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Predictive capacity of country inflation rate to life expectancy at birth

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ABSTRACT

Life expectancy has long been considered to be among the most relevant indicators of public health and economic development. With this in mind, this study determined the association of the inflation rate of a country to the population's life expectancy within 120 selected countries. The study utilized an ecological study design where existing data and statistics on inflation rates and life expectancy per country for the year 2017 from World Bank databases were collated. In classifying the countries as high life expectancy and low life expectancy, the median was identified. To further establish, describe, and explain the relationship between life expectancy and inflation rate, binary logistic regression was utilized. The result indicated that the inflation rate of a country significantly predicts its life expectancy outcomes. The analysis also reveals an inverse relationship, with life expectancy being lowered by approximately 20% for each unit of increase in the inflation rate. The financial capability of the older person does not only cover expenses for daily living but the expenses for health security. Continuous increase in the inflation rate would lessen their financial security affecting expenses for health. Therefore, changes in the economic status of a country because of its inflation rate can be counted among the factors that predict the length of life of its population. The increasing inflation rate prominently decreases the average life span of a nation's populace. Policies should be introduced to address the economic concerns of a nation since these also impact the health status of its populace.

1. Introduction

The world population has been steadily growing older, and it is currently unknown what life will be like in the future's aging societies. Demographical changes can be viewed as an economic revolution because the world of businesses and consumers will be changed throughout the globe by aging societies. A strong interaction between a change in demographics and the economy is considered a fact, because of the varying economic behavior of a population at different life stages, and a country's age structure changes can significantly affect its economic performance (Meiners and Santana, 2014).

Life expectancy is an important health status indicator based on the average number of years a person at a given age may be expected to live given current mortality rates (Naimark, 2008). In both developed and developing countries, life expectancy has been considered to be among the most relevant indicators of economic development for past decades. This situation indicates how nations, especially those with improving economies, focus on developing their social sector which includes their education, environment, sanitation and other social safety nets. Changes in income per capita of developed countries affect changes in the structure of their expenditures. These changes lead to reduced poverty levels, higher adult literacy rate, improvements in sanitation, greater access to drinking water and improved nutrition. These have been determined to contribute to increases in life expectancy (Shahbaz et al., 2016). Furthermore, extending life expectancy has frequently been a chief interest in medical research and an indicator of national public health profiles (Lin et al., 2012). Previous studies consider aging in its physical aspect which is distinct from medical or healthcare considerations, its social aspect that is insofar as it is a set of established mental constructs, and its public policy aspect. This last consideration raises issues in Economics (Meiners and Santana, 2014). These reasons provide precedence for the conceptualization of this paper. The proportion of

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elderly people in the population has been steadily growing. Across the globe, numerous elderly persons are reaching an advanced age. Considering that these demographic trends will continue to rise as the substantially populous generation of baby boomers enter their elder years, it has become imperative to examine differences in spending patterns among the elderly (Abdel-Ghany and Sharpe, 1997).

This situation raises concerns that fall under economics in aging. Economics of aging is a subcategory of population economics and involves typically the economic aspects of societal aging (Meiners and Santana, 2014). One of the concepts related to this area of study is inflation. Inflation pertains to the overall increase or average change in the Consumer Price Index (CPI) from the prior period, whether it is monthly, quarterly, or yearly. The CPI refers to a weighted average of prices for various goods. The set of goods comprising the index depends on which are considered representative of a common consumption basket. Population growth was identified as a factor that positively affects the inflation rate (Yoon et al., 2014). Increases in a country's population could potentially increase national, private and personal expenditures, leading to a greater demand for supply and services which are limited. This, in turn, could lead to a sustained increase or inflation of prices for goods and services. In particular, older adults may feel the impact of this change more strongly since they generally experience increased risk of health problems and poorer financial protection (Negin et al., 2017). As individuals grow older and they begin reaching the age of 50 and above, their expenses rise concurrently, especially since they are more prone to seeking medical care to treat the growing burdens to their physical health. Some of these may include communicable diseases like HIV and its comorbid illnesses on top of greater risks of contracting non-communicable diseases (Negin et al., 2012a; 2012b).

Determining a country's inflation rate and how it affects the country's life expectancy has important considerations in policy making for the improvement of the country's health outcomes and financing policies. It is then the purpose of this study to determine, explain, and describe the association between inflation rate of a country and the population's life expectancy.

2. Methodology

The study is an ecological study where the unit of observation is the population in a country. The variables were measured in each of a series of populations and their relationship was examined. Often, in an ecological study, the information is abstracted from published statistics and therefore does not require expensive or time-consuming data collection. The populations compared may be defined in various ways. In this study, existing data and statistics on inflation rates and life expectancy per country for the year 2017 were collated. The inflation rate referred to in this study is defined as the overall increase in the Consumer Price Index (CPI) and were taken from WBG (2017) databanks. Life expectancy refers to the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life (World Bank). The researchers retrieved the life expectancy at birth data from the WBG (2017).

After the process of harmonization, the researchers utilized data from 120 countries. To represent the distribution of data and estimate the probability a histogram was generated. In classifying the countries as high life expectancy and low life expectancy, the median was identified. A best fitting model must be established to describe the relationship between a set of independent variables and a dichotomous characteristic of interest, so the researchers performed a logistic regression analysis. To further establish, describe, and explain the relationship between life expectancy and inflation rate, the study utilized binary logistic regression. Lastly, the log odds, odds, and probability were calculated. In the actual data processing, the researchers employed the Minitab 17 software.

3. Results and discussion

The result of data analysis, as reflected in Table 1, revealed that the inflation rate of a country has an influence on life expectancy outcomes. A minute movement in the inflation rate would either increase or decrease the life expectancy of the population.

Table 1: Binary logistic regression results

Source	DF	Adj Dev	Adj Mean	Chi-Square	P-Value
Regression	1	18.75	18.750	18.75	0.000
Inflation rate	1	18.75	18.750	18.75	0.000
Error	117	146.21	1.250		
Total	118	164.96			

Model Summary:

Deviance $R-Sq$	Deviance $R-Sq(adj)$	AIC
11.37%	10.76%	150.21

Coefficients:

Term	Coef	SE Coef	VIF
$Constant$	0.825	0.292	
$Inflation\ rate$	−0.2167	0.0702	1.00

Odds Ratios for Continuous Predictors:

$Odds\ Ratio$	95% CI
$Inflation\ Rate$ 0.8052	(0.7017, 0.9238)

Regression Equation:

$$P(1) = exp(Y')/(1 + exp(Y'))$$
$$Y' = 0.825 - 0.2167\ Inflation\ Rate$$

Increases in the inflation rate lessen the likelihood of a longer life. Life expectancy is lowered

by approximately 20% for each unit of increase in inflation. This means that any increase in inflation would greatly affect the financial capability of the older person. The financial capability of the older person does not only cover expenses for daily living but the expenses for health security. Continuous increase in the inflation rate would lessen their financial security affecting expenses for health.

Previous studies that have examined the determinants of life expectancy have traditionally focused on socio-economic factors such as per capita GDP, inflation, and urbanization (Elo, 2009; Lorentzen et al., 2008; Burroway, 2010; El-Ghannam, 2002; Monsef and Mehrjardi, 2015). However, not all socio-economic factors prove significant in determining the life expectancy of a country's populace. In some cases, environmental conditions, health care services, and food supply carry a stronger impact on life expectancy (Mariani et al., 2008; Yavari and Mehrnoosh, 2006; Shahbaz et al., 2016).

A study on the effect of economic factors such as inflation rate, the rate of unemployment, gross national income and gross capital formation on life expectancy) showed that the inflation rate significantly and negatively affects life expectancy in 136 selected countries (Monsef and Mehrjardi, 2015). Income and economic development factors have encouraging effects on life expectancy (Leung and Wang, 2010). Previous researches have also stated that socio-economic development, such as increases in per capita GDP, educational expansion, and urbanization are some of the strongest predictors of life expectancy (Elo, 2009; Lorentzen et al., 2008; Burroway, 2010; El-Ghannam, 2002).

However, other studies revealed the opposite. Kabir (2008) reported that variables traditionally considered to be influential determinants of life expectancy, such as per capita income, education, spending on public health, availability of safe drinking water to the general public, and urbanization, turned out to be insignificant. Factors that did prove to be significant are the number of physicians per one hundred thousand people, adult literacy, undernourishment among the populace and the geographical location of a country. Other studies on the effect of environmental conditions and health care on life expectancy support these findings (Mariani et al., 2008; Yavari and Mehrnoosh, 2006).

In studies of determinants of life expectancy that focus on one country, socio-economic factors are the most significant determinants of life expectancy. For example, investigating the determinants of life expectancy in Pakistan throughout 1972 to 2012 show that health expenditure, the supply of food, and urbanization positively impacts life expectancy while illiteracy and a rising economic misery contributes to its decline. On another hand, production of food and growth in per capita income had a positive and significant relationship with life expectancy for the time series data of 1975 to 2013 in Turkey. Conversely, inflation and a growing population had a negative and insignificant relationship with life expectancy (Shahbaz et al., 2016). In Zimbabwe, an analysis of trends in life expectancy throughout 1970 to 2012 reveals the positive relationship of economic growth, inflation, and population growth with life expectancy while increases in agricultural land and the dependency ratio (dependent family members associated with an economically active person) negatively affect life expectancy (Murwirapachena and Mlambo, 2015).

The result in Table 1 supports the assumption that economic development serves as a determinant of social condition improvements and life expectancy increase. Countries with high living standards often have a populace that averagely lives longer with a lower mortality rate. Awareness that economic difficulty can adversely impact vulnerable populations such as the elderly, leading to a possible deterioration of health status, should be pertinent among policymakers. An earlier study reported that mortality rates are substantially higher among elderly adults who belong to lower-income groups. While an association exists between economic upturns and higher life expectancy rates, the opposite holds true, referring to an association between economic downturn and lower life expectancy rates (Mondal and Shitan, 2014).

Life expectancy changes could be attributed to long-standing changes in multiple factors, including socioeconomic status. A rise in life expectancy can be the direct outcome of enhancements in a nation's economy rather than other analyzed factors. Improving economic status exerts an encouraging impact on life expectancy for several years which suggests a reciprocal relationship between the economy and life expectancy. Improving one would gradually strengthen the other (Lin et al., 2012).

Furthermore, life expectancy is considered as the proxy of health status. The determinants of life expectancy can be economic, social and environmental factors. The rate of inflation, the rate of unemployment, gross capital formation, and gross national income are considered as primary economic factors affecting life expectancy (Monsef and Mehrjardi, 2015). The essential assumption is that stabilization policies of an economy such as in increasing output, boosting economic activities and shrinking high levels of unemployment, all contribute as significant players in the health status of any country's population. This dynamic imposes defiance for the enhancement of a healthy population and in forwarding the attention into human development (Istaiteyeh, 2017).

4. Conclusion

This study concludes that changes in the economic status of a country because of its inflation rate can be counted among the factors that predict the length of life of its population. The increasing inflation rate prominently decreases the average life span of a nation's populace. Taking the results of the study into consideration, the researchers recommend that policies be instituted to address the

economic concerns of a country since it affects the health status of its population. Programs on enhancing the spending capacity of the people may be necessary to allow better health outcomes.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

References

Abdel-Ghany M and Sharpe DL (1997). Consumption patterns among the young-old and old-old. Journal of Consumer Affairs, 31(1): 90-112. https://doi.org/10.1111/j.1745-6606.1997.tb00828.x

Burroway R (2010). Schools against AIDS: Secondary school enrollment and cross-national disparities in AIDS death rates. Social Problems, 57(3): 398-420. https://doi.org/10.1525/sp.2010.57.3.398

El-Ghannam AR (2002). The determinants of social well-being, economic development, and development index in the third world countries. Perspectives on Global Development and Technology, 1(1): 51-69. https://doi.org/10.1163/156915002100419754

Elo IT (2009). Social class differentials in health and mortality: Patterns and explanations in comparative perspective. Annual Review of Sociology, 35: 553-572. https://doi.org/10.1146/annurev-soc-070308-115929

Istaiteyeh RM (2017). Economic and social factors in shaping Jordan's life expectancy: Empirical analysis (1990-2014). Advances in Management and Applied Economics, 7(5): 45-59.

Kabir M (2008). Determinants of life expectancy in developing countries. The Journal of Developing Areas, 41(2): 185-204. https://doi.org/10.1353/jda.2008.0013

Leung MC and Wang Y (2010). Endogenous health care and life expectancy in a neoclassical growth model. In the Investing in Human Capital for Economic Development in China: 65-83. https://doi.org/10.1142/9789812814425_0004 **PMid:20849368**

Lin RT, Chen YM, Chien LC, and Chan CC (2012). Political and social determinants of life expectancy in less developed countries: A longitudinal study. BMC Public Health, 12: 85. https://doi.org/10.1186/1471-2458-12-85 **PMid:22280469 PMCid:PMC3331806**

Lorentzen P, McMillan J, and Wacziarg R (2008). Death and development. Journal of Economic Growth, 13(2): 81-124. https://doi.org/10.1007/s10887-008-9029-3

Mariani F, Barahona P, and Raffin N (2008). Life expectancy and the environment. CES Working Papers No. 48, Consumer Technology Association, Las Vegas, USA.

Meiners NH and da Santana SC (2014). Demographic change and the economics of an aging society: Key findings on the theoretical positioning of economics of aging in science. The Journal of Social, Political and Economic Studies (JSPES), 39(3): 315-341.

Mondal MNI and Shitan M (2014). Relative importance of demographic, socioeconomic and health factors on life expectancy in low-and lower-middle-income countries. Journal of Epidemiology, 24(2): 117-124. https://doi.org/10.2188/jea.JE20130059 **PMid:24390415 PMCid:PMC395669**

Monsef A and Mehrjardi AS (2015). Determinants of life expectancy: A panel data approach. Asian Economic and Financial Review, 5(11): 1251-1257. https://doi.org/10.18488/journal.aefr/2015.5.11/102.11.1251.1257

Murwirapachena G and Mlambo C (2015). Life expectancy in Zimbabwe: An analysis of five decades. International Business and Economics Research Journal (IBER), 14(3): 417-430. https://doi.org/10.19030/iber.v14i3.9207

Naimark D (2008). Life expectancy measurements. In: Kristian H and Quah SR (Eds.), International encyclopedia of public health. Academic Press, Cambridge, USA. https://doi.org/10.1016/B978-012373960-5.00187-8

Negin J, Martiniuk A, Cumming RG, Naidoo N, Phaswana-Mafuya N, Madurai L, and Kowal P (2012b). Prevalence of HIV and chronic comorbidities among older adults. AIDS, 26(Suppl 1): S55-S63. https://doi.org/10.1097/QAD.0b013e3283558459 **PMid:22781177 PMCid:PMC4404756**

Negin J, Mills EJ, and Bärnighausen T (2012a). Aging with HIV in Africa: The challenges of living longer. AIDS, 26(Suppl 1): S1-S5. https://doi.org/10.1097/QAD.0b013e3283560f54 **PMid:22713477 PMCid:PMC4017661**

Negin J, Randell M, Raban MZ, Nyirenda M, Kalula S, Madurai L, and Kowal P (2017). Health expenditure and catastrophic spending among older adults living with HIV. Global Public Health, 12(10): 1282-1296. https://doi.org/10.1080/17441692.2016.1173717 **PMid:27132656**

Shahbaz M, Loganathan N, Mujahid N, Ali A, and Nawaz A (2016). Determinants of life expectancy and its prospects under the role of economic misery: A case of Pakistan. Social Indicators Research, 126(3): 1299-1316. https://doi.org/10.1007/s11205-015-0927-4

WBG (2017). Life expectancy at birth, total (years). World Bank Group, Washington, D.C., USA.

Yavari K and Mehrnoosh M (2006). Determinants of life expectancy: A cross-country analysis. Iranian Economic Review, 11(15): 131-142.

Yoon MJW, Kim MJ, and Lee J (2014). Impact of demographic changes on inflation and the macroeconomy (No. 14-210). International Monetary Fund, Washington, D.C., USA. https://doi.org/10.5089/9781498396783.001