

**Health Transition in Kerala**  
**P.G.K. Panikar**

**Discussion Paper No. 10**  
**December 1999**

**Kerala Research Programme on Local Level Development**  
**Centre for Development Studies**  
**Thiruvananthapuram**

## **Health Transition in Kerala**

P.G.K. Panikar

English  
Discussion Paper

Rights reserved

First published December 1999

Copy Editing: H. Shaji

Printed at:

Kerala Research Programme on Local Level Development

Published by:

Dr K. N. Nair, Programme Coordinator,

Kerala Research Programme on Local Level Development,

Centre for Development Studies,

Prasanth Nagar, Ulloor,

Thiruvananthapuram 695 011

Tel: 550 465, 550 491

Fax: 550 465

E-mail: [krp@giasmd01.vsnl.net.in](mailto:krp@giasmd01.vsnl.net.in)

Url: <http://www.krpcds.org/>

Cover Design: Defacto Creations

**ISBN No: 81-87621-09-5**

---

KRPLLD

12/1999

0750

ENG

# Health Transition in Kerala

P.G.K. Panikar\*

## 1. Introduction

Kerala has achieved remarkable progress in human development, as reflected in the high levels of education and health of its population. The level of literacy among Keralites is far higher than the national average. Crude death rate, infant mortality rate, and life expectancy at birth in Kerala are comparable even to those in the developed countries. However, the question whether low mortality rates signal better health has generated heated debate in the light of the sequence of changes in the health profile, termed as “health transition, which the developed countries have experienced. Apparently, Kerala also has been passing through an advanced phase of health transition, despite remaining economically backward”. In this paper, we shall attempt a survey of the sources and the stages of Kerala’s health transition and discuss its policy implications.

## 2. Health and Health Transition

Health is a multi-dimensional and multi-causal variable. It is defined as a “state of complete physical, mental, and social well being” (World Health Organisation). Being a holistic concept, it is beyond measurability in terms of mortality and morbidity prevalence rates (Basch; 1978, pp. 204-206). The health status of a community depends on its socio-economic, environmental, biological, and political factors.

Health transition is a complex process comprising demographic (mortality), epidemiological, and health care transitions. It is manifested in rising life expectancy at birth due to changes in the fertility, mortality, and morbidity profile of a population. Demographic (mortality) transition brings down birth and death rates and changes the age structure; epidemiological transition reflects changes in the causes of death, from infectious (pandemic) diseases to non-communicable (degenerative, human-made) diseases (Caldwell: 1990; Mc Namara; 1982, p.147). However, the causal mechanisms of demographic changes are unclear and distinct variations in patterns, places, determinants, and consequence of population changes are observed in the case of epidemiological transition (Omran: 1982, p.172). Three fundamental changes in the configuration of a population’s health profile take place during epidemiological transition: (i) mortality decline due to infectious diseases, injuries, and mental illness; (ii) shift of the burden of death and diseases from the younger to the older groups; and (iii) change in health profile from one dominated by death to one dominated by morbidity. Epidemiological transition implies change in the morbidity profile from acute, infectious, and parasitic diseases (eg plague, smallpox, and cholera) to non-communicable, degenerative, and chronic diseases (eg cardiovascular diseases, cancer, diabetes, and neoplasms) (Mercer: 1990, p.262; Albala, 1995; Prata: 1992; Crews: 1987; Reis: 1978). A third component of health transition is health care transition brought about through changes in the patterns of the organised social response to health condition.

---

\* Prof. P. G. K. Panikar prepared this survey paper for KRPLLD a few months before his demise in August 1999. Prof. P. R. Gopinathan Nair has edited the manuscript. The author of several research papers and monographs on the economics of health care and nutrition in Kerala, Prof. Panikar had an illustrious career as Head of the Department of Economics, University of Kerala (1970-'76) and Director, CDS (1971-1982). The affection and regard Prof. Panikar had always shown for KRPLLD is greatly acknowledged - Programme Co-ordinator

## **Mortality and Morbidity**

Health transition as reflected in declining mortality would logically imply a corresponding decline in morbidity. However, the logic has certain limits. "In general, it is not high-mortality developing countries that have high levels of morbidity, and low-mortality (generally developed) countries that have low levels of morbidity, but quite the contrary. Currently, reported morbidity levels are the highest in the wealthiest countries, as are the per capita amounts of money spent to secure health and control disease". (Johansson, 1991, p. 90). Riley, who reviewed the morbidity trends in four countries, Japan, United States, Britain and Hungary, has shown that sickness prevalence has moved in a direction opposite to the death rate for most of the age and sex groups. The results of health surveys in these countries showed that sickness rate increased in each group while age-specific mortality rates declined (Riley, 1990, p. 916).

### **3. Health Transition in Kerala**

As mentioned earlier, health transition comprises three components, viz demographic transition, epidemiological transition, and health care transition. Of these, demographic transition is the most dominant since it influences the other two via changes in the age composition and morbidity pattern of population and raises the demand for medical care. Demographic transition in India is not confined to Kerala; all the States are in the process though they remain at different stages of the transition: Kerala stands ahead of all of them.

#### ***Demographic Transition in Kerala***

Kerala has apparently entered the third or final phase of the demographic transition characterised by low death rate and declining birth rate leading to a slow down in the growth rate of population. Thus, as of 1991, the birth rate in Kerala was estimated as a little over 18 (per 1000 population), as against 30 for all-India and an average of 28 for low-income and 24 for middle-income countries. The crude death rate of Kerala in 1991 was 6 (per 1000 population), compared to the national average of 11, and an average of 10 for low-income and 8 for middle-income countries. It is significant to note that the crude birth rates and death rates in a 'low-income country' like China and a 'middle-income country' like the Philippines exceeded the corresponding rates in the 'least developed' region of Kerala. Kerala's demographic experience has attracted wide research attention (eg (i) Zachariah, 1983; (ii) Zachariah & Irudaya Rajan, 1994; (iii) Bhat and Irudaya Rajan, 1990; (iv) Ratcliffe, 1984; (v) Zachariah & Irudaya Rajan, 1997).

Of the various sources of data on vital rates, the Sample Registration Scheme (SRS) seems to be the most comprehensive and reliable. Since SRS data are available on a yearly basis continuously only since the early 1970s, our discussion would be confined to this period.

The estimates of the crude birth rates and death rates of Kerala together with those of the other major States of India, for selected periods for the two decades (1971-1991) are presented in Table 3.1. It may be noted that both the birth rate and the death rate in Kerala have been significantly lower than the corresponding rates in all the major States included in this Table.

**Table 3.1 Trends in Vital Rates among Major States: 1971-1991**

States	Crude birth rate per Mille				Crude death rate per Mille				1987-91	
	1971-73	1976-78	1981-83	1986-88	1971-73	1976-78	1981-83	1986-88	CBR	CDR
Andhra Pradesh	34.1	33.2	31.2	29.7	15.8	14.0	10.7	10.0	27.18	9.68
Assam	36.0	31.3	34.0	33.9	17.3	13.7	12.4	12.0	31.42	11.16
Bihar	32.3	30.8	37.9	36.8	15.7	12.5	13.7	13.1	34.36	11.64
Gujarat	38.6	36.5	34.3	30.9	15.7	14.3	11.8	10.5	29.22	9.58
Haryana	40.6	34.7	36.4	34.5	11.3	13.3	9.8	9.1	33.70	8.74
Himachal Pradesh	36.0	30.7	32.3	31.2	14.6	12.3	10.3	8.9	29.32	8.82
Jammu Kashmir	32.3	31.9	31.4	32.5	10.5	11.5	8.7	8.2	31.4	7.90
Karnataka	30.7	28.3	28.4	28.9	12.4	11.6	9.2	8.7	28.10	8.68
Kerala	30.5	26.4	25.6	21.5	8.9	7.5	6.6	6.2	20.04	6.12
Madhya Pradesh	38.6	38.4	38.2	36.9	17.1	16.5	15.4	13.8	36.36	13.38
Maharashtra	31.1	27.5	29.3	29.4	12.9	11.5	9.2	8.5	28.1	8.38
Orissa	34.7	32.6	33.5	31.8	17.9	15.5	12.9	12.8	30.44	12.75
Punjab	34.1	30.7	30.3	28.6	11.7	11.1	9.1	8.2	28.16	8.25
Rajasthan	40.9	34.2	38.5	34.9	16.2	15.0	13.3	12.4	34.24	11.97
Tamil Nadu	31.3	29.8	27.9	23.5	14.5	13.7	11.6	9.5	22.44	9.33
Uttar Pradesh	43.2	40.3	38.9	37.5	21.7	20.0	15.7	14.1	36.66	13.75
West Bengal	N.A.	30.8	32.5	29.6	N.A.	11.7	10.6	8.6	28.30	8.65
India	36.3	33.3	33.8	32.1	15.9	14.5	12.1	11.0	30.80	10.80

Note: While the basis of the estimates for 1971-'75 to 1981-'86 is the data brought out as three-year moving averages, the estimates for 1987-'91 are based on annual averages; Source: Ashish Bose, Demographic Diversity of India, 1991 Census, Table 19, pp. 75-86

Moreover, these rates in Kerala have registered a steady and steep decline over this period. Thus, the birth rate declined from about 30.5 (in 1971-75) to 20.0 (in 1987-91), per 1,000 population, that is, by 34.4 per cent. The decline in death rate was by a little over 31 per cent, from an already low rate of 8.9 per 1,000 in the first half of the 1970s.

At the all-India level, birth rate declined from 36.3 to 31.8 and death rate from 15.9 to 10.8, during the same period. Thus we find that in respect of birth rate, all-India remains three decades behind Kerala and with regard to death rate, the distance is even longer.

The estimates of birth rate and death rate for Kerala for 1996 came to 17.18 and 6.2 respectively as against 29.5 and 9.8 for all-India (State Planning Board, 1998: 18). In brief, the pace of the demographic transition in Kerala has been more rapid despite its low rate of industrialisation as well as urbanisation and low per capita income.

As mentioned earlier, the demographic transition in Kerala has attracted wide attention, as reflected in the large number of studies brought out on this topic. However, these studies were, by and large, attempts at formulating alternative hypotheses on the factors underlying the transition, with the focus on decline in fertility. We had done a detailed review of these studies in an earlier exercise (Panikar, et al, 1996).

Obviously, there are other dimensions of demographic transition reflecting its effects that have received relatively little research attention. One such effect is observed in the age composition of the population.

The fall in death rates, particularly infant and child death rates, first reflects itself in the increase in life expectancy at birth (Table 3.2).

**Table 3.2 Trends in Mortality Indicators of Kerala: 1981-‘85, 1986-‘90, and 1991-‘96**

Period	CDR (Kerala)	IMR (Kerala)	Expectation of life at birth			
			Kerala		India	
			Male	Female	Male	Female
1981-1985	6.56	32.00	65.23	69.87	55.6	56.4
1986-1990	6.12	24.00	66.23	71.12	58.10	59.80
1991-1992	6.15	16.50	67.23	72.39	60.60	61.70

Notes: Last row of Col 1 & 2 average of only 2 years 1991 & 1992;

Source: Col.1 & 2, Zachariah, 1997, Table 3, p. 86; Col. 3 to 6 CMIE, 1996

**Table 3. 3 Shares of Different Age Groups in the Total Population**

States	0 – 4			60 & Above		
	1971	1981	1991	1971	1983	1991
Andhra Pradesh	13.83	12.15	11.20	6.39	6.68	6.64
Assam	17.21	—	14.30	4.73	—	5.22
Bihar	14.59	13.38	14.42	5.91	6.83	6.15
Gujarat	14.46	12.41	11.83	5.27	6.02	6.07
Haryana	15.71	15.71	14.20	5.80	5.80	7.65
Himachal Pradesh	14.34	14.33	N.A.	7.16	7.16	N.A.
Jammu & Kashmir	14.42	12.96	N.A.	5.54	5.78	N.A.
Karnataka	14.47	12.43	11.73	6.11	6.72	6.67
Kerala	13.38	10.69	9.48	6.21	7.55	8.80
Madhya Pradesh	16.04	13.55	14.12	5.79	6.50	6.58
Maharashtra	14.39	11.88	12.42	5.73	6.52	6.87
Orissa	14.24	11.82	12.26	6.04	6.42	7.06
Punjab	12.99	11.86	12.33	7.51	7.90	7.76
Rajasthan	15.57	14.07	14.53	5.52	6.07	6.14
Tamil Nadu	13.09	11.14	9.66	5.75	6.41	7.42
Uttar Pradesh	14.67	13.44	14.17	6.77	6.88	6.77
West Bengal	14.56	11.62	11.28	5.45	5.58	5.98
All India	17.00	12.55	12.80	6.97	6.54	6.67

Source: Registrar General, India, Population Projection for India and State 1996-2016, Census of India, 1991, New Delhi, 1996, Table 2, pp. 27-34

It is found that the expectation of life has remained higher in Kerala for both the males and

the females: by about 6.6 points in the case of males and 10.7 points in the case of females in 1996. Of course, the differences have declined marginally since the beginning of the 1980s.

The demographic transition via decline in death rate is accelerated by decline in birth rate as a result of which proportion of children in the population declines and proportion of the old in the population increases. The changes in proportion of the population in the major States of India, in the age groups of 0-5 and 60 years and above, from 1971 to 1991, are shown in Table 3.3. The percentage share of the child population in Kerala declined from 13.4 per cent in 1971 to 9.5 per cent in 1991; and that of the old increased from 6.2 per cent to 8.8 per cent during the same period. The rate of decline in the former and of increase in the latter are found to have been more steady and significant in Kerala than in any other State even though the broad trends are in the same directions.

It is significant that by the terminal year (1991), the proportion of the young is the lowest and that of the old is the highest in Kerala among all the States. Of the two variables, the change in the second one, ie the proportion of the old, is an indicator of the phase of the demographic transition reached in the State. However, the picture would be incomplete without further analysis of the old age group. As has been recognised by now, as demographic transition advanced, the old age group grows older; in other words, the proportion of the 'old old' increases. A break-up of the group of the old in Kerala and other States into two broad age groups is presented in Table 3. 4.

As is evident from Table 3.4, the proportion of the elderly population in Kerala is significantly higher than that in other States. In the age groups, the 'young old', (60-74 years) and the 'old old' (75 years and above), the proportions in Kerala are the highest. The inter-State difference is most pronounced in the case of the share of females in the two age groups. The proportion of the 'young old' females in Kerala was 7.13 per cent compared to 5.41 per cent at the all-India level, and the percentage share of the 'old old' came to 2.14 and 1.25 respectively.

In brief, going by conventional health status indicators, Kerala has achieved remarkable progress. A comparison of the estimates of crude death rate (CDR), infant mortality rate (IMR), and life expectancy at birth (LEB) in Kerala with the averages of these rates in India as a whole, and low-income, middle-income, and high-income economies, as given in the Table 3.5, would bring out to some extent an idea of the health status of the State's population.

In respect of all the three variables, Kerala is found to have done better than the low-income and middle-income economies. While the average IMR and LEB in the high-income economies reflect better health status than in Kerala, the estimated CDR in Kerala is significantly lower. Admittedly, the two sets of data may differ in their base and methods of estimation. Further, the age structure of the population would also be different, with a higher proportion of the old age population in the high-income advanced countries.



**Table 3.4 Percentage Distribution of the Population Aged 60 Years and above: 1991**

States	60 - 74 Years			75 Years and above		
	Males	Females	Total	Males	Females	Total
Andhra Pradesh	5.62	5.68	5.65	0.93	1.06	1.00
Assam	4.39	3.90	4.15	1.09	0.95	1.07
Bihar	5.20	4.90	5.06	1.21	0.97	1.10
Gujarat	4.82	5.44	5.02	1.14	1.38	1.06
Haryana	4.99	6.40	6.12	1.62	1.42	1.54
Himachal Pradesh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Jammu&Kashmir	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Karnataka	5.40	5.60	5.50	5.50	1.44	1.37
Kerala	6.55	7.13	6.85	1.76	2.14	1.96
Madhya Pradesh	5.16	5.37	5.26	5.26	1.35	1.33
Maharashtra	5.45	5.84	5.64	5.64	1.34	1.23
Orissa	5.74	5.84	5.79	5.79	1.24	1.27
Punjab	6.24	5.82	6.04	6.04	1.68	1.72
Rajasthan	5.01	5.29	5.14	5.14	1.10	1.00
Tamil Nadu	6.31	5.96	6.14	1.34	1.22	1.29
Uttar Pradesh	5.71	5.16	5.46	1.39	1.24	1.32
West Bengal	4.72	4.87	4.80	1.18	1.18	1.18
All India	5.42	5.41	5.42	1.25	1.25	1.25

Source: Census of India 1997, op.cit. Table 1, pp. 19-25

**Table 3.5 Broad Indices of Health (1991)**

	Kerala	Low-income Economies	Middle-income Economies	Low-high-income Economies	High-income Economies
Crude death rate per 1000 population	6	10	10	8	9
Infant mortality rate per 1000 live births	17	80	73	43	7
Life expectancy at birth (years)	71	60	62	68	77

Thus, in terms of survival norms, Kerala's record is comparable to that of high-income, developed countries. Does this picture represent, however, the real health status of the Keralites? Not necessarily, because, *a priori*, mortality rates could be brought down through medical intervention without any positive change in nutrition levels and incidence of illness. Does Kerala score high even with respect to these two parameters of health? To this question we now turn. First, we examine the trends in the incidence of illness and pattern of morbidity.

### ***Epidemiological Transition in Kerala: Trends in the Level and Pattern of Morbidity***

In a recent study on the health status of Kerala, Panikar and Soman examined the trends in the morbidity pattern in the State (Panikar and Soman, 1981). As is widely acknowledged, reliable and comprehensive data on morbidity in underdeveloped regions like Kerala are scarce. The only published source of data on morbidity in Kerala was that of patients treated in the government allopathic medical institutions. These patients constituted only a small proportion of persons who suffered from various diseases; the majority goes to medical institutions in the private sector.

Moreover, the reliability of the published data is also in doubt. In the circumstances, Panikar and Soman collected data directly from official statistics, (ie hospital records) on diseases of in-patients treated in two apex medical institutions, viz Trivandrum Medical College Hospital (MCH) and Women's and Children's Hospital (SAT) attached to it. Primary data were collected also from two private hospitals located in two mofussil towns, and the outpatient units attached to half a dozen Primary Health Centres (PHC) in representative rural areas. "Admittedly, the coverage of the sample is restricted, and selection of the institutions arbitrary".

The two broad contours of the morbidity profile are infectious or communicable diseases and

chronic diseases. Thanks to the persistence of infectious diseases due to poverty, undernutrition, and poor water supply on the one hand, and the emergence of chronic diseases due to improvement of life expectancy and the resultant increase in the proportion of the older age groups on the other, the morbidity profile of Kerala, it was pointed out, may turn out to be a mixture of diseases of poverty and diseases of affluence. We will focus our attention first on diseases of poverty and take up the other groups, chronic diseases, subsequently.

### ***Infectious Diseases***

Infectious diseases themselves passed through an epidemiological transition. During the first half of the twentieth century, plague, cholera, and smallpox constituted the dominant health hazards accounting for a sizeable proportion of total deaths in the erstwhile princely States of Travancore and Cochin. The severity of the major infectious diseases in these two States was, however, brought down during the first four decades of the present century. By 1920-'21, the epidemic of plague seems to have disappeared from the scene. The decline in mortality from infectious diseases continued even after the 1940s, the most dramatic fall having been achieved in deaths from cholera. The fall was continuous in the case of smallpox too; but it was eliminated only by the end of the 1980s (Ibid, pp. 32-34). The extent of decline in the deaths from the so-called 'fevers' during the first four decades of the century was also remarkable. Up to the 1940s, fevers claimed more than a quarter of the total deaths. Since then deaths due to fevers were declining steadily and sharply. This steep decline in deaths may presumably be mainly due to a sharp decline in deaths due to malaria in response to the active malaria control measures initiated in the late 1940s in Travancore-Cochin areas.

The second generation infectious or communicable diseases include respiratory infection, diarrhoeal disorders, skin infections, and gastro-enteritis. Not that these had not incurred earlier. Data on morbidity pattern gathered from the PHCs in four selected villages and three rural hospitals bring out some broad similarities. For instance, both at the four PHCs and the two out of the three rural hospitals, respiratory infections were the diseases for which the largest proportion of the outpatients were treated; the proportion of out-patients with respiratory infections ranged from 23.1 per cent in one non-coastal village to 35.2 per cent in a coastal village with PHCs.

"Understandably, the infection rate is the highest in the coastal villages where the problems of overcrowding and environmental sanitation are at their worst". Respiratory infections constituted the largest category of illness in two of the three rural hospitals. Next in order, in terms of the proportion of the total number of outpatients at the above centres, is diarrhoeal disorders. The incidence of diarrhoea ranged from 5.1 per cent to 13.6 per cent in the first group of villages with PHCs, while the range was between 11.1 per cent and 32.0 per cent of the total number of patients in the three villages with rural hospitals.

The information on 12 selected communicable diseases of children attended to at the SAT hospital during the 15 years (1964-1980) shows interesting patterns. The proportion of children with communicable diseases declined significantly over this period from 47 per cent in 1964-'65 to 35 per cent in 1980. The rates of decline were not, however, uniform for

all the diseases in the group. "The major share of the decline has been contributed by the reduction in diphtheria and enteric fever, for both of which more than 80 per cent decline has been recorded. The marked fall in the proportion of children with diphtheria can be attributed to the successful coverage of the children with triple vaccine and consequent increase in the immunity level of child population". The most significant aspect that emerged from the analysis is that 'diarrhoeal' and 'dysenteric' diseases did not reveal any declining trend during the period. Throughout the period, nearly one-fifth of all cases admitted was for gastro-enteritis. Given the substantial increase in medical care facilities achieved by the State during the period, one would expect a steady decrease in the proportion of children admitted for gastro-intestinal infection at this apex institution. On the contrary, the proportion of gastro-intestinal infections does not record any change at all. Gastro-intestinal infections remained one of the major illnesses among children in Kerala.

Respiratory infections contribute the other major share of illnesses among children. The share of respiratory infections to childhood morbidity is strikingly close to that of gastro-intestinal infections throughout the period under reference (1974-'78). "The high prevalence of respiratory infectious also is related to overcrowding, intestinal parasitism, and environmental pollution".

The data on adult in-patients admitted to the Trivandrum Medical College Hospital (MCH) during 1963-1978 were gathered from the well-maintained Medical Records Library of the Medical College. Broadly speaking, the prevalence rate of communicable diseases among the adult population seems to be much lower than that among children (treated at the SAT Hospital). A lower rate of incidence of communicable diseases among adults than among children is a tendency observed elsewhere also. Among the nine communicable diseases of the adult population covered in the study, three diarrhoeal disorders - gastro-enteritis, diarrhoea, and dysentery - were the most common. The proportion of patients treated for diarrhoeal and dysenteric disorders during the period worked out on the average to 80 per 1,000 admissions. Evidently this proportion was smaller than the corresponding proportion for children treated at SAT hospital, viz 200 per 1,000 child patients. The persistence of diarrhoeal and dysenteric disorders among the adult population highlights the poor quality of the environments, particularly in relation to drinking water and safe disposal of human excreta".

Next in the order came tuberculosis; the combined total of respiratory and non-respiratory tuberculosis works out to 52 per 1,000 admissions on the average for the period as a whole. The number (of the combined total) steadily declined from 60 per 1,000 admissions during 1963-'68 to 52 during 1968-'73 and 44 during the past quinquennium. Despite decline, tuberculosis ranked second in terms of the proportion of patients treated for communicable diseases at the Medical College Hospital. Enteric fever is another category that registered a small but steady decline, from 28 to 23 per 1,000 admissions.

### ***Chronic Diseases***

Among chronic diseases, cardiovascular diseases, cancer, hypertension, and diabetes emerged

at the top. At the MCH, Trivandrum, for instance, cancer emerged at the top followed by cardiovascular diseases. The proportions of patients treated for cancer and cardiovascular diseases at the MCH during 1962-'63 came to 12.1 per cent and 8.8 per cent respectively; these proportions increased to 16.3 and 9.8 per cent in 1971-'72. Apparently, the number of cancer patients seeking treatment at the MCH has increased more steadily and steeply than of patients suffering from cardiovascular diseases. Strangely enough, this trend seems to have reversed in the subsequent period. The proportion of cancer patients declined to 12.7 per cent in 1977-'78, the latest period for which data could be compiled, while that of cardiovascular patients registered a moderate increase to 11 per cent in 1977-78. Obviously, there is no causal relationship between these opposite trends. While there is a strong reason to presume a rising trend in the absolute number of persons suffering from these two chronic diseases in the State as a whole, there could be also factors which contribute to decline in their relative proportions in the MCH such as options of alternative medical institutions. Moreover, the terminal period ending 1977-'78 is too remote a period to warrant any generalisation in 1999.

A break-up of the cases of cardio-vascular diseases reveals some interesting features. Cardio-vascular diseases comprise rheumatic, hypertensive and, ischaemic heart diseases, cerebro-vascular accidents, peripheral vascular diseases, and miscellaneous heart diseases. A comparison of the proportions of patients suffering from cardiovascular diseases treated at the Trivandrum MCH in 1978 (presented in Table IV.19: 85) and the corresponding data for 1980 from a private institution, (the Pushpagiri Hospital, located at a mofussil town, Tiruvalla) yielded interesting results. In the MCH, the share of rheumatic heart disease (RHD) came to 24 per cent of all cardiovascular cases admitted, closely followed by ischaemic heart disease (IHD), 21.6 per cent, hypertension heart diseases (HHD), 11.6 per cent; and cerebrovascular accidents (CVA) 15.3 per cent while degenerative disease of peripheral vessels contributed 20 per cent. In the private hospital, the proportion of patients treated for rheumatic heart disease is much smaller. On the other hand, ischaemic heart disease and hypertensive heart disease claim significantly higher shares. These three diseases, viz IHD, HHD, and CVA, together constitute 80 per cent of all heart disease cases treated at the Pushpagiri Hospital, while such cases accounted for only 49 per cent of the total number of cases of heart diseases treated at the MCH. It is worth noting in this context that while MCH, being a government institution, gives almost entirely free treatment, Pushpagiri is a private hospital which charges patients for treatment at market rates. This difference is likely to be reflected in the types of diseases and socio-economic conditions of patients seeking treatment in the two hospitals.

The main findings of the above study are summed up as follows:

“The picture emerging from the foregoing discussion of the present health status in Kerala is a mixed one. On the one hand, the mortality rate is low, and even comparable to the levels obtained in high-income countries. On the other hand, morbidity rate is high. As for the pattern of morbidity, the picture is again a mixed one. The dominant disease group resembles that of typical underdeveloped countries. At the same time, the emergence of atherosclerotic heart disease and of degenerative and metabolic diseases as major causes of mortality resembles the situation in developed countries.

However, the persistence of the diseases of poverty and deprivation side by side with the emergence of the diseases of affluence will lead to an unequal competition for the allocation of scarce resources, posing a serious challenge to health planners, in the years to come. In brief, the health status of Kerala presents an interesting picture of a low overall mortality co-existing with considerable morbidity, mostly caused by diseases linked to underdevelopment and poverty”.

The findings of two other studies broadly conform to this main thrust. Gopalakrishna Kumar examines the puzzle posed by Kerala’s health transition, viz the persistence of high morbidity in an environment of low mortality. As he stated it, “the persistence of high morbidity in a region which has seen spectacular success in the field of health policy may at first glance be deemed surprising and unfortunate; on reasoned reflection it may well appear to be just another facet of its success in controlling the scourge of so many millions in India and elsewhere, namely, premature mortality” (Gopalakrishna Kumar, 1991). Results of the KSSP survey on health status in rural Kerala showed that morbidity rose substantially between 1978 and 1987, from 71.21 to 206.39 per 1000 population; the prevalence rate of chronic illness also increased from 83.63 to 138.02.

In a critical review of the study by Panikar and Soman, Kerala’s Health Status, Krishnan made the following observations: “The absence of the theoretical framework for analysing health transitions has led to some misunderstanding in interpreting the levels and relative changes in morbidity in Kerala. The study by Panikar and Dr Soman was one of the earliest to analyse the morbidity data on Kerala but they reached the following conclusion: ‘In brief, the health status of Kerala presents an interesting picture of a low overall mortality coexistence with considerable morbidity, mostly caused by diseases linked to underdevelopment and poverty’. We believe that this is a hasty judgement on the status of health in Kerala drawn on the basis of limited information and does not reflect the complex mechanism and time lags involved in an epidemiological transition” (Krishnan, T.N., 1991, p11).

He has also critically examined the other studies on Kerala’s health status, especially by Gopalakrishna Kumar and KSSP, the main findings of which were the prevalence of high morbidity side by side with low mortality. In his assessment “all these studies imply that the level of absolute morbidity was higher in Kerala and that the Kerala health status presented a paradox.

“However, none of these studies indicate what were the morbidity norms for various diseases against which the morbidity rates in Kerala were to be compared. Their conclusions have been arrived primarily on the basis of inter-State comparisons of morbidity almost solely collected by the National Sample Survey, at a single point in time, and somewhat supplemented by hospital attendance data. This conclusion may not be valid because we are not comparing similar ecological, environmental, and socio-economic situations” (Krishnan T N).

In this connection, the observations of Professor Amaryta Sen in a recent lecture given at CDS are interesting (B.G. Kumar Endowment Lecture, CDS, 1996).

“Kerala has the remarkable feature of being, among all the Indian States, the State with both (i), the least mortality rates, and (ii), the highest morbidity rate... Two issues immediately arise: First, can these findings both be correct? Second, can these data serve as good guides to what we are seeking to examine in the direct assessment of levels of living? The first question is not easy to tackle, but it can, in fact, be answered and this, among other things, Gopu did, in fact, decisively so. He showed that, if the quality and coverage of medical attention is extremely good, it is possible for the population of a state to suffer from various adverse conditions in terms of health and nutrition - reflected in high incidence of illness and morbidity - and still have a very low mortality rate. With a relatively low personal income per head, the nutritional inadequacies, based on deprivation of food and nutrients, can be considerable, leading to proneness to illness of various kinds. The situation can be made worse by adverse climatic conditions, such as long rainy seasons. But despite the illness and indifferent health conditions, people may not have a high death rate if medical attention help people to overcome these adversities. Thus, high morbidity and low mortality can coexist precisely because of wide coverage and generally good quality of health care in Kerala. Since we do have independent evidence to indicate that health care does have a wide coverage in Kerala and also of reasonably good quality (certainly in comparative terms), reconciling the observed morbidity and mortality data with each other is distinctly possible” (Amartya Sen 1996, p. 14).

In a more recent study initiated by the Kerala Sastra Sahitya Parishad (KSSP), Kannan, et al have attempted a comprehensive analysis of the different dimensions of the health status of Kerala covering demographic profile, morbidity and disability, maternal and child health, health care system, etc (Kannan K.P., Thankappan K.R., Ramankutty V, and Aravindan K.P. : 1991). The focus of the study was on health and development in rural Kerala. The study is mainly based on primary data collected through a health survey covering all the panchayats in this State. A detailed questionnaire was prepared, and pre-tested before canvassing it in the sample households. The questionnaire covered such diverse aspects as demographic and socio-economic dimensions, environmental and sanitation aspects, and health status of the sample population including morbidity and mortality. Training camps were organised using the services of experts from KSSP. As KSSP has been actively involved in rural development, including health, for more than 35 years in the State, they were able to identify and entrust the field survey to competent and well-motivated local investigators from the study areas themselves. The health survey was conducted during July 1987 in two stages: Stage I was the survey of sample households and stage II was the census of health care institutions in all the panchayats in Kerala.

As for the pattern of morbidity, the picture emerging from the findings of the health survey is a mixed one, similar to the picture which emerged from the study by Panikar and Soman; the morbidity profile combines acute infectious (or communicable) illnesses and chronic degenerative diseases. Communicable diseases account for 65 per cent of the total morbidity episodes. Fever and diarrhoea are the dominant acute illnesses. The rate of occurrence of fever is estimated at 115.5 per 1,000 persons, about 55 per cent of total diseases. Next in the order comes diarrhoea with an incidence rate of 22 per 1,000, accounting for about 10 per cent of total illness.

The analysis of the health survey data was well designed. The sample households were divided into groups on the basis of socio-economic status (SES) and environmental status (ENS). The SES characteristics included per capita income, land ownership, educational attainment, and housing conditions. Each of these criteria was subdivided into four strata. For eg in terms of per capita income, households were divided into four groups; < Rs 100 per month, > Rs 100 but < Rs 190; > Rs 190 but < Rs 250, and > Rs 250. The distribution of the sample households into four SES under each of the criteria was worked out. All these characteristics were used to construct an SES grouping for the rural households, the underlying reason since no single indicator would be able to capture the socio-economic status unbiasedly. "The under-reporting of income could be counterbalanced, to some extent, by distribution of land ownership. Further the housing condition would be a visible indicator of the socio-economic status of the households".

A separate status grouping of households based on environmental sanitation (ENS) is added to the SES. For this purpose six characteristics were selected, viz (i) cooking devices, (ii) source of drinking water, (iii) sanitary facility, (iv) disposal of waste water, (v) disposal of solid wastes, and (vi) existence of stagnant water in the surroundings. Households were ranked according to the level of each of these characteristics. "A composite environmental status (ENS) for the households were constructed by taking into account the above mentioned six characteristics". Weights were assigned to the various characteristics in the construction of the composite SES and SNS tables, depending on the relative importance of each characteristic in the determination of the health status of a given group. For instance in SES, the weights assigned were (i) 0.35 for income, (ii) 0.25 for education, (iii) 0.25 for housing, and (iv) 0.15 for food. For constructing the composite ENS, the weights assigned were: (i) 0.10 for cooking device, (ii) 0.35 for source of drinking water, (iii) 0.25 for sanitary facilities, and (iv) 0.10 for waste water disposal.

Morbidity rate in Kerala remained significantly above the national average. According to the results of the survey under the Sample Registration Scheme (SRS) during 1974, morbidity rate in Kerala came to a little over 71 per 1,000 people, the highest among all the major States and more than three times the all-India average of about 23 per 1,000 persons. According to the results of the health survey under KSSP, the average morbidity rate in rural Kerala in 1987 worked out to 206.39 per 1,000 people. Acute illnesses (presumably a synonym for infectious or communicable diseases) included diarrhoea, fever, malaria, filaria, diphtheria, measles, etc. Of these, diarrhoea (22 per 1,000 people) and fever (18.5 per 1,000 persons) are the two leading diseases; together they account for about 65 per cent of total illnesses. The prevalence of chronic diseases according to the results of the KSSP health survey is estimated at 138.02 per 1,000 people, more than one-and-a-half times the earlier estimate based on the SRS data of 1974. Among chronic diseases, bronchial asthma, bone and joint ailments, and hypertension are the leading items. The share of bronchial asthma, hypertension, bone and joint ailments came to 11.27 per cent, 8.05 per cent, and 12.44 per cent respectively. In contrast, the proportions of persons suffering from some leading chronic diseases like heart disease, cancer, and diabetes are relatively small, viz 3.38 per cent, 0.63 per cent, and 2.31 per cent respectively. In this connection, a comparison of the prevalence rates of acute and chronic diseases in different SES groups brings out interest-



ing results. The average prevalence rate of acute illnesses for all SES groups together (206.3) was about one-and-a-half times that of chronic diseases (138). The prevalence rates of both acute and chronic diseases decline with higher SES; but the rate of decline is steeper in the case of the former, by a little over twice that of the latter. The variation in the prevalence rates of some leading diseases across the SES is equally interesting and significant. Thus, the prevalence rates of some common ailments, the so-called diseases of poverty, such as diarrhoea, fever, tuberculosis, asthma, and gynaecological infection declined steadily across the four SES strata. On the contrary, the prevalence rates of chronic diseases, the so-called diseases of affluence such as diabetes, heart disease, and hypertension, steadily increased with increase in the SES.

Equally significant is the variation in the prevalence rates of acute and chronic diseases across the four ENS strata. In the case of both groups of diseases, the decline in prevalence rate with better environment is evident. "The differences between environmental statuses 1 and 4 acute and chronic diseases are 73 per cent and 28 per cent respectively, which are comparable or slightly more than the differentials obtained with socio-economic classes" (Ibid. p. 83).

In this connection it may be noted that, according to available data, the prevalence rate of chronic diseases in Kerala is significantly higher than that in all other States in India. According to the results of the 17th round of the National Sample Survey (NSS), the prevalence rate of all chronic diseases together in Kerala came to 8,358 per 1,00,000 persons, as against the all-India average of 2,098 (Sarvekshana, 1980, Table.7). In a recent study, the hypothesis on the association between demographic and epidemiological transitions and their medical care implications was tested with special reference to Kerala (Panikar, Soman, and Ramankutty 1996).

Empirical verification of a hypothesis like this had to be based on primary data, thanks to the limitations of all available data from secondary sources. Therefore, a sample survey of 1,000 households each from three districts, viz Thiruvananthapuram, Alappuzha, and Malappuram, was conducted by canvassing two schedules from the sample households. Of the two schedules, the first covered a wide range of questions on demographic and socio-economic aspects such as size of the household, age and sex, education, occupation, monthly consumption expenditure, type of dwelling, and water supply and sanitation. Among the major factors that affect the physical quality of life are variables related to immediate living environment.

The more important variables in this category are (i) sources of drinking water, (ii) sources of water for bathing, (iii) arrangements for the disposal of waste water, and (iv) type of toilet facilities. The second schedule included questions relating to the health status of the members of the households including incidence and prevalence of diseases, nature of illness, response to sickness, type of medical institution resorted to, and the type of medicines taken, and cost of medical care.

Efforts were made to minimise errors of reporting. Information on morbidity was collected

through fortnightly visits, using recall method. Voluntary reporting of illness episodes was validated by cross-checking with symptoms present in a checklist provided to each investigator. With the help of the checklist, it was possible to categorise the constellation of symptoms to a specific disease category, either chronic or acute. With these precautions, the morbidity data presented in this study are presumably the nearest possible approximation to the real situation in the study areas.

Data on morbidity in the sample households have been collected in four rounds with a reference period of two weeks each, spread over one year so as to capture inter-seasonal variations in morbidity. Due to some errors discovered in the data in one of the rounds, the entries for that round were left out and the data presented in the report are drawn from three rounds. The presumption was that this omission might not distort the picture from the true pattern of morbidity. An attempt has been made to categorise morbidity into acute and chronic diseases. Under both the groups, diseases are broken down to medically defined categories. During the analysis, care was taken to find out the coexistence of more than one disease condition in the same individual. The proportions of people suffering multiple conditions have been worked out and their significance assessed.

The prevalence rate of chronic diseases as a group shows a dramatic increase among the old (60 years and above); the average rate for the three rounds and the three study areas together working out to 22.42 per cent, about 11 times the average rate for children (2.05 per cent) and a little over four times the rate (5.44 per cent) for those in the age group 15-59 years. The pictures that emerged from the three rounds in each of the study areas were consistent with one another.

While canvassing the information on chronic diseases, efforts were made to catalogue these into medically definable conditions, wherever possible. The seven disease conditions into which entries under the group of chronic diseases are classified include Asthma, Blood pressure, Body/Back pain, Diabetes mellitus, Heart disease, Rheumatic diseases, and Tuberculosis. The average prevalence rate of all chronic diseases for all persons together tends to rise almost steadily across all age groups. Among the chronic diseases, blood pressure, asthma, diabetes mellitus, and heart disease were found leading in terms of the proportion of the old suffering from this group of diseases. However, as pointed out in the study, the reported prevalence of diabetes mellitus and high blood pressure among the elderly in these study areas, especially Alappuzha and Malappuram, does not reflect the magnitude of the problem truly. The prevalence rates of diabetes mellitus among the elderly in Thiruvananthapuram, Alappuzha, and Malappuram are 8.85 per cent, 2.26 per cent, and 3.87 per cent. The corresponding proportions for blood pressure are 18.95 per cent, 9.45 per cent, and 9.15 per cent. As observed in this context: "Field studies carried out in rural areas using objective criteria indicate that the real prevalence rate of hypertension among the elderly should be 20 per cent, and diabetes about 10 per cent. The under-reporting is understandable, since a significant proportion of these cases remain undiagnosed in the community".

The incidence of acute illnesses presents a different picture from that of chronic diseases, and naturally so. For instance, the association between age and incidence of acute illnesses

is the highest among the age groups 0-5 years in Thiruvananthapuram and Alappuzha samples; it is not so with the sample from Malappuram.

The pattern of variation across age groups is not found to be consistent across the study areas. Thus, the incidence of acute illnesses declines steadily across all age groups in Thiruvananthapuram; the trend is reversed in the other two study areas with the age group 60 years and above. "Apparently, the high incidence of acute illness among the elderly is not an aberration, but is consistent with the current medical perception, viz that as age advances there is a decline in body immune function, compounded by the fact that generally nutritional status of the elderly is poorer than that of the young adults".

To sum up: Kerala has made significant advance in health transition as reflected in the stages of demographic and epidemiological transitions in the State. The crude death rate and infant mortality rate and life expectancy at birth in Kerala are comparable to those in the high-income developed countries. Though the morbidity profile continues to be dominated by acute communicable illnesses, degenerative, chronic diseases, the so-called "diseases of affluence" are emerging on a significant scale. What are the factors underlying this morbidity profile? To this question we turn next.

#### **4. Factors Underlying the Health Transition in Kerala**

We have seen earlier that a plausible connection can be hypothesised between health and a wide range of factors such as national income per capita, health service inputs, biological factors including fertility and nutrition, inputs into social services other than health including education, water supply and sanitation, etc. (Cumper, 1980: 2) We shall proceed to examine the trends in some of these variables in Kerala and their likely influence on the improvement in the health status of the State's population.

##### ***Level of Income and Health***

The association between income and health is obvious. The level of income is a determinant of several factors that have a proximate connection with health such as standard of living including food intake, education, housing, electricity, water supply, and sanitation. On the other hand, poverty and ill-health are closely associated. The level of knowledge on matters related to health and responses to morbidity episodes, recovery, and rehabilitation of a person are all affected by his/her level of income. The economic and social origins of ill health are a part of the received doctrine widely covered in the literature (eg Lerner, 1969).

The authors of *Health Status of Kerala*, had examined the available sources of data on average income per capita and the pattern of its distribution among different classes in the erstwhile State of Travancore. According to the data available, apparently the average level of income was insufficient to fetch even the bare necessities of life. As for the distribution of income, a little over one-fifth of the families had an annual income of less than Rs 60, and three-quarters of the families had income below Rs 180 per year, the poverty line. (Panikar,

and Soman, 1981: 13). The situation did not seem to have improved much in the period following the formation of the State of Kerala.

According to the results of a socio-economic survey conducted by Bureau of Economics and Statistics, the income per head in nearly three-fifths of the households of Kerala came to Rs 300 per year in 1968. At 1968 prices, this level of income ie Rs 25 per capita per month, would not have been sufficient even to have the bare necessities of life. The distribution of income was also quite unequal; the average income of the top 5 per cent of households was higher than that of the bottom quintile by a factor of 11.

Estimates of per capita income for the subsequent periods are now available in the annual publication of the State Planning Board (Economic Review). However, the estimates have been revised several times, changing, the base year. Thus, we have one series of per capita income at constant prices for the period 1970-'71 to 1980-'81 with 1970-'71 as the base year, another (new series) for the period 1980-'81 to 1995-'96 at 1980-'81 prices and a third series and revised estimates for the same period with the same base year.

According to the latest revision, the per capita income in Kerala at constant (1970-'71) prices increased from Rs 567 in 1970-'71 to Rs 590 in 1980-'81. While the decimal increase in State income per capita at constant prices during the 1970s was barely four per cent, the increase during the subsequent periods was quite impressive. Thus, State income per capita at constant (1980-'81) prices increased from Rs 1,444 in 1980-'81 to Rs 1,815 in 1990-'91 and Rs 2,353 in 1995-'96. These variations work out to 25.69 per cent during the eighties and 29.69 percent in the first half of the nineties.

These are no mean accomplishments. If these estimates are correct, they should be reflected in the living standards of the State population. Among other things, an improvement in living standards will be brought out in the nutrition level of the population.

### ***Nutrition Status***

The nutrition level in Kerala had attracted a great deal of attention, thanks to the pioneering study on Poverty in India (Dandekar and Rath, 1971). According to this study, Kerala had the highest proportion of population below the poverty line in 1961-'62, viz 91 per cent of the rural and 89 per cent of the urban population. The cut-off point for defining the poverty line was the requisite minimum of calorie intake, ie 2,250 Kcal per day. The statistical basis of estimation was the data on consumer expenditure, including the quantum of food intake, during 1961-'62 collected by the National Sample Survey (17th round). According to this data, the intake of calories in Kerala during 1961-'62 came to 1,620 Kcal per day, the lowest among all the States covered by the NSS. The above assessment aroused widespread reactions among academics and policy makers.

One such reaction to the above assessment is a study brought out by the Centre for Development Studies (CDS). Sponsored by the United Nations, and under the leadership of Prof. K.N. Raj, the CDS initiated in the early 1970s a comprehensive analysis of poverty and

selected issues like nutrition, unemployment, land reforms, and public distribution system with special reference to Kerala (United Nations-CDS, 1975). As the index used for the measurement of poverty in the study by Dandekar and Rath was calorie intake per capita derived from the data on consumer expenditure, one of the main issues on which the CDS study focused its attention was the level of nutrition in Kerala. A critical examination of the data from consumer expenditure surveys like that by the NSS brought out serious discrepancies as reflected in the over-reporting of some items of food and under-reporting of other items of food. It was noted that the estimation of the national aggregate of cereal consumption was higher than the official estimate of production; on the other hand, under-reporting of some other food items like home-produced and subsidiary food items was also evident. Under-reporting and over-reporting of food consumption are likely to have occurred in the case of Kerala also. Thus, the reported consumption of cereals, particularly rice, exceeded its estimated availability; the estimate of the consumption of tapioca, on the other hand, was considerably less than its total production. It would therefore appear as though consumer expenditure surveys fail to take into account all items of food consumed (United Nations-CDS, 1975).

In this context, an attempt was made to generate fresh data on the availability of different items of food in the State. A comprehensive picture of the availability of food could be obtained from the food balance sheet of a country or a region. Taking the 1960s as a whole, the available supplies of different food items, on the basis of the food balance sheet covering this period, yielded an average of 2,339 calories per capita per day, ranging from 2,234 to 2,314. The availability of proteins came to about 38 g per capita per day, ranging from 34 g to 41 g. That the estimates of calorie supply derived from food balance sheets are not without shortcomings was duly acknowledged. The lack of data on the local production of certain items like vegetables and fruits, and information gap on imports from other States through private trade of items such as pulses, oil seeds, sugar and jaggery, would have affected the estimates of the available nutrient values. "In brief, there are significant omissions in the food balance sheets and the estimate of per capita intake of calories at 2,339 per day ie, if anything, likely to be on the low side... the important point to note is that the per capita availability of calories in Kerala is not less than either the national average or the estimated requirements for the State's population".

Since the formation of the State of Kerala in 1956, the Nutrition Division of the Public Health Laboratory had been carrying out regular diet surveys, using weighment technique. As per the result of these diet surveys it emerges that the intakes had been consistently lower than the recommended allowances of 2,400 Kcal of energy and 55 g of protein per CU during the period 1950-'70 (Panikar and Soman, 1981: 24). The findings of food consumption surveys conducted by other agencies also bring out nutrition deficiencies among all groups of the population of the State. For instance, a study conducted by the Protein Foods Association of India in 1995 indicated that the per capita intake of energy in the State was only 1,713 Kcal. The consumption of protein also indicated similar order of deficiency. In sum, the study observed that "the data available on food consumption by the people lead us to the inescapable conclusion that the people in this State have been through out taking diets low in energy and protein" (Panikar and Soman, 1981:28).

Anthropometric measures like growth in terms of height and weight by age comprise a better index of nutrition status. The programme of periodic measurement of the growth status of children in Kerala had an early start, from the middle of the 1930s. The results of these surveys revealed considerable growth retardation in terms of stunting and lower body weights. Since the formation of the Nutrition Division in the Public Health Laboratory, physical measurements of school children were conducted from time to time. The picture emerging from the data is that considerable growth retardation existed among children; both stunting and wasting (deficiency in height and weight) were noticed (United Nations-CDS, 1975, Table II.17, p. 28). The conclusion drawn from the scrutiny of all available data is as follows: "In sum, the impression one gathers from a close examination of the available data on nutritional anthropometry appears to corroborate the conclusion drawn from the food consumption data. Growth retardation, in the form of stunting and wasting, is evident throughout the period under review. As for secular trends in physical growth, the picture emerging from the time series data is rather mixed. *A priori*, improvement in nutritional status, as reflected in gain of height and weight, is possible with control of infection, and with no increase in food intake.

"In Kerala, thanks to easy accessibility and greater use of medical care facilities, prompt curative intervention in the event of even minor illness has become a common practice. Moreover, various immunisation programmes have enlarged in coverage, improving the resistance to infection. This ensured better utilisation of nutrients, on that account alone an improvement in growth measurement is to be expected. The convincing decline in the prevalence of vitamin-related deficiency signs certainly indicate a qualitative improvement in the diet and/or improved utilisation of nutrients consumed" (United Nations-CDS, 1975: 30-31).

The National Nutrition Monitoring Bureau (NNMB) has been collecting data on diet and nutritional status (clinical and anthropometric) of representative population groups on a continuous basis. A team of trained medical officers and nutritionists, using a standard protocol prepared by the Central Reference Laboratory collects the data. In each of the eight selected States where an NNMB unit is located, 500 rural households are covered every year for diet and nutrition survey.

In 80 per cent of these households, food consumption levels are assessed by one-day weighment method of diet survey, wherein the investigator weighs all the raw foods used in cooking by the family for the day. The total amounts of nutrients such as energy, protein, vitamins, and minerals are derived by referring to the Food Composition Tables of Indian Foodstuffs (NNMB, 1991, p.1). Results of the surveys conducted every year are published as Annual Reports of NNMB.

The Report of Repeat Surveys (1988-'90) includes estimates of average consumption of food stuff, average consumption of nutrients per CU per day, protein and energy intakes by different income classes, by various occupational groups, and average nutrient intakes by pre-school children. Mean anthropometric measurements of males and females of different age groups are also presented. The estimates of the above items are presented separately for each of the selected States as well as the average for all States pooled.

The estimates of average consumption of nutrients such as energy, protein, calcium, iron, and Vitamin A, for the selected States covering two periods, 1975-'79 and 1988-'90, are presented in the Report of Repeat Surveys (1988-'90). One of the important conclusions that emerge from this data is that the consumption of energy and proteins among the Kerala households is significantly lower than the recommended daily allowance (RDA). Thus, in 1975-'79 and 1988-'90, the average intake of energy by rural households in Kerala came to 1,978 and 2,140 Kcal, as against the RDA of 2,350 Kcal; the average intake of proteins in the Kerala households turned out to be 46 g and 53 g, as against the RDS of 60 g. Moreover, the average consumption of both the nutrients in Kerala in the latter period was lower than those of all other States, except Tamil Nadu.

The data on consumption of energy and proteins per CU per day in Kerala and the sample States pooled during 1975-'95 are presented in Table 4.1. The trends in the intake of both energy and proteins in Kerala reflect almost steady increase over the two decades. The trends with energy and protein intakes among all the selected States taken together seem to have been in the opposite direction.

**Table 4.1 Intake of Energy and Protein: (per CU per day Protein [g])**

Year	Energy		Protein	
	Kerala	States pooled	Kerala	States pooled
1975	1926	2296	45	64
1976	2052	2368	47	66
1977	1722	2306	41	62
1978	1805	2341	43	63
1979	2019	2366	46	62
1980	2158	2404	50	52
1981	2158	2409	—	64
1982	2203	2243	56	59
1990	2140	2283	53	62
1992	2055	2136	53	53
1995	2231	2172	57	56

Source: NNMB Report of the Report Surveys (1968-1990)

The data on consumption of energy and proteins per CU in the seven selected States are presented in the Table 4.2.

**Table 4.2 Average Consumption of Nutrients per CU per Day**

States	Energy (Kcal)		Energy adequate		Protein (g) per CU		Protein adequate	
	1975 -79	1988 -90	1975 -79	1988 -90	1975 -79	1988 -90	1975 -79	1988 -90
Andhra Pradesh	2497	2340	67.7	58.5	59.8	55.7	88.5	82.6
Gujarat	2162	2375	50.3	52.7	64.2	69.3	92.8	92.8
Karnataka	2932	2431	82.1	62.1	79.3	65.4	96.7	91.4
Kerala	1978	2140	39.0	39.7	46.4	52.9	69.7	71.5
Madhya Pradesh	2283	2614	55.1	78.4	71.5	82.5	97.0	96.0
Maharashtra	2300	2211	56.5	49.5	69.5	61.7	90.2	88.0
Tamil Nadu	2275	1871	54.8	32.1	54.8	45.6	83.0	62.1
States Pooled	2340	2283	58.0	53.3	62.9	61.8	88.2	83.5
RDI	2350				60.0			

NNMB, Report of Repeat Surveys (1988-'90), Table 4 (p.50), 7 (p.52).

The average intake of energy in Kerala, 1,978 Kcal, was found the lowest among the selected States during 1975-'79; Kerala's position was the second lowest in 1988-1990, namely 2,140 Kcal. Similar is the case with the intake of proteins during both the periods, viz 46 g and 52 g. The proportion of energy-adequate houses in Kerala worked out to be around 39 per cent during the two periods, the lowest during 1975-'79 and the second-lowest during the 1988-1990. As against this, the proportion of protein-adequate households in Kerala during the two periods is considerably higher, around 70 per cent. The ranking of Kerala in terms of proportions of households with protein adequacy is similar to that of caloric intake, ie the lowest percentages. Thus, Kerala ranks the lowest among the selected States in terms of the absolute level of average intake of calories and proteins, and the proportions of energy-adequate and protein-adequate households. It would look as though Kerala had the highest proportion of undernourished households; ie households with inadequate intakes of calories and proteins, judged in terms of the RDA. Whether the RDA itself is sanguine, valid or alterable is, however, a moot question.



The proportion of households with adequate energy and protein intake in Kerala registered a moderate increase between the late 1970s and the 1980s, as may be seen from Table 4.3.

**Table 4.3 Distribution of Households according to Protein-Energy Adequacy Status (per cent)**

State	1975 -1979		1988-1990	
	E+	P+	E+	P+
Andhra Pradesh	67.7	88.5	58.5	82.6
Gujarat	50.3	92.8	52.7	92.8
Karnataka	82.1	96.7	62.1	91.4
Kerala	39.0	69.7	39.7	71.5
Madhya Pradesh	55.1	97.0	78.4	96.0
Maharashtra	56.5	90.2	49.5	88.0
Tamil Nadu	54.8	83.0	33.1	62.1
State Pooled	58.0	88.2	63.3	83.5

Note: E + = Energy adequate; P+ = Protein adequate; Source: NNMB (1991), op.cit., Table 7, p.52.

Certain significant aspects in the inter-State differences in the proportions of households with adequate intake of calories and protein may be noted from the Table. There is considerable disparity in the level of intake of energy, which ranged between 39 per cent in Kerala and 82.1 per cent in the neighbouring State of Karnataka. The implication of the low proportion of energy adequate households is serious; Kerala had the highest proportion of undernourished households, ie households with inadequate intake of energy and proteins. A more disturbing trend is the widening of this range of disparity; the highest proportion of households with adequate energy intake during 1988-1990 being Madhya Pradesh, 78.4 per cent compared to 39.7 per cent in Kerala. Equally significant is the decline in the proportions of households with energy and protein adequacy in the majority of the selected States.

A scrutiny of the intake of nutrients, especially energy and proteins, by the population by sex and age is essential to get a better understanding of the nutrition status vis-a-vis requirement. The rationale of such an analysis is obvious, because nutrient needs vary with age, and the body growth varies in response to the level of nutrient intake. This is especially true during the critical phases of growth, the period prior to a person crossing the threshold of childhood, ie around 18/19 years. The data on the intake of nutrients by children under different age groups are presented in Table 4.9

**Table 4.9 Average Intake of Nutrients in Different States: Per Capita per Day (Boys and Girls)**

States	1 - 3 Years				4 - 6 Years		7 - 9 Years			10 - 12 Years			13 - 15 Years				Calories	
		Cal.		Pro.	Cal.	Pro												
Andhra Pradesh	873	21.8	1324	32.2	1459	34.2	1568	1638	38.3	34.4	1603	38.4	2035	1804	49.2	42.7	1920	45.9
Gujarat	706	19.3	1091	29.7	1383	38.7	1744	1540	48.4	44.2	1642	46.3	1860	1846	51.1	51.1	1853	51.1
Karnataka	801	20.6	1212	32.2	1583	40.1	1851	18709	46.4	49.5	1861	47.9	2160	2099	51.7	52.5	2130	52.1
Kerala	676	18.7	1069	30.2	1210	31.8	1463	1273	39.8	33.2	1368	36.5	1810	1527	46.1	41.1	1669	43.6
Madhya Pradesh	1018	29.4	1406	38.9	1670	47.3	1854	1577	50.9	45.3	1716	48.1	2242	2158	57.9	57.7	2200	57.8
Maharashtra	675	18.7	1132	33.7	1472	43.8	1903	1699	54.3	47.4	1776	50.9	2064	1699	59.1	20.1	1882	54.6
Orissa	775	20.2	1062	27.2	1309	32.5	1540	1556	38.8	38.7	1551	38.8	1930	2148	45.1	52.3	2039	48.7
Tamil Nadu	704	17.4	1027	26.8	1129	29.2	1304	1405	31.6	34.6	1355	33.1	1827	1802	43.1	42.3	1815	42.7
Average	779	20.2	1165	31.4	1401	37.2	1654	1564	43.6	41.4	1609	42.5	1991	1892	50.4	48.7	1942	49.6
RDI	1240	22.0	1690	30.0	1950	41.5	2190	1970	54.0	57.0	2450	2060	70.0	65.0	2640	2060	78.0	63.0

States	16 - 17 Years						18 Years And Above			18 Years And Above				
Andhra Pradesh	2345	2523	54.1	52.2	2434	53.2	2252	56.9	2584	60.2	1833	45.1	2071	47.6
Gujarat	2341	1731	66.2	46.5	2036	56.4	2192	59.1	2408	68.0	1885	51.4	1954	55.1
Karnataka	2595	2157	59.8	51.7	2376	55.8	2581	63.7	2682	58.1	2300	56.3	2428	61.9
Kerala	1959	1810	53.0	48.9	1885	50.9	2141	56.7	2293	59.0	1756	45.9	1796	38.8
Madhya Pradesh	2361	2298	65.9	62.5	2328	62.7	2311	57.5	2541	67.7	2126	57.0	2690	65.8
Maharashtra	2462	1857	71.2	50.5	2160	60.9	2105	60.6	2524	73.8	1703	47.0	1996	58.9
Orissa	2425	2462	61.9	55.7	2469	58.8	2631	68.0	2844	65.2	2307	56.4	2346	53.1
Tamil Nadu	2482	2066	59.5	51.0	2274	55.3	2125	52.3	2240	4.6	1726	42.7	1818	43.0
Average	2378	3066	61.6	51.0	2245	56.7	2292	59.4	2515	64.6	2161	56.3	2137	53.0
RDI	2425	60.0	--	2875	60.0	--	2425	75.0	2255	50.0	--	--	--	--

It is evident from Table 4.4 that the intake of calories and proteins by the boys and girls of different ages in Kerala is lower than the average of the consumption of these nutrients by the children of all the selected States taken together, as well as the RDI. In fact, the intake of nutrients by boys and girls in Kerala belonging to the age groups from 13-15 years upwards is the lowest. Moreover, the disparity tends to increase with the rise in the age group. Thus, the average intake of calories by children from Kerala in the age group 1-5 years, (676 Kcal), is lower than the all-State average (779 Kcal) by 103 Kcal; the difference increases to 191 Kcal in the age group of 7-9 years, 273 Kcal in the age group of 13-15 years, and 360 Kcal for the age group 16-17 years. The average intake of nutrients by girls of all age groups in Kerala is lower than that by boys, as in other States.

The main anthropometric measurements - height and weight - of persons, males, and females belonging to different ages in Kerala and other selected States are summarised in Tables 4.5a and 4.5b.

The most significant aspect of the two anthropometric measures is the fact that Kerala has emerged on top in both height-by-age and weight-by-age parameters of growth. While in younger ages also the boys and girls from Kerala are, by and large, ahead of their counterparts from the other selected States in respect of both height and weight, the leading position is maintained, if not improved, in all the relevant age groups, ie up to the age group 18-19 years, where for physiological reasons, growth stops. This better record in terms of body growth of Kerala children (1-19 years) would seem to be a paradox, when viewed against the background of their lower average intake of nutrients.

Conventional nutritional wisdom suggests that physical growth is determined principally by the quantity of food ingested. Particularly important in this context is energy and proteins intake. It is established that the average Indian diet provides amounts of protein of good quality, adequate for an individual's energy needs. Energy intake becomes the critical factor determining physical growth and development. Growth starts right from the very first day of infancy, and is virtually over by 18-19 years. Information on the height and weight of children and adults of selected years is furnished in Tables 4.5a and 4.5b.

Paradoxically, children of Kerala consume either the lowest or second lowest amounts of food, among children of all States surveyed by NNMB over the last 25 years, but show comparatively better growth indices. This is true for both males and females and at all ages. Two explanations may be offered for this paradox. First, the recommended intakes of food consumption are much higher than intakes optimal for balanced growth. Hence, the intake of Kerala's children, though appearing quite low compared to the recommended intake, may be adequate to support optimal growth. Otherwise, children of other States, with higher intakes than those of the children of Kerala ought to have shown better growth performance, but that is not the case. The second plausible explanation is that the food intake results in better utilisation for body building purposes in the case of children of Kerala. The principal determinant of efficient utilisation of food is freedom from morbidity. It may be safely argued that, thanks to the extensive network of hospitals, doctors and other health professionals, the rate of utilisation of health care facilities is the highest in Kerala among all the

**Table 4.5a Anthropometric Measurements: Heights in CM**

States	Age in years											
	0 - 1		5 Years		10 Years		15 Years		20-24Years		60 and above	
	M	F	M	F	M	F	M	F	M	F	M	F
Andhra Pradesh	64.3	63.9	104.1	102.8	128.9	130.3	153.6	153.1	164.0	151.9	161.7	147.7
Gujarat	63.8	63.0	98.9	99.8	128.5	125.9	151.2	149.6	163.5	149.2	160.5	147.0
Karnataka	65.1	64.6	100.7	98.0	127.7	126.2	151.4	153.2	165.6	152.6	161.1	149.1
Kerala	65.4	65.3	106.3	101.0	131.5	127.0	157.3	155.2	167.0	152.6	160.0	147.0
Madhya Pradesh	61.3	61.7	101.1	101.5	126.2	125.3	151.9	148.9	164.1	151.7	160.0	147.8
Maharashtra	61.8	61.9	99.8	99.0	125.9	127.3	155.5	150.2	163.6	151.9	161.3	148.1
Tamil Nadu	66.4	64.0	105.4	99.9	127.6	122.3	155.6	151.4	164.8	151.7	163.2	149.4
Orissa	71.6	68.7	103.3	100.4	128.3	129.0	159.3	149.7	161.2	150.4	160.9	140.6
States Pooled	64.3	63.4	102.1	100.4	127.9	126.8	154.3	151.7	164.0	151.5	161.0	147.9

**Table 4.5b Anthropometric Measurements: Weights in (Kg) N- Mean Weight Kg**

States	Age in years											
	0 - 1		5 Years		10 Years		15 Years		20-24 Years		60 and above	
	M	F	M	F	M	F	M	F	M	F	M	F
Andhra Pradesh	6.7	6.2	14.8	14.4	22.8	24.9	39.6	41.2	50.9	42.8	49.8	40.9
Gujarat	6.3	6.2	14.0	13.7	23.1	21.8	39.0	40.1	49.4	42.2	46.7	41.1
Karnataka	6.7	6.6	13.8	13.0	22.5	21.6	35.8	40.3	50.0	43.7	47.1	42.8
Kerala	7.4	6.8	15.8	14.1	25.3	21.6	40.5	42.5	52.7	46.1	50.4	45.1
Madhya Pradesh	5.1	5.6	14.0	13.7	22.5	21.4	39.4	38.7	49.2	42.4	46.2	39.9
Maharashtra	6.2	6.1	13.8	13.1	21.2	22.5	37.9	38.4	50.0	42.5	50.8	42.0
Tamil Nadu	6.8	6.2	15.2	12.9	21.8	20.3	39.0	40.2	51.7	45.0	52.5	42.2
Orissa	6.2	6.9	14.8	13.4	23.1	24.3	41.5	38.4	49.3	41.6	47.2	39.2
States Pooled	6.5	6.2	14.4	13.6	22.6	22.4	39.0	40.0	50.3	43.5	49.1	42.2

Source: NNMS (1991), op.cit

States of India. The high level of maternal literacy ensures that even minor illnesses are promptly treated, cutting down disease prevalence rates or the number of days of sickness. Prompt and adequate medical interventions appear to be the principal reason behind the pleasant paradox of low food intake and high nutrition status in Kerala.

### ***Environmental Factors***

Diseases of poverty due to adverse environment continue to afflict the majority of the low-income households in Kerala (Panikar and Soman, 1981). Incidence rate of diseases such as diarrhoea, fevers, respiratory infections, skin infections, worm infestations, and gastro-enteritis do not reflect any significant declining trend. The more recent KSSP study also brought out that acute illnesses like fever, diarrhoea, asthma, etc are still common. "Fever and diarrhoea are the commonest diseases and the morbidity rates due to these diseases from our survey is more than the total morbidity rate quoted for the most of India. Communicable diseases account for 68 per cent of the morbidity" (Kannan, et al, op.cit., p.68).

The factors underlying this group of diseases have been identified in the above studies include environmental status comprising source of drinking water, and sanitary facility. For instance, respiratory infections contributed the largest share of morbidity among the outpatients who visited the primary health centres (PHCs) at Poovar, Anjengo, Vilappilsala, and Kanyakulangara.

The infection rate was the highest among people in the coastal villages, (eg Anjengo) where the problems of overcrowding and environmental sanitation were at their worst. The prevalence of diarrhoeal disorders was also the highest in the coastal village, where overcrowding, lack of facilities for excreta disposal, and scarcity of drinking water provided an ideal breeding ground for water-borne diseases. Faecal contamination of drinking water and food are chiefly responsible for the spread of diarrhoeal disorders. Intestinal parasitism widely prevalent in Kerala is associated with an unfavourable environment (Panikar and Soman, 1981: 72-77).

No firm estimates of proportion of households in Kerala with access to safe drinking water and toilet facilities are available. It is understandable, given the nature of the variables involved. A typical village may have several sources of water such as wells, tanks, taps, bore-wells and pumps, canals, and rivers. It is difficult to guess which of these sources are safe.

Similar is the case with toilet facility. Given this ambiguity, estimating the proportions of households having safe drinking water and safe toilet facility is a difficult task. Naturally, therefore, the estimates of the proportion of households with safe drinking water, given in two official publications are found poles apart. Thus, as per the assessment by the Ministry of Rural Development, 61 out of the total 1,219 villages in Kerala had water supply even as on 1.4.1980: all the rest got the benefit of water supply during the VIth Plan and the VIIth Plans (Directorate General of Health Services, Health Information of India, 1993, Table 17.05: 256-57).

As against this, according to the estimate based on the 1991 Census, the proportion of the rural households in Kerala which had the benefit of safe-drinking water was just a little over 12 per cent (Office of the Registrar General, Census of India 1991, Housing and Amenities, 1991, Table.3.1: 44). The discrepancy may be due to the difference in the definition of the type of water; while the concept in the Census was more restrictive, limited to 'safe water' the Ministry of Rural Development might have used a wider connotation, ie water of all descriptions. Moreover, of all sources of data on household characteristics, the Census data seem to be the most reliable and comprehensive. After all, the Census, by definition, has total coverage - all the households in all the States - and decennial repetition. The size of the manpower and financial outlay involved is phenomenal. Despite the inherent limitations of such gigantic investigations, the census data are apparently more reliable for our purpose.

According to the 1991 Census, 18.89 per cent of the households in Kerala had access to safe drinking water; the proportions of rural and urban households during the same year worked out to 12.22 and 38.68 per cent respectively. The corresponding proportions at the all-India level came to 62.12 per cent, 55.92 per cent, and 81.59 per cent respectively. (Office of the Registrar General, Census of India, Housing and Amenities, 1991, Table 3.1, p. 44). It is incredible that the proportion of households having the benefit of safe water is much lower in Kerala than the national average. On the other hand, the position of Kerala households is reported to be better in terms of toilet facilities. In 1991, more than half the households had toilet facility. The proportion of households with toilet facility has been reported to be 51.28 per cent, (41.07 per cent in rural and 72.66 per cent in urban households). The corresponding proportions at the national level came to 8.84 per cent and 68.58 per cent. (Ibid, Table 5.5, Percentage of households having toilet facility in 1988 and 1991, p. 48).

The existence of a comparatively high proportion of the households, especially in the rural areas of the State where the vast majority live, without the benefit of safe water should be a matter of great concern. For, safe water is a critical component of health status; without this facility reaching all households, whatever advances are made in other sectors, would fail to bring in commensurate progress in health.

### ***Education***

One of the most important factors governing the health status of a population is its educational level. The positive association between education and health level is widely acknowledged. Education has a positive influence on both the chances of getting ill and the nature of the victims' response to the illness. A rise in the level of education contributes to a rise in health consciousness of the person or group of persons concerned, promoting personal hygiene, and stimulating prompt response to a morbidity episode, however, minor. The level of female education is particularly relevant since, it is the female members of a household who are, in general, more concerned with the health of its members, especially health of children. The level of education of women also influences decisions on antenatal and perinatal care, infant feeding and other matters governing infant and child health. These perceptions have been exemplified by the experience of Kerala vis-a-vis other States, as brought out in Table 4.6.



**Table 4.6 State-wise Literacy and Infant Mortality Rate**

States	Literacy rate 1991			IMR (per 1000 live births) (1992)
	Males (1)	Females (2)	Persons (3)	
Andhra Pradesh	56	34	45	71
Assam	62	44	53	76
Bihar	53	23	39	72
Gujarat	73	49	61	67
Haryana	69	41	52	79
Jammu & Kashmir	N.A.	N.A.	N.A.	N.A.
Karnataka	67	44	56	73
Kerala	94	87	91	17
Madhya Pradesh	55	26	42	104
Orissa	62	34	49	114
Punjab	64	50	57	56
Rajasthan	55	25	39	89
Tamil Nadu	75	52	64	58
Uttar Pradesh	55	26	42	98
West Bengal	67	47	58	64

Sources: Col. 1,2,3 State Planning Board, *Economic Review*, Kerala, 1996, Table 9.3, p. 122, Col. 4, CSO, *Selected Socio-economic Statistics*, India, 1995

It may be noted that some broad association exists between the level of female education and infant mortality rate (IMR). For example, Kerala with the highest proportion of literates

among females, viz 87 per cent, has recorded the lowest IMR, viz 17 per 1,000 live births; on the contrary, the States with low literacy rates among females such as Bihar, Madhya Pradesh, Orissa, Rajasthan, and Uttar Pradesh (BIMARU States) have registered higher IMR.

The more extensive spread of education in Kerala, especially among the females, is thanks to the active role of the State. As has been widely acknowledged, the State governments during the rule of the native kings (of Travancore and Cochin) and the Christian missionaries played major roles in the promotion of education.

The active role of the State government in the promotion of education is reflected in the steady rise of its expenditure on education as brought out in Tables 4.7 and 4.8.

**Table 4.7 Trends in Government Expenditure on Education in Kerala 1960-65**

Period	Total expenditure		Expenditure per capita	
	Rs. in lakh	Index	Rs.	Index
1960-1961	1616.30	100	9.56	100
1965-1966	2837.43	175	14.84	156
1970-1971	6012.37	372	28.25	296
1975-1976	12897.00	798	54.93	575
1980-1981	21098.54	1305	83.12	869
1985-1986	41308.68	2556	153	1600
1990-1991	77549.00	4798	240	2510

Source: Economic Review, Kerala (Annual Series)

It may be noted that the rise in government's total expenditure on education was manifold during the past three decades. As reflected in the index, during the 1960s, the total expenditure increased by more than two-and-a-half times and in the first half of the 1970s the index more than doubled.

By the beginning of the current decade the index had swelled to 4,798, ie 48 times of the level in 1960-'61. However, the rate of increase in per capita expenditure is lower than that of total expenditure, it rose from Rs 9.56 in 1960-'61 to Rs 83.12 in 1980-'81, and to Rs 240 in 1989-1990.

**Table 4.8 State-wise Per capita Government Expenditure on Education and Proportion of Expenditure on Education to Total Expenditure**

States	Per capita educational expenditure (Rs)					Expenditure on as per cent of the Total expenditure of State Govt. (1970-71)
	1970-71	1980-81	1985-86	1989-90	1990-91	
Andhra Pradesh	12.22	43	92	168		10.9
Assam	16.27	54	99	165		18.8
Bihar	8.65	34	69	135		7.3
Gujarat	13.22	53	126	201		10.8
Haryana	16.41	57	105	198		19.9
Jammu & Kashmir	19.97	—	—	—		11.7
Karnataka	15.28	47	92	167		20.1
Kerala	25.18	85	153	240		33.4
Madhya Pradesh	11.66	33	57	123		21.8
Maharashtra	14.86	61	114	219		11.3
Orissa	9.73	41	72	163		12.0
Punjab	18.97	83	130	241		23.3
Rajasthan	14.82	43	84	163		15.3
Tamil Nadu	16.09	50	107	171		12.2
Uttar Pradesh	7.87	32	64	150		11.9
West Bengal	13.69	45	89	155		19.4
All States	12.53	47	90	175		15.5

It is also worth mentioning that the per capita expenditure of the Kerala government on education has remained higher than that of all other State governments.

The per capita expenditure of the Kerala government on education is much higher than the all-States average, and has been the highest among all except once, 1989-90, when the average in Punjab exceeded that in Kerala. Kerala incurs such high rates despite the fact that its SDP per capita is much lower than the all-India average. In fact, education was allotted around one-third of the total budget in 1970-'71, a significantly higher proportion than in all the other States. Kerala has been devoting substantially high proportions of its resources to education from very early times. Education claimed around 36 per cent of the total State government expenditure during the 1950s; the proportion rose to 39 per cent in the 1960s, and to 40 per cent in the 1970s.

In the structure of education, primary schooling got the lion's share; unlike in other States in which the educational system is an inverted pyramid. Besides the formal education system, Kerala has also developed a non-formal education apparatus with a wide network of libraries and reading rooms, and a large number of Malayalam newspapers. The People's Science Movement has taken deep roots in the State and its programmes have also contributed to disabuse the masses of some deeply entrenched prejudices and superstitions which affect the health status of the masses (Panikar and Soman, 1981: 61).

### ***Medical Care***

Needless to say, the health status of a population is also influenced by its access to effective medical and health care services. That the wide coverage of medical care institutions in Kerala had a decisive role in the improvement of the health status of the State's population is well known. The number of hospitals and dispensaries under both the allopathic system and the indigenous systems of medicine and in government expenditure on medical and public health have increased steadily.

**Table 4.9 Growth of Medical Care Institutions (Allopathy), Kerala: 1955-'56 to 1995-'96**

<b>Period</b>	<b>Govt. Hospitals</b>	<b>Govt. Dispensaries</b>	<b>Grant-in-aid Institutions</b>	<b>Others Including HCS</b>	<b>Total Institutions</b>	<b>No. of Beds</b>
1955-56	59	150	57	4	303	9405
1960-61	67	197	82	10	356	13006
1970-71	112	261	163	2	563	21777
1980-81	145	645	173	6	981	31206
1990-91	140	109	908	69	1226	38726
1995-96	149	110	961	75	1295	42569

Source: Economic Review, 1997, Appendix Table 9.43, p. S 282.

**Table 4.10 State-wise Distribution of Population and Medical Care Institutions: 1991**

States	Popul- ation	Govt. Hospitals	No.of Hospital Beds	Medical Care Institutions(1992) Pvt. Hospitals Beds		Total Hospitals	Population Cov- erage of Health Care Facility Rates of of Pop- ulation to Hospi- tals (Col 1 to 6)
	(1)	(2)	(3)	(4)	(5)	(6)	
Andhra Pradesh	665.08	141	2554	1722	24237	1863	35,099
Assam	224.14	141	9687	80	1992	268	83,635
Bihar	863.74	237	20522	90	8519	328	2,63,337
Gujarat	413.10	263	20708	2031	33497	2370	17,430
Haryana	164.04	58	4796	20	2232	78	2,11,070
Jammu & Kashmir	77.19	65	3062	2	187	67	1,15,204
Karnataka	446.77	209	2716	56	9999	293	1,53,507
Kerala	290.99	141	28030	1899	49169	2040	14,264
Madhya Pradesh	661.81	363	18141	—	—	363	1,82,317
Maharashtra	789.37	495	34261	2583	37758	3115	2,53,41
Orissa	316.60	250	13077	29	1306	284	1,11,478
Punjab	202.82	174	10786	39	3782	217	93,465
Rajasthan	440.06	218	20465	—	—	218	2,01,862
Tamil Nadu	558.59	282	37935	119	10366	408	1,36,909
Uttar Pradesh	1391.12	534	34267	159	12026	735	1,89,268
West Bengal	680.78	242	47252	129	6912	592	1,73,668
All India	8463.03	4235	365696	9113	210987	13692	61,810

During the past four decades since the formation of the State of Kerala in November 1956, the total number of medical care institutions under the government, including hospitals, dispensaries, primary health centres, and grant-in-aid institutions have multiplied several fold. The total number of allopathic institutions increased from 303 in 1955-'56 to 1,295 in 1995-'96, and the number of beds from 9,405 to 42,569.

**Table 4.11 Trends in the State Governments' Expenditure on Medical Care and Public Health, 1985-86 - 1996-97**

Period	Expenditure on Medical And Public Health			
	Total	Per Capita		
	(Rs. lakh)	Index	Rs.	Index
1985-86	12681.25	100	46.27	100
1986-87	14506.58	114	52.74	114
1987-88	15103.96	119	52.37	113
1988-89	16368.36	129	55.75	120
1989-90	19230.44	152	64.34	139
1990-91	22199.04	175	76.52	165
1991-92	23180.45	183	78.60	170
1992-93	23922.90	139	80.04	173
1993-94	29845.13	235	98.53	213
1994-95	35661.43	281	116.16	251
1995-96	41787.82	330	134.31	290
1996-97	51432.27	406	163.12	353

Source: Economic Review, 1997, Table 9.11, p.105

The period during 1971-'81 witnessed the most rapid growth of medical care institutions, especially government hospitals and dispensaries under the Allopathic system; the total number of public sector medical care institutions registered steady increase at the rate of 17.5 per cent during 1955-1960, 58.2 per cent during the 1960s, and 74.3 per cent during the 1970s. The number of medical care institutions and the population

coverage of health care facility in Kerala have improved significantly. The extent of population coverage of health care facility in the major States is given in Table 4.10.

One important feature emerging from table Table 4.10 is that of the total number of hospitals in India, about two-thirds are in the private sector. The share of private hospitals in Kerala works out to be about 93 per cent. Of the total number of private hospitals among the States, one-fifth is located in Kerala.

The population coverage of health care facilities, ie the ratio of population to total number of medical care institutions, is far better for Kerala than in all the other States. That is, the number of persons per hospital works out to be 14,264 here as compared to the all-States average of 61,810. Except in Andhra Pradesh, Assam, Gujarat, and Punjab the ratio exceeded one lakh people per hospital. The high growth rate of medical care institutions in Kerala has naturally claimed an increasing share of the State Government's budget. The total expenditure of this sector rose by around three-and half times between 1969 and 1971 and by over four times during the 1970s. The trends in the State government expenditure on medical and public health in Kerala in recent periods may be observed in Table 4.11

## Summary

Health transition comprises three components, viz demographic transition, epidemiological transition, and health care transition. Kerala has apparently made significant advances in all the three components. Thus, the State has entered the final phase of demographic transition as exemplified by the low death and infant mortality rates, comparable to those of developed countries. The fall in death rates has resulted in a rise in expectation of life at birth, and increase in the proportion of the elderly-persons above 60 years - in the total population. These developments have major implications. Kerala has also been going through an epidemiological transition as reflected in its morbidity profile.

The picture emerging from a scrutiny of available data on morbidity pattern is a mixed one. On the one hand, the dominant disease group comprises acute infectious diseases including fever, diarrhoea, and worm infestation, resembling the morbidity profile of a typical underdeveloped country. On the other hand, the emergence of chronic diseases like diabetes mellitus, blood pressure, heart disease, and cancer as the major causes of death of the adult population, resembles the situation in developed countries which have gone through the epidemiological transition.

In brief, Kerala has made significant advances in health transition in terms of the rate of mortality and pattern of morbidity. True, high morbidity rates still persist. What are the causes of this apparently paradoxical phenomenon? Of the different factors governing the health status, spread of education, especially female education, and of medical care facilities have emerged as the most important. The role of the State government as the principal agent in the promotion of education, universal literacy, and expansion of medical care facilities aimed at 'health for all', has to be duly acknowledged. The high rate of prevalence of acute

communicative diseases, despite these advances is a cause for concern. The causes for the persistence of infectious diseases - the diseases of poverty - are not far to seek. They are unfavourable environment, lack of access to safe drinking water, and sanitary facilities for the majority of the households in the State.

## References

Albala C (1995), 'Epidemiological Transition in Latin America: the case of Chile', Public Health, 9(6).

Basch, Paul F (1978), *International Health*, Oxford University Press, New York.

Caldwell J.C (1979), 'Towards a restatement of demographic transition theory: an investigation conditions before the onset of fertility decline employing primarily African experience and data in Family and Fertility Change', *The Persistence of high fertility: population prospects in the Third World*, Vol. I.

Caldwell J.C. (1990), 'Introductory thoughts on health transition?' in Caldwell, et.al, (Ed) *What we know about Health Transition: Cultural, Social and Behaviourial Determinants of Health*, Australian National University, Canberra.

Crews D.E (1987), *Multiple Causes of death and the epidemiological transition in American Samoa*, Centre for the Study of Population, Florida State University, Florida.

Culyer A.J. (1976), *Measuring Health: The First Step in Need Evaluation*, in *Need and National Health Services: Economics and Social Choice*, Martin Robertson and Co., Ltd.

Cumper G.E (1980), *Determinants of Health in Developing Countries*, Research Studies Press, New York.

Drez, Medrana J (1985), 'Results, dilemmas and suggestions concerning the demographic transition theory: causes of the decline of fertility in the nineteenth century', Bulletin DELA Association De Demografia Historia, 3 (3).

Ford, Nicholas (1993), 'Epidemiological Transition: Health change with development and modernization' in Phillips (Ed) *Proceedings of the symposium in the Mahidor-Exeter British Council Link*, Institute for Population and Social Research.



Frenk, Julio, Jose Luis Babarilla, Clawinstores, et.al (1991), 'Elements for a theory of the health transition', *Health Transition Review*, I(1), April.

MC Gikashan N.D & Blandan J.R (1983), 'Primary health care and the epidemiological transition in Nepal' in Hellen J.A (Ed), *Geographical Aspects of Health: Essays in Honour of Andrew Loarmmts*, Academic, London.

Kannan, K P, et.al (1991), *Health and Development in Rural Kerala*, KSSP.

Johansson, S Ryan (1991), 'The Health transition: the cultural inflation of morbidity during decline of mortality', *Health Transition Review*, (1).

Klerman, Herbert E (Ed) (1970), *Empirical Studies in Health Economics*, Proceedings of the Second Conference on the Economics of Health, John Hopkins Press, Baltimore.

Lerner, Monro (1973), 'Conceptualization of Health and Social Well Being' in Robert & Berg (Ed) *Health Status Indexes*, Hospital Research and Educational Trust, Chicago.

Bhat Mari and Irudaya Rajan (1997), *Demographic Transition Since Independence in Kerala's Demographic Transition*, Sage Publications, New Delhi.

Mc. Namara R (1982), 'Demographic Transition Theory' in Rose JA (Ed), *International Encyclopaedia of Population*, Vol. I, Free Press.

Mercer A (1990), *Disease, Mortality and Population in Transition,: epidemiological- demographic change in England since the eighteenth century as part of a global phenomenon*, Leicester University Press, Leicester, England.

Newhouse, Joseph P (1970), 'Determinants of Days Lost from Work Due to Sickness' in Klerman, Harbert E, *Empirical Studies in Health Economics*, John Hopkins Press, Baltimore.

Omran A.R & Ross J.A (Ed) (1982), 'Epidemiological Transition Theory', in *International Encyclopaedia of Population*, Free Press, New York.

Panikar, P.G.K. (1984), 'Fertility Decline in Kerala: Social Justice Hypothesis', *Economic and Political Weekly*, 19 (13).

Panikar P.G.K. and Soman C.R. (1981), *Health Status of Kerala: Paradox of Economic Backwardness and Health Development*, Centre for Development Studies.

Panikar, P.G.K., Soman C.R., and Ramankutty, *Medical Care Implications of Demographic Transition: Case Study of Kerala* (Monograph), Centre for Development Studies.

Panikar, P.G.K. (1992), 'High Cost of Medical Care in Kerala: Tentative Hypothesis',

Prata P.R. (1992), 'The Epidemiological transition in Brazil', Cadernos De Sande Republica, 8(2).

Ratcliffe, J.W (1983), 'Toward a Social Justice Theory of Demographic Transition: Lessons from India's Kerala State', Janasamkhya.

Reis C.S (1978), 'Demographic and Epidemiological transition in Africa', Tropical Doctor, 8(4).

Riley, James C (1992), 'From a high mortality regime to a high morbidity regime; is culture everything in sickness', Health Transition Review, 2(1).

Riley, James C (1990), 'Morbidity Trends in Four Countries', Population and Development Review, 16(3).

Sorkin Alan I (1975), *Health Economics: An Introduction*, Lexington Books.

Sonja M. Hunt, James Mc Even, and Stephen P.M Kenna (1986), *Measuring Health Status*, Croom Helm, London.

Spree R (1989), 'The epidemiological transition in Germany: Concrete and differential observations', Demographic Information, 1988/89.

Zachariah K.C. (1983), 'Solution or Hopperstance', Populi 10(4).

Zachariah K.C. (1994), *Demographic Transition in Kerala in the 1980s* (monograph), Centre for Development Studies, Thiruvananthapuram.

Zachariah K.C. & Irudaya Rajan S (Ed) (1997), *Kerala's Demographic Transition: Determinants and Consequences*, Sage Publications, New Delhi.

**Kerala Research Programme on Local Level Development**  
**List of Publications**

**Discussion Paper Series**

- 1. *Regional Disparities in Development in Kerala*: K. N. Nair, A. C. Dhas, R. Anandaraj & R. Sanjith**
- 2. *Decentralisation in Kerala: A Note*: K. Nagaraj**
- 3. *Environmental Factors of Malaria Persistence: A study at Valiyathura, Thiruvananthapuram City*: S. Rema Devi & S. Dass (ISBN No. 81-87621-02-3)**
- 4. *Technological Change in Kerala Industry: Lessons from Coir Yarn Spinning*: K. T. Rammohan (ISBN No. 81-87621-03-6)**
- 5. *Development of Women in Rural Areas: A Study of DWCRA in Thrissur District*: U. T. Damayanthi (ISBN No. 81-87621-04-4)**
- 6. *Inland Fishermen and Inland Fishing: A Study in Neelamperoor Village (Alappuzha District)*: R. V. Jose (ISBN No. 81-87621-05-2)**
- 7. *Educational Development At Micro Level: Case study of two villages in Kerala*: A. Abdul Salim (ISBN No. 81-87621-06-0)**
- 7. *Performance Evaluation of Krishi Bhavan Set-up in Kerala*: Jinraj P. V (ISBN No. 81-87621-07-9)**
- 9. *Employment of Women in the Garment Industry*: Sheela Varghese (ISBN No. 81-87621-08-7)**

**Research Bulletin**

- 1. *Quality of School Education in Kerala: Dimensions and Determinants***

