CHAPTER III
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METHODOLOGY

Transition in health status, the factors determining it and the intersectoral linkages between health and non health sectors can be portrayed with the help of the empirical analysis of the relevant data. This implies that a proper methodological design has to be formulated for such an empirical analysis. This chapter purports to provide the methodological design used in the study comprising sources and nature of data, collection and analysis of data and methods and statistical tools employed. The methodology adopted in this study is consistent with the objectives and hypotheses formulated in Chapter one.

Data base: Historical Secondary Data

Since this dissertation attempts to trace and analyse the improvement in the health status of the people over the years in the backdrop of the socio-economic changes occurring in the Union Territory, the study had to rely mainly on the historical sources of data. The study relates to the period from 1954-1991 covering a period of 37 years but most of the analysis is confined to the period from 1961-1991. The secondary data comprises information relating to the indicators of health status, determinants of health and the variables drawn from health and non-health sectors. The health status and the transition in it over the period is measured chiefly with the help of transition in vital rates, such as crude death rate, crude infant mortality rate, crude maternal mortality rate, the morbidity composition, maternal morbidity rate, changes in morbidity rate and growth in medical infrastructure.

The trends in crude death rate, infant mortality rate and morbidity rate have been examined from 1961 onwards. The regional differences and rural-urban differences in these rates have also been examined; deaths according to causes and death rate per 1000 mid year population during 1961 and 1991 have also been considered and analysed. Incidence of important epidemics and other diseases in conventional groups have also been presented to indicate the health status of the people. On the determinants of health status the information relating to health facilities available including the number and rate of increase of medical institutions per 1000 population, doctor population ratio, bed
population ratio and nurse-bed ratio have been considered for the period from 1961 to 1991. The other determinants considered are total and per capita expenditure on medical and public health, urban water supply and the expenditure on it, rural water supply and protected water supply scheme and the expenditure incurred on them during the plans, nutritional level, per capita income, availability of total and per capita foodgrains, availability of pulses, availability of fish, per capita availability of milk, population, density of population, literacy, urban population, villages electrified, number of houses, length of roads and environmental sanitation.

The nutritional status is assessed in terms of the per capita availability of foodgrains, pulses, intake of calories and protein in various comparable groups as revealed by NSS Data. The data relating to the above aspects and indicators were collected at three levels, viz., rural and urban, regional and territorywise for a period of 30 years from various issues of the following publications/sources.

3. Annual Reports on Vital Statistics, published by the Local Administration Department, Government of Pondicherry
4. State Income of Pondicherry published by the Directorate of Economics and Statistics, Govt. of Pondicherry
5. Five Year Plan Documents released by the Directorate of Planning and Research Department, Government of Pondicherry
6. Census of India pertaining to the Union Territory of Pondicherry published by the Directorate of Census Operations, Pondicherry
7. Annual Reports of the Union Ministry of Health published by the Government of India
8. NSS rounds on consumption expenditure for various years.

Tools of Analysis

Specific tools appropriate to analyse the data with reference to each of the specific objectives of the study were selected and applied. They are described below:
Measurement of Growth

Improvement in health status can be measured by analysing the temporal changes in the variables mentioned above.

This requires the measurement of growth in these variables over the period from 1961 to 1991. Normally two growth rates are used to measure and to present the growth rates. They are linear growth rate (LGR) and compound growth rate (CGR). These growth rates are worked out extensively for various variables used in this study. The methodology of measuring these growth rates are indicated below:

Given the function \( Y_i = f(t) \), the growth rate \( G_i \) of the characteristic \( Y \) at the time \( t \) is defined as

\[
G_i = \frac{1}{Y_i} \frac{dy_i}{dt} \quad \text{if the function is continuous,}
\]

\[
= \frac{Y_{i+1} - Y_i}{Y_i} \quad \text{if the function is discrete}
\]

The function \( Y_i = f(t) \) can take several forms viz., linear, exponential (log-linear), log-quadratic and Gompertz and \( G_i \) varies from one functional form to another.

The linear form of the function \( Y_i = f(t) \) can algebraically be written as \( Y_i = b_0 + b_1 \cdot t \)

The growth rate based on it is

\[
G_i = \frac{\hat{b}_1}{Y}
\]

To arrive at the growth rate, the usual practice is to estimate the parameter \( b_1 \) by the 'method of least squares' and divide it by the average of \( Y \).

The exponential form of the function \( Y_i = f(t) \) can algebraically be expressed as

\[
Y_i = b_0 \cdot e^{b_1 t}
\]

or

\[
\ln Y_i = \ln b_0 + b_1 t
\]

The growth rate based on this form is \( G_i = b_1 \) which is constant over time. This

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growth rate is the compound growth rate.

**Transition in Health Status**

As noted earlier, the improvement in health status is assessed for 30 year period from 1961 to 1991. However to compare the progress taking place in the health sphere with greater focus, the entire study period is divided into two sub periods, namely, 1960 to 1975 and 1976 to 1991. A comparative analysis of the indicators of health status is made for these sub periods. In this process, the transition between two periods is analysed along with the causes of such transition between the two periods.

**Other Tools**

The other tools of analysis of the secondary data include ratio, average, percentage, coefficient of variation and correlation wherever necessary. Diagrams, graphs and tables were also used.

**Determinants of Health Status: A Theoretical Framework**

The health status of a community or people - whether it is high or low is governed by a complex set of relationships. As noted earlier, the health status can be enhanced by preventing the occurrence of illness or promoting a good life and health or by curing illness. All these three aspects of health are but a reflection of the socio-economic and cultural milieu in which people operate. For a long time, it was believed that medicines, medical practitioners and medical institutions are the *raison d'être* of good health and governments have been concentrating on the augmentation of these facilities through public investment programmes on health. However, it was later realised that the medical infrastructure can only cure illness and that approach to health development implies curative approach. However, the experience of developed countries had admittedly proved that health is something positive and is different from the negative cure of illness. The community’s health status has been found to be conditioned by their living standards including nutrition, housing, water supply and sanitation, personal hygiene and life style. The empirical evidences suggest that the improvement of a country’s health can be sustained only through concomitant improvement of these related variables. As one writer has observed, “evidence suggests that in so far as western medicine has made any impact on ill health in the Third World it has tended to avert death without improving life. That is to say, while medicine may in some instance have reduced mortality rates, in the absence of improved living standards it has produced large number of mere survivors, handicapped by constant illness and incomplete recovery.” Therefore it is now becoming obvious that Health development embraces the whole gamut of economic, environmental, social, psychological and cultural factors.
Economic factors such as improvement in per capita income, living standards and availability of foodgrains, have a positive impact on the health status of a nation. Studies have established a positive relationship between real income and life expectancy. Irma Adelman observed, “Once the major benefits from these improvements (basic public health measures) have been reached it may well be that economic conditions play the primary role in determining the subsequent rate of progress in mortality, for it stands to reason that such factors as better nutrition, improved housing, healthier and more humane working conditions and a somewhat more secured and less careworn mode of life, all of which accompany economic growth, must contribute to improvements in life expectancy.”

Economic factors such as income enhance the capacity to pay for health services. It influences the kind and amount of food consumed, the quality of housing and the type of operation of education. It also influences the Government’s ability to provide the services necessary for optimum development. Income also influences the possession of correct knowledge about the health related matters. As Rosenstock observes “There is a marked association between income and possession of correct knowledge about a wide variety of health related matters and a similar association between income and extent of belief in the efficacy of alternative procedures for preventing or controlling various health conditions. Lack of income results in poverty causing ill health. In fact, poverty and ill health are closely correlated. As Lerner remarks, “On an a priori basis, there appears to be adequate reasons for expecting substantial differentials between the health levels of the poor and that of rest of population.” This is so because the supply of health services, the most direct means for the attainment of health, is a scarce good which is likely to be distributed unequally.

Education of the community as denoted by the level of literacy is another decisive determinant of health status of the people. Education helps man to adapt to his cultural milieu and to his biological and physical environment. Formal education is spreading the relevant ideas and techniques to the people regarding health. Besides, education especially of mothers, seems to exert a positive influence on the health of the children. It is now generally agreed that parental education, particularly, maternal education, ensures greater survival of children even when income and other indices of material well being are limited. Further, it is shown that modern schooling reduces mortality levels. Educated mothers are usually more sensitive to child’s illness and report it promptly. They are even more effective in preventing sick children from dying than in preventing them from illness.

Environment - natural or man made, physical, chemical, biological and social has another significant influence on health development. If the environment of the community is hygienic the child is not exposed to a host of infectious agents. The absence of adequate
facilities for the disposal of excreta accounts for a high prevalence of bacterial, viral, protozoal and helminthic diseases. The lack of plentiful, convenient and safe water supply complicates efforts to maintain a sanitary environment, to keep food clean and to practice good personal hygiene. Over crowding and lack of ventilation predispose children to host of airborne infections.

The cultural factors like attitude towards life and death, the status of women and cultural beliefs have an enormous impact on health development of the people. For instance, the attitude towards life determines the value placed on health by a community and may thereby decide the demand for health services and the use made of them. As Margaret Mead has said, “If all children are expected to live and every effort is made to keep the puny and defective alive, this changes the position of all individuals in a given society.” The status of women affects pregnancy, parturition and lactation. The status of children, preferences for boys and girls and child rearing practice influence the occurrence of health development.

The social and behavioural factors such as the family, adolescence, adulthood also bring changes in health status. In most societies the care and early training of dependant children remains primarily the responsibility of the family. The family situation and the attitude of the family towards rearing of children have an important influence on the health status.

Modern technology, industrialisation, the expansion of cities, migration and population growth result in many ecological, social and biological changes. The deterioration of cities as a result of uncontrolled migration from rural to over crowded urban areas, the excessive pollution of air and water with the unregulated expansion of industries are detrimental to the improvement in health status. Unbridled growth of population exerts pressure on the extension of limited land and causes higher density of population leading to environmental hazards and health disasters.

Health status, in many developing and developed countries has been found to be a positive function of nutrition. It has far reaching efforts on physical, intellectual and emotional and psychomotor development and indirectly affects social development. Malnutrition and undernutrition constitute major health problems in the country. For instance, maternal malnutrition during pregnancy may retard foetal growth in utero and consequently the baby may develop specific deficiencies such as iron deficiency anaemia. If the baby is then malnourished during early childhood, its growth may be retarded and possibly its mental development as well.
These and other socio-economic factors must therefore be considered in a package for determining the health status of the people. The relationship is both direct and indirect between these variables. As David Mechanic points out, "Indirectly socio-economic level is an important variable in accounting for response to illness because in a very gross way differences in socio-economic level encompass differences in health values, understanding and information concerning diseases, future and preventive planning, cultural expectations concerning health services, feelings of social distance between oneself and health practitioners and so on." It has also been observed that the availability and utilisation of rehabilitative treatments show conspicuous variation by income classes and "the post-hospitalisation care of the poor can be generally characterised as a state of medical deprivation.”

The complex relationship that we have explained above between health and socio-economic and cultural factors can be hypothesised and empirically verified to some extent. Of course all variables in this complex model cannot be easily measured although some of them can be quantified. In this study, an attempt has been made to build an empirical model in the context of the above theoretical framework.

Infant mortality rate, as in other studies, is taken as the indicator of health status and changes in them over a period of time constitute an improvement in health status. The factors bringing changes in IMR are identified as follows: Per capita income, per capita availability of foodgrains, per capita availability of fish, literacy, density of population, degree of urbanisation, water supply, doctor population ratio, medical institutions, per capita expenditure on health. The relationship between these factors can be formulated in the multiple regression framework, whose methodology is described below.

In a functional framework, the model can be specified as below:

\[ \text{IMR} = f (\text{Pci}, \text{Pcf}, \text{pcaf}, \text{lit}, \text{dp}, \text{du}, \text{ws}, \text{dpr}, \text{mi}, \text{pceh}, h) \]

Where,

\[ \text{IMR} = \text{Infant Mortality Rate} \]
\[ \text{Pci} = \text{Per Capita Income} \]
\[ \text{Pcf} = \text{Per capita availability of food grains} \]
\[ \text{pcaf} = \text{Per capita availability of fish} \]
\[ \text{lit} = \text{Literacy rate} \]
\[ \text{dp} = \text{Density of population} \]
\[ \text{du} = \text{Degree of urbanisation} \]
\[ \text{ws} = \text{Water supply} \]
\[ \text{dpr} = \text{Doctor population ratio} \]
\( m_i = \text{Medical institutions} \)
\( p_{ceh} = \text{Per capita expenditure on health} \)
\( h = \text{No of houses} \)

In its linear form the model becomes:

\[
IMR = a_0 + a_{pc}i + a_{pcf} + a_{pcaf} + a_{lit} + a_{dp} + a_{du} + a_{ws} + a_{mi} + a_{pceh} + \mu
\]

Where,
\( a_0 = \text{Intercept or constant} \)
\( a_1, \ldots, a_{10} = \text{Regression Coefficients} \)
\( \mu = \text{Error term} \)

The expected relationship is:

1. \( \frac{\partial IMR}{\partial pci} \) i.e., \( a_1 < 0 \)
2. \( \frac{\partial IMR}{\partial pcf} \) i.e., \( a_2 < 0 \)
3. \( \frac{\partial IMR}{\partial pcf} \) i.e., \( a_3 < 0 \)
4. \( \frac{\partial IMR}{\partial lit} \) i.e., \( a_4 < 0 \)
5. \( \frac{\partial IMR}{\partial dp} \) i.e., \( a_5 > 0 \)
6. \( \frac{\partial IMR}{\partial du} \) i.e., \( a_6 > 0 \)
7. \( \frac{\partial IMR}{\partial ws} \) i.e., \( a_7 < 0 \)
8. \[
\frac{\partial \text{IMR}}{\partial \text{dr}} \quad \text{i.e., } a_8 > 0
\]

9. \[
\frac{\partial \text{IMR}}{\partial \text{mi}} \quad \text{i.e., } a_9 < 0
\]

10. \[
\frac{\partial \text{IMR}}{\partial \text{pceh}} \quad \text{i.e., } a_{10} < 0
\]

11. \[
\frac{\partial \text{IMR}}{\partial \text{h}} < 0
\]

The analysis of the data and the application of above models, methods and tools to the time series secondary data yielded the results which are presented and discussed in the subsequent chapters.