

Evaluating the Impact of Village Fund Allocation for Health on Human Capital Investment through Stunting Reduction Programs in Lamongan Regency

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ABSTRACT

This study evaluates the impact of Village Fund allocation for health on stunting reduction as an investment in human capital in Lamongan Regency. Using village-level data for 2023–2024, the study applies Propensity Score Matching (PSM) and Ordinary Least Squares (OLS) to examine supporting factors. The PSM results indicate that villages receiving the intervention experienced a statistically significant reduction in stunting prevalence of approximately 1.2 percentage points compared with non-treated villages. The OLS results show that the Village Fund intervention has a negative but marginally significant association with stunting prevalence, while posyandu activity, supplementary feeding, child immunization, and basic-service access are statistically insignificant. These findings highlight the importance of targeted and integrated village-level interventions.

INTRODUCTION

Human capital is an important component of economic development because improvements in health, education, and skills increase individual productivity and contribute to long-term economic growth. Schultz and Becker emphasize that investments in human capital generate future returns through improvements in individual capacity and productivity. In the health sector, investment is particularly important because better health conditions support learning capacity, skill development, and future participation in the labor market.

Stunting represents one of the major challenges to human capital development. It is associated with chronic nutritional deficiencies, recurrent infections, and inadequate stimulation, particularly during the first 1,000 days of life. Stunting affects not only physical growth but also cognitive development and long-term quality of life. In the long run, inadequate childhood nutrition may reduce human capital quality, productivity, and economic welfare.

In Indonesia, stunting reduction has become a national health priority. The government has promoted integrated interventions involving central, regional, and village governments. One important fiscal instrument is the Village Fund, which provides resources for village development and public services, including health and nutrition programs.

The relevance of village-level fiscal intervention is also supported by fiscal decentralization theory. Oates argues that decentralized public expenditure can improve efficiency because local governments possess better information regarding local needs and preferences. In the context of stunting, village governments are therefore expected to allocate resources according to local nutritional, health, sanitation, and socioeconomic conditions.

Lamongan Regency provides an important context for examining this relationship.

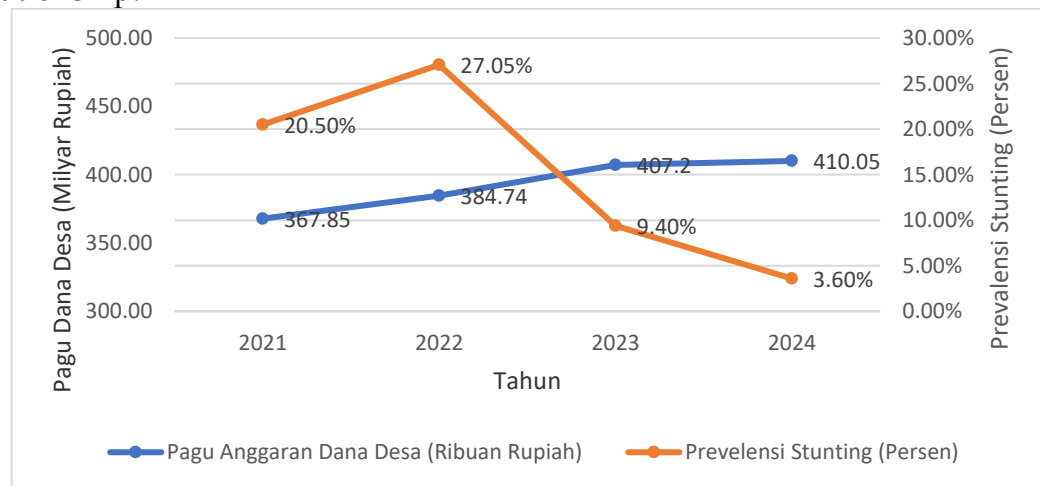


Figure 1. Trend of Village Fund Ceilings and Stunting Prevalence in Lamongan Regency (2021–2023)

Source: BPS, 2021–2023 (Result of Data Processing)

During 2021–2023, the Village Fund ceiling increased from approximately IDR 397.53 billion to IDR 410.05 billion, while reported stunting prevalence

declined from 20.50% to 3.60%. This trend suggests a possible relationship between village-level fiscal intervention and stunting reduction, although the observed correlation does not necessarily imply a causal effect.

Previous studies have produced mixed findings. Indra and Khoirunurrofik (2022) found that Village Funds significantly contributed to stunting reduction in Indonesia, particularly outside Java. In contrast, Hayati and Taifur (2024) found no significant effect of Village Funds on stunting management in Pesisir Selatan. Other studies have emphasized the importance of program implementation, infrastructure, supplementary feeding, and local administrative capacity.

The differences in previous findings indicate the need for a more specific impact evaluation at the village level. Therefore, this study evaluates whether villages allocating Village Funds to stunting reduction experienced greater reductions in stunting prevalence than comparable villages without such interventions. The study further examines whether Village Fund allocation and stunting-related service components—including active posyandu, supplementary feeding for pregnant women, child immunization, and access to basic sanitation—are associated with stunting prevalence.

LITERATURE REVIEW

Human capital theory provides an important theoretical foundation for understanding the economic implications of health and nutrition interventions. Schultz (1993) and Becker (1993) conceptualize education, health, and skills as forms of investment that enhance individual productivity and generate returns over time. In the health sector, Grossman (1972) further explains that health can be regarded as a form of capital stock that can be accumulated through investment in health care and nutrition. From this perspective, improving children's health and nutritional status is not merely a public health objective but also a form of investment in future human capital. Better nutritional conditions during childhood can support physical and cognitive development, which subsequently affects educational attainment, productivity, and economic welfare.

Stunting is particularly relevant within this human capital framework because its consequences extend beyond physical growth. Chronic nutritional deficiencies during the early stages of life may impair cognitive development and affect children's future educational and productive capacity. Therefore, efforts to reduce stunting can be understood as long-term investments in human capital. In this context, public expenditure directed toward nutrition, health services, sanitation, and child development may generate benefits that extend into adulthood. The prevention of stunting is consequently not only relevant to improving current health outcomes but also to strengthening the quality of human capital in the future.

The role of government intervention can further be explained through the theory of fiscal decentralization. Oates argues that decentralized public expenditure can improve the efficiency of public service provision because local governments have better information regarding the preferences and conditions

of their communities. In Indonesia, the Village Fund provides an important fiscal instrument through which financial resources can be allocated to the village level. Village governments can use these resources to finance various development and public service activities, including health and nutrition programs. Theoretically, the proximity of village governments to local communities allows the allocation of Village Funds to be adjusted to specific local needs and conditions.

The relationship between Village Funds and stunting reduction has been examined in several previous studies, although the empirical findings remain mixed. Indra and Khoirunurrofik (2022) found that Village Funds contributed significantly to stunting reduction in Indonesia, particularly in regions outside Java. Their findings also emphasized the importance of village administrative capacity in determining the effectiveness of Village Fund utilization. Similarly, Handayani and Arianto (2022) highlighted the importance of village governance and appropriate allocation in supporting stunting prevention programs. Other studies, however, have reported different results. Hayati and Taifur (2024), for example, found that Village Funds did not have a significant effect on stunting management in Pesisir Selatan Regency. These differences suggest that the availability of fiscal resources does not automatically translate into better nutritional outcomes.

The effectiveness of Village Fund interventions may depend on how funds are translated into concrete health and nutrition services. Posyandu activities, supplementary feeding, child immunization, and access to basic sanitation are among the mechanisms through which village-level interventions may influence children's nutritional conditions. Nevertheless, the existence of these services does not necessarily guarantee their effectiveness. Differences in implementation quality, community participation, service coverage, targeting, and local institutional capacity may lead to different outcomes across villages.

Based on the existing literature, an important research gap remains regarding the causal effect of Village Fund intervention on stunting prevalence at the village level. Previous studies have largely examined correlations or the effectiveness of Village Fund utilization in specific regions, while relatively limited attention has been given to constructing a comparable counterfactual group to estimate the impact of intervention. Therefore, this study contributes to the literature by applying Propensity Score Matching to estimate the Average Treatment Effect on the Treated (ATT) of Village Fund intervention on stunting prevalence in Lamongan Regency. The study also employs an Ordinary Least Squares model to examine the relationship between Village Fund intervention and several supporting health and basic-service indicators

METHODOLOGY

Human capital theory provides an important theoretical foundation for understanding the economic implications of health and nutrition interventions. Schultz (1993) and Becker (1993) conceptualize education, health, and skills as forms of investment that enhance individual productivity and generate returns

This study employs a quantitative approach to evaluate the impact of Village Fund allocation for stunting reduction on stunting prevalence in Lamongan Regency. The unit of analysis is the village, with the study covering

462 villages across 27 sub-districts. The study uses secondary data obtained from relevant government institutions and village-level administrative records. The dependent variable is stunting prevalence, while the main treatment variable is the allocation of Village Funds for stunting reduction programs. Additional variables include population density, the number of children under five, the number of social assistance recipients, active posyandu, supplementary feeding for pregnant women, child immunization, and the basic-service access index.

To estimate the impact of the intervention, this study applies Propensity Score Matching (PSM). PSM is used to construct a comparable control group based on observable village characteristics, thereby reducing differences between villages that received the intervention and those that did not. The propensity score represents the probability that a village receives the intervention given its observed characteristics.

$$ATT = \bar{Y}_{treatment} - \bar{Y}_{control}$$

After the matching process, the Average Treatment Effect on the Treated (ATT) is estimated to determine whether villages receiving the intervention experienced different stunting prevalence compared with comparable villages that did not receive the intervention.

In addition to PSM, the study employs an Ordinary Least Squares (OLS) regression model to examine the relationship between Village Fund intervention and stunting prevalence while considering several health and basic-service indicators. The OLS model includes active posyandu, supplementary feeding for pregnant women, child immunization, and the basic-service access index as explanatory variables, together with relevant village-level control variables. Robust standard errors are employed to address heteroskedasticity identified in the regression analysis. The combination of PSM and OLS allows the study to examine both the estimated treatment effect and the association between the intervention and supporting factors related to stunting prevalence.

REASERCH RESULT

The empirical results indicate that the Village Fund intervention is associated with a reduction in stunting prevalence among villages in Lamongan Regency.

Table 1. Average Treatment Effect on the Treated (ATT) Results

Prev_ Stunting	Treated	Controls	Difference	S.E	T- stat
Unmatched	.045124485	.050429402	-.005304918	.004296978	-1.23
ATT	.045124485	.057382273	-.012257789	.006009246	-2.04

Source: STATA (Results of Data Processing)

The Propensity Score Matching estimation produces an Average Treatment Effect on the Treated (ATT) of -0.01226 , with a standard error of 0.00601 and a t-statistic of -2.04 . This result indicates that, after matching villages with comparable observable characteristics, villages receiving the intervention experienced approximately a 1.2 percentage-point lower stunting prevalence than comparable villages that did not receive the intervention. The negative ATT suggests that the intervention was associated with a reduction in stunting

prevalence, while the statistical significance indicates that the estimated difference is unlikely to be explained solely by random variation.

The matching procedure produced an adequate common-support area between the treatment and control groups. Of the observed villages, 279 villages were included in the treatment group, while 183 control villages were located within the common-support region. The average propensity score was relatively similar between the treated and control groups, indicating sufficient overlap to perform the matching procedure. These results support the use of PSM to compare villages with similar observable characteristics.

Table 2. Ordinary Least Square (OLS) Results

Variable	Coefficient	Std. Error	t	P> t
dummy_dd	-0.0107607	0.0063809	-1.69	0.093
posyandu_aktif_dummy	0.0226384	0.0157562	1.44	0.152
jumlah_pmt_bumil	0.0004052	0.0005542	0.74	0.458
jumlah_imunisasi_balita	6.66e-05	4.43e-05	1.5	0.135
akses_indeks	-0.001448	0.0014085	-1.03	0.305
Jumlah_balita	-.0001208	.0000379	-3.18	0.002
Kepadatan_penduduk	-9.01e-07	2.47e-07	-3.65	0.000
Penerima_bantuan	-.0000329	.0000703	-0.47	0.640
_cons	0.0436943	0.0163526	2.67	0.008

Source: STATA (Results of Data Processing)

The OLS estimation provides additional evidence regarding the relationship between Village Fund intervention and stunting prevalence. The model is statistically significant overall, as indicated by a Prob > F value of 0.0043. The estimated coefficient for the Village Fund intervention is -0.01076 with a p-value of 0.093. The negative coefficient indicates that the intervention is associated with lower stunting prevalence, although the relationship is statistically significant only at the 10 percent level.

The coefficients for active posyandu, supplementary feeding for pregnant women, child immunization, and the basic-service access index are not statistically significant in the OLS model. This indicates that, within the specification used in this study, these individual service indicators do not demonstrate a statistically significant relationship with stunting prevalence. The control variables also show varying relationships with the dependent variable, suggesting that village characteristics may contribute to differences in stunting prevalence across villages.

DISCUSSION

The PSM results provide the strongest evidence in this study that Village Fund intervention contributes to stunting reduction. The estimated ATT of -0.01226 indicates that treated villages experienced approximately a 1.2 percentage-point lower prevalence of stunting than comparable untreated villages. Because PSM was used to construct a comparable counterfactual group, this result provides stronger evidence than a simple comparison of average stunting prevalence.

The finding is consistent with the human capital perspective developed by Schultz, Becker, and Grossman. Health and nutrition investments during childhood can improve the stock of human capital by supporting physical and cognitive development. Therefore, Village Fund expenditure directed toward stunting prevention may generate benefits beyond the immediate reduction in child malnutrition.

The result is also consistent with the logic of fiscal decentralization. Village governments possess information about local conditions and can direct resources toward specific community needs. In Lamongan, Village Fund interventions can support services such as posyandu, nutrition programs, immunization, and sanitation, which together form an important part of the local strategy for stunting reduction.

The OLS results, however, provide a more nuanced picture. The Village Fund intervention variable remains negative but is only marginally significant. This difference from the PSM estimate suggests that the effectiveness of the intervention may depend on implementation conditions and village characteristics. The presence of funding alone may therefore be insufficient without appropriate targeting, program quality, monitoring, and coordination.

The insignificant coefficient of active posyandu suggests that activity frequency alone may not capture service quality. A posyandu may be classified as active while the quality of nutrition monitoring, counseling, community participation, or follow-up services varies substantially across villages.

Similarly, supplementary feeding for pregnant women does not show a statistically significant association with stunting prevalence. One possible explanation is that the effectiveness of supplementary feeding depends not only on the number of recipients but also on nutritional quality, adequacy, regularity, and actual consumption. Moreover, interventions during pregnancy may require a longer period before their effects become observable in child nutritional outcomes.

Child immunization also does not show a significant relationship with stunting. This finding does not imply that immunization is unimportant. Rather, immunization primarily protects children against infectious diseases, while stunting is influenced by a broader combination of nutrition, sanitation, caregiving practices, socioeconomic conditions, and health services.

The basic-service access index is also statistically insignificant. Access to clean water, sanitation, and healthy latrines may not automatically translate into effective use. Household behavior, water quality, hygiene practices, and sanitation utilization may influence the actual health effects of infrastructure.

Overall, the findings suggest that Village Fund intervention has potential as a human capital investment mechanism, but its effectiveness depends on the quality and integration of interventions. Stunting reduction therefore requires a multidimensional approach rather than reliance on a single program component.

CONCLUSION AND RECOMMENDATION

This study finds that Village Fund intervention for stunting reduction has a significant impact on reducing stunting prevalence in Lamongan Regency. The

PSM estimation produces an ATT of -0.01226 , indicating an approximately 1.2 percentage-point reduction in stunting prevalence among treated villages relative to comparable untreated villages.

The OLS results support the direction of this finding, although the estimated effect of the Village Fund intervention is only marginally significant. Meanwhile, active posyandu, supplementary feeding for pregnant women, child immunization, and basic-service access do not show statistically significant effects in the OLS model.

These findings indicate that Village Funds can serve as an important instrument for human capital investment through health and nutrition interventions. However, the effectiveness of funding depends on implementation quality, targeting, coordination, and local institutional capacity.

First, village governments should improve the quality of stunting-related services rather than focusing solely on the quantity of activities. Second, Village Fund allocation should be increasingly based on local stunting risk and village service capacity. Third, coordination among village governments, Puskesmas, posyandu cadres, and relevant government agencies should be strengthened. Fourth, village-level health data recording and reporting should be improved to support evidence-based planning and evaluation.

ADVANCED RESEARCH

Future research should extend the analysis by using panel data covering several years to capture the longer-term effects of Village Fund interventions on child nutritional outcomes. Longitudinal data would also allow researchers to examine whether the observed short-term reduction in stunting is sustained over time. In addition, future research could incorporate broader socioeconomic variables, including household income, parental education, poverty, food security, and maternal health. A more detailed analysis of village institutional capacity and intergovernmental coordination could also help explain why similar levels of Village Fund allocation generate different outcomes across villages.

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