

## Government Health Expenditure and Stunting Prevalence Reduction in Indonesia

Diena Tiara Sari<sup>1</sup>

Corresponding author. Email: [dienatiasari@gmail.com](mailto:dienatiasari@gmail.com)

---

Submitted: 2023-03-03 | Accepted: 2023-08-30 | Published: 31<sup>st</sup> August 2023

---

### *Abstract*

Indonesia has started to set policies and programs to alleviate stunting prevalence in the last decade. By reducing stunting prevalence, the government has cut the short-term and long-term effects of stunting. Government health expenditure at the regional level is also part of regional government expenditure, which is proposed to overcome health issues. This research empirically examines the correlation between government health expenditure and stunting prevalence reduction in Indonesia. The data on government health expenditure is obtained from the Ministry of Finance, and the data on stunting prevalence is compiled from several sources such as Riskedas (Ministry of Health), SSGBI (Ministry of Health), and Statistics of Indonesia (BPS). The panel data uses the provincial level of data from 2010 until 2020, covering 33 provinces, and is estimated with the Fixed Effects (FE) model and the robustness check of the heteroskedasticity problem using fixed robustness. The results show that government health expenditure significantly reduces the prevalence of stunting in all provinces and provinces located outside Java Island.

**Keywords:** government health expenditure; regional government; stunting prevalence; panel data analysis.

---

---

<sup>1</sup> Department of Economics, Faculty of Economics and Business, Universitas Indonesia, Jakarta; School of Economics and Public Policy, The University of Adelaide, South Australia, Australia; Ministry of State Secretariat, Indonesia

## 1. Introduction

Since the last decade, the stunting reduction has become a priority for the government of Indonesia. Stunting is a condition of children with a height below their age standard due to chronic malnutrition related to poverty, maternal condition, and several illnesses since early life (World Health Organization WHO, 2016). Globally, the number of children who suffer from stunting remains high. Black et al. (2013) estimated that 165 million children in 2011 were stunted, and most lived in developing countries. This condition also makes several developing countries work hard to alleviate child stunting. In the context of the stunting burden, Indonesia is one of the five nations with the most significant number of stunting cases, putting the country's stunting rates at crisis levels (World Bank Group, 2016). From 2007 until 2013, the national stunting average has been constant at 37 percent (NIHRD, 2013).

In 2021, the prevalence of stunting in Indonesia, according to the Indonesian Nutritional Status Survey (SSGI, 2021), is 24.4 percent, which means that it is still higher than the minimum target set by the WHO, under 20 percent. On the other hand, Indonesia is ranked fifth with more than 7.6 million children whose body growth is still suboptimal (Titaley et al., 2019). Moreover, according to the Global Nutrition Report (2016), Indonesia is positioned as the 108th country out of 132 countries in Southeast Asia and has become the second-highest country. In order to overcome the high prevalence of stunting, the government of Indonesia set policies and programs to accelerate stunting reduction.

Investment in stunting reduction is important to improve the quality of human resources and prevent poverty and malnutrition. In addition, malnutrition harms decreasing productivity, school opportunities, and the quality of human resources (NPA-FN, 2011). Indonesia has one of the most significant advantage ratios for investments in stunting reduction, with an estimated 48 dollars in economic return for every dollar invested (Hoddinott et al., 2013). According to the World Bank (2006), improvement in nutrition is a very profitable investment. The prevention of stunting in the stunting reduction program is focused on addressing the cause that leads to nutritional problems, namely factors related to food security. The programs are funded by transferring the central budget (APBN) to finance the stunting program through the regional budget (APBD). To achieve development goals in Indonesia, one of the main factors is the allocation of the APBN and APBD budgets.

Within the regional budget, several streams of each sector are differentiated by objectivity, including the stunting reduction program tagged in the health sector budget allocation. According to Akeem et al. (2015), public spending has a role in ensuring economic growth, so it has implications for overall development, especially in developing countries that do not yet have the full power of the private sector and the socioeconomic framework is required to manage resources for economic growth. Coordination across governments is critical in a decentralised country like Indonesia to tackle the challenge. Approximately half of all government funds for services are spent and distributed locally (MoF, 2017a).

This study is purposed to examine the correlation between government health expenditure in reducing child stunting prevalence in Indonesia. The study is focused on examining each province's state budget allocation for the health sector. This paper is divided into five sections. The first section is the introduction. The second section is the description of the literature review and previous studies. The third section is descriptive statistics and

estimation. The fifth section is the result and discussion. The sixth section is the conclusion and policy recommendation.

## **2. Literature Review**

### **2.1. Brief Overview of Stunting**

Stunting is strongly related to the malnutrition problem. According to Vilcins, Sly, and Jagals (2018), malnutrition children will have a risk of suffering 11 points lower IQ scores compared to children who are in good nutrition. Martorell (1999) stated that the malnutrition of children mostly becomes a problem in developing countries. Although the consequences for children's future are sometimes severe, the government in low-income countries tends to understate those issues. Moreover, a lack of nutrition can disrupt children's growth, resulting in abnormal body shapes, although the parents do not have the abnormal risk genetically.

Based on WHO Conceptual framework (2013), child stunting also causes some consequences. In the short-term, child stunting has an impact on health (morbidity and mortality), developmental or growth (cognitive, motoric, and language), and economy (health expenditure and cost for sick child). According to the World Bank Group (2016), stunting causes an 11 percent decrease in GDP and reduces up to 20 percent of the revenue of adult workers. Suppose the prevalence of stunting increases by 1 percent and the GDP increases by 2.2 percent. This is also consistent with the findings of Alcazar et al. (2012), who determined that the productivity-related costs of stunting in Peru totaled 2.2 percent of GDP. Bagriansky et al. (2014) investigate the impact of stunting in Cambodia, which costs more than \$400 million per year, or roughly 2.5 percent of annual GDP, with children accounting for 57 percent of the stunting problem.

In the long term, stunting can have negative effects on people's physical (adult height, obesity, and reproductive health), mental (school performance and learning ability), and financial well-being (work capacity and productivity) (Barker, 2007). This is also in line with the study from the National Team of Acceleration of Poverty Reduction (TNP2K, 2018), which defines that children who suffer from stunting in childhood will affect their intelligence, become susceptible to illness, decrease productivity in the future, and prevent economic growth. Another study found that children aged two and under will need one year longer to complete school, which in the future will impact their future productivity in the workplace (Martorell et al., 2010). Early death can occur even in the best of circumstances due to the effects of malnutrition Barker (2007). Regarding mortality rates, statistics reveal that more than half of all childhood mortality cases in low-income countries are attributable to undernourishment (Black et al., 2003). As shown in figure 2, a higher percentage of child mortality caused by stunting happens in developing countries such as the Democratic Republic of Congo, Sierra Leone, Chad, Nigeria, Niger, and Pakistan.



human resource development. In line with these studies, Yusri (2022) examines the role of government spending in the local context in Indonesia, that when the economy develops, the functions and activities of government will also increase. One of the main sectors that need attention is health. Investment in health services has a broad impact that will extend life expectancy, reduce child mortality, and improve other health parameters (Maitra & Mukhopadhyay, 2012). Howitt (2005) examines the positive benefits of expanding health services that have a long-term development impact through six possible channels. Government expenditure also positively impacts public health outcomes (Gupta et al. (2004).

Two groundbreaking decentralisation laws in Indonesia (Law 22/1999 and Law 25/1999) were approved in August 1999 and were implemented in the Big Bang Decentralization in 2001. Other regulations that support the implementation of decentralisation in Indonesia are Law (UU) No. 23 of 2014 on local government, which regulates the pattern of central and regional relations, and Law No. 1 of 2022 concerning financial relations between the central government and local governments. (HKPD). These regulations effectively delegated most basic service delivery to around 300 district administrations (as opposed to provinces and governors). Indonesia has 34 provinces, regions, municipalities, sub-districts, and villages. Regional governments were allowed far more authority after decentralisation since most of their money was not conditional. In the aftermath of decentralisation, a 2006 World Bank assessment noted inadequacies in increasing nutrition for Indonesia's children (Friedman et al., 2006).

According to Giannoni (2002), decentralisation aims to make the production and distribution of public sector services more efficient so that it has implications for increasing the quality of decision-making through local transformation, namely increasing accountability and responsiveness to regional needs. In line with this research, the World Bank (2005) report in Uganda explained that local governments could make decisions that better reflect the needs of residents because local governments are more responsive than the central government. In the context of fiscal policy, an intergovernmental transfer is one of the impacts of fiscal decentralisation, which has also been regulated in laws and regulations that create a new mechanism for intergovernmental transfers between the central government and regional governments (Dartanto & Brodjonegoro, 2003).

In Indonesia, government spending on the health sector is mandatory spending. According to the Indonesian People's Representative Council (DPR RI), mandatory spending is defined as expenditure or state expenditure mandated by law, and the goal of this mandated spending is to address the issue of social and economic inequality. The health budget allocation is 5 percent of the APBN following the provisions of Law No. 36 2009 on Health. The health expenditure budget in Indonesia consists of employee expenditure, goods and services expenditure, capital expenditure, and other expenditures. According to Nasution (2022), the allocation of spending in the health sector can be a measure of performance in the sector as indicated by the percentage of children under five who received complete primary immunisation, the delivery process with the assistance of health workers, the availability of main health facilities at the sub-district level and the handling of several diseases such as malaria and other diseases.

Results from empirical studies conducted on Indian households show that an increase of 23% in food and nutrition programmes provided to households through public distribution results in a statistically significant increase of 9% and 5%, respectively, in the standard deviations of boys' height and weight (Bhalotra, 2002). Therefore, allocating government

expenditure to health through nutrition improvement programs is one of the solutions to solve the problem of child stunting. Government expenditure is the critical determinant of a country's development. The impact of government action will be assessed by whether funds were spent on productive or consuming activities.

Coordinating regional work units (SKPD) in the programme is required to execute nutrition interventions at the community level in the health sector. Nutritional enhancement is becoming increasingly integrated (NPA-FN, 2017). As a result, measuring the Regional Government's performance in implementing specific and sensitive interventions necessitates proper budget allocations from the regional budget (APBD) at the Regency and City levels (NPA-FN, 2017). The availability of regional financing is critical for analysing effective programmes such as community nutrition improvement, Maternal and Child Health (KIA), Early Childhood Education (PAUD), drinking water and sanitation initiatives, and social protection (NPA-FN, 2017).

According to the NPA-FN (2017), the local government leadership in stunting prevention is demonstrated by creating a conducive policy environment for executing convergent and results-oriented programs. Furthermore, the government distributes all state income and expenditure items yearly in the State Revenue and Expenditure Budget (APBN) and Regional Budget (APBD), executed by Ministries or Agencies, SKPD, and other government bodies. Each year, health expenditure is required in the APBN, accounting for 5 percent of total state expenditure, excluding personnel expenses (article 171 of Law No. 36 of 2009). As a result, healthcare expenditure must be reconsidered to achieve maximum efficacy and efficiency. Accelerating stunting reduction is one of the Ministry of Health of the Republic of Indonesia's priority objectives for health activities, notably the condition of failure to thrive in children under the age of five due to chronic malnutrition, particularly in the First 1,000 Days of Life (HPK) (NPA-FN, 2017).

In order to carry out these functions, cross-sectoral team coordination between central and local governments is required. In addition, multi-sectoral coordination is vital in regulating the financing mechanism for convergence activities. The mechanism includes priority interventions by identifying which sectors have the most significant impact on stunting prevention. In addition, the government also needs to carry out supporting interventions that focus on the nutritional and health implications associated with stunting (NPA-FN, 2017). The next step is intervening according to certain conditions, such as emergencies and disasters. According to the NPA-FN (2017), the following is the flow of financing for stunting prevention activities from government expenditure (APBN) to the regional budget (APBD). The Provincial Government prepares the Provincial Revenue and Expenditure Budget (APBD) as part of national development planning. The APBD details the initiatives to be executed and the financial sources and must be prepared to increase the performance of regional administration, which is focused on optimising public services.

### **2.3. Stunting Reduction Program in Indonesia**

Since the difficulties associated with nutrition improvement and stunting reduction are multidisciplinary and multi-sectoral, the solution should be integrated and well-coordinated. Brown et al. (2020) describes multi-sectoral nutrition intervention as a programme encompassing several sectors that use nutrition-specific and nutrition-sensitive interventions to decrease malnutrition. According to Garret and Natalicchio (2011), multi-sectoral convergence is crucial to improve the synergy between government policies and private-sector actions in alleviating malnutrition. Prior multi-sectoral nutrition efforts were

only sometimes successful or well-executed (World Bank, 2016). According to Jonsson (2013), it is crucial to integrate a multi-sectoral nutrition intervention programme design into the overall development process.

The Indonesian National Plan Action of Food and Nutrition (NPA-FN, 2019) emphasises the importance of a multi-sectoral strategy to address the unique factors of stunting because the reasons vary by community. Each stakeholder plays an important part in ensuring that the coordination successfully lowers the prevalence of stunting by finding and agreeing on the optimal formulation for actualising food and nutrition resilience. Stunting prevalence must be considered when prioritising and allocating scarce resources at the national and sub-national levels to eliminate stunting and accelerate progress toward the Sustainable Development Goals (UN, 2015).

A multi-stakeholder initiative established by Law No. 17 of 2007 began work on reducing stunting in Indonesia. The rules also support the National Long-Term Development Plan (RPJPN) 2005-2025 and the National Medium-Term Development Plan (RPJMN) 2004-2009. Both the National Plan of Action for Food and Nutrition (RAN-PG) and the Regional Plan of Action for Food and Nutrition (RAD-PG) were implemented between 2011 and 2015 as part of the second phase of Indonesia's food and nutrition programme. The government of Indonesia has prioritised the elimination of stunting as a result of this program's establishment of cross-sectoral collaboration. The World Bank's Investing in Nutrition and Early Years (INEY) project, which began in 2018, is designed to reduce the prevalence of stunting in children by 2024.

Accelerating the reduction of stunting prevalence needs both political and economic commitment. Political economy studies how political and economic aspects influence public administration to reinforce policies and achieve resource efficiency (Figueroa & Lara, 2013). A good nutrition intervention combines governmental commitment, cross-sector collaboration, community participation, the availability of community-based services, and programme adherence (Hosain et al., 2017). A shared national commitment is required to facilitate community involvement in the stunting reduction initiative. Furthermore, according to a study conducted by Hossain et al. (2017) in various low and middle-income countries (LMICs), nutritional intervention programmes will be successful if governments integrate multi-sectoral collaboration and political commitment from all connected stakeholders.

#### **2.4. Previous Studies**

Bowser et al. (2016) examined the impact of healthcare spending and income inequality on stunting prevalence. Stunting prevalence data is gathered during the period from 86 countries by using fixed effects regression to examine the role of healthcare spending variables in reducing stunting prevalence. Government health expenditure is the percentage of the total government expenditure. Stunting prevalence data comes from the Demographic and Health Survey (DHS), the United Nations International Children's Emergency Fund (UNICEF), and the World Health Organization (WHO), and it is defined as moderate or severe stunting with a height-for-age z-score of less than -2. In all nations, middle-income countries, and lower-middle-income countries, the results reveal that government health expenditure considerably affects the prevalence of stunting.

There are several studies concerning government expenditure, particularly health expenditure, with the prevalence of children under five. In Indonesia, a study about the

efficiency of government health expenditure was conducted by Ilman (2018), which utilised cross-section data using stunting prevalence data in 2013 and government health expenditure in 2008. The time difference between data on stunting prevalence and government health expenditure defines the time lag resulting from government health expenditure as the impact on stunting prevalence is observable after several years since the budget was allocated. This study obtains the prevalence of stunting data from Basic health research (Riskesdas 2007 and 2013), while the data on government health expenditures are obtained from the Information and Documentation Management Officer (PPID), Ministry of Finance (2008).

Another study on government expenditure and stunting prevalence is examined by Indra and Khoirunurrofik (2022). This study scrutinises the role of village funds and stunting reduction. Although the primary independent variable of the study is village funds, variable government health expenditure is employed as another determinant to define the reduction in stunting prevalence. The data on the village fund budget is obtained from a potential village survey (Podes) which covers 434 districts with around 75000 villages from all provinces in Indonesia. Meanwhile, the data for stunting prevalence is compiled from Basic Health Research (Riskesdas) in 2014 and 2018 using the fixed effect estimation method (FE), the variable of government health expenditure is transformed into a log-normal form. Although the variable government health expenditure (APBD health function) is not significantly impacting the stunting reduction, the coefficient from the estimation result shows a negative sign meaning it reduces the stunting prevalence but is not significant.

### 3. Data and Method

#### 3.1. Data

This study employs panel data sets from 33 Indonesian provinces from 2010 until 2020. Indonesia presently has 34 provinces. However, North Kalimantan is excluded because it was founded after 2012. Consequently, some data is still unavailable. The data comes from a variety of sources. The prevalence of stunting is the only dependent variable considered in this study. Two independent variables, government health expenditure and Gross Regional Domestic Product (GRDP) per capita, are used in natural log form. The dependent variable, the stunting prevalence of children under the age of five in all provinces, is obtained from the Basic Health Research (Riskesdas 2013 and 2018), the Indonesia Nutrition Status Survey (SSGBI, 2019), the Indonesia Nutrition Status Survey (SSGI, 2021), and data from Statistics of Indonesia (BPS).

Stunting prevalence is the percentage of children under five who are stunted as measured by the WHO median criterion in one province. Stunting is a chronic malnutrition condition defined by Statistics of Indonesia (BPS) based on the height for age index compared to WHO criteria (BPS, 2019). Children's height data is analysed for nutritional status. Each child under five years is turned into a standardised value (*Z*-score) using the 2005 WHO anthropometric standard for children under five. This statistic evaluates the percentage of children under five who are shorter than the average height of the reference population. Stunting in children demonstrates the far-reaching consequences of chronic malnutrition and recurring sickness caused by low socioeconomic status (BPS, 2019).

This study employs data from 33 provinces from 2010–2020. The data is classified into three groups to compare the result to another group. The first group contains all

provinces in Indonesia (N=33), the second group contains provinces located on Java Island (N=6), and the third group contains provinces outside Java Island (N=27). The classification is purposed to scrutinise the differences in the results between Java, the island where the capital city is located, and provinces outside Java Island. Table 1 depicts the result of summary statistics from each variable. The mean of stunting among children under five in all provinces is 32.04 percent (N=33 provinces), while the mean of stunting prevalence in Provinces in Java Island and Provinces outside Java Island are 27.63 and 33.03, respectively. Table 1 also includes trends for all independent variable standard deviations. The mean of the primary independent variable, government health expenditure, is 793028.5 for all provinces, 2259025 for provinces in Java Island, and 33.02562 for provinces outside Java Island.

**Table 1.** Summary Statistics of Variables

Variables	All provinces		Provinces on Java Island Provinces outside Java Island			
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Stunting Prevalence	32.04488	7.32962	27.63152	5.13011	33.02562	7.390179
Govt health expenditure	793028.5	1471911	2259025	2917053	467251.4	441965.5
GRDP per capita	47470	39897.01	60924.36	63878.34	44480.14	31643.62
Exclusive breastfeeding	93.72924	5.31503	94.39311	2.627041	93.58172	5.73697
Health facilities	366.6722	318.4809	800.9848	481.5186	270.1582	147.3966
Access to sanitation	85.19039	9.778297	90.73818	7.216081	83.95754	9.854556
Dwelling conditions	57.89653	14.95429	56.27515	14.43347	58.25684	15.06755
Female literacy rate	93.55242	6.452077	93.12682	4.304539	93.647	6.840561
Female labour force	52.28912	6.816184	52.43	4.304539	52.25781	6.893497

**Source:** Author calculation from the BPS dataset

The primary independent variable, government health expenditure, is obtained by combining the health function expenditure at the regency and province levels from the Directorate General of Fiscal Balance, Ministry of Finance. Some data on health expenditure includes four budget allocation streams: employee spending, capital expenditure, goods and services expenditure, and other determined expenditures. Government health expenditure is the realisation of the government budget and regional expenditure (APBD) on the health function by adding the data per district in each province. In several periods, there is data consisting of several channels in allocating budget: employee expenditure, goods and services expenditure, capital expenditure, and other expenditures. The four channels are then summed to get the overall result.

### 3.2. Method

The panel model and the drivers of stunting are used to examine the impact of government health expenditure in reducing stunting prevalence in Indonesia. Several related determinants are obtained from the previous study by Bowser et al. (2016). In this. Model, the share of income inequality is excluded from the estimation model since the availability of the data in grouping provinces by income categorisation. The panel model for estimating the impact of government health expenditure on stunting reduction such as below:

$$Y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 g_{it} + \varepsilon_{it}$$

The estimation model included proximate drivers of stunting in province  $i$  at time  $t$ , represented by  $x_{it}$ . Those drivers are determined from previous studies (Bowser et al., 2016), such as government health and regional expenditure from each province, female literacy, and exclusive breastfeeding. Other socioeconomic drivers represented by  $g_{it}$ : female labour force participation, health insurance, access to sanitation, dwelling conditions, and population density, are compiled from previous studies and  $\varepsilon_{it}$  which represents the error term (Bowser et al., 2016; Indrastuti & Pudjianto, 2019).

This paper used the Hausman tests to select the best model from the fixed-effect (FE) and random-effect (RE) models to estimate the best approach for the data panel set. According to Baltagi (2005), panel data are observations compiled from cross-section data of homes, regions, companies, and other important groups across specific periods. The FE panel estimator offers the advantage of adjusting for observed or unobserved time-constant heterogeneity (Pischke, 2009; Wooldridge, 2010; Baltagi, 2013). As a result, stable unobserved unit differences do not impact the estimations of interest, hence minimising the chance of erroneous conclusions resulting from omitted variable bias. Fixed-effects models for panel data were created to account for the omitted variable bias in non-experimental research (Allison, 2009; Treiman, 2009; Wooldridge, 2010; Fox, 2016).

Due to the use of panel data in this study, the regression model is known as the panel data regression model. Generally, panel data will generate unique intercepts and slopes for each object and period. By merging time series and cross-section data using the OLS approach known as common effect estimation, panel data regression analysis is possible. This method disregards the individual and temporal dimensions. Estimated panel data using fixed effects, where this method assumes that individuals or objects have different intercepts but have the same regression slope. An object has the same intercept for each time difference and its constant regression coefficient over time (time-invariant). This method does not use dummy variables but uses residuals that are thought to have a relationship between time and between individuals. The random effect model assumes that each variable has a different intercept, but the intercept is random or stochastic. The generalised square (GLS) method was used to estimate this regression model instead of the ordinary least square (OLS) method.

After that, the data for heteroscedasticity and autocorrelation problems are also examined. Statistical issues might occur when stunting prevalence reduction is estimated using this model. First, the appropriate approach for estimating the panel dataset should be defined. The Hausman test determines the most appropriate pooled least-squares, fixed-effects, and the random-effects model. Since the stunting prevalence variable is missing data

in 2011, 2012, and 2014, multiple imputations are used to verify the consistency of the results using the mean from the specified years. Then, we determine the existence of the heteroskedasticity and autocorrelation problem. Finally, the heteroskedasticity problem is fixed using fixed robustness, while no autocorrelation problem exists.

#### 4. Results and Discussion

The independent variables that are significant to the dependent variables in provinces located in Java are log GRDP per capita and exclusive breastfeeding. The independent variables significant to the dependent variables in provinces outside Java have logged government health expenditure, GRDP per capita, health facilities, dwelling conditions, female labour force participation, and female literacy rate. After the applied test for checking autocorrelation and heteroscedasticity, only heteroscedasticity is found, which is solved by transforming the FE model into fixed robust.

**Table 2.** Fixed Effects Regression Result of Stunting Prevalence

<b>Dependent Variable: Stunting Prevalence</b>			
Independent variables	FE		
	All provinces	Provinces on Java Island	Provinces outside Java Island
Log gov health exp	-1.848** (0.711)	-0.706 (1.032)	-1.698** (0.810)
Log GRDP per capita	-1.724 (2.352)	-10.388* (4.083)	-10.388* (4.083)
Exclusive breastfeeding	0.038 (0.043)	0.183** (0.611)	0.0360 (0.043)
Health facilities	-0.024** (0.011)	-0.007 (0.005)	-0.0449** (0.0183)
Access to sanitation	-0.114* (0.058)	-0.0926 (0.072)	-0.0933 (0.582)
Dwelling conditions	-0.099** (0.042)	0.037 (0.065)	-0.106** (0.048)
Female labour force	-0.133* (0.078)	0.335 (0.0653)	-0.178* (0.914)
Female literacy rate	-0.204*** (0.055)	-0.103 (0.141)	-0.221*** (0.052)
Constant	120.8165 (18.68523)	134.9122 (22.30588)	120.282 18.13105
R <sup>2</sup>	0.0889	0.0323	0.8830
Number of observations	363	66	297

Legend: \*\*\*, \*\*, \*, indicate significance level 1%, 5% and 10% respectively

The first results from fixed effect estimation define that six significant independent variables impact the prevalence of stunting in all provinces. Those independent variables are logged government expenditure, health facilities, access to sanitation, dwelling conditions,

female labour force, and female literacy rate. The last model is random effects which resulted in six significant variables. Log government expenditure has a significant impact on the prevalence of stunting in FE estimation, which is also followed by other significant variables such as log GRDP per capita, access to sanitation, dwelling conditions, female labour force participation and female literacy rate with the R<sup>2</sup> value for the fixed effects estimation is 0.0889.

Government health expenditure is significant for all provinces and provinces outside Java Island. The coefficient is  $-1.847$  and  $-1.698$ , respectively, and both are significant at 5 percent or 0.05 to reduce stunting prevalence by 1.85 and 1.70. Thus, increasing government health expenditure by one percentage point for all provinces in Indonesia could reduce the stunting prevalence by 1.85. The health facilities variable is also significant at 5 percent or 0.05 and is expected to reduce the prevalence of stunting at  $-0.023$ . A 0.02 percentage point stunting reduction follows every increase in regional expenditure. Access to sanitation significantly impacts stunting prevalence reduction at 10 percent or 0.1. If the access to sanitation increases by one percentage point, the stunting prevalence would decrease by 0.11 percentage points. The coefficient for dwelling condition is significant at 5 percent or 0.05 to reduce stunting prevalence by the coefficient  $-0.099$ . It can be interpreted that increasing dwelling conditions by one percentage point could reduce the stunting prevalence by 0.10 percentage points. However, the government health expenditure does not significantly affect the stunting reduction in provinces on Java Island.

The average value of the government health expenditure in provinces located on Java Island is 2259025.45 (in a million IDR), and the government health expenditure in provinces located outside Java Island is 467251.41 (in a million IDR). Meanwhile, the stunting prevalence in provinces located on Java Island is 27 percent, and the stunting prevalence in provinces located outside Java Island is 33 percent. This follows previous studies by Browser et al. (2016), which examine the impact of government health expenditure on the prevalence of stunting groups of countries based on the share of income; all countries, low-income countries, and lower-middle-income countries. Government health expenditure is the percentage of general government expenditure. In this study, government health expenditure negatively affects the prevalence of stunting in low-income countries with a coefficient  $-0.15$ , which is significant at 5 percent.

From the data can be analysed that the stunting prevalence in most provinces located on Java Island is reduced; thus, the government health expenditure is allocated to finance other programs. For instance, Jakarta, the capital city of Indonesia, has covered health insurance by giving citizens free health services. According to Widyastuti as the Head of the Public Health Office, published by Tempo (2021), the health insurance programme in Jakarta has reached Universal Health Coverage (UHC) with a coverage level of 97 percent. On the other hand, with the percentage of stunting still relatively high, the government health expenditure in provinces outside Java Island is allocated to accelerate the reduction.

In the context of the female's role in reducing stunting prevalence, a female literacy rate and female labour force participation define the female's role in reducing stunting. For all provinces and provinces located outside Java Island, the female labour force participation is significant at 10 percent or 0.1 and reduces the prevalence of stunting at  $-0.133$ . A 0.13 percentage point stunting alleviation follows every female labour force participation increase for both groups of provinces, all provinces and provinces located outside Java Island. Meanwhile, in the provinces outside Java Island, the female labour force participation is

significant at 10 percent or 0.1 and reduces the prevalence of stunting at  $-0.178$ . A 0.18 percentage point.

For all provinces, the female literacy rate significantly impacts stunting prevalence reduction at 1 percent or 0.01 and decreases stunting prevalence at  $-0.204$ . Increasing the female literacy rate by one percentage point could decrease the poverty headcount ratio by 0.20 percentage points. Meanwhile, for provinces outside Java Island, the female literacy rate significantly impacts stunting prevalence reduction at 1 percent or 0.01 and decreases stunting prevalence at  $-0.221$ . Increasing the female literacy rate by one percentage point could decrease the poverty headcount ratio by 0.22 percentage points. The two control variables which do not significantly affect the stunting reduction are exclusive breastfeeding and GRDP per capita, with coefficients of 0.038 and  $-1.724$ , respectively.

## 5. Conclusion and Recommendation

Stunting is a crucial issue that needs serious handling because stunting harms children's health and the country's economy. In Indonesia, the trend of stunting prevalence tends to decrease. The government has implemented several programs to reduce stunting prevalence. Programs and policies are a form of implementation of the government budget. Regarding stunting, the most closely related government budget is government health expenditure. Since the decentralisation era began, Indonesia has handed over the regional financial system to each regional government so that it can be maximised to finance regional programs. Government health expenditure has several financing components, such as capital, goods and services, personnel, and other expenditures. In reducing the prevalence of stunting, efforts are made through aspects of the government budget and several aspects such as sanitation, household conditions, exclusive breastfeeding, female literacy, female labour and health facilities.

Government health expenditure has been shown to significantly reduce the prevalence of stunting in all provinces and provinces located outside Java Island. Its allocation in implementing programs to reduce stunting prevalence is quite effective. As the supporting variables to the central government program, government health expenditure at the provincial level has an important role in implementing technical policies to reach the community. In the context of reducing the prevalence of stunting, other influential aspects are community sanitation access, household conditions, the role of women in the household, such as female labour force participation and female literacy rate, and health facilities at the village level. Other variables such as access to sanitation, dwelling conditions, female literacy rate, female labour force participation and health facilities significantly affect the prevalence of stunting in all provinces and provinces outside Java Island. The variables significantly affecting the stunting prevalence in provinces on Java Island are GDRP per capita and exclusive breastfeeding.

Government health expenditure as a continuation of central government programs requires the local government's commitment as the executor. In this case, the need for supervision in allocating government health expenditure must be carried out thoroughly. Moreover, the stunting management program is cross-sectoral and requires cooperation and commitment in various fields. With decentralisation and regional autonomy, the use and allocation of budgets at the regional level should be achieved properly. Local governments will determine their priority programs that will be supported by budget allocation. The

budget allocation for stunting handling in the regions will likely be increased to realise the national stunting reduction target.

## References

- Akeem, O & Bolarinwa, H (2015). Review Article, pp. 195–201, DOI: 10.4103/1117-1936.173959
- Alcazar, L, Ocampo, D, Huaman-Espino, L & Pablo, J, (2012). 'Economic impact of chronic, acute and global malnutrition in Peru', *Rev Peru Med Exp Salud Publica*, vol. 30, pp. 569–74
- Allison, P. (2019). 'Asymmetric Fixed-effects Models for Panel Data', *Socius*, DOI:10.1177/2378023119826441
- Arestis, P, Sen, H, & Kaya, (2020). 'On the Linkage between Government Expenditure and Output: Empirics of the Keynesian View Versus Wagner's Law'. *Economic Change and Restructuring*, vol. 54, pp. 265-303
- Baltagi, B. (2013). 'Econometric Analysis of Panel Data', Wiley, Chichester, 5th ed
- Bagriansky, J, Champa, N, Pak, K, Whitney, S & Laillou A (2014). 'The economic consequences of malnutrition in Cambodia are more than 400 million dollars lost annually', *Asia Pac J Clin*
- Barker, D. (2007). 'The origins of the developmental origin theory', *Journal of Internal Medicine*, vol. 261, pp. 412–417, DOI:10.1111/j.1365-2796
- Bhalotra, S (2002). 'Welfare implications of fiscal reform: The case of food subsidies in India', *Discussion Paper*, vol. 32, World Institute for Economics Research, Helsinki
- Black RE, Victora, CG, Walker, SP, Bhutta, ZA, Christian, P & de Onis, M (2013). 'Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, vol. 382, pp. 427–451
- Black, RE, Morris, SS & Bryce, J (2003). 'Where and why are 10 million children dying every year'. *Lancet*, vol. 361, pp. 2226–2234
- Bowser, D, Zeng, W, Akobirshoev, I, Morrill, T & Nandakumar (2016). 'The impact of health care spending and income inequality on stunting prevalence', *International Journal of Healthcare*. 2nd edn, DOI: 10.5430/ijh.v2n2p23
- Brown, R, Natali, S, Jeremy, S & Carmel, D (2020). 'Multi-sectoral Nutrition Programming: A review of current literature and evidence', [www.enonline.net/mspliterature2020](http://www.enonline.net/mspliterature2020)
- Dartanto, T, & Brodjonegoro, B 2003, 'Dampak Desentralisasi Fiskal di Indonesia terhadap Pertumbuhan Ekonomi dan Disparitas Antar Daerah: Analisis Model Makro dan Ekonometrik Simultan', *Indonesian Journal of Economics and Development*, vol. 4, pp. 1
- Edame, GE & Eturoma, AD (2014). 'The Determinants of Public Expenditure on Educational Infrastructural Facilities and Economic Growth in Nigeria' *Journal of Business Management and Economics*, vol. 5, pp. 152-161

Figuroa-Lara & A Martinez, VA (2013). 'Addressing social determinants of health through intersectoral actions: five public policy cases from Mexico', WHO, Geneva, ISBN: 9789241505314

Fox, J (2016). 'Applied Regression Analysis and Generalized Linear Models. Los Angeles', vol. 23, pp. 524, Sage Publications, CA

Friedman, J, et al. (2006). 'Health Sector Decentralization and Indonesia's Nutrition Programs: Opportunities and Challenges (English)', World Bank, Washington, DC, <http://documents.worldbank.org/curated/en/101241468049450209/Health-sector-decentralization-and-Indonesian-nutrition-programs-opportunities-and-challenges>

Garrett, J & Natalicchio (2011). 'Working multi-sectoral in nutrition: Principles, practices, and case studies, IFPRI Research Monograph, International Food Policy Research Institute (IFPRI) Washington, D.C., <http://dx.doi.org/10.2499/9780896291812>

Giannoni, M & Hitiris, T (2002). 'The Regional Impact of Health Care Expenditure: The Case of Italy', Applied Economics Letters, vol. 14

Global Nutrition Report (2016). <https://globalnutritionreport.org/reports/2016-global-nutrition-report/>

Gupta, S, Clements, B, & Inchauste, G (2004). 'Helping Countries Develop: The Role of Fiscal Policy, International Monetary Fund, Washington DC

Hoddinott, J, Harold, A, Jere, B, Lawrence, H & Susan, H (2013). 'The Economic Rationale for Investing in Stunting Reduction', Grand Challenges Canada Economic Returns to Mitigating Early Life Risks Project Working Paper Series, 8th edn

Hossain, M, Choudhury, N, Adi, BAK, Mondal, P, Jackson, AA, Walson J & Ahmed, T (2016). 'Evidence-based approaches to childhood stunting in low and middle-income countries: a systematic review', Arch Dis Child, vol. 102(10), pp. 903–909, DOI: 10.1136/archdischild-2016-311050

Howitt, P (2005). 'Health, Human Capital and Economic Growth: A Schumpeterian Perspective. In Health and Economic Growth: Findings and Policy Implications' G. Lopez-Casasnovas, B. Rivera, and L. Currais', eds. Cambridge, MA, MIT Press.

Indonesian Nutrition Studies Status (SSGI) 2021, <https://www.litbang.kemkes.go.id/buku-saku-hasil-studi-status-gizi-indonesia-ssgi-tahun-2021/>

Indra, J, Khoirunurrofik, K (2022). 'Understanding the role of village fund and administrative capacity in stunting reduction: Empirical evidence from Indonesia', PLoS ONE, vol. 17(1): e0262743, DOI: 10.1371/journal.pone.0262743

Indrastuty, D & Pujiyanto 2019, 'Determinan Sosial Ekonomi Rumah Tangga dari Balita Stunting di Indonesia: Analisis Data Indonesia Family Life Survey (IFLS) 2014', Jurnal Ekonomi Kesehatan Indonesia, vol. 3, DOI: 10.7454/eki.v3i2.3004

Jonsson U 2010, 'The rise and fall of paradigms in world food and nutrition policy, World Nutrition June, vol 1 & 3, pp. 128-158

Wooldridge, JM 2010, 'Econometric Analysis of Cross Section and Panel Data,' MIT Press Books, The MIT Press, 2nd ed, vol. 1, no. 0262232588

Maitra, B & Mukhopadhyay, CK 2012, 'Public Spending on Education, Health Care and Economic Growth in Selected Countries of Asia and The Pacific, Asia-Pacific Development Journal, vol. 19

Martorell, R 1999, 'The nature of child malnutrition and its long-term implications', Food and Nutrition Bulletin, vol. 20(3), pp. 288–292

McCoy, D, Peet, E & Ezzati, M 2016, 'Early childhood development status in low and middle-income countries: National, regional and global prevalence estimates using predictive modeling', PLoS Med, 13, e1002034

McGovern, ME, Aditi, K, Victor, MA & Subramanian, SV 2017, 'A review of the evidence linking child stunting to economic outcomes', International Journal of Epidemiology, vol. 46, Issue 4, pp. 1171–1191, DOI:10.1093/ije/dyx017

Ministry of Health 2018, Profil kesehatan Indonesia 2018 (Indonesia Health Profile 2018), Ministry of Health of the Republic of Indonesia, Jakarta

Nasution, M 2022, 'Studi atas belanja Kesehatan pemerintah daerah di Indonesia 6', Journal budget, vol. 7, 1st edn, Pusat Kajian Anggaran, Jakarta

National Basic Health Research (RISKESDAS) 2010, <https://labdata.litbang.kemkes.go.id/riset-badan-litbangkes/menu-risikesnas/menu-risikesdas/148-rkd-2010>

National Basic Health Research (RISKESDAS). 2018 [https://kesmas.kemkes.go.id/assets/upload/dir\\_519d41d8cd98f00/files/Hasil-risikesdas-2018\\_1274.pdf](https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-risikesdas-2018_1274.pdf)

National Plan of Action for Food and Nutrition (NPA-FN) 2011 <https://extranet.who.int/nutrition/gina/sites/default/filesstore/IDN%202011%20Rencana%20Aksi%20Nasional%20Pangan%20dan%20Gizi.pdf>2018.

National Plan of Action for Food and Nutrition (NPA-FN) 2017, [https://stunting.go.id/?smd\\_process\\_download=1&download\\_id=7943](https://stunting.go.id/?smd_process_download=1&download_id=7943)

Nutrition Programming: A review of current literature and evidence 2020, [www.enonline.net/mspliterature2020](http://www.enonline.net/mspliterature2020)

Onis, M & Branca, M 2016, 'Childhood stunting: a global perspective', Maternal & Child Nutrition, vol. 12, pp. 12–26

Paramita, A, Izza, N, T, & Laksono, Agung 2022, 'Does the Proximity of the Area Affect in Incidence of Stunting?: Study on Densely Populated Provinces in Indonesia. Indian Journal of Forensic Medicine and Toxicology, vol. 16, pp. 131–140, DOI:10.37506/ijfnt.v16i3.18257

Peacock, AT & Wiseman, J 1967, 'The Growth of Public Expenditure in The United Kingdom: Allen and Unwin'

Pischke, JS & Joshua DA 2009, "Mostly Harmless Econometrics: An Empiricist's Companion," Economics Books, Princeton University Press, 1st ed, no. 8769

Scaling Up Nutrition (SUN) 2015, 'Nutrition and the Sustainable Development Goals. Scaling Up Nutrition, <https://scalingupnutrition.org/nutrition/nutrition-and-the-sustainable-development-goals/>

Tempo Media, <https://nasional.tempco.co/read/1524875/ragam-layanan-gratis-jaminan-kesehatan-untuk-warga-dki-jakarta>

Titaley, CR, Ariawan, I, Hapsari, D, Muasyaroh, A, & Dibley, MJ, 2019, 'Determinants of the Stunting of Children Under Two Years Old in Indonesia: A Multilevel Analysis of the 2013 Indonesia Basic Health Survey', *Nutrients*, vol. 11(5), DOI:10.3390/nu11051106

TNP2K, see Tim Nasional Percepatan Penanggulangan Kemiskinan (National Team for the Acceleration of Poverty Reduction)

Treiman, D 2009, 'Quantitative Data Analysis: Doing Social Research to Test Ideas', Jossey-Bass, San Francisco, CA

United Nations (UN), 2014, 'The Millenium Development Goals Report 2014', United Nations Press, New York, ISBN 978-92-1-101308-5

UNICEF 1990, 'A UNICEF Policy Review: Strategy for Improved Nutrition of Children and Women in Developing Countries', UNICEF, New York

Vilcins, D, Sly, PD, & Jagals, P 2018 'Environmental Risk Factors Associated with Child Stunting: A Systematic Review of the Literature *Annals of global health*, vol. 84(4), pp. 551–562. DOI:10.9204/aogh.2361

World Health Organization 2010, 'A conceptual framework for action on the social determinants of health, World Health Organization

World Health Organization (WHO) 2016, 'A conceptual framework for action on the social determinants of health' World Health Organization.

World Health Organization (WHO), 'Overview of Malnutrition', [https://www.who.int/health-topics/malnutrition#tab=tab\\_1](https://www.who.int/health-topics/malnutrition#tab=tab_1)

Yusri, A (2022). 'Does Government Expenditure Affect Poverty, Health, and Education? Evidence from Aceh, Indonesia *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*', vol. 6, pp. 1–20, DOI:10.36574/jpp.v6i1.249