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**RESEARCH ARTICLE**

# The Effect of Education, Economic Growth and Artificial Intelligence on Stunting

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| *ARTICLE INFO* | **ABSTRACT** |
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| | Stunting is a global health issue where a toddler's body is smaller than average due to chronic malnutrition, particularly during pregnancy or the first 1,000 days of life. This research aims to explore the factors that contribute to stunting, focusing on three variables: education (X1), economic growth (X2), and internet access (X3). Using the EViews analysis method, we investigate how changes in each variable individually and collectively impact stunting rates. Our findings indicate that a 1% decrease in education levels leads to a 4.1% rise in stunting, while a drop in economic growth correlates with a 0.007% increase in stunting. Interestingly, a 1% increase in internet access is linked to a 0.12% rise in stunting, suggesting complex social and economic dynamics. Simultaneously, when education, economic growth, and internet access are tested collectively, increases in these variables also correspond to an increase in stunting, pointing to possible interdependent factors influencing stunting rates. |

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## INTRODUCTION

Stunting is a circumstances where the growth and development of a child is hampered due to a lack of nutrition or malnutrition during the mother's pregnancy (Khara & Mates, 2015). Stunting is explained by WHO as a circumstances in which children experience retarded growth due to poor diet and are at cogent risk of disease or death. The impact of stunting on toddlers affects children's cognitive development to be rather difficult (Salem et al., 2016). If a child's height for age is more than two standard deviations below the WHO Child Growth Standards Median, it might be considered stunting (S. Haylian Chiani et al, 2022). The Indonesian government is worried about how to prevent stunting in children because Indonesia is the country with the largest number of stunting after Pakistan 45%, Congo 43%, Ethiopia 38% and Indonesia 37.2%  (Prameswari, 2022).

It is said from research conducted that there is an influence of mother's knowledge and attitudes on stunting in children. Mothers who have low knowledge about nutrition have a 2.7 higher chance of their children experiencing stunting compared to mothers who have high knowledge about nutrition (F. Elba, H. C. Hassan, N. S. Umar, 2024). Children during their growth and nutritional needs certainly need the role of parents, especially mothers (H. Munawaroh, N. Khoirun Nada, n.d.). If a mother has low knowledge, this will affect the fulfilment of nutrition, this will cause the mother to give food that is not good and provide food that is not appropriate, a mother will be confused and will not even think about her child's nutrition so she will give food that she thinks is sufficient for her child will not

even think about her child's nutrition so she will give food that she thinks is sufficient for her child (W. Kresnawati, R. Ambarika, 2022). Another factor that is considered to influence stunting is Internet Access. Internet Access itself has many functions in preventing stunting, such as being a link for conveying information about nutrition education through various media, one of the media used is Android-based media. Android-based media is one of the educational media that uses edutainment technology, where this media is very suitable to be applied to teenagers in Indonesia. This is because Indonesia is a country with rapidly growing internet use and the total active internet use in Indonesia in 2019 reached 142.8 million people (M. Eru Putra, W. Femelia, 2022).

Stunting is not only influenced by factors directly related to health, but can spread through other factors such as decreased economic growth, poor people and lack of education. There is a relationship between this factor and stunting, namely poverty causes malnutrition, malnutrition causes slowed economic growth due to less productive human resources (Fauziah Gusvita Syarah Harahap, 2023). After further research, economic growth factors have a significant relationship with the occurrence of stunting. The greater the economic growth, the smaller the number of stunted children will be, and vice versa (Julia, 2021).

## MATERIAL AND METHODS

### Stunting

A persistent dietary issue that affects toddlers, stunting impairs their development, increases their risk of illness, lowers their IQ, and lowers the standard of a nation's human resources (Nur et al., 2021). The prevalence of stunting from Basic Health Research in 2013 showed a figure of 37.2%, while recording results in 2016 showed it was 27.5%. This is much greater than the WHO limit, which is below 20% (Susanti, 2000). Stunting can be caused by problems in the nutritional intake provided during pregnancy or as a toddler (Darus & Abdurrahman, 2023). Compared to the 3 common diseases of malnutrition, namely stunting, wasting, & overweight, stunting is the most common disease, with 149 million children affected by stunting in 2023. In addition, in 2018, more than half of the number of children affected by stunting came from Asia with a total of 81.7 million children and more than a third were in Africa with a total of 58.8 million children (D. I. Yani, L. Rahayuwati, C. W. M. Sari, M. Komariah, 2023).

### Education

Education is an important thing for humans to develop individual potential, success, knowledge and character (Vongalis-Macrow, 2016). Education is the process of using introduction and training to modify a person's mindset and behaviour in the workplace (Kanthawongs et al., 2016). Education in general is an activity carried out to convey messages to the community, groups or individuals (H. Munawaroh, N. Khoirun Nada, n.d.). Nutrition education is important and has been implemented in schools so that students know the importance of nutrition so that they can build a strong national generation and reduce the prevalence rate of stunting (Ringoringo et al., 2021).

### Economic growth

Economic growth in this research is measured using GDP (Gross Domestic Product) data (Teixeira & Queirós, 2016). GDP is the value of goods or services produced by a country in a certain period. Which adds up all the results of the citizens of the country concerned plus foreign nationals working in that country (Forte et al., 2015). GDP is said to be national income so that growth in GDP can mean an increase in the country's economy (Julia, 2021). Stunting is not always influenced by direct factors such as malnutrition but can also be caused by indirect factors such as socio-economic problems that cause poor people (Nur et al., 2021). This can affect stunted toddlers directly, with slow economic growth the number of poor people increases which causes their children to lack nutrition and sufficient food due to lack of money (Ringoringo et al., 2021). This factor also has a reciprocal effect on stunting itself because stunting is caused by economic problems while on the contrary with stunting the ability of the workforce will decrease which causes a decrease in economic growth and causes this chain to continue (Julia, 2021).

### Artificial intelligence

The implementation of AI (Artificial Intelligence) has been widely used in Indonesia in various fields in terms of information, education, health and other fields. The use of AI has been very extensive and

has succeeded in reaching several aspects of information needs, including monitoring child growth. Various case studies that have been conducted show that using an AI-based health application has an impact on improving the quality of health services (P. Utami, P. Daryuni, R. Permata Rifayanto, 2023). In addition, the AI tool discusses the use of AI as a tool to measure risk factors for malnutrition and stunting (Ambarwati, 2022). AI usage data is taken from internet access usage data, this is because for AI to be accessed, the user must have good internet access.

## Research variable

In this study, the first variable Stunting measures the level of incidence of stunting problems which is symbolized by St and is measured in terms of the number of people experiencing stunting. The second variable is Education, which measures the total number of school children who reach the Senior High School level, symbolized by Edu and measured in the number of students. The third variable is economic growth (GDP) which measures the rate of economic growth which is symbolized by E and is measured in percent (%). The data collection method used in this research is secondary data. Secondary data is data based on information collected from existing sources (O. Risdiana Chandra Dhewy, 2022). The data taken for this research was taken from the Central Statistics Agency (BPS) for education data and economic growth data, as well as the West Java Dashboard for stunting data. All data obtained uses community data in West Java province from 2018 to 2023.

## Research data method

The data collection method used in this research is secondary data. Secondary data is data based on information collected from existing sources. The data taken for this research was taken from the Central Statistics Agency (BPS) for education data and economic growth data, as well as the West Java Dashboard for stunting data. All data obtained uses community data in West Java province from 2018 to 2023.

The method used in conducting data analysis is quantitative methods. Quantitative data is research that uses numbers from the data collection, data estimation and results presentation stages (O. Risdiana Chandra Dhewy, 2022). This research takes data on the number of stunting incidents, number of education levels, average income, and the amount of economic growth measured by numbers, so this research uses quantitative data analysis methods. The analytical tool used to carry out data analysis in this research is EViews, which is a data analysis application. EViews is software that is used as a statistical analysis tool for time series data (M. Sofyan and C. Marlinda, n.d.).

## Research model

In this study we used multiple linear regression techniques. Multiple linear regression is a linear model that uses more than one independent variable or predictor (N. Sudariana and M. M. Yoedani, n.d.). To obtain the results of the analysis of the relationship between variables, this research uses a multiple linear regression model as shown below:

$$St = \beta 0 + \quad \beta 1 Edu + \ \beta 2 EG + \ \beta 3 IA + e \qquad (1)$$

$$St = \beta 0 + \quad \log \beta 1 Edu + \ \beta 2 EG + \ \beta 3 IA + e \qquad (2)$$

Where:

St = Stunting

Edu = Education

EG = Economic Growth

IA = Internet Access

$\beta 0$ = Constant

$\beta 1$, $\beta 2$ = Regression Coeffiecient

e = Error

## RESULTS AND DISCUSSION

All independent variables have a significant effect on the dependent variable. The independent variable is able to explain the dependent variable by 99%, while the outsourcing model variable explains 1%. If the number of West Java residents with education increases by 1%, the number of stunted children under five will decrease by 4.11%, so that education has a negative impact on stunting. If the Economic Growth percentage increases by 1%, the number of stunted children under five will decrease by 0.007%, this also says that Economic Growth has a negative impact to on stunting. Meanwhile internet access has a positive relationship with stunting. If internet access increases by 1%, stunting will increase by 0.012%.

### Education on stunting

Increasing the level of education in West Java has been shown to have a significant negative correlation with stunting rates in toddlers. Based on the results of the study, every 1% increase in the number of educated population in West Java has the potential to reduce the prevalence of stunting in toddlers by 4.11%. This finding highlights the importance of investing in education as an effective strategy to reduce stunting and improve the quality of life of children in the region. In addition, these results strengthen the argument that education has a key role in increasing awareness of nutrition and health, which directly contributes to reducing stunting rates.

### Economic growth on stunting

The results of the study showed that economic growth has a negative relationship with stunting rates in toddlers. Every 1% increase in the percentage of economic growth has the potential to reduce the number of stunted toddlers by 0.007%. This finding indicates that increasing economic welfare can contribute to improving nutritional and public health conditions. In addition, these results strengthen the view that sustainable economic growth can create better access to adequate health, education, and nutrition services, which ultimately supports a gradual decline in stunting rates.

### Artificial intelligence on stunting

The results of the study showed that internet access has a positive relationship with stunting rates. Every 1% increase in internet access is estimated to increase stunting rates by 0.012%. This finding indicates that although internet access has the potential to provide broader information, its undirected or less than optimal use in disseminating information related to nutrition and health can have a negative impact. These results also highlight the need to strengthen digital literacy and public education about the use of the internet to support healthy lifestyles and prevent stunting among children.

## CONCLUSION

This research shows that by increasing education by 1%, the number of stunting will decrease by 1.55%. This indicates that there is a negative and significant relationship between the education variable and stunting. This is also in line with research, which shows that economic growth has a negative and significant relationship. If economic growth increases by 1%, stunting will decrease by 0.01%. Meanwhile, the internet access variable has a positive and significant relationship, where if internet access increases by 1%, stunting will increase by 0.012%. And it can be concluded that internet access has no influence on stunting.

Based on the results of this study, it can be concluded that increasing education levels and economic growth play an important role in reducing stunting rates in Indonesia. The relationship and significance between education and economic growth with stunting rates confirms that improving the quality of human resources and economic welfare have a positive impact on overcoming the problem of malnutrition.

However, findings regarding internet access that show a positive and significant relationship to increasing stunting rates require further attention. These results indicate that although internet access can improve information connectivity and its less than optimal use, especially in the aspect of nutrition and health education, can be a contributing factor to the increase in stunting rates.

Therefore, policies that focus on improving education, strengthening economic growth, and more effective use of the internet for health and nutrition education are needed. This approach is expected to support ongoing efforts to reduce the prevalence of stunting in the future.

In the process of conducting research and writing this article, there were several limitations experienced and could be several factors that need to be considered by future researchers to further improve what might affect the research results, namely:

1. There are limitations on research time, energy and researcher capabilities.
2. This study only examines the influence of education, economic growth and Artificial Intelligence on stunting, so further research is needed to examine the influence of other factors on stunting.
3. The conclusions drawn are only based on the data analysis obtained, it is hoped that there will be further research with different research methods, wider samples, and the use of different and more complete research instruments.
The suggestions for further researchers are as follows:
1. For further researchers who will conduct similar studies to further develop the variables used to be broader.

2. Researchers can conduct surveys by coming and examining toddlers affected by stunting directly so that the data collected is more accurate.

3. Further researchers are advised to test the accuracy of the data collected so that the study results are better and more accurate.

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