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学位論文（要約）

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…….23-25

2.2 Data collection…….....25-27

2.2.1 Questionnaire…….....25-27

2.3 Statistical analysis……....27

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

3.1 Introduction…….28

3.2 Participants and methods…….....28-29

3.3 Results……..29-30

3.4 Discussion…….....30-31

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

4.1 Introduction…….32-33

4.2 Participants and methods…….....33

4.3 Results……..33-34

4.4 Discussion…….....34-35

CHAPTER 5 GENERAL DISCUSSION AND CONCLUSIONS

5.1 General discussion of IADL dependency and depression……...36-37

5.2 Limitations of the study…….....38

5.3 Conclusions and implications……...38

ACKNOWLEDGMENTS…….....39

REFERENCES……..…….40-54

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).

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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. 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

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CHAPTER 1

INTRODUCTION AND OBJECTIVES OF STUDY

1.1 Ageing in the World and Sri Lanka

1.1.1 Growing rate of population ageing

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].

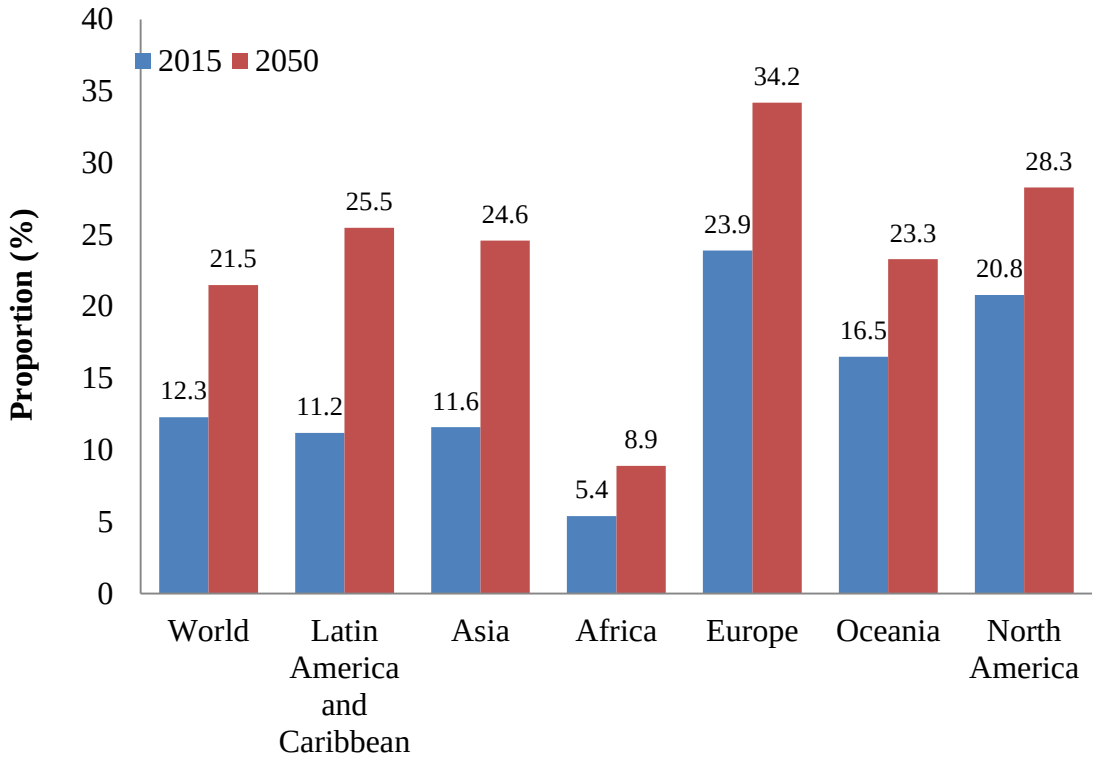


Figure 1. Proportion of population aged 60 or over: world and regions, 2015 and 2050
Source: United Nations, 2015 [9]

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).

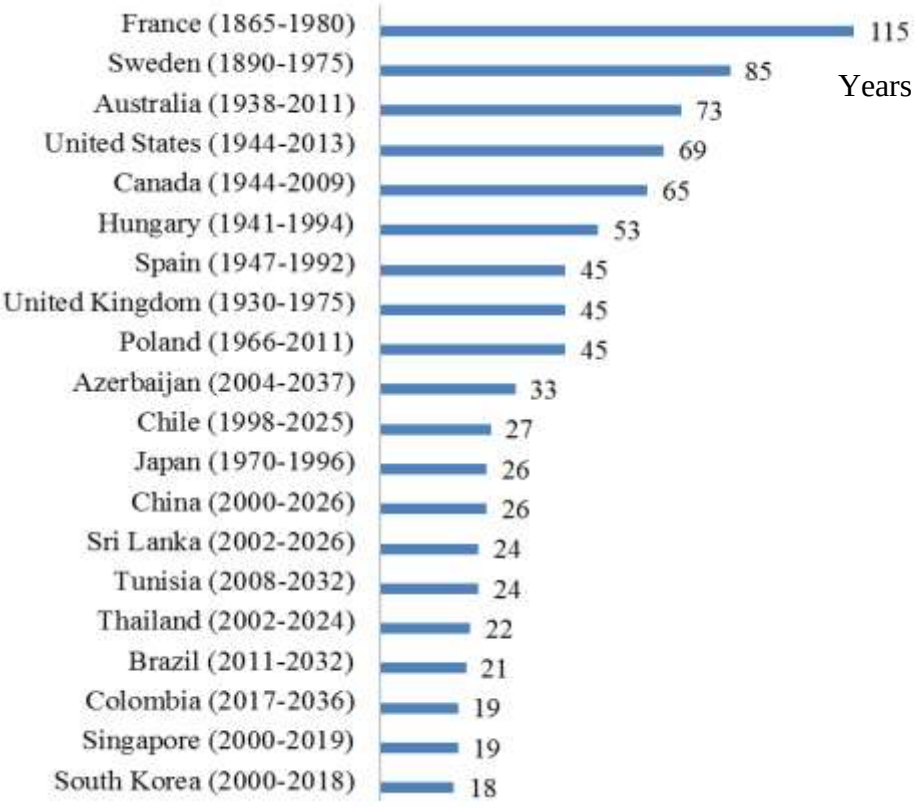


Figure 2. Number of years required for proportion of population aged 65 or over to rise from 7 percent to 14 percent in selected countries

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.

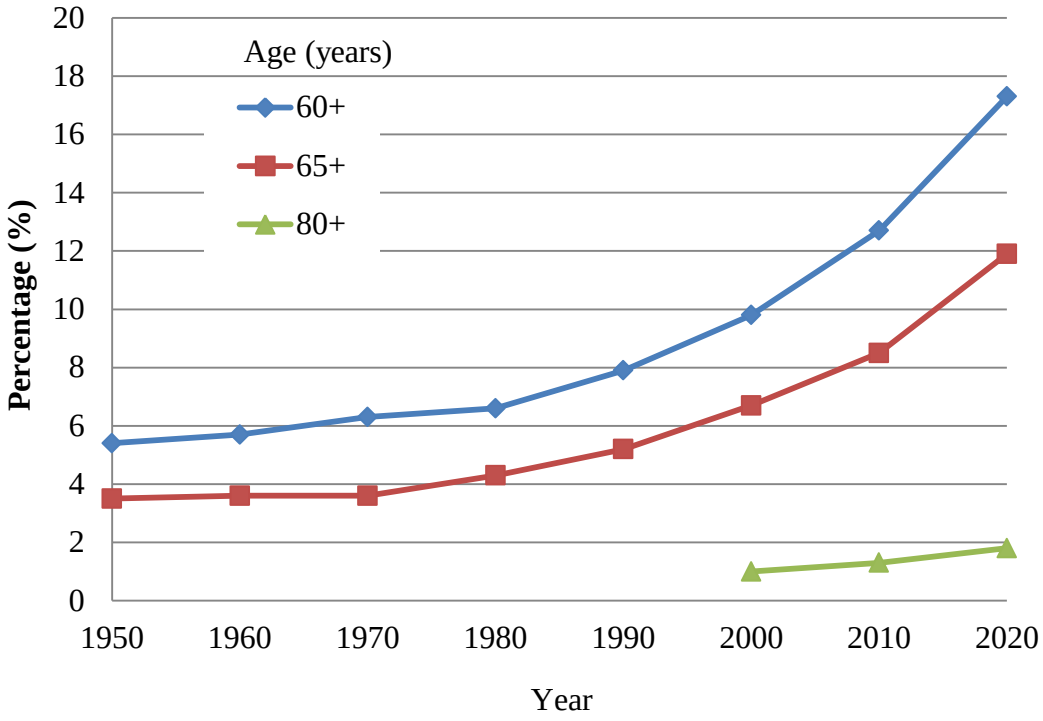


Figure 3. Proportion of population aged 60, 65 and 80 years or over in Sri Lanka, 1950-2020

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.

t 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).

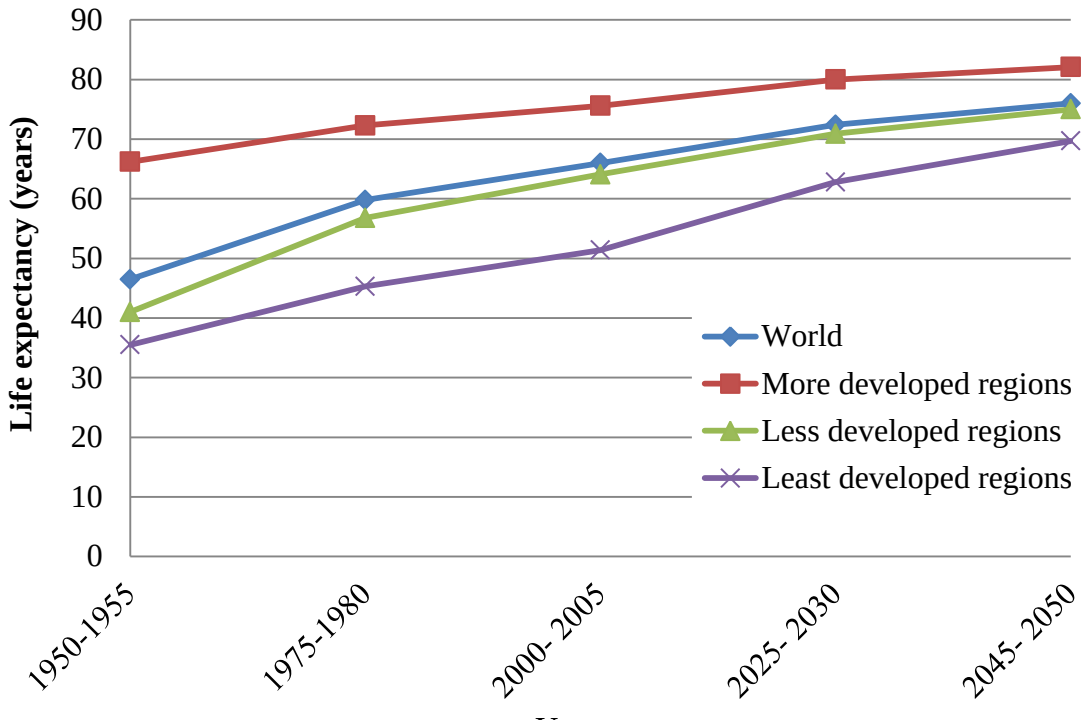


Figure 4. Life expectancy at birth in both genders by world and regions, 1950-2050
Source: UNDESA Population Division, 2009 [109]

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.

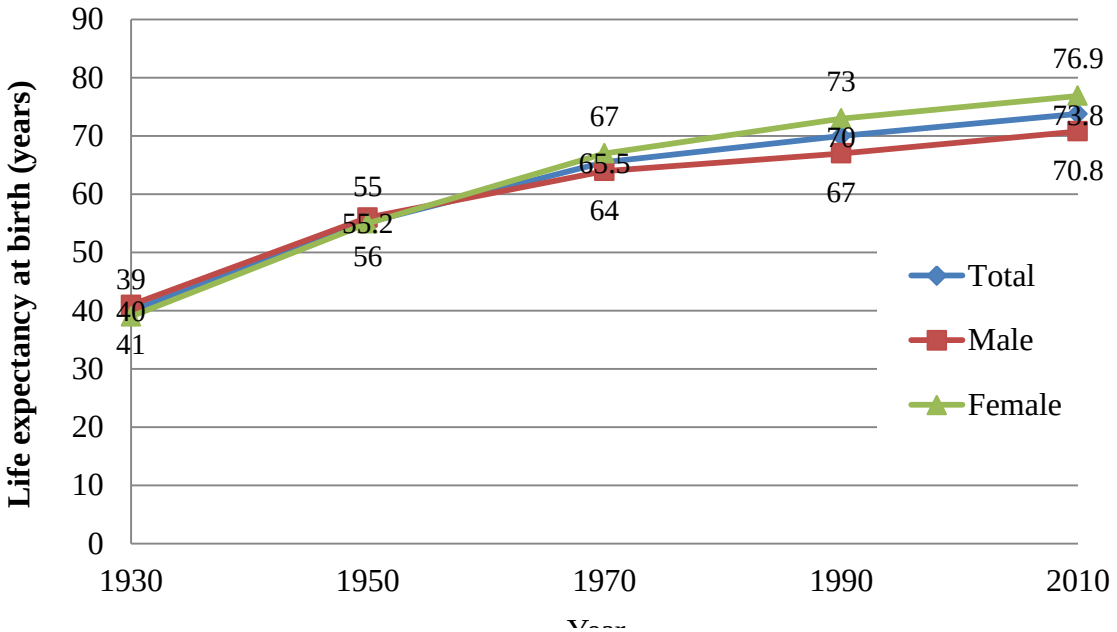


Figure 5. Life expectancy at birth by gender in Sri Lanka, 1930-2010

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.

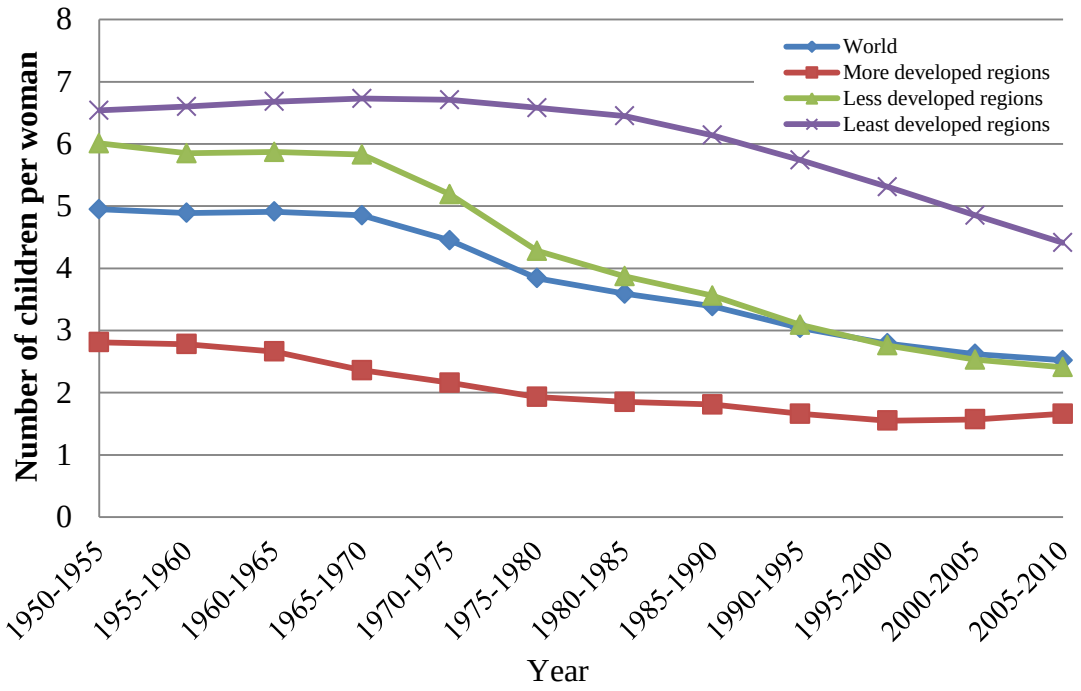


Figure 6. Total fertility rate by world and regions, 1950-2010

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).

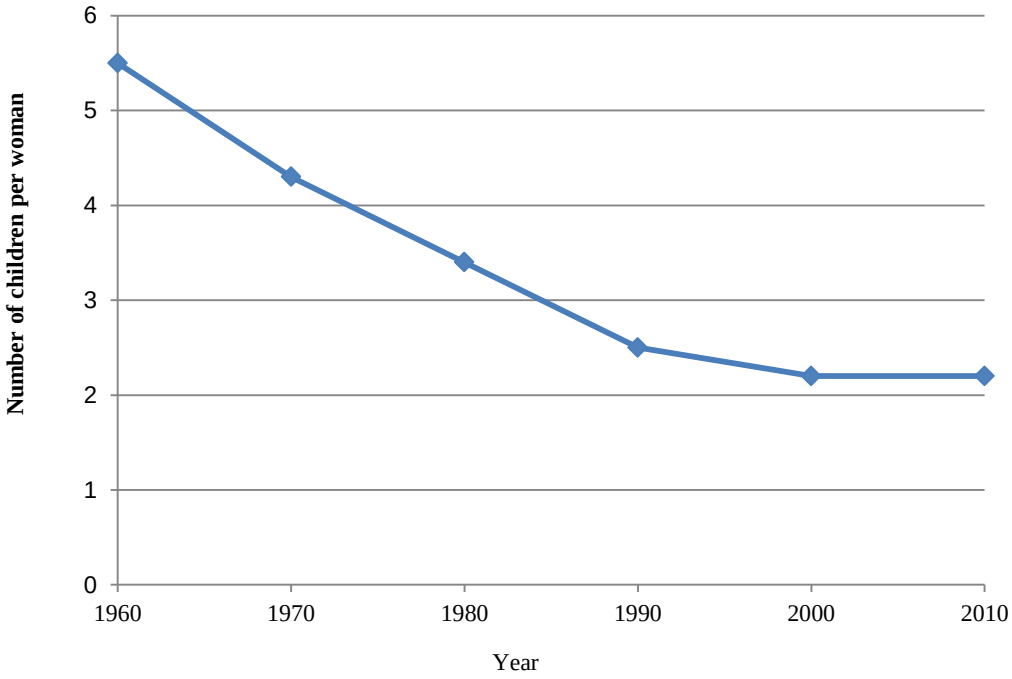


Figure 7. Total fertility rate in Sri Lanka, 1960-2010

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).

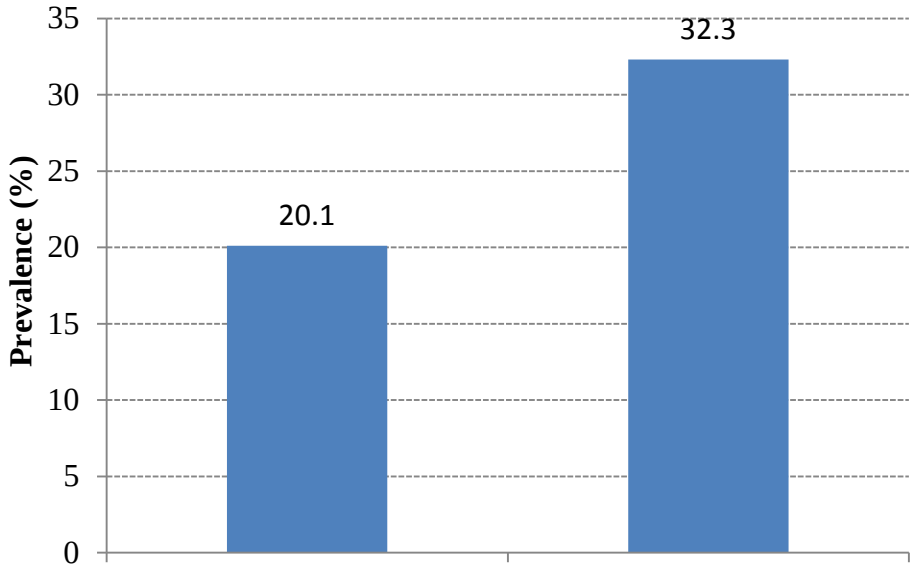


Figure 8. The prevalence of IADL dependency among people aged 65 and 60 years or older in Sri Lanka

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]

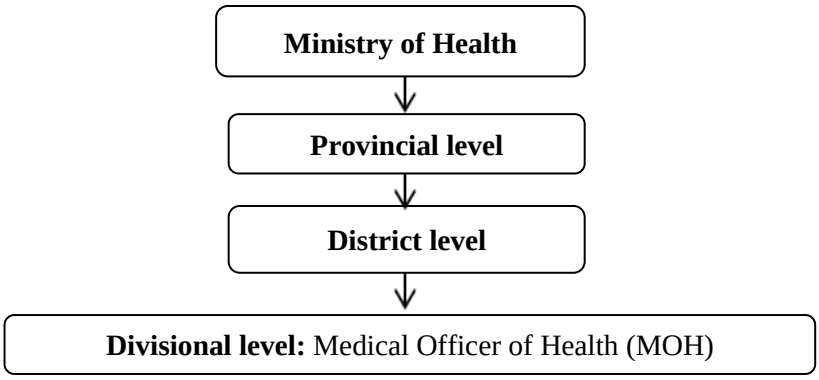
Note: All studies were cross-sectional.

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 [110]

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.

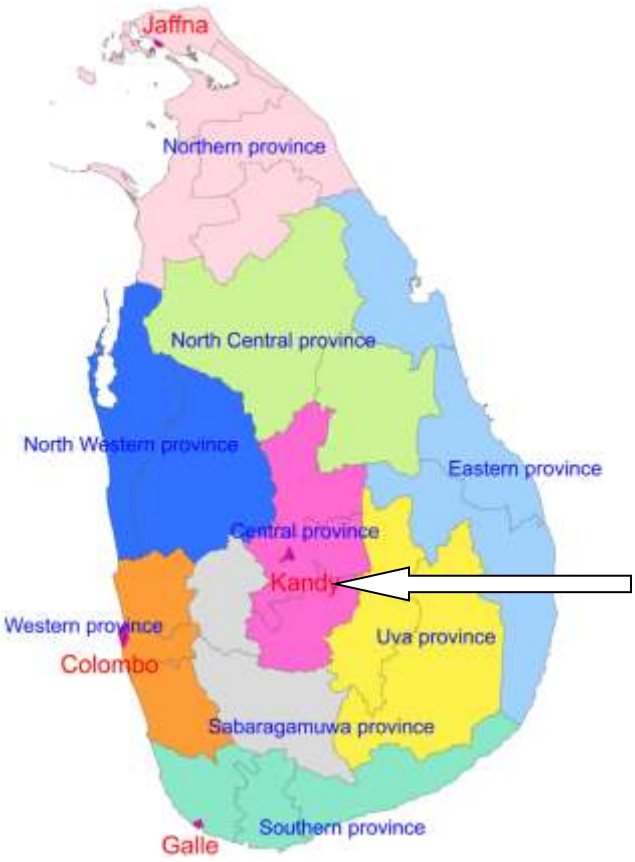
The results would play a key role in planning service provision (preventive and curative care) taking into account the huge increase in the size (21.0% in 2030) of the older population in Sri Lanka.

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.



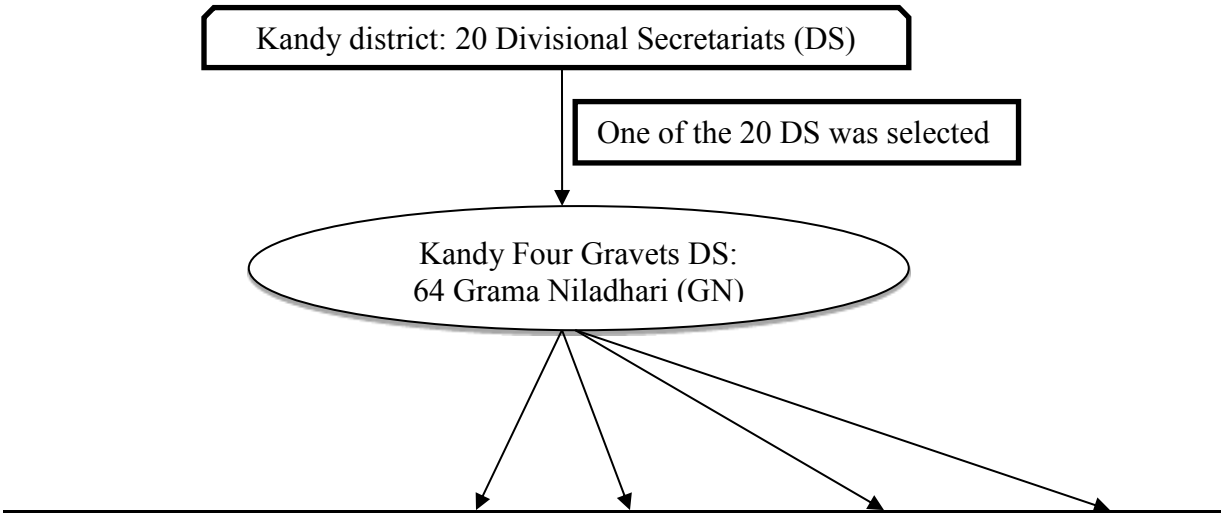
Kandy District is located in Central Province (capital: Kandy) and subdivided into twenty divisional Secretariats (DS) and 1188 GN divisions.

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 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.

2.2 Data collection

2.2.1 Questionnaire

Dependent variables: IADL functional status and feeling depression

IADL functional status was the main outcome. The TMIG Index of Competence was used to measure IADL [97], 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 [20,98,99].

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 [100]. A 15-item short version was developed by Sheik and Yesavage, based on the items that correlated best with depressive symptoms [101]. 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.

2.3 Statistical analysis

Statistical analysis

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

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 2015, 13.1% of the population was aged 60 years and older, and this proportion is projected to be 21.5% by 2030 [102].

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]. 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, no study has been conducted by their ethnicity in IADL. 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.

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

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.

For sub-levels of IADL dependence, 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”, “handling own banking”, “filling out application forms”, “paying bills” and “calling for advice”.

By the ethnicity, “Filling out application forms” was the most difficult IADL task among Tamils compared with Sinhalese and Muslims. “Handling own banking” was most difficult for the Muslims. More Sinhalese participants reported that “visiting the homes of

friends" was the most difficult task.

The prevalences of IADL dependency were 57.1% in total, 47.5% in Sinhalese, 77.6% in Tamils and 61.2% in Muslims. Among the ethnic groups, Tamils showed a significantly higher prevalence of IADL dependency than Sinhalese and Muslims.

The univariate analysis demonstrated that all sociodemographic characteristics were significantly associated with IADL dependency.

Furthermore, in order to control for interdependency or confounding, the analyses of using multivariate logistic regression model with two-way interaction terms and multilevel analysis 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. 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 was associated with IADL dependency only in Tamils.

3.4 Discussion

The prevalence (57.1%) of IADL dependency in older Sri Lankans in this study. The prevalence of IADL dependency in our study was higher than that in the two previous studies conducted in Sri Lanka [18,56].

The multivariate logistic regression analysis showed that that low economic status was associated with IADL dependency only in Tamils. 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.

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].

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. 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 [102,103]. 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 older 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 sociodemographic 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

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.

Out of the total participants, 31.8% were found to have depression. The prevalence rates of depression by ethnicity were 27.3% in Sinhalese, 42.1% in Tamils and 32.9% in Muslims. Compared with Sinhalese and Muslims, Tamils had a significantly higher prevalence.

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 and multilevel analysis showed that participants with lower education level, other marital status, low economic status, low perceived social support, and more than two self-reported diseases were significantly associated with depression. There were no significant interactions between sociodemographic characteristics and ethnicity.

4.4 Discussion

The prevalence of depression was 31.8% among Sri Lankans aged 60 years or older living in selected communities which was similar to the previous study in Sri Lanka (27.8%).

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 more than two self-reported diseases were observed to be depression-related factors in all ethnic groups. These findings were consistent with the previous studies [58,60,61,63,67,104–108].

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.

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 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 6). 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 6. 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. 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.

5.2 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. Secondly, the TMIG Index of Competence was used to measure to IADL, it warrants further studies to ascertain the validity and reliability of the TMIG for Sri Lankan people.

5.3 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.

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