CHAPTER 2

LITERATURE REVIEW

The literature on the relationships between the economic indicators and health status is very extensive. The field is broad and complex. Different investigators have contributed on different subsets depending on the kind of problem which has aroused their interest, professional field, and the availability of data. Most of the studies have been done at the level of international comparison and national level. But very few studies have considered the relationships between socio-economic indicators and health status at the province level. As a non-availability information and time this chapter could not include the related studies which have done in Mongolia.

This chapter reviews studies dealing with interaction between economic growth, poverty, education, nutrition, public health expenditure and indicators of health status according to the following sections:

1. Relationships between socio-economic indicators and health status. In this section, we will consider on the various relationships between socio-economic and health indicators. It is divided into the following subsections according to the socio-economic indicators which are of interest in this study:
   1.1. Economic development and health
   1.2. Expenditure and health
   1.3. Poverty and health
   1.4. Education and health
   1.5. Nutrition and health
2. Methodology for estimating an interaction between socio-economic indicators and health status. This section deals with the models and techniques that are used to estimate relationships between socio-economic and health indicators.

2.1. Relationship between economic indicators and health status

2.1.1. Economic development and health

This subsection deals with the various interrelationships between different stages of economic development and health indicators.

It is agreed that higher incomes help improve health and improved health contributes to economic growth. There are many studies that have investigated the relationships between economic development and health status. Studies in Brazil, Chile and Nicaragua (UNDP, 1996) show that an increase in household income is associated with improvements in such health indicators as height-for-age ratios, survival rates and life

expectancy at birth – and with reduced illness among children. In northeast Brazil a doubling of household spending increases the probability that a child will survive by 6.4 per cent in rural areas.

Guy Carrin and Claudio Politi (1996) estimated that an increase of 10 per cent in the level of GDP per capita would result in an increase of life expectancy by 1.4 per cent and decrease infant mortality and underfive mortality by 4.8 per cent and 5.8 per cent respectively.

Health affects economic growth several ways: improved health of employed persons leads to increased labor participation: improved health results increased education, which in turn increases economic growth: and improved health may lead to population growth and increased labor force participation. Also, improved health reduces production losses caused by worker illness. For instance, Mushkin (1962) estimated that the decline in mortality rates in the United States since 1900 had increased GNP by $60 billion in 1960, owing to 13 million additional workers: decline in mortality rates since 1920, which had led to an increase of 6 million workers, had increased GNP in 1960 by $28 billion. However, some authors such as Sorkin (1976) argued that countries are better off with reduced, rather than with increased population growth; diminished population growth will increase GNP per capita.

The Human Development Report (1996) reported that the overall contribution of a healthy population to economic growth is evident from a cross-country study showing that a 10 per cent increase in life expectancy, equal to 5.7 years in 1970, raises the growth rate by an estimated one percentage point a year.

A number of study investigated an impact of economic recession on the health status. The study supported by the Pan American Health Organization (1986) which investigates the consequences of the region's current economic crises for health and health care in six countries, concentrating on the central government expenditure. Evidence from this study shows that in the long run health status improves as income increases: infant mortality declines, mortality from certain diseases almost disappears, and life expectancy increases markedly. This same effect shows up in cross sectional comparisons of countries at different levels of development. This study also evidenced that connections between income and health depend on the stock of capital-including medical capital as well as safe water supplies and sanitation-accumulated from past incomes. Unless income stay so low for so long that capital deteriorates, an economic recession does not mean returning down the path which a country followed while growing.

The 1996 *World Development Report* estimated the health situation in member countries of Council for Mutual Economic Assistance (CMEA) and concluded that many of the CEE countries and NIS face a health problem associated with transition itself, superimposed on a longer term problem. This report developed policy options concentrating on the four groups of factors influence on person's health: income,

lifestyle, environmental pollution and occupational risks, and the quality of available health care.

Some researchers (Grossman 1972; Preston 1975; Yukio Kaneko 1986) argued that there is likely to be an association between a country's place on the ladder of development and its health status. Development brings changes not only in the level of mortality, but in its structure. The high mortality in poor countries reflects the high prevalence of communicable diseases (particularly diarrhoeal and respiratory diseases) and the interaction of these with malnutrition especially among children; in richer countries, mortality from these causes is much reduced, but deaths from congenital, chronic and degenerative conditions and from external causes. There are many evidences of study results conducted by different researchers.

Preston (1975) concluded that in poor countries a given increase in incomes brings a much greater absolute improvement in life expectancy than in the richer ones. Also, he said that the mortality situation in socialist countries for a given income level appears worse than the average, suggesting that equality of income distribution is not an important factor. He argued any function connecting national income and health levels has to be thought over time, presumably as a result of improvements in the information embodied in medical science, technology, and public education. He also analyzed (1980) the socio-economic variables relative health care expenditure. Preston first studied in detail life expectancy changes in the developing countries between 1940 and 1970 in order to estimate what proportion of the improvement observed was due to by per capita income, the literacy rate and calories per capita. Half of the improvement was due to improvements in these variables. Then he examined (1985) the continued improvement in life expectancy in his sample of developing countries and found that 72 percent of the total improvement, was due to improvements in income, education and nutrition. Preston's work contradicts the popular idea that expenditures on health care, especially curative health care, largely determine our health. On the contrary, many factors contribute to health- including education, nutrition and income, in addition to preventive and curative health care. These other factors played a relatively small role in developing countries during the early years of their development, but now account for a large percentage of the improvements in life expectancy. One of his findings is that countries whose per capita GNP, education and nutrition stop improving will see little increase in life expectancy in future years.

Preston's doubt regarding the relationships between country's ladder of development and health status is supported by Yukio Kaneko et al. in 1986. They studied the interrelationships between Gross National Product (GNP) and infant mortality rate in several underdeveloped, developing and developed countries. Increase in per capita GNP tended to decrease infant mortality rate in underdeveloped countries whose per capita GNP ranged from 400 U.S. dollars to 2,000 U.S. dollars. In developing and developed countries whose per capita GNP is more than 5,000 U.S. dollars, infant mortality rate reached a level sufficient for sustaining human health. Therefore, his conclusion was that each economic development group shows a rather distinct pattern in the relationship between infant mortality rate and per capita GNP. Among

underdeveloped countries such as Malawi, Nepal, Uganda, Tanzania and Kenya, there is a much greater diversity in the fundamental condition of infant mortality relative to the differences in per capita GNP. Therefore he concluded that in the early stage of the development process, more attention should be given to improving infant mortality rates rather than to substantially increasing economic activities.

Grossman (1985) developed a model of the demand for health which shows how rising income could lead to higher death rates. He said that the consumption of some goods (such as rich foods or automobiles) may adversely affect health. If the income elasticity of such goods is very high, the "shadow price" of health rises, and quantity of health demanded falls. Rising incomes could, therefore, actually raise mortality.

Study conducted by Phillips and Verhasselt (1994) supported Grossman's model. They studied elasticity of mortality with respect to income. The results show that the income elasticity for neonatal deaths is significantly lower than for post-neonatal deaths. The elasticities were particularly high for adolescents and tended to decline as age increased. Therefore, their conclusion was that as income rises, ceterus paribus, the causes with small negative or positive elasticities become relatively more important, and the overall elasticity must move toward zero or even turn positive.

A major negative impact of health improvement on GNP may be the deterioration of the quality of life as a consequence of population growth. Many authors such as Sorkin 1976; Jordan 1977 have argued that a primary impact of health improvement is a reduction in infant and adult mortality. Fewer adult deaths may have short-term effect of increased unemployment. Fewer infant deaths will likely result in increased population growth. They felt that in fact, lower mortality rates would have potentially negative effects if given budgets for health and education were divided by increasing numbers of people. Furthermore, they felt that the decreased health spending per capita would reduce the productivity of labor. Therefore, although population increase would increase GNP, the negative secondary effects could lead to a zero or negative change in GNP per capita.

Finally, economic development effects health in a complex way. Its overall effect is to make more resources available to deal with health problems. At the same time, particular aspects of development affect particular physiological and welfare components of health and may be favorable and unfavorable. Commonly, development creates a range of possibilities out of which the most favorable can be selected by purposeful action. This action may or may not be included in the provision of health services as usually defined, but usually include some minimum component of collective action.

2.1.2. Government expenditure and health

To define health expenditure requires defining health; health promoting and health related activities to be included in the health sector. Many definitions of health have been proposed. WHO's Constitution defines health as a state of complete physical, mental, and social well being and not merely the absence of disease or infirmity. From

this broad definition raises the question of which expenditures on the various health-improving activities should be included as health sector expenditures.

In the background study to the World development report of 1993, the operational definition includes all expenditures incurred by the preventive and curative health services for individuals, and population-based public health programs, as well as some programs with a direct impact on health status. They summarized and analyzed the study results, which have done on the health expenditure among different countries. The data reviewed in this study suggest that private health spending relative to GDP is unrelated to income, mortality, the size of government, geographical region, education or public health expenditure. In contrast to private spending, public health expenditure has an elasticity substantially greater than one.

Interest in health expenditure is rising, both in poor countries facing the challenge of maintaining health services during global recession and structural adjustment, and the richer countries trying to limit health expenditures that are growing faster than the GDP. It is emphasized in the World Development Report in 1993.

World spending on health totaled about $1,700 billion in 1990, or 8 per cent of global income. Of this, governments spent more than $1,000 billion or nearly 60 per cent. Of the 170 billion spent on health in the developing countries of Africa, Asia and Latin America, governments spent half the total amount – 2 per cent of those regions' GNP. Differences in health spending are an obvious starting point in the search for explanation of differences in health. But health spending alone cannot explain all the variation in health among countries. Nor can income and education, or even spending, income, and schooling taken together. Health expenditure, income, and schooling only partly explain variation in the health status.

Per capita spending for health is usually significantly lower in developing countries than developed ones. Jordan 1977 sited by Stuart Wells and Steven Keels (1980) reported that a World Bank survey of 65 developing countries. Results shows that these countries typically had government financed health expenditures of 1 percent GNP, comparable figures of developed countries range anywhere from 4 to 7 per cent. However, major increases in the percentage of budget devoted to health spending would do little to close this gap as Sorkin pointed out in 1976. For example, Sri lanka has virtually the same percentage of budget allocation for health spending as the Soviet Union but winds up with an absolute spending level of 10 per cent less. Even if developing countries rapidly increase the percentage of GNP spend on health and experience higher GNP growth rate than developed countries will result small changes in per capita health spending. The developed countries with more stable population growth rates and significantly higher GNP per capita will increase health spending more rapidly.

In conclusion, as pointed out by Guy Carrin and Claudio Politi in 1996, it is very difficult for the current public health expenditure variable to take account of the efficiency of the public health expenditure. Because, the improvement in health status depends not only how much spend for health but also how use it effectively. Secondly,

public health expenditure needs to be properly complemented by other expenditure essential for health improvement such as sanitation, water supply. Also private health expenditure may be needed as a complement to public health expenditure.

2.1.3. Poverty and health

Poverty has continued and will continue to be a major obstacle to health development. Poverty has perhaps the major single determinant of individual, family and community health. The number of poor people has increased substantially, both in the developing world and among underprivileged groups and communities within developed as well as developing countries – particularly in the slums of the great cities. During the second half of the 1980s, the number of people in the world living in extreme poverty increased, and was estimated at over 1.1 billion in 1990 – more than one-fifth of humanity. An expanding world population and a growing elderly population carry with them the danger of an even greater divide between those who are rich and those who are poor. Here again is a formidable gap to be bridged.

Gunatilleke (1995) defined the multidimensional character of poverty. He writes that poverty "is a condition which encompasses deprivation in a variety of forms: inadequate income, lack of education, knowledge and skill, poor health status, lack of access of safe water and sanitation, insufficient food and nutrition, lack of control over the reproductive process".

One major indicator of human poverty is a short life. Dying before age 40 represents a severe deprivation. In developing countries nearly a fifth of the people are not expected to survive to this age, four times the proportion in industrial countries. Deprivation in years of life reflected in child and maternal mortality. In 1960-94 the infant mortality rate in developing countries was cut by nearly three-fifths from 150 per 1,000 live births to 64. The maternal mortality rate in the developing world is 471 per 100,000 live births, more than 15 times the rate in industrial countries. Progress in deprivation in years is reflected in longer life expectancy. In developing countries life expectancy at birth increased by 16 years during 1960-94, from 46 years to 62.

It is agreed universally that the basic cause of poor health in developing country is poverty. An immediate and simple way to indicate the presence of poverty in developing countries is to measure the extent to which income is inadequate for these country's populations. Informative results are obtained when (Chen, 1993) estimate changes in absolute poverty incidence between 1985 and 1990 in 40 selected countries. The absolute poverty incidence, as an aggregate for the selected sample of these countries, declined only marginally between 1985 and 1990: from 33.3% to 33.1% of the population. They depict the relationship between life expectancy at birth, infant mortality and underfive mortality vs. GDP per capita, for 1990. The conclusion of this study supported that CDP per capita is highly correlated with health status. The coefficients associated with the life expectancy was positive. (with the mortality indicators were negative). Therefore, they focused on possible differences in public health expenditure and the poverty indicator between the high and low performers. They

rank the countries according to the sign of residuals estimated in the life expectancy equation. A negative residuals means that the country does less well than expected, whereas a positive residual associated with a country that performs better than expected. Further analysis investigating the role of poverty indicates that the level of rural poverty is substantially higher in the low performers as compared with the high performers.

They estimated that fifty per cent drop in poverty means an extra 1.7 years to life expectancy, and leads to reduction of 14.94 per thousand and 27.47 per thousand in infant mortality and underfive mortality respectively.

Richard Jolly (1986) reported that decline in average per capita income has a magnified impact on the poor and on children. There are three main factors at work:
1. the tendency for cutbacks in employment and wages to hit the poor more severely than the better-off
2. the tendency for health education and other social sectors to be cut back more than the productive sectors of government spending.
3. The tendency for poorer families to have larger numbers of children and others who are vulnerable

In developing countries a number of people are in poverty an especially important reason for differences in health. The study (World Development Report,1993) concluded that effect of economic growth on poverty reduction and per capita public spending is very important. This study looked at twenty-two developing countries with comparable data on poverty and found that variation in the prevalence of the poverty and per capita public spending on health is important in explaining cross-country variation in life expectancy. Differences in income per capita between the countries became unimportant once those two factors are taken into account. This does not mean that income growth is irrelevant to increased life expectancy; rather its main effect lies in how much it reduces poverty and supports public health services. In the twenty-two countries, roughly one-third of the effect of economic growth on life expectancy came through poverty reduction and the remaining two-thirds through increased public spending on health. Within countries, too, health correlates strongly with poverty. In India, Indonesia, and Kenya child mortality is higher in states or provinces with larger proportions of poor people. Within cities there are large differences in child survival between rich and poor neighborhoods.

Myron J. Lefcowitz (1982) has attempted to focus the available, mostly published data about income and health relationships in terms of whether financial barriers or structural barriers are more important in restricting availability and utilization of adequate health services to lower income populations. There has been almost universal agreement that the poor receive less than the non-poor in the way actual medical care- both in quantity and quality. Therefore, he has assumed in part that medical deprivation is caused by poverty. Through reviewing the data, however, that assumption has been questioned. He stated that the most recent data suggest that there is a little correlation between average number of physician visits per person per year and family income. But when children under 15 years of age taken into account there is strong relationship. Taking education of family head into account, however the correlation between family income and average number of physician visits among children disappears. This finding suggests that

education of the family head is an important factor in medical care utilization for the young. One of his conclusions is that the relationship between health and poverty as indicated by chronic diseases is very little. He have argued that mortality rates, particularly infant mortality, are better indicator than morbidity rates of the health status of a population. In general, past research has supported the generalization that these rates decrease with increased socio-economic status.

Also many studies revealed the interrelationship between poverty and specific disease. For instance, as Stuart Wells and Steven Klees (1980) pointed out disease is related to poverty in a number of ways. It reduces one's work productivity and earning ability. The lack of income leads to an inability to purchase food and consequent to malnutrition, which further magnifies disease. Additionally, disease reduces an individual's nutrition status as some disease increase caloric requirement above normal levels and other disease reduce body's ability to obtain nutrition from ingested.

Finally, poverty has a powerful influence on health, it is not just income per capita that is relevant, the distribution of income and the number of people in poverty matter as well. Many study results show that fewer people live in poverty as income rises, there is generally a strong link between incomes and health status. However, growth will not automatically reduce poverty. The prevailing view is that some growth process are more effective in reducing poverty than others, and policies which take into account the characteristics and livelihoods of the poor are most likely to yield the bet results.

2.1.4. Education and health

Households with more education enjoy better health, both for adults and for children. This result is strikingly consistent in a great number of studies, despite differences in research methods, time periods and population samples.

Personal habits and life-style choices affect adult health enormously. Because educated people tend to make choices that are better for their health, there is often strong relation between schooling and health. The 1993 *World Development Report: Investing in Health* conducted a study of U.S life expectancy at age 25 and found that between the highest and lowest levels of education, the differences was about six years for white men and about five years for white women. The same pattern occurs in developing countries. In Jamaica education had a bigger influence on health than did income, particularly before age fifty. In Russia death from coronary heart disease was two to three times more common for poorly educated than for those with higher education. In Brazil those who were illiterate or who had only primary schooling were about five times more likely to have high blood pressure than those with post-secondary schooling.

In the study of Myron J. Lefcowitz (1982), he found that at all income levels, however, education whether mother's or father's is negatively related with infant mortality. When he takes the education into account, he makes the hypothesis that health-related and health-oriented behaviors are primarily a function of valued life-styles and that education is a primary agent in the development of such tastes. Through education, the individual

develops a life style which may have a greater impact on health status than what he or she may do directly. Thus, his conclusion was that differential life styles may be the explanation.

Paul Taubman and Shervin Rosen (1982) have explored the interrelationships of a number of health variables with several socio-demographic and economic variables for white man using the Retirement History Survey. They assumed that a person's education can effect his health because education correlated with income, with consumption and life styles, with decision making ability, and with occupational and residential health risks. As people age, the percentage in better health falls and the decrease is larger for the more educated. They concluded that effect of education on health is reduced only modestly when controlled for spouse's education. It is not reduced further when control for earnings of the head. Health deteriorates more slowly for the more educated. Education, however, has little impact on improving health after its deterioration.
For married men they have examined spouse's education. The most educated women are more likely to have mates in better health than the least educated, though the effect of spouse's education is not monotonic. Own education has bigger impacts than spouse's education.

There are a number of studies, concerned with the different aspects of relationship between education and health status of the population. From the results of these studies one can generally conclude that education has an enormous effect on the personal habits and lifestyle. Many personal habits and life-style choices that have important consequences for health are formed early in life. Therefore, education can help to make informed choices and it can result changes in health status.

2.1.5. Nutrition and health

According to the WHO standards, worldwide, about 780 million people are estimated to be energy deficient.

The World Development Report in 1993 stressed that eating well is necessary for good health. Either directly or in association with infectious diseases, inadequate diets account for a large share of the world's disease burden, including as much as a quarter of that among children. Much of this suffering stems from poverty-related underconsumption of protein and energy. Low height for a given age, is the most prevalent symptom of protein-energy malnutrition; approximately 40 per cent of all two-year-olds in developing countries are short for their age. Stunted children are often also under-weight or have low weight for their age. Wasting (low weight for a given height) is less prevalent – 11 per cent or less worldwide except in India, where it reaches 27 per cent.

Both food consumption and communicable disease affect nutritional status by way of a "malnutrition-infection complex". Food consumption depends both on people's capacity to acquire food and on their knowledge of how to choose a nutritious diet.

Chronic malnutrition is mostly a consequence of poverty. Higher income allows people to buy a more balanced diet, as well as better hygiene and medical care. Malnutrition is usually the result of combination of inadequate dietary intake and infection. Women and children suffer more than man from iron deficiency anemia, from stunting caused by protein-energy malnutrition, from iodine deficiency. There are many studies which have explored economic and health consequences and causes of malnutrition.

Malnutrition is a silent emergency. But the crises are real, and its persistence has profound and frightening implications for children, society and the future of humankind.

According to a UNICEF study (1998), 226 million children under age five in developing countries, nearly 40 per cent of this age group suffer from moderate and severe stunting. Nearly two-thirds of the children studied in the Philippines were stunted. Most of them were from poor families, and their diets, and those of their mothers, were below the nutritional levels recommended by Philippine government.

In Indonesia during 1984-87 rising incomes translated into reduced malnutrition in nearly all fifty-two regions of the country. The fraction of families eating less than 2,200 calories per person per day – an energy intake adequate for only light physical activity-declined 2 percentage points, but the decline was 9 percentage points at 1,800 calories and 26 percentage points at 1,400 calories.

The causes of severe and moderate malnutrition of children under the age five in six African countries is studied by Richard Jolly in 1986. The results show those seasonal fluctuations in the levels of child malnutrition – a typical situation in predominantly rural countries where for poor families food shortages become increasingly common in the pre-harvest period. For children, the period of food shortages is often compounded by seasonal patterns in the incidence of diseases like measles or diarrhea, with their own downward pressures on growth and weight gain. Using the data from UNICEF study, he argues that the effects of adjustment in many cases have fallen disproportionately on the poor and vulnerable, with the most serious impact on children. Also he notes that economic adjustment programs affect health and nutrition in two main ways: by reducing the incomes of poorer groups in the population and by reducing the nutritional and health services provided by government.

According to the Yukio Kaneko (1986) improvement of daily calorie supply per capita was not significantly related to the increase in per capita GNP in underdeveloped countries whose per capita GNPs were under 700 U.S. dollars, such as Nepal, Uganda, Malawi, Tanzania. There is no definite positive correlation between life expectancy and per capita GNP, and between nutrition and per capita GNP.

In conclusion, poverty is the main cause of the underconsumption of protein and energy particularly malnutrition. Also poverty and lower nutrition education result deficiencies and disproportions of key micronutricients - iodine, vitamin A and iron of women and children. It leads to deficit s in mental and physical development increase in deaths.

Therefore, improved nutrition of women and children will contribute to overcoming some of the greatest health challenges facing the world, such as the burden of infectious, chronic diseases, maternal and child mortality.

2.2. Methodology for estimating an interaction between socio-economic indicators and health status

The studies discussed above used observational techniques as an other social sciences. The non-availability of data is one of the main limitations on the use of observational techniques. Apart from non-availability of data, most of the prospective studies have been done at the national level. However, studies promoted by WHO have used international data on national health expenditure and health status. Studies relevant to interaction between economic development and health have tended to fall into two groups: those concerned with single diseases and conditions; and those concerned with some overall health indicator such as infant mortality rate and life expectancy at birth.

Studies, concerned with the macro level using broad indicators of health status mostly, used regression analysis. Two-variable regressions using ordinary least-squares have often been used. In some cases researchers have used multiple regressions and its more sophisticated approaches. Especially, when income, sociological factors and health are taken into account together, multiple regression analysis is used. For example:
Anand and Ravallion (1993) proposed a model based on the following basic hypotheses: In addition to economic growth, the allocation of resources is also vital for the determination of health status. There are two types of allocation mechanisms. First, the intersectoral allocation or the allocation of economic resources between the public and private sector, and more specifically, the degree of provision of social services. Secondly, the interhousehold allocation of economic resources, or the income distribution, also matters. Based on the above, the Anand and Ravallion model is reflected in the following equation:

HS = HS (GNPC, PESS, POV)

Where:	HS	=	Health status indicator
	GNPC	=	GNP per capita
	PESS	=	Public expenditure on social services
	POV	=	Poverty indicator

The data covered 22 selected developing countries between 1985-1990. They have obtained the following results: the GNP per capita has the wrong sign and is not statistically significant. The health status indicator used is difference between desirable life expectancy (80 years) and actual life expectancy and their expected sign associated with the GNP per capita was positive. Poverty variable is measured as a proportion of people consuming less than $1.[4] The coefficients associated with POV and PESS has the expected positive sign and are statistically significant. After that Guy Carrin and Claudio

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[4] At Purchasing Power Parity (PPP) values. The purchasing power of a country's currency-the number of units of that currency required to purchase the same representative basket of goods and services that a US dollar would buy in the United States.

Politi (1996) reestimated this equation, but utilizing larger data set and two of the three explanatory variables. The findings from this analysis support the hypothesis that made by Anand and Ravallion.

Paul Taubman and Shervin Rosen (1982) have developed the following model in order to measure the level of healthiness associated with age and other socio-economic factors. The health variables used in this study ask an individual to compare his health with others of the same age and with himself at the time of the prior survey. The health status variables in level form has four possible responses: Health better than others (the same age), same-as –others, and worse-than –others, deceased.
The data source was unusual in that it followed people over time, and thus had indicators of time change in health status:

$\Delta H = H_{t+1} - H_t = f(H_t, X, t)$

where: Ht is the level of health at the time t, and X is a vector of personal characteristics. In order to determine level of the health they used questionnaire. For example, in each interview a person is asked how his health compares to others of the same age, and how his health changed during the given time period.
In principal, this difference equation is solved by given an initial condition, Ho, to obtain an equation for H_t. $H_t = G (Ho, X, t)$
The usual cross-sectional study measures only the changes in health associated with age. But this model used to estimate the differences in healthiness.

A major problem is multicollinearity in health and socio-economic factor analysis as in other social science analysis. For instance in the Anand and Ravallion equation, the wrong and not significant sign of GNPC may be related to the multicollinearity, because they revieled that the correlation coefficient between GNPC and public health spending is 0.91.

Also the use of proxies as a result of non-availability of data and exclusion of important variables create significant difficulties for the reliability of regression analysis result. For example, Chernikovsky (1977) estimated food intake as a function of income, family size, education, region of the country, and other demographic variables. All of these independent variables are probably related to each other, and the effect of any one of them on food intake would not be possible to isolate with regression analysis. As Malenbaum 1970 quoted in Stuart Wells and Steven Keels (1980), he attempted to show the relationship between agricultural output and health. It seems clear that such output is related to the health status of specific workers. However, these data were apparently unavailable, so Malenbaum used physician-population ratios and infant mortality rates as a proxies for health status. An important of regression analysis is to establish predictive capability. A significant relationship between infant mortality and agricultural output would not necessarily indicate that reductions in infant mortality would increase agricultural output. Rather, a change in the input for which infant mortality was used as a proxy could lead to improvements in agricultural output.