

Projection of Life Expectancy at Birth of Malaysian Population: A Modelling Approach

Md. Rafiqul Islam,^{1,2} Mahendran Shitan,^{2,3} Md. Nazrul Islam Mondal*¹

Abstract

The purpose of this study is to project life expectancies (LEs) by sexes and ethnic groups for Malaysia. The secondary data of LE by sex and ethnic groups for Malaysia were extracted from the Department of Statistics, Government of Malaysia. The exponential growth model was employed to fulfill the objective. Projections of LEs for male and female of Malaysia by ethnicity were estimated by using exponential growth model for the years 2014-2050. The study investigated that the LEs for male and female of Malaysia by ethnicity are showing increasing trend. Results revealed that LEs for the female is greater than that of the male for each ethnic group. The projected LEs for male and female of Malaysia in 2050 would be 79.13 and 84.05 years, respectively. The population of Malaysia will tend to live long. The Government should have clear information about the number of elderly population ensuring their healthy environment.

Key words: Life expectancy, ethnic groups in Malaysia, exponential growth model, Malaysia

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INTRODUCTION

Life expectancy (LE) is defined as the mean number of additional years that a person of a specific age will live when the age-specific mortality rates remain constant over the course of the individual's lifetime and it is an alternative measure of mortality in the human population.¹ LE

is the principal health indicator of a nation. On the contrary, education and health are the leading sectors for social development in the developing country like Malaysia. In Malaysia LE is more or less similar in international comparison with the median of LE for male and female being 72 and 77 years respectively in 2015.² LE is not the measure of the elderly population, but it represents the present situation of the socioecon-omic development of a country. In Malaysia, LE is increasing over time similar to developed countries. Like many other countries, women live longer than men in Malaysia, and this gender gap in LE has been increasing over time. The longer LE for female does not necessarily mean that they are healthier than that of men.

A number of studies using self-reported health status measure indicate higher prevalence of functional limitations and poor health among women population suggesting that the additional years may not necessarily be lived in healthy

¹Department of Population Science and Human Resource Development, Rajshahi University, Rajshahi, Bangladesh; ²Laboratory of Computational Statistics and Operations Research, Institute for Mathematical Research, University Putra Malaysia, Serdang, Selangor, Malaysia; ³Department of Mathematics, Faculty of Science, University Putra Malaysia, Serdang, Selangor, Malaysia.

***Corresponding author:** Dr Md. Nazrul Islam Mondal, Professor, Department of Population Science and Human Resource Development, Rajshahi University, Rajshahi 6205, Bangladesh, E-mail: nazrulupm@gmail.com

conditions.³⁻⁶ Projections using exponential growth model had been employed in recent studies.⁷⁻¹¹ LE is increasing every year which may imply that the aged population is growing not only in Malaysia but also all over the world. For this reason, correct information regarding increased LE in future is needed to take several steps for development of education, health, environment and others sectors in Malaysia as well as in the world as a whole. Therefore, the study has attempted to apply exponential growth model to examine the projection of LEs for male and female separately and the different ethnic groups in Malaysia for the years 2014-2050.

DATA AND METHODS

The secondary data on LE for male and female of Malaysia by ethnic groups were taken from the Department of Statistics, Government of Malaysia. There are different types of methods of carrying out population projections but primarily two methods namely the Cohort-Component Method and the mathematical approach are used. In developed nations, the Cohort-Component Method is one of the widely used method of population projections because of the availability of sufficient data. In developing countries having insufficient data, perhaps a mathematical approach might be more appropriate to make projections. For this, exponential growth model is considered for the projection of LEs of Malaysia.

For the projection of LEs for male and female of Malaysia by ethnic groups, exponential growth model is considered and the mathematical formulation of this model is addressed by

$$P_{t_2} = P_{t_1} \exp\{r (t_2 - t_1)\} , \dots\dots\dots (1)$$

where, P_{t_1} the initial LE at time t_1 (2001); P_{t_2} , the terminal LE at time t_2 (2013); r , the annual growth rate during the interval.¹²

The estimation of r is computed from equation 1 as follows.

$$r = \frac{1}{(t_2 - t_1)} \ln \left(\frac{P_{t_2}}{P_{t_1}} \right) . \dots\dots\dots (2)$$

Years 2001 and 2013 are considered as the initial and the terminal points respectively in estimating the growth rates of LEs by using equation 2. This process is carried out successively 37 times for each case.

Moreover, the LE at birth for both sexes in 2013 and 2050 have been estimated using the following formula

$$e_0^0 = \frac{e_0^f + s e_0^m}{1 + s} ;$$

Where, e_0^m is the LE at birth for male, e_0^f is the LE at birth for female and s is the sex ratio at birth at the same year. It is noted that sex ratio is chosen as 1.029 in both cases.

RESULTS

In Malaysia, the LEs for the years 2001-2013 are presented by sexes and by ethnicity in Table 1. In the case of total population, the LEs were 72.60 years for males and 77.20 years for females in 2013. In this study, three ethnic groups, *viz.* Bumiputera, Chinese, and Indian were considered. In the case of ethnic groups, the LEs were 73.67 years (male, 71.30; female, 76.10) for Bumiputera; 77.32 years (male, 75.00; female, 79.70) for Chinese; and 71.99 years (male, 67.90; female, 76.20) for Indian in 2013 (Table 1). The projected LEs up to the years 2050 by sexes and by ethnicity are presented in Table 2. The results revealed that the LEs in 2050 would be 81.56 years (male, 79.13; female, 84.05) for total population; 80.53 years (male, 77.15; female, 84.00) for Bumiputera; 83.84 years (male, 82.21; female, 85.52) for Chinese; and 78.51 years (male, 72.74; females, 84.45) for Indian ethnic groups (Table 2). The LEs for females would be higher compared to males, and the LE (83.87 years) for ethnic Chinese population would be the highest compared to other ethnic populations.

DISCUSSION

The main objective of this study was to project the LEs of Malaysian populations by ethnicity and by sex. The exponential growth model was used as the mathematical tool to project the LEs. The projections were made up to the year 2050. The results revealed that the LEs of Malaysian population is increasing with time. Women tend to live longer than men, and it is reflected in differences in LEs. In this study, the LE was considered the average number of years a person can expect to live given existing mortality patterns. The LE is considered the most commonly used indicator of a population's general health status. Nevertheless, LE should be recognised a measure of the length of life rather than the quality of life, as it does not account for the full burden of illness and disability.

Table 1. Life expectancy by ethnic groups and sex in Malaysia during 2001-2013

Year	Total		Bumiputera		Chinese		Indian	
	Male	Female	Male	Female	Male	Female	Male	Female
2001	70.6	75.1	69.5	73.7	72.8	77.9	66.4	73.7
2002	70.8	75.3	69.6	73.9	73.0	78.1	66.8	74.1
2003	70.9	75.6	69.7	74.2	73.1	78.3	66.8	74.5
2004	71.1	75.9	69.9	74.4	73.3	78.5	67.2	75.1
2005	71.4	76.2	70.1	74.7	73.6	78.9	67.6	75.4
2006	71.5	76.3	70.2	74.7	73.8	79.0	67.9	75.5
2007	71.5	76.3	70.2	74.8	73.9	79.2	67.9	75.7
2008	71.6	76.4	70.2	74.8	73.9	79.3	67.9	75.7
2009	71.6	76.5	70.2	74.8	74.0	79.5	68.0	75.8
2010	71.9	76.6	70.7	75.4	74.4	79.1	67.6	75.7
2011	72.1	76.8	70.9	75.7	74.6	79.5	67.8	75.8
2012	72.4	77.0	71.1	75.9	74.9	79.7	67.9	76.2
2013	72.6	77.2	71.3	76.1	75.0	79.7	67.9	76.2

Source: The website of Department of Statistics, Govt. of Malaysia.

Table 2. Projection of life expectancy by ethnic groups and sex in Malaysia during 2014-2050

Year	Total		Bumiputera		Chinese		Indian	
	Male	Female	Male	Female	Male	Female	Male	Female
2014	72.77	77.38	71.45	76.30	75.19	79.85	68.03	76.41
2015	72.94	77.56	71.60	76.51	75.37	80.00	68.15	76.62
2016	73.11	77.73	71.76	76.71	75.56	80.16	68.28	76.84
2017	73.28	77.91	71.91	76.92	75.75	80.31	68.41	77.05
2018	73.45	78.09	72.06	77.12	75.94	80.46	68.53	77.27
2019	73.62	78.27	72.22	77.33	76.12	80.62	68.66	77.48
2020	73.79	78.45	72.37	77.54	76.31	80.77	68.79	77.70
2021	73.96	78.63	72.53	77.74	76.50	80.92	68.92	77.91
2022	74.14	78.81	72.68	77.95	76.69	81.08	69.05	78.13
2023	74.31	78.99	72.84	78.16	76.88	81.23	69.18	78.35
2024	74.48	79.18	72.99	78.37	77.08	81.39	69.30	78.57
2025	74.66	79.36	73.15	78.58	77.27	81.54	69.43	78.78
2026	74.83	79.54	73.30	78.79	77.46	81.70	69.56	79.00
2027	75.01	79.72	73.46	79.00	77.65	81.85	69.69	79.22
2028	75.18	79.91	73.62	79.21	77.84	82.01	69.82	79.44
2029	75.36	80.09	73.77	79.42	78.04	82.16	69.95	79.67
2030	75.53	80.28	73.93	79.63	78.23	82.32	70.08	79.89
2031	75.71	80.46	74.09	79.85	78.43	82.48	70.21	80.11
2032	75.88	80.65	74.25	80.06	78.62	82.64	70.34	80.33
2033	76.06	80.83	74.40	80.27	78.82	82.79	70.48	80.56
2034	76.24	81.02	74.56	80.49	79.01	82.95	70.61	80.78
2035	76.41	81.20	74.72	80.70	79.21	83.11	70.74	81.01
2036	76.59	81.39	74.88	80.92	79.40	83.27	70.87	81.23
2037	76.77	81.58	75.04	81.14	79.60	83.43	71.00	81.46
2038	76.95	81.77	75.20	81.35	79.80	83.58	71.13	81.68
2039	77.13	81.95	75.36	81.57	80.00	83.74	71.27	81.91
2040	77.31	82.14	75.52	81.79	80.20	83.90	71.40	82.14
2041	77.49	82.33	75.68	82.01	80.40	84.06	71.53	82.37

Year	Total		Bumiputera		Chinese		Indian	
	Male	Female	Male	Female	Male	Female	Male	Female
2042	77.67	82.52	75.84	82.23	80.60	84.22	71.67	82.60
2043	77.85	82.71	76.01	82.45	80.80	84.38	71.80	82.83
2044	78.03	82.90	76.17	82.67	81.00	84.54	71.93	83.06
2045	78.21	83.09	76.33	82.89	81.20	84.71	72.07	83.29
2046	78.40	83.28	76.49	83.11	81.40	84.87	72.20	83.52
2047	78.58	83.47	76.66	83.33	81.60	85.03	72.34	83.75
2048	78.76	83.67	76.82	83.56	81.80	85.19	72.47	83.99
2049	78.95	83.86	76.98	83.78	82.01	85.35	72.61	84.22
2050	79.13	84.05	77.15	84.00	82.21	85.52	72.74	84.45

In 1980, the LE in Malaysia was 65.0 years, but by 2015, it had increased 74.50 (male, 72; female, 77) years.² The longevity can be attributed to many factors, including rising living standards, improved lifestyle and better education, as well as greater access to quality health services which are significantly increased in Malaysia. Thus, the demographic changes, socioeconomic inequalities, and availability of health factors influence LE.¹³⁻¹⁶ In Malaysia, the population expansion and demographic transition since the 1980s were accompanied by major socioeconomic development.¹⁷ After the long years of socioeconomic expansion, Malaysia transformed into a developed nation. Consequently, the economic development determines the improvements in social conditions and increases LE. Increases in LEs have also been attributed to improvements in sanitation and access to clean water.¹⁸ In Malaysia, access to improved sanitation reached 96% which is significantly high among the developing countries of Asia. An increase in LE was driven mainly by an improvement in sanitation during the nineteenth and early twentieth centuries.¹⁹

Gender differences in mortality and LE vary by countries. In most countries, men live shorter lives than women, sometimes by a margin of as much as ten years. This study identified that the LEs for females irrespective of ethnicity would be higher compared to males in Malaysia. The death rates for women were found lower than those for men at all ages. More boys than girls die in infancy and during each subsequent year of life; mortality rates for males exceed those for females. As a result, the gender gap would be widened in this century. Factors that influence gender differences in mortality include biological factors such as hormonal influences on physiology and behaviour and environmental factors such as cultural influences on gender differences in health behaviours. The importance of specific factors may reflect the environmental context.

The Malaysian Chinese consists of people of full or partial Chinese- particularly Han Chinese ancestry who were born in or immigrated to Malaysia. Most are descendants who arrived between the early and the mid-20th century. Malaysia is home to the second largest community of overseas Chinese in the world after Thailand. Within Malaysia, they are usually simply referred to as Chinese and represent the second largest ethnic group in Malaysia after the ethnic Malay majority. The ethnic Chinese populations are the socioeconomically well established middle class ethnic group and traditionally dominate the business and commerce sectors of the Malaysian economy. This study identified that the ethnic Chinese population especially women live longer than that of other ethnic groups. Malaysian Chinese women are more health conscious, and they are relatively more aware of healthy dietary habits and give priority to a healthy lifestyle. They are very particular about their health, and are active from young to old age, they go for regular medical check-ups and are physically active, more hardworking, especially the older generation. Remarkably, the older people are found more conscious about their health compared to others and tend to exercise, eat healthy food and pursue healthy lifestyles.

CONCLUSIONS

The LEs for male and female population of Malaysia by ethnic groups were estimated using exponential growth model up to year 2050. It was found that the LEs for male and female populations of Malaysia by ethnic groups showed gradually increasing trend over time. It was also observed that population of Malaysia is tending to have a longer LE. These might be used as predicted LEs for the male and female population of Malaysia by ethnic groups for further higher study. The LEs for male and female population of Malaysia in 2050

will be 79.13 and 84.05 years respectively. Hence it may be concluded that LEs for female population is longer than male population in Malaysia. As a consequence, the population of Malaysia will tend to experience serious ageing related problems in the future. Therefore, especially government and policy makers should have a clear understanding of the number of aged population to ensure their healthy environment. More research works are needed in this area.

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