

Modeling Life Expectancy in Indonesia Using System GMM Model

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Abstract. *Life expectancy marks the success of efforts to provide basic rights, such as access to good health services. Lack of improvement in conditions or stagnation is often considered a cause for concern because it can lead to a decline in the health profile of the population driven by adverse socioeconomic status trends. Consequently, the determinants of modeling the life expectancy of males and females in Indonesia were carefully selected by collecting data in 34 Indonesian provinces from 2010-2020. The modeling was carried out using the Generalized Method of Moment (GMM) method with the GMM system model approach. The results showed that the availability of health infrastructure and environmental conditions, such as sanitation and access to safe drinking water are very important to support and guarantee access to health services needed by the community. Social and economic status, such as GRDP per capita, literacy, unemployment, and poverty also contribute to the increase in life expectancy of males and females in Indonesia. Furthermore, the realization of government policies in the health sector must be continuously evaluated for the sustainability of the infrastructure development acceleration program by prioritizing community welfare improvement.*

Keywords: Health Infrastructure, Health Conditions, Life Expectancy, Socio-economic Status, System GMM Model.

JEL Codes: I15, O15, C23

1. Introduction

Life expectancy (LE) is a measure of a country's public health (Hum et al., 2015), and the double-fold increase, which occurred in the last century is evidence of substantial advances in science and health (Jamison et al., 2013; Vallin & Meslé, 2009). Several studies have also been carried out in the fields of economics, medicine, public health, and political science to determine its influential factors (Muntaner et al., 2011; Selck & Deckarm, 2015).

A country is said to have an old population structure when the proportion of the elderly aged >60 years is ≥10% of the total population (Adioetomo & Mujahid, 2014). Furthermore, Indonesia is one of the countries with the tendency to have this type of structure because the proportion of old people is 7.6% (Badan Pusat Statistik, 2015), and this number is also expected to rise to 15.77% by 2035. This increase occurred along with Indonesia's life expectancy from 69.8 years in 2010 and is projected to be 72.4 years by 2035 (Badan Pusat Statistik, 2013). The aging population structure is an indicator of the success of achieving human development nationally due to improvements in nutrition, sanitation, advances in medical technology, health services, and increased education (Martínez & Oller, 2019).

UNDP (2019) reported that the Human Development Index (HDI) in 2018 was 0.707 and it was ranked 111 among 189 countries and regions. Indonesia was below the average of 0.750 for countries with high HDI and below the average of 0.741 for countries in East Asia and the Pacific. When compared to China and the Philippines, its HDI ranked 85 and 106, respectively. A previous report also revealed that countries with high HDI have high subscriptions to fixed broadband, which is 15 times faster and the adults are more than six times faster in education compared to others with low HDI.

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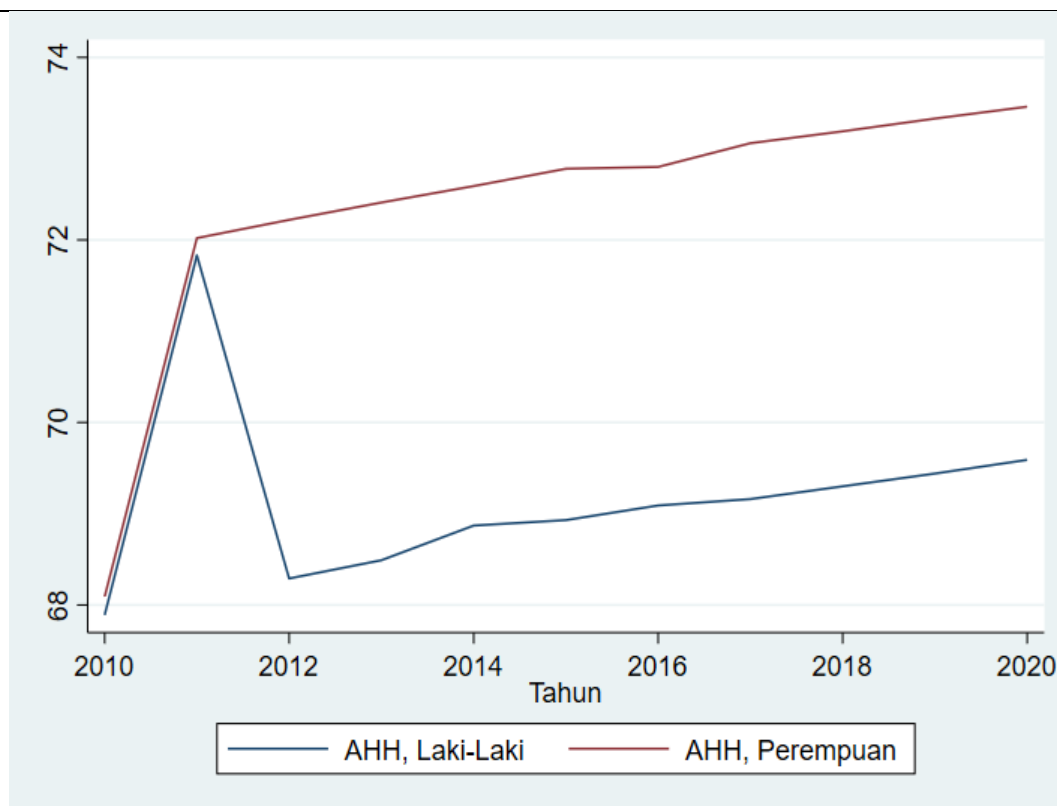


Figure 1. The Development of Life Expectancy (LE) for Male and Female in Indonesia, 2010-2020
 (Source: Central Bureau of Statistics, Author's Calculation)

The development of life expectancy (LE) in Indonesia during the decentralization era from 2010-2020 shows that females were higher than males. In 2011, the male LE was 71.83 years, while it decreased by 3.54 years to 68.29 years in 2012 and is expected to continue increasing. Since 2010, there has also been a continuous increase for females, and a value of 73.46 years was recorded in 2020. The difference between male and female life expectancy is caused by several factors, such as biological, socio-economic status, health, and environmental conditions.

Several studies on the impact of health infrastructure development, political conditions, and socio-economic status showed contradictory results. A previous study stated that investment in health infrastructure development can make community members more healthy (Amaghionyeodiwe, 2004; Craigwell et al., 2007). However, Monteiro & Turnovsky (2008) argue differently that it cannot improve the quality of human resources. Lack of access to healthcare facilities is caused by distrust of government programs as policymakers (Qureshi, 2009), economic conditions, such as budget constraints and recession (Gilmour et al., 2010), inadequate facilities, and people living in rural or semi-urban areas (Freed et al., 2013; Gupta et al., 2014; Habibullah et al., 2016).

The availability of infrastructure is important for the development of a country that can unlock potential, such as increasing employment, alleviating poverty, reducing income inequality, and improving economic growth (Negara, 2016; Salim & Negara, 2018; Kustanto, 2020). Engineer et al. (2008) and Mello & Pisu (2009) revealed that one of the factors affecting health development is accessibility, namely whether or not the health infrastructure is affordable by the community. This is because all residents do not live in urban areas, which often have complete equipment. Furthermore, equitable health human resources are one of the criteria that must be fulfilled in achieving development in the health sector.

Changes in LE are also influenced by the country's social status and political conditions (Shen & Williamson, 1997; Kabir, 2008), which are often used as variables in determining life expectancy (Navarro et al., 2006; Franco et al., 2004; Lin et al., 2012). Democratic countries can easily exercise their civil liberty rights to speak out and demand improvements in public services as well as act on their political opinions. The governments are also willing to listen and be encouraged to improve services that are closely related to the needs of the community (Lake & Baum, 2001; Gerring et al., 2011).

Based on the problems above, the increase in life expectancy can be considered good and bad. The good part is that it ensures improvements in the community's welfare and health, while the bad part involves an increase in the number of people suffering from non-communicable or communicable diseases. Therefore, this study aims to examine the impact of health infrastructure, political conditions, health conditions, environmental health, and socioeconomic status on male and female LE in Indonesia between 2010-2020. These determinants are very dynamic and constantly evolving, hence, it is important to further investigate their influence.

2. Literature Review

Constraints faced by several developing countries include the availability of infrastructure, political culture, and socioeconomic status (Todaro & Smith, 2012; Cournane et al., 2015; Chokkanathan & Mohanty, 2017). Lakshmi & Sahoo (2013) in Andhra Pradesh, India reported that healthcare infrastructures, such as the availability of hospitals, pharmacies, doctors, and the number of hospital beds had a positive and significant effect on health indicators, such as life expectancy. Similar results were also obtained by Grzywacz (2000), Amaghionyeodiwe (2004), Allin, Grignon, & Le, (2010), and Kim et al. (2017) where the equitable distribution of resources in an area was a determining factor for improving public health status. However, building infrastructures and the availability of these resources alone are not enough to achieve good status. This is because other factors, such as the operational efficiency, implementation, and maintenance of the health facilities in the country are also important (Robson et al., 2007). The causality relationship between CO₂, carbon emissions, health spending, and economic growth is bidirectional globally, while it is unidirectional in middle and upper-middle-income countries, except for low-income countries that do not show evidence of causality (Chaabouni & Zghidi, 2016).

Health is an example of a nation's success and vision, with increased longevity of 8 years since 1990 (The Lancet, 2019). According to the World Health Organization (WHO), to improve the welfare and health status of the community, it is very important to build synergies between the government and the community as the basis for achieving goals in a better direction. This cooperation is expected to help both parties take action and harmonize plans as well as set priorities for development in the health sector. Furthermore, cooperation, which is aimed at achieving common goals can be in various forms. For example, cross-border collaboration, such as the United Nations Office for South-South Cooperation (UNOSSC) and collaboration between Sudan, South Sudan, and Uganda (Taylor, 2016). It can also be in the form of cooperation between countries, such as members of the United Nations. In Asia, countries, such as Japan that have prefectures with similar backgrounds, history, culture, and geographical conditions are grouped into different regions. Previous studies revealed that there are different collaborations in several sectors, including the field of public health (Nomura et al., 2017).

The Indonesian government under the administration of Joko Widodo "Jokowi" currently believes that the availability of infrastructure in the country is poor, which led to social injustice. The current condition is better compared to when the economy was badly hit by the 1997 Asian monetary economic crisis. The Indonesian government is currently struggling to increase investment in infrastructure to a level that can encourage high economic growth as seen at the outset of the 1990s. They also realized that the health status of the community is important in responding to the current changes. Therefore, this study aims to examine the effect of health infrastructure development, political conditions, health conditions, and socio-economic status in 34 provinces of Indonesia on life expectancy. These determinants are very dynamic and continuously evolving, hence, it is important to investigate their influence.

3. Methodology

The data used in this study were obtained from the Indonesian Health Profile, Welfare Statistics, and Indonesian Statistics, which they were publicly accessible. Furthermore, this study examined the association of health and non-health variables with male and female life expectancy. The model used to analyze the determinants of LE was adapted from Kabir (2008), and then modified as follows:

$$LEMale = f(H, NH) \quad (1)$$

$$LEFemale = f(H, NH) \quad (2)$$

In equations 1 and 2, the health variable includes the number of general practitioners at the Public Health Center, specialist doctors, nurses, hospital beds, the ratio of the Public Health Center, the coverage of health insurance participation, health complaints, outpatient treatment, the number of new HIV and AIDS cases, percentage of babies who are exclusively breastfed, drinking water facilities, sanitation, toilet facilities, giving birth with the help of health workers, as well as the percentage of active family planning participation. Meanwhile, the non-health variables include GRDP per capita, poverty, inequality, unemployment rate, and literacy rate. Some of the independent variables were only available for females. Table 1 was created for the understanding of the variables used in the analysis.

Table 1: Definition of Variables Used in the Analysis

Notation	Meaning	Source
Dependent Variable		
LEMale	Male life expectancy (Percent)	Central Bureau of Statistics
LEFemale	Female life expectancy (Percent)	Central Bureau of Statistics
Independent Variable		
Socio-economic Variables		
PCGRDP	Gross Regional Domestic Product per Capita (Thousand Rupiah)	Central Bureau of Statistics
POVERTY	Percentage of poor people (Percent)	Central Bureau of Statistics
GINI	Income inequality (Index)	Central Bureau of Statistics
UNEMPL	Open unemployment rate (Percent)	Central Bureau of Statistics
LITERACY	Literacy rate (Percent)	Central Bureau of Statistics
Health Variable		
HC_DOCTOR	Health center doctor (Soul)	Indonesian Health Profile
SPESIALIST_DOCTOR	Specialist doctor (Soul)	Indonesian Health Profile
SUSTER	Number of nurses (Soul)	Indonesian Health Profile
HIV	Number of new HIV cases (Soul)	Indonesian Health Profile
AIDS	Number of new AIDS cases (Soul)	Indonesian Health Profile
SANITATION	Sanitation (Percent)	Central Bureau of Statistics
HOSPITAL_BED	Number of beds in hospital by treatment class (Unit)	Indonesian Health Profile
HCR	Health center ratio per eye (Percent)	Indonesian Health Profile
HIC	Health insurance coverage (Percent)	Indonesian Health Profile
PAIN_COMPLAINT	Percentage of population with health complaints (Percent)	People's Welfare Statistics

Notation	Meaning	Source
OUTPATIENT	Percentage of population who received outpatient treatment during the last month (Percent)	People's Welfare Statistics
PDW	Households with proper drinking water facilities (Percent)	Central Bureau of Statistics
BIRTH_HW	Giving birth with the help of a health worker (Percent)	Indonesian Health Profile
OWN_TOILET	Households with own toilet facilities (Percent)	People's Welfare Statistics
EB_BABY	Percentage of infants exclusively breastfed (Percent)	Indonesian Health Profile
KB_ACTIVE	Percentage of active family planning participation (Percent)	Indonesian Health Profile

Source: Central Bureau of Statistics, Author's Calculation

The data analysis method used was the dynamic panel data or Generalized Method of Moment (GMM). Furthermore, the dynamic panel data regression method uses panel data by adding a dependent variable lag to serve as an independent/predictor in the model (Gujarati, 2004:656). It is often used to analyze the dynamic economy, which indicates that a dependent variable is not only influenced by others but is also influenced by itself, namely its past value. There are two basic reasons why the dynamic panel approach was used in this study, namely 1) it is a common estimator, which provides a framework for comparison and assessment; 2) it offers a simple alternative to other estimators, especially maximum likelihood (Arellano & Bond, 1991). The regression model used is illustrated below:

$$Y_{i,t} = \alpha + \beta Y_{i,t-1} + \gamma X_{i,t-1} + \eta_i + \varepsilon_{i,t} \quad (3)$$

Where, Y is the dependent variable, X stands for the vector of explanatory variables, α is the intercept, β , γ is the vector of predictor variable coefficients, η is the fixed effect time, ε is a component of the model, i is the number of observations (cross-section), and t is time (time series). In the model of equation (3), the variable $Y_{i,t}$ is a function of $\varepsilon_{i,t}$, while $Y_{i,t-1}$ is also a function of $\varepsilon_{i,t}$. Therefore, there is a correlation between the regressor variables $Y_{i,t-1}$ with error ($\varepsilon_{i,t}$), which led to bias and inconsistency in the pool last square (PLS) estimator. This condition causes endogeneity problems, which indicate that when the model is estimated using a fixed or random effects approach, it produces biased and inconsistent estimators (Baltagi, 2005:135). To overcome these problems, Arellano & Bond (1991) proposed GMM, which is illustrated below:

$$Y_{i,t} - Y_{i,t-1} = \beta (Y_{i,t-1} - Y_{i,t-2}) + \gamma (X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} + \varepsilon_{i,t-1}) \quad (4)$$

In equation (4), the first differencing eliminates the intercept as well as the province-specific effect (η_i). However, estimation (4) is biased and inconsistent because the dependent variable lag ($Y_{i,t-1} - Y_{i,t-2}$) and error term ($\varepsilon_{i,t} + \varepsilon_{i,t-1}$) correlate. The selected explanatory variables can also be endogenous, hence, Arellano and Bond (1991) imposed the following moment limitation, which excludes the possibility of endogeneity in the model.

$$E [Y_{i,t-n}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } n \geq 2; t = 3, \dots, T \quad (5)$$

$$E [X_{i,t-n}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } n \geq 2; t = 3, \dots, T \quad (6)$$

The above moment limitation is applied under the assumption that: 1) the disturbance term is not serially correlated, 2) the regressor is weakly exogenous, which indicates that it does not correlate with the present and future values of the disturbance term, but can correlate with the past realization of the disturbance term (Guru & Yadav, 2019). Therefore, a valid instrument causes a lag in the values of the explanatory variables. The OLS estimation of equation (4) is biased and inconsistent because the dependent variable in the equation can be correlated with error. Table 2 presents a summary of the statistics of the variables used in this study.

Table 2. Summary Statistics

Variables	Obs	Mean	Std. Dev.	Min.	Max.
Dependent Variable					
LEMale	371	7.119.313	2.663.429	64.45	76.83
LEFemale	371	6.734.919	267.352	60.64	73.22
Independent Variable					
lnHC_DOCTOR	370	595.396	0.8306436	3.806.663	7.961.719
lnSPESIALIST_DOCTOR	370	5.964.076	1.470.227	0.3715636	9.055.906
lnSUSTER	370	8.677.614	0.8062128	6.990.256	1.093.012
lnHIV	338	6.029.182	1.476.758	1.609.438	9.097.732
lnAIDS	341	4.583.652	1.468.882	0	7.654.917
OUTPATIENT	369	4.678.762	8.202.742	27.79	70.89
PAIN_COMPLAINT	369	2.867.588	5.666.075	15.2	44.95
SANITATION	369	6.315.892	1.617.676	16.12	96.96
PDW	369	6.789.954	1.525.309	22.32	99.84
OWN_TOILET	369	7.109.485	1.228.604	33.06	93.55
HCR	370	1.727.568	1.018.487	0.28	7.73
HIC	370	7.286.616	2.168.612	24.8	165.45
EB_BABY	371	5.471.364	1.880.087	12.4	90.79
lnHOSPITAL_BED	370	8.448.779	1.031.616	5.631.212	1.089.927
BIRTH_HW	370	8.009.716	1.675.608	17.79	114.42
KB_ACTIVE	367	6.838.341	1.306.666	4.8	94.52
lnPCGRDP	371	1.034.658	0.5698749	9.139.573	1.207.147
POVERTY	369	1.175.726	6.349.244	3.42	36.8
UNEMPL	369	5.530.949	2.166.411	1.4	13.74
GINI	369	0.3626477	0.0389213	0.257	0.459
LITERACY	369	9.498.065	5.475.583	64.53	99.87

Source: Central Bureau of Statistics, Author's Calculation

4. Results and Discussions

Table 3 shows that, there are three models of the GMM System where the dependent variable is the male and female life expectancy. The specification test results in the dynamic panel data regression model using the system. This was because Blundell and Bond correlated the bias and poor precision of the First Differences GMM estimator with a weak instrument characterized by the concentration of the parameters. Furthermore, the additional light stationarity constraint on the initial state process allows the use of the estimator to be extended using the lag difference y_{it} , which is an instrument for level-level equations. It can also be extended with the lag level y_{it} , which is an instrument for the equation in first differences. The results

showed that the System GMM estimator increased efficiency compared to the First Differences GMM (Baltagi, 2005:147-148).

Arellano and Bond (1991) as well as Blundell and Bond (1998) in Monte Carlo stated that the two-step estimator led to a decrease in efficiency gains, but the associated asymptotic error was downwardly biased. At this stage, the estimation was carried out in a dynamic panel data regression model using a GMM system approach with the instrument. Various diagnostic tests in line with the process were also performed. The validity of the instrument was tested with the Sargan test, while the existence of serial correlation was assessed using the Arellano Bond test on AR (1) and AR (2). This was to ensure that the estimate obtained was consistent with the null hypothesis, namely the absence of autocorrelation. The statistic of Sargan test showed that the instrument selected from the estimated models was valid because the null hypothesis was not rejected and the results were not significant. Similar results were also obtained from the Arellano-Bond test statistics, where all the estimated models had no serial correlation. This is because the statistical test on AR (1) in all models was significant, while it was not significant on AR (2).

In Appendix 1. Table 3 shows that the availability of health workers in terms of the number of doctors at the Public Health Center, as well as the number of nurses and specialists in Model 1, showed that the doctors' population had a positive and significant effect on male and female life expectancy. Model 2 shows that the number of nurses has a positive relationship, but does not have a significant effect on male LE. Meanwhile, it had a significant and positive effect on females. These results are consistent with (Rogers and Wofford, 1989; Grubaugh and Santerre, 1994). The availability of doctors and nurses across various health centers and inter-provincial hospitals in Indonesia is very important in strengthening human resources and other health programs to make the community healthier. This is because public health is very dependent on the increased numbers of doctors and nurses in hospitals (Lakshmi, 2013), as well as the availability of workers to ensure access to healthcare services. The results showed that the number of specialist doctors in models 1, 2, and 3 has a negative and significant effect on the life expectancy of males and females. This finding indicates that the availability of workers who are developed using inputs, such as the number of specialists is needed because public health is very important. Apart from this factor, it is also highly dependent on operational efficiency, implementation, maintenance of infrastructure, and the efficiency of utilizing specialist doctors in various facilities.

Health conditions, such as AIDS and HIV in models 1, 2, and 3 showed that AIDS has a negative and significant relationship with life expectancy for males and females. Meanwhile, HIV in models 1 and 3 had a negative and significant effect on male LE. In model 2, it also had a negative but not significant effect on males. Model 1 showed that HIV has a negative and significant effect on female life expectancy, while it had a negative but insignificant effect in 2 and 3. These findings indicate that AIDS and HIV have a negative impact on health conditions, which can worsen people's LE. This study is consistent with Buvé et al (2002) that the population of Sub-Saharan Africa living with a serious and life-threatening illness, such as AIDS had important implications on disease burden and it reduced life expectancy. Christopher S. von Bartheld et al., (2017) also revealed that people without HIV/AIDS have an age gap of 8 years in survival compared to others with the disease.

Health conditions, such as residents receiving outpatient treatment, giving birth assisted by health workers, and active family planning participation in models 1 and 3 showed that the percentage of the population receiving treatment has a positive and significant impact on male life expectancy, while the effect was insignificant in model 2. Meanwhile, models 1, 2 and 3 showed that it has a positive and significant effect on female LE. The percentage of the population who have complaints of illness in 1, 2 and 3 had a positive and significant effect on the LE of males and females. In models 1 and 3, the percentage of births assisted by health workers has a positive and significant effect on women's life expectancy. This finding indicates that the higher the percentage of births, the greater the effect. These results are consistent with (Maryani & Kristiana, 2018; Pratiwi & Wibowo, 2016) that the higher and better the health condition, the higher the life expectancy of males and females. Models 1 and 3 on active family planning participation have a negative and significant effect on female LE. This finding indicates that the higher the participation, the

lower the LE recorded. The results showed that an active family planning program has a role in delaying or providing a period for giving birth. Therefore, the higher the active family planning, the lower the life expectancy because its active implementation after childbirth is a strategic effort to reduce the birth rate.

Environmental health conditions, such as sanitation and ownership of private toilets in model 1 showed that sanitation has no effect, but has a positive relationship with life expectancy for males and females. In Model 2, it had a positive and significant effect on LE. Private ownership of toilet facilities in model 1 has no significant effect, but it has a positive relationship with the life expectancy of males and females. Improved access to these facilities and ownership of private toilets creates a healthier environment, which leads to improved health status and higher life expectancy. These findings are in line with (Gupta et al., 2004; Rahman et al., 2022) that health is positively affected by per capita income, urbanization, access to sanitation, water, and ownership of toilets. Lack of access to the necessary facilities can increase the spread of diseases, such as hepatitis and diarrheal diseases including cholera and a weakened immune system.

Environmental health conditions, such as access to safe and proper drinking water in Model 3 had a positive and significant effect on the life expectancy of males and females. This is because water is needed to carry out bodily functions, such as regulating temperature and transporting nutrients. Furthermore, these findings are in line with research studies carried out by (Gupta et al., 2002; Greenidge and Stanford, 2007; Rahman et al., 2022; Angelakis et al., 2021). Clean water greatly affects human health, because people living with polluted water are prone to several disease conditions. Macfarlane et al. (2000) stated that several African and Asian countries experienced dramatic increases in life expectancy during the mid-twentieth century, due to increased access to safe drinking water. Similar results were also obtained by Gulis (2000) in 156 countries.

Models 1 and 2 show that the percentage of infants who are exclusively breastfed has no effect, but has a positive relationship with male life expectancy, while it has a positive and significant association in 3. Meanwhile, it has a positive relationship along with an insignificant effect on female LE in all models. These findings indicate that the duration of breastfeeding greatly affects infant survival in Indonesia. This is in line with (Black et al., 2008; Azuine, 2015) that exclusive breastfeeding can reduce the risk of chronic diseases, such as breast cancer, diabetes, and obesity in mothers. It is also beneficial to babies by facilitating their growth and development. This is because breast milk contains several nutrients needed by infants, and has the potential to prevent 1.4 million deaths among children under the age of five in developing countries every year.

The availability of infrastructure, such as the number of beds and Public Health Centers as well as health insurance participation showed that hospital bed has a positive and significant effect on the life expectancy of males and females in model 2. Meanwhile, the ratio of the Public Health Center had a positive and significant effect on LE in all models. The level of health insurance participation has a positive and significant effect in Model 1. Similar results were also obtained by (Grubaugh and Santerre, 1994; Kristanto et al., 2019). The availability of health infrastructure, such as the number of beds and centers as well as the level of health insurance participation have a positive impact on health, which can cause an increase in life expectancy for the community. This is because the availability of these facilities is very important in increasing LE, especially for people living in developing communities, including the 34 provinces in Indonesia. Health insurance can also create opportunities to access services as well as facilitate financing for intensive medical care.

The economic status in model 2 showed that Gross Regional Domestic Product (GRDP) per capita has a positive, but insignificant relationship with female life expectancy, while it had a positive and insignificant relationship with male LE in 1. Model 3 shows that it has a significant positive relationship with male life expectancy. This indicates that the higher the GRDP per capita, the higher the LE of the community. An increase in the average income also increases the purchasing power for goods and social services that can improve nutritional health, reduce mortality, and increase LE. Meanwhile, lower GRDP has no significant effect, which indicates that it can lead to disparities in income distribution (Craigwell et al., 2007). These results are in line with (Anand and Ravallino, 1993; Gulis, 2000; Craigwell et al., 2007; Kabir, 2008) that

countries with higher levels of economic development often invest more in public health. It can also be concluded that when more money is spent by the public on health, it increases the GRDP per capita. Several studies revealed that there is a strong negative correlation between the absolute level of income measured by GDP per capita and life expectancy among poor countries (Bank Dunia, 1993). Anand and Ravallion (1993) carried out a cross-country comparison, and the results showed that there is a significant positive relationship between GNP per capita and LE. This was caused by the impact of national revenue on the incomes of the poor and public spending on health.

Models 1 and 2 show that poverty has a negative relationship with male life expectancy, but it has no significant effect. Meanwhile, models 2 and 3 showed that it had a significant effect and a negative relationship with female LE, but an insignificant effect was obtained in 1. These findings indicate that the higher the percentage of poor people in an area, the lower the life expectancy of the community. This is consistent with (Subramanian et al., 2002; Widodo et al., 2021) that poverty in the community is causally related to poor public health. This is because the consumption patterns of the poor, which do not consider the adequacy of nutritional intake can worsen health conditions.

Model 1 shows that the unemployment rate has a negative effect and an insignificant relationship with the life expectancy of males and females, while model 2 has a negative and significant association. These findings indicate that the higher the number of unemployed people, the lower the LE recorded. This is consistent with (Grözinger, 2014; Kristanto et al., 2019) that the unemployment rate affects life expectancy dominantly and has a negative relationship. This is because people who do not have a job tend to have poorer health status compared to others that are employed.

Model 2 shows that income inequality has a negative, but insignificant relationship with male life expectancy, while model 3 has a negative relationship with no effect on female LE. These findings indicate that the higher the inequality of income distribution, the lower the life expectancy. This is in line with (Lynch, 2001; De Vogli et al., 2005; Kristanto, 2019) that when the distribution is uneven between regions, it affects the LE. However, higher income inequality is not associated with lower life expectancy. The weak effect of its decrease in Indonesia is caused by several factors, such as the decrease in the amount spent on health costs. Income inequality has contributed to the low access of the community to healthcare services due to transportation costs as well as the lack of household savings in the health sector.

Models 1 and 3 show that the literacy rate has a positive and significant effect on the life expectancy of males and females. It also has a statistically significant role in explaining LE. These findings are consistent with (Veugelers et al., 2001; Gulis, 2000; Williamson and Boehmer, 1997; Gilbert et al., 2018) that well-educated people often have a lower mortality rate. Improvements in education can lead to higher life expectancy across all of Indonesia's provinces. People with poor literacy skills are more likely to be unemployed or have low incomes, and these factors are associated with lower LE. This is because limited financial resources are associated with poorer physical and mental health. Meanwhile, people with higher literacy skills are more likely to be employed and receive higher incomes, thereby increasing their LE.

Life expectancy between males and females in 34 provinces in Indonesia can be increased when attention is paid to improving health infrastructure, such as the number of doctors, nurses, hospital beds, and other health facilities. These infrastructures must also be equally accessible to all communities in urban and rural areas to increase their life expectancy. Health conditions, such as AIDS and HIV are influential factors that also need attention and appropriate policies from the government. Environmental health, such as access to proper and safe drinking water as well as sanitation can play a role in ensuring people are healthy. Furthermore, social and economic status is conventionally considered to be very influential in determining life expectancy for males and females.

5. Conclusions

Life expectancy is the primary measure of a population's health and well-being. Its level can also reflect a country's social and economic conditions as well as the quality of public health and healthcare infrastructures. The monumental improvement in life expectancy has been a major trend in developing countries since the 20th and 21st centuries. In the absence of wars, new epidemics, or substantial economic reforms, a lack of improvement or stagnation in LE often raise concerns, while its decrease leads to several worries. Therefore, this study was carried out to evaluate the government's performance in improving welfare and people's health status. This was indicated by the male and female LE, hence, they were able to facilitate the achievement of the Sustainable Development Goals (SDGs).

This study also explored the impact of health infrastructure and conditions, political conditions, environmental health, and socioeconomic status on male and female life expectancy in Indonesia using the GMM method along with the GMM system. Twenty-one variables were used as a regression to test their significance in determining the LE across the various provinces in Indonesia. The results showed that most of the variables have a significant effect and are in line with the findings of previous studies. In modeling the GMM system, the findings revealed that the availability of infrastructure, such as health facilities is an important factor to support health services in the form of treatment and prevention of disease. Furthermore, the availability of health workers can also guarantee access to services needed by the community. These efforts are expected to lead to an increase in life expectancy. Environmental conditions, such as sanitation as well as access to proper and safe drinking water play a very important role in ensuring public health. They also improve the social and economic status, such as GRDP per capita, literacy, unemployment, and poverty, thereby increasing the life expectancy of males and females in Indonesia.

This study's results have several important policy implications for the government to increase LE between provinces in Indonesia, namely: 1) the importance of investing in health infrastructure development to improve and ensure a better and comprehensive public health status; 2) the realization of government policies in the health sector must continue to be evaluated for the consequences and benefits of the sustainability of the infrastructure development acceleration program. Budget allocation to the productive sector and more effective budget implementation by prioritizing community welfare improvement and social protection must also be carried out; 3) the accessibility of infrastructure and equitable health resources must be fulfilled in realizing development in the health sector.

6. References

- [1] Adioetomo, S. M., & Mujahid, G. (2014). *UNFPA Indonesia Monograph Series No. 1: Indonesia on the Threshold of Population Ageing* (H. Posselt (ed.)). UNFPA - United Nations Population Fund.
- [2] Allin, S., Grignon, M., & Le, J. (2010). Social Science & Medicine Subjective unmet need and utilization of health care services in Canada: What are the equity implications? *Social Science & Medicine*, 70(3), 465–472. <https://doi.org/10.1016/j.socscimed.2009.10.027>
- [3] Amaghionyeodiwe, L. A. (2004). *Government health care spending and the poor: evidence from Nigeria*. <https://doi.org/10.1108/03068290910932729>
- [4] Anand, S and M Ravallion (1993), "Human Development in Poor Countries: On the Role of Private Income and Public Services", *Journal of Economic Perspectives*, 7(1):133-150.
- [5] Angelakis, A. N., Vuorinen, H. S., Nikolaidis, C., Juuti, P. S., Katko, T. S., Juuti, R. P., Zhang, J., & Samonis, G. (2021). Water quality and life expectancy: Parallel courses in time. *Water (Switzerland)*, 13(6), 1–15. <https://doi.org/10.3390/w13060752>
- [6] Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. 58(2), 277–297.

-
- [7] Azuine, R. (2015). Exclusive Breastfeeding and Under-Five Mortality, 2006-2014: A Cross-National Analysis of 57 Low- and-Middle Income Countries. *International Journal of MCH and AIDS (IJMA)*, 4(1), 13–21. <https://doi.org/10.21106/ijma.52>
- [8] Badan Pusat Statistik. (2013). *Proyeksi Penduduk Indonesia 2010-2035*. Jakarta.
- [9] Baltagi BH. (2005). *Econometric Analysis of Panel Data*, Ed.3, John Wiley & Sons, Ltd, England.
- [10] Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., Mathers, C., & Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 371(9608), 243–260. [https://doi.org/10.1016/S0140-6736\(07\)61690-0](https://doi.org/10.1016/S0140-6736(07)61690-0)
- [11] Blundell, Richard, and Stephen Bond. (1998). “Initial Conditions and Moment Restrictions in Dynamic Panel Data Models.” *Journal of Econometrics*. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- [12] Buvé, A, K Bishikwabo-Nsarhaza, and G Mutangadura (2002), “The spread and effect of HIV-1 infection in sub-Saharan Africa”, *Lancet*, 359:2011-2017.
- [13] Chaabouni, S., & Zghidi, N. (2016). On the causal dynamics between CO2 emissions, health expenditure and economic growth. *Sustainable Cities and Society*. <https://doi.org/10.1016/j.scs.2016.02.001>
- [14] Chokkanathan, S., & Mohanty, J. (2017). Health, family Strains, dependency, and life satisfaction of Older Adults. *Archives of Gerontology and Geriatrics*. <https://doi.org/10.1016/j.archger.2017.04.001>
- [15] Christopher S. von Bartheld, J. B. and S. H.-H., Glowicz, & Bunney, P. E., Zink, A. N., Holm, A. A., Billington, C. J., & Kotz, C. M. (2017). Narrowing the Gap in Life Expectancy Between HIV-Infected and HIV-Uninfected Individuals With Access to Care. *Physiology & Behavior*, 176(5), 139–148. <https://doi.org/10.1097/QAI.0000000000001014>.Narrowing
- [16] Cournane, S., Dalton, A., Byrne, D., Conway, R., Riordan, D. O., Coveney, S., & Silke, B. (2015). European Journal of Internal Medicine Social deprivation , population dependency ratio and an extended hospital episode — Insights from acute medicine. *European Journal of Internal Medicine*, 26(9), 714–719. <https://doi.org/10.1016/j.ejim.2015.09.001>
- [17] Craigwell, R., Bynoe, D., & Lowe, S. (2007). The effectiveness of government expenditure on education and health care in the Caribbean. <https://doi.org/10.1108/14468951211213831>
- [18] De Vogli, R., Mistry, R., Gnesolto, R., & Cornia, G. A. (2005). Has the relation between income inequality and life expectancy disappeared? Evidence from Italy and top industrialised countries. *Journal of Epidemiology and Community Health*, 59(2), 158–162. <https://doi.org/10.1136/jech.2004.02065>
- [19] Engineer, M., King, I., & Roy, N. (2008). The human development index as a criterion for optimal planning *. 1(2), 172–192.
- [20] Franco, Á., Álvarez-dardet, C., & Ruiz, M. T. (2004). Effect of democracy on health : ecological study. *BMJ*, 329(December), 1421–1423.
- [21] Freed, C. R., Hansberry, S. T., & Arrietta, M. I. (2013). Structural and hidden barriers to a local health care infrastructure: Autonomy, decisions about primary health care, and the centrality and significance of power. *Res Sociol Health Care*, 31(1), 57–81. [https://doi.org/10.1108/S0275-4959\(2013\)0000031006](https://doi.org/10.1108/S0275-4959(2013)0000031006).STRUCTURAL
- [22] Gerring, J., Bond, P., Barndt, W. T., Moreno, C., Gerring, B. J., Bond, P., Barndt, W. T., & Moreno, C. (2011). Politics : Democracy and Economic Growth : A Historical Perspective How to cite this article : A Historical Perspective. *World Politics*, 54(3), 323–364. <https://doi.org/10.1353/wp.2006.0002>
- [23] Gilbert, L., Teravainen, A., Clark, C., & Shaw, S. (2018). Literacy and life expectancy: An evidence review exploring the link between literacy and life expectancy in England through health and socioeconomic factors. October. www.literacytrust.org.uk

-
- [24] Gilmour, T., Wiesel, I., Pinnegar, S., & Loosemore, M. (2010). *Social infrastructure partnerships : a firm rock in a storm ?* 15(3), 247–259. <https://doi.org/10.1108/13664381011087506>
- [25] Greenidge, K. and Stanford, S. (2007), “What are the determinants of the health status in Latin America and the Caribbean”, Central Bank of Barbados Working Papers, pp. 22-36.
- [26] Grubaugh, SG and RE Santerre (1994), “Comparing the performance of healthcare systems: An alternative approach”, *Southern Economic Journal*, 60(4):1030-1042.
- [27] Grözinger, G. (2014). *The Impact of Regional Unemployment on Life Expectancy in Germany* . May. <https://www.researchgate.net/publication/23991492>
- [28] Gupta, A., Satpathy, I., Patnaik, B. Chandra M.P., & Patel, N., (2014). Health Care Infrastructure Amenities: an Empirical Examination of Indian Perspective. *Journal of Technology Management in China*, 9(3), 245-262.
- [29] Gupta, S., Verhoeven, M. and Tiongson, E. (2002), “The effectiveness of government spending on education and health care in developing and transition economies”, *European Journal of Political Economy*, Vol. 18 No. 4, pp. 717-37
- [30] Grzywacz, J. G. (2000). Socioeconomic Status and Health Behaviors among Californians. In J. J. Kronenfeld (Ed.), *Health, Illness, and use of Care: The Impact of Social Factors (Research in the Sociology of Health Care, Vol. 18)* (pp. 121–149). Emerald Group Publishing Limited.
- [31] Gujarati, DN. (2004). *Basic Econometrics, Fourth Edition*. McGraw-Hill: New York
- [32] Gulis, G (2000), “Life expectancy as an indicator of environmental health”, *European Journal of Epidemiology*, 16(2):161-165.
- [33] Guru, B. K., & Yadav, I. S. (2019). Financial development and economic growth: panel evidence from BRICS. *Journal of Economics, Finance and Administrative Science*, 24(47), 113–126. <https://doi.org/10.1108/JEFAS-12-2017-0125>
- [34] Habibullah, P. M., Nasim-Us, S. M., & Ulrika, E. (2016). Socioeconomic inequalities of child malnutrition in Bangladesh. *International Journal of Social Economics*, 43(12), 1439–1459. <https://doi.org/10.1108/IJSE-03-2015-0065>
- [35] Hum, R. J., Verguet, S., Cheng, Y. L., McGahan, A. M., & Jha, P. (2015). Are global and regional improvements in life expectancy and in child, adult and senior survival slowing? *PLoS ONE*, 10(5), 1–14. <https://doi.org/10.1371/journal.pone.0124479>
- [36] Jamison, D. T., Jha, P., Malhotra, V., & Verguet, S. (2013). Human health: the twentieth century transformation of human health—its magnitude and value. In: How much have global problems cost the world. Cambridge University Press.
- [37] Kabir, M. (2008). Determinants of Life Expectancy in Developing Countries. *Journal of Developing Areas*, 41(2), 185–204.
- [38] Kim, T. J., Vonneilich, N., Lüdecke, D., & Knesebeck, O. Von. (2017). Income, financial barriers to health care and public health expenditure: A multilevel analysis of 28 countries. *Social Science & Medicine*. <https://doi.org/10.1016/j.socscimed.2017.01.044>
- [39] Kristanto, E., Daerobi, A., & Samudro, B. R. (2019). Indonesian Life Expectancy: Role of Health Infrastructure and Socio-Economic Status. *Signifikan: Jurnal Ilmu Ekonomi*, 8(2), 159–178. <https://doi.org/10.15408/sjie.v8i1.9579>
- [40] Kustanto, A. (2020). Pertumbuhan Ekonomi Regional di Indonesia: Peran Infrastruktur, Modal Manusia dan Keterbukaan Perdagangan. *Buletin Studi Ekonomi*, 25(1), 80–98. <https://doi.org/10.24843/BSE.2020.v25.i01.p05>

-
- [41] Lake, D. A., & Baum, M. A. (2001). The Invisible Hand of Democracy: Political Control and the Provision of Public Services. *Comparative Political Studies*, 34(6), 587–621. <https://doi.org/10.1177/0010414001034006001>
- [42] Lakshmi, T. S., & Sahoo, D. (2013). Health Infrastructure and Health Indicators: The Case of Andhra Pradesh, India. *IOSR Journal of Humanities and Social Science*, 6(6), 22–29. <https://doi.org/10.9790/0837-0662229>
- [43] Lin, R., Chen, Y., Chien, L., & Chan, C. (2012). Political and social determinants of life expectancy in less developed countries: a longitudinal study. *BMC Public Health*, 12(1), 85. <https://doi.org/10.1186/1471-2458-12-85>
- [44] Lynch, J. (2001). Income inequality, the psychosocial environment, and health: Comparisons of wealthy nations. *Lancet*, 358(9277), 194–200. [https://doi.org/10.1016/S0140-6736\(01\)05407-1](https://doi.org/10.1016/S0140-6736(01)05407-1)
- [45] Macfarlane, S, M Racelis and F MuliMusiime (2000), “Public health in developing countries”, *Lancet*, 356(2):841-846
- [46] Martínez, M. del C. V., & Oller, I. M. P. (2019). Health investment management based on patient satisfaction with the primary care doctor in the Spanish national health service context. A gender perspective. *MOJ Gerontology & Geriatrics*, 4(5), 204–211. <https://doi.org/10.15406/mojgg.2019.04.00208>
- [47] Maryani, H., & Kristiana, L. (2018). Pemodelan Angka Harapan Hidup (Ahh) Laki-Laki Dan Perempuan Di Indonesia Tahun 2016. *Buletin Penelitian Sistem Kesehatan*, 21(2), 71–81. <https://doi.org/10.22435/hsr.v21i2.245>
- [48] Mello, L. de, & Pisu, M. (2009). The Effectiveness of Education and Health Spending among Brazilian Municipalities. *OECD Economics Department Working Papers*, 53(712), 1–22
- [49] Monteiro, G., & Turnovsky, S. J. (2008). The composition of productive government expenditure. *Indian Growth and Development Review*, 1(1), 57–83. <https://doi.org/10.1108/17538250810868134>
- [50] Muntaner, C., Borrell, C., Ng, E., Chung, H., Espelt, A., Rodríguez-Sanz, M., Benach, J., & O’Campo, P. (2011). Politics, welfare regimes, and population health: Controversies and evidence. *Sociology of Health and Illness*, 33(6), 946–964. <https://doi.org/10.1111/j.1467-9566.2011.01339.x>
- [51] Navarro, V., Muntaner, C., Borrell, C., Benach, J., Quiroga, Á., Rodríguez-sanz, M., Vergés, N., & Pasarín, M. I. (2006). Politics and health outcomes. *Lancet*, 368(September 26), 1033–1037. [https://doi.org/10.1016/S0140-6736\(06\)69341-0](https://doi.org/10.1016/S0140-6736(06)69341-0)
- [52] Negara, S. D. (2016). Indonesia’s Infrastructure Development Under The Jokowi Administration. In D. Singh & M. Cook (Eds.), *Southeast Asian Affairs 2016* (pp. 145–165). ISEAS Publishing. <https://doi.org/10.1355/9789814695671-013>
- [53] Nomura, S., Sakamoto, H., Glenn, S., Tsugawa, Y., Abe, S. K., Rahman, M., Brown, J. C., Ezoe, S., Maruyama, S., Miyata, H., Mooney, M. D., Naghavi, M., Onoda, T., Ota, E., Otake, Y., Roth, G. A., Murray, C. J. L., & Shibuya, K. (2017). Population health and regional variations of disease burden in Japan , 1990 – 2015 : a systematic subnational analysis for the Global Burden of Disease Study 2015. *The Lancet*, 390(10101), 1521–1538. [https://doi.org/10.1016/S0140-6736\(17\)31544-1](https://doi.org/10.1016/S0140-6736(17)31544-1)
- [54] Qureshi, M. A. (2009). Human development , public expenditure and economic growth : a system dynamics approach. 36, 93–104. <https://doi.org/10.1108/03068290910921217>
- [55] Pratiwi, R. D. A., & Wibowo, W. (2016). Pengaruh Karakteristik Sosial Ekonomi Jawa Timur Menggunakan Analisis Regresi Multivariat. *Jurnal Sains Dan Seni ITS*, 5(2), 199–204.
- [56] Rahman, M. M., Rana, R., & Khanam, R. (2022). Determinants of life expectancy in most polluted countries: Exploring the effect of environmental degradation. *PLoS ONE*, 17(1 January), 1–16. <https://doi.org/10.1371/journal.pone.0262802>

-
- [57] Robson, L. S., Clarke, J. A., Cullen, K., Bielecky, A., Severin, C., Bigelow, P. L., Irvin, E., Culyer, A., & Mahood, Q. (2007). The effectiveness of occupational health and safety management system interventions: A systematic review. *Safety Science*, 45(3), 329–353. <https://doi.org/10.1016/j.ssci.2006.07.003>
- [58] Rogers, RG and S Wofford (1989), “Life expectancy in less developed countries: socio-economic development or public health?”, *Journal of Biosociological Science*, 21(2):245-252.
- [59] Salim, W., & Negara, S. D. (2018). Infrastructure Development Under The Jokowi Administration: Progress, Challenges and Policies. In H. Hill & S. D. Negara (Eds.), *The Indonesian Economy in Transition* (pp. 239–264). ISEAS Publishing. <https://doi.org/10.1355/9789814843102-012>
- [60] Selck, T. J., & Deckarm, R. (2015). Income, democracy, and public policy: The effects of improved sanitation on life expectancy. *Journal of Water Sanitation and Hygiene for Development*, 5(3), 525–529. <https://doi.org/10.2166/washdev.2015.025>
- [61] Shen, C. E., & Williamson, J. B. (1997). Child Mortality, Women’s Status, Economic Dependency, and State Strength: A Cross-National Study of Less Developed Countries. *Social Forces*, 76(2), 667–700.
- [62] Subramanian, SV, P Belli, and I Kawachi (2002), “The macroeconomic determinants of health”, *Annual Review of Public Health*, 23:287-302.
- [63] Taylor, M. (2016). *From Conflict to Cooperation? Sudan, South Sudan and Uganda*. <https://www.crisisgroup.org/africa/horn-africa/south-sudan/conflict-cooperation-sudan-south-sudan-and-uganda>
- [64] The Lancet. (2019). Successes and challenges for health in Indonesia. *The Lancet*, 393(10166), 2. [https://doi.org/10.1016/S0140-6736\(18\)33258-6](https://doi.org/10.1016/S0140-6736(18)33258-6)
- [65] Todaro, M. P., & Smith, S. C. (2012). *Economic Development*. London: Pearson Education.
- [66] UNDP. (2019). Human Development Report 2019 Inequalities in Human Development in the 21 st Century.
- [67] Vallin, J., & Meslé, F. (2009). The segmented trend line of highest life expectancies. *Population and Development Review*, 35(1), 159–187. <https://doi.org/10.1111/j.1728-4457.2009.00264.x>
- [68] Veugelers, PJ, AM Yip and G Kephart (2001), “Proximate and Contextual Socioeconomic Determinants of Mortality: Multilevel Approaches in a Setting with Universal Health Care Coverage”, *American Journal of Epidemiology*, 154(8):543-546.
- [69] Widodo, T., Dewata, I., Umar, I., & Putra, A. (2021). Does the Poverty Take Effect to the Life Expectancy ? *Xi’an Shiyu Daxue Xuebao (Ziran Kexue Ban)/Journal of Xi’an Shiyu University, Natural Sciences Edition*, 64(9), 301–310. <https://doi.org/10.17605/OSF.IO/FP4QS>
- [70] Williamson, JB and U Boehmer (1997), “Female life expectancy, gender stratification, and level of economic development: a cross national study of les developed countries”, *Social Science and Medicine*, 45(2):305-317.
- [71] World Health Organization (2014). *Cooperation among countries*. Retrieved October 29, 2020, from <https://www.who.int/countries/country-strategy-and-support/how-who-works-what-who-does/inter-country>

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7. Appendixes

Appendix 1:

Table 3. SYS-GMM Estimated Results: Life Expectancy for Male and Female

Variable	LEMale			LEFamale		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
I.LE	0.91797691*** (0.0361)	0.97577784*** (0.0094)	0.931091*** (0.0127)	0.94199498*** (0.0116)	0.94481112*** (0.0182)	0.9445668*** (0.0141)
lnHC_DOCTOR	0.08953575*** (0.0257)	-	-	0.0627787*** (0.0169)	-	-
lnSPESIALIST_DOCTOR	-0.0714248*** (0.0113)	-0.0844139*** (0.0073)	-0.08376*** (0.0068)	-0.07260979*** (0.0062)	-0.09463875*** (0.0083)	-0.07383238*** (0.0054)
lnSUSTER	-	0.00764657 (0.0066)	-	-	0.02162499** (0.0069)	-
lnHIV	-0.06691114** (0.0204)	-0.01966584 (0.0132)	-0.05694*** (0.0151)	-0.03629732* (0.0181)	-0.02761318 (0.0199)	-0.0271433 (0.0152)
lnAIDS	-0.0310918*** (0.0033)	-0.0300626*** (0.0049)	-0.02518*** (0.0038)	-0.02421209*** (0.0041)	-0.02441301*** (0.0051)	-0.01958092*** (0.0031)
OUTPATIENT	0.00315341*** (0.0005)	0.00061952 (0.0007)	0.00076926* (0.0003)	0.0046435*** (0.0007)	0.00151512* (0.0007)	0.00389387*** (0.0007)
PAIN_COMPLAINT	0.0168322*** (0.0016)	0.01837638*** (0.0013)	0.01309206*** (0.0009)	0.01796401*** (0.0022)	0.01719759*** (0.0015)	0.01450257*** (0.0013)
SANITATION	0.00006259 (0.0008)	0.00168272*** (0.0005)	-	0.00041004 (0.0004)	0.00248812*** (0.0005)	-
PDW	-	-	0.00515619*** (0.0008)	-	-	0.00449806*** (0.0011)
OWN_TOILET	0.00127991 (0.0015)	-	-	0.00360518 (0.0020)	-	-
HCR	0.01218568* (0.0059)	0.02500424*** (0.0064)	0.02604134*** (0.0057)	0.02170288* (0.0088)	0.03268064*** (0.0092)	0.03147287** (0.0106)
HIC	0.00194667***	-	-	0.00117757***	-	-

Variable	LEMale			LEFamale		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
EB_BABY	(0.0003) 0.00031993 (0.0002)	0.00029556 (0.0002)	0.00045375*** (0.0001)	(0.0003) 0.00017127 (0.0003)	0.0002241 (0.0002)	0.0003849 (0.0002)
lnHOSPITAL_BED	-	0.05201158* (0.0258)	-	-	0.08212797** (0.0271)	-
BIRTH_HW	-	-	-	0.00261969*** (0.0005)	-	0.00300623*** (0.0003)
KB_ACTIVE	-	-	-	-0.00090427** (0.0003)	-	-0.00122712** (0.0004)
lnPCGRDP	0.21869569 (0.2631)	-	0.12926393*** (0.0321)	-	0.04809756 (0.0799)	-
POVERTY	-0.00253123 (0.0083)	-	-0.00331408 (0.0057)	-0.00636982 (0.0071)	-0.01598246* (0.0070)	-0.01279066* (0.0060)
UNEMPL	-0.00414975 (0.0034)	-0.0172871*** (0.0038)	-	-0.00038638 (0.0033)	-0.00739028* (0.0036)	-
GINI	-	-0.18279247 (0.3484)	-	-	-	-0.04878762 (0.2998)
LITERACY	0.02017186** (0.0068)	-	0.01656018*** (0.0022)	0.0136931** (0.0046)	-	0.00982835** (0.0036)
_cons	1.4077115 (1.5533)	1.5835605** (0.5899)	2.3290767** (0.7388)	1.9370211* (0.7624)	2.7925297* (1.1544)	2.6767412** (0.9153)
N	308	308	308	306	308	306
Sargan test	0.9963	0.9929	0.9932	0.9962	0.9950	0.9936
Arellano-Bond test						
AR (1)	0.0034	0.0054	0.0073	0.0011	0.0064	0.0011
AR (2)	0.2499	0.8161	0.2884	0.1801	0.8361	0.6880

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Author's Calculation