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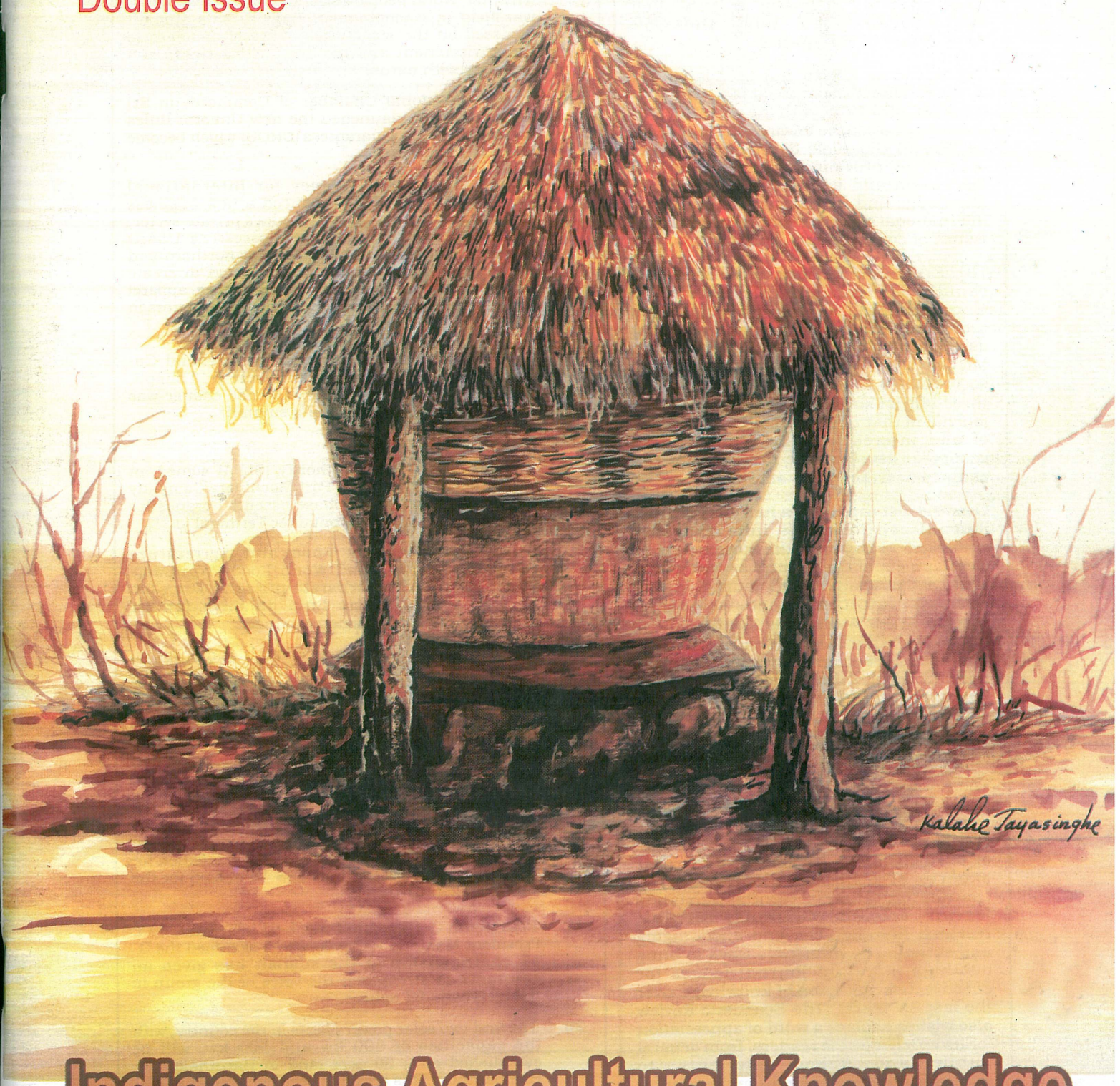

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The Contribution of Mortality Decline to Longer Working Life in Sri Lanka

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Introduction

During the past three decades, Sri Lanka has experienced considerable progress in reducing mortality and increasing life expectancy. The mortality decline has also contributed to the increase in the length of working life. The length of working life is a function of labour force participation rates and mortality rates in the working ages (conventionally defined as 15 to 64 years). The working life can also be interrupted by illness. However, as morbidity and disability data are not available with the required degree of detail and accuracy, only mortality data are used in this paper. The level of mortality has a significant effect on the supply of labour of a country. The number of infants born annually has to survive up to working age in order to enter the labour force. Having entered the labour force, the probability of continuing in working status until retirement depends again on the mortality situation that prevails in the country. In this paper, we assess the contribution of mortality decline in Sri Lanka to economically active life during the period 1968 to 2001.

The concept of the length of working life is not a new one. Since the eighteenth century, actuaries and economists have attempted to arrive at some measure of economic value of human life based on estimates of the duration of economically productive life (Wolfbein, 1949). The impact of mortality on working life could be significant. For instance, in Ghana, Kpedekpo (1969) has estimated that in 1960, 78.2 per cent of females left the labour force due to death and only 21.8 per cent withdrew for other reasons. In South Africa, Palamuleni (2007) found that, out of the total number of males who left the working population in 2001, 64 per cent left the labour force because of death and 36 per cent moved out due to other reasons. The corresponding figures for females are 45 percent and 55 per cent respectively. These figures suggest that a higher proportion leaves the labour force due to death. In another study, Dasvarma (2002) found that the contribution of declining mortality to the lengthening of working life in Indonesia was greater than the contribution of higher labour force participation rates. A study on the effect of changing mortality on working life of American men and women during 1970-1990 showed that the major causes of death affecting the young (motor vehicle accidents, homicide and AIDS (acquired immune deficiency syndrome)) although accounting for fewer deaths, were responsible for many more years of loss productivity than older Americans dying due to heart disease, cancer and stroke (Stewart, 1997).

Mortality Trends

The life expectancy at birth in Sri Lanka has increased from 64.0 years for males and 66.9 years for females during 1970-72 to 68.8 years and 77.2 years respectively during 2000-2002 (Table 1).

Table 1: Life expectancy (years) at birth from 1970 to 2002

Period	Male	Female	Average annual increase		Male-Female Difference
			Male	Female	
1970-72	64.0	66.8	-	-	2.8
1980-82	67.7	72.1	0.4	0.5	4.4
2000-02	68.8	77.2	0.1	0.3	8.4

Source: Department of Census and Statistics,

It is evident from Tables 2 and 3 that during the three decades from 1971 to 2001, while mortality had declined among both males and females, mortality above age 20 years for males has decreased at a much lower pace. In the case of females, while mortality has decline has been faster, in the peak reproductive ages the rate of decline has been rapid due to the continuous decline in the maternal mortality ratio during this period. The slow mortality decline among males is a cause for concern. It appears that while women are screened for hypertension and diabetes at the time of pregnancy, in the case of most men, these diseases go undetected until they reach a chronic stage. Thus secondary prevention is very important in the case of these diseases. Therefore, screening of both men and women after age 40 years for these diseases and subsequent treatment for those who are detected positive is an urgent need.

Table 2: Age specific death rates in the working ages by sex in 1971 and 2001

Age Group	Male		Female	
	1971	2001	1971	2001
10-14	1.1	0.5	1.0	0.4
15-19	1.5	1.0	1.4	0.7
20-24	2.2	2.0	1.8	0.8
25-29	2.6	2.3	2.4	0.8
30-34	2.8	2.8	2.5	0.9
35-39	4.1	3.9	3.2	1.1
40-44	5.4	5.2	3.4	1.4
45-49	7.6	7.0	4.7	2.3
50-54	10.4	10.5	6.3	3.8
55-59	15.3	14.3	9.9	5.6
60-64	21.3	21.4	15.3	9.9

Note: 1971 rates are from ESCAP (1976); and 2001 are computed from data from the Registrar General's Office and Estimated Population.

The fact that the male age specific mortality rates in the working ages have declined at a much lower percentage compared to those of females as evident from Table 3, reiterates the need for screening for diseases such as hypertension and diabetes in the middle ages. It is also to be noted that although mortality decline during this period has been much faster among females, the pace of decline has slowed down after age 50.

Table 3: Percentage change in mortality by sex from 1971 to2001

Age Group	Male	Female
10-14	-54.5	-60.0
15-19	-33.3	-50.0
20-24	-9.1	-55.6
25-29	-11.5	-66.7
30-34	0	-62.5
35-39	-4.9	-65.6
40-44	-3.7	-58.8
45-49	-7.9	-51.1
50-54	+1.0	-39.7
55-59	-6.5	-43.4
60-64	+0.5	-35.3

Note: Computed from data in Table 2.

Trends in Labour Force Participation

The crude labour force participation rates are presented in Table 4. It is seen that the crude rates have increased only marginally during the 30-year period from 1971 to 2001. It is also evident that the female rate is relatively low. The age specific rates of participation show some important changes (Table 5). The participation rates in the younger and older ages for males and females have declined due to greater retention in the school system and early withdrawal of from the workforce respectively. It is evident that the female participation rates are much lower in the younger and older ages. In the peak working ages however, the rates are relatively high though the male rates show a decline between 1971 and 2001. The decline in the participation rates of males in the peak working ages is significant as evident in Table 6. Assessment of the reasons for such a decline is beyond the scope of this paper. However, it is evident that the percentage of persons in the 'other' category of non-economically active population has increased from 1.5 percent in 1971 to 12.2 percent in 2001. Thus, perhaps some of marginal categories who were economically active may have been erroneously included as 'others' in the not economically active population in 2001. In the case of females however, an increased participation is seen in the peak working ages between 1971 and 2001. The female participation rates also show a slight bimodal pattern indicating that some females re-enter the labour force after completing child bearing responsibilities (Figure 1).

Table 4: Labour force participation rates in 1971 and 2001

Category	1971		2001*	
	Male	**Female**	**Male**	**Female**
Total Population	6,531,361	6,158,536	8,425,607	8,504,082
Labour Force	3,312,469	1,175,670	4,497,008	1,976,494
Participation Rate (%)	50.7	19.1	53.4	23.2

Source: Census of Population 1971 and 2001.

*Excludes 7 districts in the Northern and Eastern Provinces

Table 5: Labour force participation rates by age and sex in 1971 and 2001

Age Group	1971		2001*	
	Male	Female	Male	Female
10-14	6.0	3.9	1.6	0.9
15-19	48.3	26.7	29.8	18.6
20-24	88.9	43.1	75.0	42.7
25-29	96.9	40.2	88.1	39.5
30-34	97.7	35.2	91.3	37.0
35-39	97.5	32.9	91.8	37.9
40-44	96.8	30.8	91.1	38.3
45-49	95.7	29.5	89.3	37.1
50-54	92.3	24.7	84.3	31.8
55-59	81.1	17.6	73.1	24.3
60-64	66.2	11.0	55.8	15.2
65+	42.6	5.6	32.6	6.9

Source: Census of Population 1971 and 2001.* Excludes 7 districts in the Northern and Eastern Provinces

Note: Based on data in Table 5

Table 6: Percentage change in labour force participation by sex, from 1971 to 2001

Age Group	Male	Female
10-14	-73.3	-76.9
15-19	-38.3	-30.3
20-24	-15.6	-0.9
25-29	-9.1	-1.7
30-34	-6.6	+5.1
35-39	-5.8	+15.2
40-44	-5.9	+24.4
45-49	-6.7	+25.8
50-54	-8.7	+28.7
55-59	-9.9	+38.1
60-64	-15.7	+38.2
65+	-23.5	+23.2

Note: Computed from data in Table 5

It is important to note that during the period from 1971 to 2001, the educational level of the employed population has improved significantly. This is mainly due to higher educational attainments of the new entrants to the workforce (Table 7).

Table 7: The proportionate distribution of the employed population (%)by educational attainment in 1971 and 2001

(percent)

Educational Level	1971	2001
Primary	90.3	62,5
Secondary	8.6	35.3
Tertiary	1.1	2.2
Total	100.0	100.0

Source: Census of Population, 1971 and 2001

Loss of Active Years due to Mortality

The loss of working life due to mortality is estimated using working life tables. The working life tables estimate the reduction of average length of active life as a result of death prior to the completion of potentially active years. This is done by comparing the expectation of economically active life with gross years of active life. The gross years of active life represent the average number of economically active years for those out of a generation who do not die before retirement age, while the expectation of economically active life or the net years represent the average number of working years for a generation, including those whose working life is curtailed by death before they reach retirement age.

Thus the gross years of active life depend only on the level of participation from ages at which people begin to work and the age at which they retire, while the net years are also affected by the force of mortality. The gross years of active life are obtained by multiplying the number of years in age interval by the corresponding activity rate for each age and sex and then by adding those values to a single index for each sex. The expectation of active life at birth (e^0w_x) is derived by constructing Working Life Tables (United Nations, 1968). The loss of active years by age and sex for the years 1968, 1981 and 2001 are given in Table 8.

Table 8: Loss of active life due to mortality in 1968, 1981 and 2001

Category	1968		1981		2001	
	Male	Female	Male	Female	Male	Female
Expectation of Life at Birth	64.8	66.9	67.7	72.2	68.1	76.6
Gross Years of Active Life	51.4	13.7	42.0	13.0	40.2	16.5
Expectation of Active Life at Birth	41.5	11.8	36.2	11.9	34.7	15.6
Loss in Years of Active Life due to Mortality from Birth	9.9	1.9	5.8	1.1	5.5	0.9
Expectation of Active Life at Age 10	45.3	12.8	38.2	12.4	35.4	15.9
Loss of Active Years by Mortality after age 10	6.1	0.9	3.9	0.6	4.8	0.6
% loss of Active Years due to Mortality from Birth	19.3	13.9	13.8	8.5	13.7	5.5

Note: Data for 1968 are from A.T.P.L. Abeykoon (1973). The data for 1981 and 2001 have been derived by constructing working life tables.

Table 8 clearly indicates the contribution made by the decline in mortality to labour force participation in Sri Lanka during the period 1968-2001. While the expectation of life at birth for both males and females has increased during this period, the expectation of active life at birth as well as expectation at age 10 for men have declined. This decline in the active life of males over the years is attributed to the decline in gross years of active life as a result of the decline in age-specific participation rates. For females, however, the expectation of active life shows an increase due to increase in the gross years of active life and decline in mortality. However, it is clear that loss of active life due to mortality at birth and at age ten for males show a downward trend where the contribution of male mortality decline to active life has declined from 19.3 percent in 1968 to 13.7 percent in 2001 while that of females has declined from 13.9 percent to 5.5 percent during the same period. Thus, if not for the decline in mortality, the expectation of active life would have been much lower than what has been observed during the period 1968 to 2001.

The loss of working life due to mortality in selected districts is shown in Table 9. The loss of active life due to mortality is highest in the Anuradhapura district in the North Central Province (6.6 and 1.1 years for males and females respectively) despite the fact it has relatively high gross years of active life. This is due to the higher level of mortality prevalent in the district. The loss of active life is lowest in the southern district of Hambantota which has the highest level of life expectancy among the selected districts. The expectation of active life by age and sex for the selected districts and for the country as a whole is given in Appendix 1.

Table 9: Loss of active life due to mortality in selected districts in 2001

Category	Colombo		Anuradhapura		Ratnapura	
	Male	Female	Male	Female	Male	Female
Expectation of Life at Birth	68.2	76.1	65.8	76.3	70.5	77.4
Gross Years of Active Life	38.3	15.8	42.7	18.8	41.8	19.2
Expectation of Active Life at Birth	33.8	15.0	36.1	17.8	37.0	18.2
Loss in Years of Active Life due to Mortality from Birth	4.5	0.7	6.6	1.1	4.9	1.0
Expectation of Active Life at Age 10	34.5	15.3	37.0	18.1	37.8	18.6
Loss of Active Years by Mortality after age 10	3.8	0.5	5.7	0.7	4.1	0.7
Category	**Kurunegala**		**Kandy**		**Hambantota**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Expectation of Life at Birth	69.8	77.5	69.4	77.0	72.9	80.2
Gross Years of Active Life	41.6	15.7	39.0	14.9	41.7	14.3
Expectation of Active Life at Birth	36.7	15.0	34.5	14.1	37.3	13.8
Loss in Years of Active Life due to Mortality from Birth	4.9	0.7	4.5	0.7	4.4	0.5
Expectation of Active Life at Age 10	37.5	15.2	35.3	14.4	37.7	14.0
Loss of Active Years by Mortality after age 10	4.2	0.5	3.7	0.5	4.0	0.4

Note: The data for districts have been derived by constructing working life tables

Loss of Working Life due to Mortality from Selected Diseases

The loss of working life due to mortality varies by cause of death. Certain diseases such as accidents heart disease and cerebrovascular diseases are more likely to cause death during working life. Therefore, in this section we estimate the working life lost due to death by specific diseases using the following formula (Lau and Donnan, 1985).

Working life lost due to mortality of specific disease =

$$\left\{\begin{array}{l}(65 - \text{mid point of age group Z}) \text{ x number of} \\ \text{deaths due to specific disease in age group Z}\end{array}\right\} + 50 \text{ x number of deaths under age 15}$$

It is assumed that working life span is 50 years (65-15) and all deaths resulting from a specific disease under age 15 is considered to have lost 50 years of potential working life.

Table 10: Working years lost due to selected diseases by sex in 2001

Cause of death	Working years lost			Mean working years lost		
	Male	Female	Total	Male	Female	Total
Acute Myocardial Infarction(I21,I22)	45,662	11,786	57,447	12.4	11.0	12.1
Alcoholic Liver Disease (K70)	32,473	1,693	34,165	18.0	16.7	17.6
Asthma (J45-J46)	12,754	9,355	22,109	12.0	13.3	12.4
Cerebroavascular Disease (G80-G83)	15,701	7,985	23,686	13.0	13.6	13.3
Heart Failure (I50)	13,334	9,066	22,400	15.0	16.2	15.5
Other diseases of the Liver (K71-K76)	36,191	5,907	42,097	17.0	20.5	17.7
Other Heart Diseases (I27, I128-149, I151)	33,381	19,521	52,902	18.0	21.1	18.8
Pneumonia (J12-J18)	20,160	10,938	31,098	22.0	26.2	23.1
Renal Failure (N17-N19)	12,492	6,778	19,270	17.0	19.2	17.4
Septicaemia (A40-A41)	15,688	11,217	26,905	21.0	24.3	22.4

Note: The figures given in brackets are the codes of the International Classification of Diseases version 10 (ICD 10). The data have been derived using the formula given above.

It is evident from Table 10 that Pneumonia and Septicaemia are two diseases that seem to cause greater loss of working life of the selected causes of death. Acute Myocardial Infraction, Other Heart Diseases and Other Diseases of the Liver, although cause higher number of years lost, have relatively high mean age at death than for Pneumonia and Septicaemia (Table 11). Thus from a point of view of improvement in labour productivity, Pneumonia and Septicaemia are diseases that would require more attention.

Table 11: Number of deaths and mean age at death of selected diseases, 2001

Cause of Death	Total number of deaths	Mean age at death
Acute Myocardial Infarction(I21,I22)	4,765	52.7
Alcoholic Liver Disease (K70)	1,941	47.4
Asthma (J45-J46)	1,786	52.0
Cerebroavascular Disease (G80-G83)	1,821	51.8
Heart Failure (I50)	1,444	48.3
Other diseases of the Liver (K71-K76)	2,375	47.0
Other Heart Diseases (I27, I128-149, I151)	2,817	44.4
Pneumonia (J12-J18)	1,345	39.4
Renal Failure (N17-N19)	1,105	47.0
Septicaemia (A40-A41)	1,202	40.1

Note: Data by cause of death are from the Registrar General's Department

Conclusions

The loss of active life due to mortality in Sri Lanka has shown a clear downward trend during the period from 1968 to 2001. However, the net years of active life for males have not increased during this period due to the fact that male labour force participation rates have declined during 1971 and 2001. This decline may partly be due to some marginal categories of the employed being included in the not economically active population. In the case of females, however, the increase in the participation rates and the definite downward trend in mortality have resulted in the increase in net active life.

The loss of working life due to mortality in selected districts show that the loss of active life due to mortality is highest in the Anuradhapura district in the North Central Province (6.6 and 1.1 years for males and females respectively) despite the fact that it has relatively high gross years of active life. Thus, the loss of active life is due to the higher level of mortality prevalent in the district. The loss of active life is lowest in the southern district of Hambantota which has the highest level of life expectancy among the selected districts.

Pneumonia and Septicaemia are two diseases that seem to cause greater loss of working life due to death. Acute Myocardial Infraction, Other Heart Diseases and Other Diseases of the Liver, although cause higher number of years lost, have relatively high mean age at death than for Pneumonia and Septicaemia thus resulting in a lower loss of working life.

The analysis therefore, reveals that in order to improve labour productivity of the workforce through healthcare, health policies and programmes should focus on reducing the mortality caused by diseases that affect the young population who are more educated and have more years of working life. It is equally important to take note of the health issues of the working population over 45 years of age who are the more experienced and skilled segment of the workforce and who are more likely to suffer from degenerative diseases. Thus, health programmes should also make provision to screen the older segment of the workforce for degenerative diseases, particularly for hypertension and diabetes and provide treatment as a means to secondary prevention of disability and death.

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Appendix 1: Expectation of Active Life by Age and Sex for Sri Lanka and Selected Districts, 2001

Age group	Sri Lanka		Colombo		Anuradhapura		Ratnapura		Kurunegala		Kandy		Hambantota	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
10-14	35.43	15.92	34.54	15.30	37.01	18.15	37.78	18.56	37.45	15.18	35.29	14.40	37.75	13.96
15-19	35.45	15.91	34.54	15.26	37.05	18.15	37.77	18.53	37.47	15.18	35.32	14.39	37.79	13.96
20-24	34.18	15.03	32.98	14.08	35.77	17.44	36.47	17.68	36.31	14.49	34.35	13.72	36.76	13.33
25-29	30.87	12.97	29.59	11.83	32.44	15.63	33.11	15.65	33.06	12.64	31.34	11.94	33.53	11.54
30-34	27.02	11.06	25.65	9.77	28.57	13.70	29.16	13.73	29.33	10.92	27.57	10.23	29.65	9.88
35-39	22.96	9.26	21.59	8.03	24.44	11.60	25.00	11.78	25.36	9.19	23.42	8.58	25.56	8.25
40-44	18.87	7.41	17.56	6.40	20.23	9.34	20.74	9.62	21.15	7.36	19.17	6.90	21.32	6.59
45-49	14.89	5.55	13.64	4.78	16.06	7.02	16.49	7.40	16.83	5.52	14.95	5.15	17.02	4.98
50-54	10.90	3.75	9.84	3.21	12.01	4.83	12.33	5.18	12.52	3.72	10.85	3.45	12.78	3.42
55-59	7.18	2.22	6.30	1.89	8.16	2.93	8.36	3.17	8.40	2.19	7.03	1.97	8.71	2.07
60-64	3.97	1.05	3.31	0.88	4.73	1.49	4.80	1.56	4.75	1.06	3.81	0.89	5.00	1.02
65+	1.50	0.33	1.20	0.28	1.85	0.48	1.84	0.49	1.80	0.32	1.41	0.29	1.91	0.32

Note: The data have been derived by constructing working life tables