Determinant of Life Expectancy in Malaysia

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Abstract: This paper studies the effect of urbanization on life expectancy in Malaysia from 1991 to 2016. To achieve the research objectives, data collected annually from World Bank database and Ordinary least square (OLS) method used to investigate the research variables. The results show that urbanization exposes Malaysian to better health care and has better life expectancy, yet, health expenditure has negatively influence with life expectancy in Malaysia. Generally, urbanization has positive health impact in Malaysia.

1 INTRODUCTION

World Health Organization (WHO) estimated 70% of the global population will lives in town and cities by 2050, has significant impact on living standard, lifestyles, social behaviour and health (World Health Organization, 2010). The study conducted by Black (1999) showed that urbanization also refers to the changes in the ways in which these people live, earning livelihoods, the meals which they consume and the wide range of environmental factors to which they are exposed. Moreover, WHO identify health challenges in urbanization such as increase in non-communicable diseases (cardiovascular diseases, cancer, diabetes, respiratory diseases), unhealthy diets, less physical activities, alcohol abuse and risk of disease outbreak (World Health Organization, 2010). Henderson (1999) found that the increase in the number people in urban areas will cause a significant increase in the costs, social disparities and negative impact towards the environment. Yet, urban living also giving opportunities to access to better health care system. According to Copplestone (1991) the better infrastructure available to the people in the urban areas exposes the people to better medical treatment which helps the people to have a better access to the medical services in the urban areas compared to those in the rural areas.

Furthermore, Ashton (1992) found that, the concept of epidemiological transition, which shows while life expectancy is greater in urban areas compared to in rural areas the inhabitants are often merely suffering from different forms of ill-health, often chronic or degenerative, rather than infective. Malaysia is now one of the most prominent countries which contribute towards the urbanization in East Asia region. Therefore, urban growth in Malaysia is one of the most prominent issues which the government is looking forward to capitalize due to its high rising urbanization. Moreover, the issue of ageing population among Malaysia increasing past decades. The life expectancy at birth in Malaysia continuously rose to reach 74.7 years in 2016 compared to 72.2 years in 2000 (Department of statistics Malaysia,2016). The longevity of Malaysian should concern on new policy implementation, resources allocation for elderly and productivity contribution by this group. Life expectancy is the most widely used as indicator to measure a population's health status (OECD 2013). More specifically, life expectancy related to health of labour force, productivity and capability to adapt technological progress (Madsen, 2012). This study aims to investigate the relationship between urbanization and the life expectancy of Malaysian.

1.1 Literature Review

There are many factors that affect life expectancy based on previous research. A research conducted by Chetty and Stepner (2016) in the United States between 2001 and 2014 shows that income was positively correlated with greater life expectancy. However, the study conducted by Messias (2003)

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shows that the income disparity and the illiteracy rates are negative correlated with the life expectancy of the population. A person with more income tends to keep himself healthy by seeking regulator medical assistance compared to ones with lower income and therefore people with better income tend to be always healthier and those with lower income tend to be not healthy. It relates to the health expenditure in which the human life expectancy is expected to be greater when the income is higher. The relationship between the sosio-economic status and the life expectancy of people are moderate in less developed countries compared to developed countries and they are not explained by the traditional behavioural factors (Nikkhil Sudharsanan,2017). Sosio economic status of a person could be a result of the variables which are being studied in our study such as the employment rate. Whereas, traditional behavioural factors may also refers to the behaviours of not spending enough for the health to ensure healthiness. Even when the person has a good sosio economic status, it is not necessarily that he is going to have greater life expectancy due to traditional behavioural factors.

Halfon (2009) found that from a Life Course Perspective, health is a developmental process occurring throughout the lifespan. The life course approach conceptualizing health care needs and services evolved from research. It finds the important role played by early life events in shaping an individual's health trajectory. The life course perspective is actually a community-focused theory since social, economic, and environmental patterns that affect one's health are closely linked to community and neighborhood settings. I believe one's health is one of a factor that is involved in a human's life expectancy and even the infant mortality rate.

Reidpath and Allotey (2002) investigated that the infant mortality rate(IMR) has been criticised as a measure of population health because it is narrowly based and likely to focus the attention of health policy on a small part of the population to the exclusion of the rest. More comprehensive measures such as disability adjusted life expectancy (DALE) have come into favour as alternatives. These more comprehensive measures of population health, however, are more complex, and for resource poor countries, this added burden could mean diverting funds from much needed programmes. Unfortunately, the conjecture, that DALE is a better measure of population health than IMR, has not been empirically tested. There is a strong (generally) linear association between DALE and IMR (r=0.91). Countries with low DALE tend to have a high IMR. The countries with the lowest IMRs had DALEs above that predicted by the regression line. There is little evidence that the use of IMR as a measure of population health has a negative impact on older groups in the population. IMR remains an important indicator of health for whole populations, reflecting the intuition that structural factors affecting the health of entire populations have an impact on the mortality rate of infants. For countries with limited resources that require an easily calculated, pithy measure of population health, IMR may remain a suitable choice.

Cervellatia and Sunde (2005) found that the past two centuries were characterized by widespread and profound changes in human living conditions. For aeons, a more or less stable and unchanged environment prevailed, with a strong preponderance of agriculture and trade of basic goods, rigid social structures with usually a small ruling class, and comparably poor medical conditions. But suddenly within just more than two hundred years, that is just a few generations, the economic environment mutated utterly: the structure of the economy changed completely with industrialization breaking its way, reducing the importance of agricultural activities in favor of the industrial and the service sector. Personal life changed in every dimension to an extent not seen before or after. The traditional social environment ceased to exist, as the vast majority of the population became educated, and acquired knowledge beyond the working knowledge of performing a few manual tasks inherited by previous generations. Literacy, which used to be the privilege of a little elite, became widespread among the population. The process of human capital accumulation accelerated as more and more people acquired the ability to innovate, and to use innovations. On the other hand, the spread of new technologies in turn made it more profitable to acquire knowledge. Also the biological environment sharply changed. Lifetime duration, which had been virtually the same for thousands of years, increased sharply within just a few generations. Mortality fell significantly and fertility behavior changed profoundly, hygienic conditions improved as sanitation became more important and widespread. According to Acemoglu and Johnson (2007), improving health around the world today is an important social objective, which has obvious direct payoffs in terms of longer and better lives for millions. There is also a growing consensus that improving health can have equally large indirect payoffs through accelerating economic growth.

Healthcare expenditure is deemed to have significant influence on life expectancy since it directly helps reduce mortality and morbidity as well. A cross-provinces study shows that lower health care expenditure is related with a statistically significant increase in infant mortality and a decrease in life expectancy in Canada. However, the relationship was found to be independent of various economic, sosio-demographic, nutritional and lifestyle factors as well as provincial specificity of time trend (Crémieuxe, 1999).

Apart from that, there is higher chances of correlation between per capita income and health expenditure, since higher per capita income may lead to higher per capita health expenditure. Simultaneously, a nation's capacity to purchase the necessary goods and service that promote health can be increased with per capita income. Poverty among the societies is causally related to poor health of the societies (Subramanian, 2002). In order to achieve overall good health status, a certain level of health care expenditure may be required (Starfield and Shi, 2002). Costa Rica has attained the highest life expectancy among the developing world,74 years in 1985 and 78 years in 2002, the level comparable to a developed country. From my opinion, this is possible due to positive political and social circumstance as well as right public health policy, However, the main factors of this breakthrough were health interventions, notably a primary health care program (Rosero-Bixby, 1991). Expect a positive relationship between health care expenditure and health status if increasing resources gives an improvement in the level and quality of health services supplied to the population. There may also be diminishing returns to scale above some level of expenditure. Moreover, Hitiris and Posnet (1992) found a small negative relationship between health expenditure and mortality rates. Other than that, Grubaugh and Santerre (1994) found a positive impact of certain health inputs like number of doctors and hospital beds on health measured by infant mortality rates. Hadley (1982) shows a positive relationship between health expenditure and health), by using mortality data on the United States. Evidences have also been found on positive relationship between health care input and health outcomes in the context of Europe (Collins and Klein, 1980; Forbes and Mcgregor, 1984; and Elola, 1995).

Urban population which is part of urbanization plays a crucial role in determining life expectancy. Urban inhabitants of the developing countries basically enjoy improved medical care and means of life, better education, and other improved socio-economic facilities, and this will impact positively on the health outcomes. Kalediene and Petrauskiene (2000) found that there was a positive correlation between level of urbanization and life expectancy while investigating the patterns of regional life expectancy in Lithuania. However, state of urbanization and residential conditions are critically related to health status and health outcomes of population of a country. In a study on Rio de Janeiro, Szwarcwald et al (2000) found the worst health situation in the cluster are composed of the harbor area and northern vicinity, precisely in the sector where the highest concentration of slum residents were present. Besides,the remainder of the city have shown a seven years higher life expectancy compared to the the sector of the city as mentioned above. However, Rogers and Wofford (1989) found the opposite result when examining life expectancy for 95 developing countries because they revealed that urbanization was less significant in explaining life expectancy than anticipated due to the unhealthy condition in cities of the developing countries.

Rapid population growth in a certain country itself is a result of the diffusion of scientific-medical knowledge, and is the underlying cause of the growth of urban population(Darin-Dabkin,1977). Moreover, the concentration of population in urban areas is also affected by economic growth, which is reducing the percentage of the population employed in agricultural and rural areas. Needless to say, structural changes in employment, have led to increased number of employment in the city centre due to most of the service firms need to be centrally located so they can obtain benefit from close interaction with each other (Runde ,2015) .Apart from that industrial activities also continues to concentrate in the metropolitan area, which has a pool of skilled man-power, access to consumer markets, and a variety of auxiliary commercial services. These structural changes have also had an impact on the distribution of population in the urban areas. The increasing role of the city centre for commercial purposes forces population shift to outlying districts. Plus, by developing new transportation systems, it has allowed a degree of dispersal within the metropolitan region and facilitate outward spreading of urban areas.

2 METHOD

This study model adapted from Acemoglu and John (2007). In order to estimate urbanization effect on

life expectancy, we employed a closed-economy neoclassical growth model with the assumption the consumption good is produced with a constant return to scale aggregate production function can be express in equation (1):

$$Y_t = A_t H_t^{\gamma} L_t^{1-\gamma}, 0 < \gamma < 1, \quad (1)$$

Where Y is output, H_t is factor of production and A is capture as level of technology, yet it incorporates with variety of factor, t is time trend. The aggregate amount of effective labour is supplied, therefore can be written as equation (2):

$$H_t = h_t N_t \quad (2)$$

Where, h_t denotes the individual level of human capital and N_t is size of population. Generally, improvements in health or life expectancy will influence total production by affecting technology can see in equation (3), human capital and size of population (equation 4). The role of life expectancy for total factor productivity and human capital simply expressed as in Acemoglu and John (2007).:

$$A_t = \dot{A}_t E_t^{\gamma} \quad (3)$$

With $\gamma > 0$ and

$$h_t = \dot{h}_t E_t^{\alpha} \quad (4)$$

With $\alpha > 0$. Reduction in mortality affects population size directly, where more people survive at each points in time indirectly affects the likelihood of surviving until childbearing increase. Substituting (2), (3) and (4) into (1): we obtain:

$$Y_t = [(\dot{A}_t E_t^{\gamma})(\dot{h}_t E_t^{\alpha}) N_t]^{\gamma} L_t^{1-\gamma} \quad (5)$$

Basically, (5) relates life expectancy has influence in technology, human capital, population and quantity of labour. Our estimation of model as:

$$\ln LF_{t-1} = \beta_0 + \beta_1 \ln HE_{t-1} + \beta_3 \ln UBN_{t-1} + \beta_4 \ln IMR_{t-1} + \varepsilon_t \quad (6)$$

Where the data convert to ln form before to the first difference. LF is life expectancy, HE is health expenditure, UBN is urban population, and IMR is growth of infant mortality rate. The subscript t represents the t refer to number of years. List of variable used and source of data as in Table 1. The data estimation period covers from 1991 to 2016 yearly, which has total 26 observations. Eview software was used to analyse the data.

Table 1: List of variables.

Variables	Actual data measured	Convert data measured	Data source
Dependent variable			
Life expectancy at birth	Total (years)	lnLF	World Bank database
Independent variables			
Health Expenditure	RM'000	lnHE	Department of statistic Malaysia
Urban population	Percentage of total population	lnUBN	World Bank database
Infant mortality rate	Percentage	lnIMR	Department of statistic Malaysia

3 RESULT AND DISCUSSION

The estimated result for life expectancy model obtain as follows:

$$\ln LF_{t-1} = 0.001 - 0.003 \ln HE_{t-1} + 0.084 \ln UBN_{t-1} + 0.04 \ln IMR_{t-1} + 0.0004\ \varepsilon_t \quad (7)$$

S.E: (0.000) (0.002) (0.021) (0.004)

t-statistic = [4.852***] [-1.789*] [3.923***] [0.948^{ns}]

$R^2 = 0.470$; Adjusted $R^2 = 0.398$; d = 0.503

The results show that explanatory variables accounted for about 47 percent of the variation in the life expectancy model (Equation 7). Estimations reveal that the explanatory variables, namely health expenditure and urban population, were the most important explanatory variables with statistically significance at the 0.10 level and 0.01 respectively. Infant Mortality Rate was not significant explanatory variable. The equation (7) shows that 1 percent increase in health expenditure will lead to

0.3% decrease in life expectancy. However,1 percent increase in urban population and infant mortality rate will lead to 8.4% and 4% increase in life expectancy respectively.

The life expectancy model in our shows that an increase in health expenditure will lead decrease in life expectancy. This finding different from the research conducted by Kim and Lane (2013). Their investigation covers 17 OECD countries between 1973 and 2000 shows that one percent increase in public health expenditure increase the life expectancy by 2.6 percent, however, the infant mortality rate has negative relationship with life expectancy. Moreover, investigation on 192 countries shows that health expenditure increase, healthy life expectancy also increases (Lubitz et al., 2003). In this study the negative relationship found due to other two research focus on panel data (combine more countries), however this study use time series data to conduct the test. The negative correlation between health expenditure and the life expectancy is theoretically not consistent compared to previous study.

Apart from that, most of the low resource committee are also exposed to chronic diseases which reduce their life expectancy in the long term process even though they spend much in medical expenditures. Without the proper governance and enforcement to reduce the corruption in both public and private medical hospitals, the increase in health expenditure may shows negative health outcome and thus reduce life expectancy. However, most of the previous studies contradicts with our findings because according to the study done by (Jaba,2014) in examining the relationship between healthcare expenditures (input) and life expectancy (as a proxy for health outcomes) for 175 countries from 1995 to 2010 and their findings revealed a positive association between life expectancy and healthcare expenditures.

Aìsa et al (2014) found that an increase in healthcare expenditures leads to improved life expectancy. In line with these studies, Akinci (2014) investigated the relationship between healthcare expenditures and health outcomes for Middle Eastern and Northern African countries using yearly data from 1990 to 2010 and they found that increases in total health-care expenditures reduce infant, under-five, and maternal mortality rates. According to the research by Anyanwu and Erhijakpor (2009), they documented a positive relationship between health expenditure and life expectancy for Sub-Saharan countries and negative relationship for Northern Africa. The difference is due to the availability of physician in the country and the undernourishment that affects African continent.

The positive correlation between urban population and the life expectancy is theoretically consistent. This is because most of the urbanized area have high per capita income and this can lead to a higher standard living whereby people are exposed to better job opportunity, facilities and infrastructure. Moreover, they are exposed to many health education, talks and seminar in their workplace especially. Hence they are more health conscious, follows healthy lifestyle with exercising and proper dieting and this will enhance the quality of life. Besides, they also can afford to spend more in the medical expenses for their own betterment if it is necessary. Eventually, this will lead to higher life expectancy. This is in line with previous investigation done by Lithuania and co-researchers, where they found that there was a positive correlation between level of urbanization and life expectancy (Lithuania et la., 2000). However, Rogers and Wofford (1989) found the opposite result when examining the life expectancy for 95 developing countries whereby they revealed that urbanization was less influential in explaining life expectancy than anticipated, perhaps because of unhealthy condition in cities of the developing countries.

The positive correlation between infant mortality rate and the life expectancy is however theoretically inconsistent. When the infant mortality rate is higher, the life expectancy was expected to move in the opposite direction. This is because, the high infant mortality rate shows that the infants are not being produced in a healthy way which concludes that the parents will also not have a good generic which will cause the human life expectancy to decrease when the infant mortality rate increases. however, the study shows that the infant mortality rate in insignificant variable in the model. A study done by (Reidpath and Allotey (2002), supported the insignificance, by saying that, as a measure of population health because it is narrowly based and likely to focus the attention of health policy on a small part of the population to the exclusion of the rest.

Table 2: Summary of residual test.

Diagnostic test	Hypothesis	Result	Decision
Normality test (Jarque-Bera)	H_0: error term is normally distributed. H_A: error term is not normally distributed	JB statistic: 0.7713 Prob. value: 0.6800	P-value >0.05 H_0 is accepted. H_A is rejected
Heterosced asticity test (White)	H_0: No multicollinearity among the variables. H_A: There is multicollinearity among the variables	Prob. F (9,16):0.1842 Prob. Chi Square (2): 0.1866	P-value >0.01 H_0 is accepted. H_A is rejected
Serial Correlation test (LM)	H_0: There is no autocorrelation among the residuals. H_A: There is autocorrelation among the residuals.	Prob. F (10,12): 0.2676 Prob. Chi-Square (2):0.1629	P-value >0.05 H_0 is accepted. H_A is rejected
Multicollinearity test (Variance Inflation Factor)	H_0: The variance is homoscedasticity H_A: The variance is heteroscedasticity.	VIF = 1.887	VIF<5 H_0 is accepted. H_A is rejected.

4 CONCLUSIONS

In this study, we have investigated the effect of infant mortality rate, health expenditure and urban population on life expectancy. The result showed that health expenditure and urban population are the most important variables in determining the life expectancy of Malaysian, compare infant mortality rate appeared to be not significant in the model. The possible explanations that can be draw from the results is the causes of infant mortality rate are strongly related to those structural factors like economic development, general living conditions, social well-being, and the quality of the environment, that affect the health of entire populations. In particular, both infant mortality rate and age urban population demonstrate significant positive relationship with the life expectancy, whereas health expenditure shows significant negative relationship with the life expectancy. Employment can enhance welfareness and combat poverty which can make the life of people to better off. Moreover, life expectancy is one of the factors in measuring the Human Development Index (HDI) of each nation along with adult literacy, education, and standard of living. The World Health Organization has published statistics called Healthy life expectancy (HALE) since 2001. Hence, in order to enhance better quality life, all these factors of medical expenses, migration of people to city center and the infant mortality rate have to be analysed more thoroughly to create a new policy for the benefits of the social and economy of a certain nation.

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