Health Expectancy of the Elderly Population in Sri Lanka: Application of Sullivan Method

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Abstract

Life expectancy at birth has continuously increased in many countries over the last century. A similar trend is seen among the elderly population in Sri Lanka. In such a background, researchers have shown interest in studying the health of elders as they progress in age. However, good health of the elderly population in Sri Lanka is an emerging issue. The objective of this study is to estimate the healthy life expectancy of the elderly population in Sri Lanka. This study is based on the healthy life expectancy measurement proposed in the Sullivan Method. This study used both primary and secondary data. The information on ill health used in applying the Sullivan method comes from the 2012 Census and healthy life expectancy is calculated using the life tables constructed by the Department of Census and Statistics for the period 2011-2013 and 2000-2002. To supplement the analysis, a sample survey of 300 elderly people was carried out in the Gampaha district. The findings of the sample survey supplemented the analysis performed with the secondary data. This study found that both elderly men and women have spent a considerable time with disability because of the deterioration in health. When the difference between the total life expectancy and the healthy life expectancy was analyzed, the study found that, on average, men were in a disabled state for 0.8 years compared to 0.94 years for women in 2001. This difference has drastically increased in 2012, with 5.24 and 7.32 years for men and women, respectively. These results show that the likelihood of women facing disability has increased over the 11 years considered in the study. The study further reveals that the lack of financial security makes elderly people, especially elderly women, more vulnerable to injury and ill health.

Keywords: elderly population, healthy ageing, healthy life expectancy, life expectancy

Introduction

Life expectancy at birth has increased in many countries, including Sri Lanka, over the last century. As such, the life expectancy of the country's elderly population (population aged 60 years and above) is increasing. In such a background, whether the additional years of life are spent in good health has become a subject of interest. In Sri Lanka, it is a frequently discussed issue due to the prevalence of various chronic diseases among the elderly population. Typically, mortality indicators are used to measure the general state of health of a population. These indicators usually highlight life expectancy as one the best indicators because it is not influenced by a population's age structure and can therefore be used to compare the state of health between populations and to monitor the impact of different interventions on health. The increase in life expectancy is a characteristic of both developed and developing countries, including Sri Lanka. The decline in premature mortality and the increase in longevity, combined with the decline of fertility and the increase of degenerative chronic diseases have caused a rapid demographic and epidemiologic transition requiring a new public health agenda in the face of the complexity of this new morbidity pattern (Rogers, Rogers and Belanger, 1990). Healthy ageing is a timely concern in many countries including Sri Lanka. Therefore, health expectancy is important to ensure a sustained healthy life among the elderly population.

Health of elderly population

Sri Lanka's elderly population is increasing at an unprecedented rate because of the increase in the population's life expectancy at birth. However, greater longevity does not guarantee better health. A drastic change is seen in the elderly population due to the increasing number of females among the elders (DCS, 2016; Weeratunga, 2015). Moreover, there is an increase in the oldest age group that needs health care.

Figures 1 and 2 show the actual and projected growth of elderly men and women in Sri Lanka. It is evident that elderly females are more in number in all age groups and the gap is projected to widen by 2037.

**Figure 1: Actual and projected growth of elderly males, 2012-2037**
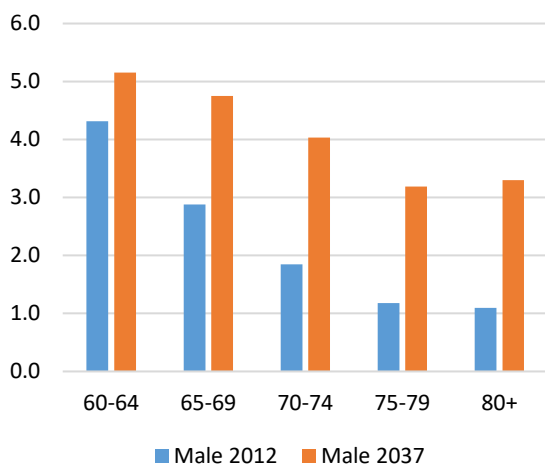
Figure 2: Actual and projected growth of elderly females, 2012-2037
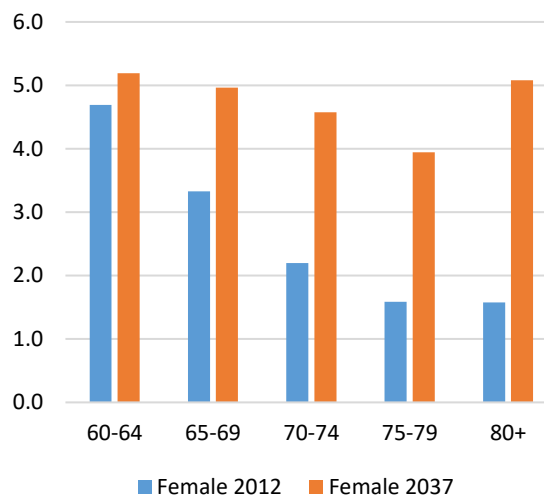
Source: Dissanayake, 2017(a)

Mortality in Sri Lanka declined substantially over the latter half of the twentieth century and at the beginning of the new millennium. Life expectancy at birth for males and females were 32.7 and 30.7 years, respectively during the 1920-22 period. By 2012, those figures rose to 71.0 years for males and 77.2 years for females. The projected figures show that the life expectancy of males is expected to reach 72.3 years while female life expectancy will be 82.5 years by 2026 (Gunasekare, 2008). Figure 3 illustrates that the gap between male and female life expectancies has been widening over the years in favour of women. The total as well as average annual gain in life years has more than doubled for females. Therefore, men seem to be increasingly exposed to a higher risk of mortality factors. Once fertility declines and is sustained at below replacement level, increase in the longevity will have a greater impact on the process of population ageing.

Figure 3: Actual and projected life expectancies at birth and at age 60, respectively, 1921-2037, Sri Lanka
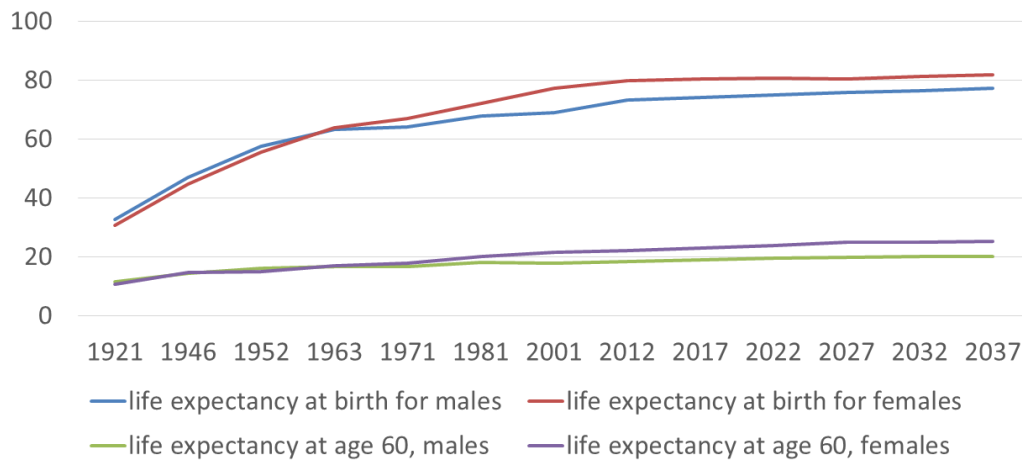
Source: Gunasekare, 2008; DCS 2012; Dissanayake, 2017(a)

In Sri Lanka, there is an increase in non-communicable diseases among the elderly population (DCS, 2014). It has been found that the majority of the elders in Sri Lanka have at least one illness and have been taking medicine for a long time (Weeratunga, 2015). Old-age illnesses such as Alzhemer's disease, cardiovascular disease, chronic diseases, arthritic condition, osteoporosis, and physical disabilities are expected to rise in future. According to Table 1, 55 percent of the elderly population are suffering from chronic illness.

Table 1: Percentage of elderly people (60 years or more) who reported chronic ilness, Sri Lanka

	Percentage reporting any chronic illness
Male	51.9
Female	57.8
Both	55.2

Source: Department of Census and Statistics, 2014

In addition, there is a strong association among the increase of life expectancy, the decrease of communicable diseases, and the increase of non-communicable diseases. It was found that the percentage of life years lost due to non-communicable diseases has increased during the recent years (Dissanayake, 2017). It is quite important to note that deaths due to non-communicable diseases in 2012 accounted for 75 percent of the total deaths in Sri Lanka (Dissanayake, 2017).

Improving health requires not only reducing death from disease, but also maintaining a high health-rated quality of life. One of the major challenges for Sri Lanka with its rapidly ageing population is to ensure that the elderly can live full, enriching, and productive lives as longevity increases. To achieve this, good health is essential.

Developing geriatric health facilities to which elderly people have easy access is a timely need. Thus, computing the health expectancy is important to develop suitable strategies to improve the health of the elderly population.

Concept of health expectancy

Health expectancy is the analysis of both healthy and unhealthy years of life where health can be defined along various dimensions. For instances, a life expectancy of 86 years composed of 82 healthy and 4 unhealthy years would mean that, on average, a person has had 4 unhealthy years over the entire 86 years. However, the 4 unhealthy years could include days with injuries from sports activities in youth, car accident at the working age or disability caused by a stroke at old age (Saito, Robineb and Crimmins, 2014:210). Life expectancy can also be divided into more than two health states, such as healthy years, mildly disabled years, and severely disabled years, provided the states are mutually exclusive. One of the confusions surrounding health expectancy research has resulted from the fact that researchers develop varying interpretations for 'healthy years' depending on the measures used to define heath status. Commonly used terms for 'healthy years' are "disability-free life expectancy", "active life expectancy", "healthy life years", and "healthy life expectancy" (Saito, Robineb and Crimmins, 2014:210).

Research problem

As indicated previously, healthy life expectancy or disability free life expectancy that enables understanding of the improved survival chances of the elderly population in Sri Lanka has not been constructed so far. Furthermore, sex differentials of healthy life expectancies are an important topic at present as feminization of ageing is taking place in Sri Lanka rapidly. It is also noteworthy that the study of healthy ageing is integral to achieving sustainable development goals because when people grow older, their health condition and related needs change. Studying these changes, especially related to ageing

and health is vital and will help the Decade on *Healthy Ageing* 2020 – 2030[1]. Therefore, this study is expected to assist in better understanding the phenomenon of healthy ageing in Sri Lanka.

Objectives

The main objective of this study is to estimate the healthy life expectancy for the elderly population in Sri Lanka. There are two specific objectives: to identify the gaps between life expectancy at elderly age and healthy life expectancy and to examine the reasons for such differences.

Methodology

This study was largely based on the concept of healthy life expectancy or expectancy of a life free of disability proposed in the Sullivan Method (Sullivan, 1971). This study used both primary and secondary data. The materials necessary for applying the Sullivan method are: (1) data derived from conventional life tables; (2) status of prevalent disability according to age. In this study, the morbidity information used in applying the Sullivan method comes from the 2012 Census. The healthy life expectancy or expectancy of a life free of disability, proposed by Sullivan, is calculated using the life tables constructed by the Department of Census and Statistics for the period 2011-2013 and 2000-2002. To calculate health expectancies using the Sullivan method, it is necessary to have data on disability of all the age groups starting from birth to 85+ years. However, the Census of 2012 in Sri Lanka does not provide information on disability for the ages 0, 1– 4 and 85+ years. Several simulations carried out suggested that the proportion of disability for both men and women resembles the exponential function and hence, the values for ages 0, 1, and 4 years were predicted with the use of the exponential curve.

The Sullivan health expectancy reveals the present health status of a population by eliminating mortality and age structural effects. In essence, health expectancy calculated using Sullivan's method is the number of life years spent in a healthy state by a particular age.

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[1] https://www.who.int/ageing/sdgs/en/

As mentioned earlier, the data needed for the use of the Sullivan method to calculate healthy life expectancies are as follows: age-specific mortality rate of the population to calculate the probability of dying in the age interval, $_nq_x$ which will be used to construct the whole life table and the proportion of disability at each age.

The healthy life expectancy is a refinement of the conventional life tables done by introducing additional information on age-specific disabilities. In this study, two life tables were calculated separately for men and women as health status varies considerably between sexes.

The healthy life expectancy ($e^h{}_x$) is calculated as follows:

$$e^h{}_x = \frac{1}{lx} \sum_x^w (1 - n\pi x) \, {}_nL_x$$

where,
$e^h{}_x$ is healthy life expectancy at exact age x
lx is the number of survivors at exact age x
nπx is the age-specific disability proportion

$_nL_x$ is the number of person years lived in the age interval x and x+n by the number of survivors at exact age x

It is quite clear from this method that two independent measures are used to reflect health status of a population: (1- $_np_x$) which refers to morbidity and $_nL_x$ which is the mortality factor.

One of the major limitations of the Sullivan method is its inability to detect an abrupt change in disability transition rates. It has also been found that as disability incidence rates increase or decrease over time, the absolute bias in the Sullivan estimate is comparatively constant with age. Therefore, the relative bias can be expected to increase at older ages as disability free life expectancy decreases.

A sample survey was conducted among the elderly to improve the reliability and quality of the research findings and to thus improve the validity of the research. For this study, a sample survey of 300 elderly persons who were above the age of 60 years, and five in-depth interviews were carried out in the Gampaha DS Division in Gampaha district. The sample

ensured equal representation of men and women. The survey carried out in this study used simple random sampling technique to draw the sample of 300 elders. The data was collected through a questionnaire.

The survey allowed us to calculate the proportion of disabilities for the sampled population. The sample survey findings supplemented the analysis performed with the secondary data. Furthermore, five in-depth interviews were thematically analysed to find out the reasons for differences between the life expectancy and the healthy life expectancy of the elderly population in Sri Lanka.

As the failure to achieve an adequate response rate on the survey would have limited the usefulness of the study, the response rate was improved by substituting non-respondent households with those that were able to respond.

Results

Health status of the elderly population: sample survey finding

This study revealed that 65.3 percent of women have at least one illness while only 34.7 of men were unhealthy in a similar manner at the time of the survey. This proves that more women are unhealthy although they enjoy a higher life expectancy, as mentioned by Dissanayake (2017). It is noteworthy that a large number of unhealthy women are widows (59%) while a lower number of unhealthy men consists widowers (41%). This shows that women are more vulnerable to ill health. Table 2 shows the distribution of major illnesses by gender. It reveals that about 25 percent of men and women are disabled and are suffering from other non-communicable diseases.

Table 2: Percentage distribution of major illness by sex

Major illness	Men	Women
Diabetes	20.0	20.1
Heart diseases	14.7	16.3
Blood pressure	34.7	46.8
Wheeze/short of breath	22.7	10.6
Factures in limbs	1.3	1.4
Disability	25.3	24.8

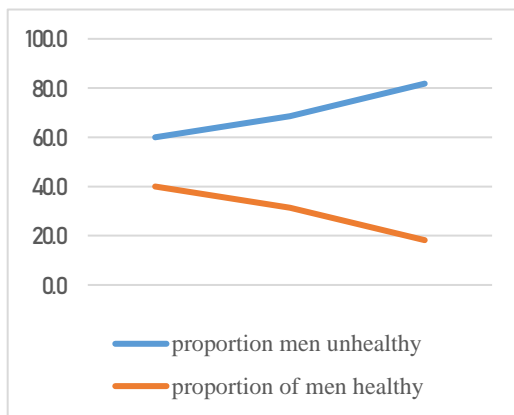Source: Authors' calculations from Sample Survey, 2018

Our survey further shows that the proportion of unhealthy men increases as age advances whereas for women, it declines after age 80, which means that either they are given the necessary healthcare at that stage, or that their true health status is not reported (Figure 4).

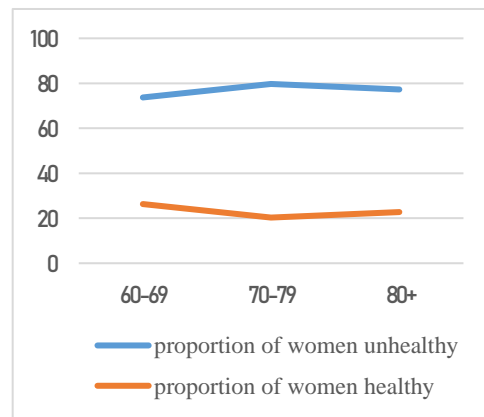**Figure 4: Percentage distribution of unhealthy elderly by gender**
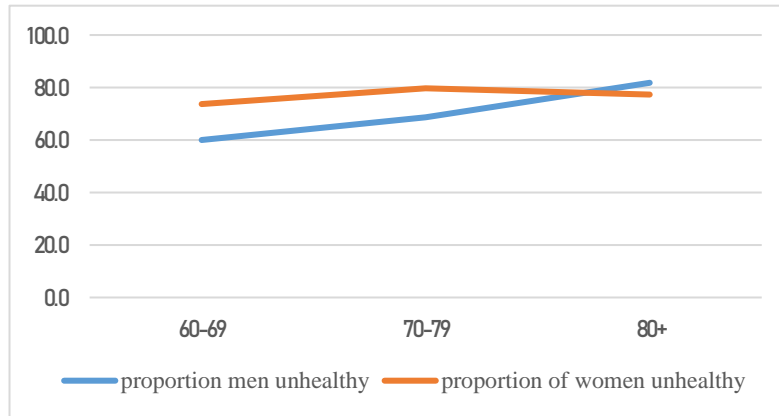
Source: Authors' calculations from sample survey, 2018

Figure 5: Percentage distribution by health status

Figure 6: Percentage distribution of women by health status

Source: Authors' calculations from sample survey, 2018

However, it is astonishing to observe that the difference between healthy and unhealthy status is larger for women compared to men as shown in figures 5& 6. There are striking inequalities in life expectancy among women. Non-communicable diseases are the leading cause of death and disability among women in most of the developing countries. Approximately 80% of chronic disease deaths occur in middle and low-income countries, where most of the world's ageing women live. In addition, more elderly women than elderly men are blind, because they live longer and the access to treatment is restricted. Furthermore, gender is a powerful determinant of mental health which is affected by factors

such as age, culture, social support, biology, and violence. For example, studies have shown that the high risk of depression for women is, at least partly, a result of negative attitudes towards them, lack of acknowledgement for their work, fewer opportunities in education and employment, and greater risk of domestic violence (World Health Organization, 2000). Depression may be a result of a medical disorder or the use of medication. Women are approximately twice as likely as men to experience a depressive episode during their lifetimes (World Health Organization, 2001). It is estimated that by the year 2020, depression will be the second leading cause of disability in the world (World Health Organization, 2004). This suggests that elderly women are more vulnerable to morbidity than men in the same age bracket. Therefore, it is reasonable to hypothesize, as observed in this survey, that a higher number of elderly women in Sri Lanka suffer from ill health than men.

Disability status of Sri Lanka and the sample

The survey allowed us to calculate the proportion of disabilities for the sampled population as we asked the elderly respondents to mention least one disability that they are suffering from. It is quite interesting to observe that the sample resembles the average Sri Lankan disability status (Figure 7 and 8). Although the survey data and national level disability prevalence cannot be compared because of different approaches used in self-reporting disability status, which sometimes include underestimation, the sample and the national level prevalence show very similar results with some fluctuations. Our survey collected data on the prevalence of disability through the "difficulties in functioning" approach. Possible self-reported responses to the questions on difficulties in functioning included at least one difficulty.

Figure 7: Comparison of disabilities with Sri Lanka and the Sample, males	Figure 8: Comparison of disabilities with Sri Lanka and the Sample, females
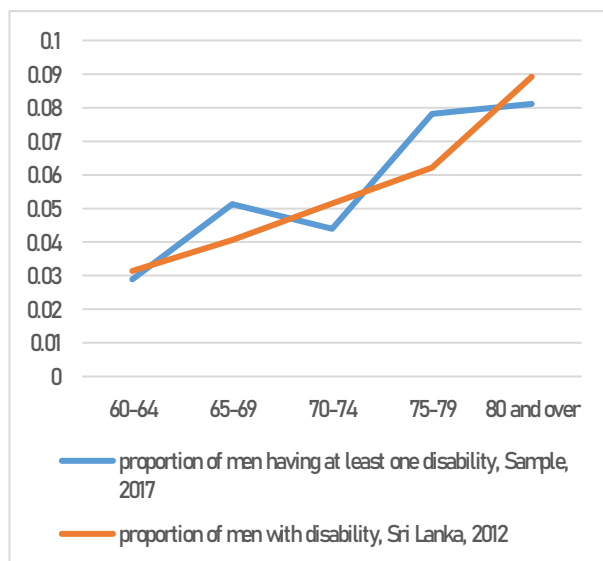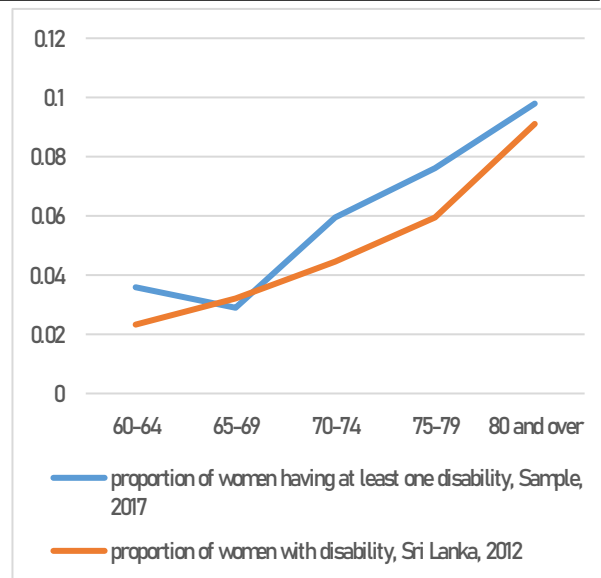
Source: Author's calculations from sample survey, 2018

Selected case studies: Is sri Lanka moving towards "morbidity expansion"?

We carried out several case studies to investigate the morbidity of elderly men and women. In general, we found that elderly men and women both become unhealthy after passing the age of 40 i.e., before they reach 60 years of age. However, most of them continue living because of the healthcare facilities available in Sri Lanka. This is an indication of morbidity expansion. The "expansion of morbidity" is an increase in the life expectancy and an increase in the proportion of life spent with underlying illness or disability (Gruenberg 1977). This is achieved when advancements in medical science reduce mortality and case fatality while the disease patterns remain the same. Improved medical care increases survival and enables individuals to live despite illness. People will live longer (due to reduced mortality) but with increased morbidity and duration of morbidity[2].

> Case Study 1
>
> Piyadasa is 82 years old and lives with his elder son's family. His wife died of breast cancer a few years ago. He is still struggling to cope with the loss saying that he lost a companion. He lives a very lonely life although he is with his son's family. He was a labourer working in the Colombo Port and retired at the age of 55. Thereafter, he found casual employment till around

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[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5602161/

70 years, until he felt that he was not fit enough to work anymore. He is suffering from various diseases such as diabetes and high blood pressure and some minor heart ailments. He receives treatment from the government hospital in Gampaha and he thinks of himself as very weak. Although he had been suffering from these diseases from around the age of 40, he never consulted a doctor, as he thought that he could manage even without medication. Later, he had to consult a doctor because his family pressurized him to do so. Now he continues his medication but says that he has no choice but to live with ailments. However, he still believes that he is not too weak, although he had been sick for many years.

Case Study 2

Seneviratne is a 74-year-old man who lives with wife in their youngest daughter's house. Seneviratne met with an accident 30 years ago and now he is walking on clutches. He lost his job and is depending on his pension. His wife, Mallika manages the household and takes care of the three grandchildren while her daughter and son-in law go to work. They are helpless and cannot do most of the work on their own, especially because of financial difficulties. When they are sick, they always depend on their children's assistance, and they feel that they are burdening their children. Mallika is partially deaf and sometimes her grandchildren laugh at her. Although Seneviratne is paralyzed, he does not have any other serious sicknesses. Mallika suffers from arthritis as well as severe depression at times.

Case study 3

Somarathne is 91 years old and his wife is 90 years old. They live with their youngest son's family. Somaratne was a clerk at a divisional secretariat and retired at the age of 55. Now he receives a pension. He says that his pension is not enough for himself and his wife who does not have any income. They mainly depend on their son. Somaratne's wife contracted chikungunya 10 years ago and as a result, she cannot walk properly. She was healthier than her husband until this illness. Somarathne did not suffer any serious sickness

except a marginally high cholesterol level until last year when he was diagnosed with cancer. However, he still survives with some oral medication. He was admitted to the general hospital several times for treatment and he said that the free healthcare provided by the government has helped him a lot.

Case study 4

Peris is 78 years old. His wife succumbed to a stroke 4 years ago. Peris was working in a private company as a sales worker, but he lost his job when he was accused of fraud at 49 years of age. Thereafter, he could not find permanent employment and was engaged in casual employment because he had three young boys to feed at that time. They are grown up now and Peris is being looked after by the eldest son as he is living close to Peris' house. Peris' wife was employed until she fell sick at the age of 53 and underwent heart surgery at a government hospital in Colombo. She lived for only 8 years after the surgery. Peris does not suffer from any sickness, but he seems to be unbothered by any sickness after his wife's death. However, the eldest son forces him to take medicine whenever he finds that his father is suffering from an ailment.

These cases suggest that widowhood and lack of financial security make elderly people vulnerable to ill health, although government provides free health care facilities. They also show that elderly women suffer the most, as most of them do not have any income. The situation is even more serious if they are widowed. The children who take care of their elderly parents force them to consult doctors when sick.

Our survey results further indicate that a higher number of men are among the elderly who get regular health treatments. The results are the same for the "no-regular health treatment" category, but with an increase in number for both genders as shown in Figure 9.

Figure 9: Nature of health by gender
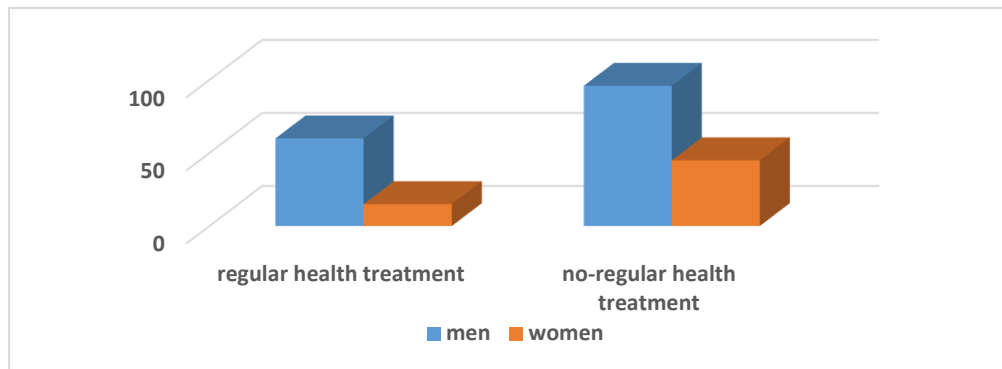
Source: Authors' calculations from sample survey

A person's health expectancy or disability free life is determined by various factors including nature of health treatment received, the person responsible for directing the sick person to a healthcare provider, and the person providing care at home. Our survey findings (Figure 10) suggest that a significant proportion of the elderly go to healthcare providers by themselves while a significant number of children also take their elderly parents to healthcare providers. It is noteworthy that most elderly mothers who are widows, are being taken care of by their children.

Figure 10: Person who takes the sick elderly to a healthcare provider
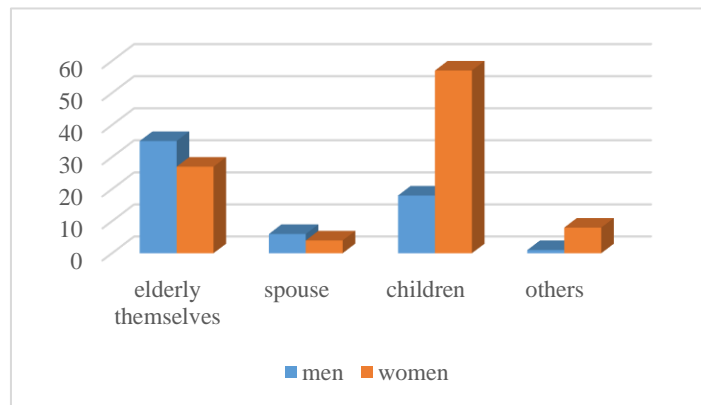
Source: Authors' calculations from sample survey

Similar to the findings of the case studies, our survey showed that many elderly people are mostly cared for by their children followed by their spouses, as shown in figure 11. The survey further reveals that, on average, an elderly respondent spends Rs. 1000 per month on their healthcare.

Figure 11: Percentage distribution of the person who takes care of the elderly parents' health at home
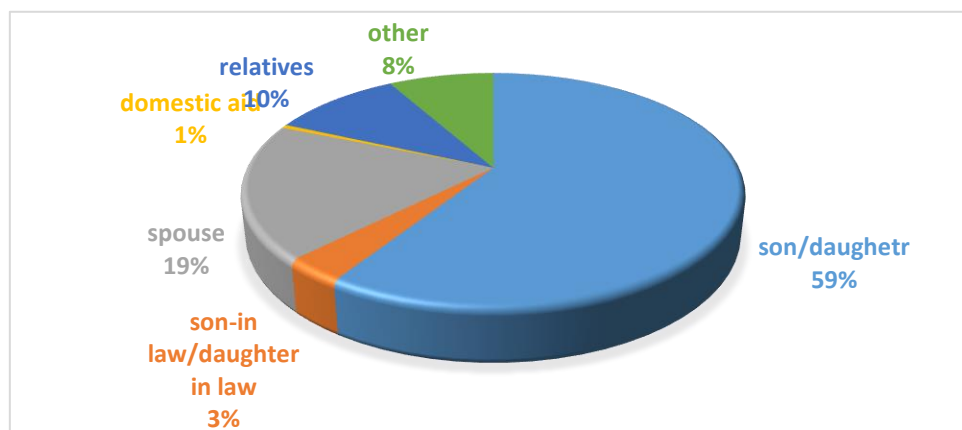
Source: Authors' calculations from sample survey

Health expectancy of elderly people in Sri Lanka

Appendix 1,2,3 and 4 show the health expectancy for men and women for the years 2001 and 2012. It is very unfortunate to observe that both elderly men and women have spent a considerable number of years with disability because of their deteriorating health condition.

When the difference between total life expectancy and health expectancy is investigated, we find that, on average, men were in a disabled state for 0.8 years compared to 0.94 years for women in 2001. However, this difference has drastically increased in 2012, with 5.24 and 7.32 years for men and women, respectively. These results show that women have reached a more morbid state compared to men after 11 years. This is a clear indication of morbidity expansion of the Sri Lankan population. This also reveals that although women enjoy better life expectancy compared to men, they spend more time in a morbid state.

Table 3: Health expectancies, men, 2001

age x to x+n)	conditional probability of death	Number of survivors at age x	person years lived in age group (interval	total years lived from aged x	total life expectancy	proportion with disability	proportion without disability	person years lived without disability in the age group	total years lived without disability from age x	disability free life expectancy (or health expectancy)
60-64	0.1082	75445	357752	1333610	17.7	0.031396	0.968604	346520	1264723	16.8
65-69	0.15562	67282	311185	975858	14.5	0.040575	0.959425	298559	918203	13.6
70-74	0.22059	56811	253433	664674	11.7	0.051491	0.948509	240384	619645	10.9
75-79	0.30638	44279	187565	411241	9.3	0.062122	0.937878	175913	379261	8.6
80 and over	0.41382	30713	223262	223675	7.3	0.089195	0.910805	203348	203348	6.6

Source: Authors' calculations from various data sources drawn from the Department of Census and Statistics and the Registrar General's Department of Sri Lanka

Table 4: Health expectancies, women, 2001

age group (x to x+n)	conditional probability of death	number of survivors at age x	person years lived in age interval	total years lived from aged x	total life expectancy	proportion with disability	proportion without disability	person years lived without disability men	total years lived without disability from age x	disability free life expectancy (or health expectancy)
60-64	0.05148	89585	437289	1932934	21.6	0.023268	0.976732	427114	1836303	20.5
65-69	0.08514	84973	408073	1495645	17.6	0.032155	0.967845	394951	1409188	16.6
70-74	0.13904	77738	363320	1087572	14.0	0.044485	0.955515	347158	1014237	13.0
75-79	0.22201	66930	299108	724252	10.8	0.059482	0.940518	281316	667079	10.0
80 and over	0.34185	52070	424411	425144	8.2	0.091062	0.908938	385763	385763	7.4

Source: Author's calculations from various data sources drawn from the Departmen Census and Statistics and the Registrar General's Department of Sri Lanka

Table 5: Health Expectancies, Men, 2012

age group (x to x+n)	conditional probability of death	number of survivors at age x	person years lived in age interval	total years lived from aged x	total life expectancy	proportion with disability	proportion without disability	person years lived without disability	total years lived without disability from age x	disability free life expectancy (or health expectancy)
60-64	.08454	82294	395075	150245	18.3	.1988	.8012	316534	980317	11.9
65-69	.12934	75337	353680	110737	14.7	.2647	.7353	260060	663782	8.8
70-74	.20403	65593	295814	753695	11.5	.3532	.6468	191332	403722	6.2
75-79	.29571	52210	223173	457881	8.8	.4582	.5418	120915	212389	4.1
80 and over	.43970	36771	234708	234708	6.4	.5720	.4280	91474	91474	2.5

Source: Authors' calculations from various data sources drawn from the Department of Census and Statistics and the Registrar General's Department of Sri Lanka

Table 6: Health Expectancies, Women, 2012

age group (x to x+n)	conditional probability of death	number of survivors at age x	person years lived in age interval	total years lived from aged x	total life expectancy	proportion with disability	proportion without disability	person years lived without disability men	total years lived without disability from age x	disability free life expectancy (or health expectancy)
60-64	.00798	91879	451138	2018248	22.0	.2337	.7663	345707	116632	12.7
65-69	.01437	88278	427412	1567110	17.8	.3100	.6900	294914	820613	9.3
70-74	.02697	82137	386517	1139698	13.9	.4104	.5896	227890	525699	6.4
75-79	.04503	71712	324133	753181	10.5	.5228	.4772	154676	297808	4.2
80 and over	.08335	57116	429048	429048	7.5	.6313	.3687	143132	143132	2.5

Source: Author's calculations from various data sources drawn from the Department of Census and Statistics and the Registrar General's Department of Sri Lanka

Following tables (7,8) clearly indicate that morbidity expansion is taking place in Sri Lanka as both elderly men and women have spent a significant number of life years in a state of disability during the period 2001 to 2012. Factually, increased life expectancy is accompanied by improvements in the population's health status. Today, however, this is not necessarily valid in terms of overall impact on the morbidity of a population, because chronic diseases have progressively replaced acute illnesses. Accordingly, the risk of illness is not only linked to the risk of dying but is also linked to the risk of becoming disabled. This has affected women more than men as shown by tables 7 and 8. According to the results of this study, the expansion of morbidity seems to have been an ongoing process among the elderly population in Sri Lanka, during the period 2001-2012. This has been observed in our field work, as shown by our survey findings and case studies. Nevertheless, it is important to note that the efforts to promote the health of youth and adults (aged 65 or less) can lead to improvements in health and longevity among the elderly, without increasing health risks. In this context, the health status seems to depend on public efforts to combat smoking, obesity, low levels of exercise, poor diet, excessive alcohol intake, and various other stress factors.

Table 7: Life years spent in disability state by men between 2001 and 201

disability free life expectancy (or health expectancy), 2001	disability free life expectancy (or health expectancy), 2012	Difference between 2001 and 2012
16.8	11.9	4.9
13.6	8.8	4.8
10.9	6.2	4.7
8.6	4.1	4.5
6.6	2.5	4.1

Source: Authors' calculations

Table 8: Life years spent in disability state by women between 2001 and 2012

disability free life expectancy (or health expectancy), 2001	disability free life expectancy (or health expectancy), 2012	Difference between 2001 and 2012
20.5	12.7	7.8
16.6	9.3	7.3
13.0	6.4	6.6
10.0	4.2	5.8
7.4	2.5	4.9

Source: Authors' calculations

A T-test is performed to investigate whether the difference between health expectancy for men and women during the period 2001-12 is statistically significant (Table 9). This suggests that the difference during the period 2001-12 is, in fact, statistically significant as shown by earlier calculations.

Table 9: T-test for the health expectancy difference between men and women, 2001-12

One-Sample Test						
	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Difference women 2001 to 12	-12.031	4	.000	-6.64000	-8.1723	-5.1077
Difference men 2001 to 12	-32.527	4	.000	-4.60000	-4.9926	-4.2074

Source: Authors' calculations

Conclusion

Over the last century, economic development, improved environmental conditions, better lifestyles, and progresses in health and medicine (particularly with the reduction of infant mortality), have led to a continuous increase in life expectancy at birth everywhere in the world. The increase in life expectancy seems to suggest that new generations enjoy better health than older generations. However, since improvements in medical technology have turned many, once deadly or infectious diseases into chronic conditions, being sick no longer implies a direct risk of death and, therefore, life expectancy as an indicator fails to provide a clear picture of the population's health status. In fact, if the probability of death decreases more than the probability of getting sick, the population's overall health status

tends to worsen over time. In other word, the prevalence of chronic diseases in the population may increase due to an increase in life expectancy if the reduction in death rate is not offset by an equivalent decrease in the rates of chronic diseases. According to this study, we have witnessed a significant decline in healthy life expectancy at birth, inverting what had been a continuous growth process. This decline was particularly evident in Sri Lanka, with significant differences, especially across gender: women tend to live longer, but spend more years in bad health than men.

Overall, if the good news is that life expectancy has increased Sri Lanka, the bad news is that healthy life expectancy is not increasing, and the lengthening of life which we have benefited from so far is not matched by an equal lengthening of life spent in good health. Therefore, although longevity is undoubtedly a success for society, bringing undeniable economic benefits, it could potentially boost the risks associated with chronic diseases in later life, which signals an increased need for long-term health care.

The idea that, over the years, people may live longer lives with disabilities was proposed in the late 70s with the theorization of the "expansion of morbidity" hypothesis. According to this theory, longevity would increase due to the progress of technology, but the extra years gained would be lived in worse health. This study proved that Sri Lanka has been more in line with the "expansion of morbidity" hypothesis, given that the number of years spent with at least one chronic disease has substantially increased among the elderly.

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