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## DETERMINATION OF TODDLER STUNTING IN INDONESIA 2020-2023 FROM AN ECONOMIC PERSPECTIVE



**Rianita Maharani<sup>1</sup>**

**Universitas Muhammadiyah Surakarta, Surakarta, Indonesia**  
[rianitamaharani3@gmail.com](mailto:rianitamaharani3@gmail.com)

**Sitti Retno Faridatussalam<sup>2\*</sup>**

**Universitas Muhammadiyah Surakarta, Surakarta, Indonesia**  
[srf122@ums.ac.id](mailto:srf122@ums.ac.id)\*

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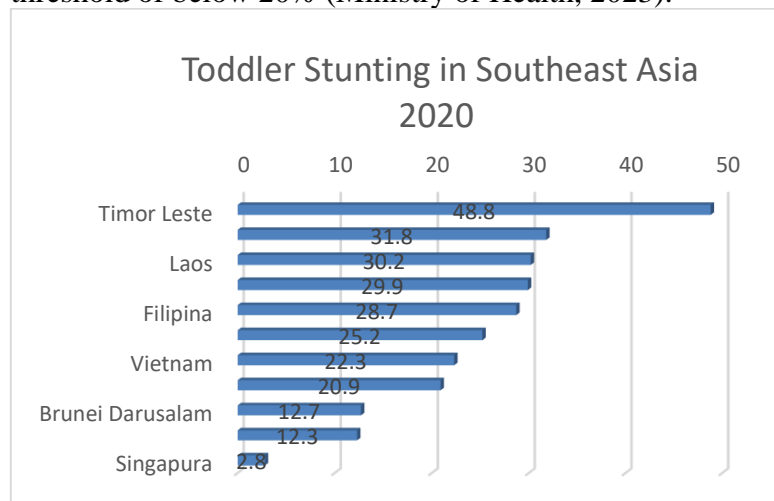
### Abstract

Stunting is a condition characterized by stunted growth and development in children caused by nutritional problems, infectious diseases, and various other factors that can affect children's health. The purpose of this study was to analyze the factors influencing the prevalence of stunting in toddlers in 34 provinces in Indonesia during the period 2020-2023. The variables analyzed included Egg Protein Consumption (KPT), Access to Clean Water (AAB), Access to Health Services (ALK), Average Years of Schooling for Girls (RLSP), and Family Planning (KB). This study used panel data regression analysis with a cross-sectional sample of 34 provinces and a time series sample of 2020-2023. Data were obtained from the Indonesian Central Bureau of Statistics and the Ministry of Health. After conducting the Chow and Hausman tests, the best estimation model for this study was the Fixed Effect Model (FEM). The results of this study indicate that access to clean water and average years of schooling for girls have a significant negative effect on stunting. Meanwhile, egg protein consumption, access to health services, and family planning did not show a significant effect on stunting in the 34 provinces in Indonesia.

**Keywords:** Stunting, Egg Protein Consumption, Access to Clean Water, Access to Health Services

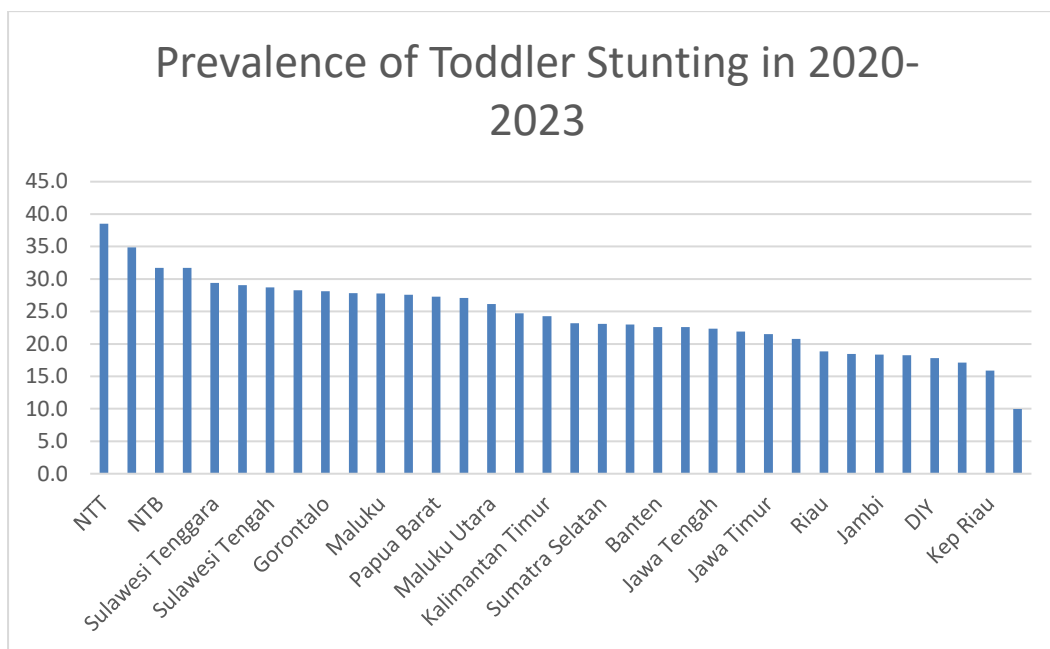
## INTRODUCTION

Stunting is a chronic malnutrition condition affecting children under five, characterized by low height for their age. It often results from inadequate nutritional intake starting from the prenatal period and continuing after birth, with signs typically becoming evident by the age of two (Ratih, 2022; Mitra et al., 2015). This condition, particularly critical during the first 1,000 days of life, hampers both physical and cognitive development (Anggraini et al., 2025). In Indonesia, stunting remains a major public health issue, with over 80% of child mortality linked to nutritional problems (Katadata, 2021). Despite various interventions, Indonesia continues to report one of the highest stunting rates in Southeast Asia. According to WHO, around 22% of children under five worldwide—approximately 149.2 million in 2020 are affected by stunting (Mardiati et al., 2023). In response, the Indonesian government issued Presidential Regulation No. 72 of 2021 to accelerate stunting reduction as outlined in the National Medium-Term Development Plan (RPJM) 2020–2024 (Sitohang & Lestari, 2024). Although the Indonesian Nutrition Status Survey (SSGI) reported a decline in stunting prevalence from 24.4% in 2021 to 21.6% in 2022, the rate remains high relative to the government’s 2024 target of 14% and WHO’s acceptable threshold of below 20% (Ministry of Health, 2023).



**Figure 1. Data on the prevalence of stunting among toddlers in Southeast Asia in 2020**  
Source: (Katadata, 2021)

According to Graph 1 on stunting prevalence in Southeast Asia in 2020, reported by the Asian Development Bank (ADB), Indonesia had the second-highest stunting rate in the region, following Timor-Leste. Timor-Leste recorded the highest prevalence at 48.8%, while Indonesia followed with 30.2%. In contrast, Singapore had the lowest stunting rate at just 2.8%.



**Figure 2. Average prevalence of stunting in Indonesia 2020-2023**

Source: (Ministry of Health of the Republic of Indonesia, 2020) and (Secretariat of the Vice President, 2024), processed

Based on Figure 2, the province with the highest stunting prevalence is East Nusa Tenggara, recording a notably high rate of 38.5%. In contrast, only Bali has successfully met the national stunting reduction target of 14%, with the lowest prevalence at 10.0%, indicating that lower percentages reflect fewer stunting cases in the region. Previous studies support various factors influencing stunting rates. Izah and Desi (2023) found that providing animal protein, such as eggs, over 30 days significantly improves nutritional status and reduces stunting in toddlers. Zakayo (2021) emphasized the role of access to clean drinking water in reducing stunting among children under five in Rukwa, Tanzania. Husnaniyah (2020) identified low maternal education levels reflected in shorter average years of schooling—as a contributing factor to stunting. Additionally, Katuche (2024) reported a significant relationship between healthcare access, particularly regular visits to health facilities, and stunting in East Bolaang Mongondow. Khumairoh (2023) further highlighted the effectiveness of family planning programs in reducing stunting rates.

Unlike previous studies that predominantly focused on one or two variables, the novelty of this research lies in its comprehensive approach by integrating multiple variables drawn from earlier studies. These variables include egg protein consumption, access to clean water, access to healthcare services, average years of schooling for women, and family planning. This study offers a fresh perspective by analyzing the determinants of stunting across 34 provinces in Indonesia, specifically targeting those with the highest stunting prevalence between 2020 and 2023. The objective is to provide a more holistic understanding of the key factors influencing stunting rates in Indonesia during this period.

## REVIEW OF LITERATURE

Ismawati (2024) describes stunting as a manifestation of impaired growth resulting from persistent nutritional deprivation, which negatively influences not only bodily development but also mental and motor functions, potentially diminishing an individual's productivity in later life. According to Siswanti (2018), the onset of stunting can be traced back to the prenatal period, with its physical signs typically emerging by the age of two. This condition often leads to enduring nutritional shortfalls, compromised immune response, and heightened vulnerability to infectious illnesses. Rahmadhani (2024) further asserts that children experiencing stunting exhibit delayed physical growth due to sustained undernourishment, which also hinders cognitive maturation.

Haddad (1999) argues that stunting serves as an indicator of long-standing chronic adversity, frequently arising from infections in early childhood. In his work *Explaining Child Malnutrition in Developing Countries*, he attributes the root causes of malnutrition to factors such as insufficient dietary intake, low maternal education levels, and substandard environmental conditions—including limited access to potable water. This view is consistent with Sen's (1999) *Development as Freedom*, which frames development as the broadening of essential human liberties, encompassing access to education, healthcare services, nutritious food, sanitary environments, and personal autonomy in life choices.

Sherry (2014) emphasizes that poor nutrition significantly restricts a child's growth, with adequate energy and protein intake being critical for proper development. Meanwhile, Candra (2020) cautions that delays in early growth stages can result in long-lasting cognitive and psychological deficits if driven by sustained nutritional deficiencies. Similarly, Purba (2021) notes that although stunting often begins in utero, it becomes visible around the age of two through signs like a child's shorter-than-average height, and—if left untreated—can cause substantial cognitive setbacks.

## RESEARCH METHOD

The analysis method applied in this study is panel data regression by applying the following econometric model:

$$ST_{it} = \beta_1 KPT_{it} + \beta_2 AAB_{it} + \beta_3 ALK_{it} + \beta_4 RLSP_{it} + \beta_5 KB_{it} + \varepsilon_t$$

Where:

ST	= Stunting (Percent)
KPT	= Egg Protein Consumption (Kg)
AAB	= Access to Clean Water (Percent)
ALK	= Access to Health Services (Unit)
RLSP	= Average Length of Schooling for Girls (Year)
KB	= Family planning (Percent)
$\beta_0$	= Constant
$\beta_1, \beta_2, \beta_3$	= Coefficient
i	= Region
t	= Period
$\varepsilon_t$	= Residual

This study employs secondary data sourced from Indonesia's Central Bureau of Statistics and the Ministry of Health, covering all 34 provinces from 2020 to 2023. Secondary data refers to information obtained from existing sources rather than collected directly from

respondents (Rahmadi, 2011). The research utilizes pre-existing datasets relevant to the study objectives without conducting primary data collection.

Specifically, this study investigates the influence of several variables Egg Protein Consumption (KPT), Access to Clean Water (AAB), Access to Health Services (ALK), Average Length of Schooling for Girls (RLSP), and Family Planning (KB) on stunting prevalence across Indonesia's provinces.

A quantitative research approach is used, which involves numerical data for data collection, analysis, and result presentation (Siyoto & Sodik, 2015). Stunting serves as the dependent variable, while the independent variables include KPT, AAB, ALK, RLSP, and KB. Panel data regression is applied using three estimation methods: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The most appropriate model is selected based on the Chow and Hausman tests.

## RESULTS AND DISCUSSION

Panel data model regression estimation uses the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) approaches. The estimation results from these three approaches are presented in Table 1.

**Table 1. CEM, FEM, and REM Regression Results**

Variable	Coefficient Regression		
	CEM	FEM	REM
C	78,6169	113,451	78,616
logKPT	-5,2604	-1,0774	-5,2604
AAB	-0,1973	-0,3575	-0,1973
ALK	-0,0002	-0,0080	-0,0002
RLSP	-3,2358	-7,1874	-3,2358
KB	0,0002	0,1441	0,0002
R <sup>2</sup>	0,3248	0,3796	0,3248
Prob. F-Stat.	0,0000	0,0000	0,0000

Chow Test  
 Cross-section F (33, 97) = 13,34; Prob. F = 0,0000  
 Hausman Test  
 Cross-section random  $\chi^2(5) = 37,44$ ; Prob.  $\chi^2(5) = 0,0000$

Source: (Processed using Stata MP17)

Following the regression analyses using CEM, FEM, and REM, two diagnostic tests were conducted to determine the most appropriate model for panel data estimation. The Chow Test was first applied to compare CEM and FEM; if the F-statistic probability is below the significance level ( $\alpha$ ), the null hypothesis ( $H_0$ ) is rejected, indicating that FEM is preferable. Subsequently, the Hausman Test was used to choose between FEM and REM, where a chi-square ( $\chi^2$ ) probability below  $\alpha$  also leads to the rejection of  $H_0$ , suggesting FEM as the better model. In this study, the Chow Test yielded a cross-section F probability of 0.0000 ( $< 0.05$ ), and the Hausman Test reported a chi-square probability of 0.000 ( $< 0.05$ ), both confirming that FEM is the most suitable model for estimating the panel data.

**Table 2. FEM Regression Results**

$$ST_{it} = 113,451 - 1,0774logKPT_{it} - 0,0357AAB_{it} - 0,0081ALK_{it} - 7,1874RLSP_{it} + 0,1441KB_{it}$$

(0,794)                      (0,027)\*                      (0,358)                      (0,000)\*                      (0,341)

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R2 = 0,3796; F = 11,87; Prob. F = 0,0000

Source: (Processed using Stata MP17)

Based on Table 2, the probability value of the F-statistic is 0.0000, which is lower than the significance level ( $\alpha = 0.05$ ). This indicates that the null hypothesis (H0) is rejected. Thus, it can be concluded that egg protein consumption, access to clean water, healthcare services, average length of schooling for girls, and family planning significantly influence stunting rates across 34 provinces in Indonesia during the 2020–2023 period. The coefficient of determination (R<sup>2</sup>) of 0.3796 implies that 37.96% of the variation in stunting can be explained by the model, while the remaining 62.04% is influenced by other factors not included in the analysis.

Furthermore, the Fixed Effect Model (FEM) estimation reveals that the lowest constant value occurred in North Sumatra in 2023, at 102.71867. This suggests that, during the 2020–2023 period, the impact of egg protein consumption, clean water access, health services, girls’ average schooling, and family planning on stunting was least pronounced in this province. Conversely, the highest constant value was recorded in Aceh in 2020, at 123.127781, indicating that the combined influence of those variables on stunting was most prominent in that province and year.

**Table 3. Results of the Validity Test of the Influence of Independent Variables**

Variable	t	Sig.t	criteria	Conclusion
KPT	-1,0774	0,794	> 0,05	not significant
AAB	-0,0357	0,027	< 0,05	significant influence
ALK	-0,0080	0,358	> 0,05	not significant
RLSP	-7,1874	0,000	< 0,05	significant influence
KB	0,14415	0,341	> 0,05	not significant

Source: (Processed using Stata MP17).

### Discussion

Table 3 reveals that, among the independent variables assessed, only Access to Clean Water and the Average Length of Schooling for Girls significantly affect stunting (ST) rates across Indonesia's 34 provinces from 2020 to 2023. In contrast, Egg Protein Consumption, Access to Health Services, and Family Planning do not exhibit a meaningful influence.

Despite eggs being a well-established source of high-quality nutrients essential for child development, this research found no statistically significant relationship between egg consumption and stunting prevalence. Ricci (2024) suggests that egg intake alone is insufficient to combat stunting without accompanying policies that enhance families' economic ability to access diverse, nutritious food. Similarly, Masters (2022) highlights the importance of not only ensuring food availability but also promoting fair distribution and nutritional education. He argues that sustainable economic development relies on overhauling food systems to support healthier diets, including increased consumption of animal-sourced protein such as eggs.

Access to clean water, on the other hand, shows a notable and statistically significant inverse relationship with stunting; specifically, a 1% increase in access to safe water corresponds with a 0.0357% reduction in stunting prevalence. This outcome aligns with earlier findings by Haddad (1999) and Mastura (2024), both of whom stress that clean water

availability is a cornerstone of public health, helping to cut down on illness-related expenses and improve workforce productivity over time. Nisa et al. (2021) further reinforce the role of water access in lowering stunting rates.

In contrast, Access to Health Services was not found to significantly affect stunting in this analysis. According to Putri et al. (2024), merely providing access to health facilities is inadequate without concurrent improvements in caregiving practices and infant nutrition. Astari (2023) likewise notes that health services must be paired with behavioral nutrition interventions and effective parenting education to address the fundamental causes of stunting. Without these supportive elements, access alone proves insufficient.

The Average Length of Schooling for Girls emerged as a highly significant factor, showing that each additional year of education is linked to a 7.1874% decrease in stunting. Education equips women with essential knowledge on childcare, sanitation, and nutrition, leading to healthier children and stronger future generations. This result supports human capital theory (Becker, 1993) and aligns with Shafiq's (2019) view that women's education is a vital factor in achieving intergenerational health improvements and sustained economic development.

Lastly, Family Planning was not found to have a significant impact on stunting. Many participants in such programs do not experience reductions in child stunting, largely due to a lack of improvements in parenting and nutrition behaviors. Khumairoh et al. (2023) and Baschieri (2017) stress that family planning initiatives must be linked with educational efforts on nutrition and child care to be effective. Gribble and Foreman (2011) also argue that government strategies should integrate family planning with maternal and child health, nutritional awareness, and household caregiving education to reduce medical expenses, enhance family economic stability, and alleviate national burdens related to health and education.

## CONCLUSION

This research explores the factors influencing stunting prevalence across 34 provinces in Indonesia between 2020 and 2023. The analysis centers on five key variables: egg protein intake (KPT), access to clean water (AAB), availability of healthcare services (ALK), average years of schooling for girls (RLSP), and family planning (KB). Employing a Fixed Effect Model (FEM) for panel data, the study identifies that both access to clean water and female education significantly and negatively correlate with stunting rates. These findings imply that improved water access helps prevent nutrient loss due to waterborne diseases, while extended education for girls fosters better household nutrition practices.

Conversely, egg protein consumption, healthcare access, and family planning do not exhibit statistically significant effects on stunting. This may reflect disparities in resource distribution, service quality, or supporting infrastructure, limiting their effectiveness in addressing malnutrition.

Although the model offers valuable findings, it accounts for only around 37.96% of the variance in stunting prevalence, indicating that important explanatory factors may have been omitted. Variables such as household income, maternal health during pregnancy, and sanitation conditions were not included, despite their potential influence on nutritional

outcomes. Additionally, the exclusive use of quantitative methods limits the capacity to understand community-level behaviors and contextual drivers of stunting.

To address this issue, policymakers are advised to prioritize access to quality education for girls, particularly in regions with high stunting rates, as educated mothers are more likely to adopt health-conscious parenting. Complementary measures, including food subsidies and income-generating programs for disadvantaged families, should be implemented to improve nutrition and overall well-being. Further studies are encouraged to include broader socioeconomic and health indicators and adopt mixed-method designs integrating qualitative insights through interviews or case studies to gain a more comprehensive understanding of the stunting phenomenon in Indonesia.

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