The state of Kerala, which achieved the below replacement level fertility much ahead of other Indian states, has the highest proportion of elderly. This proportion is going to increase from 10.6 per cent in 2001 to 18.3 per cent in 2026 (India, Registrar General, 2006). All these trends indicate towards the aging of the Kerala population. While different aspects of aging have been looked upon in case of India, but implication of aging on health expenditure has not yet been analysed either in case of Kerala or India. On this account, this research proposes to attempt an exploration of the issue of population aging and its implications for health expenditure.

There are evidences to suggest that the elderly are more likely to have health problems as compared to general population (Omran, 1971; Young, 1997; Bhatia, 2007). Regardless of physical illness, the aged are more likely to have mental health problems, which arise from senility, neurosis and extent of life satisfaction (WHO, 1989). Mental disorders are not just due to brain aging; losses associated with the quality of life and socio-economic problems are also responsible for advanced mental problems among the elderly (Prakash, 2004).

The high prevalence of health problems among the elderly has direct implication on health expenditure. As physical and mental health tends to deteriorate with age, the elderly need much more health care. In addition, the elderly often need medical care, which involves relatively expensive treatment and frequent hospitalisation. As a result of this, per capita health spending among the elderly is three to five times more than that of young population (Reinhardt, 2003). Further the study shows that the higher incidence of death due to prevalence of more severe diseases increases health-related costs among the elderly. Seshamani and Gray (2003) show that approaching death affects costs up to 15 years prior to death and the health care cost increases ten times from five years prior to death. The concentration of medical care expenditure in the last years of life is also evident in particular disease categories such as heart disease and cancer (Riley et al., 1987). studies do find rise in health expenditure in old age, but this is primarily because mortality rates increase with age and health care expenditure increases with proximity to death (Yang Norton and Stearns, 2003; Seshamani and Gray, 2004).

Given this prelude, growth in the elderly population in Kerala and prevalence of chronic diseases among them raises concerns regarding the overall burden of care for those with physical and cognitive limitations, and the health care costs of the society. In Indian context, sufficient

evidence exists pertaining to the kind of deterioration in physical and mental health in old age (Rajan, 2004; Rajan, 2008; Alam, 2008; Gupta, Dasgupta and Sawhney, 2001). But, there is no systematic exploration regarding the burden of health expenditure that could arise due to the longer life span of the elderly with multiple chronic ailments. Due to the projected increase in the population of the elderly in Kerala, the cost of managing disease is going to increase significantly.

Objectives:

Given the aforesaid background, the broad objectives of the study is to examine how population aging affects the health expenditure at the individual level. The specific objectives of the study are as follows:

1. To examine the effect of population aging on health expenditure

2. To estimate the future cost of managing chronic diseases.

Data Source and Methodology

Data sources used for the present study are NSS 60th Round (Schedule No. 25) on 'Morbidity, Health Care and Condition of Aged' (2004), population projections provided by India, Registrar General (2006) and Migration Monitoring Study (2007).[1] Out of these, NSS 60th Round raw data provides detailed information on the health status of the whole population, including the aged. The data further informs us about the health care utilisation pattern of the patients. NSS data includes information regarding the health expenditure incurred by individual both during the last 365 days and during the last seven days. In the present study, the analysis of health expenditure accounts for the last 365 days only. The obvious reason for not analysing the health expenditure during last seven days is that the information collected about health expenditure during last seven days may not reflect the true picture.

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[1] Migration Monitoring Study (2007) is the third round of the Migration Monitoring Studies conducted by the Research Unit on International Migration of the Centre for Development Studies. Households were randomly selected from all the 14 districts and all the 63 taluks of the state. The thrust areas covered in the survey are migration, remittances and employment. This round of the survey is different from the previous rounds as it also covers topics like education and health, amenities in the households, possession of consumer durables and household indebtedness.

To estimate the expected burden of aging, the future cost of certain diseases for the elderly and non-elderly is estimated using the following formula-

$$Estimated\ cost\ of\ diseases\ =\ ASMR \times CD_i \times P_i^t$$

Where,

$$ASMR\ =\ Age\ Specific\ Morbidity\ Rate = \frac{nM_x}{nP_x}$$

nM_x = Morbid population in the age group x to (x +n); nP_x = Population in the age group x to (x + n); CD_i = Per capita cost of disease for i^{th} age group; P_i^t = Projected population for i^{th} age group at time period t

To find out the effect of age on health expenditure, regression analysis is done. Health expenditure is taken as dependent variable and the independent variables are per capita expenditure (PCE), age, type of hospital used, sex, place of residence and education. Summarising, the following model was used,

$$PCHE = \beta_0 + \beta_1 PCE + \beta_2 AGE + \beta_3 DST + \beta_4 THSP + \beta_5 SEX + \beta_6 SEC + \beta_7 EDU + D\_A + D\_HSP$$
$$+ D\_SEX + D\_PRI + D\_SEC + D\_HIGH + \mu$$

Where, PCHE denotes per capita health expenditure, DST is the duration of stay in hospital THSP is type of hospital; SEC is sector (place of residence, rural-urban); EDU is education and μ is the error term; D_A is dummy for age β_0 is the intercept and β_is are coefficients.

D_A is dummy for age; D_A = 1 if age $\geq$ 60, 0 otherwise

D_HSP is dummy for type hospital; 1 if the hospital is private, 0 if it is public hospital

D_SEX is dummy for sex; 1 if female, 0 for male,

D_PRI is dummy for education; 1 if the person is primary educated[2], 0 otherwise (i.e. illiterate or more than primary educated)

D_SEC is dummy for education; 1 if the person is secondary educated, 0 otherwise (i.e. illiterate or more or less than secondary educated)

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[2] Illiterate refers to the person who is not able to read or write; primary education refers to 5 to 10 years of schooling; secondary education refers to 10-12 years of education; higher education refers to degree or diploma.

D_HIGH is dummy for education; 1 if the person is higher educated, 0 otherwise (i.e. illiterate or less than higher educated)

Preliminary Results and Discussion

Preliminary findings suggest that the proportion of elderly reporting their health as poor is as high as 37 percent for Kerala which is the highest among all Indian states. To further the discussion regarding the impact of aging on deterioration of physical health status, the disease prevalence among the elderly is presented. The proportion of elderly having at least one ailment is found to be 59 percent, which is much higher than the other Indian states and all India average. Similar result is found in case of proportion of elderly having at least two ailments and at least three ailments. Further the results indicated that the prevalence of morbidity increases with the advancement of age.

To analyse the health expenditure associated with the high prevalence of morbidity, per capita hospitalisation cost is calculated and the findings indicate that this cost is the highest for Kerala (Rs 509) in India. Further, it is revealed that the per capita hospitalisation cost for elderly is around four times higher than that of the non-elderly. All these findings suggest that high prevalence of morbidity among elderly gets reflected in high health expenditure.

Cost of hospitalisation was also analysed for different income quintiles and as expected it increases as we move towards higher wealth quintile for both elderly as well as non-elderly. It shows that people of higher income strata tend to spend more compared to people of lower strata.

Regression result

The regression result shows that all independent variables have positive and significant effect on health expenditure. As per expectations the higher income households spend more on health care. The result also suggests that heath expenditure is significantly higher for elderly compared to non-elderly. As already discussed earlier, the high health expenditure among elderly is because of the fact that the elderly are more prone to disease. Surprisingly, females have high health expenditure compared to males. However, it should be borne in mind that this is not the case when we do not control for education   (table not shown). It shows that when we control for

education, health expenditure is likely to be more for females. Education dummies show increase in health expenditure increase in educational attainment. It may be attributed to better health awareness due to education. It can also be partially attributed to better income due to higher education. The results also show rural-urban differences in health expenditure with significantly higher health expenditure among urban people.

Independent variables	Co-efficient	t-value	Standard Error
Constant	-197.152***	-331.802	1.206
PCE	.232***	524.540	.000
AGE	101.695***	143.062	.711
D_HSP	411.955***	726.370	.567
DST	26.780***	1441.133	.019
D_SEX	5.619***	10.132	.555
SEC	67.591***	108.811	.621
D_PRI	67.779***	111.081	.610
D_SEC	313.869***	336.653	.932
D_HIGH	830.036***	588.584	1.410
Adjusted R square	.134		

*** represents significant at 1 percent level, ** represents significant at 5 percent level, * represents significant at 10 percent level.

Future Cost of Disease

Estimating the future cost of diseases for Kerala, it is found that the cost of all the diseases is expected to increase from Rs. 1,603 million in 2011 to Rs, 1,770 million in 2016 to Rs, 2111 million in 2026, in which the larger part of the increase would come from the increase in the cost of diseases for the elderly. This result has significant bearing on policy implications especially in terms of public finance.