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## Modelling of Life Expectancy in Nusa Tenggara Barat

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### Abstract

The success of economic development must be supported by human development. Life expectancy is an important indicator that acts as a measuring tool for government performance in planning and evaluating national development, especially in the province of West Nusa Tenggara. The purpose of this study was to analyze the variables that affect: the population; government spending; health services; coverage of drug/vaccine availability; nutritional adequacy; education level; age at marriage; environmental sanitation; immunization; domestic violence (KDRT); life expectancy; Risk of Infant Mortality and Risk of Maternal Death. The research uses panel data consisting of 10 regencies/cities for 2008-2019 obtained from BPS, NTB Health Office, NTB DP3AP2KB, NTB Police and conducted in-depth interviews. The data analysis technique uses econometric modelling and system dynamics. The results of the study found that: the behavioral aspect of the community is 1.69 years old and is a top priority. The modelling results also show that the life expectancy in NTB is 1.73 years to 74.15 years compared to the BPS projection of 72.42 years for the National in 2035.

**Keywords:** Life Expectancy, Government Expenditure, Econometry, System Dynamic

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### 1. Introduction

Development in the health sector is an effort made by the government and all Indonesian people to realize the highest degree of public health to produce productive human resources (BPS, 2017). There are 4 (four) main factors that influence the degree of public health, namely the environment, behaviour, health services, and heredity (genetic). The main public health indicators are mortality, morbidity, and nutritional status. The degree of public health is closely related to the increase in population. If the population density is high, human reproductive power will decrease (Mantra, 2000). Controlling the number of births by considering their health status is one indicator of economic development success. The success of economic development must, of course, be supported by human development or the Human Development Index (HDI), a standardized measure that reflects not only the economic field but also life expectancy and achievement in education (UNDP, 2001).

Life Expectancy (AHH) is an important indicator that measures government performance in planning and evaluating national development, especially expenditures in the health sector. AHH describes the number of years that a newborn baby is expected to achieve to live, in a

given year, in a mortality situation prevailing in his community. (Rojas et al., 1979) states that newborns in premature conditions are largely determined by environmental factors and health care carried out by medical personnel. (Trawicki, 2017) states that immunization (vaccination) affects the health of mothers and babies who have not yet been born and impacts the population. (Pinho, 2015) stated that the high life expectancy could be seen from the birth of healthy babies. In this case, the health status in the Province of West Nusa Tenggara is shown through the Life Expectancy Rate (AHH), Infant Mortality Rate (IMR), and Maternal Mortality Rate (AKI).

Various policies on increasing life expectancy in West Nusa Tenggara Province have been implemented, such as AKINO (Death Rate Towards Zero). However, the facts on the ground state that infant and maternal mortality rates are still high and above the national figure. The need for a comprehensive policy and modelling in the analysis as a recommendation to policymakers. According to (Chofyan, 2014), at least four approach methods in policy modelling are econometrics, input-output analysis, optimization analysis, and system dynamics. The policy of increasing life expectancy using the system dynamics model is expected to provide policy alternatives that effectively reduce maternal and infant mortality so that life expectancy increases, namely by identifying the factors that make up a phenomenon and the interrelationships between these elements.

The purpose of this study was to analyze: (1) the effect of life expectancy (AHH) on the increase in population (JP); (2) Effect of Government Expenditure (PP) on Health Services (PK); (3) Effect of Government Expenditure (PP) on the Coverage of Availability of Drugs and Vaccines (KOV); (4) Effect of Government Expenditure (PP) on Nutritional Adequacy (KG); (5) Effect of Population (JP) on Government Expenditure in the health sector (PP); (6) Effect of Education Level (TP) on Age of Representation (UP); (7) Effect of Government Expenditure on Health (PP) on Education Level (TP); (8) Effect of Population (JP) and Government Expenditure on Health (PP) on Environmental Sanitation Partial and simultaneous access to healthy latrine facilities; (9) Effect of Health Services (PK) and Coverage of Availability of Drugs and Vaccines (KOV) on the coverage of basic immunization (Im); (10) the effect of Marriage Age (UP) and Education Level (TP) on Domestic Violence (KDRT) partially and simultaneously; (11) Effect of Infant Mortality Risk (RKB), Government Expenditure on Health (PP), Education Level (TP) and Effect of Domestic Violence (KDRT) on Life Expectancy (AHH) partially and simultaneously; (12) Effect of Risk of Maternal Death (RIH), Basic Immunization Coverage (Im), Health Services (PK), Nutritional Adequacy (KG), Environmental Sanitation (SL) and Coverage of Drug and Vaccine Availability (KOV) on Infant Mortality Risk Levels (RKB) partially and simultaneously; (13) Effect of life expectancy in the previous year (AHH-1), Coverage of Availability of Drugs and Vaccines (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (Im), Age Marriage (UP) and Domestic Violence (KDRT) on the Risk Level of Maternal Death (RIH) partially and simultaneously in West Nusa Tenggara for the period 2008-2019; (14) Dynamic Model in Increasing Life Expectancy with Environmental Sanitation Intervention in West Nusa Tenggara; (15) Dynamic Model in increasing Life Expectancy with Nutrition Adequacy Intervention, Health Services, Drug Availability and Immunization in West Nusa Tenggara; and (16) Dynamic Model in increasing Life Expectancy

with Intervention on Education Level, Domestic Violence and Age of Marriage in West Nusa Tenggara.

According to Blum's theory (1994), to create healthy conditions as desired in his theory, harmony is needed to maintain a healthy body; it is still very relevant to be applied. Overall, health is a physically healthy condition and spiritually and socially. Blum explained that in his theory, four main factors are determinant factors that can affect human life. The four factors consist of behavioural factors, environmental factors (socio-economic, political, and cultural), health service factors (quantity and quality), and genetic factors (heredity).

Life expectancy is the average years of life that will still be lived by someone who has managed to reach a certain age in a certain year and in a mortality situation that applies in his community. AHH is calculated using an indirect approach (indirect estimation). Child Born Alive (ALH) and Child Still Living (AMH) are two types of data in calculating Life Expectancy (AHH). According to (World Health Organization, 2001), early neonatal death occurs in the first week since birth. Every baby born alive has differences in conditions during pregnancy, the birth process, environment, and access to health facilities. It is estimated that each baby has a different survival (Clarence & Gowen, 2014).

Risk is the possibility of an emergency that is not expected in the future, such as obstetric complications during childbirth that can cause pain, disability, death, even discomfort or dissatisfaction to the mother and baby (Rochjati, 2003). Pregnancy with high risk (high-risk pregnancies) is a condition that can affect the maximum condition of the mother and fetus in the pregnancy they are facing (Manuaba, 2010).

Maturation of the Marriage Age (PUP) is a step to increase the minimum age at marriage for the first time, 20 years for women and 25 years for men. The PUP concept is not only a marriage delay but an effort so that the first pregnancy occurs at a sufficient age. Maternal education is a strong influencing factor in infant mortality. Education is a conscious effort to develop personality and abilities inside and outside school to face and solve various health problems. The high and low level of education is closely related to the understanding of health care and the need for periodic pregnancy check-ups (Dwi, 2011).

Based on Article 1 paragraph 1 of the Law of the Republic of Indonesia Number 23 of 2004 concerning the Elimination of Domestic Violence, it states that: "Domestic violence is any act against a person, especially a woman, which is the basis for suffering or suffering physically, sexually, psychologically, and/or neglect of the household, including threats to commit acts, coercion, or unlawful deprivation of liberty within the scope of the household". According to Gosita (Pradipta, 2013), that what is meant by domestic violence are various kinds of actions that cause mental, physical, and social suffering to family members by fellow family members (children/daughter-in-law, mother/wife, and father/husband).

According to Government Regulation of the Republic of Indonesia, Number 36 of 2014 concerning Health Workers, the definition of health workers is anyone who positions himself in the health sector and has skills and knowledge through education in the health sector that he takes, to carry out health efforts. Immunization is the provision of immunity or the body's resistance to disease by inserting something into the body so that the body is resistant to

diseases that are endemic or harmful to the body itself (Lisnawati, 2011). Immunization is an attempt to increase a person's immunity to disease (Kemenkes, 2018).

As needed, the availability of drugs and vaccines is very useful in health services with the same standard of availability and population (Ministry of Health, Republic of Indonesia, 2003). According to Notoatmodjo (2003), sanitation itself is a deliberate behaviour to get used to a clean and healthy living culture by preventing humans from coming into direct contact with dirt and other hazardous wastes so that human health can be maintained and improved. Nutritional status can be optimal if the body has obtained nutrients efficiently to improve physical quality, brain development, workability and health.

The National Health Insurance (JKN) is a government breakthrough program in the latest health services with an insurance system. According to the Minister of Health Regulation Number 28 of 2014 concerning Guidelines for the Implementation of National Health Insurance (JKN), the implementation of JKN is aimed at providing health services to meet basic health needs given to everyone who has carried out payment obligations.

According to the 1945 Constitution of the Republic of Indonesia Article 26 paragraph 2, what is meant by residents are Indonesian citizens and foreigners residing in Indonesia. Meanwhile, what is meant by Indonesian residents are all people residing in the Indonesian territorial territory for 6 (six) months or more and or those living for less than 6 (six) months but aiming to settle down (BPS, 2017). According to (Soepangat & Gaol, 1991), government spending increases from time to time. It is due to the increasing number of government activities that require costs. The development of state expenditures in a step-like form is due to three interrelated effects: displacement, inspection, and concentration.

## **2. Research Method**

The method used in this research is econometrics (Sugiyono, 2010) and system dynamics simulation. Vennix (2001) in Nagara (2009) describes simply one of the tools used in system dynamics modelling, namely the Causal Loop Diagram (CLD). Econometric modelling is by performing panel data regression combining time series data for the 2008-2019 time period with cross-sectional data from 10 districts/cities in West Nusa Tenggara, while system dynamics modelling was developed from systems thinking.

## **3. Result and Discussion**

### **3.1 Effect of Life Expectancy (AHH) on Population Increase (JP)**

Based on the modelling results with Random Effects, the Life Expectancy (AHH) variable positively and significantly affects the increase in the population (JP) of districts and cities in West Nusa Tenggara in 2008-2019 with a value of Prob. Less than 0.05 while the value of Adj. R2 is 0.3414 or 34.14 per cent, which means that the influence of AHH on JP is 34.14 per cent; other variables influence the rest.

### **3.2 Effect of Government Expenditure (PP) on Health Services (PK)**

Government Expenditure (PP) has a positive and significant impact on Health Services (PK). The probability value is below 0.05, 0.0000, and the coefficient is 0.0658. The magnitude of

Government Expenditure (PP) influence on Health Services (PK) can be seen from the Adjusted R-Squared variable, which is 0.3101 or 31.01 per cent; other variables influence the rest.

### **3.3 Effect of Government Expenditure (PP) on the Coverage of Availability of Drugs and Vaccines (KOV)**

Government Expenditure (PP) has a positive and significant effect on the Coverage of the Availability of Drugs and Vaccines (KOV). The probability value is below 0.05, 0.0000, and the coefficient is 0.0138. The magnitude of Government Expenditure (PP) effect on the Coverage of Drug and Vaccine Availability (KOV) can be seen from the Adjusted R-Squared variable, which is 0.3578 or 35.78 per cent; other variables influence the rest.

### **3.4 Effect of Government Expenditure (PP) on Nutritional Adequacy (KG)**

Government Expenditure (PP) positively and significantly affects Nutritional Adequacy (KG). The probability value is below 0.05, 0.0260, and the coefficient is 0.0445. The magnitude of Government Expenditure (PP) influence on Nutrition Adequacy (KG) can be seen from the Adjusted R-Squared variable, which is 0.2250 or 22.5 per cent; other variables influence the rest.

### **3.5 Effect of Population (JP) on Government Expenditure in the Health Sector (PP)**

Population Number (JP) has a positive and significant influence on Government Expenditure in the Health Sector (PP). The probability value is below 0.05, 0.0000, and the coefficient is 2.1116. The magnitude of the influence of the Total Population (JP) on Government Expenditures in the Health Sector (PP) can be seen from the Adjusted R-Squared variable, which is 0.3289 or 32.89 per cent; other variables influence the rest.

### **3.6 Effect of Education Level (TP) on Marriage Age (UP)**

Education level (TP) has a positive and significant influence on the Age of Marriage (UP). The probability value is below 0.05, 0.0114, and the coefficient is 0.0520. The magnitude of the influence of Education Level (TP) on Marriage Age (UP) can be seen from the Adjusted R-Squared variable, which is 0.3632 or 36.32 per cent; other variables influence the rest.

### **3.7 Effect of Government Expenditure on Health (PP) on Education Level (TP)**

Government Expenditure in the Health Sector (PP) has a positive and significant influence on the Education Level (TP). The probability value is below 0.05, 0.0000, and the coefficient is 0.1769. The magnitude of Government Expenditure on Health (PP) on Education Level (TP) can be seen from the Adjusted R-Squared variable, which is 0.6411 or 64.11 per cent; other variables influence the rest.

### **3.8 Effect of Population (JP) and Government Expenditure on Health (PP) on Environmental Sanitation Access to Healthy Latrine Facilities (SL)**

Population Number (JP) has a positive but not significant effect on Environmental Sanitation Access to Healthy Latrine Facilities (SL) because the probability value is above 0.05, 0.0856. The Government Expenditure Variable in Health (PP) has a positive and significant influence



on Environmental Sanitation, Access to Healthy Latrine Facilities (SL) because its value is below 0.05, 0.0187. The magnitude of the influence of Population (JP) and the variable of Government Expenditure on Health (PP) on Environmental Sanitation Access to Healthy Latrine Facilities (SL) can be seen from the Adjusted R Square variable of 0.1735 or 17.35 per cent; other variables influence the rest. Population Number (JP) and Government Expenditure on Health (PP) have a significant simultaneous or simultaneous effect on Environmental Sanitation, Access to Healthy Latrine Facilities (SL).

### **3.9 Effect of Health Services (PK) and Coverage of Drug and Vaccine Availability (KOV) on Coverage of Basic Immunization (Im)**

Health Services (PK) has a positive and significant effect on the Coverage of Basic Immunization (Im) because the probability value is below 0.05, 0.0003. Drug and Vaccine Availability Coverage (KOV) has a negative but not significant effect on basic immunization coverage (Im) because the probability value is above 0.05, which is 0.1502. The magnitude of the effect of Health Services (PK) and Coverage of Drug and Vaccine Availability (KOV) on the Coverage of Basic Immunization (Im) can be seen from the Adjusted R Square variable of 0.1149 or 11.49 per cent; other variables influence the rest. Health Services (PK) and Coverage of Availability of Drugs and Vaccines (KOV) have a significant simultaneous or simultaneous effect on the Coverage of Basic Immunization (Im).

### **3.10 Effect of Marriage Age (UP) and Education Level (TP) on Domestic Violence (KDRT)**

Marriage Age (UP) has a positive but not significant effect on Expenditure on Domestic Violence (KDRT) because the probability value is above 0.05, 0.9905. Education level (TP) has a negative and significant effect on Expenditure on Domestic Violence (KDRT) because the probability value is below 0.05, 0.0000. The magnitude of the effect of Married Age (UP) and Education Level (TP) on Expenditures on Domestic Violence (KDRT) can be seen from the Adjusted R Square variable of 0.4113 or 41.13 per cent; other variables influence the rest. Marriage Age (UP) and Education Level (TP) have a significant simultaneous or simultaneous effect on Expenditures on Domestic Violence (KDRT).

### **3.11 Effect of Domestic Violence (KDRT), Education Level (TP), Government Expenditure in Health (PP) and Infant Mortality Risk (RKB) on Life Expectancy (AHH)**

The Infant Mortality Risk Variable (RKB) has a negative and significant effect on Life Expectancy (AHH). The variable of government expenditure in the health sector (PP) has a negative and significant effect on life expectancy (AHH). The variable level of education (TP) has a positive and significant effect on life expectancy (AHH). Variable Domestic Violence (KDRT) has a negative and insignificant effect on Life Expectancy (AHH). The magnitude of the influence of Infant Mortality Risk (RKB), Government Expenditures in the Health Sector (PP), Education Level (TP), and Domestic Violence (KDRT) on Life Expectancy (AHH) is 0.8018 or 80.18 per cent, and other variables influence the rest. Meanwhile, the probability of the number of Domestic Violence (KDRT), Education Level (TP), Government Expenditure in the Health Sector (PP) and the Risk of Infant Mortality (RKB) have a significant simultaneous or simultaneous effect on Life Expectancy (AHH).

### **3.12 Effect of Drug and Vaccine Availability Coverage (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (Im) and Risk of Maternal Death (RIH) on Infant Mortality Risk Level (RKB)**

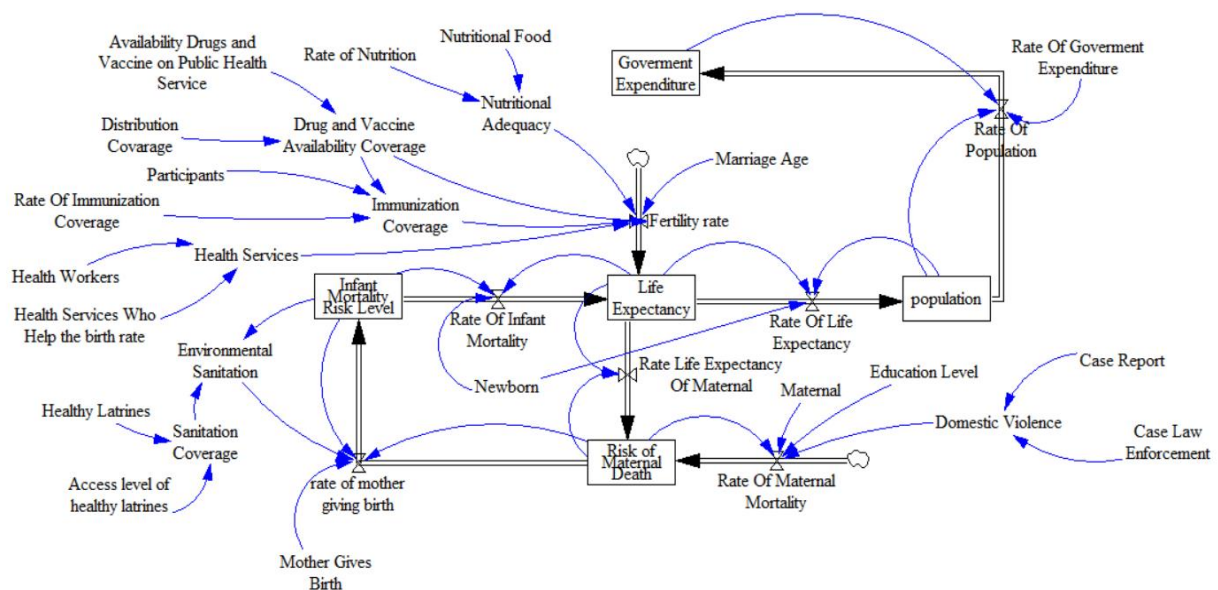
The Variable Risk of Maternal Mortality (RIH) positively and significantly affects the Infant Mortality Risk Level (RKB). The Basic Immunization (IM) variable has a negative and insignificant effect on the Infant Mortality Risk Level (RKB). The Health Service (PK) variable has a negative and insignificant effect on the Infant Mortality Risk Level (RKB). The Nutrition Adequacy Variable (KG) has a positive and insignificant effect on the Infant Mortality Risk Level (RKB). Environmental Sanitation (SL) variable has a negative and significant effect on the Infant Mortality Risk Level (RKB). Variable Coverage Availability of Drugs and Vaccines (KOV) has a positive and significant effect on the Infant Mortality Risk Level (RKB). The simultaneous or simultaneous influence of the variables of Drug and Vaccine Availability Coverage (KOV); Environmental Sanitation (SL); Nutritional Adequacy (KG); Health Services (PK); Basic Immunization Coverage (IM). Risk of Maternal Death (RIH) have a significant effect on The Infant Mortality Risk Level (RKB) in the Regency/City of West Nusa Tenggara in the 2008-2019 period, and the magnitude of the effect is 0.8727 or 87.27 per cent, and other variables influence the rest.

### **3.13 Effect of Life Expectancy in the Previous Year (AHH-1), Coverage of Availability of Drugs and Vaccines (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (Im), Marriage Age (UP) and Domestic Violence (KDRT) on the Risk Level of Maternal Death (RIH)**

Variable Domestic Violence (KDRT) has a positive and significant effect on the Risk Level of Maternal Death (RIH). Marriage Age (UP) has a negative and significant effect on the Risk Level of Maternal Mortality (RIH). Basic Immunization Coverage (IM) has a negative but not significant effect on the Risk Level of Maternal Mortality (RIH). Health Services (PK) has a positive but not significant effect on the Risk Level of Maternal Mortality (RIH). Nutritional Adequacy (KG) has a positive but not significant effect on the Risk Level of Maternal Mortality (RIH). Environmental Sanitation (SL) has a positive and insignificant effect on the Risk Level of Maternal Mortality (RIH). Coverage of Availability of Drugs and Vaccines (KOV) has a negative and insignificant effect on the Risk Level for Maternal Death (RIH). The previous year's Life Expectancy (AHH) had a negative but not significant effect on the Risk Level for Maternal Mortality (RIH). The magnitude of the effect of the previous year's life expectancy (AHH-1), Coverage of Availability of Drugs and Vaccines (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (IM), Marriage Age (UP) and Domestic Violence (KDRT) are 0.271836 or 27.18 per cent, and other variables influence the rest. While the effect of the probability of the previous year's life expectancy (AHH-1), the coverage of drug and vaccine availability (KOV), environmental sanitation (SL), nutritional adequacy (KG), health services (PK), basic immunization coverage (IM), age Marriage (UP) and Domestic Violence (KDRT), have a significant simultaneous effect on the Risk Level of Maternal Mortality (RIH). It is evidenced by the F statistic below 0.05.

### 3.14 Analysis of Dynamic Model of Maternal and Infant Mortality in Increasing Life Expectancy

Data modelling and flow diagram making are divided into several sub models. Data modelling is carried out to determine behaviour patterns and relationships between variables in the simulation to determine the model's suitability with behaviour in real conditions. The implementation of the data modelling is depicted from a causative diagram, after making a causative diagram, then a flow diagram that will make it easier to describe scenario modelling. The following is the implementation of the flow diagram of the Dynamic Model of Maternal Mortality (RIH) and Infant Mortality Risk (RKB) in increasing Life Expectancy (AHH).



**Figure 1. Dynamic Model Complex of Maternal Mortality Risk and Infant Mortality Risk in Increasing Life Expectancy**

#### 1) *Dynamic Model Scenario with Environmental Sanitation Intervention*

The risk of maternal mortality, if the government implements a policy by increasing access to healthy latrines, will reduce the risk of infant mortality to increase life expectancy. Based on the results of dynamic modelling, it is obtained that the Life Expectancy in West Nusa Tenggara in 2035 is 0.57 years with normal conditions; after intervention with Environmental Sanitation Variables, the Life Expectancy in 2035 is 1.08 years, meaning that there is an increase of 0.4 years.

#### 2) *Dynamic Model with Intervention of Nutrition Adequacy, Health Services, Drug Availability, and Immunization*

Dynamic modelling results found that with the intervention of the next 15 (fifteen) years from 2020-2035, health variables, especially delivery assistance, became the main priority in the model, increasing the life expectancy of 11 months, three weeks six days. Nutritional adequacy is the second priority, increasing nine months, one week, two days. The third priority, Variable Coverage of Vaccination/immunization with an increase of 8 months, two weeks, one day. Variable level of distribution coverage of drug/vaccine availability in all Public Health Centers



of West Nusa Tenggara with an increase of 3 months and three weeks two days from the normal value without intervention, which is one week and three days.

### 3) *Dynamic Model with Intervention of Education Level, Domestic Violence and Age of Marriage*

The results of dynamic modelling show that the increase in Life Expectancy in West Nusa Tenggara from the aspect of community behaviour indicated by the Variable: Level of Education, Domestic Violence and Age of Marriage will increase in the next 15 years if local government policies intervene on the variables of domestic violence and marriage age. Priority, and then the level of education, is also very important. It is known from the modelling results that with the intervention on the age of marriage, the Life Expectancy in the Regency/City of West Nusa Tenggara can increase in 2035 by 18 months. Two weeks while the domestic violence variable increases by 18 months, one week six days and the variable level of education increases by 4 Months 2 Weeks 4 Days from before the intervention was two months four days.

The modelling results show that the West Nusa Tenggara local government needs to carry out priority interventions. The next 15 years are: increasing the age of marriage, reducing the level of domestic violence, improving environmental health, increasing the number and quality of health workers, increasing the nutritional adequacy of the community, increasing immunization coverage, improving education, and maintaining the availability of drugs/vaccines in all Puskesmas.

The study results show that Life Expectancy (AHH) has a positive and significant effect on the Increase in Population (JP) in Regencies/Cities in West Nusa Tenggara Province for 2008-2019. These results are by the proposed hypothesis, meaning life expectancy will increase the population. This study is in line with the findings of (Gwatkin & Brandel, 1982) (Joshua & Schlag, 1999), namely that the increase in life expectancy is the cause of increasing population growth. It shows an increase in the birth of healthy babies and a decrease in the number of deaths each year, so population growth is very rapid.

Government Expenditures (PP) have had a positive and significant effect on Health Services (PK) in Regencies/Cities in West Nusa Tenggara Province from 2008-2019. This result is by the proposed hypothesis, meaning that the increase in government spending in the health sector (PP) will impact increasing health services (PK), especially health workers who provide delivery services. This study is in line with (Amirin et al., 2021) findings, which states that government spending can improve the quality of health services, namely by giving more rewards to workers in the health sector, such as remuneration or other wages in Iran. Meanwhile, (Sadiq & Khan, 2019) states that government spending on information technology in the health sector can improve health services by digitizing health services in Austria, Switzerland, and Germany.

Government Expenditures (PP) have a positive and significant influence on the Coverage of Availability of Drugs and Vaccines (KOV) in the Regency/City of West Nusa Tenggara Province for 2008-2019. These results are by the proposed hypothesis, meaning that the increase in Government Expenditures (PP) will increase the Coverage of Availability of Drugs and Vaccines (KOV) in the District/City Health Centers of West Nusa Tenggara. This study is

in line with the findings of (Padmawati et al., 2014) stated that local governments have an important role and responsibility for access to drug supply for the community in the area. The central government also must guarantee the availability of drugs in the regions through the APBN. Meanwhile, (Charlene et al., 2020) stated that the government allocates an adequate budget to provide vaccines, and the government can communicate the benefits of vaccines, which will positively impact the economy.

Government Expenditure (PP) has a positive and significant influence on Nutrition Adequacy (KG) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. This result is by the proposed hypothesis, meaning that the increase in Government Expenditures (PP) will increase the Nutrient Adequacy Number (KG) of West Nusa Tenggara Regency/City. This research is in line with (Oluwatoyin et al., 2015) findings that government spending should increase and restructure the allocation of public spending for the health sector. (Farhan et al., 2016) that financing health services for many countries improve current citizens' nutritional health status and sustainability. (Choirunisa & Adisasmitta, 2014) stated that funding is an important factor in overcoming malnutrition in children under five. The greater the regional income for financing in the health sector, the lower the percentage of malnutrition in the community.

Population Number (JP) has a positive and significant influence on Government Expenditure in the Health Sector (PP) in the Regency/City of West Nusa Tenggara Province for 2008-2019. This result is by the proposed hypothesis, meaning that increasing the number of residents (JP) will increase government spending in the health sector (PP) for the Regency/City of West Nusa Tenggara. This research is in line with (Liu, 2020) which states that the increasing number of people with diabetes is one of the causes of increasing government spending in the health sector so that modern technological innovations for the treatment of diabetes can sustainably reduce the cost of treatment. Meanwhile, Jakovljevic (2016) found that the population birth rate, per capita income, and inflation are factors causing the government's increase in the health budget; this is evidenced by the increasing need for pharmaceutical financing, especially the procurement of medicines in poor and developing countries.

The level of education (TP) has had a positive and significant influence on the Age of Marriage (UP) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. These results are by the proposed hypothesis, meaning that increasing the Education Level (TP) will increase the Age of Marriage (UP) in the Regency/City of West Nusa Tenggara. This research is in line with the findings of (Bawono et al., 2019), showing that low levels of education play a role in the occurrence of early marriage in Madura, while (Akanksha et al., 2017) finds that increasing the education of girls throughout South Asia has succeeded in delaying the age of marriage.

Government Expenditure in the Health Sector (PP) has a positive and significant influence on the Education Level (TP) in the Regency/City of West Nusa Tenggara Province for 2008-2019. This result is by the proposed hypothesis, meaning that the increase in Government Expenditure in the Health Sector (PP) will increase the Education Level (TP) in the Regency/City of West Nusa Tenggara. This study is in line with Ifa (2018) findings, which states that government spending increases education levels in Morocco in the medium term and

Tunisia in the long term. At the same time, the research of Muttaqin et al (2017) stated that the education expenditure/budget of all cities in Indonesia significantly reduces children dropping out of school.

Population Number (JP) has a positive but not significant effect on Environmental Sanitation, Access to Healthy Latrine Facilities (SL). In contrast, the Government Expenditure variable in the health sector (PP) has a positive and significant effect on Environmental Sanitation, Access to Healthy Latrine Facilities (SL) in Regency/City of West Nusa Tenggara Province for the period 2008-2019. This study is in line with the findings of Othman (2021), which states that a significant increase in population has a major impact on decreasing environmental quality in the short term. Still, suppose the government carries out population control on decreasing environmental quality. In that case, it will have an insignificant impact in the long term. One form of government intervention is increasing government spending with environmentally friendly programs so that environmental quality improves sustainably in the long term.

Partially, the Health Service Variable (PK) has a positive and significant effect on the Coverage of Basic Immunization (Im). In contrast, the Coverage of the Availability of Drugs and Vaccines (KOV) has a negative but no significant effect on the Coverage of Basic Immunization (Im) in the District/ City of West Nusa Tenggara Province for the period 2008-2019. This study is in line with (Meilani et al., 2021). The health workers have a very important role in achieving the basic measles immunization coverage target in Indonesia, considering that there are still anti-vaccine communities, so socialization through health workers is needed about the benefits of vaccines. The Variable Coverage of Drug and Vaccine Availability (KOV) has an insignificant decreasing impact partially on the Coverage of Basic Immunization (IM). In every Puskesmas, the availability of drugs and vaccines has been fulfilled, but mothers and babies who will be given immunizations are often delayed/delayed. Arrive at the nearest health centre.

Partially Variable Age of Marriage (UP) has a positive but not significant effect on Domestic Violence (KDRT). In contrast, Education Level (TP) has a negative and significant influence on Domestic Violence (KDRT) in the Regency/City of Nusa Province Southeastern West 2008-2019 period. This study aligns with Tokuc (2009) findings, which found that increasing after marriage did not necessarily reduce domestic violence. The variable level of education (TP) shows that the higher the level of knowledge (education) will significantly reduce domestic violence. With sufficient knowledge, the husband and wife will understand each other's conditions to prevent domestic violence.

The Infant Mortality Risk (RKB) variable has a negative and significant effect on Life Expectancy (AHH). This finding is in line with the findings of Murray (1988), who found that the higher the risk of infant mortality during pregnancy is a factor causing the decreased life expectancy of newborns. (Shartova et al., 2021) found a tendency for a low risk of infant mortality to increase life expectancy with various interventions such as providing health facilities. Government Expenditure on Health (PP) has a negative and significant effect on Life Expectancy (AHH). This result rejects the proposed hypothesis, meaning that the direct effect of Government Expenditure on Health (PP) does not impact increasing Life Expectancy (AHH) in the Regency/City of West Nusa Tenggara. This study is in line with (Elizabeth & Bein, 2018) findings that increased spending on the public health care system is not optimal for increasing

life expectancy because other health care costs are still expensive and inaccessible to the population. Simultaneously the Risk of Infant Mortality (RKB), Government Expenditures in the Health Sector (PP), Education Level (TP), and Domestic Violence (KDRT) have a significant simultaneous or simultaneous effect on Life Expectancy (AHH) in Regency/City Provinces West Nusa Tenggara period 2008-2019.

The Risk of Maternal Mortality (RIH) has a positive and significant impact on the Infant Mortality Risk Level (RKB). These results are by the proposed hypothesis, meaning that the decrease in the Risk of Maternal Death (RIH) impacts the reduction of the Infant Mortality Risk Level (RKB) in the Regency/ City of West Nusa Tenggara for the period 2008-2019. This study is in line with the findings of (Jyoti & Patel, 2020). A high and significant infant mortality rate was found among mothers with poor wealth status compared to the middle and rich groups in Bangladesh. Pregnant women with poor social status worked harder to meet their needs. The Basic Immunization (IM) variable has a negative and insignificant effect on the Infant Mortality Risk Level (RKB). This result rejects the proposed hypothesis, meaning that the increase in the Basic Immunization (IM) given does not significantly reduce the Infant Mortality Risk Level (RKB) in the District/City of West Nusa Tenggara for the period 2008-2019. This study is in line with (Lestari et al., 2019) findings that providing complete basic immunization impacts reduces the risk of infant mortality in Indonesia. Still, many factors cause complete basic immunization to be uneven between provinces, namely maternal education, mother's knowledge, mother's working hours, and community/family support where she lives. The simultaneous or simultaneous influence of the variables of Drug and Vaccine Availability Coverage (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (Im) and Risk of Maternal Death (RIH) have a significant effect on The Infant Mortality Risk Level (RKB) in the Regency/City of West Nusa Tenggara in the 2008-2019 period.

Domestic Violence (KDRT) has a positive and significant effect on the Risk Level for Maternal Death (RIH). This result is by the proposed hypothesis, meaning that the decrease in Domestic Violence (KDRT) significantly reduces the Risk Level for Maternal Death (RIH) in the Regency/City of West Nusa Tenggara in the 2008-2019 period. This study is in line with the findings of (Paul & Mondal, 2020), who found that mothers who experienced physical, emotional and sexual violence by their partners increased the risk of death for mothers and babies in the womb. Basic Immunization Coverage (IM) has a negative but not significant effect on the Risk Level of Maternal Mortality (RIH). This result rejects the proposed hypothesis, meaning that increasing Basic Immunization Coverage (IM) has no significant impact on reducing the Risk Level for Maternal Mortality (RIH) in the Regency/City of West Nusa Tenggara in the 2008-2019 period. This study is in line with the findings of (Munoz, 2018) that maternal immunization has the potential to improve maternal and child health worldwide in the future by reducing maternal and infant morbidity and mortality associated with diseases caused by pathogens in the perinatal period and early life. Variables are the numbers of life expectancy in the previous year (AHH-1), coverage of drug and vaccine availability (KOV), environmental sanitation (SL), nutritional adequacy (KG), health services (PK), basic immunization coverage (IM), marriage age (UP) and Domestic Violence (KDRT), have a significant simultaneous effect on the Risk Level of Maternal Mortality (RIH).

Health service factors affect the degree of public health because the existence of health facilities is very decisive in health recovery services, prevention of disease, treatment and nursing, and community groups that require health services. Health variables, especially delivery assistance carried out by health workers, are the main priority in the model, increasing life expectancy. Furthermore, nutritional adequacy is the second priority. The variable coverage of vaccination/immunization is the third priority, the variable level of distribution coverage of the availability of drugs/vaccines in all Public Health Centers of West Nusa Tenggara.

Behavioural factors affect public health because, healthy or not, the health of individuals, families and communities is very dependent on human behaviour itself. The results of alternative dynamic modelling of local government policies by intervening to increase Life Expectancy in the Regency/City of West Nusa Tenggara for the next 15 years (2035) show that the variables of domestic violence and age of marriage are prioritized, and then the level of education. It means that local governments must suppress or reduce domestic violence cases by carrying out persuasive law enforcement with a family approach or based on local wisdom. In addition, the age of marriage gets serious attention because there are still many teenage marriages that draw codes that should still be studied in school.

The results of this study use a dynamic model approach, intervene on environmental sanitation variables, namely access to healthy latrines, health services, namely health workers who assist in childbirth, nutritional adequacy, availability of drugs/vaccines in all health centres, immunization, level of education, age of marriage and domestic violence. Stairs, the intervention results show an increase in 2035, which is 7.87 years, so that the Life Expectancy in NTB becomes 74.15 years. This figure is higher than the BPS projection for the National, which is 1.73 years. At the same time, for West Nusa Tenggara is 5.85 years. The results of this study by intervening 8 model variables are close to the projection of the National Life Expectancy by BPS.

#### **4. Conclusion**

Life Expectancy (AHH) has had a positive and significant effect on the Increase in Population (JP) in Regencies/Cities in West Nusa Tenggara Province from 2008-2019. Government Expenditure (PP) has had a positive and significant effect on Health Services (PK) in Regencies/Cities in West Nusa Tenggara Province from 2008-2019. Government Expenditures (PP) have a positive and significant effect on the Coverage of the Availability of Drugs and Vaccines (KOV) in the Regency/City of West Nusa Tenggara Province for 2008-2019. Government Expenditure (PP) has had a positive and significant influence on Nutrition Adequacy (KG) in the Regency/City of West Nusa Tenggara Province from 2008-2019. The Population Number (JP) variable has a positive and significant influence on Government Expenditure in the Health Sector (PP) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. The Education Level (TP) variable has a positive and significant influence on the Age of Marriage (UP) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. The Government Expenditure Variable in the Health Sector (PP) has a positive and significant influence on the Education Level (TP) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. The Variable Population Number (JP) has a positive but not significant effect on Environmental Sanitation, Access to Healthy Latrine



Facilities (SL). In contrast, the Government Expenditure variable in Health (PP) has a positive and significant effect on Environmental Sanitation, Access to Healthy Latrine Facilities (SL) in the Regency/City of West Nusa Tenggara Province for the 2008-2019 period. If simultaneously the variables of increasing population and government spending have a significant effect. Partially, the Health Service Variable (PK) has a positive and significant effect on the Coverage of Basic Immunization (Im). In contrast, the Coverage of the Availability of Drugs and Vaccines (KOV) has a negative but not significant effect on the Coverage of Basic Immunization (Im) in the Regency/City of West Nusa Tenggara Province for the period 2008-2019. Simultaneously, the variables of Health Service (PK) and the Coverage of Availability of Drugs and Vaccines (KOV) have a significant simultaneous or simultaneous effect on the Coverage of Basic Immunization (IM) in the Regency/City of West Nusa Tenggara Province for the period 2008-2019, because of the health workers who provide services with the health of the mother and baby to pick up the ball or come to the mother and baby's place of residence by bringing supplies of medicine/vaccine from the Puskesmas. Variable Age of Marriage (UP) has a positive but not significant effect on Domestic Violence (KDRT). In contrast, Education Level (TP) has a negative and significant influence on Domestic Violence (KDRT) in the Regency/City of Nusa Province Southeastern West 2008-2019 period. It is due to the decision to marry due to family decisions (matchmaking), while women with higher education experience less domestic violence. Simultaneously, the Variable Age of Marriage (UP) and Education Level (TP) have a significant simultaneous or simultaneous effect on Expenditure on Domestic Violence (KDRT). Meaning that if the marriage age is mature and has broad knowledge, it will prevent or reduce the level of domestic violence. Partially the Infant Mortality Risk Variable (RKB) has a negative and significant effect on Life Expectancy (AHH). This result is by the proposed hypothesis, meaning that decreasing the Risk of Infant Mortality (RKB) will increase the Life Expectancy Rate (AHH) in the Regency/City of West Nusa Tenggara. The variable of government expenditure in the health sector (PP) has a negative and significant effect on life expectancy (AHH).

This result rejects the proposed hypothesis, which means that the direct effect of Government Expenditure on Health (PP) does not impact increasing Life Expectancy (AHH). The variable level of education (TP) has a positive and significant effect on life expectancy (AHH). This result is by the proposed hypothesis, meaning that an increase in education (TP) impacts increasing the Life Expectancy Rate (AHH) in the Regency/City of West Nusa Tenggara, but the increase is insignificant. The Domestic Violence (KDRT) variable has a negative but not significant effect on Life Expectancy (AHH) in the Regency/City of West Nusa Tenggara Province for 2008-2019. Simultaneously the Risk of Infant Mortality (RKB), Government Expenditures in the Health Sector (PP), Education Level (TP), and Domestic Violence (KDRT) have a significant simultaneous or simultaneous effect on Life Expectancy (AHH) in Regency/City Provinces West Nusa Tenggara period 2008-2019. The Variable Risk of Maternal Mortality (RIH) positively and significantly affects the Infant Mortality Risk Level (RKB). The Basic Immunization (IM) variable has a negative and insignificant effect on the Infant Mortality Risk Level (RKB). The Health Service (PK) variable has a negative and insignificant effect on the Infant Mortality Risk Level (RKB). The Nutrition Adequacy Variable (KG) has a positive and insignificant effect on the Infant Mortality Risk Level (RKB). Environmental

Sanitation (SL) variable has a negative and significant effect on the Infant Mortality Risk Level (RKB). Variable Coverage Availability of Drugs and Vaccines (KOV) has a positive and significant effect on the Infant Mortality Risk Level (RKB). Simultaneously or simultaneously, the variables of Drug and Vaccine Availability Coverage (KOV), Environmental Sanitation (SL), Nutritional Adequacy (KG), Health Services (PK), Basic Immunization Coverage (Im) and Risk of Maternal Death (RIH) have a significant effect on the level of Infant Mortality Risk (RKB) in West Nusa Tenggara Regency/City in the 2008-2019 period. Variable Domestic Violence (KDRT) has a positive and significant effect on the Risk Level of Maternal Mortality (RIH). Variable Age of Marriage (UP) has a negative and significant influence on the Risk Level of Maternal Mortality (RIH).

Variable Basic Immunization Coverage (IM) has a negative but not significant effect on the Risk Level of Maternal Mortality (RIH). The Health Service (PK) variable has a positive but not significant effect on the Risk Level of Maternal Mortality (RIH). The Nutrition Adequacy Variable (KG) has a positive but not significant effect on the Risk Level of Maternal Mortality (RIH). Environmental Sanitation (SL) variable has a positive and not significant effect on the Risk Level of Maternal Mortality (RIH). Variable Coverage Availability of Drugs and Vaccines (KOV) has a negative and insignificant effect on the Risk Level of Maternal Mortality (RIH). The variable life expectancy in the previous year (AHH-1) had a negative but not significant effect on the Risk Level of Maternal Mortality (RIH). Variables are the number of life expectancy in the previous year (AHH-1), coverage of drug and vaccine availability (KOV), environmental sanitation (SL), nutritional adequacy (KG), health services (PK), basic immunization coverage (IM), marriage age (UP) and Domestic Violence (KDRT), have a significant simultaneous effect on the Risk Level of Maternal Mortality (RIH). The classical theory of Hendrik L. Bloom states that environmental factors are the main priority because they influence and role of 45 per cent. This study found that environmental factors became the second factor that became the government's concern in this study using Environmental Sanitation as seen from access to healthy latrines. It increases life expectancy by 1.08 months in the next 15 years. Meanwhile, genetic factors are not included in this study because of the difficulty of obtaining macro data in the Regency/City of West Nusa Tenggara.

The Health Service factor is a factor that influences 15 per cent or the third factor. At the same time, the results of this study became the second priority, namely health workers, nutritional adequacy, priority vaccination/immunization coverage variables and distribution coverage levels of drug/vaccine availability in all Puskesmas Nusa Tenggara Barat. It can increase life expectancy by 11 months, three weeks six days in the next 15 years. The community behaviour factor is the second factor that influences 35 per cent. According to the results of dynamic system modelling, the government's main priority is behavioural factors, namely reducing domestic violence, maintaining the marriage age and increasing education levels to increase life expectancy. Of 18 Months, 2 Weeks in the next 15 years. Local governments in increasing life expectancy, government expenditure budgeting should focus more on aspects of community behaviour, especially reducing domestic violence, maintaining marriage age and increasing education levels. Local governments are more focused on health services, especially on adding and improving the quality of health workers and their distribution to remote areas. Community nutrition is also very important to prevent maternal and fetal mortality and stunting

in the future, immunization coverage and maintaining adequate distribution to prevent future diseases. Local governments must pay attention to environmental aspects, namely access to healthy latrines in rural and densely populated areas, such as providing latrine facilities and socializing the importance of maintaining environmental health to prevent maternal and infant mortality in polluted environment

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