

## **Analysis of The Influence of Spending in The Health Sector and Poverty on Life Expectancy and Health Development Challenges in The Islands Region (Case Study of District/City In Riau Islands Province)**

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### **ABSTRACT**

*This research aims to determine how health spending and poverty influence the life expectancy of districts/cities in the Riau Islands Province and the challenges faced in health development in the Riau Islands, one of Indonesia's archipelagic regions. Life Expectancy is a measurement of the average human life expectancy, which is used as an indicator in the health sector to calculate the Human Development Index and is one of the government's performance outputs in the health sector. This research uses a Panel Data regression model using Life Expectancy data as the dependent variable and spending in the health sector and the percentage of poor people as independent variables in 7 (seven) districts/cities in the Riau Islands from 2017 to 2021. The results show that spending in The health sector has a positive and significant effect on life expectancy, in contrast the percentage of poor people has a negative and significant effect on the life expectancy of districts/cities in the Riau Islands Province.*

**Keywords:** *life expectancy (LER), health expenditure, Poverty, multiple regression.*

### **ABSTRAK**

Penelitian ini bertujuan untuk mengetahui bagaimana pengaruh belanja kesehatan dan kemiskinan terhadap Angka Harapan Hidup Kabupaten/kota di Provinsi Kepulauan Riau dan tantangan yang dihadapi dalam pembangunan kesehatan di Kepulauan Riau yang merupakan salah satu daerah kepulauan di Indonesia. Angka Harapan Hidup adalah pengukuran ekspektasi rata-rata umur manusia, yang digunakan sebagai salah satu indikator di bidang kesehatan untuk menghitung Indeks Pembangunan Manusia dan menjadi salah satu output kinerja pemerintah dibidang kesehatan. Penelitian ini menggunakan regresi model Data Panel dengan menggunakan data Angka Harapan Hidup sebagai variabel terikat dan belanja di bidang kesehatan serta persentase masyarakat miskin sebagai variabel bebas di 7 (tujuh) kabupaten/kota di Kepulauan Riau selama periode 2017 sampai dengan 2021. Hasilnya menunjukkan bahwa belanja bidang kesehatan berpengaruh positif dan signifikan terhadap Angka Harapan Hidup sedangkan persentase jumlah masyarakat miskin berpengaruh negatif dan signifikan terhadap Angka Harapan Hidup kabupaten/kota di Provinsi Kepulauan Riau.

**Kata Kunci :** angka harapan hidup (AHH), belanja kesehatan, kemiskinan, regresi berganda.

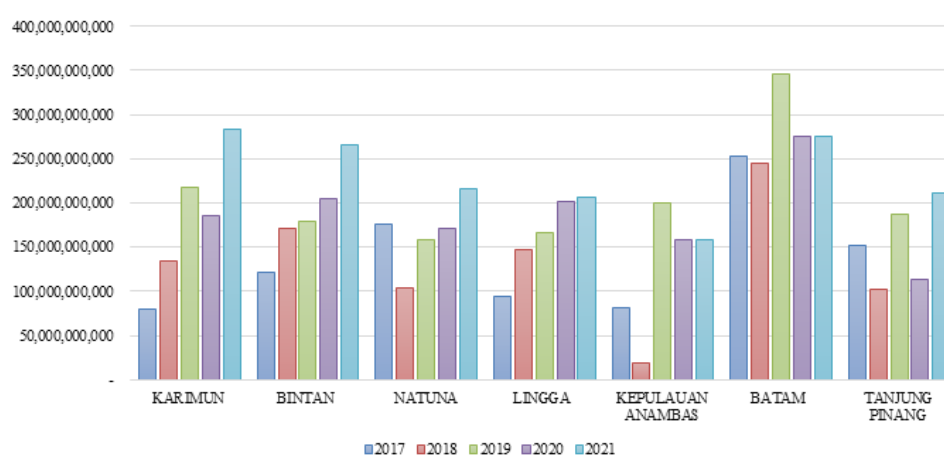
### **INTRODUCTION**

Health development is one of the main pillars of achieving the Sustainable Development Goals (SDGs) set by the United Nations. In the current global context, health development challenges have become a major focus for governments, non-governmental organizations and the academic community. Health development is not only about overcoming disease and causes of death but also about creating a healthy society. Although there have been significant improvements in access to basic health services in many countries, major challenges remain along the journey towards inclusive and sustainable health development. Factors such as lack of health infrastructure, inequities in access to quality health services, and poverty-related health problems continue to be major obstacles.

There is a new reality that has emerged in the last few decades. Increasing health development outcomes in low-income and middle-income countries has an impact on changes in health needs, increasing community expectations so that health development goals become more ambitious, requiring increased service standards and health outcomes as well as social values (Kruk et al., 2018).

Excellent public health conditions are an important factor in creating a prosperous society and, at the same time a target that the government must achieved and realized. Achieving health development targets contributes to achieving human development measures (Human Development Index) and Sustainable Development Goals ( Sustainable Development Goals ).

Riau Islands Province (Kepri), one of Indonesia’s archipelagic provinces, has unique challenges in providing quality health services to its people. The geographical conditions comprising 19 leading islands (Karimun 2, Batam 4, Bintan 1, Natuna 7, Anambas 5), which directly border neighboring countries, pose serious challenges and problems for accessing health facilities and improving community welfare. Infrastructure and distance between districts/cities and between sub-districts are challenges for providing access to health services. The distribution of the population on the Riau Islands is uneven, which can be seen from the 2,401 islands, of which only 394 are inhabited. Government intervention in the limited provision of quality health services can be done through budget allocations. Determining the size of the health budget has a very important role. An adequate and efficient health budget helps improve public health and strengthens health resilience in a province.

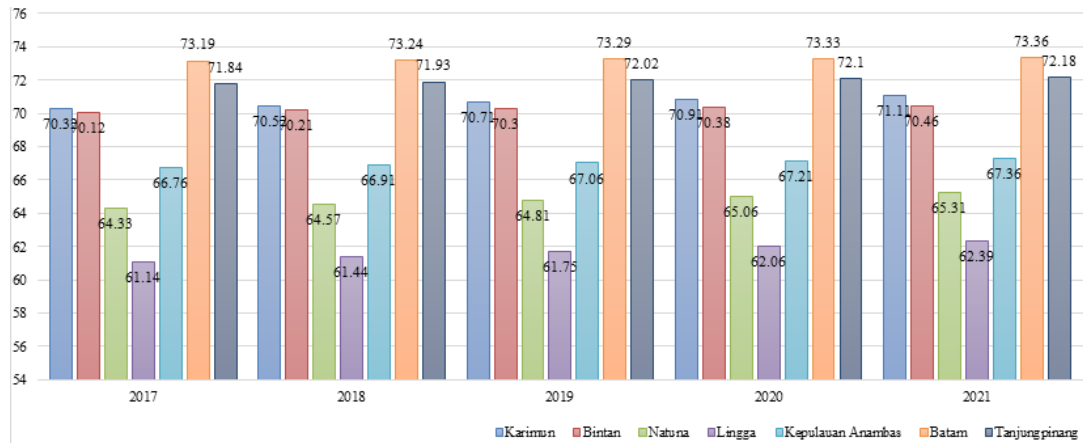


Source: Riau Islands Province Health Profile 2017-2021

**Figure 1**  
**Development of Realized District/City Health Expenditures in Riau Islands Province FY 2017-2021**

Figure 1 shows that, the realization of district/city health spending in the Riau Islands Province fluctuated during the research period. Only the realization of health expenditure in Bintan Regency and Lingga Regency has experienced a progressive increase from 2017 to 2021. The realization of health expenditure in the Anambas Islands Regency in 2018 was the lowest realization of health expenditure from 2017 to 2021, while the realization of health expenditure in Batam City in 2019 was the highest.

The size of the existing health budget shows how much of a priority a program is for a government. Life Expectancy is one of the outcomes of the health budget disbursed by the Government. Life Expectancy is how long, on average, a newborn baby can be expected to live if current death rates do not change (OECD, 2016) Increases and improvements in health levels can be seen from increases in life expectancy (Hasanah et al., 2021). Life expectancy or life expectancy at birth is the indicator most often used to see the output of health development (Sihaloho, 2019), (Ranabhat et al., 2018). High mortality (infants, children, and adults) directly reduces life expectancy. Socio-economic status, disease control approaches, lifestyle, and existing healthcare financing systems are also associated with mortality and morbidity (Ranabhat et al., 2017), (Dieleman et al., 2017). Low life expectancy in an area indicates that health development has not been successful, and vice versa (Muda et al., 2019).

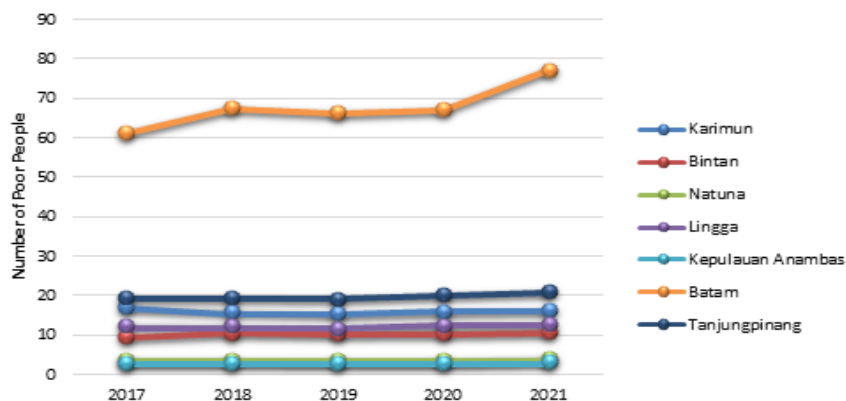


Source: Riau Islands Province Health Profile 2017-2021

**Figure 2**

**Development of District/City Life Expectancy Rates (LER) in Riau Islands Province 2017-2021**

Figure 2, shows that the Life Expectancy Rate (LER) for all districts/cities in the Riau Islands Province experienced a progressive increase throughout 2017-2021. The performance of the Regional Government in increasing Life Expectancy (LER) is improving every year. Lingga Regency's LER is the lowest, while Batam City's LER is the highest throughout 2017-2021. However, if we look at the growth rate, Lingga Regency LER in 2021 experienced the highest growth rate throughout the research period, which experienced growth of 0.33 points compared to the previous year, while Batam City LER in 2021 was the LER with the lowest growth rate throughout the research period with growth of 0.03 points compared to the previous year. It is important to recognize that poor health and poverty are interrelated and form a vicious cycle difficult to break. Poverty is the root of many diseases and causes death; reducing poverty levels will have a direct impact on better health (Tafran et al., 2020), (Rajan et al., 2013) and (Odorico et al., 2015). Additionally, poor health conditions can limit an individual's ability to work and earn an income, trapping them in poverty. Poverty is a multidimensional problem that requires multidimensional policies and intervention programs so that individual welfare increases and they can be free from poverty (Muda et al., 2019). The number of poor people in the Riau Islands can be seen in Figure 3 below:



Source: Riau Islands Province in Figures for 2018-2022.

**Figure 3**

**Number of Regency/City Poor People in Riau Islands Province 2017-2021 (in Thousand People)**

Figure 3 shows that Batam City has the highest number of poor people throughout the 2017-2021 period, with the highest number in 2021 being 77,170 people and the Anambas Islands in 2019 having the lowest number at 2720 people. The population of Batam City is the highest in the Riau Islands Province, and the Anambas Islands are also the district with the lowest population in the Riau Islands Province. However, in percentage terms, Natuna Regency in 2020 had the lowest percentage

of poor people at 4.3 percent of its population, while Lingga Regency in 2017 had the highest percentage of poor people at 13.8 percent. There are many infectious diseases in poor communities and poor conditions for pregnant women and malnourished children (Mubita-Ngoma, 2018). Furthermore, poverty affects children's health not only when they are young but also later in their lives as adults (Gupta, et al, 2007). The high poverty rate is the result of rapid population growth. High population growth rate impact on high health problems (Taylor, CE, Newman, JS, & Kelly, 1976). Many studies examine the influence of health spending and poverty on Life Expectancy (LER) (Bangun, 2019) .

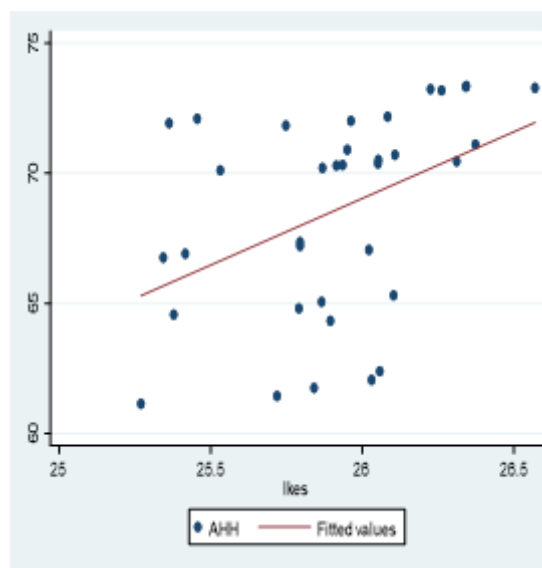
**METHODS**

This research is quantitative research using a descriptive approach and a verification approach. The data used is panel data. Panel data analysis includes two dimensions, namely, the cross-sectional dimension and the time series dimension. Based on the source, the data used is secondary data. Secondary data is data obtained by researchers indirectly through intermediary media, which consists of: (1) studies sourced from supporting journals and literature reviews; and (2) data on the number of poor people, Life Expectancy Rate (LER), and total health expenditure from 7 Regencies/Cities in the Riau Islands Province during the 2017-2021 period were obtained from the Riau Islands Provincial Central Statistics Agency and the Riau Islands Provincial Health Service.

The dependent variable in this research is Life Expectancy. In contrast the independent variable is the percentage of poor people, which is used as a proxy for poverty and the realization of district/city health spending in the Riau Islands Province. This research uses the Ordinary Least Square (OLS) method. Determining the best model is done using the PLS Model, Fixed Effect Model and Random Effect Model . The Ordinary Least Squares (OLS) method is a method that is often used to estimate regression model parameters. Classical assumption tests were carried out in this research, including normality, autocorrelation, multicollinearity, and heteroscedasticity tests so that the model meets the BLUE (Best Linear Unbiased Estimator) criteria.

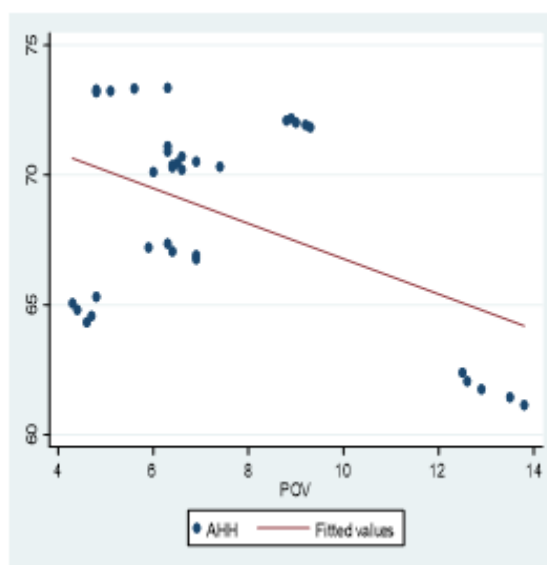
The models in this research are as follows:  $AHH_{it} = \alpha + \beta_1 LnKes_{it} + \beta_2 Pover_{it} + \mu_{it}$   
 Information : AHH: Life Expectancy Rate; Lkes: Natural logarithm of realized health spending;  
 Pover: Percentage of poor people; it: Regency –i in year –t;  $\mu_{it}$ : Error in Regency/City i in year t;  $\alpha$ : Intercept;  $\beta$  1-2: Regression coefficient

**RESULTS**



Source: processed data

**Figure 4**  
**Form of the relationship between LER and health spending**



Source: processed data

**Figure 5**  
**Form of the Relationship between LER and Poverty**

Based on Figure 4 and 5, it can be seen that LER has a positive relationship with health spending, where increasing health spending affects increasing LER. In contrast, poverty has a negative relationship with LER. The more the number of poor people increases, the lower the LER. The results of data processing using Stata, by selecting the best model between *Pooled Least Square* (PLS), *Fixed Effect Model* (FEM), and *Random Effect Model* (REM) by carrying out the Chow Test and Hausman Test, the *Random Effect Model* is the best choice.

**Table 2**  
**Panel Regression Results**

Variable	PLS	FEM	BRAKE
LKes	3,773 *** (1,847)	0.576 *** (0.160)	0.5739 *** (0.158)
Pover	-0.544 *** (0.221)	-0.237 *** (0.099)	-0.2497 *** (0.096)
Constant	-25,189 (48,365)	55,367 *** (4,462)	55,531 *** (4,663)
Prob > chi2		0.00	
R-Squared		27.96	

Note: Significant Level: \* for 10%, \*\* for 5%, \*\*\* for 1%

Source: processed data

Based on Table 2 with an R-squared value of 27.96, it can be interpreted that the variation in the change in the value of the Life Expectancy variable can be explained simultaneously by the independent variables of 27.96% *ceteris paribus* while other independent variables outside the model explain the remainder. Hypothesis testing needs to be carried out to answer the research objectives. Probability value  $\chi^2 = 0.0000 < \alpha = 0.05$ , thus rejecting  $H_0$ , which means that the independent variables together significantly influence the dependent variable, namely Life Expectancy, so this model can be used.

Partial tests on the independent variables were also carried out on the model where the variables of realization of health spending and the percentage of poor people significantly influenced the Life Expectancy Rate (LER), which was indicated by the probability value that none was greater than the critical value of 1%. Based on the regression results, it is known that the variable health expenditure realization (Lkes) has a coefficient of 0.57 and a significance level of 1%, which means it has a positive and significant influence on Life Expectancy (LER). An increase in the realization of

health spending by 1 (one) unit will increase the Life Expectancy Rate (LER) by 0.57 units. These results are in line with research results from (Wowor, 2013) (Sari et al., 2019), (Sihaloho, 2019). The poverty variable has a coefficient of -0.249 and a significance level of 1%, which means it has a negative and significant influence on Life Expectancy. An increase in the percentage of poor people by 1 percent will reduce the Life Expectancy Rate (LER) by 0.249 units. These results are in line with research by (Torpy et al, 2007), (Wardhana et al., 2020), (Kristanto et al., 2019), (Tafran et al., 2020) and Sihaloho (2019).

Effective health spending can increase life expectancy by ensuring better access to quality health services. Increased access to timely medical care, early diagnosis of disease, management of chronic disease, and health promotion and disease prevention can all contribute to increasing life expectancy in society. Government spending in the health sector for the development of facilities and infrastructure, as well as health infrastructure, also has an impact on increasing the accessibility and quality of health services, providing health education, supporting medical research, and strengthening health infrastructure, the government can directly influence the health welfare of the community. When people have better access to appropriate and affordable medical care and are adequately educated about health, they have a greater opportunity to prevent disease, receive timely treatment, and increase life expectancy. Several economic theories and models support this idea. One of them is the Human *Capital Theory*, which economist Gary Becker first introduced in the 1960s. This theory states that education and health are forms of human investment that produce long-term profits. In this context, government investment in health is considered a human investment, which in turn increases society's productive capacity and life expectancy.

There is also the Social Determinants of *Health Theory* which states that social and economic factors, including access to health services, influence people's health. This theory shows that by improving the accessibility of health services through government spending, people's life expectancy can increase.

It is important to note that although these theories provide a basis for understanding the relationship between government spending on health and life expectancy, the real success of these investments depends on the efficiency of spending, wise implementation of policies, and equitable access and services across society. Good management, transparency, and accountability in using of health funds are very important to achieve the desired results in increasing people's life expectancy. This theory emphasizes that inequalities in the distribution of these social and economic factors primarily cause inequalities in public health. In other words, people with limited access to education, stable employment, adequate housing, and limited access to other economic and social resources tend to have worse health risks and lower life expectancy.

The concept of Social Determinants of Health has been around for decades. However, its recognition and emphasis as a major theory and framework in public health research has increased in the late 20th and early 21st centuries. One study that supports the relationship between health spending and life expectancy is *the World Health Report 2000*, published by the World Health Organization (WHO). This report highlights the importance of an effective healthcare system and accessing quality health services as key factors in increasing life expectancy. However, it is important to remember that increasing life expectancy also involves other social factors such as education, economic conditions, sanitation, and nutrition. Therefore, a holistic and comprehensive approach is needed to extend life expectancy and improve the overall welfare of society.

Poverty has a negative influence on life expectancy; that is, when poverty increases, life expectancy decreases. This is also in line with the theory of social determinants of health, which was first introduced by a British doctor and sociologist named Sir Michael Marmot (1980). This theory suggests a relationship between poverty levels and life expectancy. In this theory, Marmot highlights that social and economic factors, including poverty, directly impact people's health and contribute to differences in Life Expectancy between different social groups. His work, including *The Black Report* in 1980 and his acclaimed book "*The Status Syndrome: How Social Standing Affects Our Health and Longevity*" published in 2004, has played a key role in bringing understanding and awareness of this theory. Marmot also chaired the Commission on the Social Determinants of World Health, which reported its results in the report "*Closing the Gap in a Generation*" in 2008. This effort has increased global awareness of the important role of social factors in determining people's health and life

expectancy. The theory of social determinants of health is not only found in Marmot's work but is also a theme studied by many researchers in public health and other social sciences. Research and growing empirical evidence have strengthened this argument, showing that increasing poverty often has a negative impact on people's health and can shorten life expectancy.

#### *Challenges for Health Development in the Riau Islands Province, which is an Island Region*

Island regions often face special challenges in health development which impact life expectancy, poverty and health spending. These challenges include limited access to quality healthcare, inequities in development, and unique environmental challenges.

1. Limited access to health services. In archipelagic areas, access to health facilities is often limited due to the geographical location between scattered islands which is remote and difficult to reach, especially during the strong wind season, thus preventing island residents from accessing quality medical care. This can lead to late diagnosis, less effective treatment, and increased mortality because diseases that can be prevented or treated well under normal conditions, such as respiratory tract infections and other infectious diseases, can become fatal if not treated quickly and effectively. So limited access to health services in the islands can reduce the population's life expectancy.
2. Infrastructure and Transportation. Infrastructure development in island areas is often more expensive than in plain areas due to topography, accessibility and logistical challenges. The construction process requires additional costs for transporting materials, labor, and equipment to hard-to-reach locations. So, the funds allocated for infrastructure development in island areas are relatively higher. The high costs of developing this infrastructure impact limited infrastructure, which means that health facilities in island areas need more access to sophisticated medical equipment and trained medical personnel. This can affect the quality of care provided to patients, which can affect life expectancy.
3. Poor infrastructure can also result in limited access to health education. Insufficient knowledge about good health practices and disease prevention can lead to increased preventable diseases, which can claim lives and reduce life expectancy. Also, poor infrastructure and limited transportation make the distribution of medicines, medical equipment and health personnel difficult. Delays in treating illnesses and emergencies can threaten the lives of island residents, affecting life expectancy.
4. Lack of trained health workers. A shortage of trained health workers, including doctors, nurses, and other medical personnel, is a significant problem. Many health workers prefer to work in health centers on large islands, leaving smaller islands with a shortage of medical personnel.
5. Poverty. Poverty in island areas can affect health spending. When low incomes are faced with high health costs, priorities for health spending may decrease. This means residents may delay or avoid much-needed medical care, leading to worsening health conditions and negatively impacting life expectancy.
6. The direct impacts of climate change in island areas include rising sea levels, rising temperatures, disruption of the availability of clean water, and weather changes. All of these impacts will usually be followed by social impacts and increased health problems. So they are very vulnerable to the risk of infectious diseases such as malaria, dengue fever and diseases caused by poor hygiene.

#### **CONCLUSION**

Health spending has a significant positive impact on people's life expectancy. When the government and related institutions allocate sufficient funds to the health system, the accessibility and quality of health services improve. This leads to early diagnosis of diseases, management of chronic diseases, and timely treatment of medical conditions, all of which contribute to increasing the population's Life Expectancy. On the other hand, poverty negatively and significantly impacts Life Expectancy. People living in conditions of poverty often face limited access to adequate health services, balanced nutrition, clean water and good sanitation. These factors, along with poor housing conditions and limited education, increase the risk of disease and premature death, which reduces Life Expectancy. Therefore, efforts to increase people's life expectancy must be focused on two main things: increasing health spending and poverty alleviation. By allocating adequate resources to the

health system and strengthening social infrastructure, governments can create an environment where people can access good medical care and receive adequate health education. Improving specific aspects of social development is necessary to increase life expectancy and public health. Policymakers should strengthen primary care systems to reduce inequalities in health. Meanwhile, programs designed to reduce poverty levels and improve people's living standards will help break the cycle of poverty and improve prosperity, ultimately extending the population's life expectancy.

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