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RESEARCH ARTICLE

IMPACT OF SOCIO-ECONOMIC CHANGES ON DEMOGRAPHIC TRANSITION IN SRI LANKA (1963- 2007)

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ABSTRACT

There is a reciprocal relationship between population growth and economic development. Although many socio-economic indicators affected to change the population growth rate, the health and education indicators have observed that there is a significant development of the people. Therefore, this study has paid special attention to the said variables. When examining the indicators presently in respect of the nutritional level, education, health condition, housing and sanitation facilities in Sri Lanka, could be well observed that these welfare activities have affected positively on the population. Maternal mortality rate, infant mortality rate, life expectancy at birth, literacy rate, school enrollment rate etc. have all shown steady and commendable improvement in the last five decades. This study reveals that the crude death rate and literacy rate have significant and negative impact on population growth rate. I.e. health and education have been strongly affected on demographic transition. Also, the study shows that the impact of health on demographic transition has been higher than the impact of education. As a result of country's socio-economic progress, Sri Lanka has been entered the third stage of demographic transition and reaching the final stage of it. This situation has specially caused to change the age structure of the population in Sri Lanka and the former population pyramid with a wide base has been gradually changing.

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INTRODUCTION

The demographic transition theory propelled several researchers to study the linkages between development and demographic outcomes. Demographic transition is called as the transformation of countries from high birth rate and high death rates to low birth and low death rates (Crook, 1957; Bhende &Kanitkar 1985; Killick, 1981). Generally, socio-economic development and birth rate and death rate are believed to be negative related. Development, according to the United Nations (1987) definition is "a multidimensional phenomenon, which includes level of economic production, education, provision of health care services, status of women, nutritional status of population , quality of housing, distribution of goods and services, transport system and access to communication network". Therefore, development encompasses improvements in both social and economic development. From the time, Sri Lanka gained Independence; it still exists as a developing country with lesser income. The main objectives of all the ruling governments made enormous efforts to bring the source of livelihood up to a considerable state.

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Among these welfare sources, the free education, health facilities and food subsidiary become very important (Jayasundara, 1986, P.43). Like many developed countries in the world, our country has successfully attempted to reduce the rate of mortality since 1950s. The crude death rate, which was 12.6 per thousand of the population in 1950, has declined to 6 per thousand in 2009. Similarly, the infant mortality rate, which was 82 per thousand live births, has dropped to 9 per thousand in 2007. Also, fertility rates too have shown continuous decline over the past decades. Crude birth rate and the total fertility rate have shown significant decline between 1952 and 2007. The crude birth rate, which was 38.8 per thousand of the population in 1952, has declined to 18 in 2010.

The education was behind as a dynamic force in the development of the health conditions of the people and the socio-economic status of females. During the period 1946-71, the rate of literacy of females out of the entire population of the country has increased from 57.8% up to 78.1% which has become 91.4% in the year 2009. The literacy level of females during these years has increased from 53.6% to 70.7% while that of the males has grown up from a percentage of 90% to 93% respectively with an appreciable rate of speed (Gunasekara, 1976, p. 236; Central Bank of Sri Lanka, 2010). Similarly, the independent Sri Lanka the free health facilities are provided continuously spending a great deal of resources.

As a result of the same, the health indicators have observed that there is a significant development of the health conditions of the population. These indicators of Sri Lanka are in par with most of the other developed countries currently. The basic dimension of the health conditions of the people is the life expectancy at birth. The life expectancy of males was 47 years while that of the females was 45 years during the period 1945-47. By the year 1967, the life expectancy had gone up to 65 years and 67 years while in 2007 it had increased up to 70 years and 78 years respectively. By the time Sri Lanka gained Independence, the nutritional conditions of the population was not in a satisfactory situation. The main reasons for these shortcomings were due to the poor income positions, inapplicable habits in consuming food and limited supplies of foodstuffs. In 1948, the significant impact for malnutrition caused diseases due to and vitamin deficiency and lack of nutrients. Therefore, the governments which came to power after the Independence, having observed the lengthy adverse effects of malnutrition, exercised various types of programs such as providing food subsidiaries etc. in order to enhance the nutritional conditions of the people. Such subsidiaries which were activated on individual basis helped a great part of the population to improve their health situation. Especially, the families with poverty level were assisted to get a considerable amount of the daily needs of calories through these subsidiaries. Therefore, by the end of the 1960 decade, a substantial improvement could be seen in the nutritional status of the people.

After the open economic policy in 1977, a vast progress could be observed in welfare programs of the country. The social welfare programs which were activated for the development nutritional level of the entire population prolonged for a long period were without any discrimination between the rich and poor. Therefore, when examining the indicators presently in respect of the nutritional level, education, health conditions, housing and sanitation facilities, it could be well observed that these welfare activities have effected positively on the population. Similarly, after the open economy in 1977, a unique development in the field of education could be noticed in the country. The success of the various programs affected in the field of education confirm when considered the literacy rate enhanced up to 93%. Accordingly, the rapid improvement in the field of education and health services has had a fast decline of the birth rate and death rate. As a result, currently Sri Lanka is well advanced in its demographic transition. It was one of the first developing countries to achieve below-replacement level fertility. The country's socio-economic development, specially health and education have been caused this situation.

The objectives, data and method

The objectives of this paper are to examine the interaction between socio-economic development and demographic transition in Sri Lanka and to investigate the impact of health and education on demographic transition in the country. The study mainly based on secondary data. The data were collected during the period for 1963-2007. In order to obtain secondary data referred to available literature and research papers nationally and internationally published pertaining to the topic of the study. As well as, the secondary data were collected from various survey reports related to the population covering the period from 1963 to 2007. I will be examined the impact of health and education on demographic transition for the period 1963-2007, using a regression model. In this model it is assumed that the population growth (PGR) or demographic transition is a function of health and education, when other variables are remaining constant. The health is measured from crude death rate (CDR) and the education is measured from literacy rate (LR). Therefore,

$$PGR = F(CDR, LR)$$

It assumed this relationship is linear and there is a negative relationship between PGR and CDR and also between PGR and LR. Accordingly, the model expected to estimate is,

$$PGR = \beta_0 - \beta_1 CDR - \beta_2 LR + U$$

Population growth and trends in Sri Lanka

According to the latest estimates, Sri Lanka has a population of more than 20 million. Statistical data shows, Sri Lanka's population rose from 2 million in 1871 to 12 million in 1969 i.e., around six fold increase in a century. The first doubling from 3 to 6 million took approximately 50 years, while the second doubling from 6 to 12 million took only about 38 years. According to the projections, the next doubling from 12 to 24 million would take approximately 65 years (Johnes & Selverathnam, 1971; Central bank of Sri Lanka annual report, 2007; Dept. of census and statistics, 1974; Korale, 1988; De Silva and Samarasekara, 1999.

Socio-economic development in the country

When Sri Lanka gained independence in 1948, the country had achieved a reasonable level of socio-economic development. Socio-economic indicators of post-independent Sri Lanka have been more in line with those of a developed country despite its per capita income representing the characteristics of a developing country. With 20 million people, Sri Lanka has maintained a literacy rate above 90% and average life expectancy at birth above 75 years which is remarkable achievement in a developing country. The Per capita income is the main traditional criterion of economic development still being applied in a country. The world development report in 2008, divides the economy into 4 categories as follows according to the per capita income of the countries in the world.

Countries with US$ 905 or less income	-	Low income countries
Countries between US$ 906-3,595 incomes	-	Lower-middle income countries
Countries between US$ 3,596-11,115 incomes	-	Upper-middle income countries
Countries between US$ 11,116 and more income	-	High income countries

According to the above classification, Sri Lanka remained as a low income country prior to 1999. The per capita income at the time of gaining Independence in our country was US$ 120 and US$ 152 in 1960 was the highest in South and Southeast Asia, next to Malaysia (Abeyratne and Rodrigo, 2002, p.7). It increased up to US$ 814 by the year 1997. But as the country exceeded the per capita income level of US$ 905 after 1999, it transformed from the level of low income countries towards the lower-middle income country level. With the closed economy in Sri Lanka prior to 1977, the per capita income grew only by 1.6%. But after the open economic policy in 1977, it enhanced up to a percentage of 4.5%. Accordingly, the per capita income of the country during the years 2004, 2005 and 2006 became US$ 1,030, 1,197 and 1,345 respectively.

Table 1. Some social indicators in Sri Lanka 1946-2007

Indicator	1946	1953	1963	1973	1980	1985	1990	1995	2007
Literacy rate (%)	58	65	72	78	86	87	88	90	92
School enrollment (ages 5-14)	41	58	65	86	100	100	100	100	100
Life expectancy (years)	43	56	63	66	68	71	72	72	74
Infant mortality (per '000)	141	71	56	46	34	23	18	16	9
Maternal mortality (per '000)	11	4.9	2.4	1.2	0.6	0.5	0.3	0.2	0.1
Death rate (per'000)	20	11	9	8	6	6	6	6	6
Birth rate (per '000)	37	39	34	28	28	24	21	19	18
Population growth rate (%)	1.7	2.8	2.7	2.0	2.2	1.8	1.5	1.3	1.0

Sources: Snodgrass, 1998; Annual reports of the Central bank of Sri Lanka

Table 2. Crude birth rate and crude death rate in Sri Lanka, 1871-2010

Year	Crude Birth Rate (Per '000)	Crude Death Rate (Per '000)	Average Annual Growth Rate %
1871	-	-	-
1881	27.4	22.7	1.4
1891	29.4	24.3	0.9
1901	34.4	27.6	1.7
1911	38.1	28.8	1.4
1921	36.6	30.4	0.9
1931	39.8	26.5	1.7
1946	37.4	20.3	1.5
1953	38.7	10.9	2.8
1963	34.1	8.5	2.7
1971	30.4	7.7	2.2
1981	28.2	5.9	1.7
2001	18.9	5.9	1.1
2010	17.6	6.2	1.0

Source: Department of Census & Statistics

Presently, it could be well observed that this value has advanced over US$ 1,500 and the continuous increase in Sri Lanka's per capita income to a level of US$ 2,399 by 2010 **(**Central Bank of Sri Lanka, 2010). As a result of the advancement of the per capita income, a distinguished development could be seen in the fields of education, health, housing, nutrition and personal attitudes while there was a remarkable reduction in poverty and unemployment. As an example, higher economic growth has been accompanied by a decline in unemployment, excluding the North and East, from 8.1% in 2004 to 7.2% in 2005 and 6.4% in 2006 (The World Bank, 2007). The current unemployment rate in Sri Lanka is 4.9 **% (**Central Bank of Sri Lanka, 2010). It shows that the development of the economy of Sri Lanka has had a gradual advancement.

Socio-economic changes and population growth

The growth of Sri Lanka's population over the years has been influenced by two factors; natural increase (excess of births over deaths) and net migration (difference between the number of immigrants and emigrants). The relative importance of these two components has varied over time. Net migration contributed the greater share of the increase in the population between 1871 and 1901. Thereafter, natural increase has been the major determinant of population growth in Sri Lanka. Consequently, births and deaths are two prominent factors that decide on the growth of population in the country (Abayasekera, 1976, p.1; Sirisena, 1986, p.28).

Migration

Fertility, mortality and net migration are key factors that contribute to the size, growth and expansion of the population. Migration to Sri Lanka and migration from Sri Lanka has had both positive and negative influences on the Sri Lankan society.

Prior to gaining independence, migration positively contributed to population growth and economic development with the inflow of Indian Tamils to work in the Tea and Rubber plantations. Subsequently, since independence with the restrictions of emigration and the send back of stateless persons, migrations stopped to influence the rate of growth of population. However, during the past few decades in a given period, the number of female migrants going to the Gulf States for temporary employment has been much larger than those returning after completing their employment contracts. As a result, migration has contributed negatively to population growth during the past few decades (Population Division, 2002, p.11). When we examine the international migration in Sri Lanka, from 1871 till the beginning of the 20th century, more than half of the population growth was due to migration. It went up to a high range of 66.7% (Reports of census of population, Gunathilake, 2007). During this period Sri Lanka obtained the labor force needed for estate agriculture work from India. As a result of this migration increased more than emigration**.** That means, immigrants labor played a vital role in the growth of population, especially in the periods 1871-1881 and 1891-1901, due to the British bringing in persons from South India to work in the coffee and tea plantations and for road constructions. As the period between 1870 and 1880 was the most prosperous period for the coffee cultivation, Indian laborers rapidly arrived in the country and the rate of migration increased. It is evident from the statistics that due to high birth and death rate during 1871-1946, natural increase component was not very significant during this period. But there was a decline in the coffee cultivation during the period 1880 and 1890 and this resulted in the decrease of migration (Sarka, 1957, p. 168). However, the widening gap between mortality and fertility levels contributed to the acceleration of population increase since 1946. Nevertheless, after 1900, the importance of the migration aspect has gradually decreased. During the period 1901 and 1911 it decreased from 34.1% to 18.7% in the period between 1921 and 1931.

Also, at the end of the decade 1911 - 1921, the price of rubber dropped and that resulted in the decrease of the estate labour force. Finally, with the bad results of the decline of the world economy affected Sri Lanka too, in 1939 as the state followed a policy of restricting the employment of non Sri Lankan in the estate service, the amount of population that was added through migration dropped. Between 1946 and 1952 the migratory population rate was 8% and thereafter the migrants entirely left Sri Lanka. The significance of net migration in population growth in Sri Lanka reduced after independence due to restrictions on migration. After the "Sirima-Shastri Agreement" (Indo-Ceylon Agreement) of 1964, net migration has been a negative factor in population growth. However, for the first time in the period 1953-1963, Sri Lanka's international migration contributed to -4.9% of the country's population. Since then, this minus effect has shown to develop gradually. During the period 1971-1981, this value was -25.0%. At present with a few exceptions as many countries, follow political and emigration rules and regulations, migration does not occupy any important place in the growth of population. As a whole, between 1901 and 1953, the contribution of migration has gradually declined, while that of natural increase had steadily increased. In recent years, the population growth of Sri Lanka is entirely decided by the changes made by there two factors; mortality and fertility.

Mortality

Among the demographical factors that decide the amount, the growth, the composition and the distribution of a population in a country, a very important factor is mortality. A large number of developed and developing countries experienced sharp decline in mortality immediately after the Second World War. Through rising living standards and improved medical technology, those countries have succeeded in reducing the level of mortality and increasing the life expectancy of their population. An impressive shift from high to low mortality in Sri Lanka has been recorded since 1946 despite its low per capita income (Siddhisena, 2000, p.119). As depicted in table 2, the crude death rate in Sri Lanka grew up until 1920s and thereafter the gradual dropped. The overall crude death rates, which were considerably high during the pre 1946 era and it declined substantially to a lower level since 1950s. When we consider it as a whole, before 1946 there was an agricultural economy with a low income and as the economy was poor the mortality rate was at a higher level. But as Sri Lanka's economy became a specialized market economy, the death rate was very rapidly dropped. In 1946 the death rate that was 20.3 for a thousand persons was 14.3 by 1947. That is, it dropped by 30%. This reduction of death rate had a major impact on the population profile of the country. Besides the eradication of malaria, the continuing decline in the death rate could be attributed to much improve maternal and child care. It can be understand from the below table.

Table 3. Infant mortality and maternal mortality 1946- 2007

Year	Infant Mortality Rate	Maternal Mortality Rate
1946	141	15.5
1953	71	4.9
1963	56	2.4
1971	45	1.4
1981	30	0.6
1991	18	0.4
2001	12	0.1
2007	9	0.1

Source: Department of census & statistics

Decline in infant mortality rate also indicate a spectacular reduction in mortality. The infant mortality rate decreased from 141 in 1946 to 101 in 1947 or by 28 percent. As well as, the maternal mortality rate fell from 15.5 in 1946 to 10.6 in 1947 or by 32 percent (Siddhisena, 2000, p.121). Consequently, the life expectancy at birth increased from 43 years in 1946 to 52 years in 1947. In the years 1946 and 1947 on account of malaria, the number of deaths that took place was 12, 578 and it was reduced to 4557. A result of this was that the life expectancy of a person, that was 43 years in 1946 rose up to 52 years in 1947. The percentage of deaths which took place within a year rapidly dropped and as a developing country like Sri Lanka it is a great victory and it remains a unique incident in the history of demography.

Table 4. Life expectancy of male & female in Sri Lanka 1946-2007

Year	Women	Men	Total
1946	41.6	43.9	42.2
1953	57.5	58.8	58.2
1962	61.4	61.9	61.7
1971	66.7	64.2	65.5
1981	72.1	67.7	69.9
1991	74.8	70.1	72.5
1995	75.0	70.1	72.6
2001	75.4	70.7	73.1
2007	77.9	70.3	74.1

Source: DCS; ESCAP Population data sheets

According to table 4 the life expectancy of a person was 42.2 in 1946. It was 73.1 in 2001. That is, it has increased by 30%. Another distinct feature is, between 1946 and 1962 a man's life expectancy was longer than that of a woman. After 1962 we see that situation turned vice-versa. Hence, by 1991 a woman lives 05 years than a man. Through medical technological progress, public health safety programs were successfully launched and they enabled the drop in the mortality rate. As a result of this the life expectancy of individual has gradually began to increase. Demographers have estimated that the life expectancy of men and women will increased 73.5 years 78.5 years respectively in 2025 (Abeykoon, 1991). As a whole, we can understand that the declining of death rate prior to 1946 as well as post 1946 was attributed to several factors.

They are, eradication of malaria, improvement of educational attainments, inclusion of family planning activities with maternal and child health programs, promotion of health education, use of new medical technology (such as antibiotics), higher nutritional levels, better environmental sanitation and the improvement of health facilities such as the establishment of Maternal Homes, Rural Hospitals and Para medical services and in the improved production and distribution of food (Abeykoon, 1996, p.49; Siddhisena, 1998, p.474; Gunasekara, 1976, p.8).

Policies in subsidizing basic food items such as rice, wheat flour and sugar for over 30 years have affected especially the poorest people and that have helped to reduce mortality, particularly infant and maternal mortality in Sri Lanka (Abeykoon, 1991). The mortality transition in Sri Lanka, can be grouped under three phases An initial stage of relatively slow gain in expectation of life prior to 1946, a second phase of accelerated gain during 1946 to 1963 and a third phase of slower gain moving towards higher life expectancy at birth since 1963 (Country Profile Sri Lanka, Undated).

Fertility

In population studies, Fertility occupies a prominent place. It is the key factor of determining age structure in any country. When examining the fertility of Sri Lanka, our country had entered replacement level of fertility between the period 1994 and 1995 (De Silva, 1994, p.22). According to a demographic and health survey, conducted in 2000, during the period 1995 and 2000 the total fertility rate in our country was 1.96. In relation to the drastic fall of the death rate in Sri Lanka after the world war, there has not been a drop in the birth rate. This can be clearly seen in table 3 given above. The crude birth rate in Sri Lanka prior to 1953 was high fluctuating between 42 (1926) to 36 (1945). However, since 1953, there has been a clear decline in the crude birth rate. In 1953, it was 38.7 for a thousand and by 1963, it dropped. In the year 1963 the birth rate was 34.1 for a thousand. The drop in the birth rate by 1971 was 30.4 and this is a noteworthy progress. Accordingly, during 1953 to 1963, the crude birth rate dropped by 12 percent whilst in the following decade (1963-1971) it dwindled to 18 percent. Later that value dropped to 28.2 and 21.0 for a thousand in 1981 and 1991 respectively. And this reveals that the trend in the gradual drop of the birth rate has been gradually accelerated. According to this the drop in the fertility rate stated in the year 1953 it is clear then that major part of it occurred in 1960 and 1970. Specially, after 1963 level of fertility rate in Sri Lanka began to decrease (Abeykoon, 2000, p. 56). The reason for that, although various development plans had mentioned that because of a population that is over the limit it affects the development plans, the government intervention to population growth began in the middle of 1960s.

Table 5 Total fertility rate in Sri Lanka 1952-2000

Period	Total Fertility Rate
1952 -1954	5.3
1962 -1964	5.0
1970 -1972	4.1
1980 -1982	3.4
1982 -1987	2.8
1988 -1993	2.3
1995 - 2000	1.9

Sources: Abeykoon, 1998; Demographic and health survey, 2000

According to the table 2 and .5, since 1950s, crude birth rate and the total fertility rate of Sri Lanka has decreased gradually. In this way, there are a few factors which brought about the decrease of total fertility rate. Specially, during the period from 1953 to 1963 initial fertility decline in Sri Lanka was mainly attributed to the rise in the age at marriage of females. (Fernando, 1976, p. 67; Peoples Bank, 1985, p. 16; Population Division, 2002, p.7; B.K.Caldwell and J.C.Caldwell, 2003, p.25; Department of Census and Statistics, 1974, p.14). A powerful factor was the decrease of the rate of fertility among the reproduction age group of the population; that is of women between the years 15 to 49 after 1963. Also, the rise in educational level of married females in the reproductive ages has contributed to the increase in the age at marriage and contraceptive use. The granting of free education facilities to the entire population has made a rapid increase in literacy levels, and given an opportunity for both the rich and the poor alike to pursue higher education. Specially, female literacy rate recorded a spectacular increase of 33% from 67% in 1963 to 89% in 2001.

In recent years, the upward social mobility of females brought about by the wider availability of economic opportunities and their participation in the modern economic sectors have contributed to higher level of contraceptive use and fertility decline in Sri Lanka. Further in recent years the expansion of family planning programs, started from 1963 also has enabled the drop in the fertility rate **(**Sirisena, 1986, p.31). A number of socio-economic factors that contributed to the rapid decrease of fertility can be identified further. The rapid entry of more and more women in to the education and jobs, the growing living standards of women, the expansion of women's taking decisions making powers, rapidly decrease in the infant mortality rate and specially the vast increase of long term expenses, on children are some of the important factors in this contest. With the rising cost of living, especially, the women who were engaged in education faced economic problems and as a solution to that a large number of them found employment. Today this rise of women's rate of employment has been increasing and this could be seen by the fall of the rate of unemployment of women. These changes increased female employment and also increase competition among females for employment. Due to high competition females had to wait for a long period of time in hope of employment. Therefore, they ended up getting married.

In generally, most studies have shown that the education was one of the major factors that contributed to the reduction in fertility in Sri Lanka (Dissanayake, 1996, p.148; Department of Census and Statistics, 1974, p.21; Hanna and Nadarajah, 1976, p.86). Also, studies have shown that there is a clear inverse relationship between mothers' education and fertility **(**Population Division, 2002; Grabill, Kiser and Whelpton, 1958). Literacy, especially female literacy, affects fertility and child mortality. It has been observed that as the female literacy raises, fertility and child mortality decline substantially. Literacy enables the mother to take better care of children and have better concern for hygiene, immunization and family planning practices (Pant, 1997). However, the crude birth rate has in the last decades decreased due to four main factors: change of female age structure, changes in the proportion married, changing marital fertility, and the increasing use of both modern and traditional contraceptive methods (Abeykoon, 2006, p.5).

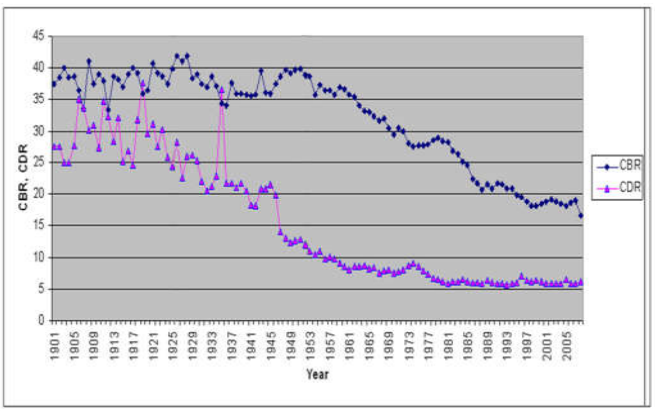
Socio-economic changes and stages of demographic transition in Sri Lanka

Demographic transition in Sri Lanka started quite early in comparison to other low income countries **(**Karunarathne, 2000, p. 211**).** Implementation of free health facilities reduced the death rate by one-third in the mid 1940s. Furthermore, Legislation of family planning programs in the early 1970s led to a significant decline in the birth rate. In addition, expansion of educational facilities and other social development achievements also influenced the rapid demographic transition. As a whole, a drastic reduction with respect to demographic indicators such as crude birth rate, crude death rate, total fertility rate, maternal mortality rate, infant mortality rate, child death rate and increase the life expectancy at birth have been recorded within the past four five decades. Sri Lanka has witnessed rapid demographic transition since the middle 20th century. Following fertility decline and extend life expectancy, population in Sri Lanka has transformed from a phase with high fertility, high mortality and low natural growth to a phase with low fertility, low mortality and low natural growth.

Stage 1 Pre-modern (High stationary phase/ Pre-industrial stage)

As can be seen from figure 1, the crude death rate in Sri Lanka showed a highly fluctuating but increasing trend during the period 1901-1946. That is the 1st phase of demographic transition in Sri Lanka. As expected, the crude death rate was accompanied by a crude birth rate of a similar pattern. The size of the population in Sri Lanka during this period was determined mainly by the behavior of mortality (Dangalle, 1982). Before 1946, the birth and death rates were very high. It was 40 per thousand births and 30 per thousand deaths. So, the speed of population growth also was very slow. It fluctuated between 0.9% - 1.7%. During this first stage of demographic transition, the main reason for the increased birth rate and death rate was due to the undeveloped nature of the economy. The production was based on simple technology and with the family labor without any excessive output. Although, there were large scale productions in certain areas, due to the lack of transport facilities, such productions could not be transferred to other parts of the country. As a result of this situation, a scarcity of food items could be in such areas. Similarly, due to the undeveloped technology, the production and consumption of nutritional food was at a very low level. Thus, the nutritional level of the people was not satisfactory. Due to the lack of sufficient health facilities, infectious diseases and epidemics spread in the country immensely. These diseases could not be avoided as there was no proper medical treatment available in the country. In view of the above the death rate was in a higher level resulted in the undeveloped economy.

The birth rate was also was very high due to undeveloped nature of the economy. As the main source of economy was agriculture, the families concentrated on producing more children in order to grow up the family strength for the use of labor. No excessive productions were left out as they depended only on simple technology and family labor for their means of income. Resulting in the above situation parents depended on the children at their old age. Apart from the above, at the first stage of population transition due to the undeveloped state of the economy, most of the children died in their early ages. Therefore, the parents were compelled to produce more children which resulted in the increase of the birth rate.



Source: Based on data obtained from census reports; DCS and CBSL annual reports

Figure 1. Demographic transition in Sri Lanka 1901-2008

Stage 11 Early transition (Early expanding phase/ Transitional stage)

Since 1946, Sri Lanka had gradually entered the phase II of the demographic transition which is characterized by low death and high birth rates (Sirisena, 1986, p.29; Sandaratne, 1975). The impressive decline in the crude death rate by 29.2% from 20.3 per thousand in 1946 to 14.3 per thousand in the following year appears to be the deciding factor behind the selection. In 1901, the birth rate was 34.4 per thousand while the death rate was 27.6 per thousand. However, in 1946, the birth rate was 37.4 per thousand; an increase over the 1901 level and the death rate was 19.8 per thousand. During the early expanding phase, the crude birth rate did not follow the declining crude death rate; instead it remained at a high level with minor fluctuations. As a whole, although the mortality rate decreased during the period 1946-1953, there was no decreased in the birth rate. Therefore, the rate of population increased escalates sharply. The reason for that is the wide gap between mortality and the fertility level. When we consider the period before 1946, the mortality rate that existed at that time was a decrease of 13.7 per thousand between 1946 and 1953, and population arose sharply up to 2.8% (Karunathilake, 1987, p.171). This stage which could be recognized as the 2nd stage of demographic transition has also created a growth in the economy. Although there was a steady decrease in the mortality rate, the birth rate was not decreased as living conditions were not so happy. On account of this, although the death rate rapidly decreased, the birth rate did not decrease similarly. Although during the period 1953-1963, there was a minor decrease in the birth rate, but it was considered a striking trend after the year 1963. Therefore, the gradual drop of the mortality and fertility rates, the population growth during this period also began to drop.

.This second stage of the demographic transition in the country was stepping on to the development process of the country. At this stage, owing to certain changes in the economy, the death rate became lesser. The main change in the economy was due to the development of the technology to a certain level. During this period, there were developments in the transport modes and communication levels where the productions increased with excess outputs. As a result of these developments, the nutritional level of the people came up satisfactorily as they could consume more nutritional food. As there was a certain amount of rise in the health facilities, infectious diseases and epidemics could be kept away with the awareness of avoiding such diseases. Further, the welfare activities of the government too increased with the provisions of free food items, free education and free health facilities. In addition to the above, infectious diseases and epidemics could be lessened with the spreading of methods of vaccination. During this period, policies in respect of food and nutritional values were also activated. As a result of the above, the death rate in the country declined at the second stage.

Although the situation was as such, the birth rate of the second stage was in a higher level. The reason for the same is at the traditional level, the parents adopted an attitude of preferring larger families but it took fairly a long span of time to change over to the attitude of preference of smaller families.

Stage III Late transition (Late expanding phase/ Industrial stage)

As shown in the demographic transition model, sharp declining birth rate is the major characteristic of the late expanding period. Recent demographic developments indicate that Sri Lanka has moved into a more advanced phase of demographic transition which could be identified with the decline in birth rates.

Similarly, with a further fall in the death rate and immigration it has a negligible impact. During the inter-censal period 1953-63, the crude birth rate in Sri Lanka recorded a decline of 11.9% with an average rate of 1.3 percent per annum. During the next period 1963-1973, the birth rate showed a relatively continuous decline. Between the two years it fell by 19.4 percent at an average rate of 2.0 percent per annum. The death rate had declined but it remained at a higher level than in the period after 1971. The death rate which was 19.8 per thousand in 1946 had fallen to 7.7 by 1971. The 1960s have seen a steady decline in the birth rate. From a level of 36.6 in 1960 the birth rate fell to 29.4 in 1970, declining further to 28.7 in 1972 and to 27.8 in 1973 (Karunathilake, 1987, p.178). Thus in a period of about 14 years from 1960 to 1973, the birth rate declined by about 24 percent. As a whole, the fall in the crude birth rate in Sri Lanka since the mid 1950s has been recognized mainly to the various factors such as, changes of the age structure of the population, changes in the marriage rate, changing age at marriage and changes in the fertility (Dangalle, 1982).

Nevertheless, the birth rate started declining at the third stage of demographic transition which resulted in the change of their attitudes. It was due to few main changes in the economy at the third stage. The development in the field of education holds an important role out of the said changes. The parents could realize the economical problems along with the development of education which resulted in giving up the preference of larger families and holding an attitude of preferring smaller families. Within this stage it was significant that more females were interested in education. As a result of the above, the marriageable age extended and the reproduction period of the females became shorter along with the decrease of the birth rate. With the females focusing on education, a sharp increase was seen in them joining various employments. Due to this reason, their marriage delayed which in return was consequent in a decrease of birth rate was noticeable resulting in shorter reproduction period. Another reason for the decrease of the birth rate at the third stage was the introduction of family planning methods and following such methods as a result of the development of education.

Similarly, at the third stage, productions of the country increased with the widening of the labor market. Both the spouses in a family became employed as a result of the development of education. The birth rate decreased as the parents believed the attitude that smaller families are suitable as they cannot afford to have more children to maintain with the monthly salary they get. Another aspect in the economy of the third stage developed with the emergence of industrial cities which became further complex. People had to live in complicated environments. They had to live in flats due to the scarcity of houses and crowding in houses in these complicated cities. Looking after children also became a problem in these crowded cities. Therefore, parents preferred the attitude of smaller families which resulted in the decrease of the birth rate. The death rate also speedily decreased at the third stage. It was due to the economic growth of the second stage which developed further at the third stage. The development of technology, transport facilities, communication, the increase in the production of nutritional food, the import of goods by which the consumers could enjoy the nutritional food enhancing their health levels resulted in the decrease of the death rate. The development of free health facilities, free education, food subsidiaries, production and importation of modern medicines helped in avoiding infectious diseases and epidemics. The awareness of the people was promoted widely with the introduction of health education which helped to avoid infectious diseases and epidemics which controlled the death rate successfully at the third stage. According to the above facts, it could be clearly said that, up to 1946 the death rate of Sri Lanka was at a higher level. Therefore, Up to 1946, Sri Lanka was in the first stage of the demographic transition and which changed over to the second stage after 1946. Similarly, decreasing of the birth rate of Sri Lanka started after the 1960 decade. Especially, after 1963, the death rate of Sri Lanka decreased speedily. Accordingly, Sri Lanka stepped on to the third stage of demographic transition in 1963 and presently, Sri Lanka is reaching the fourth stage of the demographic transition. With the stepping the third stage of the transition, there began to appear the signs of the population ageing. As a result of declines of fertility and mortality, the age structure of the population in Sri Lanka has changed dramatically.

Growth of Health and Education in the country

Sri Lanka has been often cited as a low income country with a remarkable high level of progress. It ranked highest among all low income countries and stood developed among the economically advanced countries in terms of the physical quality of life index (PQLI) (Abeysekera, 1986, p.291). Indeed, the human development such as, life expectancy, adult literacy rate and infant mortality rate achievements have been amply standard. These achievements were based on massive investment in the social sectors, on free health care, universal free education and subsidized food (Jayasundera, 1986, P.43). These welfare expenditures during the decades of the 1960s and 1970s averaged around 9% to 10% of GDP and as much as half this expenditure, 4% to 5% of GDP was accounted for by an untargeted food subsidy (Jayawardena, 2004, p.96). For more than 55 years, successive government has been committed to continuing a policy of providing extensive welfare services to all segment of the population. These benefits have included subsidies on essential food-stuffs, particularly rice, free education, free medical care and subsidized prices for public transportation and housing (Karunathilake, 1987, p.190; Ratnayake, 2004, p.4). These programs accounted for 8.3% of GNP in the 1950s, 10.7% in the 1960s, 9.8% in the 1970s and 6.5% in the 1980s (Alailama, 1997, p.127).

Education

Investment in human capital is a cornerstone for economic growth and development. In Sri Lanka, the general educational level of the public, tend to develop greatly as a result of the free education move initiated by the C.W.W.Kannangara Report. The 1940s Kannangara reforms envisaged a crucial role for education in promoting fundamental democratic rights, social equity, social-economic mobility, economic efficiency, national harmony and character development (Jayaweera, 1998, p.311). It was a fundamental obligation by any government to provide free educational facilities to children throughout the primary, secondary and tertiary stages. The benefits of the free education scheme are difficult to quantify, but there is no doubt that the scheme has made a substantial contribution to the uplifted of the community and to the development effort With the educational reformation which wakened up after gaining Independence, children hailing from rural poor families were able to enjoy the free educational

facilities up to higher education in an equitable social status. Education was a vital obstacle for enjoying medical facilities for the general public, development of economic status of women and the economic progress of the country. The steady increase in the number of students attending schools itself is a reflection of the easy access to education due to its universally free nature. The number of students attending schools doubled within the 20 year period 1950-1970. As primary education was made compulsory, the percentage of children between 5 to 14 years in school also increased. The number of students pursuing secondary and higher education also showed a dramatic increase in the 1960s and 1970s (Abeysekera, 1985, p.295). Accordingly, during the period between 1946-71, the proportion of the literacy level of the population has increased from 57.8% to 78.1% while the ratio of the same in women has spanned from 53.6% to 70.7% and men claimed to have developed their levels of literacy from 70.1% to 85.2% (Gunasekera, 1976, P.326). Because of the compulsory primary education policy and the free education policy which were in effect for fairly a considerable length of time, the literacy level of the population enhanced remarkably with a noticeable advancement. During the period after independence up to the recent past when ascertaining the development of the education system, there are several aspects that we can observe as very clear. Some of such general indexes are the proportion of developed literacy level, increased number of school going children, lessening of the distances to schools, pupil/teacher proportion, and the other indexes are specialized education system, teacher training system and student welfare system etc.

However, the expenditure on education which was relatively low in the early 1950s rose sharply since the late 1950s. This was mainly due to the increase in the number of students seeking entry to schools reflecting the growth in population that took place consequent to the dramatic drop in mortality in 1946. The growth in education expenditure became more significant in the 1960s with the take over of the private fee-levying schools by the government. Free education is the second highest item of subsidized expenditure of government (Karunathilake, 1987, p.203). Under the free education system, the government pays the total cost of salaries of teaching related staff. In addition, meeting the cost of equipment and maintenance of educational infrastructure are also accounted for. Furthermore, scholarships and bursaries, free mid-day meals and free text books have also been distributed by the government from time to time.

Health

Similarly, the national health policy in Sri Lanka from the early 1950s has been governed by the commitment to provide comprehensive health care to the entire population. No charges have been levied or public health services from 1950 onwards. Outdoor treatment has been provided at no cost to the patients, at all government hospitals and dispensaries. Of the total expenditure on major welfare services, the amount spent by the government on free health services has been the lowest. However, successive governments have maintained reasonably high levels of expenditure on health averaging about 6% of total government expenditure until the 1970s. Accordingly, the facility of free medical assistance, the health conditions of the population have shown a considerable advancement. Indeed important facts that free medical care has contributed to an appreciable decline in the death rate from the late forties. Today the country is privileged to have probably one of the lowest death rates among the developing countries of the world. Similarly, the infant mortality rate has fallen from 263 per thousand in 1935 to 140 per thousand in 1950, and 46 per thousand in 1973 and to 33 per thousand in 1984. Also, improved medical care has contributed to an increase in longevity among males and females in the island.

Impact of Health and Education on population growth

There is a significant relationship between the variables demographic transition, health and education. In the study, the variable Crude Death Rate (CDR) in the model, represent the health status and Literacy Rate (LR) represent the education status of the people. These variables used as independent variables. The demographic transition is measured from Population Growth Rate (PGR) and used as a dependent variable.

The Model

To analyze the impact of health and education on population growth, we can estimate a model using the relevant data of the said variables. The model has the following form:

$$PGR = \beta_0 + \beta_1 CDR + \beta_2 LR + U$$

Where,
PGR = Population Growth Rate
CDR = Crude Death Rate
LR = Literacy Rate
β_0 = Constant Term
β_1 and β_2 = Parameters
U = Disturbance Term

This equation suggests that there is a linear relationship between dependent variable i.e. PGR and independent variables i.e. CDR and LR. Further, an inverse relationship is expected between PGR and CDR and also between PGR and LR. Accordingly, the model expected to estimate is:

$$PGR = \beta_0 - \beta_1 CDR - \beta_2 LR + U$$

Data Issues

The impact of education and health on demographic transition has been explored in the context of Sri Lanka for the period 1963-2007. I used annual time series data of PGR, CDR and LR. The data on Growth Rate of Population, Crude Death Rate and Life Expectancy have been obtained from Census of Population (various issues) and Annual Reports of the Central Bank of Sri Lanka (various issues).

Crude Death Rate

The crude death rate is the annual number of deaths per 1000 people. The variable crude death rate represents the health status of the people. It has been found that the birth and death rates are two major demographic components related to the population growth. The theory of demographic transition suggests that the significant fall in death rate without accompanying decline in birth rate is the main reason for population growth. The health sector in Sri Lanka has achieved a considerable development. It was due to the government being directly involved in activities such as health education, health infrastructure and widening of hospital network etc.

Further, especially after 1977, private sector also attended to participate in providing health supplies which was a grate contributory factor for the development in the health sector. Therefore, Sri Lanka is attained a very low level of mortality and as a result has been enjoying a very high level of life expectancy. The decline in the death rate has been achieved by greater control over the causes of death through a number of measures, such as, the eradication of the malaria mosquito by the use of D.D.T, the use of antibiotics, extension of health education and improvements in environmental sanitation and other public health measures. The death rate of population in the country was considerably high before 1946. The remarkable decrease in the CDR in Sri Lanka which was particularly, marked between 1946 and 1950. Especially, the death rate fell substantially recording a 30 percent decline, from 20.2 in 1946 to 14.3 in 1947. The death rate in Sri Lanka is 5.8 per thousand populations in 2007.

Literacy Rate

There is a close relationship between education and population growth rate. Education plays an important role in improving overall economic and social status which greatly influences the number and spacing of children desired and eventually attained. Most of the available research evidence indicates the negative relationship between female education attainment and fertility. Especially in developing countries like Sri Lanka, on the potential use of higher female educational attainment as an effective weapon in fertility reduction. Countries with higher literacy rates or higher education levels have lower total fertility rates than countries whose populations have lower education levels.

More educated women have a greater probability of remaining childless compared with women with a lower level of education. Women with higher levels of education desire smaller families. With a rising cost of living especially the women who were engaged in education and as a result of that women's rate of employment has been increased in Sri Lanka. Therefore, this has been caused to increase the competition for employment among females. Due to high competition female had to wait for a long period of time in hope of employment. Thus, they ended up getting married when their old and having children. There is a noticeable improvement in educational field in Sri Lanka. As a result of educational reforms in 1944, opportunities were open even for the children of poor families to rise up to enjoy the levels of higher education. Accordingly, the literacy rate of the country has been increased from 71.6% in 1963 to 93% in 2007.

Estimation of the Model

The linear regression model presented above estimated for the data with the help of SPSS computer package. The result is given in table below.

Table 6. Regression, Coefficient, Standard Errors and t Values

Model	Coefficients(a)		t - statistics
	B	Std. Error	
(Constant)	9.292	1.344	6.912
CDR	-.142	.070	-2.020*
LR	-.079	.011	-7.340*

a Dependent Variable: PGR
* Significant at 5% significant level

Evaluation and Interpretation of the Model

Three parameters have been estimated in the model, i.e. β_0 (Constant), β_1, and β_2. Out of these three, β_1 and β_2 can be interpreted as the partial derivatives of PGR with respect to CDR and LR respectively. The first explanatory variable of the model CDR represent the health status of the people. The parameter of CDR has fulfilled the theoretical criteria i.e. priory expectation its sign. Estimated parameter of the variable CDR is -0.142. This implies a negative relationship between population growth rate and crude death rate. Similarly, the degree of parameter expresses that when the crude death rate increase by one unit, the population growth rate will be declined by -0.142 units. The variable CDR is statistically insignificant at 5% significant level since the calculated t value is higher than the relevant table value. Thus, it can be concluded that in relation to Sri Lanka, crude death rate was an important factor determinant of population growth rate during the period in concern.

The second explanatory variable of the model LR represent the education status of the people. The parameter of LR also has fulfilled the theoretical criteria i.e. priory expectation its sign. Estimated parameter of the variable LR is -0.079. This expresses a negative relationship between population growth rate and literacy rate. Similarly, the magnitude of parameter implies that when the literacy rate increase by one unit, the population growth rate will be declined by -0.079 units. The parameter LR is statistically significant at 5% significant level. Accordingly, LR is an important factor determining population growth rate in the country. Value of the R- square of the model is 0.745. This implies that about 75 percent of the total variation of the dependent variable PGR is explained by the independent variables included in the model. Hence, the fit of the model is statistically significant.

In addition, the Durbin-Watson Statistics of the estimated model is 1.921. This implies that the problem of autocorrelation has been removed. The overall significant of the model can be tested by the ANOVA table given below.

The Hypothesis Tested:

H_0: $\beta_1 = \beta_2 = 0$ (All parameters are equal to zero)
H_1: $\beta_1 \neq \beta_2 \neq 0$ (All parameters are not equal to zero)

Table 7. Analysis of variance table ANOVA (b)

Model	Sum of Squares	df	Mean Square	F*	Sig.
Regression	7.140	2	3.570	61.308	.000(a)
Residual	2.446	42	.058		
Total	9.586	44			

a Predictors: (Constant), LR, CDR
Dependent Variable: PGR

According to the table 8, since $F^* > F$, i.e. 61.308 > 3.23, the null hypothesis i.e. H_0 is rejected. That is, the overall regression is significant. Accordingly, the results show that there is a significant effect of CDR and LR as a whole, on population growth in the country.

Changing age structure of the population

An important effect of demographic transition is the change in the age structure of the population. Age structure transition is a process of shifting age structure from young to old population.

Table 8. Age structure of the population in Sri Lanka

Year	As a percentage of total population		
	<15	15-59	60+
1946	37.2	57.4	5.4
1953	39.7	54.9	5.4
1963	41.5	52.5	5.9
1971	39.0	54.7	6.3
1981	35.2	58.2	6.6
1991	31.2	60.7	8.1
2001	26.3	64.5	10.2
2006	24.4	65.1	10.5
2011	22.8	64.7	12.5
*2021	19.4	63.9	16.7
*2031	16.1	63.2	20.7
*2041	15.2	60.0	24.8
*2051	14.9	56.3	28.8
*2061	14.4	54.3	31.3
*2071	14.8	52.0	33.3

* Estimated Sources: De Silva, 1994 and 2007; Rathnayake & Siddhisena, 1998

After the 2nd world war as a result of the steady decrease of the fertility rate in the population, and an increase in the life expectation, one could see a continue rate of increase in the ageing population in the country (Table 8). According to the projections, this ageing population in the country is increasing very rapidly in the future. During the early years, the age pyramid in Sri Lanka were expanding type, that is broad-based, indicating high birth rates and decreasing death rates. But, as a result of the elderly population growing faster with compared to growth of the child population, the broad-based population pyramid is transforming into a "barrel shape" or "cylindrical shape" one (Ministry of Health and Women's Affairs, 1993, p.11). Thus, when considering the present situation in the age composition, it is clear to us, that the child population has decreased and the fertile age group (labor force) has increased by numbers. If we can use this increased labor force very fruitful for the economic development, we will be able to solve some of the problems faced by the aging population in the future. The reason for that, this happy situation runs on only for a very short time for only 2 or 3 decades.

Conclusion

There is a reciprocal relationship between population growth and economic development. As the various socio-economic welfare programs implemented by the different governments, in Sri Lanka, a great development could be seen in the fields of education and health. These two variables have been strongly impacted on population growth rate. Therefore, the high rates of birth and death in Sri Lanka before gaining independence have been brought to a very low level at present. Also, literacy rate and life expectancy of the people have been increased to a higher level. Accordingly, as a result of country's socio-economic progress, Sri Lanka has been entered the third stage of demographic transition and reaching the final stage of it. This situation has specially caused to change the age structure of the population in Sri Lanka and the former population pyramid with a wide base has been gradually changing. When we consider the age structure of the population, the ageing population in the country will increase very rapidly in the near future. Even at present, the old people have taken a high percentage of the population.

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