THE ECONOMIC COST OF MORBIDITY IN TERMS OF HUMAN DEVELOPMENTA CASE STUDY OF INDIA

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Introduction:

It has been increasingly felt that health is a significant contributory factor of economic growth as well as economic development. In the age of globalization, the morbidity prevalence as well as morbidity incidence is a major concern for policymakers along with other obstacles of development. And just because of that there should be effective policies towards the health sector. But, surprisingly in countries like India, health is found to be a neglected factor, and such negligence gives a massive blow to the process of economic growth as well as economic development. While calculating the Human Development Index, we take a poor measure of health status which is life expectancy at birth, which fails to reflect the overall health status of a nation properly. Higher life expectancy is taken to be a reflection of good health. But, it ignores the prevalence of morbidity or illness which reduces the efficiency or productivity of a person, even if he/she enjoys higher life expectancy. For, example a person dies at age forty; with out suffering from diseases much. And another person survives till age eighty, but he gets infected by different types of diseases, several times of his life, then he fails to enjoy effective life expectancy. The higher life expectancy does not necessarily mean it is effective. So, there is a need to take prevalence of morbidity and its cost into consideration, while calculating Human Development Index. Several research works have been done to estimate the economic cost of morbidity or the costs of illness. The cost of illness measures the burden of illness over the entire population. The cost of illness (COI) can be measured in terms of direct and indirect cost. Direct cost measures the opportunity cost of resources used for treating a particular illness, where as indirect cost measure the value of resources lost due to a particular illness. (Kirschstein, 2005). Direct medical cost includes the out of pocket

medical expenditure incurred during hospitalization or as outpatient e.g. emergency department care, nursing home care, rehabilitation care, diagnostic test, medicine cost etc (Hodgson and Meiners, 1982, Kirschstein, 2005, Rice 1999, Segel 2006).

Different methods are applied to estimate the economic cost of morbidity or illness. There are three methods of estimation indirect costs: the human capital method, the friction cost method, and the willingness to pay method. The human capital method measures the lost production, in terms of lost earnings, of a patient or caregiver (Hodson and Meiners 1982, Hodson 1983, Rice 1967). The friction cost method, measures only the production losses during the time it takes to replace a worker (Koopmanschap 1992, Koopmanschap et al. 1995, Johannesson and Karlsson, 1996). This approach assumes that short-term work losses can be made up by an employee and the loss of employee only results in costs in the time it takes for a new employee to be hired and trained, known as friction cost. The willingness to pay approach measures the amount an individual would pay to reduce the probability of illness or mortality (Segel. 2006, Hodson. 1983). And, there is a well known concept in Health Economics, Disability Adjusted Life Years (DALY), which is used to measure the burden of diseases and number of healthy life lost due to premature mortality. However, the major drawback of DALY estimate is that they are based on hospital based records of the type nature, the incidence levels of disease and disability. In countries like India, the institutional and hospital based statistics do not reflect the true level incidence of diseases and disabilities.

This study mainly focuses on the human capital method. The income, which is a dimension of Human Development and the economic growth, depends upon the quality of human capital of nation as the Lucas model says. The prevalence of morbidity aggravates the quality of human capital and directly reduces the income level by reducing the productivity. But this is only the direct channel. There are indirect channels also. Since, health and educations are two important ingredients of human capital and there is a complementary between these two, due to the prevalence of morbidity income level tends to be reduced via the reduced health status and reduced educational attainment. And these are indirect channels. Like income, health and education tend to be affected through direct and indirect channels.

Review of Literature:

Among the list of diseases, HIV/AID has turned out to be one of the deadly diseases in the world. Ithas been empirically estimated that there has been a significant cost of AIDs in Sub-Saharan Africa (T.J Philpson and R.R Soars, 2002). The authors have found that the social cost of AIDs is $800 billion. To estimate this social cost value of life methodology is used. It shows that the monetary value of the economic cost of AIDS in sub-Saharan Africa is extremely high. Despite the extreme poverty in the area, the estimated social cost of AIDS in sub-Saharan Africa has been found to be $800 billion, which corresponds to virtually the whole production of the region during one year. Another study of Africa has found that that growth rate of Malaria free Africa would be 1.25% points higher (Elsa V. Artadi and Xavier Sala-i-Martin, 2003). In addition if African LE were at OECD levels, its growth rate would go up by an additional 2.07% points. In other words, if Africa enjoyed health status similar to industrialized nation, growth rate would be 3.32% points higher. This empirical evidence, therefore, suggests that people's income and their growth rates are affected fundamentally by the aggregate health status of the region in which they live. It also suggests the existence of a trap: poor countries tend to grow less because they have poor health, and they tend to have poor health because they are poor. Apart from income, education is an important dimension of Human Development. Recentstudy of schools in Kenya report that schooling is greatly affected by different types of Worm diseases like Hookworm, Roundworm, and Whipworm (Edward Miguel & Michel Kremer, 2001). So Educational Attainment which is an important dimension of Human Development is greatly reduced. They randomly selected schools for treatment with deworming drugs – drugs against hookworm, whipworm, and schistosomiasis. The results now show that children in the treated schools reduced their absenteeism by one quarter, which gains being larger among the youngest children. The paper also shows untreated kids in treated schools tended to show lower absenteeism, which is thought to be an externality resulting from social norms: absenteeism is seen to as socially bad if few people miss class. This study is a pure reflection of the fact that education attainment gets disturbed by the prevalence of diseases. There is a case study of India, focuses on trends, patterns and differentials of morbidity in India (Soumitra Ghosh & Arokiasamy, 2009). This study has investigated

that India has made significant progress in improving the health status in terms of reducing Infant Mortality and increasing Life Expectancy, but Morbidity is yet to be assessed. This paper has used NSSO data on morbidity prevalence rate across major states of India and found that reporting of ailment/illness depends on different factors like Income, Education, social class and sex. So, only by looking at the prevalence of morbidity it's difficult to capture the impact of morbidity on Income, Health and Education. Similarly, there is also a study on West Bengal (Soumitra Ghosh, 2009), which has investigated the level, differentials and determinants of morbidity in West Bengal. The morbidity prevalence rate for the year 1995-96 was 65 per thousands in rural and 64 per thousand in urban areas. Female reported more illness than males in both rural and urban areas. The prevalence rate of illness was higher among children aged 0-4 and adults above 60 years compared to other age groups. Significant seasonal and regional variations were found. There was an inverse relationship between household size and morbidity prevalence. The untreated illness was found to be higher in rural than in urban areas. The economic costs associated with several diseases and disabilities attributable to environmental contaminants in Washington State, including Asthma, Cardiovascular diseases, Cancer, Birth defects, Neurobehavioral effects (Kate Davis, July 2005). The estimates are based on 'Cost of Illness' estimates that include direct health care costs and indirect costs, such as those associated with morbidity and premature mortality. The total cost of diseases and disabilities has two parts, one is direct, which is nothing but out of pocket medical expenditure and indirect costs which are associated with productivity. So, this indirect cost reflects that diseases affect income level via affecting Health Status because of the causality from health to income. But there is also causality from Educational Attainment to Income. So, the diseases and disabilities are also likely to affect Income via affecting Educational Attainment, and this needs to be incorporated.According to the duration of ailment morbidity prevalence is classified as 'acute' and 'chronic'. There have been myths, realities, prevalence of chronic diseases. The economic impact of chronic diseases takes into account the Micro and Macro economic impacts (Sukumar Vellakka, *2009)*. Micro economic impact captures effect of chronic diseases on consumption and savings and loss of productivity, which has significant impact on individuals and households. And on the other hand macro economic consequences capture the adverse impact of Morbidity on long term growth via reduced life expectancy and adult mortality. Morbidity or disease

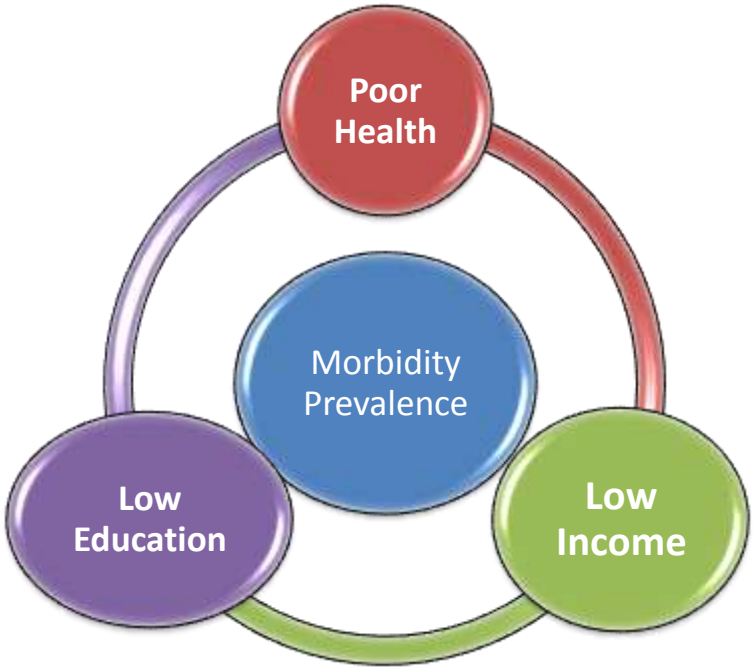
prevalence not only gives rise to low income but also gives rise to Health-Poverty Trap (Xavier Sala-i-Martin, *2005),* which is just like a vicious cycle of poverty. This "Health-Poverty Trap" is a result of a bilateral causality between health status and poverty. Poor health gives rise to poverty through a plenty of channels, and poverty in turn leads to poor health through a variety of channels. These channels are addressed in this study. This poor health is an outcome of morbidity or illness. Poverty increases the chance of being infected by different types of diseases. And if a disease persists then it becomes difficult for a poor individual to recover from it.

Objective of the study:

The objective of this study is to examine how significantly Morbidity Prevalence and different types of disabilities affect Human Development by affecting its three dimensions, such as Longevity, Educational Attainment and Access to Resources. So, Human Development is influenced by the prevalence of morbidity, via the three channels. These three channels are to be estimated, and at the same time it is to be checked that out of these three dimensions which dimension is mostly affected, and which dimension is affected least, by the prevalence of morbidity. By this I want to show how the prevalence of morbidity does or illness creates a Human Development Trap. That is because of suffering from any ailment, individuals start loosing their capabilities in respect of the three dimensions of Human Development.

Existence of Human Development Trap

The Human Development is shown graphically as below:



Morbidity Prevalence appears in the middle of the three, which leads to poor health, low education and low income, and the nations enters into the "Human Development Trap", when morbidity prevails. Now, it be seen that Poor health, low education and low income are linked with each other, which is the reflection of bilateral causality between the three. Prevalence of morbidity makes the health poor, poor health reduces the ability to acquire education and earn more. And low level of education and low income in turn reduces the health status and so on. This is called the 'Human Development Trap'.

Table-1 Human Development Index of all the States and UTs of India

	Human Development(2006)				Human Development(1996)			
States and UTS	**HI06**	**EI06**	**YI06**	**HDI06**	**HI96**	**EI96**	**YI96**	**HDI96**
Andaman & Nikobar	0.701	0.644	0.78	0.70833	0.692	0.605	0.736	0.67766
Andhra Pradesh	0.588	0.434	0.733	0.585	0.52	0.363	0.668	0.51866

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Arunachal Pradesh	0.624	0.606	0.712	0.64733 3	0.61 3	0.358	0.675	0.54866 7
Assam	0.495	0.607	0.682	0.59466 7	0.44 4	0.529	0.656	0.543
Bihar	0.542	0.403	0.575	0.50666 7	0.48	0.317	0.494	0.43033 3
Chandigarh	0.765	0.684	0.901	0.78333 3	0.73 9	0.632	0.797	0.72266 7
Chhattisgarh	0.523	0.429	0.696	0.54933 3	0.39 3	0.371	0.589	0.451
Dadra &Nagarhaveli	0.682	0.619	0.73	0.677	0.56	0.488	0.671	0.573
Daman & Diu	0.715	0.655	0.73	0.7	0.54 4	0.493	0.671	0.56933 3
Delhi	0.675	0.707	0.837	0.73966 7	0.63 9	0.642	0.779	0.68666 7
Goa	0.792	0.654	0.845	0.76366 7	0.73 5	0.629	0.764	0.70933 3
Gujarat	0.599	0.545	0.757	0.63366 7	0.54 4	0.481	0.697	0.574
Haryana	0.604	0.533	0.792	0.643	0.53 1	0.455	0.724	0.57
Himachal Pradesh	0.634	0.598	0.771	0.66766 7	0.56 6	0.516	0.689	0.59033 3
J & K	0.601	0.483	0.686	0.59	0.53 1	0.434	0.661	0.542
Jharkhand	0.594	0.447	0.683	0.57466 7	0.49 1	0.317	0.494	0.434
Karnataka	0.632	0.504	0.73	0.622	0.59 4	0.417	0.662	0.55766 7
Kerala	0.836	0.697	0.758	0.76366	0.83	0.679	0.695	0.73633

				7	5			3
Lakshadweep	0.729	0.63	0.73	0.696333	0.755	0.632	0.671	0.686
Maharashtra	0.699	0.596	0.773	0.689333	0.631	0.531	0.752	0.638
Madhya Pradesh	0.461	0.47	0.656	0.529	0.34	0.371	0.589	0.433333
Meghalaya	0.562	0.612	0.713	0.629	0.57	0.566	0.648	0.594667
Mizoram	0.695	0.642	0.728	0.688333	0.565	0.634	0.656	0.618333
Manipur	0.762	0.635	0.707	0.701333	0.684	0.518	0.627	0.609667
Nagaland	0.719	0.647	0.734	0.7	0.64	0.628	0.692	0.653333
Orissa	0.474	0.463	0.674	0.537	0.356	0.403	0.623	0.460667
Pondicherry	0.725	0.642	0.809	0.725333	0.773	0.575	0.679	0.675667
Punjab	0.665	0.561	0.777	0.667667	0.636	0.486	0.739	0.620333
Rajasthan	0.527	0.415	0.681	0.541	0.425	0.342	0.647	0.471333
Sikkim	0.657	0.61	0.728	0.665	0.545	0.542	0.66	0.582333
Tamil Nadu	0.682	0.566	0.75	0.666	0.59	0.482	0.695	0.589
Tripura	0.643	0.611	0.733	0.662333	0.566	0.551	0.621	0.579333
Uttar Pradesh	0.49	0.459	0.636	0.528333	0.405	0.363	0.606	0.458
Uttaranchal	0.624	0.607	0.726	0.652333	0.492	0.363	0.606	0.487

				0.64233	0.57			0.57266
West Bengal	0.668	0.533	0.726	3	8	0.478	0.662	7

Data Source: ***Ministry of Women and Child Development, Government of India (2009)***

There has been a wide variation in human achievement in respect of the three dimensions of Human Development across the States and UTs of India. So, Human Development varies across all the States and UTs of India. This variation can result from different factors like, infrastructure, industrialization, urbanization, institutional quality etc. But, along with everything there is factor like policies towards the health sector which can improve the health status and reduce the morbidity. The variation in respect of health policies implemented by different State Governments results in a variation in respect of health status and prevalence of illness or morbidity. The objective is to see how significantly this variation in morbidity prevalence explains the variation in Human Development.

To understand the variation in morbidity prevalence let's consider the following:

Table-2: Data on "Acute[1]" and "Chronic[1]" Morbidity across States and UTs of India in 1996

States and UTs	Total No. of Persons Reporting Ailments(1995-96)			
	Rural		Urban	
	Acute	Chronic	Acute	Chronic
Andaman & Nikobar Island	3600	300	1000	100
Andhra Pradesh	2311000	1187700	741100	356800
Arunachal Pradesh	10300	400	3700	100
Assam	1346000	162500	134700	24300
Bihar	1884800	715000	313600	96200
Chandigarh	14500	1900	51300	28700
Dadra &Nagarhaveli	7000	1300	600	0
Daman & Diu	1200	1400	1000	300
Delhi	13000	300	292100	112600

Goa	18800	12300	11700	3000
Gujarat	969200	296300	334600	132600
Haryana	724100	207300	201700	73100
Himachal Pradesh	297400	135400	22800	6300
J & K	214500	47100	75100	13200
Karnataka	1088200	479500	331800	141800
Kerala	1447700	693100	354800	154500
Lakshadweep	2100	1600	1100	0
Maharashtra	1811800	709900	1075800	383100
Madhya Pradesh	1924100	287500	480900	118900
Meghalaya	47100	1500	6700	200
Mizoram	4300	1300	1700	0
Manipur	6100	3600	500	200
Nagaland	15200	400	9500	900
Orissa	1446400	163300	211200	41500
Punjab	771600	275500	377800	157800
Rajasthan	675800	184500	210900	80100
Sikkim	12400	1200	700	100
Tamil Nadu	1500200	493600	839400	268500
Tripura	298200	30100	23600	7200
Uttar Pradesh	5863400	1423100	1296600	335000
West Bengal	2227000	908600	839900	273600

Data Source: NSSO 52nd round survey (November, 1998)

[1]Morbidity is acute if duration of illness is less than 15 days, and it is chronic if it is more than 15 days.

There has been a significant variation in the prevalence of morbidity (acute and chronic) across all the States and Union Territories of India. In the above table the estimated number of persons reported ailment is given out of total population of each State and Union Territory of India.

Sample design, Methodology and Data source

Here, data on Human Development index, morbidity prevalence etc. has been taken across all the thirty five States and Union Territories of India. Data on morbidity prevalence or prevalence of ailment has been obtained from NSSO 52nd and 60th round survey, held on 1992 and 2004. A stratified multi-stage design had been adopted. The first units (FSU) were the 1991 census villages in the rural sector and Urban Frame (UFS) blocks in the urban sector. The ultimate stage units (USU) were households in both the sectors. In case of large villages/blocks requiring hamlet-group (hg)/sub-block (sb) formation, one intermediate stage was the selection of two hgs/sbs from each FSU.

We have Dependent Variables: HI(T), EI(T), YI(T)

Where, HI(T) = Health Index in the current period T, EI(T) = Education Index in the current period T and YI(T) = Income Index in the current period T.

Explanatory Variables: HI(T-10), EI(T-10), YI(T-10), HEXP(T-2),EDEX(T-2), MPR(T-2), MPR(T-10)

Where, HI(T-10) = Health Index ten years back, EI(T-10) = Education Index ten years back, YI(T-10) = Income Index ten years back, HEXP(T-2) = Health expenditure as a percentage of total expenditure at lag two, EDEX(T-2) = Education expenditure as a percentage of total expenditure at lag two ,

MPR(T-2) = Morbidity Prevalence Rate at lag two and MPR(T-10) = Morbidity Prevalence Rate at lag ten. Here the prevalence of "Acute" illness/morbidity is taken. The estimated number of person reporting ailment has been taken here. From the sample estimate NSSO has estimated the number of persons suffering from illness in the overall population of each State and UTs of India.

Now, I have the following regression models:

$$HI(T)_i = \alpha_0 + \alpha_1 \times YI(T-10)_i + \alpha_2 \times MPR(T-K)_i + \alpha_3 \times HEXP(T-2)_i + U1_i \text{.....(1)}$$

$$EI(T)_i = \beta_0 + \beta_1 \times EI(T-10)_i + \beta_2 \times MPR(T-K)_i + \beta_3 \times EDEX(T-2)_i + U2_i \text{.....(2)}$$

$$YI(T)_i = \theta_0 + \theta_1 \times YI(T-10)_i + \theta_2 \times MPR(T-k)_i + \theta_3 \times HEXP(T-2)_i + \theta_4 \times EDEX(T-2)_i + U3_i \text{.....(3)}$$

Data on Human Development index of all the states and UTs are obtained from a study by Ministry of Women and Child Development, GOI (2009). Data on morbidity prevalence is obtained from NSSO 52nd round (1996) and 60th round (2004) survey.

Data on health expenditure is obtained from RBI and State Finance, a study of budget of 2002-03. Data on education expenditure is obtained from indiastat.com. Here, I have taken data on all the above mentioned variables different States and UTs of India. Here, current period is 2006. Sample size is thirty five.

Here, k = 2 or 10. MPR (T-2) and MPR (T-10) can not be included as explanatory variables in a single equation, since there is some sort of association between these two. So, they are included in different equations to avoid the problem of multicolinearity.

Again because, of the problem of Multicolinearity , in the first equation, instead of taking Health Index at lag ten, I have taken Income Index at lag ten. As there is degree of association between HI(T-10) and MPR(T-k) (k=2,10).

Incorporation of these regressors needs the following justification.

We know that investment is accumulation of stocks. Like investment in physical capital there is investment in health. Investment in health causes the augmentation of the health status. If V_t is the investment in health at period t, then one can write:

$V_t = H_t - H_{t-1}$

Where, H_t: Stock of health at period t

H_{t-1}: Stock of health at period t-1.

Therefore,

$$H_t = V_t + H_{t-1}$$

$$= V_t + V_{t-1} + H_{t-2}, \quad \text{Since, } V_{t-1} = H_{t-1} - H_{t-2}$$

$$\text{Or, } H_{t-1} = V_{t-1} + H_{t-2}$$

$$= V_t + V_{t-1} + V_{t-2} + H_{t-3}, \quad \text{and so on.}$$

Therefore,

$$H_t = V_t + V_{t-1} + V_{t-2} + V_{t-3} + \ldots + V_{t-10} + \ldots + V_0$$

Where, V_0 is the initial period investment in health.

Income is one important factor, influencing the investment in health. Since, higher is income level higher is the ability to incur health expenditure, like expenditure for going to gym, taking healthy food and drink etc. Even medical expenditure can be treated as health investment. Medical expenditure is incurred because of illness. Because of illness health stock depreciates. To recover the depreciated health stock it is required to incur health expenditure. So, higher is the level of income, higher is the ability to undertake the investment in health.

If I assume current period investment in health, depends on current period income. Then one can write:

$$V_j = V_j(Y_j), \text{ where, } j = 1, 2, 3, \ldots$$

Therefore,

$$H_t = V_t(Y_t) + V_{t-1}(Y_{t-1}) + V_{t-2}(Y_{t-2}) + V_{t-3}(Y_{t-3}) + \ldots + V_{t-10}(Y_{t-10}) + \ldots + V_0(Y_0)$$

$$\text{So, } H_t = F(Y_t, Y_{t-1}, Y_{t-2}, \ldots, Y_{t-10}, \ldots, Y_0)$$

So, current period health stock (H_t), depends on current period and past period income levels.

Here, in equation 1, YI(T-10) included as a regressor, which may influence the current period health status. This is a long period lag, because investment in health is a long-term investment, can't be influenced in the short run. More than one lag value of YI can't be taken, because of multicolinearity.

In the equation 2, education index at lag ten (EI(T-10)) is included as a regressor.

Since, parental education is important determinant of child education. In a family if an individual completed his/her education ten years ago, at present his/her child's education is likely to be influenced by the parent's education, which was acquired ten years ago.

Educational attainment in last year or two years ago is least likely to influence the current period educational attainment. The existing stock of knowledge can augment the stock of knowledge or accumulate new knowledge, not in the short run, but in the long run.

Let, S_t be the investment in education.

Therefore, $S_t = E_t - E_{t-1}$, Where, E_t = Stock of education in period t

And, E_{t-1} = Stock of education in period t-1.

So, $E_t = S_t + E_{t-1}$.

By iterative process as before,

$E_t = S_t + S_{t-1} + S_{t-2} + \ldots + S_0$ Where, S_0 is the initial stock of education.

Now, investment in education depends on many factors. Income is one of the important factor. But, the existing stock of education another important factor can influence this investment. Since, education brings consciousness; it makes parents conscious about sending their children to school and about making the investment decision in accumulating human capital. So, if the investment in education is a function of existing stock of education, so it can be written as follows:

$S_i = S_i(E_i)$, where, i = t, t-1, t-2,…,0

Therefore, $\mathbf{E_t = S_t(E_t) + S_{t-1}(E_{t-1}) + S_{t-2}(E_{t-2}) + \ldots + S_{t-10}(E_{t-10}) + \ldots + S_0(E_0)}$

So, I can write, $\mathbf{E_t = G_t(E_t, E_{t-1}, E_{t-2}, \ldots, E_{t-10}, \ldots, E_0)}$

So, the current period educational attainment depends on education acquired in the past periods. Since, investment in education is a long term investment, here; I have taken educational attainment at lag ten as a regressor. Here, one can not take more than one lag of this variable, because of the problem of multicolinearity.

Similarly, in the equation 3, I have taken Income Index at lag ten as a regressor. The reason is, if the income is higher in the current period that will encourage the savings, and savings will give rise to investment. And finally investment leads to capital accumulation and that leads to income growth. So, the future income will increase. So, the lag is taken here. If we take a look at the accelerator principal,

$I_t = \beta (Y_{t-1} - Y_{t-2})$, where, I_t = Investment in period t. $\beta>0$

Y_{t-1}: Income in period t-1 and Y_{t-2}: Income in period t-2

So, change in income promotes investment, and investment leads to capital accumulation, which further simulates the future income growth.

In case of Morbidity Prevalence Rate, I have taken two lag values, such as MPR(T-2) and MPR(T-10). Here, data on morbidity prevalence is available for two years, such as 1996 and 2004 according to NSSO 52nd and 60th round survey. Our current period is 2006. I have separately checked the impact of these two lag values.

Finally, I have incorporated HEXP(T-2) and EDEXP(T-2), which are health expenditure at lag two and education expenditure as a percentage of total expenditure at lag two respectively. Health expenditure and education expenditure are nothing but the investment in health and investment in education. Here, lag values are taken since, the immediate

impact of these investments can not be found, as these are the long term investments, its impact can not be found in the short run.

Regression Result:

	Dependent Variables					
	OLS1			OLS2		
Explanatory Variables	**HI(T)**	**EI(T)**	**YI(T)**	**HI(T)**	**EI(T)**	**YI(T)**
HI(T-10)				**7514751 (.06184)*** **		
YI(T-10)	**.7546367 (.22823)*** **		**.7169782 (.08587)*** **			**.7416124 (.09318)*** **
EI(T-10)		**.6529241 (.08305)*** **			**.6710616 (.07356)*** **	
HEXP(T-2)	**-.4766919 (1.204252)**		**.7516346 (.41317)***	**.5768275 (.60365)**		**-.7086096 (.4431)**
EDEX(T-2)		**-.0077864 (.1386052)**	**.147584 (.11310)**		**-.0078943 (.1407)**	**.147411 (.12377)**
MPR(T-10)	**-.0266018 (.0136984)***	**-.014402 (.0082615)***	**-.0154561 (.00484)*** **			
MPR(T-2)				**-.0044992 (.00678)**	**-.0135363 (.0081)***	**-.0126407 (.00533)** **
Const.	**.1542422 (.1623897)**	**.2565768 (.0502758)*** **	**.2561886 (.06986)*** **	**.1889064 (.04591)*** **	**.2417827 (.04752)*** **	**.2382407 (.07668)*** **
R Squared	**.3840**	**.7744**	**.7913**	**0.8520**	**0.7701**	**0.7613**
Adj. R Squared	**.3155**	**.7532**	**.7592**	**0.8356**	**0.7479**	**0.7246**
F(3,31)	**5.61**	**27.46**	**24.65**	**51.83**	**34.62**	**20.73**

No. of Obs.	**35**	**35**	**35**	**35**	**35**	**35**

(Note: Standard errors are given in the parenthesis, */**/ Significant at 10%/5%/1% level)***

Analysis of Results

From the above results it can be seen that Morbidity Prevalence Rate at lag ten (MPR(T-10)) significantly affects all three dimensions. Whereas MPR at lag two (MPR(T-2)), only significantly influences educational attainment and income index. So, it can be said that only over the long period of time (here ten years) prevalence of morbidity reduces the health status, not in the short run. But other two dimensions can be significantly affected in a comparatively short period of time (two years). If full immunization does not take place, then health deteriorates in the long run. Some diseases are not fully curable, they can slowly deteriorate the health stock, and that can be realized in the long run. Lack of education makes people unconscious about their health, so they do not go to doctors, when they suffer from some diseases, sometime they rely on self-treatment. So, they fail to recover from the disease, the disease persists, which can make them vulnerable to death.So, here the regression results reveals that higher order lag of morbidity prevalence is more significant than the lower order lag, in reducing people's life expectancy at birth.

Then from OLS-1 and OLS-2 it can be seen that morbidity prevalence at lag two as well as lag ten reduces the Education Index, which captures the Educational Attainment significantly at 10% level. The level of significance is low, and the possible reason may be that the prevalence of ailment among the students is likely to be less as compared to that of among the older people. During the young age we likely to have higher level immunity, which can resist the prevalence of diseases. But still students suffer from diseases, and it is a matter of concern for them and their parents. In order to acquire education, brain power needs to be developed; mental wellbeing needs to be maintained properly. But illness creates disturbances in the development of brain power and disturbs the mental wellbeing. After birth, the brain power starts being developed from childhood, with proper intake of iron, protein etc. Illness disturbs this development process. Moreover, empirical evidence reveals that because of illness, many students fail to reach schools and can not acquire properly, because physical fitness is required for acquiring education. Apart from this physical and mental wellbeing, a student needs support from the side of his/her parents.

It's obviously the financial and mental support. It is often seen that most of them who lost their parents in their childhood, could not complete their education properly. They had to stop their education for having family responsibility. Diseases are also responsible for that. Some diseases are responsible for early death. Early death of parents prevents a child from acquiring further education.

Now, the regression result reveals that the both MPR at lag two and MPR at lag ten reduce the income index significantly at the 5% and 1% level of significance respectively. This happens through a variety of channels. First and foremost the out of pocket medical expenditure reduces the income, as most part of the income spent on the medicines, health check-up etc and on the other hand, illness reduces the productivity of human capital, an unproductive human capital fail to deliver higher level of output and income falls. And as I mentioned above that prevalence of diseases increases the probability of death at early age, which makes people impatient and make them consume more and save less. And low saving reduces the scope of investment and slows down the income growth.

Now, it's the time to find out which dimension is reduced most by the prevalence of morbidity. Since the higher order lag is found to be more significant, I consider MPR at lag ten.

It can be seen that MPR at lag ten significantly reduces the income index at 1% level of significance, whereas health status and educational attainment are reduced by this at 10% level of significance. So, the impact of morbidity on income index is found to be maximum.

And it's what is expected. Firstly and higher level of morbidity reduces the productivity of labor force and so the income falls. This is the supply side effect only. There is demand side effect also. Prevalence of diseases can reduce the consumption of people. Suppose, a person is suffering from jaundice, then he has lot of restriction in respect of dieting and others. So, his/her consumption of different food reduces. In this way illness restriction in different respect, consumption is one among them. Demand for many commodities reduces and their market becomes narrower. So, from the demand side it can be said that due to illness or prevalence of ant diseases, market of different commodities can shrink, and this can reduce the incentive of producers to produce more. And so, finally it gives an

adverse impact on income of those who are engaged in the production of these commodities.

So, it is clear from the regression result that out of the three dimensions income index is reduced mostly by the prevalence of morbidity. Now, since both health status and educational attainment are affected at 10% level, we need to find out of these two which one is affected mostly and which one is affected least.

In the equation (1) and in equation (2), coefficients of MPR(T-10) are α_2 and β_2 respectively.

Notice, $\boldsymbol{\alpha_2}$= -.0266018 and $\boldsymbol{\beta_2}$= -.014402 are the estimated values. (Estimated values of parameters are written in bold)

Now let's consider the following Null Hypothesis:

Ho: $(\boldsymbol{\alpha_2} - \boldsymbol{\beta_2}) = 0$, which says that health status and educational attainment are equally affected by the prevalence of ailments.

And the alternative hypothesis is H1: $(\boldsymbol{\alpha_2} - \boldsymbol{\beta_2}) \neq 0$.

But, the above null hypothesis is failed to be rejected at 5% level of significance.

So, the variable MPR equally affects health status and educational attainment equally.

So, finally we can say that prevalence of morbidity affects the Income index most, and equally affects Health Status and Educational Attainment.

Conclusion:

So, the empirical result reveals that morbidity prevalence affects all the three dimensions of human development in the long run and it causes a trap, known as Human Development Trap. For example the prevalence of morbidity directly reduces the Health Status, Educational Attainment and Income. But the story does not stop here, a reduced health

status (due to illness) further reduces the ability to acquire education and earn more. Low income with lack of education in turn reduces the health status and so on. It is just like a trap, known as Human Development Trap.

Now by the definition of Human Development Index, it is a simply the average of human achievement in respect of health, education and access to resources. So, the total impact of morbidity on Human Development is its impact through all the dimensions and it is found to be the following:

$$\frac{dHDI}{dMPR\,(T-10)} = 1/3\times(-.0266018) + 1/3\times(-.014402) + 1/3\times(-.0154561) = -0.0188 \ldots\ldots \text{(a)}$$

So, morbidity prevalence rate can reduce the Human Development Index almost by two percent. Though by an index Human Development can not be captured, but still the value of the index decreases by two percent (approximately), and this reveals that human capabilities in respect of the three dimensions get sacrificed by the prevalence of ailment in the past.

Now, similarly if MPR at lag two considered then

$$\frac{dHDI}{dMPR\,(T-2)} = 0.00873 \text{ (approx.)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(b)}$$

Since, morbidity fails to influence the health status in the short-run, total impact is less than the previous case.

From equation (a), it can be written that:

$$\frac{dHDI\,(T+10)}{dMPR\,(T)} = -0.0188$$

It implies that if ailment appears as a shock in the current period T, then the Human Development Index will be reduced by almost two percent after ten years. So, the effect of the shock will persist for a long time, if full immunization does not take place.

From equation (b), it can be written that -

$$\frac{dHDI\,(T+2)}{dMPR\,(T)} = 0.00873$$

So, the effect of the shock does not die out in the long run if the full immunization does not take place. Our result reveals that in different States and UTs of India, full immunization did not take place so, the prevalence ailments turns out to affect the Human Development in the long run. Had there been full immunization as well as proper access to health care facilities then the effect of the shock (morbidity) would have died out in the long run. The immediate policy suggestions can be a great emphasis on full immunization, accessibility to basic health care facilities and improvement of health infrastructure. This can hopefully prevent ailments to be less effective in the long run. Even if illness prevails, there is a need to cure it by proper medical treatment and applying proper medicines. So, diseases are not curable, so there is also a need to invest in R & D of medicines and vaccines of these diseases.

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