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## Abstract

*This study examines the economic profiles of morbidity by disease in Kerala and all-India by estimating Engel elasticities for diseases and classifying them as between those associated with affluence and deprivation. Morbidity rates, in general, are more for the rich than for the poor. There could be factors other than income, which influence the morbidity rates as revealed by horizontal pseudo-Lorenz curves for distribution of reported total morbidity across households. That morbidity rates are higher for the rich than for the poor households does not hold uniformly valid at the level of individual diseases. This is borne out by pseudo-Lorenz curves for disease-specific morbidity. Pseudo-Lorenz curves lay above/below the Line of Equal Distribution depending upon the nature of diseases. The sub-set of undiagnosed diseases is a poor man's disease in both rural and urban all-India but only in urban Kerala. To avoid Type II errors in targeting medical facilities, it would be useful to identify those diseases, which afflict the rich proportionately more, that is, diseases with Engel elasticities more than one. Such diseases are virtually insignificant in Kerala. They account for 1.23 and 1.75 per cent of reported morbidity cases in rural and urban Kerala respectively. As regards all-India, they have significant presence. Their respective shares in total rural and urban morbidity cases are 7.83 and 6.83 per cent. Generally coronary heart diseases, diabetes and hypertension are considered as life style diseases. Among them, only diabetes mellitus has elasticity greater than one for rural and urban all-India; heart disease and hypertension too have elasticities greater than one only for rural all-India. As regards Kerala, none of them are luxury diseases. This could also be interpreted to represent a process whereby the diseases of affluence and deprivation converge in Kerala. In other words, this may represent a shift in the epidemiology of diseases in Kerala.*

Key words: Affluence, Deprivation, Diseases, Engel elasticities

JEL Code(s): I10

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# Morbidity Profiles of Kerala and All-India: An Economic Perspective

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## 1. Introduction

Public policy in the New Millennium has revised its approach towards poverty eradication with an explicit recognition that deprivation has multiple dimensions, both income and non-income, human in particular. Among the non-income dimensions, health and education have received special attention. Recognizing this fact, the National Common Minimum Programme has laid emphasis on increasing public investment on health to 2-3 per cent of gross domestic product (GDP) (Government of India (GoI), 2006b; p. 212).<sup>2</sup> Consistent with this emphasis, the Union Budget for 2008-09 has increased the allocation for the health sector by 15 per cent. Given the universal trend towards liberalization, privatization and revising the scope for public health centers with emphasis on cost recovery, choice of cost-effective strategy towards health care assumes importance.<sup>3</sup> This in turn would call for an understanding and appreciation of the morbidity profile of the population and the proximate determinants.<sup>4</sup> Other factors, which motivate such a study, are as follows:

- Such reform measures of the health sector would increase out-of-pocket health expenditures and hence, render health a costly option for the poor (see, for instance, Sen *et al.*, 2002 and Sepehri *et al.*, 2006).
- As advocated by the *World Development Report 1993* on 'Investing in Health', public expenditure on health should be made cost-effective by focusing on the poor. There is undue emphasis on specialized care in tertiary facilities but little on low-cost, effective programmes like those for control and treatment of infectious diseases and of malnutrition. The burden of disease in the developing countries could be reduced by 25 percent by redirecting about half of the current expenses on services of low-cost-effectiveness to public health programmes and essential clinical services (World Bank, 1993; p. iii)
- The paradox of low mortality coexisting with high levels of morbidity in Kerala is explained in terms of poverty and the associated diseases. Few attempts have been made to verify this hypothesis and examine its implications.<sup>5</sup> If valid, this hypothesis would also be interpreted to favour a

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<sup>2</sup> The South Asian Association for Regional Cooperation (SAARC) has called upon the member countries to allocate at least 3 per cent of the GDP to the health sector.

<sup>3</sup> Efforts to reform the health sector in India, which included *inter alia* user charges for services in public health facilities to the non-poor in particular have been initiated in India since the early 1990s (GoI 2007c; p. 221).

<sup>4</sup> This is because health programmes and interventions based only on mortality estimates have ended up as lopsided cost-ineffective strategies. This would also end up with situations like the one obtaining in Kerala, that is, paradox of low mortality and high morbidity.

<sup>5</sup> Quite often policy recommendations are made with inadequate appreciation of empirical realities. For instance, an oft-repeated recommendation for targeting the public distribution system to the poor is to change its commodity composition in favour of coarse cereals. This is based on the belief that only the

hard choice for a strategy of growth over a strategy of policy interventions for improvement in health status.

- An understanding of profile is also important to avoid syndromes like the ‘10/90 disequilibrium’<sup>6</sup> in providing medical services to the public.<sup>7</sup> In fact, there is already a perception that diseases of poverty and affluence coexist in Kerala because due to “partial perception of the problem and ad hoc remedies”, “health policies and programs (in Kerala) are fragmented in approach and disease-oriented and curative in content” (Pankiar and Soman 1984; p. 103). Needless to state, the economic and social costs of such misallocation of resources would be quite heavy.
- Further, as pointed out by the *Human Development Report 2005* for Kerala, high morbidity is an emerging health issue that matters for human development since it raises issues regarding “quality and affordability of Health care” (CDS, 2006).
- Finally, “...poverty is both a cause and consequence of ill-health. ...we do not have data on how the burden of disease differs in poor and non-poor segments of the population between and within countries.” (GFHR, 2000b).

This study, therefore, seeks to begin with an examination of the economic profiles of morbidity by disease in Kerala and all-India by estimating Engel elasticities for diseases and classifying them as between those associated with (a) affluence; and (b) deprivation respectively.

The paper is organized as follows: Section 2 provides some background in terms of statistical information on economic and health status of the population of Kerala in relation to all-India and different explanations for the observed findings. Section 3 provides some information on database, Section 4 on methodology and Section 5 on findings. The final section concludes the paper.

## **2. Kerala: Development & Health Status**

The State of Kerala has received wide appreciation for conscious public intervention to promote human development and welfare. Of course, there were apprehensions till recently about the sustainability of the growth strategy. However, recent growth experience of Kerala has disproved such doubts:

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poor consumer coarse cereals. But the consumption patterns of the poor too have changed and coarse cereals no longer have a dominant weight in the consumption budget of the poor. In terms of shares, the rice consume as much as the poor (Suryanarayana 1995).

<sup>6</sup> This term is coined to describe the imbalance / mismatch between the magnitude of the problem and the resources set aside to address it (Global Forum for Health Research (GFHR)2000a), Drugs for Neglected Diseases Working Group (DNDWG) 2001). It refers to the fact that less than 10 per cent of the global health research is on diseases associated with the poor, which account for about 90 per cent of the global disease burden, that is, health problems affecting 90 per cent of the world population. As regards details, pneumonia and diarrhoea, the two biggest killer diseases, account for about 11 per cent of the total global burden of disease but only one-fifth of 1 per cent of health research funds.

<sup>7</sup> In fact, studies show a similar mismatch in the provision of health institutions and facilities across rural and urban sectors in India (Duggal *et al.* 1995, Nandraj and Duggal 1997 and Sule 1999).

- As per the recent NSS survey findings, Kerala stands much better of than all India in terms of per capita expenditure estimates (Table 1). Per capita consumer expenditures in rural (Rs 746.75) and urban Kerala (Rs 998.06) are higher than the corresponding estimates for rural (Rs 483.36) and urban (Rs 936.27) all India. Though the extent of inequality in the distribution of consumption is higher in rural Kerala than that in rural all-India, incidence of absolute poverty in rural Kerala (17.52 %) is about half of that in rural all-India (32.82 %).

However, a similar profile does not emerge in terms of nutritional intake measures like estimates of per capita calorie, protein and fat intakes in Kerala and all-India. The average levels of calorie intake are slightly less in Kerala than in all-India in both rural and urban sectors. But Kerala is far ahead of the nation in terms health outcome indicators like infant and child mortality rates. Latest available estimates for 2005-06 show that infant mortality is 15.3 (57.0) for Kerala (all-India) and under-five child mortality rate is 16.3 (74.3) for Kerala (all-India) (International Institute for Population Sciences and Macro International, 2007; p. 187). Life expectancy at birth is also much higher for Kerala than for all-India. Estimates for 1992-96 for (rural-urban and male-female combined) was 73.1 years for Kerala but 60.7 years for all-India (GoI, 2001; p. 218)

- Still Incidence of morbidity is higher in Kerala than India as a whole. It is about 25 per cent in both rural and urban Kerala but less than 10 per cent for rural and urban all-India. Unlike at all-India level, extent of inequality in morbidity is less than in Kerala in both rural and urban sectors (Figures 1 & 2).
- This co-existence of high level of morbidity with low levels of mortality and high life expectancy in Kerala is one feature, which has attracted much attention. Recent *Human Development Report 2005* for Kerala also acknowledges this fact.

There have been different explanations for this observed paradox:

- Increase in life expectancy
- Better reporting in a state with higher levels of education and awareness.
- Better utilization of health services because of high levels of education and public awareness of rights and access to health services (Panikar and Soman 1984).
- Averting death without improving life, that is, lopsided health strategy; emphasis on curative medicine to reduce death rates and not on sustained improvement in health status through nutrition, housing, water supply, sanitation and medicine.
- Lopsided emphasis on social development overlooking the importance of income growth (Chen and Schaik 1986).
- Infections account for a majority of morbidity and incidence of illness is more for the poor than the rich (Kannan *et al.*, 1991).
- Dominance of diseases of deprivation.

While some of the hypotheses set out are obvious and need not call for much verification, some need definite scrutiny. For instance, there is empirical basis for doubts regarding the validity of the hypothesis on life expectancy:

- i) As pointed out by the *Human Development Report 2005* for Kerala, life expectancy at birth is high in Kerala largely because of reductions in infant and child mortality rates (CDS 2006; p. 25); and
- ii) Morbidity rates are virtually the highest in Kerala for all age groups by gender and rural/urban sector (Tables 2 & 3).

Similarly, one is not sure how valid is the hypothesis pertaining to diseases of deprivation, which also needs some empirical examination. This is particularly so in the context of the recent growth performance and improvement in levels of living of the population in Kerala in the wake of the 1973-OPEC-Crisis. This is precisely what this study seeks to examine. As already stated, it attempts to address the following questions:

- What is the economic profile of each disease as reflected in morbidity rates across per capita consumer expenditures of households?
- What is the share of each disease in reported total morbidity by sector in Kerala and all-India?

### **3. Data Base**

This study is carried out on the basis of the NSS findings from its 60<sup>th</sup> round survey during January-June 2004 of morbidity and utilization of health services. Statistical information is taken from the published report (Report no 507) as well as unit record data.

The survey was based on a two-stage stratified sample design: census villages in the rural and blocks in the urban areas constituted the first stage units and households were the second stage units in both the sectors. The survey was carried out during two sub-rounds of three months each between January and June 2004. Hence, the estimates may be subject to seasonal bias and may not be representative for the agricultural year. Still we prefer to use this database if only because it is the latest available.

The NSS definition of illness includes (i) disabilities related to visual, hearing, speech, loco motor and mental faculties; (ii) physical damages involving cuts, wounds, hemorrhage, fractures and burns due to accidents; and (iii) spontaneous abortion, natural or accidental". The details are ascertained in terms of probing questions to the extent possible the individual members of the sampled household. The enquiry regarding morbidity was with reference to the 15 days preceding the date of enquiry. As regards hospitalization, the preceding 365 days was the relevant reference period.

### **4. Methodology**

This study proposes to examine the class profile of diseases by examining their distribution patterns across per capita consumer expenditure, what in other words is

called pseudo-Lorenz curves. Generally pseudo-Lorenz curves would lie below the Line of Equal Distribution for any normal item, which belongs proportionately more to the rich. However, for items, which are owned disproportionately more by the poor than by the rich, pseudo-Lorenz curves would lie above the Line of Equal Distribution. Such a scenario would generate negative values for pseudo-Lorenz ratios. Accordingly, depending upon the sign of the estimated pseudo-Lorenz ratios one could classify them as between those associated with deprivation and otherwise.

A finer distinction as between diseases associated with the poor and those associated with the rich could be made by developing a concept of elasticity similar to Engel elasticity of consumer demand in Economics. Engel elasticity measures the response of consumer demand to income/total expenditure and is given by the ratio of percentage change in demand to percentage change in income/total expenditure. If it is negative, it is called an inferior good consumed largely by the poor. If it is positive and greater than one, it is called a luxury consumed largely by the rich. In a similar way, we estimate Engel elasticity of number of persons reporting a given illness; if it were negative, it would indicate that the illness is prevalent and reported largely by the poor people.

For purposes of estimation, we assume that the relation between number of people reporting a given ailment and per capita household expenditure is linear on a double logarithmic scale and is given by

$$E(y) = g(x) = Ax^n \quad (i)$$

where 'x' represents per capita household expenditure and 'y' stands for number of persons reporting the ailment. We further assume that 'x' follows log-logistic distribution characterized by:

$$\log \frac{F(x)}{1-F(x)} = a + b \log x \quad \dots(2)$$

where F(x) is the cumulative distribution function. Within this framework, we use the concentration (Lorenz) curve approach of Iyengar (1964) to estimate the Engel elasticities of number of persons reporting a given ailment with respect to per capita household expenditure. Given this framework, the concentration (Lorenz) curve of x could be obtained from the parametric equations:

$$P_\xi = \frac{\xi}{1+\xi} \quad \dots(3)$$

$$q_\xi = \frac{1}{B(l,m)} \int_0^\xi \frac{\tau^{l-1}}{(1+\tau)^{l+m}} d\tau \quad \dots(4)$$

$$\text{where } q_\xi = e^a x^b ; l = 1 + \frac{1}{b} ; m = 1 - \frac{1}{b} \text{ such that } l + m = 2$$

From equation (3) and (4), concentration (Lorenz) curve for x is given by:

$$q = \frac{1}{B(l, m)} \int_0^P \tau^{l-1} (1-\tau)^{m-1} d\tau \quad \dots(5)$$

where  $q$  is the cumulative share in total number of persons reporting ailment corresponding to  $P$ .

The specific concentration curve (pseudo-Lorenz curve) for number of persons reporting ailment is given by

$$Q = \frac{1}{B(l^*, m^*)} \int_0^P \tau^{l^*-1} (1-\tau)^{m^*-1} d\tau \quad \dots(6)$$

where  $l^* = 1 + \frac{\eta}{b}$ ;  $m^* = 1 - \frac{\eta}{b}$  such that  $l^* + m^* = 2$  and  $Q$  is the cumulative share in total number of persons reporting ailments corresponding to  $P$ .

For the log-logistic distribution, the concentration (Lorenz) ratio for  $x$  is given by  $\frac{1}{b}$

and the specific concentration (pseudo-Lorenz) ratio for  $y$  is given by  $\frac{\eta}{b}$ . The product of pseudo-Lorenz for  $y$  and the reciprocal of Lorenz for  $x$  would give the Disease elasticity with respect to household expenditure.

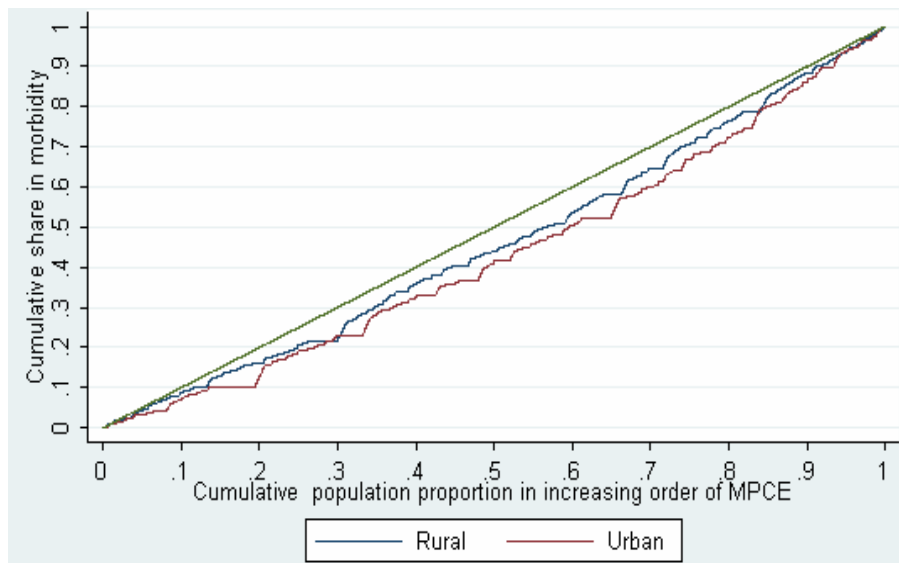
This study is based on estimates of pseudo-Lorenz ratios as well as Engel elasticities for diseases. Such estimates are provided in Tables 4 to 9. The results are discussed in the following section.

## 5. Results

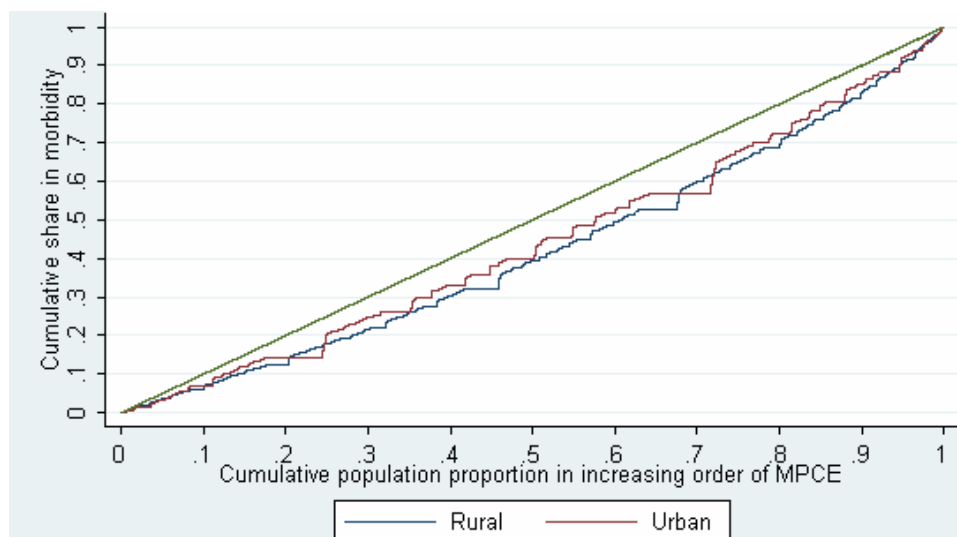
Consistent with the economic, geographic and institutional differences, the results on the economic profile of diseases differ between Kerala and India as a whole for both rural and urban sectors. Some salient features are as follows:

1. As brought out by Figures 1 and 2 below, incidence of diseases in general are more for the rich than for the poor in both the sectors in Kerala and India as a whole. Between Kerala and all-India, the relative share of the rich is more at the all-India level than in Kerala. The graphs also bring out another important feature, that is, the pseudo-Lorenz curves are not smooth and convex; in fact, they are horizontal at several places implying zero morbidity for households in some ranges of per capita consumer expenditure at both lower and upper ends of consumer expenditure distribution. In other words, this would imply morbidity profiles of population classified solely with reference poor and non-poor categories would sometimes be misleading.





**Figure 1: Pseudo-Lorenz Curve for Morbidity: All-Kerala**



**Figure 2: Pseudo-Lorenz Curve for Morbidity: All-India**

2. However, this aggregate profile does not hold uniformly valid at the level of individual diseases. This is borne out by pseudo-Lorenz curves for disease-specific morbidity. Pseudo-Lorenz curves lie above/below the Line of Equal Distribution depending upon the nature of diseases. Consistent with such a profile, estimates of

pseudo-Lorenz ratios range from less than (-) 1 to greater than (+) 1 Table 4). Estimates of pseudo-Lorenz ratios are negative for those diseases whose burdens are carried disproportionately more by the poor. A list of these diseases and their features by region and sector is provided below:

- **Diseases associated with Deprivation: A Disaggregate Profile**

<b>Sector</b>	<b>Common to Kerala &amp; All-India</b>	<b>Only in Kerala</b>	<b>Only in all-India</b>
<b>Rural</b>	<i>Worm infestation, tuberculosis, bronchial asthma, prostatic disorders, cataract, diseases of skin, under-nutrition, anaemia, whooping cough, fever of unknown origin, locomotor, speech, hearing, accidents et al, other diagnosed diseases,</i>	<i>Bronchial asthma, psychiatric disorders, conjunctivitis, tetanus, cancer &amp; other tumors</i>	<i>Diarrhoea/dysentery, amoebiosis, hepatitis/Jaundice, glaucoma, malaria, eruptive, mumps, diphtheria, filariasis/elephantiasis, visual, other undiagnosed diseases</i>
<b>Urban</b>	<i>Tuberculosis, bronchial asthma, diseases of kidney/urinary system, psychiatric disorders, cataract, anaemia, diphtheria, fever of unknown origin, filariasis/elephantiasis, locomotor, visual, speech, accidents et al, other diagnosed diseases, other undiagnosed diseases</i>	<i>Diseases of kidney/urinary system, neurological disorders, glaucoma, cancer &amp; other tumors,</i>	<i>Diarrhoea/dysentery, gastritis/gastric or peptic ulcer, worm infestation, amoebiosis, hepatitis/Jaundice, conjunctivitis, diseases of skin, malaria, eruptive, mumps, whooping cough,</i>

- Though this set includes diseases generally associated with poverty, there are some differences as experienced by Kerala and India as a whole. For instance, malaria is a poor man's disease at the all-India level but does not figure at all in Kerala.
- Tuberculosis and asthma are generally considered to be associated with deprivation and significant in Kerala (CDS, 2006; pp. 29-30). Our Engel elasticity estimates confirm this perception for Kerala. As regards all-India, tuberculosis is an inferior disease in both rural and urban sectors but asthma is only in urban India. The estimates sector wise shares in total reported morbidity is less than or about one per cent for tuberculosis in both Kerala and all-India. Bronchial asthma, with a share of more than 3 per cent (5 per cent in rural Kerala) has a significant presence (Tables 6 & 7).
- The sub-set of undiagnosed diseases is a poor man's disease in both rural and urban all-India but only in urban Kerala. However, the '10/90' disequilibrium syndrome does not appear serious here since the share of undiagnosed diseases in reported morbidity is less than two per cent.
- At a time, when the Government is so much pre-occupied with targeting and cost-efficiency in resource use, one option would be to focus on medical facilities to treat diseases of the type listed above. However, the classification provided above is quite disaggregated and may not make sense for the cost-efficiency perspective. It would be possible to aggregate them into broad groups depending upon nature of illness. Such an attempt is made below:

### Diseases associated with Deprivation: An Aggregate Profile

Sector	Common to Kerala & All-India	Only in Kerala	Only in all-India
Rural	Eye ailments, skin related, febrile illness, disabilities, accidents at al	Kidney & prostatic	Gastro intestinal infection & infestations
Urban	Respiratory, eye ailments, skin related, febrile illness, disabilities, accidents et al	Kidney & prostatic, Neurological	Gastro intestinal infection & infestations

- Now it would be worthwhile to estimate their share in total cases of diseases reported and examine how are the hypothesis pertaining to their dominance in Kerala is valid? Their share is Kerala is less than 50 per cent in both rural and urban sectors but more than 50 per cent in India as a whole. In rural India, diseases of poverty account for about two-thirds of the reported cases.

### Share (%) of Diseases associated with Deprivation

Sector	Kerala	All-India
Rural	49.30	64.01
Urban	47.01	57.21

- Let us classify diseases with Engel elasticities less than (-) 1 as those concentrated on the very poor. Even in this respect Kerala and all-India profiles differ.
  - Such diseases are conspicuous by their absence in urban all-India. Diphtheria is the only such disease found in rural all-India with a share in total rural reported morbidity cases of just 1.70 per cent.
  - In rural Kerala, prostatic disorders and tetanus are the only two diseases with Engel elasticities less than (-) 1. But their share in total reported morbidity cases is just 0.16 per cent. But the profile is different for urban Kerala. There are about eight such diseases, which, though individually insignificant, collectively account for 6.35 per cent of total urban morbidity cases.

5. Having identified the diseases reported proportionately more by the poor, it would be useful to identify those diseases, which afflict the rich proportionately more, to avoid Type II errors in targeting medical facilities. Following consumer economic theory, we may classify all those diseases with Engel elasticities more than one as diseases of affluence. Such a profile based on disaggregate estimates of Engel elasticities is provided below:

### • Diseases associated with Affluence: A Disaggregate Profile

Sector	Common to Kerala & All-India	Only in Kerala	Only in all-India
Rural	<i>Goitre</i>	Gynaecological disorders, mumps, glaucoma	Heart diseases, hyper tension, diabetes mellitus, tetanus,
Urban		Hepatitis/ Jaundice, goiter, whooping cough, diseases of moth teeth and gum,	Diabetes mellitus, tetanus,

- Such diseases are virtually insignificant in Kerala. They account for 1.23 and 1.75 per cent of reported morbidity cases in rural and urban Kerala respectively. As regards all-India, they have significant presence. Their respective shares in total rural and urban morbidity cases are 7.83 and 6.83 per cent.
- Generally coronary heart diseases, diabetes and hypertension are considered as life style diseases. Among them, only diabetes mellitus has elasticity greater than one for rural and urban all-India; heart disease and hypertension too have elasticities greater than one only for rural all-India. As regards Kerala, none of them are luxury diseases. This could also be interpreted to represent a process whereby the diseases of affluence and deprivation converge in Kerala. In other words, this may represent a shift a in the epidemiology of diseases in Kerala.

## 6. Summing Up

Given the current emphasis on cost-effective policy strategies to deal with the health dimension of deprivation as part of an overall strategy to eradicate poverty, this paper makes an attempt to understand the economic profile of morbidity in the state of Kerala and India as a whole. The choice of Kerala for a special focus in this study is guided by its unique features on the health front like low mortality rates coexisting with high morbidity rates. The study is carried out on the basis of the estimates of morbidity by diseases across household per capita consumer expenditure distribution from the National Sample Survey (60<sup>th</sup> Round) conducted during January – June 2004. For this purpose, co-variation between morbidity rates and economic status as measured by per capita household consumer expenditure is estimated in terms of Engel elasticities. Some salient features of the findings are as follows:

- Morbidity rates, in general, are more for the rich than for the poor in both rural and urban sectors in Kerala and India as a whole. Between Kerala and all-India, the relative share of the rich in total morbidity is more at the all-India level than in Kerala.
- Morbidity profiles of population classified solely with reference to poor and non-poor categories would sometimes be misleading. There could be factors other than income, which influence the morbidity rates as revealed by horizontal pseudo-Lorenz curves for distribution of reported total morbidity across households.
- That morbidity rates are higher for the rich than for the poor households does not hold uniformly valid at the level of individual diseases. This is borne out by pseudo-Lorenz curves for disease-specific morbidity. Pseudo-Lorenz curves lay above/below the Line of Equal Distribution depending upon the nature of diseases.
- Tuberculosis and asthma are generally considered to be associated with deprivation and significant in Kerala. Our Engel elasticity estimates confirm this perception for Kerala. As regards all-India, tuberculosis is an inferior disease in both rural and urban sectors but asthma only in urban India.
- The estimates of sector wise shares in total reported morbidity is less than or about one per cent for tuberculosis in both Kerala and all-India. Bronchial asthma, with a share of more than 3 per cent in rural and urban all-India and

urban Kerala and more than 5 per cent in rural Kerala has a significant presence.

- The sub-set of undiagnosed diseases is a poor man's disease in both rural and urban all-India but only in urban Kerala.
- The sector specific share of diseases associated with deprivation in total reported morbidity is less than 50 per cent in both rural and urban sectors of Kerala but more than 50 per cent in India as a whole. In rural India, diseases of poverty account for about two-thirds of the reported cases.
- Diseases with Engel elasticities less than (-) 1 are those concentrated on the very poor. Such diseases are conspicuous by their absence in urban all-India. Diphtheria is the only such disease found in rural all-India with a share in total rural reported morbidity cases of just 1.70 per cent.
- In rural Kerala, prostatic disorders and tetanus are the only two diseases with Engel elasticities less than (-) 1. But their share in total reported morbidity cases is just 0.16 per cent. But the profile is different for urban Kerala. There are about eight such diseases, which, though individually insignificant, collectively account for 6.35 per cent of total urban morbidity cases.
- To avoid Type II errors in targeting medical facilities, it would be useful to identify those diseases, which afflict the rich proportionately more, that is, diseases with Engel elasticities more than one. Such diseases are virtually insignificant in Kerala. They account for 1.23 and 1.75 per cent of reported morbidity cases in rural and urban Kerala respectively. As regards all-India, they have significant presence. Their respective shares in total rural and urban morbidity cases are 7.83 and 6.83 per cent.
- Generally coronary heart diseases, diabetes and hypertension are considered as life style diseases. Among them, only diabetes mellitus has elasticity greater than one for rural and urban all-India; heart disease and hypertension too have elasticities greater than one only for rural all-India. As regards Kerala, none of them are luxury diseases. This could also be interpreted to represent a process whereby the diseases of affluence and deprivation converge in Kerala. In other words, this may represent a shift in the epidemiology of diseases in Kerala.

**Table 1: Nutritional Status: Input and outcome measures (2004-05)**

	<i>Kerala</i>		<i>India</i>	
	<b>Rural</b>	<b>Urban</b>	<b>Rural</b>	<b>Urban</b>
% Exp on food	45	40	55	42.5
% Exp on cereals	11	8.4	18	10.1
Per capita calorie intake per day (Kcals)	2014	1996	2047	2020
Per capita protein intake per day (gm)	55.4	56.7	57	57
Per capita fat intake per day (gm)	40.8	44.9	35.5	47.5
Per capita consumer expenditure (PCE) per month	746.75	998.06	483.36	936.27
Lorenz ratio (%) of PCE distribution	28.2	32.8	25.7	32.5
Poverty: Head count ratio (%)	17.52	26.19	32.82	27.81
Incidence of morbidity: Total Population	25.53	24.06	8.82	9.95
Incidence of morbidity: Poor	21.97	17.98	6.47	8.17
Incidence of morbidity: Non-poor	26.28	26.22	9.97	10.61

*Source:* NSS reports from the 60<sup>th</sup> (January-June 2004) and 61<sup>st</sup> (July 2004-June 2005) rounds.

**Table 2: Incidence of Morbidity across Age Groups by gender in Major States:  
Rural Sector (January – June 2004)**

State	Male						Female					
	Age group (years)						Age group (years)					
	0-14	15-29	30-44	45-59	60 & above	All	0-14	15-29	30-44	45-59	60 & above	All
Andhra Pradesh	7.6	3.0	5.7	12.3	34.4	8.6	5.7	3.8	7.9	14.5	37.2	9.3
Assam	9.6	3.4	3.5	6.5	36.3	7.8	9.7	4.3	5.2	9.4	40.7	8.6
Bihar	6.1	2.2	2.2	5.1	18.0	5.3	6.3	2.2	3.8	6.2	15.7	5.3
Chhattisgarh	6.3	4.6	7.2	8.8	15.6	6.9	5.9	4.9	8.0	7.9	14.6	7.0
Gujarat	5.8	2.9	5.0	6.2	35.8	7.0	5.2	3.8	5.2	10.3	24.4	6.8
Harayana	6.7	6.3	7.6	11.9	24.5	8.6	6.1	9.6	13.2	14.0	21.3	10.6
Himachal Pradesh	4.4	3.1	5.0	10.9	28.8	7.3	3.8	4.1	15.1	17.3	26.1	10.1
Jammu & Kashmir	6.8	1.8	3.6	8.6	33.8	7.0	5.1	2.9	7.2	8.2	35.3	6.9
Jharkand	3.3	0.7	0.9	1.6	9.6	2.4	4.6	3.7	3.1	5.3	6.9	4.3
Karnataka	4.5	1.9	3.8	9.0	33.1	6.3	4.7	2.7	4.7	10.7	25.8	6.4
<b>Kerala</b>	<b>22.2</b>	<b>11.8</b>	<b>19.2</b>	<b>31.5</b>	<b>56.2</b>	<b>24.2</b>	<b>18.6</b>	<b>16.0</b>	<b>22.0</b>	<b>39.0</b>	<b>58.6</b>	<b>26.6</b>
Madhya Pradesh	4.8	3.6	4.9	5.1	22.5	5.7	4.0	4.7	7.8	10.1	20.0	6.6
Maharashtra	7.8	3.3	5.1	10.0	31.3	8.4	8.3	6.0	9.1	11.8	30.1	10.3
Orissa	8.3	4.9	6.4	8.7	16.3	7.9	7.4	4.8	7.3	9.0	15.9	7.6
Punjab	9.5	6.9	9.9	15.7	30.3	11.4	7.8	9.9	20.2	26.1	41.7	16.0
Rajasthan	4.6	2.6	4.7	8.3	16.4	5.2	3.6	4.6	8.3	9.7	13.5	6.1
Tamil Nadu	6.9	2.9	5.7	13.8	28.7	8.6	5.6	5.4	13.0	12.2	29.6	10.3
Uttaranchal	6.1	3.9	1.1	3.9	16.5	5.4	2.3	4.9	8.3	2.2	13.5	4.9
Uttar Pradesh	8.7	5.5	8.7	11.9	2.86	9.6	7.2	8.1	11.8	16.2	26.6	10.4
West Bengal	11.0	5.5	9.9	16.2	35.7	11.5	9.8	6.1	10.0	15.5	36.9	11.3
All-India	7.6	4.1	6.4	10.7	28.5	8.3	6.8	5.7	9.3	13.2	28.2	9.3

Source: GoI (206), pp. A-127- A-128.

**Table 3: Incidence of Morbidity across Age Groups by gender in Major States:  
Urban Sector (January – June 2004)**

State	Male						Female					
	Age group (years)						Age group (years)					
	0-14	15-29	30-44	45-59	60 & above	All	0-14	15-29	30-44	45-59	60 & above	All
Andhra Pradesh	7.7	3.5	10.6	14.2	51.1	10.2	10.4	6.8	7.4	19.7	56.2	12.7
Assam	6.7	3.2	5.4	5.9	40.0	7.2	10.6	4.2	7.9	12.0	32.2	9.5
Bihar	3.1	3.2	2.7	17.9	24.6	6.3	5.9	3.7	5.7	6.5	23.9	6.4
Chhattisgarh	4.8	4.4	2.3	13.2	24.9	6.3	4.6	3.8	7.5	22.0	20.2	8.1
Gujarat	8.0	2.9	5.4	9.4	38.0	7.7	5.0	3.6	7.5	12.2	28.8	7.8
Harayana	5.2	8.2	6.3	12.5	32.0	8.6	4.1	6.4	10.9	13.4	25.2	8.9
Himachal Pradesh	4.2	0.5	1.4	5.9	31.7	3.9	5.3	4.3	9.5	10.4	31.0	7.8
Jammu & Kashmir	8.6	3.4	1.7	10.3	38.3	7.5	7.0	1.8	5.6	19.6	31.2	8.1
Jharkand	3.5	3.4	0.9	4.4	20.3	4.2	3.0	3.6	3.6	18.1	11.1	5.9
Karnataka	3.9	2.8	3.2	7.3	28.5	5.3	3.3	1.5	5.5	8.8	36.3	6.1
<b>Kerala</b>	<b>25.5</b>	<b>12.2</b>	<b>13.7</b>	<b>32.2</b>	<b>52.9</b>	<b>23.5</b>	<b>19.8</b>	<b>13.6</b>	<b>15.3</b>	<b>36.3</b>	<b>57.4</b>	<b>24.4</b>
Madhya Pradesh	7.4	2.5	4.1	5.2	24.6	6.0	5.2	4.0	7.4	10.4	25.2	7.1
Maharashtra	1.2.1	6.0	7.1	16.2	40.0	11.5	7.9	5.9	10.5	19.8	43.7	12.2
Orissa	8.9	0.8	4.7	5.5	14.9	5.6	5.6	2.9	2.7	7.8	19.9	5.2
Punjab	8.2	7.6	9.0	11.9	28.8	10.0	7.2	4.8	11.3	26.0	34.1	11.5
Rajasthan	6.4	3.5	5.9	8.1	27.8	6.9	5.1	4.4	10.7	7.6	25.4	7.6
Tamil Nadu	7.7	3.2	6.1	13.8	30.3	8.7	7.7	5.4	8.5	14.2	34.6	10.6
Uttaranchal	9.3	1.8	1.9	4.0	33.6	6.5	4.0	3.5	6.7	11.1	15.5	6.5
Uttar Pradesh	8.8	5.3	6.9	14.9	29.8	9.3	8.1	7.7	13.8	23.8	37.1	12.6
West Bengal	13.7	6.1	8.8	13.9	47.9	13.7	11.4	9.0	15.4	24.9	54.2	17.8
All-India	8.4	4.4	6.4	12.7	35.2	9.1	7.4	5.6	9.5	17.3	38.3	10.8

Source: GoI (2006a), pp. A-129- A-130.



**Table 4: Estimates of Psuedo-Lorenz ratios by disease and Sector: Kerala vs. All-India**

Disease	Code	All-India		Kerala	
		Rural	Urban	Rural	Urban
Diarrhoea/ dysentery	1	-0.1032	-0.1946	0.0624	0.0399
Gastritis/gastric or peptic ulcer	2	0.0172	-0.0413	0.0403	0.0611
Worm infestation	3	-0.1068	-0.0966	-0.2178	0.1371
Amoebiosis	4	-0.0844	-0.0664	0.2147	.
Hepatitis/Jaundice	5	-0.0878	-0.0950	.	0.4439
Heart disease	6	0.3145	0.2434	0.1944	0.1637
Hypertension	7	0.3676	0.3015	0.1348	0.1896
Respiratory including ear/nose/throat ailments	8	0.1041	0.0272	0.0670	0.0568
Tuberculosis	9	-0.1014	-0.3232	-0.1893	-0.3898
Bronchial asthma	10	0.0556	-0.0376	-0.0603	-0.1865
Disorders of joints and bones	11	0.1117	0.0718	0.0326	0.0418
Diseases of kidney/urinary system	12	0.1207	0.1891	0.0138	-0.1900
Prostatic disorders	13	-0.2105	0.2114	-0.7357	.
Gynaecological disorders	14	0.0132	0.0246	0.3142	0.1978
Neurological disorders	15	0.1419	0.0234	0.1352	-0.0124
Psychiatric disorders	16	0.0657	-0.0308	-0.0092	-0.3041
Conjunctivitis	17	0.0348	-0.0048	-0.2544	0.1288
Glaucoma	18	-0.0883	0.0380	0.3704	-0.2110
Cataract	19	-0.0586	-0.1579	-0.1410	-0.0574
Diseases of skin	20	-0.0155	-0.1893	-0.0056	0.0141
Goitre	21	0.3004	0.2439	0.3835	0.6968
Diabetes mellitus	22	0.4328	0.3276	0.1911	0.2052
Under-nutrition	23	-0.1397	0.0340	-0.2713	.
Anemia	24	-0.1108	-0.1868	-0.1845	-0.8187
Sexually transmitted diseases	25	0.1315	0.3124	.	.
Malaria	26	-0.1052	-0.1671	.	.
Eruptive	27	-0.0953	-0.1659	0.0346	.
Mumps	28	-0.1932	-0.1084	0.4965	.
Diphtheria	29	-0.4363	-0.0425	.	-0.6790
Whooping cough	30	-0.0873	-0.0543	-0.1635	0.4130
Fever of unknown origin	31	-0.1076	-0.1506	-0.0793	-0.0028
Tetanus	32	0.3098	0.6133	-0.6620	.
Filariasis/Elephantiasis	33	-0.0622	-0.2353	.	-0.6986
Locomotor	34	-0.0401	-0.1247	-0.1555	-0.5324
Visual including blindness (excluding cataract)	35	-0.0693	-0.1439	0.1677	-0.1038
Speech	36	-0.2114	-0.0758	-0.2711	-0.8166
Hearing	37	-0.0594	0.0483	-0.1532	0.1123
Diseases of Mouth/Teeth/Gum	38	0.2290	0.1425	0.1998	0.3446
Accidents/Injuries/Burns/Fractures/Poisoning	39	-0.0151	-0.1075	-0.1520	-0.3589
Cancer and other tumors	40	0.1112	0.0561	-0.1357	-0.2971
Other diagnosed ailments	41	-0.0218	-0.0159	-0.0893	-0.0991
Other undiagnosed ailments	99	-0.0517	-0.0973	0.0700	-0.3451
MPCE Lorenz ratio	-	0.2573	0.3262	0.2830	0.3292

**Table 5: Estimates of Psuedo-Lorenz ratios by broad groups of diseases and Sector: Kerala vs. All-India**

Disease	Code	All-India		Kerala	
		Rural	Urban	Rural	Urban
Gastro intestinal infection & infestations	1,2,,,5	-0.0616	-0.1351	0.0236	0.0592
Cardio vascular diseases	6,7	0.3458	0.2709	0.1391	0.1565
Respiratory	8,9,10	0.0620	-0.0256	0.0052	-0.0345
Joints & bones	11	0.1079	0.0623	0.0172	0.0124
Kidney & prostatic	12,13	0.0726	0.1818	-0.0891	-0.2102
Neurological	15	0.1386	0.0139	0.1204	-0.0400
Eye ailments	17,18,19	-0.0490	-0.1057	-0.1129	-0.0409
Skin related	20	-0.0192	-0.1986	-0.0211	-0.0175
Diabetes	22	0.4302	0.3183	0.1768	0.1841
Febrile illness	26,,,31	-0.1132	-0.1496	-0.0972	-0.0064
Disabilities	34,,,37	-0.0654	-0.0890	-0.1022	-0.3043
Accidents et al	39	-0.0189	-0.1172	-0.1700	-0.3884
MPCE Lorenz ratios		0.2573	0.3262	0.2830	0.3292

**Table 6: Estimates of Expenditure Elasticities and incidence of Diseases by Sector: All-India**

Disease	Code	<i>Rural India</i>		<i>Urban India</i>	
		Exp. elasticity	% incidence	Exp. elasticity	% incidence
Diarrhoea/ dysentery	1	-0.401	5.48	-0.597	3.71
Gastritis/gastric or peptic ulcer	2	0.067	4.04	-0.127	2.70
Worm infestation	3	-0.415	0.45	-0.296	0.37
Amoebiosis	4	-0.328	0.44	-0.204	0.22
Hepatitis/Jaundice	5	-0.341	0.42	-0.291	0.51
Heart disease	6	1.222	1.89	0.746	4.75
Hypertension	7	1.429	3.53	0.924	9.40
Respiratory including ear/nose/throat ailments	8	0.405	7.04	0.083	7.22
Tuberculosis	9	-0.394	1.33	-0.991	0.74
Bronchial asthma	10	0.216	3.81	-0.115	3.15
Disorders of joints and bones	11	0.434	6.46	0.220	6.81
Diseases of kidney/urinary system	12	0.469	0.92	0.580	1.12
Prostatic disorders	13	-0.818	0.14	0.648	0.09
Gynaecological disorders	14	0.051	1.30	0.076	0.95
Neurological disorders	15	0.552	1.91	0.072	2.32
Psychiatric disorders	16	0.255	0.70	-0.094	0.63
Conjunctivitis	17	0.135	0.41	-0.015	0.47
Glaucoma	18	-0.343	0.24	0.117	0.32
Cataract	19	-0.228	1.64	-0.484	1.39
Diseases of skin	20	-0.060	2.44	-0.580	1.75
Goitre	21	1.168	0.11	0.748	0.13
Diabetes mellitus	22	1.682	2.26	1.004	6.82
Under-nutrition	23	-0.543	0.11	0.104	0.22
Anaemia	24	-0.431	0.47	-0.573	0.50
Sexually transmitted diseases	25	0.511	0.09	0.958	0.00
Malaria	26	-0.409	2.06	-0.512	0.96
Eruptive	27	-0.371	0.58	-0.509	0.21
Mumps	28	-0.751	0.29	-0.332	0.22
Diphtheria	29	-1.696	0.14	-0.130	0.23
Whooping cough	30	-0.339	2.59	-0.166	2.25
Fever of unknown origin	31	-0.418	20.55	-0.462	15.00
Tetanus	32	1.204	0.04	1.880	0.02
Filariasis/Elephantiasis	33	-0.242	0.12	-0.721	0.13
Locomotor	34	-0.156	1.99	-0.382	1.60
Visual including blindness (excluding cataract)	35	-0.270	1.23	-0.441	0.75
Speech	36	-0.822	0.23	-0.233	0.37
Hearing	37	-0.231	0.97	0.148	0.94
Diseases of Mouth/Teeth/Gum	38	0.890	0.97	0.437	1.10
Accidents/Injuries/Burns/Fractures/Poisoning	39	-0.059	2.73	-0.330	2.60
Cancer and other tumors	40	0.432	0.50	0.172	0.58
Other diagnosed ailments	41	-0.085	14.61	-0.049	14.68
Other undiagnosed ailments	99	-0.201	2.80	-0.298	2.08

**Table 7: Estimates of Expenditure Elasticities and Incidence of Diseases by Sector: Kerala**

Disease	Code	Rural Kerala		Urban Kerala	
		Exp. elasticity	% incidence	Exp. elasticity	% incidence
Diarrhoea/ dysentery	1	0.221	0.87	0.121	0.61
Gastritis/gastric or peptic ulcer	2	0.143	2.65	0.186	1.83
Worm infestation	3	-0.770	0.33	0.416	0.62
Amoebiosis	4	0.759	0.30		0.00
Hepatitis/Jaundice	5		0.00	1.348	0.10
Heart disease	6	0.687	3.57	0.497	4.78
Hypertension	7	0.477	7.61	0.576	9.84
Respiratory including ear/nose/throat ailments	8	0.237	12.29	0.172	13.79
Tuberculosis	9	-0.669	0.63	-1.184	0.68
Bronchial asthma	10	-0.213	5.20	-0.567	3.27
Disorders of joints and bones	11	0.115	8.97	0.127	7.44
Diseases of kidney/urinary system	12	0.049	0.72	-0.577	1.27
Prostatic disorders	13	-2.600	0.10		0.00
Gynaecological disorders	14	1.110	0.73	0.601	1.23
Neurological disorders	15	0.478	2.59	-0.038	3.10
Psychiatric disorders	16	-0.033	1.57	-0.924	0.74
Conjunctivitis	17	-0.899	0.21	0.391	0.42
Glaucoma	18	1.309	0.19	-0.641	0.12
Cataract	19	-0.498	1.23	-0.174	0.78
Diseases of skin	20	-0.020	2.01	0.043	0.99
Goitre	21	1.355	0.24	2.117	0.32
Diabetes mellitus	22	0.675	5.92	0.623	8.52
Under-nutrition	23	-0.959	0.03		0.00
Anemia	24	-0.652	0.26	-2.487	0.25
Sexually transmitted diseases	25		0.00		0.00
Malaria	26		0.00		0.00
Eruptive	27	0.122	0.45		0.00
Mumps	28	1.755	0.07		0.00
Diphtheria	29		0.00	-2.063	0.18
Whooping cough	30	-0.578	1.04	1.254	1.10
Fever of unknown origin	31	-0.280	15.40	-0.009	17.47
Tetanus	32	-2.340	0.06		0.00
Filarisis/Elephantiasis	33		0.00	-2.122	0.32
Locomotor	34	-0.550	1.46	-1.617	1.37
Visual including blindness (excluding cataract)	35	0.593	0.79	-0.315	0.19
Speech	36	-0.958	0.28	-2.480	0.26
Hearing	37	-0.541	0.56	0.341	1.14
Diseases of Mouth/Teeth/Gum	38	0.706	0.68	1.047	0.23
Accidents/Injuries/Burns/Fractures/Poisoning	39	-0.537	2.06	-1.090	2.33
Cancer and other tumors	40	-0.480	0.43	-0.903	0.39
Other diagnosed ailments	41	-0.316	16.46	-0.301	13.36
Other undiagnosed ailments	99	0.247	2.04	-1.048	0.96

**Table 8: Expenditure Elasticities and Incidence of Diseases by Sector: All-India**

Disease	Code	Rural India		Urban India	
		Engel elasticity	% share	Engel elasticity	% share
Gastro intestinal infection & infestations	1,2,..,5	-0.240	10.83	-0.414	7.51
Cardio vascular diseases	6,7	1.344	5.41	0.830	14.15
Respiratory	8,9,10	0.241	12.19	-0.079	11.11
Joints & bones	11	0.420	6.46	0.191	6.81
Kidney & prostatic	12,13	0.282	1.07	0.557	1.21
Neurological	15	0.539	1.91	0.043	2.32
Eye ailments	17,18,19	-0.190	2.29	-0.324	2.18
Skin related	20	-0.075	2.44	-0.609	1.75
Diabetes	22	1.672	2.26	0.976	6.82
Febrile illness	26,..,31	-0.440	26.19	-0.459	18.87
Disabilities	34,..,37	-0.254	4.42	-0.273	3.65
Accidents et al	39	-0.073	2.73	-0.359	2.60

**Table 9: Estimates of Expenditure Elasticities and Incidence of Diseases by Sector: Kerala**

Disease	Code	Rural Kerala		Urban Kerala	
		Engel elasticity	% share	Engel elasticity	% share
Gastro intestinal infection & infestations	1,2,..,5	0.083	4.16	0.180	3.16
Cardio vascular diseases	6,7	0.492	11.18	0.475	14.62
Respiratory	8,9,10	0.018	18.11	-0.105	17.74
Joints & bones	11	0.061	8.97	0.038	7.44
Kidney & prostatic	12,13	-0.315	0.82	-0.639	1.27
Neurological	15	0.426	2.59	-0.121	3.10
Eye ailments	17,18,19	-0.399	1.63	-0.124	1.32
Skin related	20	-0.075	2.01	-0.053	0.99
Diabetes	22	0.625	5.92	0.559	8.52
Febrile illness	26,..,31	-0.344	16.96	-0.019	18.75
Disabilities	34,..,37	-0.361	3.09	-0.924	2.95
Accidents et al	39	-0.601	2.06	-1.180	2.33

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