DOES STUNTING AFFECT REGIONAL ECONOMIC GROWTH IN INDONESIA? (CASE STUDY IN CENTRAL JAVA PROVINCE)

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Abstract. Stunting is one of the biggest problems facing the world, including Indonesia. The high rate of stunting in Indonesia is considered one of the factors that influence the low level of economic growth in various regions of the country. This study aims to prove that stunting prevalence affects Indonesia's economic growth. The study utilizes data on the prevalence rate of stunting in 36 regencies/cities in Central Java. We employ panel data regression analysis to address the research objectives. The study's findings indicate that the prevalence rate of stunting in a given area has a significant impact on economic growth. Handling to reduce stunting in the region is important to maintain economic growth.

Keywords: prevalence stunting, regional inequality, SDG's, socio-economic, economic growth

A. Introduction

Stunting has become a global problem, and it is one of the Sustainable Development Goals (SDGs). Reducing stunting is the main target in the SDGs, namely eliminating all forms of malnutrition for short and thin children by 2030 and improving the nutrition of adolescent girls, pregnant women, and the elderly. Stunting has a major and long-term impact, not only on the individual aspect but also on the life of society, nation, and state. Continuous health problems in individuals lead to increased health spending over time, which in turn burdens the family and ultimately increases family poverty. Stunting will reduce a person's productivity level and cause a decline in output. Study by (1) stated that the prevalence of stunting has the potential to reduce Gross Domestic Product (GDP) by 1-2 percent per year.

The prevalence rate of stunting in the world is still quite high, around 150 million, or around 22 percent of the world's total population. Indonesia itself has a stunting prevalence that is still much lower than the world's, which is 21.6 percent (2). This figure has decreased significantly compared to 2018, which was 31.8 percent of the total population of Indonesia, or around 85.9 million people (Asian Development Bank, 2022). However, the prevalence of stunting in Indonesia is still much higher than the government's target of 14 percent.
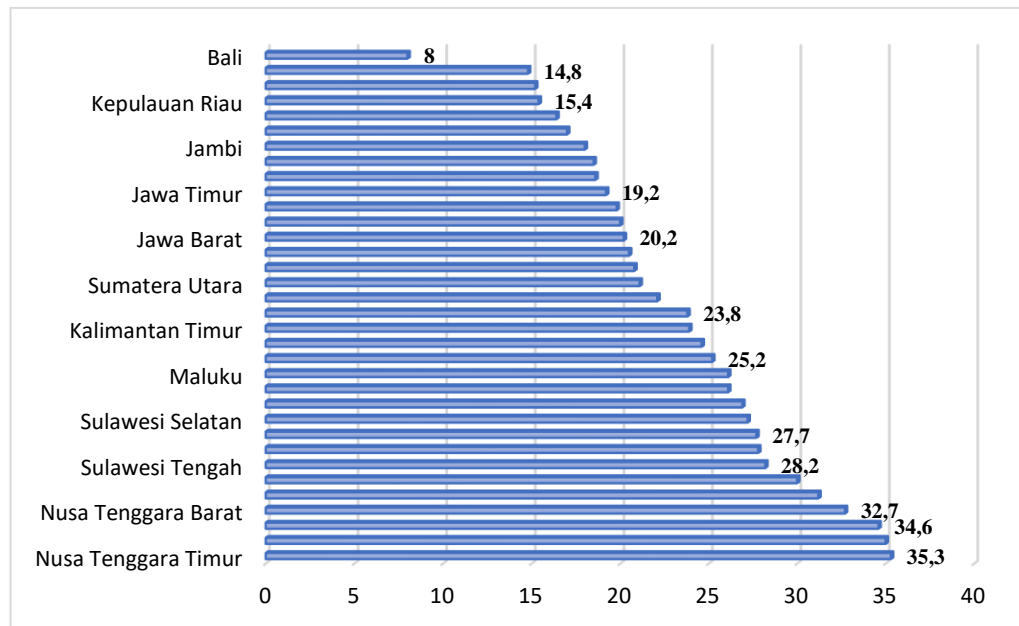
Figure 1. Prevalensi stunting based on province in Indonesia

Source: Ministry of Health (2022)

Figure 1.1 shows Indonesia's stunting prevalence distribution by province. Almost all provinces in Indonesia have failed to meet the government's 14 percent target due to the high prevalence of stunting in their regions. East Nusa Tenggara (NTT) Province has the highest stunting prevalence in Indonesia (35.3 percent), while Bali Province has the lowest at 8 percent. The high prevalence of stunting in Indonesia underscores the need for prioritizing its management, particularly in areas outside Java.

Many regions continue to use a holistic and integrative multi-sector approach to prevent and reduce stunting prevalence, addressing both nutritional and non-nutritional aspects. Prioritizing the causative factors guides efforts to reduce the prevalence of stunting. The direct causes of stunting are a lack of nutritional intake and poor health status. Low food security, social environmental conditions, health environments, and housing environments are also indirect causes of stunting (3). Stunting prevention focuses on direct causal factors through the integration of specific and sensitive nutritional interventions (4)(5)(6)(7), sanitation and socioeconomic factors serve as indirect factors (8)(9)(10)(11)(12) (13)(7)(14).

In addition to nutritional and socio-economic factors, the major issues associated with stunting also stem from economic factors, education, and knowledge about child care (15). Other factors that also influence the prevalence of stunting are poor sanitation facilities and access to clean drinking water (16)(7)(14). It is still necessary to prove the relationship between nutritional, socioeconomic, and sanitation facility factors and the prevalence of stunting.

Analysis of the determinants of stunting prevalence is important to formulate policies to reduce the prevalence of stunting. In Indonesia, studies on the determinants of stunting prevalence in districts and cities have focused more on nutritional, socio-economic, socio-demographic, and sanitation aspects. Research on the prevalence of stunting, which incorporates spatial aspects and uses multivariate analysis to group regions, has not been widely conducted at the district and city level in Indonesia.

The research aims to: (1) look into the factors that affect the rate of stunting in Central Javan regencies and cities by looking at their nutritional, socioeconomic, and sanitation facilities; and (2) put regions into groups based on the rate of stunting in Central Javan regencies and cities.

B. Methods

1. Research Data

The purpose of this study is to examine 36 regencies/cities in Central Java for the period 2022-2023. The data required are six dimensions of causes of stunting, namely: health, nutritional, housing, education, social protection, and other factors. The proxy for each of these variables can be found below:

Table 1. Definition of research variable

Research Variable	Operational Definition	Unit
Health dimensions	Percentage of babies who received complete immunization	Percentage
Dimensi gizi	Percentage of children aged 0-6 months who receive exclusive breastfeeding for 6 months	Percentage
Housing dimensions	Percentage of households with access to safe drinking water	Percentage
Dimensions of education	Percentage of school-age children who access early childhood education (PAUD)	Percentage
Dimensions of social protection	Percentage of population that has social security	Percentage
Economic dimension	The amount of per capita income received each month	Rupiah

Source: Elaborasi peneliti (2024)

2. Analysis tools

a. Panel data regression analysis

Panel data regression analysis combines time series and cross-section data, measuring cross-section units at different times. We constructed the research model in the following manner:

$$Y_{it} = \alpha + \alpha_{it} + X'_{it}\beta + \varepsilon_{it}$$

$$Stunting_{it} = \alpha_0 + \beta_1 IM_{it} + \beta_2 EKS_{it} + \beta_3 Water_{it} + \beta_4 PAUD_{it} + \beta_5 SOS_{it} + \beta_6 SAN_{it} + \beta_7 MPASi_{it} + \beta_8 KKS_{it} + \beta_9 Income_{it} + \varepsilon_{it}$$

where:

IM_{it} : percentage of babies receiving complete immunization
EKS_{it} : percentage of babies receiving exclusive breastfeeding for 6 months
$Water_{it}$: percentage of households with access to clean and safe drinking water
$PAUD_{it}$: percentage of school-age children receiving early childhood education
SOS_{it} : percentage of population that has social security
$Income_{it}$: per capita income received each month

b. Analysis Multivariate

Multivariate analysis enables the analysis of a very large number of variables (17). Principal component analysis (PCA) and cluster analysis (CA) are the multivariate analyses used in this study. We use PCA and CA to determine the pattern of regional grouping based on factors causing stunting prevalence. The use of PCA and CA analysis enables regions to be classified into very high, high, medium, and low groups based on stunting determinants.

Cluster analysis, a multivariate analysis technique, identifies and groups objects with similarities into specific groups. Thus, objects in the same group will have the same similarities based on the selection criteria set (17). Principal Component Analysis (PCA) is a way to identify patterns in data and then express the data in another form to show the differences and similarities between the patterns (18). The goal of using PCA is to simplify the observed variables by shrinking or reducing their dimensions (18). The reduction in dimensionality does

not eliminate much information because PCA aims to obtain PC1 and PC2 with the largest eigenvalues, thus maintaining the data's characteristics.

C. Result and Discussion

   1. Determinants of stunting prevalence

   Analysis of stunting determinants based on regression as follows:

$$\text{Prev. stunting} = 9.6 - 0.0195 \text{ immunization} + 0.0026 \text{ breast milk} + 0.098 \text{ water} + 0.0484 \text{ sanitasi} + 0.1016 \text{ mpasi} + 0.0970 \text{ kks} + 0.1426 \text{ paud}^{**} - 0.1383 \text{ jkn}^{***} - 3.16 \text{ Ln\_pdrb}^{**}$$

   The R-squared value stands at 43.75, indicating that the variables of immunization, breastfeeding, access to clean water, proper sanitation, provision of additional breastfeeding food, assistance for prosperous families, early childhood education, residents with health insurance, and per capita income can account for 43.75 percent of the stunting prevalence variable. Other variables not included in the model account for the remaining 56.25 percent. Early childhood education, ownership of health insurance, and per capita income are the variables that significantly influence the prevalence rate of stunting in Central Java Province. Ownership of health insurance and per capita GRDP have a negative effect, whereas early childhood education has a positive effect on the prevalence rate of stunting.

The impact of stunting prevalence on economic growth:

$$\text{Ln PRDB} = 0.145 - 0.0031 \text{ prev. stunting} + 0.2703 \text{ Ln. invest}^{***} + 0.03020 \text{ AK sekunder}^{***}$$

   The R-squared value of 64.96% indicates that the independent variables effectively explain 64.96% of the dependent variable, while other variables beyond the model account for the remaining 35.04%. Stunting prevalence rate, investment, and high school-educated workforce variables can explain 64.96% of the economic growth rate, while other variables not included in the model influence the remaining 35.04%. The investment and workforce variables have a significant impact on economic growth in Central Java Province. This is in accordance with Solow's theory, which states that physical capital and labor factors are the main drivers of a country's economic growth.

   2. Clustering of regions based on stunting prevalence indicators

   The following figure displays the distribution of prevalence rates in districts and cities in Central Java:
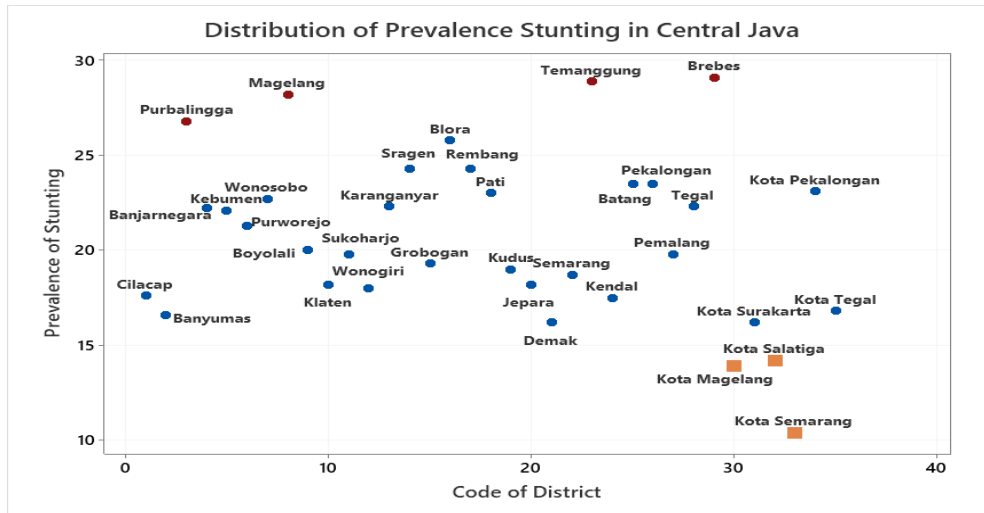
Figure 2. Distribution of stunting prevalence in districts and cities in Central Java

Source: data processed by researchers (2024)

Figure 2 shows the distribution of stunting prevalence rates in Central Java's regencies and cities. Regencies and cities in Central Java continue to display a relatively high stunting prevalence rate of 20.68 percent, significantly exceeding the government's set target of 14 percent. The area with the highest stunting prevalence rate is Brebes Regency at 29.10 percent, and the lowest is Semarang City at 10.40 percent. The division of regions based on cluster analysis shows that regions will group according to similar characteristics. The cluster analysis divides the regencies and cities in Central Java into 4 clusters, as follows:
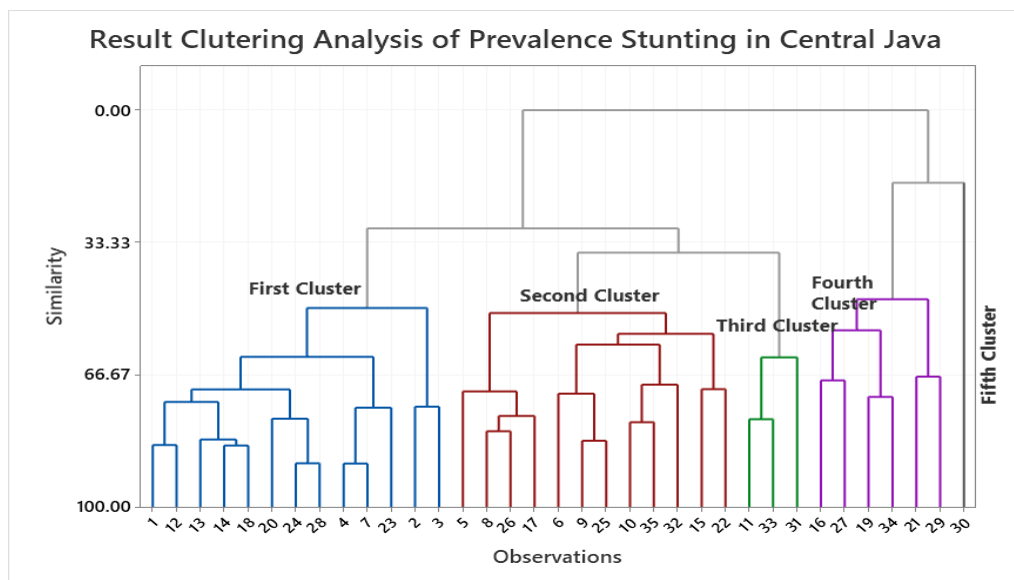

Figure 3. Results of cluster analysis of stunting prevalence level in Central Java

Source: data processed by researchers (2024)

Figure 3 displays the results of the CA study on the prevalence of stunting in districts and cities in Central Java. There are 5 clusters formed, namely cluster 1, cluster 2, cluster 3, cluster 4, and cluster 5. Cluster 1 exhibits similar characteristics of 49.89%, Cluster 2 displays similar characteristics of 51.14%, and Cluster 3 displays similar characteristics of The number of members of each cluster is 13 areas in Cluster 1, 12 areas in Cluster 2, 3 areas in Cluster 3, 6 areas in Cluster 4, and only 1 area in Cluster 5.

Table 2. Division of regions based on clusters

Name of Cluster	Regions	
Cluster 1	Cilacap	Tegal
	Wonogiri	Banjarnegara
	Karanganyar	Wonosobo
	Sragen	Temanggung
	Pati	Banyumas
	Jepara	Purbalingga
	Kendal	
Cluster 2	Kebumen	Magelang
	Pekalongan	Rembang
	Purworejo	Boyolali
	Batang	Klaten
	Kota Tegal	Kota Salatiga
	Grobogan	Semarang
Cluster 3	Sukoharjo	Kota Semarang
	Kota Surakarta	
Cluster 4	Blora	Pemalang
	Kudus	Kota Pekalongan
	Demak	Brebes
Cluster 5	Kota Magelang	

Source: data processed by researchers (2024)

Tabel 3. Cluster Centroid

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Grand centroid
immunization	73.7154	83.0667	86.7333	57.8667	72.4	75.2829
modern contraception	58.8846	55.5000	38.3000	56.2000	40.7	54.9800
breastfeeding	90.4615	68.3000	91.5000	60.2000	14.8	75.6029
water access	92.8615	93.3500	99.2000	94.6667	99.7	94.0771
early childhood education	45.0846	49.9917	54.9667	44.0000	53.6	47.6714
Social security	60.0000	74.1583	78.0333	69.0500	90.2	68.8143
welfare family assistance	44.9462	40.4583	30.6333	44.4500	47.0	42.1543

Cluster analysis identifies the advantages and disadvantages of each cluster group based on the indicators that form it, as evidenced by the distance between the cluster centers. The largest positive value indicates the cluster's advantages, while the smallest negative value indicates the indicator's weaknesses. According to Table 3, it is generally known that cluster 3 is the highest in handling stunting, while cluster 5 is the lowest. Cluster 3 has advantages in terms of community access to clean drinking water and exclusive breastfeeding. However, this cluster still faces challenges in achieving indicators related to fertile couples using modern contraception. Meanwhile, Cluster 5 has advantages in terms of access to clean and proper drinking water, but its weakness is the low level of exclusive breastfeeding.

D. Conclusion

Significant determinants of stunting prevalence in Central Java cities and districts in Central Java are early childhood education, health insurance ownership and GRDP per capita. The prevalence rate of stunting in cities and districts in Central Java has a negative but insignificant effect on economic growth in cities and districts in Central Java. Significant factors that influence economic growth in Central Java are the number of workers with high school education and investment. This condition shows that economic growth in Central Java is in accordance with Solow's theory. Cluster analysis reveals that Central Java divides cities and districts into 5 clusters based on factors influencing the prevalence rate of stunting. Cluster 2 has the most members, while cluster 5 has the fewest members. Cluster analysis allows us to

see the group with the highest stunting handling performance in cluster 3, while the lowest is in cluster 5.

E. Acknowledgement

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