
PUBLIC HEALTH RESEARCH

Premature Mortality among Elderly in Malaysia, 2014

Nazirah Alias, Mohd Azahadi Omar, Shubash Shander Ganapathy, Mohamad Fuad Mohamad Anuar, Chandrika Jeevananthan, Fazila Haryati Ahmad and Tan Lee Ann

Centre for Burden of Diseases Research, Institut Kesihatan Umum (Institute for Public Health), Ministry of Health Malaysia, Jalan Bangsar, 50590 Kuala Lumpur, Malaysia.

**For reprint and all correspondence: Nazirah Alias, Centre for Burden of Diseases Research, Institut Kesihatan Umum (Institute for Public Health), Ministry of Health Malaysia, Jalan Bangsar, 50590 Kuala Lumpur, Malaysia.*

Email: nazirah.alias@moh.gov.my

ABSTRACT

Received	11 November 2018
Accepted	29 July 2019
Introduction	Substantial advances on the life expectancy have been achieved in Malaysia over the past few decades. It is essential that elderly lead a healthier old age which leans towards successful aging. Thus, this study describes the major causes of premature mortality among the elderly population in Malaysia, 2014.
Methods	The calculation of premature mortality in terms of Years of Life Lost (YLL) was based on the method used in the Global Burden of Disease (GBD) study. YLL is the mortality component determined by the age-sex specific number of deaths and life expectancy at the age of death. Mortality data was obtained from the Department of Statistics Malaysia. Elderly aged 60 years and above were included in this study.
Results	The major causes of premature mortality among elderly in Malaysia were Cardiovascular and Circulatory Diseases (39.0%); followed by Malignant Neoplasms (16.6%), Respiratory Diseases (9.8%), Respiratory Infections (9.2%) and Diabetes Mellitus (6.8%).
Conclusions	Awareness programme, early screening and help seeking among elderly should be a priority in planning health services to reduce the burden of Non-communicable diseases (NCD) among elderly.
Keywords	Mortality - Years of Life Lost (YLL) - Elderly.

INTRODUCTION

The world population is ageing rapidly worldwide. Globally, life expectancy at age 60 has been increasing from 18.7 years in 2000 to 20.4 years in 2015.¹ By 2020, the Department of Statistics Malaysia had projected the ageing population of Malaysia aged 65 years and above to reach 7.2%. By 2040, the old age group population in Malaysia is estimated to increase to 14.5% of the total population.² In 2017, males and females at the age of 65 in Malaysia were expected to live for another 15.0 and 17.1 years respectively.³

As the demographic transition towards an ageing population and advances on the life expectancy is achieved in Malaysia, it is crucial that the elderly lead a healthier old age and towards successful ageing. Successful ageing is conceptually based on lower probability of disease and related disability, high cognitive and physical functioning and active with life among the elderly.⁴ However, in the 21st century, maintaining the elderly health, increasing their social participation, reducing institutionalization and improving their quality of life have all become our public health challenges towards achieving active ageing.⁵ It is crucial to have a summary measure of population health, including the premature mortality, especially for a country like Malaysia which is undergoing rapid demographic transition. By calculating the Years of Life Lost (YLL), we can measure the impact of mortality from each disease, thus enabling formulation of proper interventions to improve the wellbeing of the elderly population, lead towards active and successful ageing and evaluate the successfulness of the programs in place. This summary measures are intended to contribute in health planning, decision-making for health policy and to monitor the population health.⁶ Hence, this study aims to describe the major causes of premature mortality among the elderly population in Malaysia in 2014.

METHODS

This study used the methods directly from the Global Burden of Disease (GBD) study developed by Murray and Lopez.⁷ We followed this methodology to study the premature mortality among elderly in Malaysia, by estimating the Years of Life Lost (YLL), by five years interval age group, sex, cause categories and specific categories for the year of 2014. All deaths for elderly aged 60 years and above were included in this study.

YLL, representing the fatal burden, is the mortality component to calculate the Disability Adjusted Life Years (DALYs), a universal indicator for quantification of all states of ill health. Following the classification system for the disease burden, all diseases and injuries were classified into three broad cause groups, namely communicable, maternal, perinatal and nutritional

conditions (Group I); communicable diseases (Group II) and injuries (Group III).⁸ A total of 22 major categories of diseases consisting of 112 specific categories of diseases were then distributed among these three broad groups.

Years of Life Lost (YLL) are the total number of un-lived years in population due to premature mortality and were based on death that has occurred before the expected life expectancy due to disease, disability or injury. YLL are calculated from the age and sex-specific number of deaths, multiplied by the age and sex-specific mean life expectancy. The age and sex-specific mean life expectancy were determined by the observed mean age at death in age interval and the life expectancy figures at the exact age corresponding to the age interval. In this study, YLL were calculated by multiplication of total number of deaths for the disease categories in five years age interval, with the remaining life expectancy for the specific age group. Life expectancy was obtained from the Department of Statistics Malaysia which is the official source of national statistics in Malaysia.

All Malaysian mortality data for the year 2014 were collected through the vital registration system by the National Registration Department (NRD). After compiling the data, the Department of Statistics will subsequently assign the ICD-10 codes for each death to the registered cause of deaths and produce the final national annual vital registration statistics. Data on the number of deaths by sex, age and cause of deaths with its corresponding ICD-10 code for this study were obtained from the Department of Statistics Malaysia.

In Malaysia, there are currently two systems for certification of deaths, which is the medically certified deaths (deaths that occur in health facilities, certified by an attending physician) and non-medically certified death (deaths that occur outside health facilities, reported to the local police station by the next of kin). Based on the study on Determination of Cause of Deaths in Malaysia 2013, the cause of death from all non-medically certified deaths were estimated using verbal autopsy methods for more accurate estimation of cause of deaths and to reduce the number of ill-defined cause of death.⁹

All data were analyzed using Microsoft Office Excel version 2010.

RESULTS

In Malaysia, premature mortality among elderly in 2014 contributed to 30.9% of total deaths in males and 41.5% in females, based on 51,210 deaths among males and 45,691 deaths among females. We estimated the burden of premature mortality among elderly in Malaysia was 1.1 million YLL in 2014, which is 35.1% of the total 3.12 million YLL

Premature Mortality among Elderly

from 150,318 numbers of deaths throughout the year.

The burden of premature mortality among elderly contributed a total of 1,091,729 YLL for overall cause of death in 2014, with 52.7% of them in males. For every 1,000 elderly, 417.4 YLL was lost due to premature mortality, with a rate of 449.5 per 1,000 population in males and 386.7 per 1,000

populations in females. Overall, by broad cause groups, non-communicable diseases (Group II) was the highest contributor with 83.5% (348.4 per 1,000 population) followed by 11.7% (48.7 rate per 1,000 population) for communicable, maternal, perinatal and nutritional conditions (Group I) and remaining 4.9% (20.3 rate per 1,000 population) from injuries (Group III) (Table 1).

Table 1 Years of Life Lost (YLL) by sex and broad cause group, Malaysia, 2014

Cause Group	Total			Males			Females		
	YLL	%	Rate/ 1,000	YLL	%	Rate/ 1,000	YLL	%	Rate/ 1,000
Group I	127,385	11.7	48.7	59,145	10.3	46.2	68,240	13.2	51.1
Group II	911,257	83.5	348.4	477,505	83.1	373.3	433,752	83.9	324.5
Group III	53,087	4.9	20.3	38,223	6.6	29.9	14,863	2.9	11.1
Overall	1,091,729	100	417.4	574,873	100	449.5	516,855	100	386.7

Note: Group I: communicable, maternal, perinatal and nutritional conditions; Group II: Non-communicable diseases; Group III: Injuries

The major causes of premature mortality among elderly in Malaysia in 2014 were Cardiovascular and Circulatory Diseases, which accounted for 39.0% of the total YLL and Malignant Neoplasms with 16.6% (Table 2). Both of these diseases accounted for more than half of the total YLL. Respiratory Diseases are the third highest with 9.8%, followed by Respiratory Infections with 9.2% and Diabetes Mellitus with 6.8%. In both genders, Cardiovascular and

Circulatory Diseases and Malignant Neoplasms remained as the top two major contributors of YLL. In males, Respiratory Diseases (12.2%) and Respiratory Infections (7.8%) remained as the third and fourth leading causes of YLL respectively. Unintentional Injuries (6.1%) rise as the fifth leading cause of YLL among males. Among females, Respiratory Infections (10.8%) are the third leading cause of YLL followed by Diabetes Mellitus (8.1%) and Respiratory Diseases (7.0%).

Table 2 Years of Life Lost (YLL) by sex and cause categories, Malaysia, 2014

Cause category	Rank	Total			Rank	Males			Rank	Females		
		YLL	%	Rate/ 1,000		YLL	%	Rate/ 1,000		YLL	%	Rate/ 1,000
Cardiovascular And Circulatory Diseases	1	426,084	39.0	162.9	1	218,691	38.0	171.0	1	207,393	40.1	155.2
Malignant Neoplasms	2	181,204	16.6	69.3	2	97,754	17.0	76.4	2	83,450	16.1	62.4
Respiratory Diseases	3	106,555	9.8	40.7	3	70,357	12.2	55.0	5	36,198	7.0	27.1
Respiratory Infections	4	100,490	9.2	38.4	4	44,621	7.8	34.9	3	55,869	10.8	41.8
Diabetes Mellitus	5	73,891	6.8	28.3	6	31,955	5.6	25.0	4	41,936	8.1	31.4
Unintentional Injuries	6	49,474	4.5	18.9	5	35,036	6.1	27.4	8	14,438	2.8	10.8
Digestive Diseases	7	48,161	4.4	18.4	7	24,057	4.2	18.8	6	24,103	4.7	18.0
Genito Urinary Disease	8	40,999	3.8	15.7	8	19,051	3.3	14.9	7	21,948	4.2	16.4
Infectious Diseases	9	26,881	2.5	10.3	9	14,509	2.5	11.3	9	12,372	2.4	9.3
Skin Diseases	10	12,000	1.1	4.6	11	4,093	0.7	3.2	10	7,906	1.5	5.9
Neurological Conditions	11	8,417	0.8	3.2	10	4,835	0.8	3.8	11	3,581	0.7	2.7
Endocrine, Blood And Immune Disorders	12	5,090	0.5	1.9	13	2,391	0.4	1.9	12	2,699	0.5	2.0
Musculoskeletal Diseases	13	5,015	0.5	1.9	14	2,334	0.4	1.8	13	2,681	0.5	2.0

Intentional Injuries	14	3,613	0.3	1.4	12	3,188	0.6	2.5	15	425	0.1	0.3
Benign Neoplasms	15	3,339	0.3	1.3	15	1,556	0.3	1.2	14	1,783	0.3	1.3
Oral Conditions	16	363	0.0	0.1	16	323	0.1	0.3	16	40	0.0	0.0
Congenital Anomalies	17	93	0.0	0.0	17	73	0.0	0.1	17	21	0.0	0.0
Sense Organ Diseases	18	31	0.0	0.0	18	18	0.0	0.0	18	13	0.0	0.0
Nutritional Deficiency	19	15	0.0	0.0	19	15	0.0	0.0	19	0	0.0	0.0
Mental And Behavioural Disorder	20	15	0.0	0.0	20	15	0.0	0.0	20	0	0.0	0.0
Maternal Conditions	21	0	0.0	0.0	21	0	0.0	0.0	21	0	0.0	0.0
Neonatal Conditions	22	0	0.0	0.0	22	0	0.0	0.0	22	0	0.0	0.0
Overall		1,091,729	100	417.4		574,873	100	449.5		516,855	100	386.7

Table 3 describes the leading YLL by specific diseases among elderly. Cerebrovascular Diseases with 18.3% are the leading cause of YLL followed by Ischaemic Heart Disease (IHD) (16.1%), Lower Respiratory Infections (9.2%), Chronic Obstructive Pulmonary Diseases (COPD) (7.5%), and Diabetes Mellitus (6.8%). Trachea, Bronchus and Lung cancers are the sixth leading causes with 3.9% followed by Road Traffic Injuries with 2.7%. The top six leading specific diseases in term of premature mortality among elderly were the same diseases for both sexes but different in ranking. IHD (17.5%) are the highest YLL contributor among males followed by

Cerebrovascular Diseases (16.5%), COPD (10.3%) and Lower Respiratory Infections (7.8%). The next fifth, sixth and seventh highest leading cause among males are the same with the overall leading causes. In females, Cerebrovascular Diseases (20.3%) was the leading cause, followed by Ischaemic Heart Disease (14.7%) and Lower Respiratory Infections (10.8%) to make up the top three leading specific causes, followed by Diabetes Mellitus (8.1%), COPD (4.3%) and Trachea, Bronchus and Lung Cancers (2.9%). Breast cancer (2.7%) ranked as the seventh leading specific cause of YLL among female elderly.

Table 3 Top 20 Years of Life Lost (YLL) by sex and specific diseases, Malaysia, 2014

Specific diseases	Ran k	Total			Ran k	Males			Ran k	Females		
		YLL	%	Rate/ 1,000		YLL	%	Rate/ 1,000		YLL	%	Rate/ 1,000
Cerebrovascular Diseases (Stroke)	1	199,564	18.3	76.3	2	94,630	16.5	74.0	1	104,934	20.3	78.5
Ischaemic Heart Disease	2	176,216	16.1	67.4	1	100,407	17.5	78.5	2	75,809	14.7	56.7
Lower Respiratory Infections	3	100,402	9.2	38.4	4	44,601	7.8	34.9	3	55,801	10.8	41.7
Chronic Obstructive Pulmonary Disease	4	81,603	7.5	31.2	3	59,386	10.3	46.4	5	22,217	4.3	16.6
Diabetes Mellitus	5	73,891	6.8	28.3	5	31,955	5.6	25.0	4	41,936	8.1	31.4
Trachea, Bronchus and Lung Cancers	6	42,967	3.9	16.4	6	28,148	4.9	22.0	6	14,819	2.9	11.1
Road Traffic Injuries	7	29,159	2.7	11.1	7	24,157	4.2	18.9	15	5,003	1.0	3.7
Nephritis and Nephrosis	8	26,463	2.4	10.1	9	12,910	2.2	10.1	8	13,553	2.6	10.1
Colon and Rectum Cancers	9	25,360	2.3	9.7	8	14,315	2.5	11.2	9	11,045	2.1	8.3
Liver Cancers	10	16,716	1.5	6.4	10	9,961	1.7	7.8	13	6,756	1.3	5.1
Breast Cancer	11	15,674	1.4	6.0	30	1,682	0.3	1.3	7	13,992	2.7	10.5
Falls	12	13,690	1.3	5.2	11	6,886	1.2	5.4	12	6,804	1.3	5.1
Skin and subcutaneous diseases	13	12,000	1.1	4.6	18	4,093	0.7	3.2	10	7,906	1.5	5.9
Hypertensive	14	11,759	1.1	4.5	19	3,916	0.7	3.1	11	7,843	1.5	5.9

Premature Mortality among Elderly

Disease												
Tuberculosis	15	9,812	0.9	3.8	12	6,514	1.1	5.1	19	3,298	0.6	2.5
Asthma	16	9,802	0.9	3.7	20	3,475	0.6	2.7	14	6,326	1.2	4.7
Stomach Cancer	17	9,076	0.8	3.5	14	5,394	0.9	4.2	17	3,682	0.7	2.8
Peptic Ulcer Disease	18	8,023	0.7	3.1	15	4,777	0.8	3.7	20	3,246	0.6	2.4
Mouth and Oropharynx Cancers	19	6,191	0.6	2.4	17	4,130	0.7	3.2	25	2,061	0.4	1.5
Prostate Cancer	20	6,163	0.6	2.4	13	6,163	1.1	4.8	-	0	0.0	0.0

Overall, the YLL rates per 1,000 populations for the top five leading specific diseases were then distributed by sex and age group (Figure 1). Among males, Cerebrovascular Diseases, IHD, Lower Respiratory Infection and Diabetes Mellitus showed decreasing rates per 1,000 populations with increasing age. Both sexes

had increasing rates per 1,000 populations with increasing age for COPD. However, Cerebrovascular Diseases, IHD, Lower Respiratory Disease and COPD among females had an increasing rate per 1,000 population with increasing age, while decreasing rate per 1,000 population for Diabetes Mellitus.

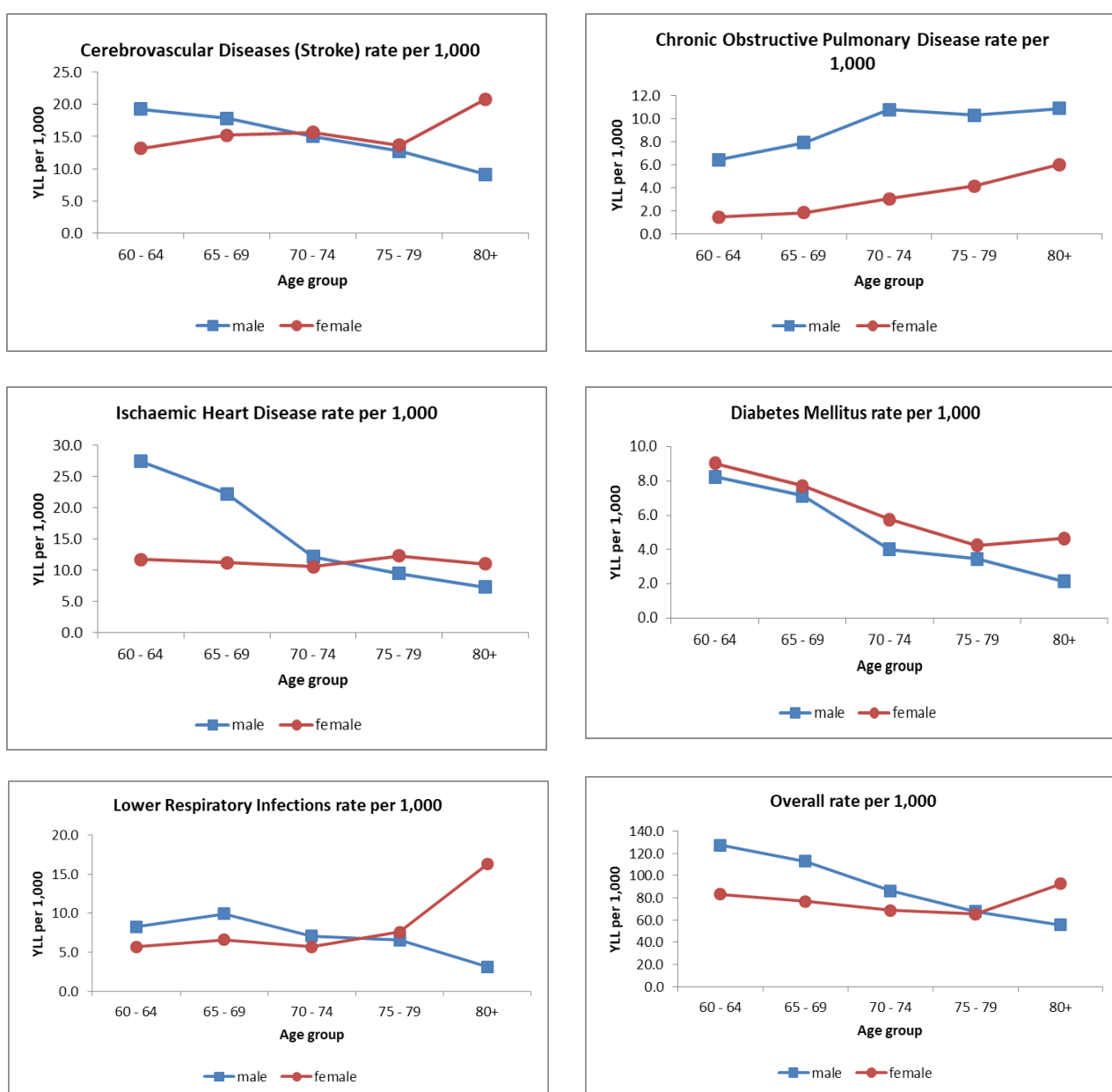


Figure 1 Distribution of Years of Life Lost (YLL) rates by sex and age group among the leading specific diseases, Malaysia, 2014

By age groups, the burden of premature mortality among those in the age group of 60 – 64 years was the highest with 25.1% (Table 4). This table also shows the YLL rates per 1,000 population by sex and age group. In males, 60 – 64

years of age were the highest contributor for the burden of disease with 28.3% (127.3 per 1,000 populations) while in females, the highest YLL were in age group of 80 years and above with 23.9% (92.6 per 1,000 population).

Table 4 Years of Life Lost (YLL) by sex and age group, Malaysia, 2014

Age group	Total			Males			Females		
	YLL	%	Rate/ 1,000	YLL	%	Rate/ 1,000	YLL	%	Rate/ 1,000
60 - 64	274,120	25.1	104.8	162,861	28.3	127.3	111,259	21.5	83.2
65 - 69	247,019	22.6	94.4	144,372	25.1	112.9	102,648	19.9	76.8
70 - 74	202,006	18.5	77.2	110,059	19.1	86.1	91,946	17.8	68.8
75 - 79	173,865	15.9	66.5	86,641	15.1	67.7	87,224	16.9	65.3
80+	194,719	17.8	74.4	70,940	12.3	55.5	123,778	23.9	92.6
Overall	1,091,729	100	417	574,873	100	449	516,855	100	387

DISCUSSION

Our study indicates the major diseases among elderly in our population in term of premature mortality by YLL calculation. Deaths in elderly contributed to 64.5% from total deaths in 2014. Females attributed to 47.3% YLL from 45,691 deaths which were much lower than males with 52.7% YLL from 51,210 deaths. According to our study, non-communicable diseases (NCD) were the largest contributors of premature mortality among elderly in Malaysia. According to World Health Organization (WHO), NCD were the major causes of deaths of 49 million people each year, corresponding to 70% of all death globally, with 15million of them occurred in 30 to 69 years of age.^{10,11} A cross sectional study in teaching hospital in Nepal among 100 patients aged 60 years and above concluded that NCD as the major disease in elderly population with substantial impact on public health.¹² NCD especially cardiovascular diseases and cancers were the most common cause of premature mortality in women aged 50 years and above regardless of their level of economic income group.¹³ Thus, there is a need for awareness, early screening and help seeking among these elderly to emphasize that disease and disability were not part of old age.¹⁴

Cardiovascular and circulatory diseases as expected were the most leading cause of premature mortality among elderly in both gender mostly due to cerebrovascular diseases (stroke) and IHD. In Malaysia, more than half of the population aged 65 years and above have hypertension, which is highly associated with cardiovascular disease (CVD), stroke and renal failure due to elevated blood pressure.¹⁵ By proportion, rural China, Hong Kong, Japan, Korea and Malaysia were categorized into intermediate mortality with 20- 30% of total deaths from all-causes due to CVD.¹⁶ Majority of CVD can be prevented, yet 28.7% of elderly aged 65-69 years were having undiagnosed or not known of having hypertension and 48.5% of elderly aged 55-59 years were having undiagnosed

hypercholesterolemia.¹⁷ In Malaysia, people do health screening for prevention of CVD mainly by opportunisticly by health care providers or through their own initiation, as some older people did perceived age as a CVD risk factor and some considered aging as a natural process of life instead of CVD risk factor.¹⁸

The second highest YLL in elderly were contributed by malignant neoplasms, specifically by Trachea, bronchus and lung cancer; and Colon and rectum cancer in both genders. Liver cancers in males and breast cancers in females were also among the most leading burden of cancers among elderly. In Europe and USA, lung cancer was the leading burden of cancer deaths with current median age of diagnosis at 69 years, which is gradually increase among the aging population.¹⁹ However, in Canada, lung cancer was the leading cause of cancer death in 2010 for both sexes with death peak at 70 to 79 years of age.²⁰ A data collected from 1980 to 2010 on breast cancer among women showed that females aged 50 to 79 contributed to higher number of death in Malaysia compared to those aged 15 to 49 years.²¹ In Malaysia, the incidence of breast cancer were highest among Malays and Chinese aged 50- 60 years and at the age of 60 years and above for Indians.²² Although many efforts had been implemented to reduce cancer burden, the situation is still worrying because of lack of awareness for early screening. Breast screening facilities in Malaysia is still underutilized for Breast Self-Examination (BSE), Clinical Breast Examination (CBE) and mammography screening.²³ A study in Hulu Langat, Selangor showed only 8.3% of elderly women aged 60 years and above went for mammogram screening.²⁴ Another study showed poor knowledge about colorectal cancer (CRC) screening among Malaysians and almost 93.6% of the respondents have never had CRC screening test.²⁵

Above all, only chronic obstructive pulmonary disease (COPD) showed increasing rate

Premature Mortality among Elderly

per 1,000 populations over the age suggesting chronic respiratory diseases worsen as age increases. COPD causes deterioration in quality of life, functional and physical activity in elderly populations.²⁶ Diabetes mellitus (DM) was also the common issue among elderly in Malaysia. According to the National Health and Morbidity Survey (NHMS) 2015, the prevalence of DM among elderly aged 70-74 years were 39.1%; 27.9% among them were aware about their DM status while 13.6% elderly aged 65-69 years were undiagnosed or not known they had DM.¹⁷

Various action plans and initiatives have already been formulated and implemented in the country to reduce the preventable and avoidable burden of mortality among Malaysian population including the elderly according to the National Strategic Plan for NCD (NSP- NCD) 2016- 2025.²⁷ There must be a systematic implementation of the entire key strategy action plan to overcome NCD, through the reduction of either common modifiable risk factors of NCD such as harmful use of alcohol, unhealthy diet, tobacco use and physical inactivity or the common metabolic risk factor such as raised blood glucose, blood pressure, blood lipid and excess body weight. To promote awareness on NCD, the Social Security Organization of Malaysia (SOCISO) had provided health screening vouchers to all their registered employees aged 40 years and above since 2013; but up to December 2016, only 19.9% used their vouchers.²⁸ The seven key strategic action of National Strategic Plan for Cancer Control Program (NSPCCP) 2016- 2020 should also be highlighted to increase knowledge and promoting screening for early detection.²⁹ Since 2007, the Ministry of Women, Family and Community Development (MWFC) has provided a RM50 subsidy for mammogram screening for women with high risk of breast cancer.²³

Further improve in implementation of KOSPEN (Healthy Community Empowers the Nation)³⁰ programme to prevent NCD by developing a healthy and productivity community through a culture of healthy living should be empowered to be applied among nationwide population including the elderly. The Ministry of Health with strong support from all government agencies, professional bodies and private sector should collaborate to fully implement the awareness and strategies plan.

Measuring the YLL due to premature mortality and the main cause of death is very crucial to determine the health status among elderly in Malaysia. However, this YLL estimation is not intended to substitute other health status indicators in Malaysia such as Infant and Maternal Mortality Rate, but as a complementary indicator to emphasize the health status to be nationally representative. Calculating YLL need to have the reliable data sources of mortality data as it's purely

based on death records from Department of Statistics, Malaysia. There is an issue upon information on cause of death which is no verification on data quality and accuracy of recorded death certification. However, by using structured verbal autopsy, cause-specific mortality estimates can be yielded by redistribution of death due to ill- defined causes of deaths. Another limitation is the classification of the group of diseases. The method from the GBD itself is not categorized up to specific diseases or condition that responsible for the cause of death.

CONCLUSION

NCD contributed to the most premature mortality among elderly in Malaysia. By calculating YLL due to premature death, we provided a basis for policymakers for future planning on prevention or intervention programs. Therefore, increasing awareness, early screening and reducing the risk factors attributable to disease burden should be a priority to achieve successful and healthy ageing.

ACKNOWLEDGMENT

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article. We would also like to thank all those who were involved in this study for their contribution and commitment throughout the study.

FUNDING

This study was funded by the Ministry of Health, Malaysia [NMRR-16-2320-33704].

CONFLICT OF INTEREST

The Authors declares that there is no conflict of interest.

REFERENCES

1. World Health Organization. World health statistics 2016: monitoring health for the SDGs, sustainable development goals [Internet]. Geneva, Switzerland: WHO Press; 2016 121 p. Available from http://www.searo.who.int/srilanka/areas/health_systems_management/world-health-statistics-2016.pdf.
2. Size of Population. [cited 2018 Feb 14]. Available from: <https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=Y3kwU2tSNVFDOWp1YmtZYnhUeVBEdz09>.
3. Life Expectancy at Birth by Major Ethnic Group. [cited 2018 Feb 14]. Available from: <https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=dkdvKzZOK1NiemEwNIJteDBSUGorQT09>.

4. Wahl HW, Deeg D, Litwin H. Successful ageing as a persistent priority in ageing research. *Eur J Ageing*. 2016 [cited 2018 Feb 15];13(1):1–3. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5550565/pdf/10433_2016_Article_364.pdf DOI: 10.1007/s10433-016-0364-5.
5. Onunkwor OF, Al-Dubai SAR, George PP, Arokiasamy J, Yadav H, Barua A, et al. A cross-sectional study on quality of life among the elderly in non-governmental organizations' elderly homes in Kuala Lumpur. *Health and Quality of Life Outcomes*. 2016 [cited 2018 Feb 14]; 14(6). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4709911/pdf/12955_2016_Article_408.pdf DOI: 10.1186/s12955-016-0408-8.
6. Gènova-Maleras R, Catalá-López F, de Larrea-Baz NF, Álvarez-Martín E, Morant-Ginestar C. The burden of premature mortality in Spain using standard expected years of life lost: a population-based study. *BMC Public Health*. 2011; 11(1):787. Available from: <http://bmcpublihealth.biomedcentral.com/articles/10.1186/1471-2458-11-787> DOI: 10.1186/1471-2458-11-787.
7. Wang H, Naghavi M, Allen C, Barber RM, Carter A, Casey DC, et al. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388(10053):1459–544. DOI: 10.1016/S0140-6736(16)31012-1.
8. World Health Organization. WHO methods and data sources for global burden of disease estimates. Geneva: World Health Organization. 2017 [cited 2018 Feb 19];1(January):17. Available from: http://www.who.int/gho/mortality_burden_disease/en/index.html.
9. Ganapathy SS, Yi Yi K, Omar MA, Anuar MFM, Jeevananthan C, Rao C. Validation of verbal autopsy: Determination of cause of deaths in Malaysia 2013. *BMC Public Health*. 2017 [cited 2018 Mar 23];17(1). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5553780/pdf/12889_2017_Article_4668.pdf DOI: 10.1186/s12889-017-4668-y.
10. Organization WH. WHO Noncommunicable diseases. WHO. World Health Organization; 2017 [cited 2018 Feb 20]. Available from: <http://www.who.int/mediacentre/factsheets/fs355/en/>.
11. Forouzanfar MH, Alexander L, Anderson HR, Bachman VF, Biryukov S, Brauer M, et al. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015 Dec 5 [cited 2018 Feb 20];386(10010):2287–323. Available from: <https://www.sciencedirect.com/science/article/pii/S0140673615001282> DOI: 10.1016/S0140-6736(15)00128-2.
12. Shakya Y, Shrestha B, Acharya R, Gupta S. Disease Pattern among Elderly People coming in Tribhuvan University Teaching Hospital, Kathmandu, Nepal. *Journal of Institute of Medicine*. 2017;39(2):76–9. Available from: <http://www.jiom.com.np/index.php/jiomjournal/article/view/954/906>.
13. Stevens GA, Mathers CD, Beard JR. Global mortality trends and patterns in older women. *Bulletin of the World Health Organization*. 2013; 91(9):630–9. Available from: <http://www.who.int/entity/bulletin/volumes/91/9/12-109710.pdf> DOI: 10.2471/BLT.12.109710.
14. Aggarwal P, Kakkar R, Kandpal SD, Goel D, Bansal S. Health Awareness and practices among geriatrics in reference to non-communicable diseases in Dehradun district. *Sub- Himalayan Journal Health Res*. 2015; 2(1):35–8.
15. Rashid A, Azizah A. Prevalence of hypertension among the elderly Malays living in rural Malaysia. *The Australasian Medical Journal*. 2011 [cited 2018 Mar 28]; 4(6):283–90. Available from: <http://dx.doi.org/10.4066/AMJ.2011.660> DOI: 10.4066/AMJ.2011.660.
16. Khor GL. Cardiovascular epidemiology in the Asia-Pacific region. *Asia Pacific Journal of Clinical Nutrition*. 2001 [cited 2018 Mar 27]; 10(2):76–80. Available from: <http://apjcn.nhri.org.tw/server/APJCN/10/2/76.pdf>.
17. Institute for Public Health. National Health and Morbidity Survey 2015 (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems. Vol. II, Ministry of Health Malaysia. 2015. 1-291 DOI: 10.1017/CBO9781107415324.004.

Premature Mortality among Elderly

18. Cheong AT, Khoo EM, Tong SF, Liew SM. To check or not to check? A qualitative study on how the public decides on health checks for cardiovascular disease prevention. *PLoS One*. 2016 [cited 2018 Mar 28];11(7). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4945067/pdf/pone.0159438.pdf>.
19. Owonikoko TK, Ragin CC, Belani CP, Oton AB, Gooding WE, Taioli E, et al. Lung cancer in elderly patients: An analysis of the surveillance, epidemiology, and end results database. *Journal of Clinical Oncology*. 2007;25(35):5570–7. DOI:10.1200/JCO.2007.12.5435.
20. Dagnault A, archambault J. Lung cancer in elderly patients, topics in cancer survivorship. Ravinder Mohan, IntechOpen. 2005;22:8S63-9 Available from: <https://www.intechopen.com/books/topics-in-cancer-survivorship/approach-to-lung-cancer-in-the-elderly-population> DOI: 10.5772/20364.
21. Abdullah MAA, Jamil SAM, Jalal YMTMT. Modelling count data: An application to a breast cancer data in Malaysia. *AIP Conference Proceedings*; 2016; 1775 (1) p. 030003. Available from: <http://aip.scitation.org/doi/abs/10.1063/1.4965123> DOI: 10.1063/1.4965123.
22. Chye GLC, Rampal S, Yahaya H. Cancer Incidence in Peninsular Malaysia 2003-2005. *National Cancer Registry*. 2008 [cited 2018 Mar 29];53–7. Available from: <http://www.moh.gov.my/images/gallery/Report/Cancer/CancerIncidenceinPeninsularMalaysia2003-2005x1x.pdf> DOI: 10.1002/ijc.29670.
23. Dahlui M, Ramli S, Bulgiba AM. Breast cancer prevention and control programs in Malaysia. *Asian Pacific Journal of Cancer Prevention*. 2011 [cited 2018 Mar 29];12(12):1631–4. Available from: http://eprints.um.edu.my/3063/1/Breast_cancer_prevention_and_control_programs_in_malaysia.pdf.
24. Rahmah MA, Aniza I, Che Engku Nor Bahiyah CEM. DO elderly women in Malaysia go for mammogram screening? *Malaysian Journal of Public Health Medicine*. 2013 [cited 2018 Mar 29];13(2):20–6. Available from: [https://www.mjphm.org.my/mjphm/journals/volume_13_\(2\)/DO_ELDERLY_WOMEN_IN_MALAYSIA_GO_FOR_MAMMOGRAM_SCREENING.doc.pdf](https://www.mjphm.org.my/mjphm/journals/volume_13_(2)/DO_ELDERLY_WOMEN_IN_MALAYSIA_GO_FOR_MAMMOGRAM_SCREENING.doc.pdf).
25. Al-Naggar RA, Al-Kubaisy W, Yap BW, Bobryshev Y V., Osman MT. Attitudes towards colorectal cancer (CRC) and CRC screening tests among elderly Malay patients. *Asian Pacific Journal of Cancer Prevention*. 2015 [cited 2018 Mar 29]; 16(2):667–74. Available from: http://journal.waocp.org/article_30488_17a09ac0a46cb71ed9097d9178262967.pdf DOI: 10.7314/APJCP.2015.16.2.667.
26. Peruzza S, Sergi G, Vianello A, Pisent C, Tiozzo F, Manzan A, et al. Chronic obstructive pulmonary disease (COPD) in elderly subjects: Impact on functional status and quality of life. *Respir Med*. 2003 [cited 2018 Feb 22]; 97(6):612–7. Available from: <http://www.sciencedirect.com>.
27. Ministry of Health Malaysia. National Strategic Plan for Non-Communicable Disease (NSP-NCD) 2016-2025. Mustapha FI, editor. NCD Section, Ministry of Health Malaysia; 2016. 1-22 p. Available from: www.moh.gov.my.
28. The SOCSO Health Screening Program 2013 - 2016: Fact Sheet [Internet]. Prevention and Health Promotion Department and Actuarial and Statistical Branch, SOCSO. [cited 2018 Mar 29]. Available from: http://sehat.perkeso.gov.my/images/THE_SOCSO_HEALTH_SCREENING_PROGRAM_2013_-_2016_FACT_SHEET.pdf.
29. Ministry of Health Malaysia. National strategic plan for cancer control programme 2016-2020. NCD Section, Ministry of Health Malaysia; 2017.
30. Lim K, M Fadhli Y, Omar M, Rosnah R, M. Nazaruddin B, Sumarni M, et al. Technical Report on Evaluation of Effectiveness of Implementation of “Komuniti Sihat Perkasa Negara” (KOSPEN) Programme In Malaysia - Phase 1. Institute for Public Health, Ministry of Health, Malaysia; 2015 [cited 2018 Mar 28]. Available from: <http://iku.moh.gov.my/images/IKU/Document/REPORT/2014/KOSPEN2014.pdf> DOI: 10.13140/RG.2.1.1947.800.