Do Socio-economically Backward Sections of Society Lag in Epidemiologic Transition? - An Exploratory Analysis for India

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Abstract

India has witnessed a remarkable decline in mortality since 1921 and particularly after independence. This decline is accompanied by an 'epidemiologic transition'. Research on epidemiologic transition has recognized that the pattern of causes of death has been changing over time and it also varies across populations. Most analyses adopt an ecological approach, of relating the pattern to the national or societal level of mortality and of other characteristics such as income (see the recent work of Salomon and Murray, 2002). A natural question that arises is that does the cause pattern vary by economic classes and also by social groups 'within a population'? It is conceivable that different socioeconomic classes of a population follow different paths of epidemiologic transition and hence at a time point during the process are at different phases of transition. This is an issue of relevance in a country like India with a highly stratified society. Using data from the second National Family and Health Survey of India (1998-99), this paper examines whether various socioeconomic characteristics of households influence the pattern of causes of death among various age-sex groups. The results of logistic regressions reveal that social deprivation, standard of living, and education seem to be important determinants of the relative risk of death due to communicable diseases. In other words, socially and economically backward classes lag behind the more advanced sections in the transition process. There is thus a strong case for targeted health interventions.

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Introduction:

In India, as in most of the developing world, the level of mortality has declined substantially throughout the twentieth century, particularly during the second half of it. The life expectancies increased from 22.6 years for males and 23.3 years for females during 1901-10 to 60.1 years for male and 61.4 years for female by 1992-96 (India, RG; 1999); correspondingly the crude death rate declined from 42.6 during 1901-11 to 8.5 in 2002 (India, RG; 2002). Along with mortality transition, India is also undergoing an 'epidemiologic transition'. Ruzicka *et al.* (1991) noted, even after taking into account limitations of causes of death data of India, that, there is an increasing incidence of diseases of the circulatory system (largely heart attacks) in rural areas. About half of deaths classified as due to diseases with 'other clear symptoms' are attributed to cancer. A large proportion of the deaths attributed to 'senility'- mostly concentrated in the older age groups; however, deaths due to infectious and communicable diseases are also high, especially in the early ages of life.

By and large the mortality transition in India was largely due to public health and disease control measures, which were imported from the developed countries and, therefore, have been independent of economic development (Bhende and Kanitkar, 1999). These include DDT spraying, the use of antibiotics like penicillin and vaccines like the B.C.G. etc. Though the assistance provided by the World Health Organization to eradicate such mass killers as malaria, smallpox etc. has been helpful, the achievements

of the Indian health services system in this regard with an extensive institutional network in the public sector can not be ignored. This network, despite severe limitations in the delivery of preventive, promotive, and rehabilitative health care, served as an institutional life-support system for the poor in the country. However, the new macro-economic agenda under the rubric of structural adjustment programs initiated in the nineties undermined the approach to primary health care and enforced an entirely new paradigm of health services. The paradigm included changes in the conceptualization, planning, and delivery, apart from new ways of health financing. Though epidemiologic priorities have also been changing, the pace is not similar. The question that naturally arises whether this is the appropriate time of withdrawing State involvement in health care where large social and economic inequality exist within population. A natural corollary to the above question is: "*is there any variation in the epidemiologic situation among unequal socioeconomic groups?*" This paper seeks to examine whether household characteristics, such as standard of living, caste or religion, and individual characteristics, such as education play a role in the pattern of causes of deaths, more specifically, the proportion of death due to communicable diseases in various age-sex groups, and tries to lead to suitable policy implications.

Methods and Material:

Mortality statistics in India are very limited as in many Asian countries. In India one of the major sources of mortality statistics has been vital registration system, which also has an item on cause of death. However, this information in majority of cases is not authenticated by a medical practitioner or even by paramedical personnel. A scheme on

"Medical Certification of Cause of Death" (hereafter called MCCD) has been introduced in selected hospitals, generally in urban areas. For the rural areas, another scheme known as "Survey of Causes of Death (Rural)" (hereafter called SCD(R)) provides for recording of cause of death through a post-death enquiry based on a non-medical list of causes and symptoms of illness preceding death. The National Family Health Survey (NFHS-2), India, carried out between 1998-99 by the ORC-Macro and the International Institute for Population Sciences, Mumbai, collected information from a nationally representative sample of 92, 486 households and from each on ever-married woman of age group 15-49 on fertility, mortality, family planning, and important aspects of reproductive health, nutrition and childcare (IIPS and ORC Macro, 2001). This survey also asked the questions to the head of the household or any other adult member on number of deaths occurred in the household during the two years preceding the survey (for details see notes to Table: 1), the cause of death, age and sex of the deceased member. It is worthwhile to mention that the data on causes of death as collected by NFHS-2 are not medically certified in any case. However, an advantage of NFHS-2 data set is that individual records of background characteristics are available, thus permitting a detailed analysis, whereas, in the MCCD and SCD (R) data sets these information are not available. Hence, though the pattern can be obtained from all the three sources, further analyses are possible only on the NFHS data. The households covered in the NFHS-2 consist of 517, 379 individuals and reported 11, 942 deaths during the two years prior to survey. A file was created of these 11,942 deaths with information on the age and sex of the deceased persons; besides, information on religion, caste and educational attainment of the head of the household and standard of living of the household was also included.

In the MCCD and the SCD (R), the causes of death have been classified into the seventeen broad classes as per International Classification of Diseases (ICD, IX and X revision). In the NFHS-2, the causes are not listed in the schedules or the initial tabulation according to the International Classification of Diseases (ICD). However, on the basis of the description, it is possible to classify a cause into one of the seventeen categories. Yet, some categories listed in the NFHS-2, like "fevers not classifiable", "not classifiable digestive disorder", "others" etc. posed difficulty in classification due to doubts about appropriate ICD class to which they belong. For example, deaths in the category "fever not classifiable" might have taken place due to some infectious and parasitic diseases or by any other communicable ailments, which was not known to the respondent. Similarly, "not classifiable digestive disorder" category may consist of the deaths due to diarrhoeal diseases or appendicitis or hernia of abdominal cavity or some other causes. Also, no specific cause of death has been mentioned in "others" category.

In the present analysis, first the causes of death have broadly been classified into following classes as mentioned in Salomon and Murray (2002): "communicable, maternal, perinatal and nutritional diseases" (hereafter called communicable) that consist of infectious and parasitic diseases, respiratory infections, maternal conditions arising during the perinatal period and nutritional diseases; "non-communicable diseases" comprised of malignant neoplasms, diabetes mellitus, endocrine disorders, neuro-psychiatric conditions, sense organ diseases, cardiovascular diseases, chronic respiratory diseases, digestive diseases, genitor-urinary diseases, skin diseases, musculoskeletal diseases, congenital anomalies, oral conditions; "injuries" consist of unintentional and intentional (self-harm) injuries. Then for further analyses, the classes "non-

communicable", "injuries", "others" and "don't know" have been combined together to form a broad group "other than communicable" (hereafter called others) because such a classification would reduce the number of deaths included in each category as well as the significance of the study.

The analysis has been done separately for each sex and for the five age groups 0-4, 5-14, 15-49, 50-69 and 70+, representing infancy and early childhood, late childhood, young-middle adulthood, late adulthood, and old age respectively. The youngest age group (infancy and early childhood) generally has high mortality. The late childhood period is characterized by very low mortality. The age group 15-49 also has low mortality though it coincides with the childbearing span. The last two age groups show progressively high morality and a shift in the cause pattern.

Predictor variables influencing causes of death at each age group and sex are chosen as the following: place of residence, religion, caste (ethnicity), educational attainment of the household head, standard of living of the household, and crowding of the household. Rural areas in the developing country like India are characterized by inadequate sanitary and water supply infrastructure and poor access to health services as compared to urban areas and hence presumably more susceptible to communicable diseases than their urban counterparts. Variations in the socio-cultural practices related to childbirth, food habits, marriage, family system and customs related to prevention and treatment-seeking behaviour of diseases have been observed among various religious groups like Hindu, Muslims, Christians, Sikhs etc (three categories are used: Hindu, Muslim and Others). Besides, within the Indian caste hierarchy, some groups are identified as backward. The most disadvantaged and traditionally oppressed castes are

denied access to various services and resources, these have been classified as scheduled castes (SCs) and scheduled tribes (STs) (caste is categorized as: SCs and STs, other backward castes (OBCs) and others- non-backward). Causes of death could also conceivably vary according to household economic condition. But since NFHS-2 did not collect data on household income or expenditure, a proxy, standard of living index as calculated by NFHS-2, has been incorporated in the analyses. This is based on of the following household and economic characteristics: type of house, toilet facility, source of drinking water, source of lighting, main fuel for cooking, separate room for kitchen, ownership of house, ownership of irrigated land, ownership of livestock and consumer durable goods.[‡] On the basis of the scores, households are classified into low, medium and high standard of living. Education of the head of the household is an important factor possibly influencing the cause pattern since higher educated persons, owing to their exposure to outside world, are more aware of personal hygiene and issues on preventive, promotive, and curative healthcare than less educated person (education is categorized as: illiterate, educated up to middle school, and higher educated) . "Crowding" is an important variable in the causes of death analyses as it has implications for personal hygiene and transmission of diseases. Here "crowding" is measured as the number of persons per room. Further it has been grouped into two categories: less than or equal to 3 persons per room and greater than 3 persons per room.

Since the objective of the present study is to observe the effects of socioeconomic variables on the pattern of causes of death (communicable and others) in each age-sex group, a generalized logistic regression has been employed for each age-sex group

[‡] For details of scores of each variable refer to the report of National Family and Health Survey, India, 1998-99 (IIPS and ORC Macro, 2001).

(altogether ten sets of logistic regressions). The generalized logistic regression equation can be written in the following form:

logit q = ln [q/(1-q)] = $\__0$ + $\_\__i X_i$,

where q is the probability that a death is caused by communicable diseases

and $\{X_i\}$ (i = 1, 2….6) are the aforesaid predictor variables, $\__0$ is the intercept and

$\__i$'s (i = 1,2 ……6) are the regression coefficients corresponding to the six explanatory variables. The results of logistic regressions are given in conventional format of regression coefficients.

Results and Discussion:

Distribution of the Causes of Deaths from Three Different Sources:

Table 1 depicts the frequency distribution of causes of deaths from three major data sources in India, namely, MCCD, SCD (R) and NFHS-2. It is worthwhile to mention that though the data collected by MCCD have the advantage of being based on medical certification of causes of death, these cover only those deaths *that occurred in selected major hospitals*, and hence are not a *representative sample* of deaths in India. On the other hand, data of SCD (R) are based either on lay reporting of symptoms or other signs. In principle, the SCD (R) is representative of rural areas, but the coverage is quite incomplete. The NFHS-2 data are based on reporting by head of the households. Although causes of death from this source are not *confirmed* by medical personnel, they are obtained from a nationwide household survey of a *representative sample* of both rural and urban areas.

From Table 1 it can be observed that the death toll from "diseases of circulatory system" (22.2 per cent), largely heart attack, is the highest among all cause groups recorded by the MCCD. According to the MCCD, the other major causes of deaths are "infectious and parasitic diseases" (15.7 per cent), "symptoms, signs and ill-defined conditions" (14.2 per cent) and "injury and poisoning" (12.1 per cent). On the other hand, according to the SCD (R) and the NFHS-2, the largest percentage is attributed to "symptoms, signs and ill-defined conditions" (18.4 and 22.7 per cent respectively) most of which are due to senility. According to the SCD (R) the other leading causes of death are "diseases of the respiratory system" (17.2 per cent), "diseases of the circulatory system" (12.5 per cent), "infectious and parasitic diseases" (12 per cent) and "injury and poisoning" (10.8 per cent). These four cause groups also figure prominently in the NFHS-2 distribution but not in the same order. It has been noted that there are some disease categories listed in the NFHS-2 (last five categories of Table 1), which can not be included in cause category, as stated earlier. According to the NFHS-2, "fever not classifiable" has also taken a high toll (7.9 per cent).

As the present article tries to see the effects of various background characteristics on the pattern of causes of death by age and sex, the further analyses and discussions will be based only on NFHS-2 data, which provide individual records.

Table: 1

Percentage Distribution of Deaths According to Major Cause Groups from Medical Certification of causes of Death (MCCD) (1997), Survey of Causes of Deaths (Rural) (SCD) (R) (1998) and National Health and Family Survey (NFHS-2) (1998-99)

Major Group No.	Causes of Death	MCCD	SCD (R)	NFHS-2[a]
I	Infectious and Parasitic Diseases (001-139)	15.7	12.0[b]	12.6
II	Neoplasms (140-239)	3.2	4.3	4.4
III	Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders (240-279)	3.1	1.1	2.4
IV	Diseases of Blood and Blood Forming Organs (280-289)	2.3	3.3	0.6
V	Mental Disorders (290-319)	0.1	---	0.4
VI	Diseases of the Nervous System And Sense Organs (320-389)	3.1	6.0	3.7
VII	Diseases of the Circulatory System (390-459)	22.2	12.5	9.0
VIII	Diseases of the Respiratory System (460-519)	7.1	17.2	10.5
IX	Diseases of the Digestive System (520-579)	4.8	2.1	1.5
X	Diseases of the Genitourinary System (580-629)	1.5	1.2	---
XI	Complication of Pregnancy, Child Birth and the Puerperium (630-676)	0.9	0.6	0.7
XII	Diseases of the Skin and Subcutaneous Tissue (680-709)	0.2	---	---
XIII	Diseases of the Musculoskeletal System and Connective Tissue (710-739)	0.07	---	---
XIV	Congenital Anomalies (740-759)	0.6	0.4	1.8
XV	Certain Conditions Originating In the Perinatal Period (760-779)	8.8	7.9	2.6
XVI	Symptoms, Signs and Ill-Defined Conditions (780-799)[c]	14.2	18.4	22.7
XVII	Injury and Poisoning (800-999)[d]	12.1	10.8	7.7
	Fever not Classifiable	---	---	7.9
	Not Classifiable Digestive Disorders	---	---	0.9
	Others	---	---	6.3
	Don't Know	---	---	2.1
	Undefined Codes	---	---	.07
	Missing	---	---	2.6
	All Causes	**100**	**100**	**100**

Notes on Table1

a. Deaths are computed from 92, 486 households (total population of 517, 379) from the period 1 January, 1996 to survey date for those states surveyed in 1998 and from 1 January, 1997 to survey date for those states surveyed in 1999.
b. 'Viral Infection' in SCD(R) has been added to 'Infectious and Parasitic Diseases' to make the data comparable.
c. In the MCCD, 'Symptoms, Signs and Ill-defined Conditions' includes deaths due to senility without mention of psychosis (ICD Code 797) and other signs, symptoms and ill defined conditions (780-796, 798, 799). In SCD (R) this group comprises 'Acute abdominal pain, Jaundice, Senility & Toxaemia'. For better understanding and comparison, the diseases 'Acute Abdominal Pains', 'Jaundice', 'Convulsions' and 'Senility' are pooled together in the case of NFHS-2 under the cause category 'Symptoms, Signs and Ill-Defined Conditions'.
d. 'Injuries, Poisoning and Other Consequences of External Causes', 'External Causes of Mortality', 'Other External Causes of Accidental Injuries', 'With Venomous Animal Contact' all are pooled to the category 'Injury and Poisoning'.

Results of Bivariate Analysis:

Table 2 depicts the percentage of deaths due to communicable diseases by various socioeconomic and spatial variables in both sexes. It has been observed that in the rural areas the percentage of deaths due to communicable diseases is higher than in urban areas for both sexes. Proportion of deaths due to communicable diseases does not vary much by religion. However, the proportion of deaths due to communicable diseases is relatively high among SCs and STs in both sexes. It can also be observed that, proportion of deaths due to communicable causes is the lowest among the households of high standard of living irrespective of sex. Similarly, the share of communicable diseases falls with a rise in the education of the head of the household. Also, the proportion of deaths due to communicable ailments is high among crowded households than the less crowded households for both sexes.

Table: 2

Number of Deaths due to Communicable and Other Causes in Various Socioeconomic Categories by Sex, NFHS-2, 1998-99

	Female				Male			
Variables	**C[a]**	**AO[b]**	**Total**	**PC[c]**	**C[a]**	**AO[b]**	**Total**	**PC[c]**
Place of Residence								
Rural	1800	2278	4078	44.1	2030	2790	4820	42.1
Urban	387	937	1324	29.2	518	1202	1720	30.1
Religion of HH[d]								
Hindu	1675	2546	4221	39.7	1985	3109	5094	39.0
Muslim	265	355	620	42.7	282	451	733	38.5
Others	246	312	558	44.1	277	431	708	39.1
Caste/Tribe of HH[e]								
Non-SC&ST, non-OBC	674	1223	1897	35.5	569	1534	2103	27.1
SC & ST	1080	935	2015	53.6	876	1121	1997	43.9
OBC	697	929	1626	42.9	638	1147	1785	35.7
Standard of Living								
Low	913	956	1869	48.8	1078	1183	2261	47.7
Medium	1022	1492	2514	40.7	1189	1850	3039	39.1
High	226	732	958	23.6	257	909	1166	22.0
Education of HH[f]								
Illiterate	1001	1126	2127	47.0	1274	1577	2851	44.7
Middle	901	1251	2152	41.9	951	1479	2430	39.3
High	285	838	1123	25.4	323	936	1259	25.7
Crowding								
≤3 Persons per room	1408	2359	3767	37.4	1715	2962	4677	36.7
>3 Persons per room	776	855	1631	47.6	829	1028	1857	44.6

Notes on Table 2:

a: C: Communicable, Maternal, Perinatal and Nutritional Diseases

b: AO: Non-communicable, Accidents & Injuries, Other Diseases

c: PC: Percent of deaths due to Communicable, Maternal, Perinatal and Nutritional Diseases

d: Religion of the head of the household of the deceased person

e: Caste/Tribe membership of the head of the household of the deceased person

f: Education of the head of the household of the deceased person

Results of Logistic Regression by Age and Sex:

In order to assess the net effects of various factors on the probability that the cause of death is communicable disease, logistic regression analyses were performed. This was done separately for each of the age groups: 0-4, 5-14, 15-49, 50-69, and 70+ and for both the sexes. In the 0-4 age group, where the concentration of communicable diseases is higher than other diseases, it has been observed that among females, religion and education of the head of the household head have moderate impact on causes of death by controlling all other socioeconomic variables (Table 3). It has been found that females of 'other' religions have nearly 60 per cent higher odds of dying by communicable diseases than Hindu females. Here since 'other' religions consists of Christians, Buddhists, Sikhs, Jains etc. so it is difficult to identify the plausible reason behind this. It has also been observed that for females the probability of dying by communicable diseases is significantly lower (at 5 per cent level of significance) when head of the household is has higher level of education compared to the reference group, illiterate. This is probably because higher education gives greater awareness about personal hygiene, which is very important to combat communicable diseases of the childhood. It has been noticed that among males of 0-4 age group those belonging to SCs and STs have significantly higher risk (more than 45 per cent) of dying by communicable diseases than non-SC, ST and non-OBC males. This finding implies that the SCs and STs, who represents socially backward sections of society, face disadvantages in tackling communicable diseases, though it is not clear why this effect is seen only in case of males.

Table: 3

Results of Logistic Regression of Cause being Communicable Disease on Socioeconomic Variables for 0-4 Age Group by Sex

Predictor Variables	Female			Male		
	N	Sig	Exp(B)	N	Sig	Exp(B)
Place of Residence						
Rural (rc)	602			615		
Urban	105	.893	1.016	139	.527	0.936
Religion						
Hindu (rc)	548			573		
Muslim	78	.173	0.756	99	.659	1.087
Others	81	.022	1.623*	82	.446	0.856
Caste/Tribe						
Non-SC, ST & Non-OBC (rc)	182			222		
SC & ST	315	.528	0.926	329	.002	1.467**
OBC	210	.196	1.172	203	.822	0.973
Standard of Living						
Low (rc)	332			341		
Medium	325	.832	1.029	342	.976	0.996
High	50	.543	0.875	71	.891	1.027
Education						
Illiterate (rc)	350			395		
Middle	276	.223	1.162	264	.617	0.942
High	81	.014	0.652*	95	.808	1.041
Crowding						
≤3 Person /Room (rc)	421			476		
>3 Persons /Room	286	.131	1.140	278	.962	.996
	Total Sample = 707			**Total Sample = 754**		
	Intercept = .677			**Intercept = .591**		
	-2LL = 883.305			**-2LL = 940.750**		
	Pseudo R^2 = .039			**Pseudo R^2 = .029**		

Note:
N: Number of deaths in the category
Exp(B): Odds ratio
rc: *Reference Category*
** The coefficient in the underlying logistic regression is significant at the 5 per cent level.*
*** The coefficient in the underlying logistic regression is significant at the 1 per cent level.*

Table: 4

Results of Logistic Regression of Cause being Communicable Disease on Socioeconomic Variables for 5-14 Age Group by Sex

Predictor Variables	Female			Male		
	N	**Sig**	**Exp(B)**	**N**	**Sig**	**Exp(B)**
Place of Residence						
Rural (rc)	479			507		
Urban	82	.151	.828	96	.649	0.947
Religion						
Hindu (rc)	453			469		
Muslim	46	.450	0.827	59	.486	0.857
Others	62	.222	1.354	75	.670	1.096
Caste/Tribe						
Non-SC, ST & Non-OBC (rc)	136			143		
SC & ST	229	.867	1.024	285	.196	1.185
OBC	196	.913	1.014	175	.932	0.989
Standard of Living						
Low (rc)	246			271		
Medium	273	.515	0.908	289	.942	0.990
High	42	.734	1.087	43	.922	0.978
Education						
Illiterate (rc)	271			291		
Middle	223	.254	1.170	251	.621	1.067
High	67	.106	0.735	61	.692	0.926
Crowding						
≤3 Person /Room (rc)	326			389		
>3 Persons /Room	235	.317	0.910	214	.150	1.146
	Total Sample = 561			**Total Sample = 603**		
	Intercept = .521			**Intercept = .482**		
	-2LL = 710.734			**-2LL = 778.351**		
	Pseudo R^2 = .025			**Pseudo R^2 = .016**		

Note:
N: Number of deaths in the category
Exp(B): Odds ratio
rc: Reference Category

Table: 5

Results of Logistic Regression of Cause being Communicable Disease on Socioeconomic Variables for 15-49 Age Group by Sex

Predictor Variables	Female			Male		
	N	**Sig**	**Exp(B)**	**N**	**Sig**	**Exp(B)**
Place of Residence						
Rural (rc)	831			920		
Urban	243	.113	0.893	407	.206	0.916
Religion						
Hindu (rc)	859			1054		
Muslim	94	.147	1.275	97	.048	1.386
Others	121	.980	1.004	176	.148	0.809
Caste/Tribe						
Non-SC, ST & Non-OBC (rc)	342			449		
SC & ST	409	.001	1.370**	476	.000	1.423**
OBC	323	.068	0.844	402	.384	0.926
Standard of Living						
Low (rc)	411			477		
Medium	514	.766	1.028	628	.182	1.125
High	149	.106	0.796	222	.001	0.630**
Education						
Illiterate (rc)	475			660		
Middle	428	.301	1.100	483	.083	1.177
High	171	.034	0.761*	184	.173	0.830
Crowding						
≤3 Person /Room (rc)	755			938		
>3 Persons /Room	319	.041	1.155*	389	.176	1.092
	Total Sample = 1074			**Total Sample = 1327**		
	Intercept =.102			**Intercept = -.729**		
	-2LL = 1431.423			**-2LL = 1648.879**		
	Pseudo R^2 = .066			**Pseudo R^2 = .067**		

Note:
N: Number of deaths in the category
Exp(B): Odds ratio
rc: *Reference Category*
** The coefficient in the underlying logistic regression is significant at the 5 per cent level.*
*** The coefficient in the underlying logistic regression is significant at the 1 per cent level.*

Since the level of mortality in the 5-14 age group is very low, the number of deaths is quite small among both males and females, and none of the predictor variables show any significant impact on causes of death as observed from the Table 4.

As we move on to the 15-49 age group, Table 5 indicates that, among females, caste/tribe membership of the head of the household and education of the head of the household have significant impact on the causes of death. Women from higher educated households have nearly 25 per cent lower odds than those from illiterate households of a death being due to communicable diseases. The higher education presumably facilitates better hygienic conditions as a result of which the persons are less prone to communicable diseases. Among women of 15-49 age-group, the effect of crowding in the household has also been observed. Crowed households are more prone to communicable diseases; note that this is even after controlling the effect of standard of living. Among males, caste/tribe membership of the head of the household and standard of living of the household are found to have significant impact on the causes of death. Males living in the households of high standard of living are having nearly 35 per cent less chance that a death is caused by communicable diseases than the males living in the low standard of living households. This is due to the fact that, high standard of living indicates the behavioural and life-style change. This finding supports the earlier findings by Ruzicka and Kane (1991). For females, the effect of standard of living is in the same direction but not significant. Among both sexes it has been observed that the probability of dying by communicable diseases is more than 35 per cent higher among SCs and STs compared to the non-SC, ST and non-OBC population. The reason behind this has already been mentioned.

Table: 6

Results of Logistic Regression of Cause being Communicable Disease on Socioeconomic Variables for 50-69 Age Group by Sex

Predictor Variables	Female			Male		
	N	**Sig**	**Exp(B)**	**N**	**Sig**	**Exp(B)**
Place of Residence						
Rural (rc)	806			1064		
Urban	294	.013	0.797*	418	.568	0.962
Religion						
Hindu (rc)	873			1209		
Muslim	89	.786	1.053	131	.750	0.953
Others	138	.253	0.823	142	.941	1.011
Caste/Tribe						
Non-SC, ST & Non-OBC (rc)	404			554		
SC & ST	374	.152	1.158	473	.007	1.258**
OBC	322	.877	0.985	455	.546	0.952
Standard of Living						
Low (rc)	348			494		
Medium	520	.455	1.077	700	.245	1.098
High	232	.001	0.582**	288	.000	0.636**
Education						
Illiterate (rc)	384			660		
Middle	433	.299	1.103	483	.689	1.033
High	283	.627	0.940	184	.069	0.822
Crowding						
≤3 Person /Room (rc)	819			1121		
>3 Persons /Room	281	.352	0.931	361	.220	1.082
	Total Sample = 1100			**Total Sample = 1482**		
	Intercept = -1.158			**Intercept = -.710**		
	-2LL = 1305.423			**-2LL = 1868.522**		
	Pseudo R^2 = .076			**Pseudo R^2 = .066**		

Note:
N: Number of deaths in the category
Exp(B): Odds ratio
rc: *Reference Category*
** The coefficient in the underlying logistic regression is significant at the 5 per cent level.*
*** The coefficient in the underlying logistic regression is significant at the 1 per cent level.*

Table 6 establishes that, the SC and ST males of 50-69 age group are at significantly higher risk of communicable diseases compared to the non-SC, ST and non-OBC males even after controlling all other socioeconomic variables. This again establishes their social deprivation and inability to prevent or combat the communicable diseases even at the older ages. It has also been observed that in this age group, in both sexes, standard of living is significantly and negatively associated with the deaths due to communicable diseases.

Table 7 shows the result of logit regression for the age group 70+ for both sexes. It has been observed that those who live in the higher educated households have moderately lower probability of dying by communicable ailments than those from less educated households; this is true for both females and males. It has also been found that females from crowded households are more susceptible to communicable diseases. And among males, SCs and STs have significantly higher risk of communicable ailments (more than 30 per cent) compared to non-SC, ST and non-OBC males. Similarly, a high standard of living lowers the chance of death due to communicable disease in case of males.

Table: 7

Results of Logistic Regression of Cause being Communicable Disease on Socioeconomic Variables for 70+ Age Group by Sex

Predictor Variables	Female			Male		
	N	**Sig**	**Exp(B)**	**N**	**Sig**	**Exp(B)**
Place of Residence						
Rural (rc)	1139			1467		
Urban	525	.439	0.944	539	.016	0.848*
Religion						
Hindu (rc)	1373			1652		
Muslim	162	.884	1.023	173	.977	1.004
Others	129	.861	1.029	181	.968	0.995
Caste/Tribe						
Non-SC, ST & Non-OBC (rc)	701			802		
SC & ST	460	.079	1.179	605	.000	1.321**
OBC	503	.803	1.022	599	.090	0.878
Standard of Living						
Low (rc)	446			565		
Medium	764	.075	1.156	948	.111	1.121
High	454	.660	0.949	493	.014	0.772*
Education						
Illiterate (rc)	582			660		
Middle	666	.107	1.143	483	.398	1.064
High	470	.034	0.791*	184	.006	0.774**
Crowding						
≤3 Person /Room (rc)	1247			1492		
>3 Persons /Room	417	.023	1.168*	514	.541	1.037
	Total Sample = 1664			**Total Sample = 2006**		
	Intercept = -1.225			**Intercept = -1.178**		
	-2LL = 1721.541			**-2LL = 2236.497**		
	Pseudo R^2 = .029			**Pseudo R^2 = .054**		

Note:
N: Number of deaths in the category
Exp(B): Odds ratio
rc: *Reference Category*
** The coefficient in the underlying logistic regression is significant at the 5 per cent level.*
*** The coefficient in the underlying logistic regression is significant at the 1 per cent level.*

Conclusions:

It has been observed that in India life expectancy has increased and death rate in every age group has decreased considerably over the past few decades. As is well known, mortality decline is associated with change in the pattern of causes of death. The present study has tried to assess whether the cause pattern also varies by household characteristics in various age-sex groups in India by using the data from the NFHS-2. It is to be acknowledged that in the NFHS-2, cause of death has been reported by the head of the household or by any adult member and not *medically certified*. Besides, deaths due to HIV/AIDS have not been reported, though the share of HIVAIDS in the deaths is quite small in India and a household survey is not a good instrument to capture this aspect. With this caveat, the present study found that social deprivation among the weaker sections of the society as manifested by "caste", ignorance due to illiteracy, and low standard of living of the household seem to be the most important determinants of the pattern of cause of deaths across the age-sex groups in Indian population. The analyses reveal that certain factors have a significant influence in some of the age-sex groups. The overall picture is that the epidemiologic transition is in progress but its advance has varied on socioeconomic lines: chronic and degenerative diseases of adulthood have a growing prevalence among the better-off, educated and urban population, while communicable diseases remain relatively more prevalent among the rural based illiterate or semi-literate poor masses and the socially weaker sections.

It is to be noted that most of the diseases by which poor people die are avoidable illnesses. The socially and economically deprived sections may lack the knowledge to protect themselves adequately or seek needed services, lack the power to protect their

rights, and lack income to access services. The recent re-orientation of public policy towards cuts in public spending on health services, including tertiary level medical care, shifting curative care to the private sector, introduction of cost-recovery mechanisms in public hospitals, defining essential clinical and public health packages, shifting responsibility of medical and public health care to the households or the household micro-environment would be disastrous to the poor. If the state abdicates its responsibility for the provision of health care, the majority of the households at the subsistence level in India would be left without any life-support system. Effective intervention strategies by targeting a relatively small set of diseases and conditions, such as malaria, tuberculosis, maternal and perinatal conditions, widespread causes of child mortality including measles, tetanus, diphtheria, acute respiratory infection, and diarrhoeal diseases, and malnutrition that exacerbates those diseases, other vaccine preventable illnesses and tobacco-related diseases can reduce the heavy burden of diseases among poor. It can be done by two ways. One is investing in health system by the government-to make it strong enough, well-funded, and with the right priorities to deliver essential interventions. Decentralization of healthcare delivery may serve as a very effective tool in this regard. The delivery system could also be targeted so that the really needy receive the essential support. The other way is by complementary steps in education, especially, education on various health issues and community involvement, so that the poor can effectively get access to and are motivated to seek out these essential interventions.

It must be noted here that, due to small sample size we could not examine the regional differences among the factors. But it is likely that, due to diversified agro-

climatic zones in India, disease pattern may also vary among different regions along with factors affecting them. It increasingly becomes important to design healthcare policies based on knowledge of local circumstances, and to consider the short and long term implications of shifts in the allocation of healthcare resources between the prevention and treatment of communicable and non-communicable diseases.

References

Bhende, Asha A. and Tara Kanitkar (1999). *Principles of Population Studies*. Bombay: Himalaya Publishing House.

Bulatao, R. (1993). Mortality by Cause, 1970 to 2015. In J.N. Gribble and S.H. Preston (Eds.), *The Epidemiological Transition: Policy and Planning Implications for Developing Countries*. Washington, DC: National Academy Press.

Caselli, G., F. Meslé, J. Vallin (2002). Epidemiological Transition Theory Exceptions. *Genus* LVIII (1): 9-51.

Frenk, J.,T. Frejka, J.L. Bobadilla et al. (1989a). The Epidemiologic Transition in Latin America. In *International Population Conference*, *New Delhi*, Vol.1, Liege: International Union for the Scientific Study of Population: 419-431.

Frenk, J., J.L. Bobadilla, J. Sepulveda et al. (1989b). Health Transition in Middle-Income Countries: New Challenges for Healthcare. *Health Policy and Planning* 4(1):29-39.

Gadomski, A., R.E. Black, H.W. Mosley (1990). Constraints to the Potential Impact of the Direct Interventions for Child Survival in Developing Countries. In J. C. Caldwell et al. (Eds.), *What We Know About Health Transition: The Cultural, Social and Behavioural Determinants of Health.* Canberra: Health Transition Centre, Australian National University: 729-741.

Gaylin, D.S. and J. Kates (1997). Refocusing the Lens: Epidemiologic Transition Theory, Mortality Differentials, and the AIDS Pandemic. *Social Science and Medicine* 44 (5):609-621.

Gwatkin, G.R. and M. Guillot (2000). *The Burden of Disease among the Global Poor: Current Situation, Future Trends, and Implications for Strategy.* Human Development Network, HNP, The World Bank, Washington DC.

Hakulinen, T., H. Hansluwka, A.D. Lopez, and T. Nakada (1986). Global and Regional Mortality Patterns by Cause of Death in 1980. *International Journal of Epidemiology* 15(2):226-233.

India. Office of the Registrar General (ORG) (1999). *Compendium of India's Fertility and Mortality Indicators (1971-1997), Based on the Sample Registration System*. New Delhi: Vital Statistics Division, Registrar General of India, Ministry of Home Affairs.

India. Office of the Registrar General (ORG) (2001). *Medical Certification of Causes of Death, 1997.* New Delhi: Vital Statistics Division, Registrar General of India, Ministry of Home Affairs.

India. Office of the Registrar General (ORG) (2001). *Survey of Causes of Death (Rural) 1998.* New Delhi: Vital Statistics Division, Registrar General of India, Ministry of Home Affairs.

India. Office of the Registrar General (ORG) (2002). *Sample Registration System Bulletin 2002*. New Delhi: Vital Statistics Division, Registrar General of India, Ministry of Home Affairs.

International Institute for Population Sciences (IIPS) and ORC Macro (2001): *National Family Health Survey (NFHS-2), India, 1998-99.* Mumbai: IIPS.

McKeown, T. (1976). *The Modern Rise of Population*. New York: Academic Press.

Mercer, A.J. (1985). Smallpox and Epidemiologic-Demographic Change in Europe: The Role of Vaccination. *Population Studies* 39 (2): 287-307.

Murray, C.J.L. and A.D. Lopez (Eds.) (1996). *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020.* Cambridge, MA: Harvard University Press (Global Burden of Disease and Injury Series, Vol.1).

Murray, C.L.J., G.Yang, and X. Qiao (1992). Adult Mortality: Levels, Patterns and Causes. In R.G.A. Feachem et al. (Eds.), *The Health of Adults in the Developing World*. New York: Oxford University Press: 23-111.

Olshansky, S.J. and A.B. Ault (1986). The Fourth Stage of Epidemiologic Transition: The Age of Delayed Degenerative Diseases. *Milbank Memorial Fund Quarterly* 64(3): 355-391.

Omran, A.R. (1971). The Epidemiologic Transition: A Theory of Epidemiology of Population Change. *Milbank Memorial Fund Quarterly* 49 (4): 509-538.

_____ (1982). Epidemiologic Transition. In J.A. Ross (ed.), *International Encyclopedia of Population.* London: Free Press: 172-183.

Preston, S.H. (1976). *Mortality Patterns in National Population, with Special Reference to Recorded Causes of Death.* New York: Academic Press.

Rogers, R.G. and R. Hackenberg (1987). Extending Epidemiologic Transition Theory: A New Stage. *Social Biology* 34: 234-243.

Ruzicka, L and P. Kane (1991). Transition of Adult Mortality and Causes of Death in Selected Countries of Asia. *Genus* 47(3-4): 31-62.

Ruzicka, L. and P. Kane (1990). Health transitions: The Course of Morbidity and Mortality. In J. C. Caldwell et al. (Eds.), *What We Know About Health Transition: The Cultural, Social and Behavioural Determinants of Health.* Canberra: Health Transition Centre, Australian National University: 1-26.

Salomon, A.J. and C.J.L. Murray (2002). The Epidemiologic Transition Theory Revisited: Compositional Models for Causes of Death by Age and Sex. *Population and Development Review*, 28(2): 205-228.

United Nations Economic and Social Council (2002). Mortality and Morbidity Trend in Poverty Reduction. *Fifth Asian and Pacific Population Conference,* Senior Officials Segment, 11-14 December 2002, Bangkok.

Vallin, J. (1993). Life Expectancy: Past, Present and Future Possibilities. In J.M. Robine et. al. (Eds.). *Calculation of Health Expectancies: Harmonization, Consensus Achieved and Future Perspectives.* Paris: Editions INSERM; John Libbey Eurotext: 63-77.

Waldron, I. (1993). Recent Trends in Sex Mortality Ratios for Adults in Developed Countries. *Social Science and Medicine* 36(4): 451-462.

World Health Organization (1999). The World Health Report 1999: *Making a Difference*. Geneva: World Health Organization.

World Health Organization (2001). *Macroeconomics and Health: Investing in Health for Economic Development.* Report of the Commission on Macroeconomics and Health chaired by Jeffrey D. Sachs, Geneva: World Health Organization.