Journal of Management & Muamalah, Vol. 7, No. 1, 2017
eISSN 2180-1681

A Study of Population Ages Structure and Health Care Expenditure in India

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ABSTRACT

This paper examines the relationship between population ages structure and health care expenditure in the case of India. Total population in India increased from year to year, as in 1970 total population is 5.54 million and increased to 1.25 billion. Projection of population established in 2015 predict that the total population will keep growing until at least 2050, reaching an estimated 8 billion people in 2024, and 9 billion people in 2024 and 9 billion by 2040. As the demographic transition follows its course worldwide, the population will age significantly, with most countries outside Africa trending towards a rectangular age pyramid. As a increasingly in population ages structure, population ages 0-14 years, population ages 15-64 years and population ages 65 years and above and this will increased in consume of the healthcare expenditure. As we know that, total young population and ageing population are increased from year to year. Thus in this paper is estimate the effect of population in population ages structure especially as an increased in number of young population (ages 0-14 years) and ageing population (ages 65 years and above) on healthcare expenditure in case of India. By using bound testing approach to cointegration and error correction model, developed within an autoregressive distributed lag (ARDL) framework developed by Pesaran et al. (1999) and data cover from period 1970-2012, we investigate whether a long-run equilibrium relationship exists between population ages structure and health care expenditure. Using this approach, we find evidence of long run relationship between population ages structure and health care expenditure, gross domestic product per capita, inflation rate and hospital beds in India but the population ages 65 years and above is most influence health care expenditure. These findings support the hypothesis that population ages structure will increased healthcare expenditure in India.

Key Words: Population ages structure, healthcare expenditure, India, ARDL model

Kajian Keperluan Struktur Umur dan Perbelanjaan Penjagaan Kesihatan di India

ABSTRAK

Kajian ini mengkaji hubungan antara struktur usia penduduk dan perbelanjaan penjagaan kesihatan dalam kajian kes di India. Jumlah penduduk di India semakin meningkat dari tahun ke tahun, pada tahun 1970 jumlah penduduk adalah 5.54 juta dan meningkat kepada 1.25 bilion. Unjuran penduduk pada tahun 2015 meramalkan bahawa jumlah penduduk akan terus berkembang sehingga sekurang-kurangnya 2050, mencapai anggaran 8 bilion orang pada tahun 2024, dan 9 bilion orang pada tahun 2024 dan 9 bilion pada tahun 2040. Memandangkan peralihan demografi di seluruh dunia, penduduk akan bertambah dengan ketara, dengan kebanyakan negara di Afrika contohnya, yang sedang menuju ke arah piramid umur segi empat tepat. Struktur usia penduduk yang semakin meningkat, penduduk umur 0-14 tahun, penduduk umur 15-64 tahun dan penduduk umur 65 tahun ke atas dan ini akan meningkat dalam penggunaan perbelanjaan penjagaan kesihatan. Seperti yang kita ketahui, jumlah penduduk muda dan populasi golongan tua meningkat dari tahun ke tahun. Oleh itu, dalam kajian ini, menganggarkan kesan penduduk dalam struktur umur penduduk terutamanya sebagai peningkatan jumlah penduduk muda (umur 0-14 tahun) dan populasi yang semakin tua (umur 65 tahun ke atas) mengenai perbelanjaan penjagaan kesihatan dalam kes India. Dengan menggunakan pendekatan ujian terikat untuk model "cointegration" dibangunkan dalam "autoregressive distributed lag" (ARDL) yang dibangunkan oleh Pesaran et al. (1999) dan menggunakan data dari tempoh 1970-2012, kami mengkaji sama ada hubungan keseimbangan jangka panjang wujud antara struktur usia penduduk dan perbelanjaan penjagaan kesihatan. Dengan menggunakan pendekatan ini, kita dapati bukti hubungan jangka panjang antara struktur umur penduduk dan perbelanjaan penjagaan kesihatan, jumlah pertumbuhan domestik ekonomi, kadar inflasi dan jumlah katil hospital di India dan penduduk berumur 65 tahun ke atas paling mempengaruhi perbelanjaan penjagaan kesihatan. Penemuan ini menyokong hipotesis bahawa struktur umur penduduk akan meningkatkan perbelanjaan penjagaan kesihatan di India.

Kata Kunci: Struktur umur penduduk, perbelanjaan penjagaan kesihatan, India, model ARDL

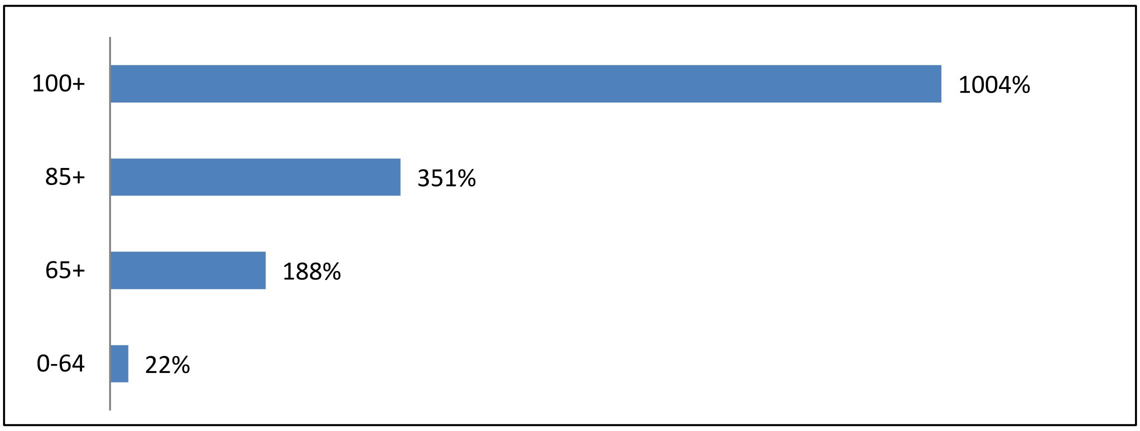
INTRODUCTION

Health care spending varies by factors such as age and sex. Average health care spending per person increase with age, although spending for children and for young adults is equally the same, but spending on adults, age 65 and older have the highest health care spending and more longer life expectancy increase the cost of medical care (National Institute on Aging, National Institute of Health, 2011). The growing population enlarges the patient pool for healthcare market and also facing an aging society, unfortunately, diseases especially chronic diseases affect older adults disproportionately, and as a result of ageing population, they will be increasingly pressured to handle a growing sick population. An ageing society could lead to an increase in needs for medical services which could boost the health care industry. When people get old, they are normally fragile to diseases, and older people consume more drugs than younger people do.

In general, the analysis shows that healthcare costs increases by age with the exception of the very youngest ages. Costs, on average, are very high in the first year and two of birth and drops significantly by the age of five. At this point, cost increases modestly through the teen years. The "cross-over-age" occurs in the early 60s, when the per capita spending for male exceeds than the females. Medicare costs for beneficiaries age 65 and older continue to increase with age (Yamamoto, Health Care Cost Institute's Independent Report Series, 2013).

Population age structure is often included as a covariate in health expenditure regression. Commonly used indicators are the share of young (aged under 15 years) and old people (ages above 65 years) over the active or total population (Xu and Saksena, 2011). The increasing health care suggests an increasing market scale for healthcare. Using data compiled by the World Bank and United Nations.Besides that, report from United Nations, World Population Prospect (2010) the rising life expectancy within the older population itself is increasing the number and proportion of people at very old ages. The "oldest people" (people aged 85 or older) constitute 8 percent of the world's 65 and over population: 12 percent in more developed countries and 16 percent in less developed countries. In many countries, the oldest old are now the fastest growing part of the total population. On a global level, the 85 and over population is projected to increase 351 percent between 2010 and 2050, compared to a 188 percent increase for the population aged 65 or older and a 22 percent increase for the population under age 65 (Figure 1).

Figure 1: Projected Population for World's Population by Age, 2050.



(Source: United Nations, World Population Prospect, The 2010 Revision)

In 2010, an estimated 524 million people were aged 65 and above is 8 percent of the world's population. By 2050, this number is expected to nearly triple to about 1.5 billion, representing 16 percent of the world population. Although more developed countries have the oldest population profiles, the vast majority of older people and the oldest population profiles, the vast majority of older people and the most rapidly aging population are in less developed countries. Between year 2010 and 2050, the number of older people in less developed countries is projected to increase more than 250 percent, compared with a 71 percent increase in developed countries.

In India, total population is increasing and the government is concerned about the expending population size. In the early 1970s, the Indian government implemented a population control policy called "The Sterilization Program". This program is compulsory and enforced for men with more than two children but this program was unsuccessful, and starting from year 2000, India introduced the National Population Policy to control the population growth. The growth in population was influenced by various factors, such as increases in percentage of population in the productive ages structure, high fertility rate, low infant mortality rate and also early marriage. Since these policy implemented, the government has successfully reduced the population growth rate. Thus population ages 0-14 years are reduced from 41.13 percent in 1970 to 34.21 in 2000 and 29.65 in 2013 but population ages 65 years and above is increases from 3.3 percent in 1970 to 4.36 percent in 2000 and 5.38 percent in 2013 (Sources World Bank).

Besides that, population ages 65 years and above or ageing needs much more on health care, including nursing and other services and expenses are expensive because of high technology and cost of hospitalization. This ages is one of the factors influences the increase in the health care expenditure. The more elderly population will challenge the health system and the projected expenditure for ageing population for both most populous countries is increasing. In fact the total population ages 65 years and above is increasing in India, the health care expenditure increased from 60 million to 227 million in 2050. Over the past century, life expectancy has increased dramatically and the world will soon have ageing people larger than children. Although population ages 65 years and above is occurring in every country, the top 10 countries with the highest share of ageing are the developed countries but the trend will change by year 2050. India will be among the countries that cover the developing countries by 2050 in terms of growth of ageing population. A longer life means that people have both, the more productive years and the more years of suffering and ageing, which is associated with the extended period of morbidity (Castro et al., 1998). This age structure will increase pressure on health infrastructure and health spending. The major challenges of population ages 65 years and above include the increase in economic and social demands, rising burden of chronic disease, increase risk of disability, care providing for ageing and the feminization of ageing.

This is aims to examine the effects of population in population ages structure especially as an increased in number of young population (ages 0-14 years) and ageing population (ages 65 years and above) on healthcare expenditure in case of India.This study contribute the empirical literature by incorporating population ages structure as indicators measuring young population ages (0-14 years) working ages population (ages 15-64 years) and ageing population (65 years and above). Besides that, it also contribute to the empirical model the population ages and healthcare expenditure using a cointegration and error correction modeling strategy. In India, as an increased in the population, and changes in the population ages structure it will impact on the healthcare expenditure. Thus there is a strong need for further knowledge of these particular issues to provide such analysis for policy maker.

The rest of paper is organized as follows. Sections 2 discuss the empirical literature. It is followed by a review of the data, methodology and empirical model are discussed in Section 3. After discussing the empirical model used in this study, Section 4 describe the effects of population ages structure on healthcare expenditure in India. The final section concludes and outlines several policy implication

LITERATURE REVIEW

Many empirical studies have shown that demographic factors have a strong influence on health care spending. An increase in population also affects health care expenditures. People will demand more from health care, especially for the elderly. Feldstein (1996) found that demographic variables also influence the level and composition of public spending as the elderly population demands more from health care, housing, and social security. An increase in government spending affects the increase in demographic transitions, such as population density.Samadi and Rad (2013) studied the determinant of healthcare expenditure in Economic Cooperation Organization (ECO) using panel data econometrics and they found that a long term relationship was found between health care expenditures per capita and GDP per capita, the proportion of population below 15 and above 65 years old, number of physicians, and urbanization. Besides, all the variables had short term relationships with health care expenditure, except for the proportion of population above 65 years old.

Sanz and Velzquez (2007) and Remmer (2004) found that the variation of the dependency ratio of the population must be taken into account because this proxy is increasing government spending, especially health care and social security. They measured the dependency ratio as the percentage of the population that is 65 years of age or older. In addition, Dummer and Cook (2008) examined health care in China and India. China and India are similar in rapid economic growth and demographic factors. The factors that determine health care spending are supply side factors. On the supply side factor, the factors depend on the health status and the ability of the elderly rather than on age. Demographic growth, health care consumption, and age are clearly linked. Therefore, indicators such as the proportion of the young and old are important factors in explaining variations in health care expenditures. Grossman (1972), Leu (1986), Hitiris and Posnett (1992), Di Matteo and Di Matteo (1998), and Felder, Meier and Schmitt (2000) found that these variables are important effects on health care expenditures.

Evidence exists regarding the significant effect of variables such as an elderly or a young population. An earlier study by Newhouse (1992) found that age composition has important effects on health care expenditures, and this variable has been included in most of the macro studies since then. Leu (1989) found that the young population under 15 years of age has a positive relation with health care expenditures, while a population above 65 years of age is negatively correlated with health care expenditures and result found by Boulet et al. (2008) found that the medical cost for the children with the down syndrome are 12 to 13 times higher than the for normal children.

An elderly population will spend more on health care or medical care than younger populations. There is evidence that aggregate health care expenditures rise because of a higher percentage of the elderly population in a country. A study by Fujino (1987) showed that the elderly use 3.2 times the medical services as the average person. Murthy and Ukpolo (1994) found that the elderly population is the most significant determinant of health care expenditures. Another study by Shoven, Topper, and Wise (1994) conducted in America showed that the health care expenditures for elderly people will exceed the annuity revenue in 2020, and this will burden the health care system and annuities. Similarly, Meng and Yeo (2005) found that the old age dependency ratio is growing rapidly and that the health care system has moved away from public financing to a largely self-financing system. Another study by Seshamani and Gray (2002) found that the changes in demographic structure are estimated to be responsible for only approximately 2 percent of the observed increase in health care expenditures in England and Wales.

In India, Rahman (2008) asserted that health care expenditures are not luxury goods. He also found that other factors, such as per capita income and the literacy rate, have a significant impact on health care expenditures and that structural demand variables, such as population over the age of 60, population per primary health care center, and population per doctor, have insignificant impacts on health care expenditures. Tang (2010) found that income, health, prices, and proportion of population aged over 65 are cointegrated with the health care expenditures. Otherwise, income is bi-directional in nature, and the policy import is that initiatives to promote health care expenditures should be implemented to achieve sustainable economic growth and development. Cole and Neumayer (2006) found that changes in the elderly population account for 13 percent of the increase in health care expenditures. Nordin & Nordin (2016) in studied of impact of ageing population on healthcare expenditure in China. They using bound testing approve proposed by Pesaran et al. (2001) in estimating developing countries such as China,India, Rusia, Brazil and Thailand. The result was found that there was a stable long-run relationship between ageing population influence healthcare expenditure in developing countries. China have a higher imapct of population on healthcare expenditure followed by Russia and India.

METHODOLOGY

All series examined in this study- population ages structure, health care expenditure, gross domestic product per capita, inflation rate and hospital beds are collected from the World Bank Indicator. The data is annual and spans the time period 1970-2012. Usually, population ages structure is measured by population ages (AGE) and model estaimated with seperate population ages structure; which is population ages 0-14 years (AGE 1), population 15-64 years (AGE 2) and population ages 65 years and above (AGE 3) to avoid the multicollinearity problem. Then health care expenditure (HCE) measured by the sum of public and private health care expenditure, gross domestic product per capita (GDPC), inflation rate (INF) and hospital beds (BEDS).

In terms of methodology, the paper adopts the recently developed autoregressive distributed lag (ARDL) framework by Pesaran and Shin (1999). This approach does not involve pre-testing variables, which means that the test on the existence relationship between varaibles in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mixture of both.

Basically, the ARDL approach to cointegration involves estimating the conditional error correction model version of ARDL model for the effects of population ages structure on health care expenditure.

$$\begin{aligned} \Delta LNHCE_t = \beta_0 + \beta_1 LNAGE_{t-1} + \beta_2 LNGDPC_{t-1} + \beta_3 LNINF_{t-1} + \beta_4 LNBEDS_{t-1} \\ + \sum_{i=1}^{3} \beta_{5i}\, \Delta LNPOP_{t-1} + + \sum_{i=1}^{3} \beta_{6i}\, \Delta LNGDPC_{t-1} + \sum_{i=1}^{3} \beta_{7i}\, \Delta LNINF_{t-1} \\ + \sum_{i=1}^{3} \beta_{8i}\, \Delta LNBEDS_{t-1} + \mu_t \end{aligned} \tag{1}$$

where:
HCE = Healthcare Expenditure (% of GDP)
AGE = Population Ages Structure
- $AGE1$ = Population Ages 0-14 years
- $AGE2$ = Population Ages 15-64 years
- $AGE3$ = Population Ages 65 years and above

$GDPC$= Gross Domestic Product per Capita

INF= Inflation rate
$BEDS$ = Total Number of Hospital Beds
Δ=First different operator
To examine the long-run relationship, bounds testing for cointegration based on critical values adopted from Pesaran et.al (2001) was used with the following null hypothesis (for no long-run relationship) and alternative hypothesis (for a long-run relationship):

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0 \text{and } H_A \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0.$$

EMPIRICAL RESULTS

A unit root test was done for all variables using the Augmented Dickey Fuller (*ADF*) and Phillips-Perron tests to satisfy the pre-requisite condition of the dependent variable being nonstationary or containing a unit root in *I* (1) and stationary in *I* (0), as prescribed by Pesaran et al. (2001).Based on the *ADF* test statistic in Table 1, for India, the results of the *ADF* test statistics showed that all series were stationary at different levels; the results of the level of the constant and the trend indicate that health care expenditures (*HCE*) fail to reject the null hypothesis of nonstationary at the 0.10, 0.05, and 0.01 marginal levels, respectively. This indicates that these series are non-stationary at their level form. Therefore, these variables either contain a unit root process, or they share a common stochastic movement. On the other hand, the result of stationary indicates by *HCE* at first difference both at constant and trend.

This indicates that these series are stationary, and it was integrated at order 1. All the variables are stationary at level *I(0)*, except gross domestic product per capita (*GDPC)* and hospital beds (*BEDS)* are stationary at *I(1).* For the Phillips-Perron test, it was found that all series are stationary at the first difference *I*(1) except health care expenditure (*HCE*), population ages 0-14 years (AGE1), population ages 15-64 years (AGE2), population ages 65 years and above (AGE3), inflation rate (*INF)* which were stationary at the level *I*(0). Thus, it can be concluded that the series have unit roots, and the results have mixtures of*I*(0) and *I*(1) variables, which would not be possible under the Johansen procedure. This provides a good reason for using the bound test approach, or the *ARDL* model, proposed by Pesaran et al. (2001). The order of integration was tested at 1, 5, and 10 per cent significance levels, and the critical values were obtained from the Mackinnon (1991) Tables. The results were robust regardless of the lag length. They showed that after differencing the variables once, they were confirmed to be stationary. The ADF and Phillips-Perron tests applied to the first difference of the data series rejected the null hypothesis of nonstationary for all of the variables; therefore, it can be concluded that none of the variables used in this study were *I* (2).

Table 1: Result of ADFunit root test result for stationary of the variables India

	ADF				PHILIPS PERRON			
	LEVEL		FIRST DIFFERENCE		LEVEL		FIRST DIFFERENCE	
	No trend	**Trend**	**No trend**	**Trend**	**No trend**	**Trend**	**No trend**	**Trend**
$LHCE$	-4.0730 (0)***	-2.8155 (0)	-3.8827 (2)***	-5.8650 (1)***	-4.0359 (3)***	-2.8109 (4)	-5.8027 (2)***	-6.1444 (0)***
$LNAGE1$	2.3347 (9)	-4.0846 (3)***	-3.9510*** (8)	-3.3296 (8)***	8.3527 (5)	1.0927 (5)	-5.3609 (4)***	-5.7437 (4)***
$LNAGE2$	-0.1037 (7)	-6.1164 (3)***	-4.2586 (6)***	-1.9467 (6)**	7.3848 (5)	1.0269 (5)	-3.2405 (3)***	-3.7810 (4)***
$LNAGE3$	4.4226 (2)	-4.9777 (3)***	-4.2260 (1)***	-5.7843 (1)***	2.6812 (5)	0.0076 5(5)	-4.0804 (1)***	-4.4636 (1)***
$LGDPC$	0.3934 (0)	-0.9259 (0)	-5.7715 (0)***	-5.7483 (0)***	0.2879 (3)	-1.1930 (3)	-5.7918 (2)***	-5.7676 (2)***
$LBEDS$	1.7705 (0)	0.2662 (0)	-5.1680 (0)***	-5.6163 (0)***	1.4920 (3)	-0.0955 (3)	-5.2523 (3)***	-5.2523 (3)***
$LINF$	-4.3895 (0)***	-4.5076 (0)***	-2.7621 (3)***	-2.7906 (3)***	-4.4327 (2)***	-4.5116 (2)***	-8.6212 (12)***	-8.4674 (11)***

(Sources: Author Calculations by Eviews, 7.0)
Notes: Critical vales are presented *at 1%, ** at 5% and *** at 10% critical values of ADF statistic and value in the parenthesis is number of lags for ARDL.

The estimated coefficient of the long-term relationship between young and ageing on health care expenditures was expected to be significant, which is reported in Table 2. The results of the Wald test (f-statistic) show that all models have a long-term relationship with the variables, and the value of the critical bound is cited from Pesaran et.al (2001). Once the existence of the co-integration relationship among the variables was confirmed, the estimated equation for the long-term coefficient of the selected $ARDL$ (p_1, p_2, p_3, p_4) was identified based on Akaike's information criterion (AIC).

The F-statistic results show that there is existing of a long run relationship among the dependent and independent variables. F-statistic shows that there is co-integration and existence of the long run relationship between the dependent and independent variables. For population aged structure 0-15 years, the result is 4.3113 and significant at 5 percent significant level, the result for population aged structure 15-64 years also have co-integration and the result is 3.6060. This result also indicates that have co-integration between the variables. Lastly for the population aged structure for 64 years and above also have co-integration between the variables which is 3.8887 at 5 percent significant level. This output was helpful to decide that the null hypothesis of no-co integration can be rejected and co-integration relationship exists along with health care expenditure and its independent variables. So, the next step is to estimate the long run as well as the short run coefficient of the model.

Table 2: Result of F-Statistic population aged structure and health care expenditure in and India

Population Age Structure	F-Statistics	
Age 0-15 Years (AGE1)	4.3113**	
Age 15-64 Years (AGE2)	3.6060*	
Age 65 Years and above (AGE3)	3.8887**	
Significant Level	**Bound Critical Values**	
	I(0)	*I(1)*
1%	3.383	4.832
5%	2.504	3.723
10%	2.131	3.223

Notes: F-statistic result were presented by using Microfit 4.0
** Existence of co-integration at 5% and *** 1% significant level

After checking order of the co-integration, the next step is to check long run relationship among variables. Table 3 reports the result for the long run relationship between health care expenditure with population ages structure in India. Population aged structure 0-15 years are classified as young population, 15-64 years as working aged population and 65 years and above is ageing population. From the result, for aged structure 0-15 years indicates that when this aged population increases it will increase health care expenditure and this result is 0.9724 and this result is significant. This result is in line Khorassani and Paskawych (2009) reported the proportion of population 15 years old of young seems to have the largest effect on the per capita health care expenditure in United States. They concluded that children are the ones highest in demand for health care.

On the other hand, for aged 15-64 years, have positive relationship with health care expenditure. This means, for this aged or working aged population, health care is important to them to ensure a healthy life. The result is 0.5551 for India and similar as for aged 65 years and above also have positive and significant effects to health care expenditure. The impact of ageing population is higher in India 0.9685 compare to the other population ages structure. These findings support the hypothesis that ageing people account for a larger portion of health care expenditures because they are not participating in the labor market; however, as the aged need to spend money on medication and consultation, health care expenditures are much higher compared to younger people. This result is consistence with those of Zweifel, Felder and Meiers (1999), McGrail et al. (2000) and Seshamani and Gray (2004). Based on the literature, the common belief is that the effects of ageing on health care are a "red-herring" and it is the proximity to death, which is also related to age, matters. If expenditure increases with age because of the direct effect, the increase in ageing population will increase health care expenditure for the society significantly. From the result of the population aged structure, it will conclude that, these aged structures are important factor to determine the increases in health care expenditure in India.

On the other hand, GDPC also positive effects on health care expenditure. The results are positive, and these findings mean that an increase in *GDPC* will also increase health care expenditures. This is supported by previous literature, such as Behesshti and Sojoudi (2008), Gerdtham and Lothgren (2000), and Clemente et al. (2004), who showed that there is a long-term relationship between total health care expenditures and *GDPC.* The result for the inflation rate is negatively correlated with the health care expenditure and this means that, when inflation rate increased, health care expenditure will decrease and the result is significant. Finally, our results for the total number of hospital beds are is negative.

Table 3: Result of Long-Run Relationship for population aged structure and health care expenditure for India

	Ages 0-15 Years	Ages 15-64 Years	Ages 65 years and above
ARDL	(1,0,1,0,0)	(1,0,1,0,0)	(1,0,1,0,0)
AGE1	0.97249		
	(0.70067)**		
AGE2		0.55512	
		(0.57362)**	
AGE3			0.96853
			(0.87932)**
GDPC	0.13249	0.16691	0.075823
	(0.49608)**	(0.63744)	(0.27293)
INF	-0.092989	-0.094620	-0.087415
	(-1.0883)	(-1.0712)	(-1.1311)
BEDS	-0.62288	-0.64386	-0.56311
	(-1.8558)*	(-1.8793)**	(-1.7351)*

Note: Computation Long run results were presented using Microfit, 4.0.*** indicate significant at 1 percent, ** 5 percent and * 10 percent significance level.

For the short run estimation, the result of Error Correction Model (ECM) is given in Table 4. From the result it shows that the negative sign of ECM and this confirm that there has a long run relationship with variables. The coefficient of error correction is significant at 1 percent significant level with correct or negative sign. The coefficient of ECM for population aged structure is negative sign and significant. These results are confirmed that there have long run relationships between the variables. Population aged structure also have positive relationship with health care expenditure. These is shows in table above that for population aged 0-15 years, the coefficient is 0.1699, for population aged 15-64 years the coefficient is 0.0945 and lastly population aged 65 years and above is 0.1839 in India. Thus, from the result, population ages structure also affect the health care expenditure and aged between 0-15 years or young population have a high relationship with the health care expenditure and population aged 65 years and above also highly correlation with health care expenditure in India. For the control variable, GDPC and hospital beds also give a positive effect to the health care expenditure while only inflation rate is negatively correlated between health care expenditure which means that, when price increases treatment cost may rise because the unit prices of health care goods and services increase. The performance of the model is tested by the overall goodness of fit presented on Table 5. It implies that the model can be explained about 60 percent of its observation. It is confirmed by high R-squared value and low standard error. The value of DW-statistic of average 2 in India present that there is no serial correlation of the residual of the model and it is confirmed by the diagnostic test.

Table 4: Result of Short-Run Relationship for population aged structure and health care expenditure for India

	Ages 0-15 Years	Ages 15-65 Years	Ages 65 years and above
ECM (-1)	-0.1747 (-2.3261)**	-0.1703 (2.6509)***	-0.1899 (-2.3683)***
AGE1	0.16993 (0.6854)**		
AGE2		0.094572 (0.56777)*	
AGE3			0.1839 (0.8037)**
GDPC	0.1326 (1.8137)**	0.1282 (1.7478)*	0.1402 (1.8681)**
INF	-0.0162 (-1.3474)	-0.0161 (-1.3322)	-0.0166 (-1.3771)
BEDS	0.1088 (1.6344)*	-0.1096 (1.6430)	0.1069 (1.6068)*
R-Squared	0.3221	0.31911	0.3256
S.E. of Regression	0.0311	0.0312	0.0311
DW-statistic	2.0835	2.0828	2.0663

Note: Short-run results were presented using Microfit, 4.0. *** indicate significant at 1 percent, ** 5 percent and * 10 percent significance level.

To test the stability of the model, cumulative sum of recursive residual test (CUSUM) and cumulative sum of square of recursive residuals test (CUSUMQ) proposed by Brown et al. (1975) were performed. CUSUM test is a residual test based on the cumulative sum of the residuals based on the first n-observation by updating recursively and then to be plotted against the break points. If the CUSUM plot stays within the 5 percent significant level (shows by two straight lines as a critical value lines), the estimated coefficient is stable. Similar measure also applies on CUSUMQ test which based on the square of the recursive residuals. The graphical presentation of effects of the population ages structure on health care expenditure for CUSUM and CUSUMQ describe on Figure 2. From the graphs confirm that coefficient over the sample period stays within the critical value lines, and then it can be conclude that the coefficient is stable. For India, Figure 2, CUSUM and CUSUMQ is not completely stable within 5 percent of critical bands; however, the deviation seems to be transitory as there is sign that the plot of CUSUM and CUSUMQ statistic returns back to inside the criteria bands. Thus, judging from this, the estimated model is stable.

The diagnostic test result on this model passed all three test, serial correlation test, functional form test and normality test. Table 5 indicates the model passes all the test and this implies that it has a correct functional form, its residuals are serially uncorrelated, normally distributed and homoscedastic.

Figure 2(a): Cumulative Sum of Recursive Residuals for population aged 0-15 years

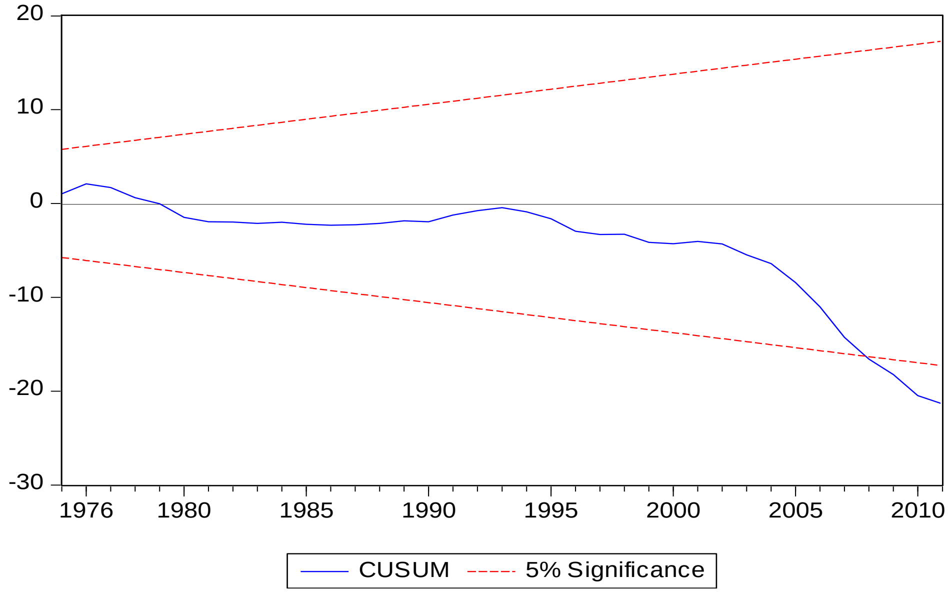


Figure 2(b): Cumulative Sum of Squares of Recursive Residuals population aged 0-15 years

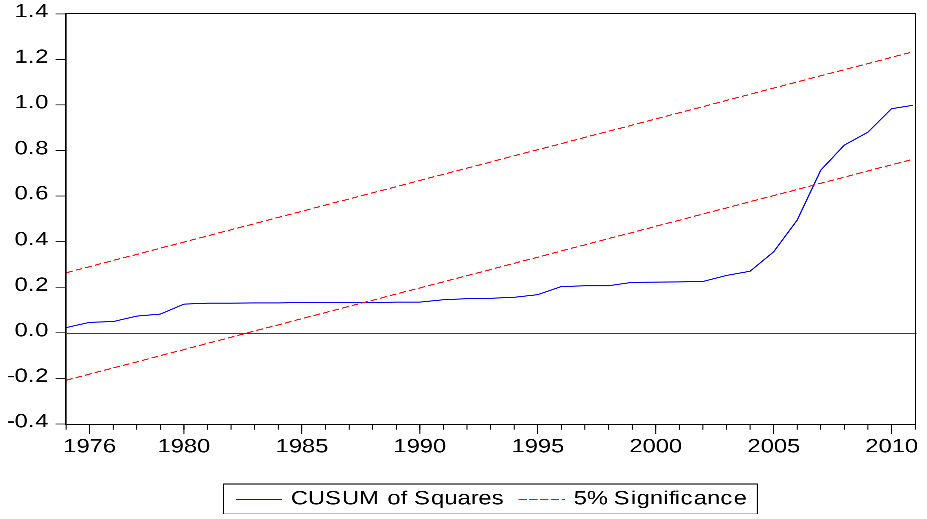


Figure 2(c): Cumulative Sum of Recursive Residuals for population aged 15-64 years

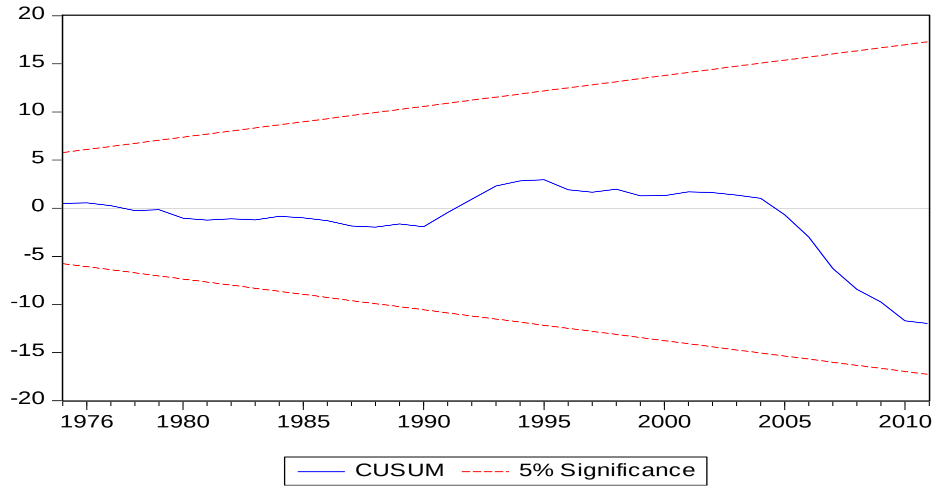


Figure 2(d): Cumulative Sum of Squares of Recursive Residuals for population aged 15-64 years

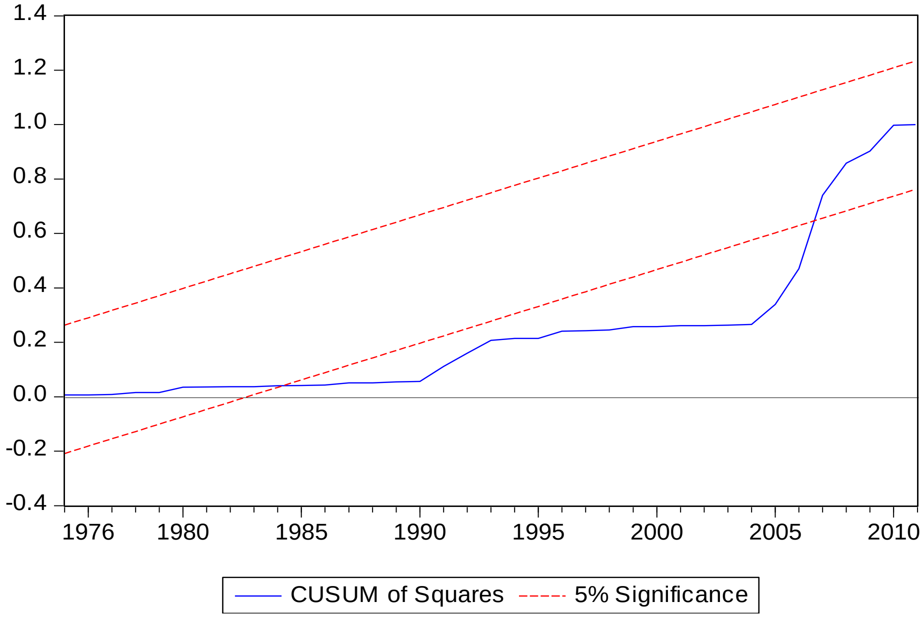


Figure 2(e): Cumulative Sum of Recursive Residuals for population aged 65 years and above

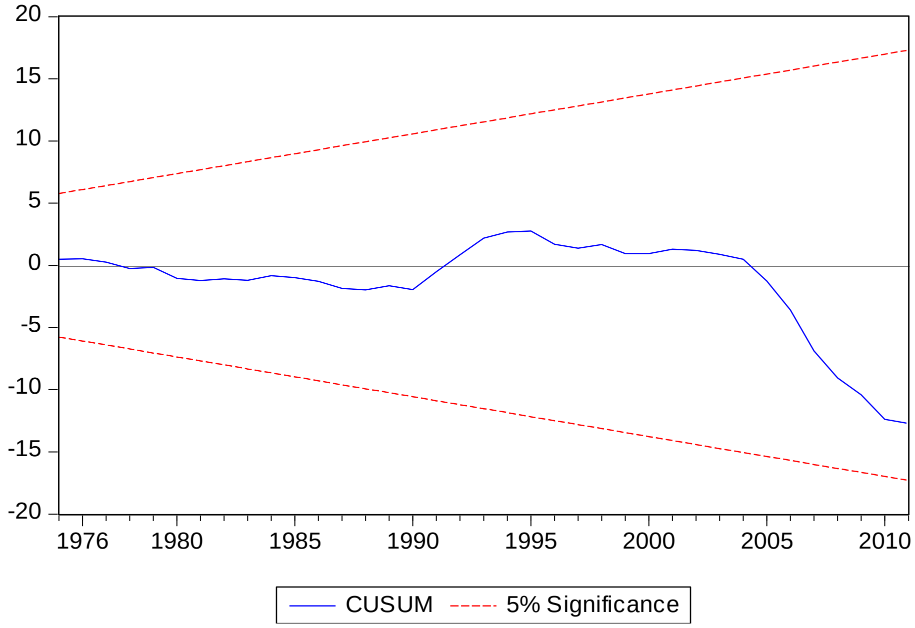


Figure 2(f): Cumulative Sum of Squares of Recursive Residuals for population aged 65 years and above

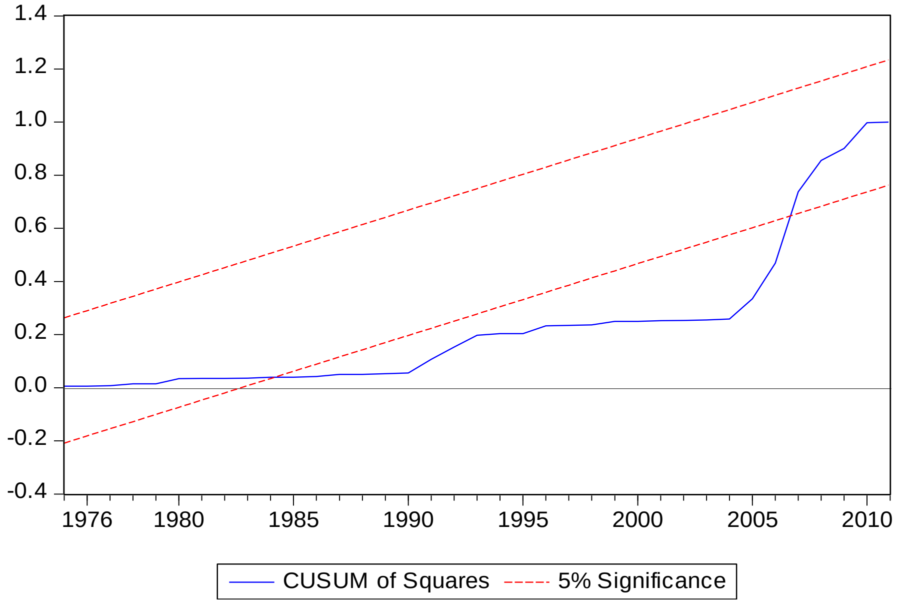


Table 5: Diagnostic Checking for population aged structure and health care expenditure in India.

Test Statistics	AGE1	AGE2	AGE3
A:Serial Correlation	0.1359 (0.7120)	0.1402 (0.7080)	0.0965 (0.7560)
B:Functional Form	1.6163 (0.2040)	1.3721 (0.2410)	1.7570 (0.1850)
C:Normality	0.40279 (0.8180)	0.4277 (0.8070)	0.4141 (0.8130)

Note: A:Lagrange multiplier test of residual serial correlation; B:Ramsey's RESET test using the square of the fitted values; C:Based on a test of skewness and kurtosis of residuals and value in parenthesis is standard deviation.
(Source: Computation using Microfit 4)

CONCLUSION

In conclusion, all indicators of population have a positive effect on health care expenditures both in the short-term and long-term estimations, for India. An increase in the population size will influence the demand for health care expenditures, especially for countries with higher ageing populations, which is similar to the study by Kandil (2005). The population aged structure 0-15 years is higher than the population aged structure 65 years and above in the period of study. Both in the long-term and short-term estimations, the population aged structure 0-15 have a higher impact on health care expenditures than the other indicators. In addition, even though the young population has a larger effect on health care expenditures, the other indicators; population aged 65 years and above, and the population aged 15-64 years are also significantly and positively correlated with health care expenditures. The effect of the population aged 65 years and above on health care expenditure is positive and significant, but the effect is weak, which is similar to the study by Kandil (2005). Di Matteo (2005) found that the results of the age variables agree with the previous literature that health care expenditures of the elderly and young were greater than those for middle-aged people. India had a higher number and proportion of elderly, and the elderly population is growing rapidly; however, in comparison with developed countries, India's population is still young. India is the second largest elderly populated country after China. An increase in the population aged 65 years and above actually impacts health care expenditures more than the other demographic variables. With the development of the economy and health care services in India, the life expectancy has been rising steadily over the past three decades.

Estimating health care expenditure over the demographic transition is primary work needed to understand the influence of population and population ages structure in India. Specifically, while health care spending of population ages structure increases and has a mixed age effects which is in the same direction as population effects in health care expenditure. The cohort effects causes population ages 0-14 years, population ages 15-64 years and population ages 65 years and above to increase health care expenditure with the needed of the medical expenses and due to high diseases especially for the population ages 65 years and above.

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