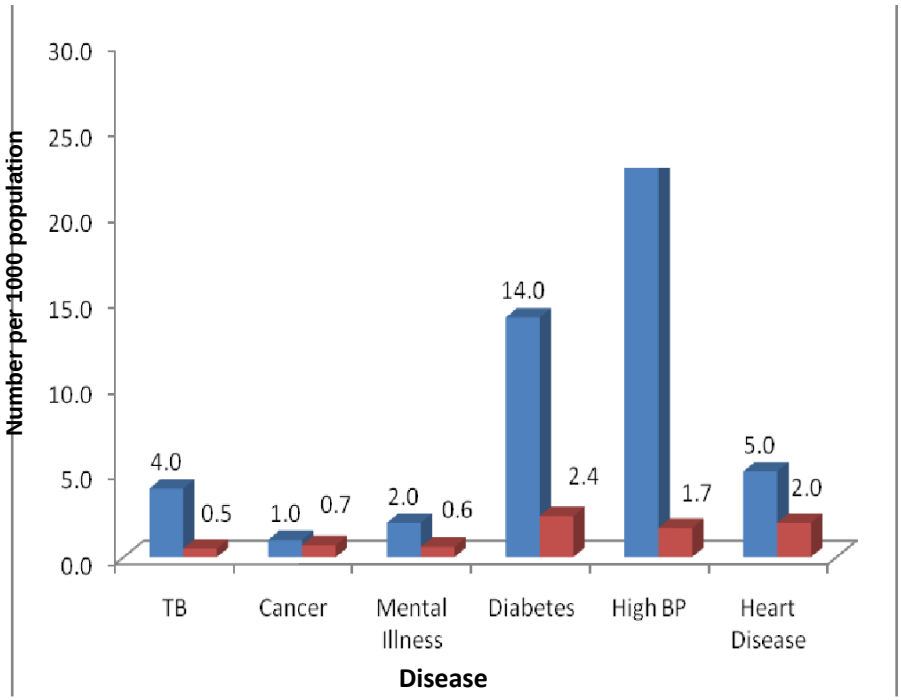


Figure 1. Prevalence of selected diseases and rich-poor ratio in prevalence of selected diseases, India.

dominance test, suggested by the World Bank, was used in the analysis (O"Donnell et al., 2008) .

Finally, binary logistic regression models were fitted to assess adjusted effects of socioeconomic, demographic and cultural characteristics on the risk of selected diseases (having disease = 1; otherwise = 0). Wald test was used to assess the overall effect of wealth quintiles on the risk of selected diseases. It must be noted that the analysis for diabetes and blood pressure (BP) was restricted to population aged 20 years or above as the prevalence of these diseases is almost negligible in ages 0 to 19 years. Because of this, we lost 0.5 and 1.0% of the diabetes and high BP cases from our sample. The analysis of risk factors was also limited to people aged 20 years or more. All the analysis was carried out using STATA 10.0.

RESULTS

The results section is divided into two sub-sections. The first sub-section deals with the socio-economic inequalities in the risk of selected diseases. Here, we test our first two hypotheses. The second sub-section deals with the socio-economic inequalities in the prevalence of risk factors from which we test our third hypothesis.

Socio-economic inequalities in the risk of selected diseases

The prevalence of the six selected diseases is presented in Figure 1. The prevalence of high blood pressure (24 per 1,000 population) was highest followed by prevalence of diabetes (14 per 1,000 population). Heart disease was the next most common problem facing Indian population (5 per 1,000 population). The prevalence of TB, cancer, and mental illness were 4, 1 and 2 per 1000 respectively. The prevalence of TB, cancer, mental illness and heart disease may be lower than the other two because of the difference in age structure of the two populations on which the estimations are based. The latter are based on population aged 20 years or more whereas the former is based on the whole sample. However, even if we compute the prevalence of diabetes and high blood pressure on the whole population, the prevalence of the two diseases is higher than the prevalence of cancer, mental illness, TB and heart disease.

Results presented in Table 1 suggest significant variations in the risk of selected diseases across the categories of wealth quintile. Indeed, diabetes, high blood pressure, and heart disease were more concentrated among the richest category whereas TB and mental illness were concentrated more among the poorest sections of the population. The risk of cancer did not vary across the categories of wealth quintile.

The rich-poor ratios presented in Figure 1 reveal huge socio-economic inequalities in the risk of selected diseases; the inequalities being to the disadvantage of the poor in case of TB, cancer and mental illness and being to the disadvantage of the rich in case of diabetes,

Table 1. Prevalence per 1000 population of selected diseases by wealth quintile, India, IHDS 2004-05.

Wealth quintile	Diseases					
	TB	Cancer	Mental illness	Diabetes‡	High BP‡	Heart
Lowest quintile	5.1	0.9	2.2	8.7	19.4	3.7
2nd quintile	4.3	0.9	1.6	7.1	18.2	5.3
3rd quintile	3.9	0.5	1.3	11.0	19.7	4.5
4th quintile	2.9	0.7	1.4	15.7	22.7	5.5
Top quintile	2.3	0.6	1.3	20.9	33.4	7.4

‡ Analysis is done only for people aged 20 years or more

high blood pressure and heart diseases. A naked eye look at the concentration curves suggests significant socio-economic inequalities in the risk of selected diseases (Figure 2). However, the dominance test provides an interesting picture. In case of TB and mental illness, concentration curves dominate Lorenz curve thus suggesting that inequalities in wealth did explain some part of the overall inequality in risk of these diseases. On the other hand, the Lorenz curve dominated concentration curve in case of diabetes, high blood pressure and heart disease thus indicating that the wealth related inequalities in the risk of diabetes, high blood pressure and heart disease among the sampled population were significantly more than the overall inequality in the risk of these diseases in the sampled population. Cancer was a special case where neither the concentration curve dominated Lorenz curve nor did it dominate the line of equality suggesting no socio-economic inequality.

The concentration index is another widely used measure of socio-economic inequality. The advantage with concentration indices is that they can be standardized for other important variables. The overall concentration indices do suggest the presence of socio-economic inequality in the risk of diabetes, high blood pressure and heart diseases favoring poorer groups (Table 2). Results further reveal socio-economic inequality in occurrence of TB and mental illness to the disadvantage of the poorer sections of the society. The concentration indices controlled for selected socio-economic and demographic variables also suggest significant concentration of inequality to the disadvantage of the richer sections of society in case of diabetes and high blood pressure. Interestingly, the adjusted concentration indices do not suggest any socio-economic inequality in the risk of diseases like TB,cancer, mental illness, and heart disease.

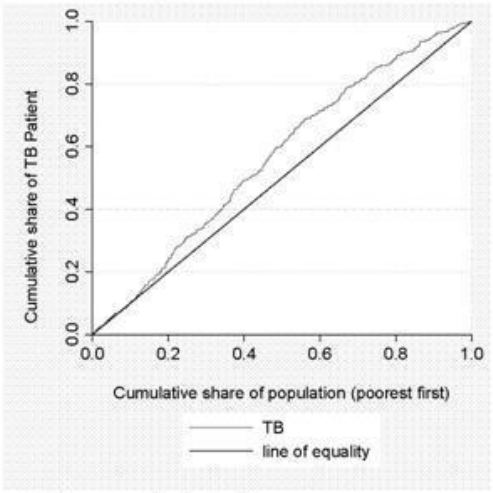
The logistic regression results also suggest socio-economic inequalities in the risk of diabetes and high blood pressure; the richer sections of the population being at significantly higher risk compared to the poorer sections of the society (odds ratio greater than 1). The „Wald" test results were significant in case of these two diseases suggesting the fact that wealth quintile was a significant predictor of these diseases (Table 3). Logistic regression results did not suggest the presence of socio-economic inequalities in the risk of cancer, mental illness, and heart disease.

The evidence presented thus supports our first hypothesis that diabetes and high blood pressure are associated with affluence. But we did not get sufficient evidence to prove our second hypothesis that TB and mental illness are associated with poverty. Though poor were more likely than the rich to suffer from TB, the concentration of TB among the poor was not significant.

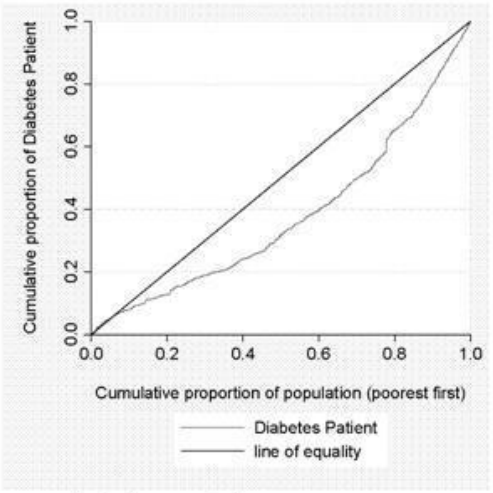
Socio-economic inequalities in risk factors of the selected diseases

A considerable proportion of the sampled population smoked (15%), chewed tobacco (17%), or consumed alcohol (18%). Interestingly, 58% of the households were crowded, thereby meaning that in 58% of the households, on an average, more than 2 members stayed per room. Findings further reveal variations in the presence of risk factors across the categories of wealth quintile (Table 4). The presence of risk factors was found to be higher among the poorer quintiles compared to the richer quin-tiles (19% versus 10% in case of smoking; 23% versus 10% in case of chewing tobacco; 10% versus 5% in case of alcohol use; 60% versus 46% in case of crowding).

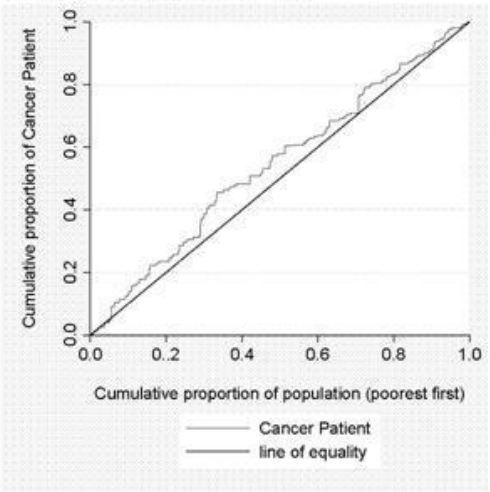
The rich-poor ratios for the selected risk factors suggest disproportionate concentration of the risk factors among the poorer sections of the society (Figure 3). The concentration curves further suggest that all the four risk factors were significantly concentrated among the poorer sections thus indicating the presence of the socio-economic inequality to the disadvantage of the poor. The adjusted inequality indicators presented in Table 5 depict the presence of socio-economic inequality only in smoking, consuming alcohol and chewing tobacco. The inequalities were to the disadvantage of the poorer sections of the society. On the other hand, crowding was not disproportionately distributed among the poorer sections of the society (Figure 4). Overall, we do find sufficient evidence to support our hypothesis that three of



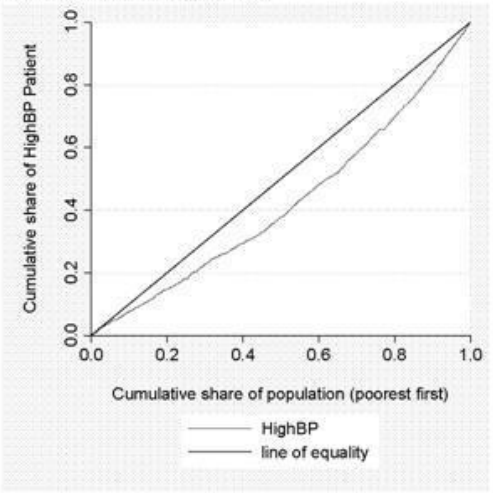
Concentration curve dominates Lorenz curve
Concentration curve dominates 45° line



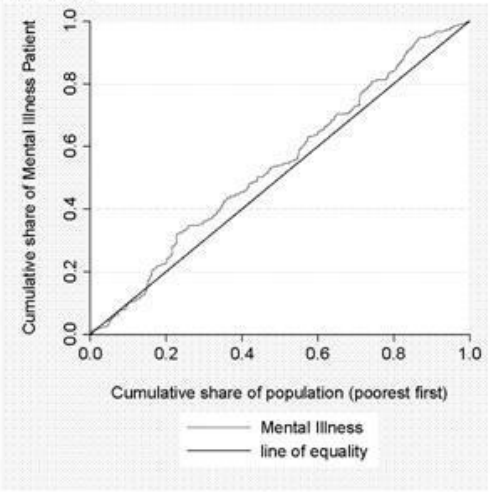
Lorenz curve dominates concentration curve
45° line dominates concentration curve



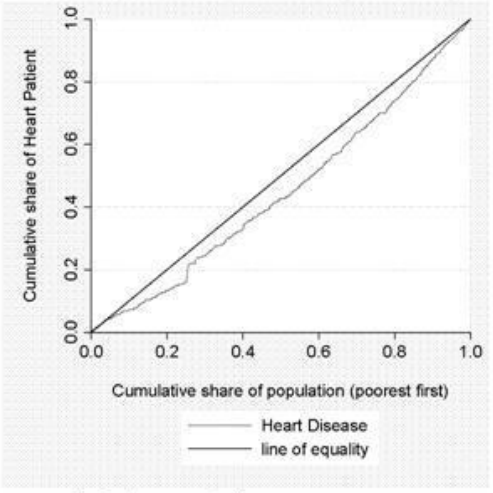
Non Dominance



Lorenz curve dominates concentration curve
45° line dominates concentration curve



Concentration curve dominates Lorenz curve
Concentration curve dominates 45° line



Lorenz curve dominates concentration curve
45° line dominates concentration curve

Figure 2. Concentration curve illustrating inequalities in the prevalence of selected diseases, India, IHDS 2004 to 2005.

Table 2. Concentration indices for selected diseases, India, IHDS 2004-05.

Selected disease	Over all concentration index	Concentration indices adjusted for					
		Age	Sex‡	Education‡	Caste‡	Religion‡	Residence‡
TB	- 0.154***	-0.176*	-0.178*	-0.086**	-0.077	-0.076	-0.065
Cancer	-0.090	-0.110	-0.112	-0.038	-0.068	-0.068	-0.094
Mental illness	-0.099**	-0.112	-0.119	-0.063	-0.066	-0.068	-0.078
Diabetes‡	0.215***	0.231***	0.229***	0.167***	0.152***	0.147***	0.105***
High BP‡	0.125***	0.139***	0.143***	0.107***	0.083***	0.080***	0.034**
Heart	0.095***	0.084	0.085	0.058	0.032	0.031	-0.002

*** p <0.001, ** p <0.01 and * p<0.05; ‡ analysis is done only for people aged 20 years or more.

Table 3. Odds ratios showing the effect of wealth quintile on the prevalence of selected diseases, India, IHDS 2004-05.

Wealth quintile	Odds ratio					
	TB	Cancer	Mental illness	Diabetes‡	High BP‡	Heart disease
	##			###	###	
Lowest quintile(R)						
2nd quintile	0.93	0.79	0.75	0.76*	0.90	0.95
3rd quintile	0.87	0.52*	0.70	1.03	0.91	0.92
4th quintile	0.71**	0.70	0.75	1.11	0.96	0.95
Top quintile	0.65**	0.72	0.75	1.34**	1.17**	1.09

*** p <0.001, ** p <0.01 and * p<0.05; # - Wald test used to examine whether wealth Quintile is a predictor of risk of selected diseases; R, reference category; ‡ analysis is done only for people aged 20 years or more.

Table 4. Prevalence of risk factors of selected diseases by wealth quintile, India, IHDS 2004-05.

Wealth quintile	Risk factor			
	Smoking‡	Chewing tobacco‡	Alcohol‡	Crowding
Lowest quintile	191	235	99	598
2nd quintile	187	213	117	660
3rd quintile	174	188	98	654
4th quintile	145	144	75	574
Top quintile	103	104	51	460

‡ Analysis is done only for people aged 20 years or more.

the four selected risk factors were unequally concentrated among the poorer sections.

DISCUSSION

The key messages that emerge out of the analysis are – 1) there are significant socio-economic inequalities in the risk of diseases in India, 2) diabetes and high blood pressure are associated with affluence, 3) no sufficient evidence to suggest that TB and mental illness are associated with poverty and 4) the risk factors like smoking, drinking, and tobacco use are concentrated more among the poorer sections of the society. One of the strengths of the analysis is the use of a population-based representative dataset. Another significant improvement over the earlier datasets is that it relies on physician diagnosis instead of self-reports of illnesses.

The findings of the present study are consistent with the findings of earlier studies that have also documented socio-economic inequalities in health including mortality and morbidity (Dalstra et al., 2005; Gnavi et al., 2008; Gupta and Gupta, 2009; Huisman et al., 2003; Kunst et al., 2005; Mackenbach et al., 2005; Mackenbach, 2006; Shidhay and Patel, 2010; Vukovic et al., 2008). The findings on diabetes and high blood pressure do confirm the earlier notion that these are associated with affluence (Blas and Kurup, 2010) and afflict wealthy people more

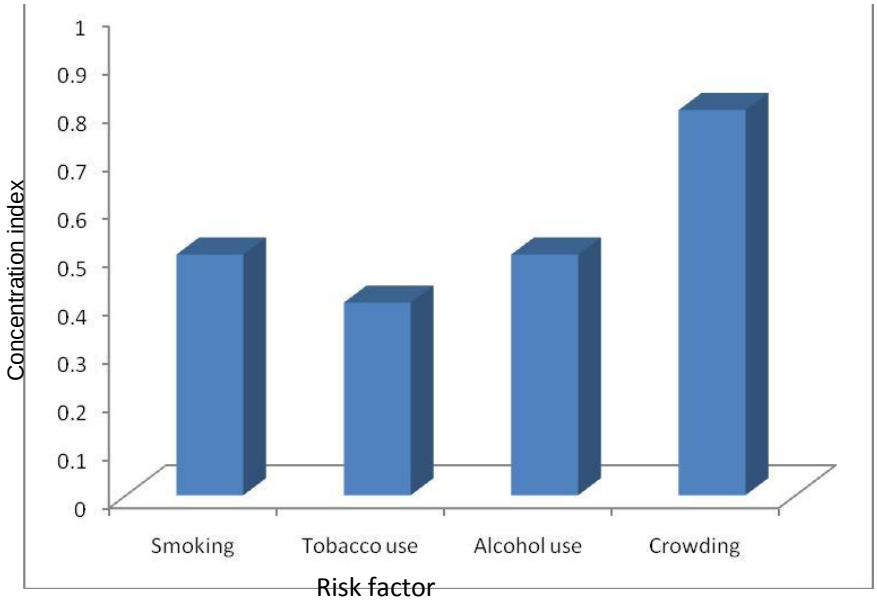


Figure 3. Rich-poor ratio for risk factors of selected diseases in India.

Table 5. Concentration indices of risk factors of selected diseases, India, IHDS 2004-05.

Risk factor	Over all concentration index	Concentration indices adjusted for					
		Age	Sex‡	Education‡	Caste‡	Religion‡	Residence‡
Smoking‡	-0.119***	-0.118***	-0.134***	-0.054***	-0.053***	-0.052***	-0.041***
Chewing tobacco‡	-0.160***	-0.158***	-0.170***	-0.112***	-0.101***	-0.099***	-0.087***
Alcohol‡	-0.141***	-0.143***	-0.160***	-0.073***	-0.043***	-0.046***	-0.047***
Crowding	-0.020***	-0.017***	-0.017***	-0.002***	0.000	0.000	0.000

*** p <0.001, ** p <0.01 and * p<0.05; ‡ Analysis is done only for people aged 20 years or more.

than the poor. Although, getting a physician‟s diagnosis is likely to be economically and socially structured (Desai et al., 2010), the findings are in line with the international observations. Diseases like hypertension, although common, are inadequately detected and treated (Reddy et al., 2005). So, rich are as likely as or slightly less likely than the poor to report diagnosis of diseases like hypertension. An interesting finding of the study is that the poor and rich are at equal risk of getting TB or mental illness when adjusted for important socio-economic and demographic characteristics. The finding on mental illness is particularly more likely to get affected by the social stigma attached to mental illnesses in the Indian society. The social stigma attached to mental illnesses might have resulted into lower reports of mental illnesses. One cannot also rule out an association between socio-economic status and reporting of mental illnesses in the sampled population. Another plausible reason could be that mental illnesses are still inadequately detected and treated in India. Because of the afore-mentioned reasons, mental illnesses have relatively lower demonstrable validity compared to other outcomes like diabetes and tuberculosis. An ideal strategy could be to rely on independently administered diagnostic tests to establish such associations. However, performing such studies may not be cost-effective and also may not be representative of the population in the true sense.

These findings are of immense value. Findings clearly suggest that India is facing complex situation in terms of burden of chronic diseases. First, the prevalence of chronic diseases is exceptionally high in India compared to other developed countries. Not only are the prevalences high, but conservative assumptions show that the number of people living with chronic diseases is expected to rise dramatically (NCHM, 2005; Sharma, 2008; Xavier et al., 2008). Secondly, there are significant socio-economic inequalities. Again, the socio-economic inequalities are double-edged. For certain diseases the burden is on the poor whereas for the others the burden is on the rich. At the same time India also has a huge

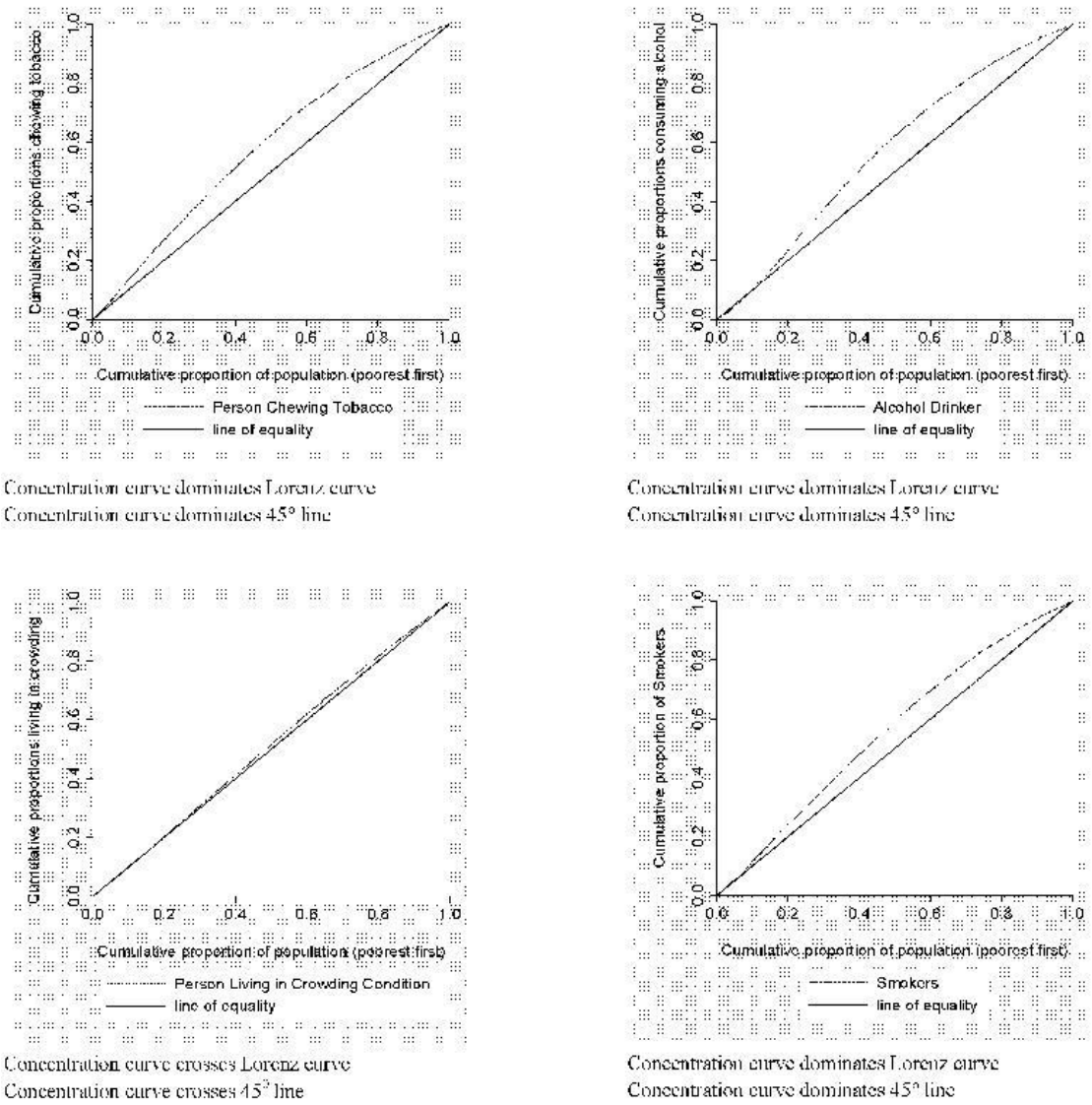


Figure 4. Concentration curve illustrating inequalities in the prevalence of risk factors of selected diseases, India, IHDS 2004 to 2005.

burden of infectious diseases both in terms of levels and socio-economic gradients. Tackling each of these require different strategies. For example, the diseases that are more prevalent in poor arise because of poor hygiene, poor sanitary conditions, and poor living conditions, whereas the diseases commonly present among the rich arise because of life-style related factors. Undoubtedly, these require different strategies and interventions. With rapid economic growth, urbanization, and economic development, the socio-economic inequalities are likely to rise in the near future. This can be easily inferred from the patterns of socio-economic inequalities in health in the developed countries. Addressing these inequalities is going to be a crucial policy challenge in the coming decade (Desai et al., 2010). It is also important to note that as India has already achieved impressive gains in the eradication of communicable diseases, attention must now shift to the role of unhealthy lifestyles in causing illness.

Though the study has some limitations in terms of its reliance on physician diagnosis to assess the associations and inequalities, it has some positive points as well. Given the fact that it is very challenging to measure population health, this study for the first time has provided empirical evidence to support the ongoing debate on the selected diseases. The study has gone a step forward to provide support to two important and interesting hypotheses. To improve over the findings of the present study,

future studies must rely on using independent diagnostic tests rather than relying on self-reported diagnosis. Future studies on health, apart from questions on smoking, drinking and tobacco use, must also include questions on broad risk factors such as physical activity, nutrition, etc because such factors could play an important role in the differences found as was the case in ATTICA study (Panagiotakos et al., 2008).

REFERENCES

Blas E, Kurup AS (2010). Equity social determinants and public health programme. World Health Organization, Geneva.

Dalstra JA, Kunst AE, Borrell C, Breeze E, Cambois E, Costa G, Geurts JJM, Lahelma E, Oyen VH, Rasmussen NK, Regidor E, Spadea T, Mackenbach JP (2005). Socioeconomic differences in the prevalence of common chronic diseases: an overview of eight European countries. Int. J. Epidemiol. 34(2): 316-326.

Desai SB, Dubey A, Joshi BL, Sen M, Shariff A, Vanneman R (2010). Human Development in India: Challenges for a Society in Transition. Oxford University Press, New York.

Eaton WW, Martins SS, Nestadt GO, Bienvenu J, Clarke D, Alexandre P (2008). The burden of mental disorders. Epidemiol. Rev. 30(1): 1-14.

Gnavi R, Karaghiosoff L,Costa G, Merletti F, Bruno G **(**2008). Socio-economic difference in the prevalence of diabetes in Italy: the population-based Turin study. Nutrition. Metabol. Cardiovasc. Dis., 18(10): 678-682.

Gupta R, Gupta KD (2009). Coronary heart disease in low socioeconomic status subjects in India: an evolving epidemic. Indian Heart J., 61(4): 358-367.

Huisman M, Kunst AE, Mackenbach JP (2003). Socio-economic inequalities in morbidity among the elderly: a European overview. Soc. Sci. Med., 57(5): 861-873.

IIPS, ORCMacro (2007). National Family Health Survey (NFHS-3), 2005-06: India, International Institute for Population Sciences, Mumbai. p. 1.

Kakwani NC (1977). Measurement of tax progressivity: an international comparison. Econ. J. 87(345): 71–80.

Kakwani NC, Wagstaff A, Doorslaer VE (1997). Socioeconomic Inequalities in Health: measurement, computation and statistical inference. J. Econom., 77(1): 87-104.

Kunst AE, Bos V, Lahelma E, Bartley M, Lissau I, Regidor E, Mielck A,Cardano M, Dalstra JAA, Geurts JJM, Helmert U, Lennartsson C, Ramm J, Spadea T, Stronegger WJ, Mackenbach JP (2005). Trends in socio-economic inequalities in self-assessed health in ten European countries. International J. Epidemiol., 34(2): 295-305.

Lawes CMM, Hoorne SV, Rodgers A (2008). Global burden of blood-pressure-related disease, 2001. Lancet, 371(9623): 1513-1518.

Lopez A, Mathers CD, Ezzati M (2006). Global burden of disease and risk factors. Oxford University Press, New York.

Mackenbach JP (2006). Health Inequalities: Europe in Profile. An independent report commissioned by the UK Presidency of the EU.

Mackenbach JP, Looman CW, Dalstra JAA, Kunst AE, Lahelm E (2005). The shape of relationship between income and self assessed health: an international study. Int. J. Epidemiol., 34(2): 286-293.

Muniyandi M, Ramachandran R (2008). Socioeconomic inequalities of tuberculosis in India. Expert Opin. Pharmacother., 9(10): 1623-1628.

NCMH (2005). NCMH Background Papers – Burden of Disease in India. New Delhi: National Commission on Macroeconomics and Health, Ministry of Health & Family Welfare, Government of India.

O"Donnell O, Doorsaler VE, Wahstaff A, Lindelow M (2008). Analyzing health equity using household survey data: a guide to techniques and their implementation, World Bank Institute Learning Resource Series. The World Bank, Washington DC.

Panagiotakos DB, Pitsavos C, Chrysohoou C, Vlismas K, Skoumas Y, Palliou K, Stefanadis C (2008). Dietary habits mediate the relationship between socio-economic status and CVD factors among healthy adults: the ATTICA study. Public Health Nutr., 11(12): 1342-1349.

Sharma S (2008). Hypertension and cardiovascular disease in South Asia: no end in sight. J. Am. Soc. Hypertension 2(3): 125-130.

Sidhaye R, Patel V (2010). Association of socio-economic, gender and health factors with common mental disorders in women: A population-based study of 5703 married rural women in India. International J. Epidemiol., 39 (6): 1510-1521.

Reddy SK, Shah B, Varghese C, Ramadoss A (2005). Responding to the threat of chronic diseases in India. Lancet, 366(9498): 1744-1749.

Rutstein SO (1999). Wealth versus expenditure: comparison between the DHS wealth index and household expenditure in four departments of Guatemala. ORC Macro, Calverton, Maryland.

Taylor DW (2010). The burden of non-communicable diseases in India. The Cameron Institute, Hamilton ON.

Tuberculosis Research Centre (TRC) (2004). Estimation of the burden of pulmonary tuberculosis in India for the year 2000.Tuberculosis Research Centre, Chennai.

Wagstaff A, Paci PE, van Doorslaer E (1991). On the measurement of inequalities in health. Soc. Sci. Med., 33(5): 545-557.

World Health Organization (2006). Global TB Control Report 2006. World Health Organization, Geneva.

World Health Organization (2009). Chronic diseases and health promotion. World Health Organization, Geneva.

World Bank (2006). World Development Report: Equity and Development. World Bank, Washington DC

Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, Gupta R, Joshi P, Kerkar P, Thanikachalam S, Haridas KK, Jaison TM, Naik S, Maity AK, Yusuf S (2008). Treatment and outcomes of acute coronary syndromes in India (CREATE): a perspective analysis of registry data. Lancet, 371(9622): 1435-1442.

Yajnik K, Chakraborty A, Jochem KA (2002). Mathematical model for determining the effect of tuberculosis control programmes on its prevalence in India (draft report). The World Bank, New Delhi.