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学位論文

Instrumental Activities of Daily Livings (IADL) and Depression in Community-Dwelling People Aged 60 Years or Older in Kandy District, Sri Lanka - With Special Reference to Ethnicity -

（スリランカ・キャンディ地区の地域高齢者における手段的日常生活動作とうつ

－民族性の視点から－）

2017 年 3 月

北海道大学

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TABLE OF CONTENTS

LIST OF PUBLICATIONS……i

LIST OF PRESENTATIONS AT ACADEMIC SEMINARS……ii

LIST OF ABBREVIATIONS……..iii

SUMMARY……..iv-viii

LIST OF TABLES……ix

LIST OF FIGURES……..x

CHAPTER 1 INTRODUCTION AND OBJECTIVES OF STUDY

1.1 Ageing in the world and Sri Lanka

1.1.1 Growing rate of population ageing…….....1-5

1.1.2 Life expectancy and fertility …….....5-10

1.1.3 Health status of people aged 60 years or older …….....10-13

1.2 Instrumental activities of daily living (IADL) and depression in the world and Sri Lanka …….....13-17

1.3 Gaps in health status by ethnicity in Sri Lanka…….....17-20

1.4 Health care system in Sri Lanka…….....20-22

1.5 Aims of the study…….....22

CHAPTER 2 METHODOLOGY

2.1 Study design and sampling…….23-26

2.2 Data collection…….....26-29

2.2.1 Questionnaire…….....26-29

2.3 Statistical analysis……....29-31

CHAPTER 3 ETHNIC DIFFERENCE IN IADL DEPENDENCY IN COMMUNITY-DWELLING PEOPLE AGED 60 YEARS OR OLDER IN KANDY DISTRICT, SRI LANKA

3.1 Introduction…….32-33

3.2 Participants and methods…….....33

3.3 Results……..34-43

3.4 Discussion…….....44-47

CHAPTER 4 ETHNIC DIFFERENCE IN DEPRESSION IN COMMUNITY-DWELLING PEOPLE AGED 60 YEARS OR OLDER IN KANDY, SRI LANKA

4.1 Introduction……48-49

4.2 Participants and methods…….....49

4.3 Results……..49-56

4.4 Discussion…….....57-60

CHAPTER 5 GENERAL DISCUSSION AND CONCLUSIONS

5.1 Summary of the study results……...61-62

5.2 General discussion of IADL dependency and depression……...62-64

5.3 Limitations of the study…….....64-65

5.4 Conclusions and implications……...66

ACKNOWLEDGMENTS…….....67

REFERENCES……..…….68-85

APPENDIX: Questionnaire……..……..86-93

LIST OF PUBLICATIONS

1. Amartuvshin Khaltar, Neelawala G.W. Priyadarshani, Nisansala Y. Delpitiya, Chandrika Jayasinghe, Ananda Jayasinghe, Asuna Arai, Hiko Tamashiro. Ethnic difference in dependency in instrumental activities of daily living among community-dwelling older people in a single divisional secretariat of Kandy District, Sri Lanka. Journal of Cross-Cultural Gerontology 2016; (Submitted).

2. Amartuvshin Khaltar, Neelawala G.W. Priyadarshani, Nisansala Y. Delpitiya, Chandrika Jayasinghe, Ananda Jayasinghe, Asuna Arai, Hiko Tamashiro. Depression among older people in Sri Lanka - with special reference to ethnicity-. Geriatrics & Gerontology International 2016; (Submitted).

LIST OF PRESENTATIONS AT ACADEMIC SEMINARS

1. Amartuvshin Khaltar, Hiroko Yamashina, Bongani Kaimila, Koji Kanda, Asuna Arai, Yoshihide Obayashi, Chandika Gamage, Chinyere Nwafor-Okoli, Hiko Tamashiro. Comparative Descriptive Analysis of HIV/AIDS in Mongolia and Japan. First Annual Public Health Conference. December. 8, 2011. Ulaanbaatar, Mongolia.
2. Amartuvshin Khaltar, Neelawala G.W. Priyadarshani, Nisansala Y. Delpitiya, Chandrika Jayasinghe, Ananda Jayasinghe, Asuna Arai, Yoshihide Obayashi, Hiko Tamashiro. Health Condition and Attitudes towards Long-Term Care among Community-dwelling Older People in Kandy District, Sri Lanka. One Health International Conference. Sept. 5-6, 2014. Kandy, Sri Lanka.
3. Amartuvshin Khaltar, Neelawala G.W. Priyadarshani, Nisansala Y. Delpitiya, Chandrika Jayasinghe, Ananda Jayasinghe, Asuna Arai, Yoshihide Obayashi, Hiko Tamashiro. Ethnic Differences in Instrumental Activities of Daily Livings among Older People in Kandy, Sri Lanka. The 25th Scientific Meeting of the Japan Epidemiological Association. January. 21-23, 2015. Nagoya, Japan.
4. Amartuvshin Khaltar, Neelawala G.W. Priyadarshani, Nisansala Y. Delpitiya, Chandrika Jayasinghe, Ananda Jayasinghe, Asuna Arai, Yoshihide Obayashi, Hiko Tamashiro. Association between instrumental activities of daily livings (IADLs) dependence and depression among community-dwelling older people in Sri Lanka. The 10th IAGG Asia/Oceania Regional Congress. October. 19-22, 2015. Chiang Mai, Thailand

LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
AOR	Adjusted Odds Ratio
CI	Confidence Interval
DS	Divisional Secretariat
GN	Grama Niladhari
GDS	Geriatric Depression Scale
IADL	Instrumental Activities of Daily Living
LE	Life Expectancy
MOH	Medical Officer of Health
MSPSS	Multidimensional Scale of Perceived Social Support
OECD	Organization for Economic Co-operation and Development
OR	Odds Ratio
p Value	Probability Value
TFR	Total Fertility Rate
TMIG	Tokyo Metropolitan Institute of Gerontology
WHO	World Health Organization

Summary

Ageing is one of the most important global agenda, facing a great challenge not only by developed countries but also by many developing countries. The world population (≥ 60 years) increased from 9.2% in 1990 to 12.3% in 2015. This is being driven by improvements in longevity and declines in fertility and mortality in all major regions of the world.

Many published reports have focused on the issues surrounding successful ageing among people aged 60 years or older. In order for these people to be healthy, the World Health Organization (WHO) has emphasized on both their active physical activities and continuing participation in social, economic, cultural, spiritual and civil affairs. However, there appears to be no agreement on how to measure successful ageing. Some authors define people that are ageing successfully as those who have the highest score on a combined scale of physical and mental function, absence of depression, performing activities of daily living (ADL) (bathing or dressing, etc.) and instrumental activities of daily living (IADL) (using public transportation, preparing food, paying bills, etc.) and capacity to live an independent life.

The ability to perform IADL is a major indicator of health condition and quality of life especially in community-dwelling people aged 60 years or older. IADL dependency can affect a person's ability to maintain an independent lifestyle. Studies reported that IADL dependency usually precedes ADL dependency. High IADL competence is an important component of successful aging. Difficulty in performing IADL can cause

increased use of health services, institutionalization, and high mortality in community-dwelling aged 60 years or older.

Depression is one of the common health issues in the world. Recently, WHO has reported that 350 million people across the world are suffering from depression, which is projected to be the highest global burden of disease by 2030. Among people aged 60 years or older, depression is also one of the most common disorders. These people are vulnerable as they often have multiple co-existing medical and psychological problems. In addition, depression is common response to negative life events such as being widowed or divorced, being retired, and loss of social role and network. Depression decreases an individual's quality of life and increases dependence on others. Thus, the absence of depression is considered to be one of the measures of successful ageing among people aged 60 years or older.

People aged 60 years or older account for 13.9% of the total population in Sri Lanka in 2015 (WHO, 2015), which is considered to be one of the most rapidly ageing societies in Asia in coming decades. Substantial declines of both fertility and mortality rates and increase in life expectancy in Sri Lanka have led to an unprecedented ageing of its population.

Sri Lanka is the multi-ethnic, multi-linguistic and multi-religious society. Almost three-quarters of the population are Sinhalese (73.9%), followed by Tamils (17.8%), Muslims (7.4%) and others (0.9%). Each has different beliefs, traditions, social structures and practices. Previous studies reported that there was a wide gap in health status and behaviours among ethnic groups in the country; for example, metabolic syndrome, oral health related quality of life, diabetes mellitus, obesity and alcohol consumption. It is also

shown that depressive symptoms among these people were more frequently observed in non-Sinhalese (Tamils and Muslims) than Sinhalese. However, no study has been conducted by their ethnicity in IADL. With the background knowledge, this study planned to investigate:

- Ethnic difference in IADL dependency and its associated factors
- Ethnic difference in depression and its associated factors.

We conducted a cross-sectional survey among people aged 60 years or over living in single divisional secretariat of Kandy district, Sri Lanka. The participants were asked about ethnicity (Sinhalese, Tamils, and Muslims), sociodemographic characteristics, IADL and depression status by face-to-face interviews with a structured questionnaire. IADL was measured by the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence and the total score of less than 10 was considered as dependency. Depression was measured by Geriatric Depression Scale-15 items and the total score of 6 and above was considered as depression. The chi-square test was used to examine ethnicity-based differences in sociodemographic characteristics and IADL status or depression. Adjusted odds ratios (AORs) were calculated by multivariate logistic regression analysis including all significant variables and two-way interaction terms between these variables and ethnicity. In addition, multilevel analysis was carried out.

The results of this study were:

- Participants (n=778) consisted of 56.6% of Sinhalese, 22.1% Tamils, and 21.3% Muslims. The total prevalence of IADL dependency was 57.1% (Sinhalese-47.5%, Tamils-77.6%, Muslims-61.2%). After adjusting for covariates, age, education level, occupation and number of self-reported disease were shown to

be IADL dependency-related factors among all ethnic groups. Economic status was significantly associated with IADL dependency only in Tamils. The IADL dependency-associated factors from the multilevel analysis were consistent with those from the multivariate logistic regression analysis.

- Of the all participants, the prevalence of depression was 31.8% (Sinhalese-27.3%, Tamils-42.1%, Muslims-32.9%). Multivariate logistic regression analysis showed that low education level, other marital status, economic status, perceived social support and number of self-reported diseases were significantly associated with depression in all ethnic groups. Regarding depression-related factors, the results from multilevel analysis were consistent with those from the multivariate logistic regression analysis.

The prevalence (57.1%) of IADL dependency of the present study was higher than the previous study (32.3%) conducted in Sri Lanka. The prevalence of depression (31.8%) was similar to the previous study (27.8%). However, there were several methodological differences for example other ethnic groups represented 10.5% in the previous study and 43.4% in the present study, who had much higher prevalence of IADL dependency and depression than Sinhalese. Lawton and Brody scale was used in the previous study the measurement of IADL. While TMIG Index of Competence was used in the present study. These may explain the higher prevalence of IADL dependency and depression in this study. IADL dependency-associated factors in all ethnic groups in the present study are consistent with the previous studies. In our study, Tamils had a lower social status in the all parameters than Sinhalese and Muslims. These differences may contribute to high IADL dependency among Tamils.

Depression-related factors among all ethnic groups in our study are consistent with the previous studies. Tamils had a lower education level, other marital status, low economic status and perceived social support than Sinhalese and Muslims. The different distribution of these characteristics may affect the varied prevalence of depression among ethnic groups.

In conclusion, our findings would offer guidance on the detection of subpopulations who are prone to IADL dependency and depression. Strengthening community health services should be focused on those at probable risks shown to be associated with these health outcomes. The significant interaction between sociodemographic characteristics and ethnicity were observed in IADL dependency, but not in depression. Its reason remains to be explained, but the distinct history from Sinhalese and Muslims of Tamils who eventually got assimilated to Sinhala society might be a potential factor. Further study is needed to explore the details taking into account the cultural/religious aspects and behaviours of Tamils population.

I trust that the findings of this study could contribute a better understanding of important issues relevant to IADL and depression as well as its associated health matters, especially in many Asian countries including Sri Lanka.

LIST OF TABLES

1. Ageing in South Asian and Sri Lanka perspective in 2000 and 2030
2. Prevalence of disability in people aged 60 years or older by leading health condition associated with disability in developed and developing countries
3. Common health problems among people aged 60 years or older in Sri Lanka
4. Proportion of ethnicity
5. Previous studies on ethnic difference in health status among Sri Lankans
6. Sociodemographic characteristics
7. IADL dependency by ethnicity
8. IADL dependency by sociodemographic characteristics by ethnicity
9. IADL dependency by sociodemographic characteristics
10. Associated factors for IADL dependency
11. Multilevel analysis of IADL dependency
12. Depression by sociodemographic characteristics by ethnicity
13. Depression by sociodemographic characteristics
14. Interactions between sociodemographic characteristics and ethnicity
15. Associated factors for depression
16. Multilevel analysis of depression
17. Comparison of IADL dependency and depression with the previous study

LIST OF FIGURES

1. Proportion of population aged 60 or over: world and regions, 2015 and 2050
2. Number of years required for percent of population aged 65 or over to rise from 7 percent to 14 percent in selected countries
3. Proportion of population aged 60, 65 and 80 years in Sri Lanka, 1950-2020
4. Life expectancy at birth in both sexes by world and regions, 1950-2050
5. Life expectancy at birth by gender in Sri Lanka, 1930-2010
6. Total fertility rate by world and regions, 1950-2010
7. Total fertility rate in Sri Lanka, 1960-2010
8. The prevalence of IADL dependency among people aged 65 and 60 years or older in Sri Lanka
9. Organization for provision of health care services
10. Provinces and major cities in Sri Lanka
11. Selection procedures of study population

.

CHAPTER 1

INTRODUCTION AND OBJECTIVES OF STUDY

1.1 Ageing in the World and Sri Lanka

1.1.1 Growing rate of population ageing

Population aging, which means there are a greater number of people aged 60 years or older in relation to younger people within a population group. However, in many developed countries, the age of 65 is used as a reference point for older persons as this is often the age at which persons become eligible for old-age social security benefits.

Every country in the world is experiencing growth in the number and proportion of people aged 60 years or older in their population. In 1950, there were 205 million people (≥ 60 years) in the world. In 2015, it increased to almost 901 million (12.3% of total population). It is projected to more than double by 2050, reaching 2.1 billion (22.0%) [1] . Among those aged 60 years or over worldwide, the population aged 80 years or over accounted for 14% in 2014 and will represent 19% by 2050.

Speed of population ageing is different between countries. Ageing process is taking place fastest in the developing countries. Currently there are 15 countries with more than 10 million people aged 60 years or older, seven of these being developing countries. It means that almost two in three people (≥ 60 years) live in developing countries. By 2050, 33 countries are expected to have 10 million people (≥ 60 years) that nearly four in five will live in developing countries where 80 % of population (≥ 60 years) will be concentrated [2].

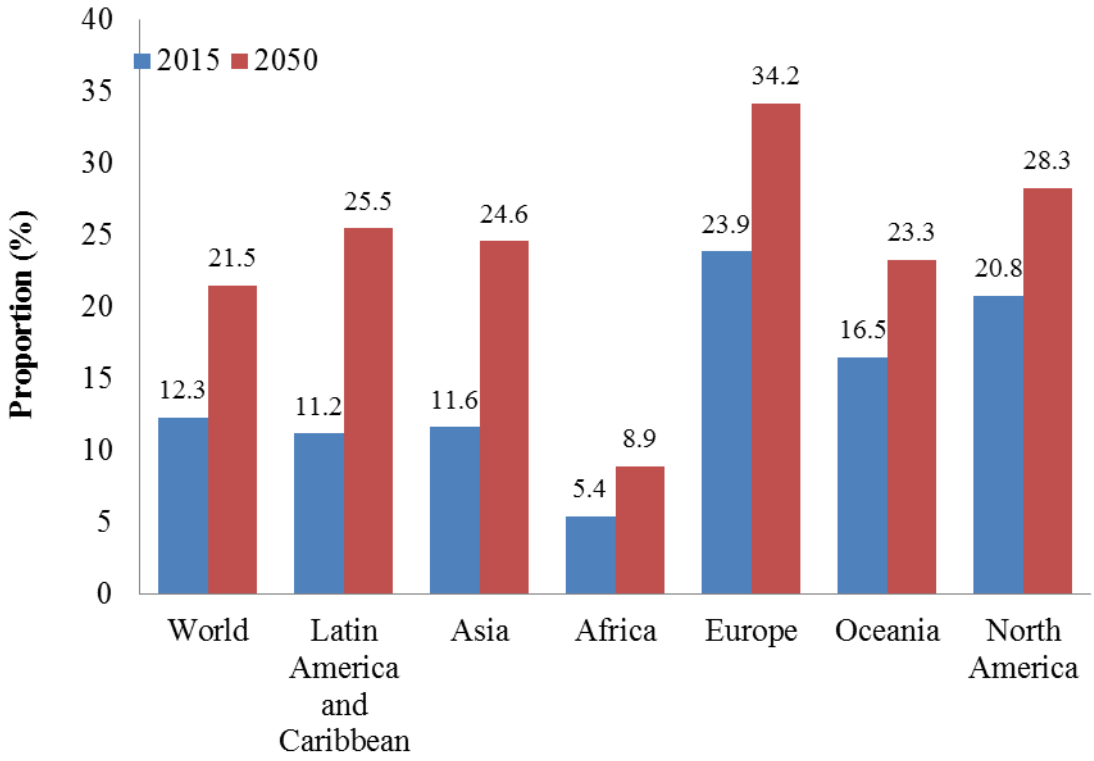


Figure 1. Proportion of population aged 60 or over: world and regions, 2015 and 2050
Source: United Nations, 2015 [9]

For Latin America and the Caribbean, the population (≥ 60 years) is expected to increase 11.2% in 2015 to 25.5% in 2050. Similarly, Asia is expected to shift from 11.6% to 24.6%, Africa from 5.4% to 8.9%, Europe from 23.9% to 34.2%, Oceania from 16.5% to 23.3% and Northern America from 20.8% to 28.3%, respectively [3] (Figure 1).

An index used to measure the rate of ageing is doubling time which measures the time required for a country to double (from 7% to 14%) the percentage of elderly in total population. Doubling time has taken between 18 and 115 years in the countries examined. For example, the doubling time in Japan was 26 years. Asian countries including South Korea, Singapore, Thailand and Sri Lanka, are expected to take even in

shorter time. It is estimated for South Korea, Singapore, Thailand and Sri Lanka to be 18, 19, 22 and 24 years, respectively [4] (Figure 2).

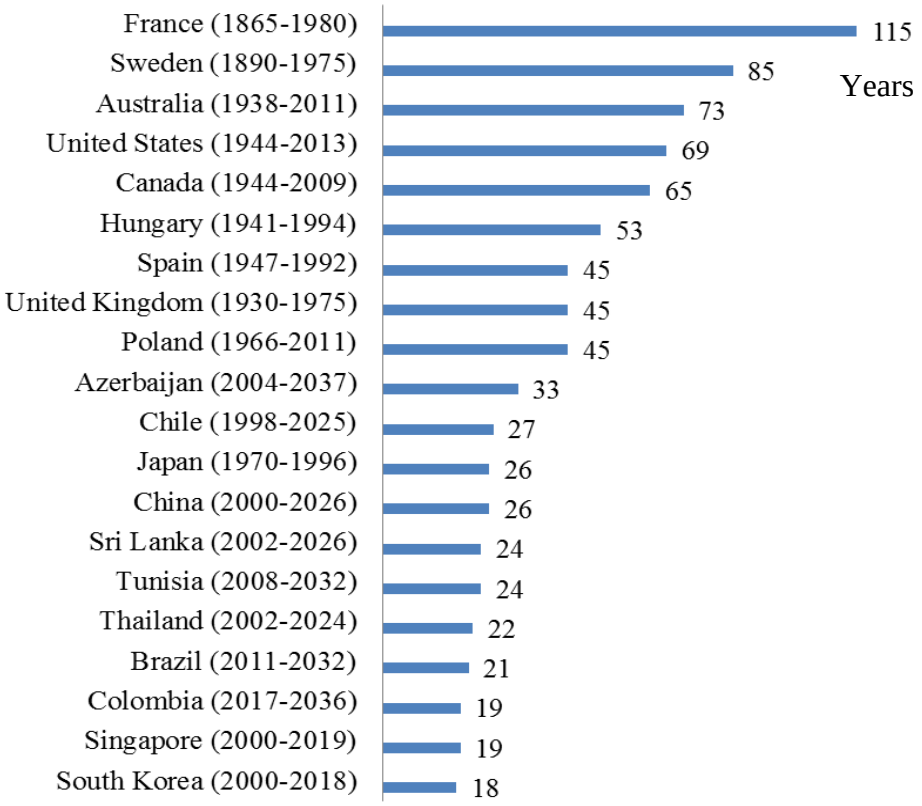


Figure 2. Number of years required for proportion of population aged 65 or over to rise from 7 percent to 14 percent in selected countries

Source: Kinsella et al. 2009 [4]

Ageing is a universal phenomenon but while the population ageing process in developed countries occurred over a relatively longer period of time, it has been far more rapid in developing countries. Developing countries are not yet prepared to face many public health challenges for older population.

Sri Lanka is one of the fastest ageing populations in developing countries. As shown in Table 1, the proportion of older population aged 60 years or over in total population was 9.8% in 2000 and is projected 21.5 % in 2030 [5,6].

Ageing phenomenon in Sri Lanka is the highest in South Asia [7]. Firstly, doubling percentage of ageing population took 56 years from 5.4% in 1946 to 10.8% in 2002. Secondly, doubling percentage (10.8% to 21.6%) projected more rapid; 24 years from 2002 to 2026 [8].

Table 1. Ageing in South Asian countries in 2000 and 2030

Country	**Proportion of aged 60 years or over in total population (%)**	
	2000	**2030**
Afghanistan	4.7	5.5
Bangladesh	4.9	9.7
Bhutan	6.5	7.4
India	7.6	14.0
Nepal	5.9	7.8
Pakistan	5.8	7.8
Sri Lanka	9.8	21.5

Source: Siddhisena, 2004 [8]

The age is an important variable to consider when planning how to meet the demand for health and social services. Sri Lanka has depicted an increasing trend of population aged over 60 since 1960s and those aged over 65 since 1980s (Figure 3). In 1950, population aged 60 and 65 years or over were 5.4% and 3.5 %, respectively. However, in 2010, it accounted more than two times in total population. Due to declining mortality rate and increase in life expectancy, the proportion of people aged 80 years or older who need special care in terms of health, companionship and

psychological support will continue to increase year by year. Population aged 80 or over will increase from 1.0% in 2000 to 1.3% in 2010. It is projected to 1.8% in 2020.

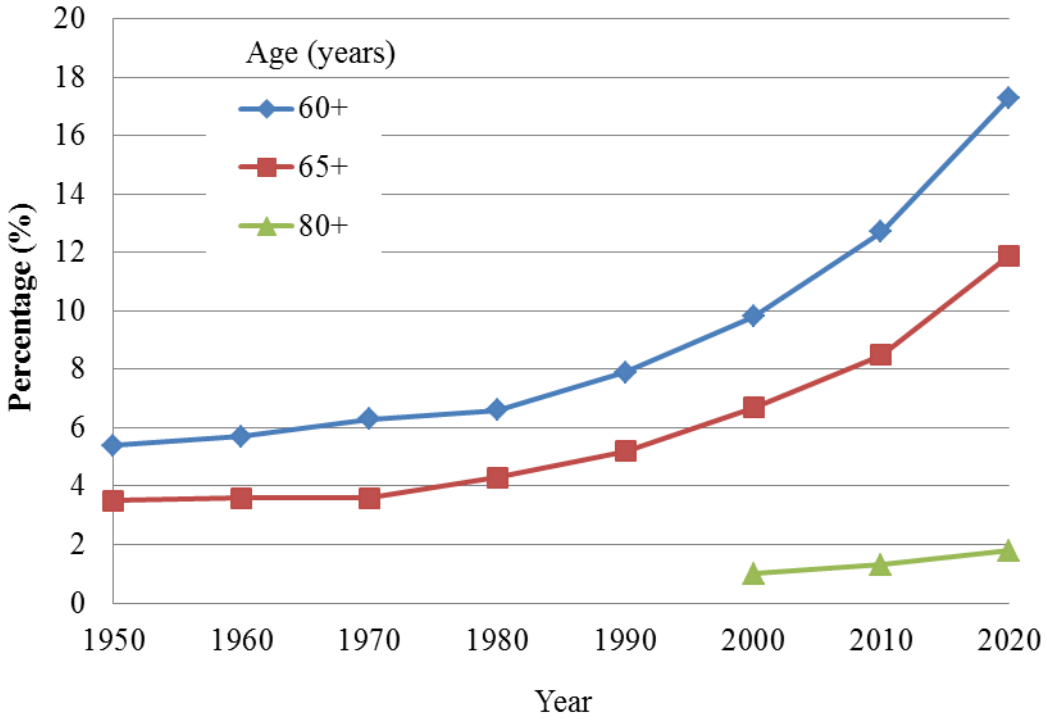


Figure 3. Proportion of population aged 60, 65 and 80 years or over in Sri Lanka, 1950-2020

Source: Siddhisena, 2004 [8]

1.1.2 Life expectancy and fertility

Population ageing is occurring due to a number of factors including increased life expectancy (LE) [9]. Increased LE at birth has resulted from, among others, advances in public health such as improved drinking-water and sanitation, improvements in health and nutrition across the life-course, preventive medicine including childhood immunization, and improvements in the health-care of aged people [10].

Global averages of LE at birth were 46.5 years in 1950-1955 and 66 years in 2000-2005, and it is projected to increase to 76 years in 2045-2050. In the less and least developed regions, it has also increased significantly in recent years.

It was observed 41.0 and 35.5 years in 1950-1955 in less and least developed regions, respectively. It was 64.1 and 51.4 years in 2000-2005 and projected to be 75.0 and 69.7 years in 2045-2050, respectively. Especially, the gaps in LE between more developed regions and less or least developed ones are expected to narrow over time. For example, the gaps in LE between developed and least developed regions were 30.7 years in 1950-1955 and were projected to be 12.4 years by 2045-2050 [11]. The increase in LE is more prominent in least and less developed regions than the more developed which has significantly contributed to the elevation of the world average. It is projected that life expectancies of less and least developed regions will be 75.0 and 70.0 years in 2045-2050, respectively as compared with the global average of 76.0 years (Figure 4).

Increased LE is also the main driver of population ageing in Sri Lanka. LE for both men and women increased for the past decades. It increased from 55.2 years in 1950 to 75.0 years in 2012 which is higher than the global average (70.0 years). LE is 73 years for male and 76 years for female that are close to that in Organization for Economic Co-operation and Development (OECD) countries [6]. LE among females rapidly has increased than males in Sri Lanka. Thus, the gaps between males and females have widened since 1960s; 3.0 years in 1970, 6.0 years in 1990, and 6.1 years in 2010 (Figure 5).

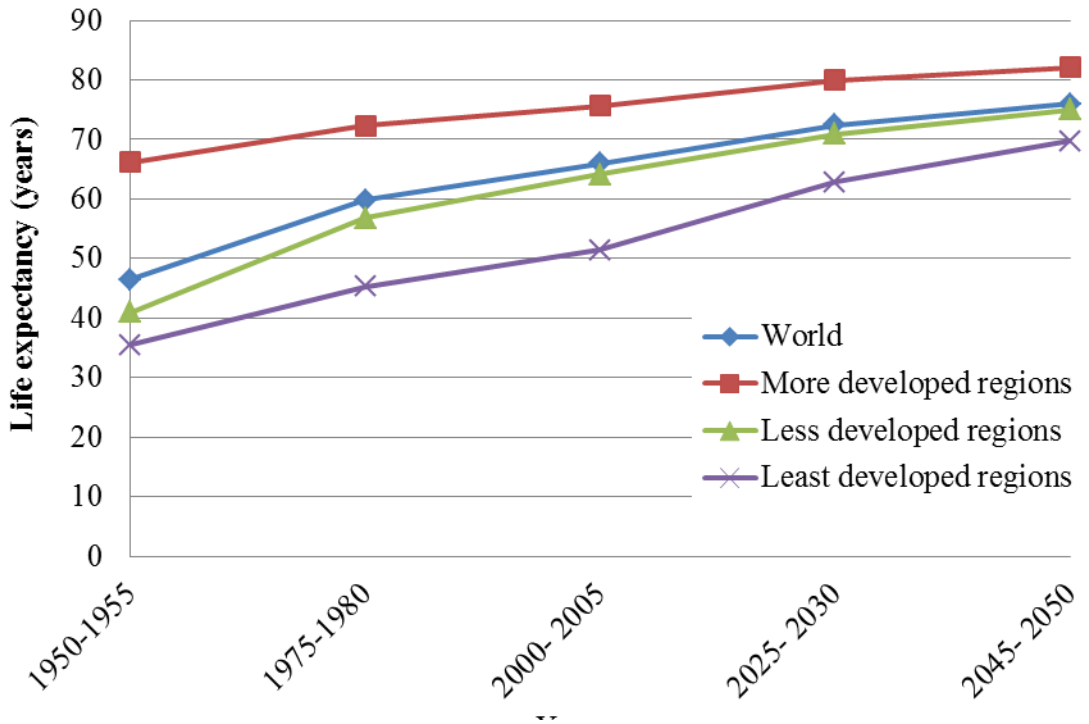


Figure 4. Life expectancy at birth in both genders by world and regions, 1950-2050
Source: UNDESA Population Division, 2009 [129]

It should be noted that the gaps are stabilized in these years, which are also observed in many more developed countries [12]. We also point out that LE of men was higher than that of women before 1950. Published literature has reported that slower mortality decline for male is partially caused by behavioural risk factors (e.g., smoking) than female [13]. Cigarette smoking among males had the greatest contribution to the widening of gender gaps in LE, which led to higher mortality from lung cancer and heart disease in males.

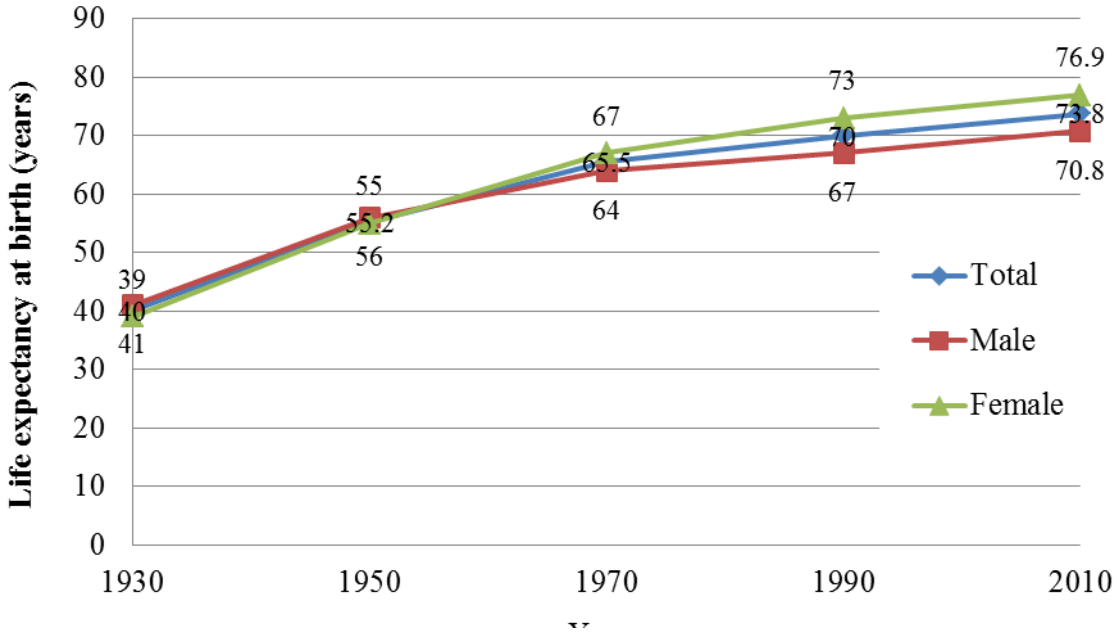


Figure 5. Life expectancy at birth by gender in Sri Lanka, 1930-2010

Source: WHO, 2012 [88]

Declining in fertility rate is also one of the primary determinants of population ageing. Fertility rates are said to be below replacement level when each adult woman on average does not give birth to enough children to sustain population level (estimated to be around 2.1 children per woman). Decreases in women's fertility rates have been attributed to a host of cultural and social factors such as increases in the average age of marriage and childbirth, easy access to reliable contraceptive methods, longer educational and career paths and economic factors such as the ability to give up work to care for a child, or affordability and accessibility of childcare [1].

Regarding total fertility rate (TFR), there are four levels: "high fertility" (TFR>= 5.0), "replacement-level fertility" (TFR= 2.1), "below replacement fertility" (TFR< 2.1) and "very low fertility" (TFR<1.3) [14].

TFR decreased globally by half, from 4.95 in 1950-1955 to 2.52 in 2005-2010 and has been well "below the replacement level" in the more developed regions since 1975. In the more developed regions, TFR dropped from 2.81 in 1950-1955 to very low level of 1.66 in 2005-2010. TFR in the less developed regions had started later and has proceeded faster. TFR dropped from 6.01 in 1950-1955 to 2.41 in 2005-2010 in the less developed region (Figure 6) [15]. Sri Lanka is not very different from the world situation in relation to TFR.

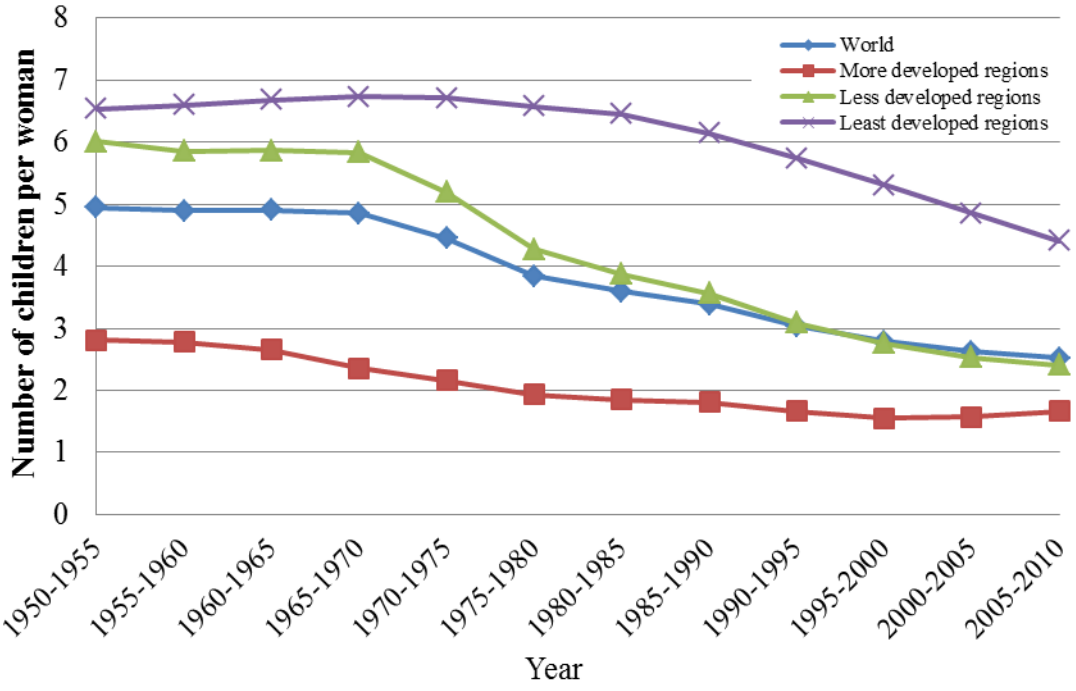


Figure 6. Total fertility rate by world and regions, 1950-2010

Source: United Nations, 2015 [15]

Sri Lanka is one of the few Asian countries that achieved conspicuously a steady and sustained decline of fertility. In Sri Lanka, in response to economic pressure even in the absence of state-sponsored family planning programs, individual family planning can be regarded as a major contributory factor in the declining fertility rates.

In Sri Lanka, TFR was 5.5 in 1960. In 2000, it reached its lowest levels at 2.2 but after 2000 it remained to be relatively constant (Figure 7) [16]. Sri Lanka is the lowest TFRs in the South Asia region.

Why has the TFR in Sri Lanka stabilized after 2000? There are several contributing issues including changing in attitudes towards family planning which constitutes declining average age of marriage in ethnic groups, withdrawal of abortion facilities and weakening of contraceptive programs (Department of Demography, University of Colombo, Sri Lanka).

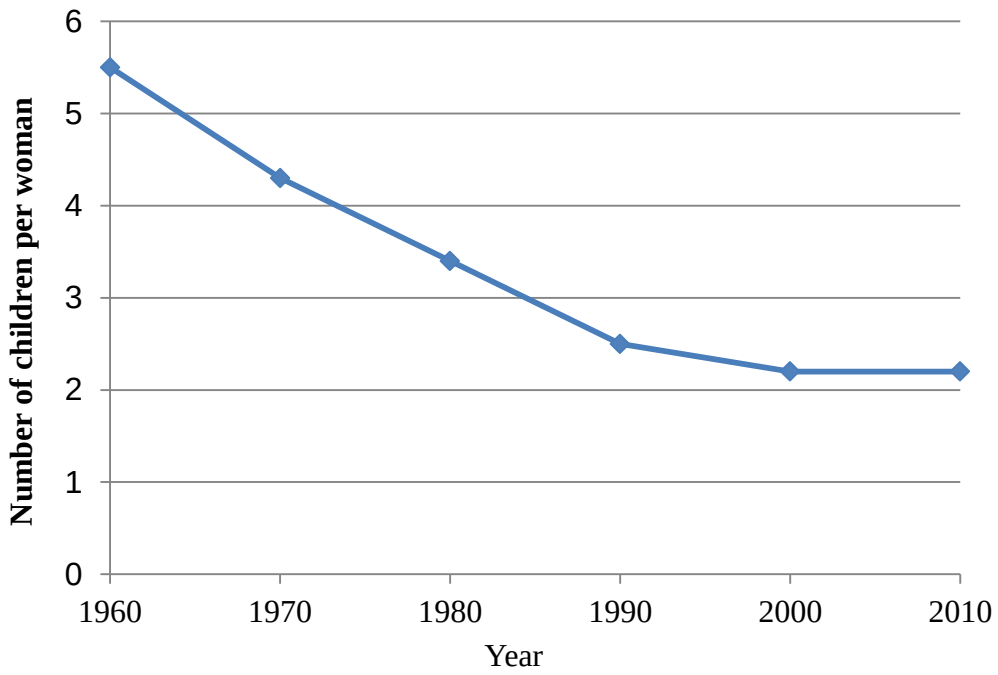


Figure 7. Total fertility rate in Sri Lanka, 1960-2010

Source: World data atlas, Sri Lanka [16]

1.1.3 Health status of people aged 60 years or older

Ageing is not a disease but eventually leads to structural and functional decline and involves increased susceptibility to diseases. Due to the increase in LE, changes of

lifestyles, and the influences of socioeconomic and environmental factors, the health status is changing thus especially making chronic diseases more prominent. The projected statistics show that globally, chronic diseases will be the leading cause of morbidity, hospitalization and disability among people aged 60 years or older in 2030 [17]. The most common chronic diseases found among these people are coronary artery disease, hypertension, stroke, diabetes mellitus, malignancies, chronic renal failure, and chronic obstructive pulmonary disease. These diseases affect older persons in developing countries far more than in the developed countries. For example, those in developing countries lose five times as many years from chronic lung disease and twice as many from stroke as in developed countries [17].

With the rise of living standards in many developing countries, their health status is more or less similar to that of the already developed countries. Food consumption behaviours of the people in the developing countries have changed which resulted in the development of unhealthy new eating patterns that may not be as healthy as the old. An excess of food is leading to problems of obesity and excesses of sugar have contributed to a significant rise in diabetes. Excess of alcohol and cigarettes results in the various health problems and changes in work and living environments have led to an increase in hypertension [17]. Visual and hearing impairment, dementia and osteoarthritis are the main causes of disability among aged people in the developing countries [17]. They also carry almost three times bigger burden of visual impairment as that of the developed world.

Huge numbers of older persons are living with disability is a consequence of accumulated health risks across a lifespan of disease, injury and chronic illness. Key

causes of old-age disability are visual impairment, hearing loss and osteoarthritis (Table 2).

Worldwide, more than 46% of people aged 60 years or over have disabilities. Since the consequences of disability can seriously affect the economic, social and psychological aspects of their life as well as their families and the community, effective health care services should be developed to alleviate and prevent it and its impact. Older Sri Lankans are a particularly important resource in the family context as they contribute to household management and childcare. Good health condition of aged people therefore contributes to well-being within the family and increases the earning capacities of the younger generation [18].

Table 2. Prevalence of disability in people aged 60 years or over by leading health condition associated with disability in developed and developing countries.

Health problems	**Developed countries (millions)**	**Developing countries (millions)**
Visual impairment	15.0	94.2
Hearing loss	18.5	43.9
Osteoarthritis	8.1	19.4
Ischemic heart disease	2.2	11.9
Dementia	6.2	7.0
Chronic obstructive pulmonary disease	4.8	8.0
Cerebrovascular disease	2.2	4.9
Depression	0.5	4.8
Rheumatoid arthritis	1.7	3.7

Source: UNFPA, 2012 [17]

Table 3. Common health problems among people aged 60 years or older in Sri Lanka

Health problems	Male		Female	
	n	%	n	%
Joint pain	20,749	39.2	32,849	43.8
Hypertension	8,747	16.5	14,990	20.0
Asthma/Dyspnea	7,406	14.0	8,929	11.9
Heart problems	4,260	8.0	4,471	5.9
Diabetes	4,156	7.8	5,551	7.4
Fracture	1,983	3.7	2,471	3.3
Mental illness	824	1.5	1,055	1.4
Cancer	451	0.8	550	0.7
Others	4,298	8.1	3,993	5.3

Source: WHO, 2004 [19]

According to the results of the needs assessment done for community health care for the elderly population in 50 Medical Officer of Health (MOH) areas in Sri Lanka, it revealed that joint pain is the number one health problem followed by hypertension, asthma, heart problems and diabetes mellitus [19]. Joint pain and hypertension are predominantly higher among females than males. Heart problems among males show high percentage (8.0%) compared to the females (5.9%) (Table 3). The prevalence of mental disorders is not high either.

1.2 Instrumental activities of daily living (IADL) and depression in the world and Sri Lanka

Many published reports have focused on the issues surrounding successful ageing among aged people. In order for them to be healthy, WHO has emphasized on both active physical activities and continuing participation in social, economic, cultural, spiritual and civil affairs. However, there appears to be no agreement on how to measure successful ageing. Some authors define people that are ageing successfully as those who

have highest score on a combined scale of physical and mental function, absence of depression, limitation in performing activities of daily living (ADL) (bathing or dressing, etc.), instrumental activities of daily living (IADL) (using public transportation, preparing food, paying bills, etc.) and capacity to live an independent life [20].

In our study, the ability of individuals to live in the community was ascertained by using the scales of measurement of IADL and feeling depression which were subject to the subsequent review.

ADL involve basic self-care activities that are fundamental to independent living within one's own residence, and their impairment may indicate more advanced level of physical disability. IADL is generally more complex than ADL and involves activities that require a higher level of personal competence such as managing of money and shopping that are necessary for more independent living in the community. The reports on IADL dependency are still limited in many Asian countries but its data would useful for the design and evaluation of health services which are required for the maintenance of an independent lifestyle among aged people [21].

IADL dependency usually precedes ADL dependency [22]. Thus, the ability to perform IADL has shown to be a major indicator of health condition and quality of life especially in community-dwelling people aged 60 years or older [23–25]. In other words, high IADL competence is an important component of successful aging [26–29]. Difficulty in performing IADL can cause the increased use of health services and institutionalization in community-dwelling people [30,31]. Knowledge of the prevalence of IADL dependency among people aged 60 years or older is based on cross-sectional and longitudinal studies in the various geographical locations.

The prevalence of IADL dependency varied from 3.4% to 60.0% in different countries such as Brazil [32–34], Canada [35], Colombia [34], Japan [36–41], Malaysia [42], Spain [25,43] and United States [44]. These studies used different population samples, sample characteristics (e.g., age), type of scale, number of assessed IADL items, contents of the items and definitions of dependence. These may in part explain the variation in the prevalence throughout the various locations. Thus, it makes the comparison in the IADL dependency rates among the different communities or countries difficult. However, the rates appear to, de facto, vary significantly in different countries.

From the previous studies, the factors have been identified to be associated with IADL dependency in people aged 60 years or older, including: 1) women [24,36,44–46], 2) older age [36,37,42,44,47–49], 3) low education level [50], 4) occupational status: agricultural, forestry, and fishery workers have significantly higher risks of disability than white-collar workers [51,52], 5) living without spouse [36,50], 6) low economic status [42,53], 7) depression[54,55] and 8) physical ill [24].

Sri Lanka is facing rapid population ageing which is faster than any other South East Asian countries. In Sri Lanka, estimates of prevalence of IADL dependency range from 20.1% [56] to at least 32.3% [18]. Both Malhotra et al [18] and Nugegoda and Balasuriya [56] used the "Lawton and Brody scale" to measure IADL dependency (Figure 8).

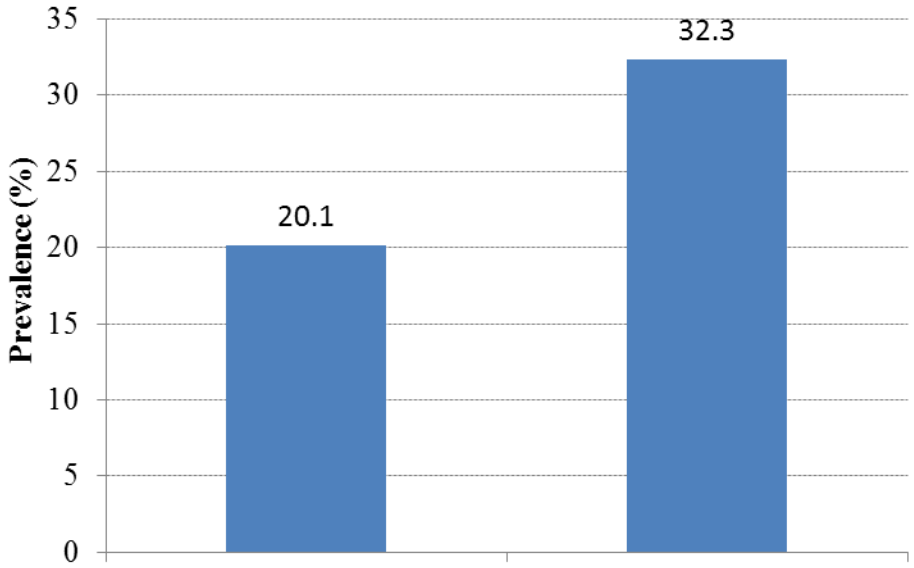


Figure 8. The prevalence of IADL dependency among people aged 65 and 60 years or older in Sri Lanka

Source: Nugegoda, 1995 [56]; Malhotra, 2010 [18]

Furthermore, depression is the common health issue in all of world. Recently, WHO has reported that 350 million people across the world are suffering from depression, which is projected to become the highest global burden of disease by 2030 [57]. Among people aged 60 years or older, depression is also the most common disorder [58]. People aged 60 years or older are vulnerable as they often have multiple co-existing medical and psychological problems [59]. In addition, depression is the common response to negative life events such as being widowed or divorced, being retired, and loss of social role and network [60]. Depression decreases an individual's quality of life and increases dependence on others [61]. Thus, the absence of depression is considered to be one of the measures of successful ageing among people aged 60 years or older [29].

WHO estimates that worldwide prevalence of depression varies between 10% and 20% [62]. WHO's intercountry studies (which were conducted in Brazil [63], China [64], Japan [60], Korea [65], Malaysia [61], Pakistan [66], Taiwan [67] and United States [68]) on depression

among people aged 60 years or older showed that its prevalence ranged from 3.6% to 30.6%. Various factors have been identified to be associated with depression in these people including: 1) socio-economic: female gender, widowhood, separated/divorced marital status, low economic status, rural residence [69–75], 2) negative stressful life events: bereavement and retirement [76–78], 3) unhealthy behaviour: poor dietary habits and lack of physical activity [79,80], 4) chronic conditions: stroke [69,81] and cardiovascular disease [73,78,82], 5) cognitive impairment [69,78,83,84], 6) functional disability [71,72,78] and 7) low quality of life [72,85,86].

In Sri Lanka, the prevalence of depression among community-dwelling people aged 60 years or older was 27.8% in one study [5]. This survey reported that the associated factors were 1) disabilities, 2) functional impairment, 3) income inadequacy, 4) minorities, and 5) living alone. However, literatures in Sri Lanka are limited on depression.

1.3 Gaps in health status by ethnicity in Sri Lanka

Sri Lanka is one of the multi- linguistic, multi-ethnic, and multi-religious countries in the world, comprising Sinhalese (73.9% of the total population), Tamils (17.8%), Muslims (7.4%) and others (0.9%) [88] (Table 4).

Table 4. Proportion of ethnicity

Ethnicity	% of total population	Main religion	Main language
Sinhalese	73.9	Buddhist	Sinhala
Tamils	17.8	Hindus	Tamil
Muslims	7.4	Islam	Tamil
Others	0.9	Combination of the above three	Combination of the above two

Source: Shafi & Harun-Or-Rashid, 2013 [90]

The Sinhalese make up the majority of the population and speak the Sinhalese language and are mainly Buddhist. The Tamils are the largest minority and speak the Tamil language and are largely Hindus. Muslims make up the third substantial race in Sri Lanka, the bulk of who speak Tamil language and are mostly Islam [89].

Ethnic means relating to a people or group that shares a culture, religion or language. Ethnic group is a group of people whose members identify with each other, through a common heritage that is real or assumed. This shared heritage may be based upon putative common ancestry, history, kinship, religion, language, shared territory, nationality or physical appearance [90].

Sri Lanka is one of the South Asian countries which experienced ethnic conflict for a long time [91]. But few studies on ethnic differences in health have been conducted in Sri Lanka, thus, little ethnic information on health available. Particularly, ethnic-specific community study among aged people is lacking (Table 5).

Malhotra et al. showed that non-Sinhalese representing only 10.5% of total sample size were more likely to have depressive symptoms compared with Sinhalese ethnic group [18]. Since the survey was conducted during the ethnic conflict between the

Sinhalese and Tamils, it is possible that Tamils and other minorities perceived ethnic discrimination, leading to depressive symptoms [18].

Moreover, a report (n=4,485) showed that Muslims had a higher prevalence of metabolic syndrome among people aged 18 and over between different ethnic groups [92]. This study sample consisted of 6.7% of Tamils and 6.6% of Muslims and the rest of Sinhalese. It was the first report on the ethnic-specific prevalence of metabolic syndrome in South Asian countries including Sri Lanka. This could be due to differential dietary habits and physical patterns among the different ethnic groups [92].

Nanayakkara et al [93]conducted a study about oral health among preschool children. The study sample (n=784) was comprised of 89.8% (Sinhalese), 7.9% (Muslims) and 2.3% (Tamils). The study demonstrated that Tamils have the poorest child oral health related quality of life, while Muslims have the poorest oral health related quality of life at the family level. It suggested that ethnicity is the key dimension to consider when planning and providing oral health services to preschool children [93].

Table 5. Previous studies focusing on ethnic difference in health status among Sri Lankans

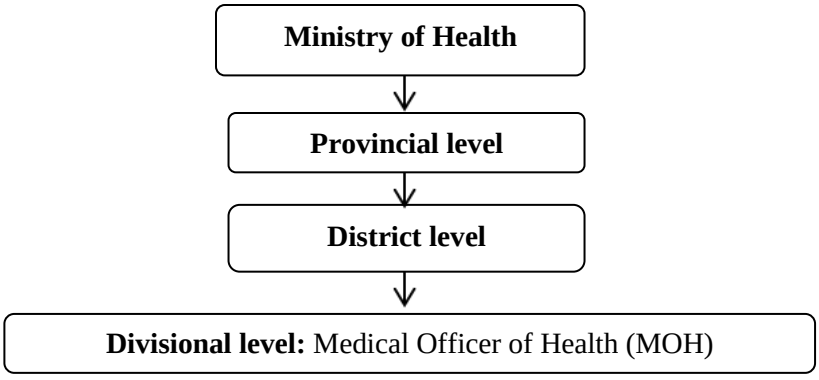
Measures	Participants	Results	References
Depressive symptoms	Community-dwelling older people aged 60 years or over (n=1181)	Depressive symptoms: Non-Sinhalese > Sinhalese.	Malhotra et al. (2010) [18]
Metabolic syndrome	Adults aged 18 or over (n=4485)	Metabolic syndrome: Muslims > Sinhalese	Katulanda et al. (2012) [92]
Oral health related quality of life	Preschool children (n=784)	Lower oral health related quality of life of the child and family: Tamils and Muslims> Sinhalese	Nanayakkara et al. (2013) [93]
Diabetes mellitus	Adults aged 35 or over (n=1300)	Diabetes mellitus: 14.4 % in Sinhalese 29.0% in Tamils and 20.0% in Muslims	Pubudu De Silva et al. (2012) [94]
Obesity	Adults aged 35-64 years (n= 1234)	Obesity: Muslims > Sinhalese and Tamils	Pubudu De Silva et al. (2015) [95]

Note: All studies were cross-sectional.

In addition, Pubudu De Silva et al [94] conducted a cross-sectional study about diabetes mellitus among people aged 35 or over. The participants (n=1,300) consisted of Sinhalese (68.1%), Tamils (22.8%) and Muslims (8.9%). This study showed that Tamils had a higher prevalence of diabetes mellitus compared with Sinhalese and Muslims [94]. Pubudu De Silva et al [95] showed that Muslims were more likely to have obesity, suggesting that social and cultural practices may influence their lifestyle and diet.

1.4 Health care system in Sri Lanka

In Sri Lanka, both the public and private sectors provide health care. The public sector supplies comprehensive health care for nearly 60% of the population. The Ministry of Health is primarily responsible for the provision of comprehensive health services which includes preventive and curative care. At provincial level, the provincial health office is totally responsible for management and effective implementation of its health services. Medical Officer of Health (MOH) is also responsible for the preventive and promotional health care in the defined area and carried out the action through the trained field staff working at field level. There are three levels of curative care institutions as shown Figure 9. The distinctions between levels are basically made on the size and range of facilities provided.



	Preventive care (Health promotion and prevention of diseases)	**Curative care**		
		Primary	**Secondary**	**Tertiary**
Public	MOH	Maternity homes Central dispensaries Rural hospitals Peripheral units District hospitals	District general hospitals Base hospitals – Type A (4 basic specialists: ear, nose and throat, eye) Base hospitals – Type B (1 specialist)	Teaching hospitals Provincial general hospitals District general hospitals
Private		Outpatients	Hospitals and clinics	

Figure 9. Organization for provision of health care services in Sri Lanka

Source: Fernando, 2000 [130]

Many of today's people do not undergo screening for diseases and are not aware of how to prevent non-communicable and lifestyle-related diseases. Sri Lanka's health system is facing several problems in curative and preventive care. The report noted that aged people lack a regular visit to doctor, and there is no infrastructure to ensure regular screening for illness and disability at all levels of curative care from the community to the hospital. Health care for aged people is expected to become an important focus for the social and health care services in Sri Lanka [96] taking into account the increase in the size of the older population. Changing not only in the volume of services needed, but also in the type of services should be considered. Sri Lanka's health system has not evolved to take on these additional challenges [5].

1.5 Aims of the study

With the background knowledge, our study hypothesized that there was ethnic difference in IADL dependency and depression among people aged 60 years or older in Sri Lanka. Therefore, this study aimed to explore ethnic difference in 1) IADL and 2) depression among community-dwelling people in Kandy District, Central Province, Sri Lanka.

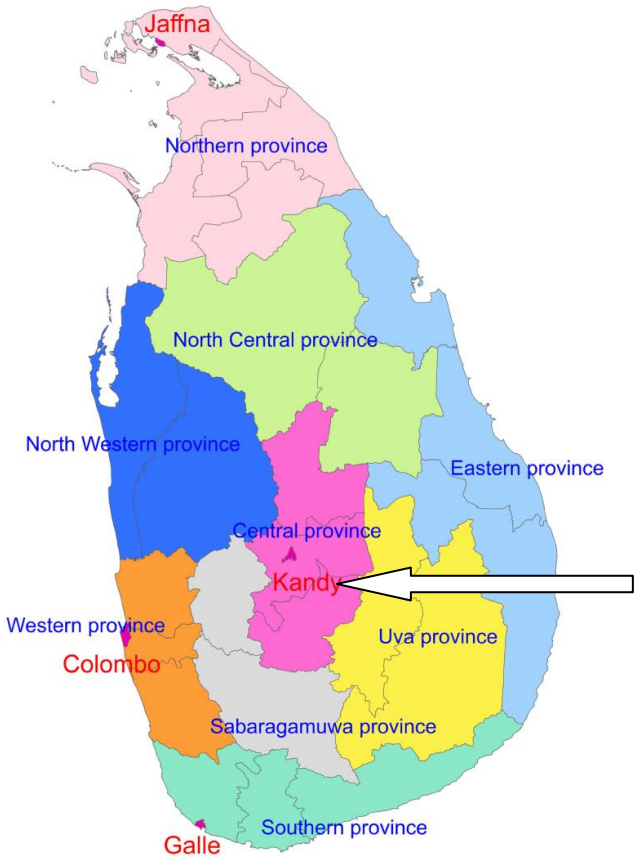
The results would play a key role in planning service provision (preventive and curative care) taking into account the huge increase in the size (21.0% in 2030) of the older population in Sri Lanka.

CHAPTER 2

METHODOLOGY

2.1 Study design and sampling

Sri Lanka is an island nation located off the southern coast of India in South Asia. Sri Lanka is bordered by the Indian Ocean, the Gulf of Mannar in the Laccadive Sea, and the Palk Strait, which separates Sri Lanka from India. Sri Lanka has a total area of about 65,610 square kilometres and a population of over 20 million. The capital city is the Sri Jayawardenepura Kotte.



Kandy District is located in Central Province (capital: Kandy) and subdivided into twenty divisional Secretariats (DS) and 1188 GN divisions.

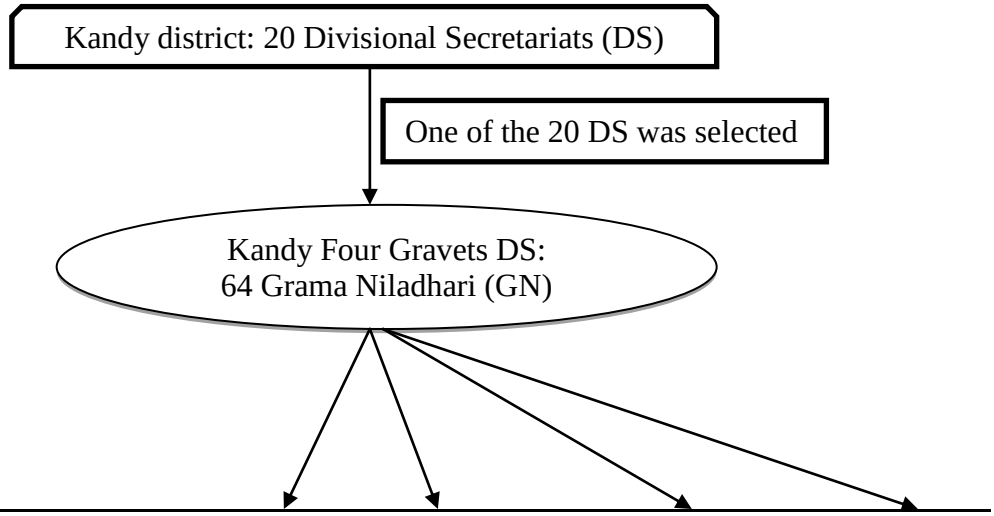
Map 1. Provinces and major cities in Sri Lanka.

Sri Lanka has nine provinces and twenty-five districts divided into 256 divisional secretariats (DS), which consist of approximately 14,008 Grama Niladhari (GN; meaning "village officer") divisions.

A cross-sectional survey was conducted in community-dwelling people aged 60 years or older in a suburban area of Kandy District, Sri Lanka, from July to August 2013. Given the accessibility to the residents and distribution of ethnicity, we conducted convenience sampling to select geographical areas. Kandy District is the second-largest city of Sri Lanka and located in the Central Province. The total population of Kandy district is 1,375,382. As mentioned in the introduction, Sri Lanka is a multi-ethnic and multi-religious society. Kandy is suburban and a Sinhala majority city; there are sizable communities belonging to other ethnic groups, such as Tamils and Muslims. There are two distinct Tamils communities in Sri Lanka, Sri Lankan Tamils and Indian Tamils. The former makes up the majority in the Northern Province and parts of the Eastern Province, and the latter was brought to Sri Lanka from India by the British in the 19th Century to work on plantations and then later in tea rubber plantations. Indian Tamils are mainly found in Kandy district where tea is grown. The first tea plantations were established here. Among the all 25 districts, the distributions of ethnicity in Kandy district (Sinhalese-74.1%, Tamils-12.2%, Muslims-13.1% and others-0.6%) are very similar to whole Sri Lanka (Sinhalese-73.9%, Tamils-17.8%, Muslims-7.4% and others-0.9%) [97]. On the other hand, the proportion of Indian Tamils (one of the two types of Tamils) is higher in Kandy district (8.1%) than in general Sri Lanka (4.6%) [98].

Kandy district has 20 DSs. The Kandy Four Gravets DS is one of the 20 DSs and comprises 64 GNs. The Kandy Municipal Council governs the City of Kandy. We asked

from Kandy Municipal Council, to collaborate with our study and to introduce us GNs including ones in where certain proportions of Tamils and Muslims populations commonly resided and they were willing to participate in the study. Finally, 4 GNs (Katugasthota, Mahaiyawa, Bowala and Mavilmada) agreed to participate in the study. These GNs had different distribution of ethnic groups; Muslims were dominant in Katugasthota, Tamils in Mahaiyawa, and Sinhalese in Bowala and Mavilmada. We obtained the lists of residence from the 4 GNs. In reference to the lists, we visited all houses where these people resided in whole area of Katugasthota (n=118) and Mahaiyawa (n=799) GNs. In Mavilmada (n=501) and Bowala (n=701) GNs, we visited from house to house to have at least 200 target residents in each as a goal (Figure 10).



	1. Katugasthota GN	2. Mahaiyawa GN	3. Bowala GN	4. Mavilmada GN
Number of people aged 60 years or older	118	799	701	501
Number of persons interviewed (%)	88 (74.6)	246 (30.8)	202 (28.8)	244 (48.7)

Figure 10. Selection procedures of study population

People who resided in nursing and residential homes were excluded because of the higher probability of deteriorated health or functional status such as hearing loss. The target people aged 60 years or older who agreed to participate in the study and gave written informed consent were subject to a 15-20 minutes face-to-face interview using a structured questionnaire. The interview was conducted by one interviewer in each household and by the second interviewer if there was more than one target person in the household.

The interviewers were trained by two public health specialists from Hokkaido University Graduate School of Medicine. A pilot test was performed to check the clarity of the interview questionnaire, and to adjust the tools and skills of field staff. Field supervisors verified the quality of information on the questionnaires.

2.2 Data collection

2.2.1 Questionnaire

Dependent variables: IADL functional status and feeling depression

The IADL scale, developed by Lawton and Brody [99] is a widely used instrument with well-documented reliability and validity in research related to aging populations. This scale was the first research tool to measure older adults' performance on eight specific activities: using a telephone, shopping, food preparation, housekeeping, laundry, using transportation, managing own medications, and handling banking. A short, five-item version of the IADL scale is also widely used [100]. Lawton attempted to define competence at a theoretical level, from the most basic to the most complex functioning, resulting in a model comprising seven competence sublevels: life maintenance,

functional health, perception and cognition, physical self-maintenance, instrumental self-maintenance, effectance, and social role [101].

Koyano et al [102] designed a 13-item index of competence that referenced Lawton's model, and called it the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence. The TMIG Index of Competence covers instrumental self-maintenance, intellectual activity, and social role, selected from the seven sublevels of Lawton's model. Unlike Lawton's IADL scale and other existing unidimensional scales, the TMIG Index of Competence is multidimensional and can therefore measure higher-level competence. In addition, because this instrument uses self-administered yes/no questions, it can be easily used with community-dwelling older adults to detect difficulties in competence at an early stage.

IADL functional status was the main outcome. The TMIG Index of Competence was used to measure IADL [102], comprising 13 items with yes-or-no questions: 5 instrumental self-maintenance items (using public transportation, shopping for daily necessities, preparing meals, paying bills, managing banking); 4 intellectual activity items (filling out application forms, reading newspapers, reading books or magazines, being interested in news or programs dealing with health); and 4 social role items (visiting a friend's home, calling for advice, visiting a sick friend, and initiating conversations with young people). Responses to each item were either "yes" (able to do) scored as "1," or "no" (unable to do) scored as "0." Study participants with a total score of 10 or over were categorized as "independency in IADL" and those who scored less than 10 were categorized as "dependency in IADL." The cut-off point of 10 has been commonly used in the previous studies in Japan [20,103,104].

Depression was measured by the short version of the Geriatric Depression Scale with 15 items (GDS-15). The Geriatric Depression Scale (GDS) is an instrument that was developed to assess depressive symptoms and screen for depression among aged people. 30 items were chosen for inclusion in the scale and this GDS can be self-administered and the questions have a yes/no format in order to be easy to understand for them [105]. A 15-item short version was developed by Sheik and Yesavage, based on the items that correlated best with depressive symptoms [106]. This screening instrument is non-diagnostic: which is high sensitivity and lower specificity. The score ranges from 0 to 15, with a higher score indicating more depression. We used a cut-off point of 5 or above to indicate of feeling depression.

Independent variables: Sociodemographic variables included age, ethnicity, education level, marital status, occupation before the age 60 years, economic status, and living arrangements.

Sociodemographic variables included gender, age, ethnicity, education level (years), marital status, occupation before 60 years old, economic status, and living arrangement. These sociodemographic variables were selected based on the factors associated with IADL dependency in previous studies [22,24,25,37,42–46,50,52,107–109].

Age was categorized into 3 groups: 60–64 years, 65–74 years, and ≥75 years. Education level was categorized as 0–5 years, 6–10 years, or ≥11 years. Marital status was placed into married or others (never married/divorced/separated/widowed). Occupation before 60 years old was assigned to the unemployed, employed in public services, or others (agriculture/forestry/fishery, industry, and services). Economic status was assessed by the possession of household necessities such as electronics, water

supply, television, refrigerator, telephone, washing machine and motorcycle or car. Participants who had none of a washing machine and motorcycle or car were classified as having low economic status; all others were classified as high economic status. Living arrangement was classified as living with a spouse or living without a spouse. Perceived social support was assessed using the revised Multidimensional Scale of Perceived Social Support (MSPSS) (1–5 ranking scale) [110], with total scores ranging from 1 to 60; a score higher than the mean (42.26) was categorized as "high," and a score below the mean was categorized as "low."

The participants were asked to select their ethnic group, with response options on Sinhalese, Tamil, Muslim and others. For the purpose of the present study, Tamils included Sri Lankan Tamils and Indian Tamils. Usually, "Muslims" is used to refer to people who practice Islam. However, the word "Muslims" has been used as an ethnic group in several previous studies in Sri Lanka [93,94] and Muslims themselves usually use it as self-identification (e.g., Sri Lanka Muslims Congress is a political party). Therefore, Muslims (comprising mainly Sri Lankan Moors and Malays) was used as an ethnic group in this study.

2.3 Statistical analysis

Statistical analysis

We used SPSS Version 18.0 (PASW Statistics for Windows, Version 18.0; SPSS Inc., Chicago, IL) and R version 3.2.3 [111] for data analysis. Chi-square tests were used to examine ethnicity-based differences in sociodemographic characteristics and IADL functional status. The 95% confidence intervals of prevalence of IADL dependency and

depression were calculated using the Wald method. We used a multivariate logistic regression model to identify factors associated with IADL dependency after adjusting for age and sex. All variables that were significant ($p<0.05$) and two-way interaction terms between these variables and ethnicity were entered into the logistic regression model to calculate adjusted odds ratios (AOR) and their 95% confidence intervals (CIs). The Hosmer and Lemeshow goodness of fit test was used to assess the goodness of fit of a model.

Multilevel regression analyses were also performed to evaluate an effect of ethnicity on the IADL dependency- and depression-related factors. Here, we considered ethnicity groups as a "level" which is a random variable. First of all, an intra-class correlation (ICC) was calculated to determine the amount of ethnicity-group homogeneity in the TMIG Index of Competence score and GDS-15 score. For comparisons with the findings from our previous analyses with logistic regression models, we used a generalized linear mixed model for binomial distribution data with logit link function. Parameters were estimated by maximal likelihood. In the multilevel analyses, the intercept-only model (null model) included a random effect of ethnicity on intercept. We added the fixed effects of sociodemographic variables to the null model (Model 1). The random effects of ethnicity on slopes of gender, marital status and economic status, which were remained in the final model of our previous logistic regression analyses, were added to the Model 1 (Model 2). The Model 3 included the fixed effects of sociodemographic factors and the random effects of ethnicity on slopes of all sociodemographic variables. All fixed effect coefficients were exponentiated to calculate OR. We also calculated 95% confidence intervals of ORs. The deviance,

Akaike's Information Criterion (AIC), and Schwarz's Bayesian Information Criterion (BIC) were used to find the best covariance structure. A smaller value indicates a better fit.

Written informed consent was obtained from all individual participants before their interview. The Hokkaido University Graduate School of Medicine Ethical Committee and the University of Peradeniya Faculty of Medicine Ethics Committee approved the study.

CHAPTER 3

ETHNIC DIFFERENCE IN DEPENDENCY IN INSTRUMENTAL ACTIVITIES OF DAILY LIVING IN COMMUNITY-DWELLING PEOPLE AGED 60 YEARS OR OLDER IN KANDY DISTRICT, SRI LANKA

3.1 Introduction

Sri Lanka has more than 20 million populations, having experienced population aging at a faster rate than any other South East Asian countries. In Sri Lanka, people at aged 60 years are considered to be in transition when they mandatorily retire [8]. In 2015, 13.1% of the population was aged 60 years and older, and this proportion is projected to be 21.5% by 2030 [112].

Also, Sri Lanka is a multi-ethnic country, comprising Sinhalese (73.9% of the total population), Tamils (17.8%), Muslims (7.4%) and others (0.9%) [88]. Sinhalese are predominantly Buddhist, the majority of Tamils are Hindu and Muslims are mostly Islam [89].

The previous studies have shown that there are wide gaps in health status among ethnic groups in Sri Lanka [18,92–94]. Pubudu et al [94] reported that diabetes mellitus was common among Tamils aged 35 years or over than Sinhalese and Muslims. Katulanda et al [92] mentioned that metabolic syndrome was more prevalent among Muslims aged 18 years or over compared with Sinhalese and Tamils. Nanayakkara et al [93] demonstrated that poor oral health of the children is significantly associated with Tamils among preschool children than Sinhalese and Muslims. These health gaps, thus, are expected to cumulate with advancing age and could more influence on physical and mental health in

later life. Malhotra et al [18] reported that Sinhalese were less likely to develop depressive symptoms than others ethnic group of community-dwelling people aged 60 years or older.

However, studies conducted among these people by their ethnicity were scarce. With the increasing importance of maintaining autonomy and preventing from long-term care in Sri Lankans, it is necessary to assess IADL as an indicator of independence of daily living in community-dwelling people aged 60 years or older with reference to ethnic differences. Therefore, this study aimed to assess the ethnic specific prevalence of IADL dependency and its associated factors in community-dwelling people aged 60 years or older in a district of Sri Lanka. The results may be useful to assist decision-makers in Sri Lanka in planning effective preventive care programs.

3.2 Participants and Methods

Sampling

Consequently, 778 people aged 60 years or older agreed to participate in the study and signed an informed consent document. All of the participants were asked to participate in a 15-20 minutes face-to-face interview using a structured questionnaire. Questionnaire included socio-demographic information and Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence was used.

Statistical analysis

Chi-square test, multivariate logistic regression model with two-way interaction terms and multilevel analysis were performed to identify factors associated with IADL dependency.

3.3 Results

General characteristics of participants

As shown in Table 1, of the participants (n=778), 56.6% were Sinhalese, 22.1% Tamil and 21.3% Muslim. Except for gender distribution, there were significant differences in all general characteristics among ethnic groups. The Sinhalese in general were better or higher education, economic status, living arrangement, social support, and less self-reported diseases than Muslims and Tamils. Tamils in particularly, indicating a social gradient in terms of these general social and economic characteristics. It also showed that Muslims' economic status was not different from Sinhalese. Characteristically, Tamils indicated the worse social status in the all parameters examined than Sinhalese and Muslims. Furthermore, Muslims and Tamils had almost the same number of the self-reported diseases but more than Sinhalese (Table 6).

Table 6. Sociodemographic characteristics (n=778)

Characteristics	Total n (%)	Ethnicity			p value
		Sinhalese n (%)	Tamils n (%)	Muslims n (%)	
Total	778 (100.0)	440 (56.6)	172 (22.1)	166 (21.3)	
Gender					
Male	299 (38.7)	184 (42.3)	55 (32.0)	60 (36.1)	
Female	474 (61.3)	251 (57.7)	117 (68.0)	106 (63.9)	0.05
Age					
60－64	220 (28.4)	108 (24.6)	53 (30.8)	59 (35.8)	
65－74	362 (46.6)	197 (44.9)	90 (52.3)	75 (45.4)	
≥75	194 (25.0)	134 (30.5)	29 (16.9)	31 (18.8)	<0.01
Education level (years)					
≥11	287 (36.9)	214 (48.6)	19 (11.0)	54 (32.7)	
6－10	155 (19.9)	91 (20.7)	27 (15.7)	37 (22.4)	
0－5	335 (43.1)	135 (30.7)	126 (73.2)	74 (44.8)	<0.01
Marital status					
Married	589 (77.1)	355 (82.6)	111 (65.7)	123 (74.5)	
Others[a]	175 (22.9)	75 (17.4)	58 (34.3)	42 (25.5)	<0.01
Occupation before 60 years old					
Public services[b]	167 (21.5)	126 (28.8)	26 (15.1)	15 (9.1)	
Others	261 (33.7)	130 (29.7)	73 (42.4)	58 (35.1)	
Unemployed	347 (44.8)	182 (41.5)	73 (42.4)	92 (55.8)	<0.01
Economic status[c]					
High	457 (58.7)	288 (65.5)	60 (34.9)	109 (65.5)	
Low	321 (41.3)	152 (34.5)	112 (65.1)	57 (34.5)	<0.01
Living arrangements					
Living with spouse	314 (40.4)	206 (46.8)	46 (26.7)	62 (37.3)	
Living without spouse	464 (59.6)	234 (53.2)	126 (73.3)	104 (62.7)	<0.01
Perceived social support[d]					
High	392 (50.5)	249 (56.7)	68 (39.5)	75 (45.5)	
Low	384 (49.5)	190 (43.3)	104 (60.5)	90 (54.5)	<0.01
Number of self- reported diseases					
0－1	315 (40.5)	204 (46.4)	58 (33.7)	53 (31.9)	
≥2	463 (59.5)	236 (53.6)	114 (66.3)	113 (68.1)	<0.01

Each characteristic was calculated excluding missing data.
[a]Others included never married, divorced, separated and widowed.
[b]Public services included government, education, health, and armed forces.
[c]Economic status was categorized based on household necessities such as electronics, water, television, refrigerator, telephone, washing machine, motorcycle and car. The participant was classified as economically low, if there was no washing machine, motorcycle and car.
[d]Perceived social support was assessed using a Zimet scale by ranking levels of 1–5. Therefore, the total score ranged from 1 to 60, and a score that was higher than the mean was categorized as "high" and less than the mean was categorized as "low".

Dependence of IADL by ethnicity is shown in Table 7. The data showed interesting patterns among the ethnic groups in terms of the sub-level of IADL dependence. Sinhalese were less dependence in the instrumental self-maintenance than

Tamils and Muslims but the rates of the dependence of the last ethnic groups were almost the same. Under the sub-level of intellectual activity, there was a social gradient: Sinhalese were much less dependent than Tamils and Muslims but Tamils were more dependent than Muslims in all factors except for the interest in health stories which were the equal rates. In the social role, again, Tamils had higher dependence rates in all factors than Sinhalese and Muslims which showed more or less equal proportion except visiting friends' home.

Thus, in general, Sinhalese had less dependence than other ethnic groups while Tamils had the worst. Muslims were assigned to most often somewhere between Sinhalese and Tamils but occasionally placed into the same rates as Sinhalese.

The five most commonly reported IADL dependency items were "visiting homes of friends" (56.4%), "handling own banking" (52.7%), "filling out application forms" (49.2%), "paying bills" (48.5%) and "calling for advice" (41.5%). There were some differences in the top-five dependence rates among 3 ethnic groups but the participants were highly dependent on these items. All participants were highly dependent on the instrumental self-maintenance items such as "paying bills" and "banking" as well as the intellectual activity like "filling out application forms". Tamils showed substantially high dependence in these 3 items. In addition, the data showed that Muslims visit friends' homes more often than Sinhalese and Tamils.

By the ethnicity, Tamils were dependent in almost all IADL tasks except for "preparing meals" and "interested in news stories or programs dealing with health" compared with Sinhalese and Muslims. In other hand, Muslims more likely to be dependent in "preparing meals" (50.0%) and "interested in news stories or programs

dealing with health" (37.3%) compared with Sinhalese and Tamils.

"Filling out application forms" (70.9%) was the most difficult IADL task among Tamils compared with Sinhalese (37.7%) and Muslims (57.2%). "Handling own banking" (58.4%) was most difficult for the Muslims. More Sinhalese participants (57.0%) reported that "visiting the homes of friends" was the most difficult task (Table 7).

The prevalences of IADL dependency were 57.1% (95% CI: 53.2%, 61.0%) in total, 47.5% (43.6%, 52.2%) in Sinhalese, 77.6% (71.7%, 83.5%) in Tamils and 61.2% (53.4%, 69.0%) in Muslims. Among the ethnic groups, Tamils showed a significantly higher prevalence of IADL dependency than Sinhalese and Muslims. The prevalence in Muslims was significantly higher than in Sinhalese.

As shown in Table 8, females, with lower education level, being other marital status, unemployed and employed in other than public services and with low economic status were more likely to have higher rate of IADL dependency than corresponding counterparts among all of the ethnic groups. The rate of IADL dependency increased with advancing age (OR= 1.73, 95% CI: 1.04, 2.90 at 65–74 and OR= 8.13, 95% CI: 4.55, 14.52 at 75 years or older), living without spouse (OR= 5.04, 95% CI: 2.38, 10.65), low perceived social support (OR= 2.14, 95% CI: 1.45, 3.15) and having more than two self-reported diseases (OR= 2.66, 95% CI: 1.80, 3.93) in Sinhalese. In Tamils, IADL dependency increased with living without spouse (OR= 2.64, 95% CI: 0.69, 10.05) and having more than two self-reported diseases (OR= 6.77, 95% CI: 3.07, 14.94) (Table 8).

The univariate analysis demonstrated that all sociodemographic characteristics were significantly associated with IADL dependency (Table 9). Females, age group especially after 75 years old, low education level, other marital status, non-public

services of occupation, low economic status, living without spouse, low perceived social support, and those with two or more self-reported diseases had significantly higher IADL prevalence as compared with the corresponding counterparts. These results conform to the previous findings (Table 9).

Table 7. IADL dependency by ethnicity (n=778)

TMIG Index of Competence		**Dependency, n (%)**			
			Ethnicity		
Sublevels	**Question items**	**Total (n=778)**	**Sinhalese (n=440)**	**Tamils (n=172)**	**Muslims (n=166)**
Instrumental Self-maintenance	Can you use public transportation by yourself?	295 (37.9)	138 (31.4)	81 (47.1)	76 (45.8)
	Are you able to shop for daily necessities?	281 (36.1)	142 (32.3)	73 (42.4)	66 (39.8)
	Are you able to prepare meals by yourself?	321 (41.3)	155 (35.2)	83 (48.3)	83 (50.0)
	Are you able to pay bills?	377 (48.5)	188 (42.7)	102 (59.3)	87 (52.4)
	Can you handle your own banking?	410 (52.7)	199 (45.2)	114 (66.3)	97 (58.4)
Intellectual activity	Are you able to fill out any application forms?	383 (49.2)	166 (37.7)	122 (70.9)	95 (57.2)
	Do you read newspapers?	237 (30.5)	88 (20.0)	90 (52.3)	59 (35.5)
	Do you read books or magazines?	294 (37.8)	115 (26.1)	111 (64.5)	68 (41.0)
	Are you interested in news stories or programs dealing with health?	212 (27.2)	87 (19.8)	63 (36.6)	62 (37.3)
Social role	Do you visit the homes of friends?	439 (56.4)	251 (57.0)	111 (64.5)	77 (46.4)
	Are you sometimes called on for advice?	323 (41.5)	185 (42.0)	86 (50.0)	52 (31.3)
	Are you able to visit sick friends?	306 (39.3)	155 (35.2)	94 (54.7)	57 (34.3)
	Do you sometimes initiate conversations with young people?	272 (35.0)	148 (33.6)	76 (44.2)	48 (28.9)

Table 8. IADL dependency by sociodemographic characteristics by ethnicity

Variables	Sinhalese			Tamils			Muslims		
	Total n	Dependency n (%)	OR (95% CI)	Total n	Dependency n (%)	OR (95% CI)	Total n	Dependency n (%)	OR (95% CI)
Total	436	207 (47.5)		170	132 (77.6)		165	101 (61.2)	
Gender									
Male	183	62 (33.9)	1.00	54	33 (61.1)	1.00	60	27 (45.0)	1.00
Female	248	142 (57.3)	2.61 (1.76-3.89)	116	99 (85.3)	3.71 (1.75-7.85)	105	74 (70.5)	2.92 (1.51-5.69)
Age									
60－64	106	29 (27.4)	1.00	53	38 (71.7)	1.00	59	32 (54.2)	1.00
65－74	195	77 (39.5)	1.73 (1.04-2.90)	88	71 (80.7)	1.65 (0.74-3.66)	74	43 (58.1)	1.17 (0.59-2.33)
≥75	134	101 (75.4)	8.13 (4.55-14.52)	29	23 (79.3)	1.51 (0.51-4.45)	31	26 (83.9)	4.39 (1.48-12.99)
Education level (years)									
≥11	212	57 (26.9)	1.00	19	6 (31.6)	1.00	54	17 (31.5)	1.00
6－10	90	47 (52.2)	2.97 (1.78- 4.97)	27	17 (63.0)	3.68 (1.06-12.77)	36	21 (58.3)	3.05 (1.27-7.32)
0－5	134	103 (76.7)	9.04 (5.46-14.95)	124	109 (87.9)	15.74 (5.20-47.67)	74	62 (83.8)	11.25 (4.84-26.15)
Marital status									
Married	351	154 (43.9)	1.00	109	75 (68.8)	1.00	122	69 (56.6)	1.00
Others	75	49 (65.3)	2.41 (1.43-4.06)	58	55 (94.8)	8.31 (2.43-28.45)	42	31 (73.8)	2.17 (1.00-4.70)
Occupation before 60 years old									
Public services	126	29 (23.0)	1.00	25	15 (60.0)	1.00	15	4 (26.7)	1.00
Others	130	58 (44.6)	2.69 (1.57-4.62)	73	53 (72.6)	1.77 (0.68-4.57)	58	29 (50.0)	2.75 (0.78-9.65)
Unemployed	178	120 (67.4)	6.92 (4.12-11.64)	72	64 (88.9)	5.33 (1.80-15.81)	91	67 (73.6)	7.68 (2.23-26.42)
Economic status									
High	285	115 (40.4)	1.00	60	37 (61.7)	1.00	108	61 (56.5)	1.00
Low	151	92 (51.2)	2.31 (1.54-3.45)	110	95 (86.4)	3.94 (1.85-8.36)	57	40 (70.2)	1.81 (0.92-3.59)
Living arrangement									
Living with spouse	205	54 (26.3)	1.00	44	25 (56.8)	1.00	61	29 (47.5)	1.00
Living without spouse	231	153 (66.2)	5.04 (2.38-10.65)	126	107 (84.9)	2.64 (0.69-10.05)	104	72 (69.2)	0.99 (0.30-3.29)
Perceived social support									
High	248	98 (39.5)	1.00	68	51 (75.0)	1.00	74	45 (60.8)	1.00
Low	187	109 (58.3)	2.14 (1.45-3.15)	102	81 (79.4)	1.29 (0.62-2.67)	90	56 (62.2)	1.06 (0.56-2.00)
Number of self-reported diseases									
0－1	202	70 (34.7)	1.00	58	32 (55.2)	1.00	53	28 (52.8)	1.00
≥2	234	137 (58.5)	2.66 (1.80-3.93)	112	100 (89.3)	6.77 (3.07-14.94)	112	73 (65.2)	1.67 (0.86-3.25)

Table 9. IADL dependency by sociodemographic characteristics (n=778)

Variables	Total n (%)	In dependency n (%)	Dependency n (%)	p value
Total	771	331 (42.9)	440 (57.1)	
Gender				
Male	297	175 (58.9)	122 (41.1)	
Female	470	155 (33.0)	315 (67.0)	<0.01
Age				
60－64	218	119 (54.6)	99 (45.4)	
65－74	357	166 (46.5)	191 (53.5)	
≥75	194	44 (22.7)	150 (77.3)	<0.01
Ethnicity				
Sinhalese	436	229 (52.5)	207 (47.5)	
Tamils	170	38 (22.4)	132 (77.6)	
Muslims	165	64 (38.8)	101 (61.2)	<0.01
Education level (years)				
≥11	285	205 (71.9)	80 (28.1)	
6－10	154	69 (44.8)	85 (55.2)	
0－5	332	58 (17.5)	274 (82.5)	<0.01
Marital status				
Married	582	284 (48.8)	298 (51.2)	
Others	175	40 (22.9)	135 (77.1)	<0.01
Occupation before 60 years old				
Public services	166	118 (71.1)	48 (28.9)	
Others	261	121 (46.4)	140 (53.6)	
Unemployed	341	90 (26.4)	251 (73.6)	<0.01
Economic status				
High	453	240 (53.0)	213 (47.0)	
Low	319	92 (28.8)	227 (71.2)	<0.01
Living arrangement				
Living with spouse	75	53 (70.7)	22 (29.3)	
Living without spouse	587	243 (41.4)	344 (58.6)	<0.01
Perceived social support				
High	390	196 (50.3)	194 (49.7)	
Low	380	134 (35.3)	246 (64.7)	<0.01
Number of self-reported diseases				
0－1	313	183 (58.5)	130 (41.5)	
≥2	459	149 (32.5)	310 (67.5)	<0.01

Each characteristic was calculated excluding missing data.
Instrumental activities of daily living (IADL): Total score ≥ 10: “independency”, total score < 10: “dependency”.

Furthermore, in order to control for interdependency or confounding, the analyses of using multivariate logistic regression model with two-way interaction terms were also carried out. The results showed that age, education level, occupation and people with more than two self-reported diseases were more likely to be associated with IADL dependency compared with the corresponding groups (Table 10). Although economic status did not have a significant association with IADL, we observed a significant interaction between economic status and ethnicity. That is, low economic status (AOR= 4.79, 95% CI: 1.50, 15.31) was associated with IADL dependency only in Tamils (Table 10).

Before multilevel analysis, we calculated the intra-class correlation (ICC) of the TMIG Index of Competence score among ethnic groups. The ICC was 0.06, indicating that 6% of the variance was explained by ethnic group membership. As shown in Table 11, the random effect of ethnicity on the intercept in the null model (intercept-only model) reduced by adding individual variables in the Model 1. The Model 2 included all sociodemographic variables and random effects of ethnicity on the intercept and slopes of gender, marital status and economic status. The Model 3 included all sociodemographic variables and random effects of ethnicity on the intercept and slopes of all variables. We considered that the Model 2 was adopted because the model fit statistics were smaller than other models based on the deviance, AIC, and BIC and included random effects on slopes of several sociodemographic variables. The Model 2 showed that IADL dependency was related to people aged 75 or over, with lower education level, unemployed and employed in other than public services and having more than two self-reported diseases. We found that the random effect of ethnicity on economic status which

was not reduced by the full model (Model 3) (Table 11).

Table 10. Associated factors for IADL dependency (n=638)

Variables	AOR[a] (95% CI)	p value
Gender		
Male	1.00	
Female	1.82 (0.95－3.50)	0.07
Age		
60－64	1.00	
65－74	1.09 (0.68－1.75)	0.71
≥75	4.38 (2.36－8.12)	<0.01
Ethnicity		
Sinhalese	1.00	
Tamils	1.01 (0.36－2.81)	0.99
Muslims	1.18 (0.49－2.81)	0.71
Education level (years)		
≥11	1.00	
6－10	2.26 (1.33－3.84)	<0.01
0－5	7.09 (4.24－11.87)	<0.01
Marital status		
Married	1.00	
Others	1.45 (0.70－3.01)	0.31
Occupation before age 60 years old		
Public services	1.00	
Others	2.11 (1.15－3.87)	0.02
Unemployed	2.95 (1.48－5.90)	<0.01
Economic status		
High	1.00	
Low	1.04 (0.59－1.84)	0.89
Living arrangement		
Living with spouse	1.00	
Living without spouse	1.54 (0.80－2.96)	0.20
Perceived social support		
High	1.00	
Low	1.06 (0.70－1.60)	0.80
Number of self-reported diseases		
0－1	1.00	
≥2	1.91 (1.26－2.90)	<0.01
Gender*Ethnicity		
Male*Sinhalese	1.00	
Female*Tamils	0.46 (0.14－1.51)	0.20
Female*Muslims	1.04 (0.37－2.90)	0.94
Marital status*Ethnicity		
Married*Sinhalese	1.00	
Others*Tamils	4.75 (0.78－28.88)	0.09
Others*Muslims	0.81 (0.24－-2.74)	0.74
Economic status*Ethnicity		
High*Sinhalese	1.00	
Low*Tamils	4.79 (1.50－15.31)	<0.01
Low*Muslims	1.23 (0.43－3.49)	0.70

Note: Multivariate analysis was performed excluding missing data.
[a] AORs (adjusted odds ratios) were calculated by multivariate logistic regression analysis including all the variables listed in the table with two-way interaction terms between these variables and ethnicity.
Instrumental activities of daily living (IADL): Total score ≥ 10: "independency", total score < 10: "dependency".

Table 11. Multilevel analysis of IADL dependency (n=638)

		Null model (n=771)		Model 1 (n=638)		Model 2 (n=638)		Model 3 (n=638)	
		IADL dependency OR (95% Confidence Interval)							
Fixed effect									
Intercept		0.05 (0.02－0.11)							
Gender (Ref: Male)	Female			1.79 (1.03－3.11)*		1.70 (0.97－2.98)		1.74 (0.99－3.07)	
Age (Ref: 60－64)	65－74			1.09 (0.68－1.72)		1.09 (0.69－1.73)		1.17 (0.69－1.97)	
	≥75			4.05 (2.18－7.53)**		4.23 (2.32－7.73)**		3.39 (1.42－8.08)**	
Education level (years) (Ref: ≥11)	6－10			2.21 (1.32－3.73)**		2.26 (1.34－3.80)**		2.26 (1.34－3.82)**	
	0－5			7.59 (4.45－12.97)**		7.16 (4.35－11.80)**		7.01 (4.25－11.58)**	
Marital status (Ref: Married)	Others			1.66 (0.97－2.84)		1.68 (0.99－2.87)		1.71 (1.00－2.94)	
Occupation before 60 years old (Ref: Public services)	Others			2.05 (1.15－3.67)*		2.13 (1.19－3.84)*		2.14 (1.18－3.86)*	
	Unemployed			2.54 (1.32－4.87)**		2.90 (1.48－5.69)**		2.91 (1.47－5.75)**	
Economic status (Ref: High)	Low			1.50 (0.97－2.31)		1.76 (0.81－3.80)		1.71 (0.82－3.55)	
Living arrangement (Ref: With spouse)	Without spouse			1.50 (0.78－2.87)		1.52 (0.79－2.92)		1.51 (0.79－2.90)	
Perceived social support (Ref: High)	Low			1.09 (0.73－1.63)		1.10 (0.73－1.65)		1.09 (0.72－1.63)	
Number of self-reported diseases (Ref: 0－1)	≥2			2.02 (1.34－3.04)**		1.93 (1.28－2.91)**		1.88 (1.24－2.86)**	
		Variance	**SD**	**Variance**	**SD**	**Variance**	**SD**	**Variance**	**SD**
Random effects									
Intercept		0.29	0.54	0.02	0.12	0.00	0.00	0.00	0.00
Gender	Male					0.00	0.00	0.00	0.00
	Female					0.00	0.00	0.00	0.00
Age	60－64							0.01	0.09
	65－74							0.06	0.25
	≥75							0.09	0.30
Education level (years)	≥11							0.00	0.00
	6－10							0.00	0.00
	0－5							0.00	0.00
Marital status	Married					0.00	0.00	0.00	0.00
	Others					0.00	0.00	0.00	0.00
Occupation before 60 years old	Public services							0.00	0.00
	Others							0.00	0.00
	Unemployed							0.00	0.00
Economic status	High					0.00	0.04	0.01	0.08
	Low					0.25	0.50	0.16	0.40
Living arrangement	With spouse							0.00	0.00
	Without spouse							0.00	0.00
Perceived social support	High							0.00	0.00
	Low							0.00	0.00
Number of self－reported diseases	0－1							0.00	0.00
	≥2							0.00	0.00
Model fit statistics									
Deviance		1015.6		617.7		613.4		612.7	
AIC		1019.6		645.7		659.4		712.7	
BIC		1028.9		708.2		761.9		935.6	

* p<0.05, ** p<0.01

3.4 Discussion

The prevalence (57.1%) of IADL dependency in older Sri Lankans in this study was higher than that reported in previous studies of community-dwelling people aged 60 years or older in Asia [36–42], North and South America [32–35,44] and Europe [25,43]. However, due to the methodological differences in these studies, cross-country comparisons should be interpreted with caution. For example, in Asia, all four studies conducted in Japan were recruiting people aged 65 years or over. In two studies of them which IADL was measured using the five item subscale of instrumental self-maintenance of the TMIG Index of Competence, the prevalence rates were 21.9% and 43.5% [38,40]. Another two studies in which IADL was measured using five items from TMIG Index of Competence plus three items from Lawton and Brody scale, the prevalence rates were 3.4% and 12.2% [37,39]. However, in the study conducted in Malaysia, IADL was measured using six items of Lawton and Brody scale and prevalence was 33.5% [42].

The prevalence of IADL dependency in our study was higher than that in the two previous studies conducted in Sri Lanka [18,56]. Both studies used the "Lawton and Brody scale" rather than the TMIG Index of Competence to measure IADL dependency. Nugegoda and Balasuriya [56] reported that IADL dependency was 20.1 % among people aged 65 years or over without specifying their ethnicity. Malhotra et al [18] mentioned that prevalence of IADL was 32.3% among aged 60 years or over with about 10.5% of non-Sinhalese ethnicity. Our study sample included Tamils and Muslims at 43.4%, who had a much higher prevalence of IADL dependency than Sinhalese participants. These may explain the higher prevalence of IADL dependency in this study.

IADL dependency was found to be generally higher in all items among Sri Lankan

people aged 60 years or older than Japanese counterparts [36,47]. Gender differences in "preparing meals" and "filling out any application forms" were similarly observed between Sri Lankan people aged 60 years or older and Japanese people aged 65 years or over.

The multivariate logistic regression analysis showed that that low economic status was associated with IADL dependency only in Tamils. Previous studies have highlighted that people with low economic status tend to have less money to spend on their health [42,53]. Thus, the economic status especially in Tamils in Kandy District could be an important factor for IADL independence. This may lead to different way of losing IADL competence among different ethnic groups in Sri Lanka. In all three ethnic groups in our study, more Tamil participants had a low economic status than Sinhalese and Muslims. However, it should be noted that Tamils in living north in Sri Lanka are more likely to include those with high economic status.

Age, education level, occupation and self-reported diseases were significantly associated with IADL dependency, which did not vary across ethnic groups. IADL dependency increased with advancing age, which is consistent with previous studies [36,37,42,44,47–49]. A lower education level was significantly associated with IADL dependency which could be explained by the fact that those with a low education level might have limited information on health services and methods of accessing services when necessary [50].

In the present study, being unemployed or employed in work other than public services before 60 years old was significantly associated with IADL dependency. Occupational status is a better long-term predictor of physical disability than education,

and can change the life course [107]. However, occupational hazards may play a part in causes of disability [113]. Previous studies have shown that farmers and blue-collar workers had a higher IADL dependence than white-collar workers [51,52]. Li et al [113] presented that agricultural, forestry, and fishery workers had significantly higher risks of disability than white-collar workers.

Almost 60% of participants had more than two diseases. Having more than two self-reported diseases had a significant influence on IADL dependency, which is consistent with previous studies [24,33,42,114]. The presence of diseases is an important determinant of IADL dependence, and diseases can affect older adults regardless of social status and background. It should be noted, however, that IADL dependency might affect the outcomes of diseases, thus warranting prospective studies.

The IADL dependency-associated factors from the multilevel analysis were consistent with those from the multivariate logistic regression analysis. Also, the multilevel model revealed the random effect on economic status by ethnicity which was similar to our findings of the interaction between economic status and ethnicity from the multivariate logistic regression analysis. However, in the multilevel models, it was difficult to explain how ethnic difference of economic status was related to IADL dependency because we did not have any other variables in ethnicity-level than ethnicity. Further study is needed to take into account the cultural, religious aspects and health behaviours of ethnicities.

In conclusion, different ethnic groups showed different prevalence rates of IADL dependency, although almost all factors associated with IADL dependency were common between ethnic groups except for economic status. Thus, our findings would offer

guidance on the detection of subpopulations who are prone to IADL dependency. Strengthening community health services should be focused on those at probable risks shown to be associated with this health outcome.

CHAPTER 4

ETHNIC DIFFERENCE IN DEPRESSION IN COMMUNITY-DWELLING PEOPLE AGED 60 YEARS OR OLDER IN KANDY, SRI LANKA

4.1 Introduction

Depression in aged people has been identified as an important public health problem in developing countries including Sri Lanka. The multi-ethnic country is experiencing population aging at a faster rate than any other South East Asian countries and is not well prepared for this issue.

Sri Lanka's population is ethnically diverse, comprising Sinhalese (73.9% of the total population), Tamils (17.8%), Muslims (7.4%) and others (0.9%) [88]. Sinhalese are predominantly Buddhist, the majority of Tamils are Hindu, Muslims are mostly Islam [89]. Each ethnic group has their own characteristic beliefs, customs, social structures, dietary habits and physical activities patterns. Thus, the ethnicity is a key dimension to consider when planning preventive measures and health services [92,93].

Previous studies have shown wide gaps in health status particularly diabetes mellitus, metabolic syndrome, obesity, and oral health among ethnic groups in Sri Lanka [92–94]. Although there is a limited number of researches on depression in Sri Lanka, it was reported that depression is a heavy burden among aged Sri Lankans [19]. It is also shown that depressive symptoms among these people were more frequently observed in non-Sinhalese ethnic group than Sinhalese [18].

Every year, many people experience a mental disorder, of which in particular, the rate of depression is high [112,115]. Thus, it is one of the urgent public health issues to

develop the preventive program for depression among them taking into account the ethnic difference. Therefore, this study aimed to assess the factors associated with depression by their ethnicity among community-dwelling people aged 60 years or over in Sri Lanka.

4.2 Participants and Methods

Sampling

Consequently, 778 people aged 60 years or older agreed to participate in the study and signed an informed consent document. All of the participants were asked to participate in a 15-20minutes face-to-face interview using a structured questionnaire. Questionnaire included socio-demographic information and the geriatric depression scale -15 items (GDS-15) was used.

Statistical analysis

Chi-square test, multivariate logistic regression and multilevel analysis were performed to identify the factors associated with depression.

4.3 Results

As shown in Table 6, of the participants (n=778), 56.6% were Sinhalese, 22.1% Tamils and 21.3% Muslims. There were significant differences in all sociodemographic characteristics except for gender among ethnic groups. The Sinhalese were more likely to have higher education, be employed with public services before 60 years old, live with spouse, have high perceived social support, and less self-reported diseases than Muslims and Tamils. Tamils tended to have low education and low economic status than in the other two ethnic groups.

Out of the total participants, 31.8% (95% CI: 27.9%, 35.7%) were found to have depression. The prevalence rates of depression by ethnicity were 27.3% (23.4%, 31.2%) in Sinhalese, 42.1% (34.3%, 49.9%) in Tamils and 32.9% (25.1%, 40.7%) in Muslims. Compared with Sinhalese, Tamils had a significantly higher prevalence. There were no significant differences between Tamils and Muslims, and Sinhalese and Muslims.

As shown in Table 12, females, with lower education level, being other marital status, with low economic status, low perceived social support and having more than two self-reported diseases were more likely to have depression than corresponding counterparts among all of the ethnic groups. The rate of depression increased with people aged 75 years or older (OR= 1.95, 95% CI: 1.09, 3.51), unemployed (OR= 2.70, 95% CI: 1.59, 4.84), employed in other than public services (OR= 2.04, 95% CI: 1.09, 3.81) and living without spouse (OR= 2.25, 95% CI: 1.02, 4.98) in Sinhalese. In Tamils, depression increased with living without spouse (OR= 1.40, 95% CI: 0.33, 5.85). Muslims showed a relatively high rate of depression were more likely to be unemployed (OR= 3.54, 95% CI: 0.75, 16.78), employed in other than public services (OR= 2.53, 95% CI: 0.51, 12.60) and living without spouse (OR= 1.50, 95% CI: 0.39, 5.78) (Table 12).

The association between sociodemographic characteristics and depression by univariate analysis is shown in Table 13. All sociodemographic characteristics except for age were significantly associated with depression.

Multivariate logistic regression model with two-way interaction terms between sociodemographic characteristics and ethnicity showed that participants with lower education level (adjusted odds ratio [AOR]= 2.30, 95% confidence interval [CI]: 1.36, 3.87), other marital status (AOR= 1.84, 95% CI: 1.15, 2.96), low economic status (AOR=

2.20, 95% CI: 1.44, 3.35), low perceived social support (AOR= 2.84, 95% CI: 1.90, 4.23), and more than two self-reported diseases (AOR= 2.94, 95% CI: 1.90, 4.56) were significantly associated with depression (Table 15). There were no significant interactions between sociodemographic characteristics and ethnicity (Table 14).

In addition, multilevel analysis was carried out. The ICC for depression was 0.01, indicated that 1% of the variance was explained by ethnic group membership. Table 16 shows that the random effect of ethnicity on the intercept in the null model (intercept-only model) comes to almost zero by adding individual variables in the Model 1. The Model 2 included all sociodemographic variables and random effects of ethnicity on the intercept and slopes of gender, marital status and economic status. The model 3 included all sociodemographic variables and random effects of ethnicity on the intercept and slopes of all variables. The model 2 was adopted because it was better fit from the deviance, AIC, and BIC and included random effects on slopes of several sociodemographic variables. The Model 2 demonstrated that lower education level, other marital status, low economic status, low perceived social support and having more than two-self-reported diseases were depression-related factors. These analyses did not show any random effects of ethnicity on variables in relation to depression.

Table 12. Depression by sociodemographic characteristics by ethnicity

Variables	Sinhalese			Tamils			Muslims		
	Total n	Depression n (%)	OR (95% CI)	Total n	Depression n (%)	OR (95% CI)	Total n	Depression n (%)	OR (95% CI)
Total	418	114 (27.3)		164	69 (42.1)		158	52 (32.9)	
Gender									
Male	175	34 (19.4)	1.00	54	16 (29.6)	1.00	56	14 (25.0)	1.00
Female	239	79 (33.1)	2.05 (1.29-3.25)	110	53 (48.2)	2.21 (1.10-4.42)	102	38 (37.3)	1.78 (0.86-3.68)
Age									
60－64	104	23 (22.1)	1.00	48	17 (35.4)	1.00	56	18 (32.1)	1.00
65－74	184	45 (24.5)	1.14 (0.64-2.02)	88	40 (45.5)	1.52 (0.74-3.14)	70	22 (31.4)	0.97 (0.46-2.06)
≥75	129	46 (35.7)	1.95 (1.09-3.51)	28	12 (42.9)	1.37 (0.53-3.55)	31	12 (38.7)	1.33 (0.53-3.33)
Education level (years)									
≥11	202	35 (17.3)	1.00	18	1 (5.6)	1.00	52	12 (23.1)	1.00
6－10	91	34 (37.4)	2.85 (1.63-4.98)	26	9 (34.6)	9.06 (1.03-79.03)	35	8 (22.9)	0.99 (0.36-2.74)
0－5	125	45 (36.0)	2.68 (1.60-4.50)	120	59 (74.2)	16.44 (2.12-127.51)	70	32 (45.7)	2.81 (1.26-6.24)
Marital status									
Married	336	83 (24.7)	1.00	105	37 (35.2)	1.00	115	31 (27.0)	1.00
Others	74	30 (40.5)	2.08 (1.23-3.52)	56	31 (55.4)	2.28 (1.18-4.42)	42	21 (50.0)	2.71 (1.30-5.63)
Occupation before 60 years old									
Public services	118	19 (16.1)	1.00	25	12 (48.0)	1.00	14	2 (14.3)	1.00
Others	128	36 (28.1)	2.04 (1.09-3.81)	70	25 (35.7)	0.60 (0.24-1.52)	54	16 (29.6)	2.53 (0.51-12.60)
Unemployed	170	58 (34.1)	2.70 (1.50-4.84)	69	32 (46.4)	0.94 (0.38-2.34)	89	33 (37.1)	3.54 (0.75-16.78)
Economic status									
High	275	52 (18.9)	1.00	57	16 (28.1)	1.00	104	25 (24.0)	1.00
Low	143	62 (43.4)	3.28 (2.10-5.14)	107	53 (49.5)	2.52 (1.26-5.02)	54	27 (50.0)	3.16 (1.57-6.35)
Living arrangement									
Living with spouse	195	33 (16.9)	1.00	45	13 (28.9)	1.00	58	13 (22.4)	1.00
Living without spouse	223	81 (36.3)	2.25 (1.02-4.98)	119	56 (47.1)	1.40 (0.33-5.85)	100	39 (39.0)	1.50 (0.39-5.78)
Perceived social support									
High	236	35 (14.8)	1.00	66	18 (27.3)	1.00	72	16 (22.2)	1.00
Low	181	79 (43.6)	4.45 (2.80-7.07)	98	51 (52.0)	2.89 (1.48-5.66)	85	36 (42.4)	2.57 (1.27-5.19)
Number of self-reported diseases									
0－1	192	32 (16.7)	1.00	56	10 (17.9)	1.00	50	11 (22.0)	1.00
≥2	226	82 (36.3)	2.85 (1.79-4.54)	108	59 (54.6)	5.54 (2.54-12.10)	108	41 (38.0)	2.17 (1.00-4.70)

Table 13. Depression by sociodemographic characteristics (n=741)

Variables	Total n (%)	Non depression n (%)	Depression n (%)	p value
Total	741	505 (68.2)	236 (31.8)	
Gender				
Male	285	221 (77.5)	64 (22.5)	
Female	452	281 (62.2)	171 (37.8)	<0.01
Age				
60－64	208	150 (72.1)	58 (27.9)	
65－74	342	235 (68.7)	107 (31.3)	
≥75	188	118 (62.8)	70 (37.2)	0.13
Ethnicity				
Sinhalese	418	304 (72.7)	114 (27.3)	
Tamils	164	95 (57.9)	69 (42.1)	
Muslims	158	106 (67.1)	52 (32.9)	<0.01
Education level (years)				
≥11	272	224 (82.4)	48 (17.6)	
6－10	153	101 (66.0)	52 (34.0)	
0－5	315	179 (56.8)	136 (43.2)	<0.01
Marital status				
Married	556	405 (72.8)	151 (27.2)	
Others	172	90 (52.3)	82 (47.7)	<0.01
Occupation before 60 years old				
Public services	157	124 (79.0)	33 (21.0)	
Others	252	175 (69.4)	77 (30.6)	
Unemployed	328	205 (62.5)	123 (37.5)	<0.01
Economic status				
High	436	343 (78.7)	93 (21.3)	
Low	305	162 (53.1)	143 (46.9)	<0.01
Living arrangement				
Living with spouse	72	58 (80.6)	14 (19.4)	
Living without spouse	564	379 (67.2)	185 (32.8)	0.02
Perceived social support				
High	374	305 (81.6)	69 (18.4)	
Low	365	198 (54.2)	167 (45.8)	<0.01
Number of self-reported diseases				
0－1	298	245 (82.2)	53 (17.8)	
≥2	443	260 (58.7)	183 (41.3)	<0.01

Each characteristic was calculated excluding missing data.

Table 14. Interactions between sociodemographic characteristics and ethnicity

Variables	AOR[a] (95% CI)	p value
Gender		
Male	1.00	
Female	1.97 (0.95－4.10)	0.07
Age		
60－64	1.00	
65－74	0.91 (0.44－1.85)	0.79
≥75	0.85 (0.39－1.84)	0.68
Ethnicity		
Sinhalese	1.00	
Tamils	0.86 (0.04－18.73)	0.92
Muslims	2.98 (0.20－43.47)	0.43
Education level (years)		
≥11	1.00	
6－10	1.54 (0.76－3.09)	0.23
0－5	1.88 (0.95－3.72)	0.07
Marital status		
Married	1.00	
Others	1.72 (0.86－3.44)	0.12
Occupation before age 60 years old		
Public services	1.00	
Others	1.03 (0.47－2.25)	0.94
Unemployed	0.63 (0.26－1.54)	0.31
Economic status		
High	1.00	
Low	1.97 (1.13－3.46)	0.02
Living arrangement		
Living with spouse	1.00	
Living without spouse	1.44 (0.58－3.60)	0.43
Perceived social support		
High	1.00	
Low	3.68 (2.14－6.33)	<0.01
Number of self-reported diseases		
0－1	1.00	
≥2	2.94 (1.63－5.32)	<0.01
Gender*Ethnicity		
Male*Sinhalese	1.00	
Female*Tamils	0.74 (0.18－3.11)	0.68
Female*Muslims	0.35 (0.06－2.07)	0.94
Marital status*Ethnicity		
Married*Sinhalese	1.00	
Others*Tamils	0.61 (0.18－2.08)	0.43
Others*Muslims	2.35 (0.65－8.45)	0.19
Economic status*Ethnicity		
High*Sinhalese	1.00	
Low*Tamils	0.82 (0.26－2.60)	0.74
Low*Muslims	1.83 (0.59－5.66)	0.30

Note: Multivariate analysis was performed excluding missing data.
[a] AORs (adjusted odds ratios) were calculated by multivariate logistic regression analysis including all the variables listed in the table with two-way interaction terms between these variables and ethnicity.

Table 15. Associated factors for depression (n=614)

Variables	AOR[a] (95% CI)	p value
Gender		
Male	1.00	
Female	1.55 (0.89－2.69)	0.12
Age		
60－64	1.00	
65－74	0.98 (0.60－1.59)	0.93
≥75	0.93 (0.53－1.65)	0.81
Ethnicity		
Sinhalese	1.00	
Tamils	0.63 (0.36－1.10)	0.11
Muslims	0.86 (0.51－1.43)	0.55
Education level (years)		
≥11	1.00	
6－10	1.29 (0.73－2.27)	0.38
0－5	2.30 (1.36－3.87)	<0.01
Marital status		
Married	1.00	
Others	1.84 (1.15－2.96)	0.01
Occupation before 60 years old		
Public services	1.00	
Others	0.90 (0.49－1.63)	0.72
Unemployed	0.62 (0.32－1.20)	0.15
Economic status		
High	1.00	
Low	2.20 (1.44－3.35)	<0.01
Living arrangement		
Living with spouse	1.00	
Living without spouse	1.30 (0.65－2.61)	0.46
Perceived social support		
High	1.00	
Low	2.84 (1.90－4.23)	<0.01
Number of self-reported diseases		
0－1	1.00	
≥2	2.94 (1.90－4.56)	<0.01

Note: Multivariate analysis was performed excluding missing data.
[a] AORs (adjusted odds ratios) were calculated by multivariate logistic regression analysis including all the variables listed in the table.

Table 16. Multilevel analysis of depression (n=614)

		Null model		Model 1 (n=614)		Model 2 (n=614)		Model 3 (n=614)	
		Depression OR (95% Confidence Interval)							
Fixed effect									
Intercept		0.05 (0.02－0.11)							
Gender (Ref: Male)	Female			1.60 (0.87－2.62)		1.50 (0.79－2.88)		1.52 (0.87－2.65)	
Age (Ref: 60－64)	65－74			1.01 (0.62－1.64)		1.01 (0.61－1.65)		0.98 (0.60－1.60)	
	≥75			1.05 (0.61－1.81)		1.04 (0.58－1.86)		1.01 (0.57－1.79)	
Education level (years)	6－10			1.25 (0.71－2.20)		1.25 (0.71－2.22)		1.15 (0.55－2.38)	
(Ref: ≥11)	0－5			1.98 (1.21－3.22)**		2.00 (1.15－3.48)*		2.05 (1.19－3.52)**	
Marital status (Ref: Married)	Others			1.73 (1.09－2.76)*		1.74 (1.04－2.90)*		1.74 (1.07－-2.82)*	
Occupation before 60 years old (Ref: Public services)	Others			0.89 (0.49－1.62)		0.89 (0.49－1.63)		0.87 (0.43－1.76)	
	Unemployed			0.64 (0.33－1.23)		0.64 (0.32－1.26)		0.62 (0.29－1.33)	
Economic status (Ref: High)	Low			2.09 (1.39－3.15)**		2.10 (1.39－3.17)**		2.09 (1.38－3.17)**	
Living arrangement (Ref: With spouse)	Without spouse			1.31 (0.65－2.63)		1.31 (0.65－2.63)		1.29 (0.64－2.61)	
Perceived social support (Ref: High)	Low			2.80 (1.88－4.16)**		2.80 (1.87－4.18)**		2.78 (1.73－4.47)**	
Number of self-reported diseases (Ref: 0－1)	≥2			2.84 (1.84－4.38)**		2.85 (1.84－4.42)**		2.90 (1.87－4.50)**	
		Variance	**SD**	**Variance**	**SD**	**Variance**	**SD**	**Variance**	**SD**
Random effects									
Intercept		0.06	0.24	0	0.00	0.00	0.00	0.00	0.00
Gender	Male					0.00	0.00	0.00	0.00
	Female					0.00	0.05	0.00	0.00
Age	60－64							0.01	0.07
	65－74							0.09	0.29
	≥75							0.00	0.06
Education level (years)	≥11							0.00	0.07
	6－10							0.00	0.00
	0－5							0.01	0.10
Marital status	Married					0.00	0.01	0.00	0.00
	Others					0.01	0.07	0.00	0.00
Occupation before	Public services							0.00	0.00
60 years old	Others							0.00	0.00
	Unemployed							0.00	0.00
Economic status	High					0.00	0.00	0.00	0.00
	Low					0.00	0.00	0.00	0.00
Living arrangement	With spouse							0.00	0.00
	Without spouse							0.00	0.00
Perceived social support	High							0.00	0.01
	Low							0.00	0.06
Number of self- reported diseases	0－1							0.00	0.00
	≥2							0.00	0.00
Model fit statistics									
Deviance		920.2		630.7		630.7		630.1	
AIC		924.2		658.7		676.7		730.1	
BIC		933.4		720.6		778.3		951.1	

* p<0.05, ** p<0.01

4.4 Discussion

The prevalence of depression was 31.8% among Sri Lankans aged 60 years or older living in selected communities. This was relatively higher than reported in the previous studies conducted in Japan (29.3%) [116], Taiwan (27.5%) [67] and Pakistan (22.9%) [117] among people aged 65 years or over, and in Brazil (30.6%) [63], China (26.1%) [64], Korea (21.7%, 30.0%) [65,118], Malaysia (7.6%) [61], Japan (5.7%) [60] and United States (3.6%) [68] among people aged 60 years or over. However, methodological differences in these studies mean that cross-country comparisons should be interpreted with caution. In a previous study in Sri Lanka, the prevalence of depression was 27.8% in the sample which included 10.5% non-Sinhalese ethnic groups[18]. Our study sample included Tamils and Muslims (43.4%), who had a much higher prevalence of depression than Sinhalese participants.

The results of multivariate logistic regression demonstrated no significant interaction between sociodemographic characteristics and ethnicity, meaning that the factors associated with depression did not vary among ethnic groups. Lower education level, other marital status, low economic status, low perceived social support, and number of self-reported diseases were observed to be depression-related factors in all ethnic groups. These findings were consistent with the previous studies [58,60,61,63,67,118–122].

Our study showed that a lower education level was significantly associated with depression. A possible explanation for this result is that those with high education level have fewer health problems than those with lower education level. People with high education level may have better living conditions, healthier lifestyles and seek appropriate health services when necessary [50].

Other marital status was shown to be depression-related factors. Married people can

maintain their independent living than other marital status, because they can cooperate and help each other with weaknesses [50].

Economic status has been reported as a depression-related factor in the previous studies [60,61,63,118–120]. In Sri Lanka, recently aged people more likely to be self-employed and do not have any formal financial support, and many are dependent on their children or other relatives [123]. Among them, economic independence is important not only to purchase goods and support their livelihood, but also to facilitate them to have social role and be productive in the community [112,118]. Low economic status reduces individuals' capacity to manage stress and thereby increase one's vulnerability to negative emotions and cognitions, which may result in depression [122].

Low perceived social support was significantly associated with depression in our study. Social support can be defined as "social resources that persons perceive to be available or that are actually provided to them" [122]. Social support is an important factor in preventing depression in aged people. A study reported that social support could mitigate or buffer the effects of stress [124]. Those with high social support were less likely to experience depression. That is, the individuals with high social support should be able to effectively cope with the major stressful life events than those with low or no support who may be particularly vulnerable to life changes [125]. In this study, almost half of the participants reported low perceived social support. Although further investigations are needed, it would be important to enhance social support for aged people in Sri Lanka.

Almost 60% of the participants had more than two diseases. Having more than two self-reported diseases had a significant influence on depression, which is consistent with the previous studies [24,33,42,114]. The presence of diseases is an important determinant of

depression among the older adults regardless of their social status and background.

The previous studies in Sri Lanka revealed ethnicity difference among preschool children and people aged 18 or over in lifestyle-related diseases such as oral health [93], obesity [126], diabetes mellitus [94] and metabolic syndrome [92]. Different ethnic groups may have different social and cultural practices that influence their lifestyle and diet. However, we have not observed any ethnic differences in factors associated with depression among the participants.

We must be cautious about interpreting our results in which methodological differences may in part explain the study outcomes including differences in population samples and sample characteristics (e.g., age, proportion of ethnic groups). The varied sample sizes of ethnic groups may give a difference in statistical power among ethnicities. In addition, the prevalence of depression differed among ethnic groups, which may be resulted from different distribution of depression-related factors such as lower education level, other marital status, low economic status, low perceived social support and more than two self-reported diseases.

Regarding depression-related factors, the results from multilevel analysis were consistent with those from the multivariate logistic regression analysis. Both of the analyses revealed that there was no significant difference in factors associated with depression among ethnicities. It warrants further studies with a larger sample taking into account the cultural, religious aspects, and health behaviours of ethnicities, as well as other well-known potential risk factors of depression such as certain personality traits, and childhood trauma or depression.

In conclusion, the results from this study would help practitioners uncover aged

people with high risk of depression, and intervene its development or exacerbation among them. Our study findings could also highlight important issues relevant to depression as well as its associated health matters, especially in many Asian countries.

CHAPTER 5

GENERAL DISCUSSION AND CONCLUSIONS

5.1. Summary of the study results

Sri Lanka is the multi-ethnic, multi-linguistic and multi-religious society. Previous studies reported that there was a wide gap in health status among ethnic groups in the country. However, ethnic studies on IADL and depression status among community-dwelling people aged 60 years or older in Sri Lanka are still limited. Therefore, this study planned to investigate ethnic difference among Sinhalese, Tamils, and Muslims in IADL dependency, depression, and their associated factors. We conducted a cross-sectional survey among community-dwelling people aged 60 years or older from a suburban area of Kandy District, Central Province, Sri Lanka from July to August, 2013.

The total prevalence of IADL dependency was 57.1% (Sinhalese – 47.5%, Tamils – 77.6% and Muslims – 61.2%). The univariate analysis demonstrated females, age group especially after 75 years old, low education level, other marital status, unemployed and employed in other services, low economic status, living without spouse, low perceived social support and those with two or more self-reported diseases had significantly higher IADL dependency prevalence than the corresponding counterparts. After adjusting for covariates, aged 75 or over, lower education level, unemployed and employed in other than public services and having more than two self-reported diseases were shown to be IADL dependency–related factors among all ethnic groups. Low economic status was associated with IADL dependency only in Tamils.

The total prevalence of depression was 31.8% (Sinhalese – 27.3%, Tamils – 42.1% and Muslims – 32.9%). The prevalence of depression is significantly related to females, lower education level, other marital status, unemployed and employed in other than public services, low economic status, living without spouse, low perceived social support and those with 2 or more self-reported diseases, except for age. After adjusting for covariates, lower education level, other marital status, low economic status, low perceived social support and more than two self-reported diseases were shown to be depression–related factors in all ethnic groups. The significant interactions between sociodemographic characteristics and ethnicity were not observed.

5.2 General discussion of IADL dependency and depression

This study showed that the prevalence of IADL dependency was higher than in previous study conducted in Sri Lanka. The prevalence of depression of present study was similar to previous study conducted in Sri Lanka. Different ethnic groups showed different prevalence rates of IADL dependency and depression. However, there were several methodological differences (Table 17). In a previous study in Sri Lanka, other ethnic groups (Tamils and Muslims) representing 10.5% and more likely to had depressive symptoms. In present study, sample was included Tamils and Muslims at 43.4%, who had a much higher prevalence of IADL dependency and depression than Sinhalese. Previous study used the “Lawton and Brody Scale” rather than the TMIG Index of Competence to measure IADL dependency. These differences may explain the higher prevalence of IADL dependency and depression in this study.

Table 17. Comparison of IADL dependency and depression with the previous study

	Present study	**Previous study** (Malhotra et al. 2010)
IADL dependency	57.1%	32.3%
Depression	31.8%	27.8%
Characteristics		
Age	60 or over	60 or over
% ethnicity	Non Sinhalese－43.4%	Non Sinhalese －10.5%
Scale (IADL)	TMIG Index of Competence	Lawton and Brody Scale
Scale (Depression)	GDS－15 (Sinhala and Tamil version)	GDS－15 (Sinhala version)
Data collection	Structured interview	Structured interview
Study period	2013	2006
Study site	Kandy District	13 Districts

People aged 75 or over, with lower education level, unemployed and employed in other than public services and having more than two self-reported diseases were significantly associated with IADL dependency. These results are consistent with the previous studies. In our study, Tamils had a lower social status in the all parameters than Sinhalese and Muslims. These differences may contribute to high IADL dependency among Tamils. Generally, Tamils in Sri Lanka have shown to have lower education level, lower life expectancy and poorer quality of life than other ethnic groups. Tamils face additional social problems such as poor housing, lack of support in old age and widespread poverty in communities [127]. These factors are considered to be associated with high IADL dependency. Low economic status may play a role in high IADL dependency among Tamils.

Study revealed that lower education level, other marital status, low economic status, low perceived social support, and having more than two self-reported diseases were significantly related to depression in all ethnic groups. These results are consistent with the

previous studies. Tamils had a lower education level, other marital status, low economic status and perceived social support than Sinhalese and Muslims. The different distribution of these characteristics may affect the varied prevalence of depression among ethnic groups. The previous study demonstrated that the prevalence of depression was higher in Tamils and Muslims than Sinhalese. Psychological insecurity and scarcity of opportunities such as employment during and after the conflict between Tamils and Sinhalese might have contributed to a higher rate of depression among Tamils [128].

5.3 Limitations of the study

There are several limitations in the study. Firstly, the participants in our study were selected from several GN divisions in Kandy district alone using convenience sampling, inducing not representative of the population of Sri Lanka although Kandy district has a similar ethnic distribution to the whole Sri Lanka population. Especially, the proportion of Indian Tamils is higher in Kandy district (8.1%) than in Sri Lanka as a whole (4.6%). This may influence our health outcome of higher prevalence of IADL dependency and depression. Kandy is a suburban and convenience sampling could not include central, plantation and estate areas of Kandy. The population of Tamils who were subjected to our study mainly were from non-plantation origin, which have been to have higher economic, educational, and other socioeconomic status than other Tamils in the country. Thus, the results of this study may underestimate health indices such as IADL dependency and depression which we studied. Further studies including Tamils living in other areas in Kandy and districts is needed for our findings to be generalized.

Secondly, the TMIG Index of Competence was developed in Japan according to

Japanese norms of aged people and used for the first time in Sri Lankan people in our study. We firstly asked two professors at the University of Peradeniya Faculty of Medicine to evaluate whether the context of all TMIG items was appropriate for the Sri Lankan settings. The pre-test was performed to check the clarity of the interview questionnaire among community-dwelling people aged 60 years or older who were visiting in the event for free health check-up, and it needed a minor brush up of wording but was found to be suitable for the use in these settings. We carefully checked each items upon the collection of the data and ensured no items to be extremely biased distribution of Yes/No responses. Also, we compared the responses to each item in this study with those in previous studies conducted in Japan, and found that IADL dependency was generally higher in all items among Sri Lankan people than Japanese counterparts. However, gender differences in "preparing meals" and "filling out any application forms" were similarly observed both in our study and in previous studies in Japan [36,47]. It warrants further studies to ascertain the validity and reliability of the TMIG for Sri Lankan people, but we are confident that this scale as well as GDS scale is easy and feasible to use at least among the people in Sri Lanka and other Asian countries where the similar sociocultural conditions to Sri Lanka prevail.

Thirdly, the sample sizes for 3 ethnic groups were not equal, giving a differential statistical power among ethnic groups. On the other hand, when interpreting the results, we paid particular attention to focusing on the general trends of the associations as well as p values. It demands further studies with larger sample sizes, especially to ascertain ethnicity-based risk factors, which are important to design and implement ethnic-specific control and prevention strategies in Sri Lanka.

5.4 Conclusions and implications

Despite these limitations, our findings would offer guidance on the detection of subpopulations who are prone to IADL dependency and depression. Strengthening community health service should be focused on those at probable risks shown to be associated with these health outcomes. The significant interaction between sociodemographic characteristics and ethnicity were observed in IADL dependency, but not in depression. Its reason remains unexplained, but the distinct history from Sinhalese and Muslims of (Indian) Tamils who eventually got assimilated to Sinhala society might be a potential factor. Further study is being planned by our local collaborators to explore the details taking into account the cultural/religious aspects and health behaviours of Tamils population as well as the advantages of TMIG Index of Competence. The local collaborators are now also working with the Kandy District health officers on how to feedback the data to the communities where the survey was carried out.

However, there are still some challenges in the future researches. Firstly, how to explain the mechanism of the impact of ethnic differences in IADLs dependence and depression? Secondly, how should the findings be applied to future IADL dependence and depression intervention studies? All these issues, among others, should be carefully considered in the future researches.

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Bad Good

An Epidemiological study of claim for long- term care among older people in certain selected communities of Sri Lanka

Department of Community Medicine
Faculty of Medicine
University of Peradeniya
Sri Lanka

Department of Global Health and Epidemiology
Graduate School of Medicine
Hokkaido University
Japan

We really appreciate your valuble participation in this study. This study is conducted to investigate epidemiology of long term care among old people in Sri Lanka. Your honest responses will help the local government to understand better and develop long-term care related issues with helping in your future life.

Long term care is a range of services needed for persons who are dependent on help with basic ADL. This central personal care component is frequently provided in combination with help with basic medical services such as help with wound dressing, pain management, medication, health monitoring, prevention, rehabilitation or services of palliative care.

For official use only

(1) Questionnaire No. (4 digits ID)

	4th										3rd										2nd										1st									
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
1		●																																						

(2) Date (20YY/MM/DD)

	Y		Y								M		M								D		D							
	1	2	1	2	3	4	5	6	7	8	9	0	1	0	1	2	3	4	5	6	7	8	9	0	1	2	3	0	1	2	3	4	5	6	7	8	9	0
1	●			●									●																											

(3) Time of survey(24 hour format)

Start Time(HH:MM)_____End Time(HH:MM)

	H			H									M			M									H			H									M			M								
	1	2	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	0	1	2	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	0
1																																																							

(4) GN Division

	Region				
	1. Bowala	2. Katugasthota	3. Mahaiyawa	4. Mavilmada	5. Poornawaththa West
1					

(5) Interviwer ID/ House ID

	Interviwer ID		Interviwer ID										House ID		House ID										House ID				
	0	1	1	2	3	4	5	6	7	8	9	0	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
1																													

(6) Signature of Interviewer/Superviser

This form is processed through machines. Please DO NOT write your answer outside of form area.

A. GENERAL INFORMATION

(7) A1. Gender

( ) 1. Male ( ) 2. Female

(8) A2. How old are you? (Years)

( ) 1. 60-64 ( ) 2. 65-69 ( ) 3. 70-74 ( ) 4. 75-79 ( ) 5. 80 and over

(9) A3. What is your ethnicity?

( ) 1. Sinhalese ( ) 2. Tamil ( ) 3. Muslim ( ) 4. Other

(10) A4. What is your religion?

( ) 1. Buddhism ( ) 2. Hinduism ( ) 3. Islam ( ) 4. Christianity ( ) 5. Other

(11) A5. What is your highest education?

( ) 1. No formal education ( ) 2. Primary education (1-5 years) ( ) 3. Below ordinary level (6-10 years) ( ) 4. Ordinary level ( ) 5. Advanced level

( ) 6. University or higher

(12) A6. What is your marital status?

( ) 1. Married ( ) 2. Never married ( ) 3. Divorced/Separated ( ) 4. Widowed

(13) A7. Current number of children

	Total		Total-										Sons										Daughters									
	0	1	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

(14) A8. Are you working now?

( ) 1. Yes ( ) 2. No

(15) A9. What was your major occupation before your 60 years old?

( ) 1. None (e.g.Housewife) ( ) 2. Agriculture/ Forestry/Fishery (e.g. Farmer/Fisherman/ Wood cutter) ( ) 3. Industry (e.g. Factory/Construction/Mining worker)

( ) 4. Services (e.g. Business/Hotel/Restaurant/ Transportation activities) ( ) 5. Public services (e.g. Government/ Education/Health/ Army forces) ( ) 6. Other

(16) A10. Are there any following household goods at your home? (Check all that apply)

( ) 1. Electricity ( ) 2. Refrigerator ( ) 3. Washing machine ( ) 4. Television ( ) 5. Fan

( ) 6. Water supply in your house ( ) 7. Car/ Van ( ) 8. Motorcycle//Three wheeler ( ) 9. Land phone ( ) 10. Bathroom in your house

( ) 11. None

(17) A11. What are your income sources now? (Check all that apply)

( ) 1. Salary ( ) 2. From children ( ) 3. Pension ( ) 4. Savings ( ) 5. Allowances (Government / Non-government)

( ) 6. Other

(18) A12. Are you satisfied with your current income?

() 1. Yes () 2. No

B. LIVING ARRANGEMENT

(19) B1. Are you currently living in your own house?

() 1. Yes (Skip to B3) () 2. No (Go to B2)

(20) B2. If choose "No" in B1 who is the owner in your living place?

() 1. Children () 2. Spouse () 3. Siblings () 3. Other relatives

() 4. Government quarters () 5. Rent house owners () 6. Religious communities () 7. Others

(21) B3. Who are living with you now? (Check all that apply)

() 1. Living alone () 2. Spouse () 3. Son () 4. Daughter () 5. Children in-laws

() 6. Grandchildren () 7. Siblings () 8. Others

(22) B4. Who is mailny taking care of you in following types of categories in past 3 months? (Please select the most appropriate answer)

		Self	Spouse	Son	Daughter	Children in-laws	Other relatives	None
1	B41. Household help	()	()	()	()	()	()	()
2	B42. Financial support	()	()	()	()	()	()	()
3	B43. Health support	()	()	()	()	()	()	()
4	B44. Emotional support	()	()	()	()	()	()	()

(23) B5. Are you satisfied about transportation facilities you use?

() 1. Yes () 2. No

(24) B6. What are the difficulties you have? (Check all that apply)

() 1. Distance from the services () 2. Location (climbing up/down) () 3. No/Few regular services () 4. Financial problems () 5. Getting on/off

() 6. No priority seat for elders () 7. Much crowded () 8. Physical disabilities () 9. Other (Specify

(25) B7. Are there any following institution around your residence?

		None	Less than 1 km	1-3 km	4-5 km	More than 5 km
1	B71. Private medical clinic	()	()	()	()	()
2	B72 Pharmacy	()	()	()	()	()

C. PERCEIVED SOCIAL SUPPORT

(26) C1. Do you agree or disagree the following statements?
1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

		1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
1	C11. There is a special person who is around when I am in need	○	○	○	○	○
2	C12. There is a special person with whom I can share my joys and sorrows.	○	○	○	○	○
3	C13. My family really tries to help me.	○	○	○	○	○
4	C14. I get the emotional help and support I need from my family.	○	○	○	○	○
5	C15. I have a special person who is a real source of comfort to me.	○	○	○	○	○
6	C16. My friends really try to help me.	○	○	○	○	○
7	C17. I can count on my friends when things go wrong.	○	○	○	○	○
8	C18. I can talk about my problems with my family.	○	○	○	○	○
9	C19. I have friends with whom I can share my joys and sorrows.	○	○	○	○	○
10	C110. There is a special person in my life who cares about my feelings.	○	○	○	○	○
11	C111. My family is willing to help me make decisions.	○	○	○	○	○
12	C112. I can talk about my problems with my friends.	○	○	○	○	○

(27) C2. How often do you go to the religious place?

○ 1. Almost every day ○ 2. Several times every week ○ 3. Several times every month

○ 4. Several times every year ○ 5. Almost never

(28) C3. What kind of activities do you have in your religious place? (Check all that apply)

○ 1. Socializing with people ○ 2. Financial cooperation ○ 3. Emotional support ○ 4. Spiritual support ○ 5. Other

○ 6. None

D. HEALTH STATUS

(29) D1. What kind of diseases are you suffering now? (Check all that apply)

○ 1. Heart disease	○ 2. Stroke	○ 3. Cancer	○ 4. Chronic respiratory diseases	○ 5. Diabetes
○ 6. Kidney disease	○ 7. Liver disease	○ 8. Gastric disease	○ 9. Hypertension	○ 10. Arthritis
○ 11. Sight deficiency	○ 12. Hearing acuity	○ 13. Other	○ 14. None	

(30) D2. What level do you rate your health status?

○ 1. Bad	○ 2. Fairly Bad	○ 3. Moderate	○ 4. Fairly Good	○ 5. Good

(31) D3. Please select the most appropriate answer.

		Yes	No
1	D31. Can you use public transportation (bus or train) by yourself?	○	○
2	D32. Are you able to shop for daily necessities?	○	○
3	D33. Are you able to prepare meals by yourself?	○	○
4	D34. Are you able to pay bills?	○	○
5	D35. Can you handle your own banking?	○	○
6	D36. Are you able to fill out any application forms?	○	○
7	D37. Do you read newspaper?	○	○
8	D38. Do you read books or magazines?	○	○
9	D39. Are you interested in news stories or programs dealing with health?	○	○
10	D310. Do you visit the homes of friends?	○	○
11	D311. Are you sometimes called on for advice?	○	○
12	D312. Are you able to visit sick friends?	○	○
13	D313. Do you sometimes initiate conversations with young people?	○	○

(32) D4. Geriatric depression scale GDS-15

		-Yes	No
1	D41. Are you basically satisfied with your life?	○	○
2	D42. Have you dropped many of your activities and interests?	○	○
3	D43. Do you feel that your life is empty?	○	○
4	D44. Do you often get bored?	○	○
5	D45. Are you in good spirits most of the time?	○	○

		Yes	No
6	D46. Are you afraid that something bad is going to happen to you?	○	○
7	D47. Do you feel happy most of the time?	○	○
8	D48. Do you often feel helpless?	○	○
9	D49. Do you prefer to stay at home, rather than going out and doing new things?	○	○
10	D410. Do you feel you have more problems with memory than most?	○	○
11	D411. Do you think it is wonderful to be alive now?	○	○
12	D412. Do you feel pretty worthless the way you are now?	○	○
13	D413. Do you feel full of energy?	○	○
14	D414. Do you feel that your situation is hopeless?	○	○
15	D415. Do you think that most people are better off than you are?	○	○

E. AWARENESS AND ATTITUDES TOWARDS LONG-TERM CARE

(33)

		Yes	No
1	E1. Have you ever considered the issue of long-term care?	○	○
2	E2. Do you have any future plan for your long-term care?	○	○
3	E3. Have you ever talked with someone for your long-term care issues?	○	○

(34) E41. In your opinion, who should "most" take care of the older people? (Choose the most appropriate answer)

○ 1. Themselves ○ 2. Children ○ 3. Other relatives ○ 4. Government ○ 5. NGOs

○ 6. Charity organizations ○ 7. Religious communities ○ 8. Others ○ 9. Do not know

(35) E42. What are the reasons for your answers in E41? (Check all that apply)

○ 1. It is a traditional norm ○ 2. Financial issue ○ 3. Convenience ○ 4. Quality of service ○ 5. Closeness

○ 6. No others to take care of ○ 7. Do not know

(36) E5. In the future, which types of care would you prefer?

		Yes	No	Do not know
1	E51. Home care from family members	○	○	○
2	E52. Home care services from health workers	○	○	○
3	E53. Institutional services for elderly (over 60 years old)	○	○	○
4	E54. Day care centers	○	○	○

(37) E6. If you choose "Yes" for "E51. Home care from family members", whom do you prefer caring you? (Check all that apply)

○ 1. Spouse ○ 2. Son ○ 3. Daughter ○ 4. Children in-laws ○ 5. Brothers

○ 6. Sisters ○ 7. Others

(38) E7. If you choose "Yes" for "E52. Home care services from health workers", whom do you prefer caring you? (Check all that apply)

○ 1. Doctors ○ 2. Nurses ○ 3. Volunteers ○ 4. Others ○ 5. Do not know

(39) E8. If you choose "Yes" for " E53. Institutional services for elderly and E54. Day care centers", where would you like to stay?(Check all that apply)

○ 1. Government's elderly care home ○ 2. Private elderly care home ○ 3. NGO/ Religious organizations' elderly care home ○ 4. Any of above ○ 5. Do not know

(40) E9.Would you like to pay for elderly care services?

○ 1. Yes ○ 2. No ○ 3. Do not know

(41) E10. Who should pay the expenses for you? (Check all that apply)

○ 1. Self ○ 2. Spouse ○ 3. Children ○ 4. Governmnent ○ 5. NGO / Religious organizations

○ 6. Private insurance ○ 7. Other ○ 8. Do not know

(42) E11. What would be the "major worry" if you use the elderly care services listed in below?

1. Finance 2. Health 3. Relationship with my family
4. Relationship with others 5. Quality of services 5. Lack of information 7. Religion 8. Other

		1	2	3	4	5	6	7	8
1	E111. Home care services from health workers	○	○	○	○	○	○	○	○
2	E112. Institutional services for elderly	○	○	○	○	○	○	○	○
3	E113. Day care centers	○	○	○	○	○	○	○	○

(43) E 12. If you have any other suggestions, comments, any difficulties or any new ideas about elder cares please write it below.

Thank you very much for your cooperation!