The Influence of Health Facilities and Personnel on Life Expectancy in Yogyakarta Province

Sri Suharsih [a*], Ammar Thorif [a], Mufiidah Qurrota 'Aini [a] and Agnes Debora Sinaga [a]

[a] *UPN Veteran Yogyakarta, Indonesia.*

Authors' contributions

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ABSTRACT

Aims: Health service development aims to improve the quality of human resources. In this case, health development leads to public awareness and their desire to live healthily. One indicator of development success is the change in the average life expectancy (AHH) of an area. Life expectancy is a national or regional standard for measuring the government's success in improving public health. The life expectancy rate for DIY Province will be the highest in Indonesia in 2022.
Study Design: This research is using quantitative design with analysing data time series using secondary data.
Place and Duration of Study: Sample: The data used is annual data from 2000 to 2022, obtained from the online data of the Yogyakarta Health ministry and in figure.

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*Corresponding author: E-mail: sri.suharsih@upnyk.ac.id;

Methodology: The analytical method used is multiple regression on time series data.
Results: The results of the study showed that the number of health workers, outpatient visits, and inpatient visits did not have a significant effect, while the number of hospitals and health centres had a significant effect on life expectancy. It is hoped that this research can become the basis for policies to increase higher-quality medical personnel in the future.
Conclusion: The number of health workers, outpatients, and inpatients does not significantly impact life expectancy unless accompanied by quality facilities and infrastructure. In times of crisis (e.g. pandemic), inadequate facilities can decrease life expectancy. Additionally, increasing health workers without equal distribution, especially in remote areas, has no effect on life expectancy. However, the number of hospitals and health centers has a significant impact on life expectancy as they provide essential disease prevention and treatment services.

Keywords: Health facilities; life expectancy; DIY; expectancy in DIY; multiple regression.

1. INTRODUCTION

Life expectancy refers to the average age expected by some individuals or also as the average estimated years that humans will live. The basic choices that people usually choose are to live a decent life and be able to live a long, healthy life, obtain education and have access to the necessary resources. High and low life expectancy can be a factor that can be considered in describing a society's socio-economic progress. Life expectancy is an estimate of how long a person has lived since birth, measured in years. According to Saraswati and Widaningsih (2008), life expectancy is the average length of life of a person who has just been born [1-3].

Life expectancy is an important population standard and is used as an index to measure the quality of the population. The high and low average life expectancy is a factor that needs to be considered in describing the socio-economic progress of society. Life expectancy in each country varies greatly, and some developed countries tend to have higher life expectancy than developing countries. Increasing life expectancy shows the success of socio-economic development programs, so that life expectancy becomes a measurement index for the Human Development Index. The average life expectancy is increasing every year, indicating that human development has achieved success. This is due to the productive age population meeting the needs of the elderly (Ministry of Health of the Republic of Indonesia, 2013).

2. LITERATURE REVIEW

2.1 Health Services

Komaruddin [4] defines service as an achievement carried out or sacrificed in order to satisfy the requests or needs of other parties. Another definition states that service is something that can help, welcome, reply, heed, satisfy, serve, present, help, respond, provide everything that is needed or something that is needed by another party [5].

2.2 Medical Facility

in step with the Republic of Indonesia government law wide variety forty seven of 2016 regarding fitness carrier facilities (Ministry of health, 2016), a health centre or fitness service facility is a device or region that is used to carry out health provider efforts, each in phrases of promotive, preventive, curative and also rehabilitative done by using the significant government, nearby government, or the community. Health service facilities have 3 levels, including: Firstly, first level health service facilities that focus on providing basic health services. Second, second level health service facilities which focus on providing specialist health services. And thirdly, third level health services focus on providing subspecialty health services [6-8].

2.3 Health Workers

Health workers primarily based at the law of the Republic of Indonesia regarding health No. 36 of 2014 are each person who dedicates themselves to the fitness zone and has understanding and capabilities via education within the fitness sector for positive types that require authority to perform fitness efforts. Health workers also have an vital function in enhancing the most excellent of health offerings to the community so that people are capable of increase their attention, will and capacity to stay healthily in order that the highest level of fitness may be carried out as an funding for the

improvement of human sources which can be socially and economically efficient and as an detail of fashionable welfare as intended inside the Preamble to the 1945 charter of the Republic of Indonesia.

2.4 AHH Indicators in Development Goals

The policy direction and strategy for national health development 2020-2024 is part of the long-time improvement Plan for health (RPJPK) 2005-2025. The intention of health development is to increase consciousness, will and ability to live healthily for everyone if you want to achieve the best degree of public health, as a funding for the development of socially and economically effective human assets. meanwhile, the fitness improvement goal to be carried out in 2025 is a boom inside the level of public fitness as indicated by an increase in lifestyles expectancy, a decrease inside the maternal mortality fee, a lower inside the infant mortality fee, and a lower in the superiority of undernutrition among kids below 5 (DIY Health Department Strategic Plan 2023-2026).

The degree of health as an indicator of the DIY Human Development Index (HDI) depends on the development of mortality and morbidity rates. In the health context, deaths that are of primary concern are deaths caused by various health problems which in this case can be divided into general deaths and specific deaths (deaths of mothers, babies, and toddlers). Specific deaths that are of priority concern have a large influence

on life expectancy due to the magnitude they produce. DIY's Life Expectancy Rate (AHH) is the best nationally with an achievement of 74.74 years in 2017, 74.82 years in 2018, 74.92 in 2019, and in 2020 reaching 74.99 (DIY BPS), this shows that the health status of the people of DIY is getting better [9,10].

2.5 Previous Research Results

Health facilities, health workers and regional gross domestic product together or simultaneously have a significant influence on life expectancy in West Nusa Tenggara province in 2019-202 [11]. Factors that have a significant influence on AHH in South Sulawesi in 2019 are a clean and healthy lifestyle, poor nutrition, and average school attendance. (Alwi et al., 2023). From the research results (Princess, 2015) It can be seen that the significant contribution of health facilities and services, in this case the number of health workers sought by local governments, can create a higher level of life expectancy. Life expectancy is essentially a general description of the conditions of an area. The increase in life expectancy in Central Kalimantan province shows an improvement in public health status, including increased access and better quality of health services, helping to reduce poverty levels through increasing employment opportunities in Central Kalimantan province [12]. Apart from that, the ratio of community health centres per sub-district has a significant influence on AHH [13].
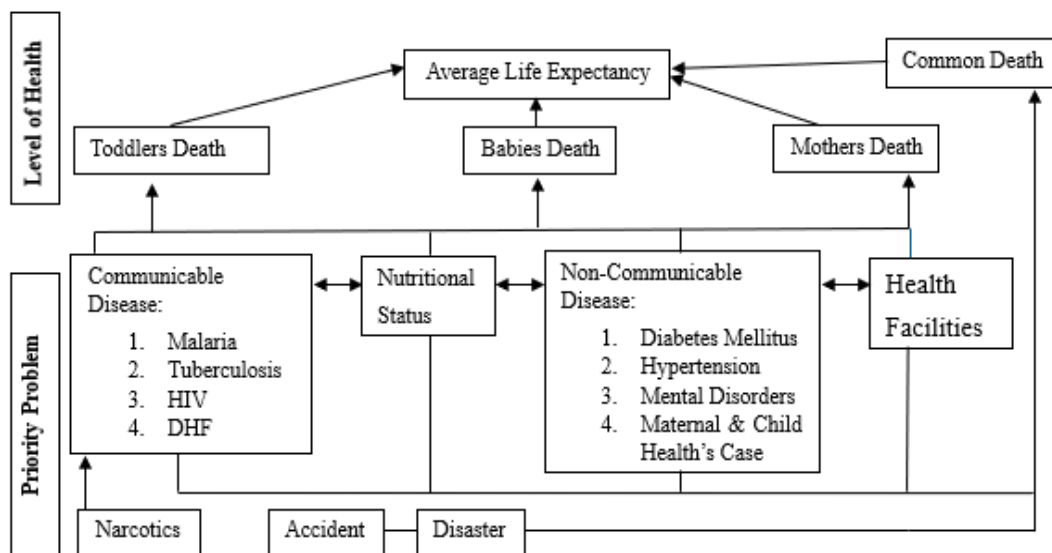

Fig. 1. AHH indicator achievement source: DIY Health Office Plan 2022

There's sturdy and fine courting among clinical group of workers, medical insurance, and life expectancy. The dependency and poverty ratio also has a sturdy and negative dating with lifestyles expectancy. however, the provision of fitness facilities and earnings inequality have a weak dating with existence expectancy. Kristanto et al., [14].

3. METHODOLOGY

3.1 Classical Assumptions

The classical assumption test is used to test the feasibility of the multiple regression model used through the presence or absence of residual normality, multicollinearity, autocorrelation, and heteroscedasticity in the regression model. The research procedure for testing the classical assumptions in multiple regression analysis is as follows:

   a. Normality Test: Normality check to check whether or not the standardized residual values within the regression example are commonly allotted or not. on this technique the residual fee is usually distributed if the Jarque-Bera opportunity value is > 0.05.
   b. Multicollinearity Test: to test whether the regression version bureaucracy a very sturdy/high or ideal correlation among the impartial variables. If it is observed that there is an excessive dating between the unbiased variables, it can be said that there are multicollinear symptoms within the studies.
   c. Heteroscedasticity Test: There is unequal variance in the residuals for all observations in the regression model. Based on the Obs*R-Squared P-value obtained when > 0.01, this proves that there is no problem with heteroscedasticity. You can use White's test or Breusch-Pagan test to test this hypothesis.
   d. Autocorrelation Test: Carry out the LM test (Bruesch Godfrey method). This method is based on the F fee and Obs*R-Squared, wherein if the original opportunity price of Obs*R-Squared exceeds the self-assurance stage, then H0 is regular. is that there may be no autocorrelation problem.

3.2 Multiple Regression (log-linear)

Multiple linear regression is a regression model that includes more than one independent variable. Multiple linear regression analyses were done to acknowledge its path and how the dependent variable is influenced by the independent variable. Ghozali, [15].

The reason why the author chose the multiple linear regression method in the data time series is because the multiple linear regression model allows authors to measure the influence of each independent variable on dependent variable while controlling other variables. It' important when the dependent variable is influenced by many factors; the multiple regression model often gives more information than some independent variables; the multiple regression model allows authors to compare the relative significance of various independent variables in influencing the dependent variable; and with the multiple regression model, authors can indefity and handle multicollinearity problems where there is high correlation between independent variables that can influence the interpretation of regression coefficient [16,17].

Because there are unit difference in the data, data transformation is done to simplify the interpretation and further analysis with the linear regression technique. Here is the multiple linear regression model we used:

$$Y = \alpha_0 + \beta_1 \log(X_{1t}) + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 \log(X_{4t}) + \beta_5 \log(X_{5t}) + t$$

3.3 Statistical Test (Adjusted R-Squared)

At the value of the coefficient Adj, R^2 which is an illustration that the independent variables together are able to provide an explanation of the dependent variable by the coefficient value.

3.4 Uji Statistik (Uji t)

A partial test or t-test is done to see whether one independent variable is affecting the dependent variavle by comparing the calculated t value and t table or comparing its calculated probability with the standard error rate of 0.05.

So that the hypothesis of this research are:

   - If the probability value of the t-value is less than 0.05, the independent variable (number personnel, number of hospitals, number of community health centers, number of inpatients, and number of outpatients) is significantly influential on life expectancy.

- If the probabilty value of the t-value is more than 0.05, the independent variable (medical personnel, number of hospitals, number of community health centers, number of inpatients, and number of outpatients) is not significantly influential on life expectancy.

3.5 Data

For the collecting technique, the secondary data used in this research was obtained from many trustworthy and relevant sources related to our research topic. The process of collecting secondary data began with indentifying the data source. Where the data we have comes from the annual publication of the Yogyakarta Special Region Provincial Statistics Agency, which is the official and trustworthy source. Then, researchers select and validate data that id relevant to the topic under study, collect data, and end with data processing. Because there is a limitation in the secondary data, it it possible that there is a bias in the research result.

In research using secondary data, using data on life expectancy, the number of health facilities including the number of hospitals and the number of health centres, the number of medical personnel or doctors, the number of outpatient/inpatient visits in Yogyakarta Province, taken from the Central Statistics Agency (BPS) and Yogyakarta publication in figures 2001-2023.

4. RESULTS AND DISCUSSION

Variable Description:

Y : Life Expectancy
X1 : Medical Personnel
X2 : Number Of Hospitals
X3 : Number Of Community Health Centres
X4 :Number Of Outpatient Treatments
X5 : Number Of Hospitalizations

The Normality Test of this regression model obtained a Jarque-Bera value of 0.785 > 0.05, which means the model is normally distributed. Multicollinearity Test in the multicollinearity test estimation results, the Cantered VIF value is less than 10, which means the model is free from multicollinearity. Heteroscedasticity Test in the estimation results of the heteroscedasticity test, the Obs R-squared probability value has a value of 0.3492 > 0.05, so it can be interpreted that

this model is free from heteroscedasticity. The autocorrelation test on this estimate obtained a chi square probability value of 0.3891 > 0.05, which means the model is free from autocorrelation. From the classical assumption test above, the estimation model can be tested further as below.

Estimated result of the multiple linear regression presented in the following equation.

$$Y = 67,0948 - 0,0562 \log(X1) + 0,0298\, X2 + 0,0061\, X3 + 0,0903 \log(X4) + 0,0298 \log(X5)$$

$$(0,7252)\ (0,0000)\ (0,0053)\ (0,1193)\ (0,4947)$$

From the result of the data processing above, it can be seen that the value of adj. R-Squared is 0.9485 (94.85%). It showed that medical personnel, the number of hospitals, the number of community health centers, the number of inpatients, and the number outpatients altogether can give an explanation for life expectancy in the amount of 94.85%. The rest of it, 5.15%, is explained by the other variable outside the model.

The number of hospitals (X2 has a positive and significant effect on life expectancy in Yogyakarta Province also increased. Theoretically or conceptually, an increase in the number of hospitals in one area also pushes the increase in life expectancy in that area. The results of this study are consistent with previous research conducted by Ginting [12] and Pratiwi & Budyanra [13].

The number of community health centers (X3) has a positive and significant effect on life expectancy (Y) at a 95% trust level. With the number of community health centers bulilt, the life expectancy in that area. The result of this study is consistent with previous research done by Ginting [12] and Pratiwi & Budyanra [13].

Number of outpatient treatments (X4) and number of hospitalizations (X5) doesn't have a positive and significant effect on life expectancy (Y) at a 95% trust level. Because they only provide treatment when someone is already sick, they are unable to prevent the occurrence of diseases and poor health conditions in the long term, In addition, the quality and effectiveness of healthcare services, including inpatient and outpatient care, play a more important role than their more availability.

Table 1. Descriptive Statistics

Variabel	Min	Maks	Mean	Std. Deviasi	Jarque-Bera
Life Expectancy (year)	71.98000	75.08000	73.63783	1.055862	2.041116
Medical Personnel (people)	606.0000	6306.000	2445.304	1556.801	4.350355
Number of Hospitals (unit)	31.00000	93.00000	56.69565	22.34530	2.681566
Number of Community Health (unit)	446.0000	670.0000	579.7391	56.57916	1.594648
Number Of Outpatient Treatments (visit)	35905.00	10087270	4926542.	3151176.	1.530108
Number Of Hospitalizations (visit)	5235.000	1680451.	374362.8	454100.9	18.19722

Table 2. Data statistics and tnterpretation

Dependent Variable: Y
Method: Least Squares
Date: 10/28/23   Time: 08:05
Sample: 2000 2022
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	67.09482	1.058822	63.36740	0.0000
LOG(X1)	-0.056225	0.157340	-0.357348	0.7252
X2	0.029829	0.004809	6.202116	0.0000
X3	0.006161	0.001926	3.199456	0.0053
LOG(X4)	0.090385	0.055105	1.640244	0.1193
LOG(X5)	0.029832	0.042744	0.697913	0.4947

R-squared	0.960248	Mean dependent var		73.63783
Adjusted R-squared	0.948556	S.D. dependent var		1.055862
S.E. of regression	0.239483	Akaike info criterion		0.198789
Sum squared resid	0.974985	Schwarz criterion		0.495005
Log likelihood	3.713923	Hannan-Quinn criter.		0.273287
F-statistic	82.12990	Durbin-Watson stat		1.713603
Prob(F-statistic)	0.000000			

The number of health workes (X1) does not have a positive and significant effect on life expectancy (Y) at a 95% trust level. This is because access to indequate medical tools and health facilities effects the quality of how health workers handle patients.

5. CONCLUSION AND RECOMMENDA-TIONS

Based on the analysis carried out, the conclusions of this research are the number of health workers, the number of outpatients and the number of inpatients do not have a significant long-term effect on life expectancy, this is because the large number of health workers if not balanced by quality facilities and infrastructure does not have a significant effect, this is also applies to the number of outpatients and inpatients, because low or inadequate quality in health services can reduce their

positive impact on life expectancy. Under certain conditions the number of inpatient and outpatient care increases (for example a pandemic) and then the number of health facilities is inadequate, then life expectancy will decrease. Meanwhile, under normal conditions, the number of Health Workers is increasing, but if it is not accompanied by equal distribution, especially in remote areas, it will have no effect on life expectancy. The number of hospitals and the number of health centres have a significant effect on life expectancy because hospitals and community health centres have the task of preventing disease in the community (at community health centres) and treating disease with adequate facilities (at hospitals).

Apart from that, we also provide recommendations based on research results, it is necessary to increase the number and quality of hospitals and health centers in DIY Province,

so that a clear strategic plan needs to be prepared to improve the quality of health services and facilities. In terms of health budget management, it is best to maximize the health budget towards the costs of socializing disease prevention in the community, because prevention can make a limited budget more effective than focusing on medical costs. For future research, it is recommended to use data with a longer range or use panel data (per district) to analyze the influence of different entities in each district.

Based on researchers direct experiences in this research process, there are some limitations to be noticed by the upcoming researchers to complement their research. The limitations oog this research may be limited or do not cover every relevant variable. The result of this research may not be generalized yet to other regions. Beside that, this research is only focusing on some factors (health workers, health facilities, lifestyle, and access to education, can also affect life expectancy. And last, the analysis technique used may not be able to catch the complexity of the data or variable being analyzed.

So suggestions for the upcoming researchers are to add another variable that is still relevant, like socioeconomic status, lifestyl, and access to education, to achieve a more comprehensive understanding of factors that affect life expectancy and to use analysis techniques that can look at the short-term and long-term effects, like the Vector Autoregression (VAR) model.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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