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The Effect of Child Health on Poverty in Indonesia

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Abstract

Despite economic growth, Indonesia continues to face high rates of child malnutrition, particularly stunting and wasting. This study examines how poverty influences child health outcomes using provincial panel data from 33 provinces (2012–2022). The Generalized Method of Moments (GMM) is employed to address endogeneity and unobserved heterogeneity. Results show that child stunting as well as child wasting has a positive and significant effect on poverty, indicating that poorer households face greater nutritional challenges. In contrast, access to clean water and household electricity significantly reduces poverty, highlighting the importance of basic utilities in combating poverty. Health expenditure and environmental factors also play notable roles. These findings emphasize the need for integrated policy approaches that link child wellbeing, infrastructure access, and nutrition-sensitive interventions to achieve poverty reduction and advance Indonesia's vision for sustainable development. This study has a limitation to not include some new provinces in Indonesia due to unavailability of data as well as sample with short data period. The findings will have an implication of the importance of government to focus on socioeconomics factors such as infrastructures, nutrition intake to achieve better child wellbeing which later will reduce the poverty rate.

Keywords: Poverty, Stunting, Wasting, GMM

Introduction

As a developing country with sustain economic growth, Indonesia is trying to unlock its potentials to achieve the vision of Golden Indonesia 2045 (*Indonesia Emas 2045*) on its 100 years independence anniversary. The Government of Indonesia has set five main goals as an accomplishment for the milestone (https://indonesia2045.go.id). The first goal is to be the top five highest GDP per capita in the world with the amount close to USD 30,000. The next priority is the decline in poverty rate and drop in poverty gap. It is expected that the poverty rate will be lower than 1% and Gini coefficient will be expected to be no more than 0.30. World Bank (2024)[1] explains that, poverty rate in Indonesia counted as 8.57% and separated between rural and urban areas in provincial level. While ADB (2024)[2] estimates 9% of

[1] https://www.worldbank.org/en/news/factsheet/2025/06/13/updated-global-poverty-lines-indonesia

[2] https://www.adb.org/where-we-work/indonesia/poverty

population living below poverty line with children under 5 years are 22.6% and 8.4% are under prevalence of stunting and wasting, respectively. Other supporting goals follow to ensure that not only macroeconomic side will support the growth and development but also the other crucial field in real sector namely education, health, and well-being of the people.

The progress of poverty reduction in Indonesia, including eradication of extreme poverty has made a remarkable progress. However, the improvement in human capital outcomes is still poor which hinders the productivity of its population and widening the inequality gap (World Bank, 2023). The low productivity of population may cause by nutritional deficit during childhood. The outcome of early childhood development from child's birth to five years, which is recognized to be a critical period to shape long-term skills and productivity, remains poor and show limited progress. Health sectors play as an essential contributing factor on achieving the vision of Golden Indonesia 2045 and childhood health outcomes are an important factor of Human Capital Index (CPI). Child health sector is necessary to monitor since current children will reach their productive age in the year 2045. Improvement in education that will lead to increase in productivity is expected to support the vision of Golden Indonesia 2045 with innovation and qualified health system. The interactions on this system will boost the human development index (HDI) expected to reach score of 0.7.

World Bank (2024) elaborates that human capital methodology from the interaction of knowledge, skills and well-maintained health will empower the people in a country to maximize its potential and boost economic growth[3]. Unfortunately, rapid economic growth and progress on poverty reduction in Indonesia is inconsistent with the reality of high rate of chronic malnutrition rates which remain undoubtedly high. The steady decline in poverty does not come close to the slow and slight improve in stunting reduction. People whose growth was stunted in childhood were shorter later in life as a young adult, experience lower cognitive function and tend to spend fewer years in education which later translates into lower earnings in life. Household poverty is recognized to be one of the socioeconomic risk factors which affect children's nutritional status. Other factors affecting chronic malnutrition are maternal education, water and sanitation conditions, and access to healthcare system. It is found that, unexpectedly, in the wealthiest quintile of households, child stunting rates were still high (Arief et al., 2025). Thus, nutritional problem will not directly be solved by boosting economic growth.

The hidden cause and consequences of malnutrition on children are complex, multidimensional and interrelated among sectors. The general factors such as political instability and economic growth may hinder the nutrition development while the specific factors such as respiratory and infectious disease may directly act as a major reason to increase the risk of malnutrition (De Silva & Sumarto, 2018). The unbalanced development is resulted from variations in poverty, nutritional outcomes, output, and human capital among provinces. This widened gap has triggered focus of economic activities around Java and Sumatera islands, left those in eastern Indonesia neglected behind.

[3] https://humancapital.worldbank.org/content/dam/sites/data/humancapital/pdf/country-briefs-2024/Indonesia.pdf?utm_source=chatgpt.com

Since there are various socioeconomic factors that may affect nutrition status of children, the study to reveal whether the effect of poverty on child health is influenced of other mediating factors; namely household sanitation, housing condition, and food security is essentials.

Recent data from *Survei Status Gizi Indonesia* (SSGI) and Riskesdas (*Riset Kesehatan Dasar*) translates the statistics into the urgency of malnutrition problem and the need for immediate action. According to SSGI, which covers the nutrition status of children under five (stunting, wasting, underweight, and overweight) and its determinants, there was a significant drop of 16% on rate of stunting in Indonesia from 2013 to 2022. On the other hand, during this ten-year period, the rate of wasting decreased steadily to 7.7%. Similarly, the underweight rate experienced a slight decline from 19.6% to 17% in the same period.

Data from Statistics Indonesia (2022) mentioned that around 8.2% of Indonesia's GDP are invested in health. This proportion is progressing compare to previous year with the amount of 6.2%. Health becomes the main priority sector along with education and social security program which counted for 20% and 16.8%, respectively in the same year. The goals of health development policy among others are boosting access to a qualified health services for mother, children, and elderly; fastening the improvement of nutrition; improving the disease control and environmental health; and so forth.

There is a growing interest on using child malnutrition as an indicator of poverty. Children is a representative of each country's future. Children with malnutrition will affect their productivity during their productive age as represented by the work capacity and intellectual performance (Setboonsarng, 2005). Implementing child malnutrition as a poverty indicator has strong benefit to not adjusted for inflation and to not constrained of limited availability of price data. In the region of Africa, rapid population growth without control from the government, imbalance practices on agriculture and industrial sector, corruption and poor governance practice which trigger the abundant of debt profile, infectious diseases from AIDS, malaria, Ebola to COVID-19 pandemic, insufficient health infrastructure and domestic conflict lead to the outcome of poverty and malnutrition (Adeyeye et al., 2023). Poverty is the main root cause of hunger and malnutrition in Africa while both causes of poverty will uplift the problem of diseases in this continent. As a main cause of malnutrition, poverty can be deepened from malnutrition and malnourished children can be trapped in the cycle of poverty which has serious consequences on health (Ma et al., 2022).

Limited access to clean water and health facilities plays essential role in causing malnutrition among poor people. Open defecation caused by poor sanitary condition foster the transmissional disease such as diarrhoea infections as a path to stunting on children. The effort to combat the open defecation has led to a significant reduction of only 4.2% households perform open defecation in 2023, a significant drop from nearly 30% in 2000. The government of Indonesia with support from international organizations such as UNICEF proves a steady progress to facilitate improved water and sanitation services. However, in 2023, safely managed sanitation to ensure safety of disposal on faecal waste is still limited. It only covers around 10 percent of people with access to safely managed sanitation services. The national roadmap is to ensure that 100 million persons have safely managed water services in 2030. Shuvo et al. (2025) confirms the manifestation of worm as an associated factor with undernutrition in Bangladesh. This finding was resulted from nearly 75%

households practice open defecation and approximately 64% had a poor waste management and disposal system. Since access to safe drinking water and ending malnutrition is one of the main targets of SDGs, Brahma & Mukherjee (2021) suggest to increase access to safe water with good monitoring system to combat malnutrition.

Health access also becomes crucial part on reducing key priorities on SDGs goals related to maternal mortality, improving newborn care, increase the rate of participation on immunization, eliminating tropical disease like malaria and other health issues, including mental health. A significant progress has been curbing the child and newborn mortality rates but maternal mortality rates become a challenge since Indonesia ranked eight globally for this indicator. Ministry of Health, WHO, and UNICEF contribute actively to improve the primary health system for a health challenge in an environment and climate change situation.

Moreover, poverty hinders the access to education through several steps. Parents who obtain lower level of education will have a limited nutritional knowledge and for mother, has no power to conduct a decision. Less-educated parents are less likely to provide their children with diverse diet, immunization, as well as sanitation and hygiene facilities at home. Parents with poor education will be unaware of health awareness campaign and interventions which resulted in weak or no evidence of the effectiveness of supplementary nutrition to mothers, health check-ups or growth monitoring (Brahma & Mukherjee, 2021). Uneducated, unemployed, and lack of income drive women with lacked access to appropriate health care information. They have limited choice due to scarcity of basic health choices, as elaborated by Sandu (2005) in rural Rumanian women, most of malnourished children were found belong to mothers who were illiterate (Abidoye, 1999). The prevalence of stunting and underweight is low among children when both mothers and fathers have similar level of education (Nahar & Zahangir, 2024). Those elaborated research highlighted the different impact of maternal education on health behaviour.

From the previous studies, the growing importance of child nutrition on poverty is widely discuss among regions using cross sectional studies. Nevertheless, only a few research has been done on the trajectories between child malnutrition which focus on stunting and wasting rate as its determinants factors affecting the level of poverty. Therefore, this study would like to fill this gap by focusing on the path in how poverty will affect stunting and wasting rate in Indonesia. Section 1 from this study will discuss introduction, section 2 will explain background of this study, section 3 elaborates literature review, section 4 and 5 will focus on research methodology and analysis of study, respectively. Section 6 will conclude the study.

Literature Review

Factors affecting poverty

The intertwined relationships between poverty and malnutrition are in the empirical discussions for years among regions in the world. A study in India to measure poverty highlighted a socio-demographic indicators involved related to socioeconomic status; elaborated as education, occupation, assets, income and living condition. A study in semi-urban slum area in southern India found the need to standardization the scales since it is critical to understand the people's residential to design interventions, including policy against childhood stunting that used as an indicator of chronic deprivation as well as monitor the

policy to alleviate poverty (Kattula et al., 2016). Another approach called Consensual Approach had been used by Pomati et al. (2024) which indicators asked in a survey including eating three meals a day, accessing health facilities and transport access, ability to afford clothing, social activities and savings as a poverty measurement. The variables used highlighted the importance of dimensions and specific deprivations that are not entirely captured by existing multidimensional poverty approach used in India. They conclude that the current Demographic and Health Survey (DHS) underestimated the basic essentials factors to be included. The need of expanding the measurement scales of poverty is needed to broaden the index with indicators that include cultural and social factors.

Poverty is the main cause of hunger that led to malnutrition and may act as an obstacle to poverty alleviation. Poor households tend to have a children who were suffering from at least one form of malnutrition (Adeyeye et al., 2023; Ma et al., 2022; Rahman et al., 2021). Poverty may affect children's welfare in many ways, it may increase the likelihood the occurrence of sustain wounds, skin diseases or burned by fire for children involved in labour activity (Adabor, 2025).The finding of impact on poverty to its determinants reached several conclusions. Okogun & Hiwatari (2024) found that in Nigeria, there is a change in dominance hierarchy of poverty gap between north and south. The female and child poverty were influenced by poverty and cultural differences.

Factors Affecting Child Health Outcome

There are wide range of factors affecting malnutrition (Brahma & Mukherjee, 2021), including mother's health, socioeconomic, and demographic characteristics. Access to safe drinking water affecting the higher weight-for-height Z (WHZ) score. The contradictory effects were found in the acute water diarrhea (AWD)-vaccines variables and the high dependency ratio in the family as well as higher household size that leads to lower WHZ.

The empirical evidence from Beal et al. (2018) concludes that nonexclusive breastfeeding in the first six months of life, low household socio-economic status, premature birth, short birth height, and low maternal height as well as maternal education is the main determinants of stunting in Indonesia. It is found that children with unimproved toilets and unfiltered drinking water in the households has an increased risk of stunting. Poor access to health care and living in rural areas also reinforced this condition. Another study conclude that age, household environment, and food sanitation were correlated with severely wasted in rural and sub-urban areas. Space between birth, nutrient intake and health care facilities were contributed as a factor but only in sub-urban areas. While in rural areas, family members, income and calcium intake were associated with prevalence of severely wasted (Sulistyaningsih et al., 2024). Stunted children height for age Z score was found to have a strong association with child morbidity, parental education, and social economic status (SES) (Soekatri et al., 2020).
The prevalence of undernutrition children in slum areas in Bangladesh was higher in 6-23 months-olds and whose mothers had more than three under-five children. Undernutrition was also significantly associated with maternal education, timely complementary feeding, latrine type, and worm infestation (Shuvo et al., 2025). Rahman et al. (2021) concludes their study in Bangladesh that malnutrition impacted child mortality and morbidity which in turn lowering level of education, decrease economic productivity and visualizing poverty.

Poverty and Malnutrition

Africa with many countries listed as low-income countries experienced the connection among elements that caused malnutrition. Lack of intervention for rapid population, inefficient agricultural and industrial productions, bad governance and corruption which triggering high debt performance, diseases (ranging from AIDS, malaria to COVID 19), insufficient health infrastructures and national conflicts will in turn give an escalation of poverty and malnutrition (Adeyeye et al., 2023). Energy plays a crucial factor on affecting malnutrition, lack of electricity for lighting, the use of biofuels, not owning a refrigerator and television as well as mobile phones were correlated with the increased risk of a household experiencing undernutrition. This households were experiencing energy poor as counted in Multidimensional Energy Poverty Index (MEPI) (Dake & Christian, 2023).

Malnutrition is one of contributing factor of poverty and nutrition as a main determinants of health. The government intervention on health and nutrition will affect the formation on human capital. Better health and nutrition will lead to better school performance as well as increase labour productivity which later translate as higher future earnings to improve national income. The dynamic impact resulted from stunting are separated into negative and positive impact. The earlier comes from the food security index, poverty line, women's year of schooling, specific allocation funds, and hopeful family program while positive impact resulted from the variable village funds and fiscal decentralisation. (Schiff & Valdes, 1990; Hamzah et al., 2025).

The root of child malnutrition is deriving from children's lack of intake variation on food which may be caused by food insecurity. Poverty is associated with hidden hunger and nutrient deficiencies while food insecurity may lead to both hidden hunger as well as overnutrition which may cause overweight and obesity (Tanumihardjo et al., 2007). Poverty triggered the food insecurity problem due to "poverty-related" or "resource-constrained" condition (Siddiqui et al., 2020). Unstable food supplies with low food quality may affect immunity and induced infections for individuals. In turn, imbalance in nutrition will reduce the capacity of work as well as human capital and threatened countries to be more vulnerable to poverty. Poverty may exacerbate the severity of malnutrition since it is associated with hidden hunger and nutrient deficiencies. It affects the capacity of individual in terms of mental and psychological that leads to declining the productivity levels and dragged the countries into more susceptible poverty. Due to this cause and effect, the connection of malnutrition and poverty seen as a vicious cycle (Siddiqui et al., 2020). Shariff et al., (2024) examined the condition of double burden of malnutrition among indigenous people of Peninsular Malaysia. This people represent 0.7% of the population on Peninsular Malaysia in 2019 and generally become the poorest and marginalized group that experiencing violence, threatened livelihoods and possible extinction. It was found that the problem of double burden malnutrition (DBM) was found on this ethnic group with 28.8% mothers and children interviewed experiencing problem of overweight/obese mother and underweight/stunted children. The determinants factors for this problem were food insecurity, height of mother with lower than 150 cm, energy intake, and child's age.

Government Intervention on poverty and Malnutrition

Policy to reduce the poverty which in turn will affect reduction in the rate of malnutrition has been conducted by respective governments. Cash transfer program under the name Pantawid

Pamilya have impacts on household's income and consumption in the Philippines. Thus, it is expected to decline the future poverty (Capuno, 2025).

Ma et al. (2022) conclude the policy to the burden of malnutrition and poverty include access to basic services including wash, sanitation, hygiene, and health care, diversity of health and nutritious food, and education to the exclusive breastfeeding in the first six months of life.
In Indonesia, the newly elected President Prabowo initiated meal nutritious program which aimed to reducing malnutrition among school-aged children. This recent program is still ongoing and the outcome result need to be constructed from the data and study. However, study in the US as a developed country by Bitler et al. (2025) found that the National School Lunch Program and School Breakfast Program had not statistically significant effects on food insecurity. Nevertheless, free school meals affect the quantity and quality of foods that student consume.

Reducing malnutrition, including stunting and wasting, need a balanced collaboration among stakeholders. In one of the districts in Aceh, Indonesia, Sufri et al. (2024) mentioned that the policymakers agree that the implementation cost is sufficient but the need of supervision from experts and collaboration between health and non-health sectors needs to be strengthened in terms of adoption, feasibility, compliance, and nutrition-sensitive intervention coverage.

Previous research has extensively explored the determinants of child nutrition in that puts child wasting and stunting as a dependent variable of poverty and other socioeconomic variables. However, only a few research has been examined the reversed pathways on how the high level of child malnutrition will worsen poverty. Past studies also underestimate the importance of multidimensional aspects such as access to electricity, safe drinking water and sanitation. Methodologic gap also existed due to most studies focus on static models that do not address endogeneity, reversed causality, or heterogeneity across regions. To fill this gap, this study uses Generalized Methods of Moments (GMM) to capture the long-term nature of poverty and malnutrition in Indonesia using provincial data from 2012 to 2022.

Hypothesis Development

The first hypothesis related to child malnutrition and poverty. Increase in malnutrition will lead to higher poverty levels. Children who lacks of nutrition will have lower cognitive development that may lead to lower productivity and lower earnings in the future. The argument will be malnutrition is a driven of poverty.
H1: Higher child stunting rates increase the level of poverty
H2: Higher child wasting rates increase the level of poverty
The next hypothesis is related to access to clean drinking water (HHDW). Lack access of clean water raises the risk of disease, increase healthcare cost, reduce productivity which later increase the likelihood of household falls into poverty.
H3: Higher access to clean water reduces poverty level
The variable of amount of electricity distributed (ELDI) and household access to electricity (HELS). Regions with lower electricity access has lower access to information as well as healthcare, they also lack in capacity of economic advancement.
H4: Household access to electricity reduces poverty levels

Methods

The ultimate goal of SDGs on children is ensuring their happiness and grow for the future. Clark et al. (2020) constructed the national profile to measure the survive and thrive as an indicator to analyze the environmental flourish as well its threats on children profile. The indicators of surviving include survival rate on children under 5, access to maternal and child health services, basic hygiene and sanitation, and lack of extreme poverty.

Some research elaborates the data used to support the analysis. Corsi et al. (2012) explains on the use of Demographic Health Survey (DHS) which has been conducted in more than 80 countries. The key advantages are high response rate, national coverage, and consistency which useful to allow for comparability across populations and over time. In Indonesia, there are several data sources available for the research on socioeconomic and health survey. Statistics Indonesia, *Survei Sosial Ekonomi Nasional (*Susenas*)* and Indonesia Family Life Survey (IFLS) are among the widely used. Most of the data collected annually, while IFLS has been conducted started in 1993 and now has completed wave 5.

In order to estimate the examine the variable poverty (POV) to child health outcome and other determinants variable, the representative models are as follows:

$$lnPOV = \alpha_0 + \alpha_1 lnCH + \alpha_2 lnUTIL + \alpha_3 lnGDRP + \alpha_4 lnCOPR + \alpha_5 lnCPI + \alpha_6 lnHEXP + \alpha_7 lnCO_2 \quad (1)$$

where the prefix *ln* represents the natural logarithm, *POV* represents poverty rate, *CH* represents is the percentage of child health outcome which can be differentiated intro child wasting and child stunting, *UTIL* denotes utilities, *GDRP* is provincial GDP, *COPR* is average protein consumption per day, *CPI* is consumer price index, *HEXP* is health expenditure by the government, and CO_2 is carbon dioxide emission. Utility, which is represented by water and electricity, is further represented by several sub-categories, namely (i) household percentage based on the safe source of drinking water *(HHDW)*, (ii) the percentage of household with source of electricity from PLN (State Electricity Company) *(HELS)*, and electricity distributed in gigawatt hour *(ELDI)* for electricity, i = 1,2,...,33, t = 2012, 2013,…, 2022 indicates the province and year, respectively.

Panel data is adopted on this study to examine individual-specific effects, time effects or both to deal with heterogeneity or individual effects, the existence of which may be present. Each province in this study has the same number of observations; therefore, this study adopted a balanced panel structure. In the standard panel models, there are three approaches to apply: the Ordinary Least Square (OLS) model, Fixed-Effect Model (FEM), and Random-Effect Model (REM). The OLS model is identical when data from different levels are combined with no assumption of individual differences. According to Gujarati and Porter (2009), there are five criteria to be fulfilled as an assumption in Pooled OLS: linearity in parameter; exogeneity, where error does not correlate with any other regressors; homoscedasticity (error has the same variance) and not correlated with each other (autocorrelation); the observation of independent variables is not stochastic but fixed in repeated samples without measurement error, and no multicollinearity exists.

FEM is applied if there are variations in terms of groups or time periods. Under the fixed-effect model, the slope coefficients of the regressors do not vary across individuals or over time. Individual effect is allowed to be correlated with other regressors since the individual effect is time-invariant and is considered part of the intercept. Thus, heterogeneity as OLS

assumptions is not violated. Study using this method is applied by Banerjee et al. (2021) which estimates energy poverty on health and education outcomes. The application of fixed effect 2SLS identification is used to control for the endogeneity relationship between EDI (energy poverty index) and development outcomes.

This study uses generalized method of moments (GMM) because it applies a more efficient estimation in the dynamic panel data model. Standard panel models may also not be appropriate in the presence of country-specific effects, lagged dependent variables, and explanatory variables endogeneity (Ibrahim & Law, 2014) the dynamic panel model is more powerful in order to eliminate the individual specific heterogeneity and provide better efficiency estimators (Nafti, 2021). The main advantage of GMM is its ability to address endogeneity, a common problem when explanatory variables are correlated with the error term. By using valid instruments—variables correlated with the endogenous regressors but uncorrelated with the error term—GMM produces consistent estimates under weaker assumptions than alternative methods such as OLS or maximum likelihood.

The Hansen and autoregressive test are applied on this model. The Hansen Test of over-identifying restrictions is used to examine the validity of the instruments by comparing the respective conditions with the sample analogue. Serial correlation was used to test the null hypothesis of no first-order serial correlation and no second order serial correlation in the residuals of the first differenced equation. The null hypothesis is the absence of first-order serial correlation AR (1) and the second-order serial correlation AR (2). The rejection of the first hypothesis and failure to reject the second hypothesis prove that the tests are valid and the models are correctly specified. System GMM will achieve greater efficiency if the required assumptions remain, although it requires more assumptions than the first difference. Moreover, system GMM uses the level of the dynamic panel model compared to the different versions so that the effects of time-invariant regressors can be estimated. Overall, GMM provides a reliable and efficient estimation framework, making it well-suited for the empirical setting of this study where endogeneity and potential distributional misspecification are concerns.

Table 1
List of variables, definitions, and sources

Variables	Definition	Source
POV	Poverty rate	Statistics Indonesia (2022)[4]
CH		
CHS	Percentage of children under five with stunting	Survey Status Gizi Indonesia (SSGI)[5], Ministry of Health Republic of Indonesia (2022)
CHW	Percentage of children under five with wasting	
UTIL		
HHDW	Household percentage based on the improved source of drinking water	Statistics Indonesia (2022)[4]
ELDI	Electricity is distributed in GWh (Gigawatt Hour)	
HELS	Percentage of households with an electricity source from PLN (*Perusahaan Listrik Negara*/National Electricity Company)	

[4] https://www.bps.go.id/id/statistics-table?subject=522&sortBy=date%2Ctitle&sortOrder=desc%2Casc
[5] https://stunting.go.id/buku-saku-hasil-survei-status-gizi-indonesia-ssgi-2022/

GDRP	Gross Domestic Regional Product
COPR	Average percentage protein consumption in grams per capita per day
CPI	Consumer Price Index
CO_2	Carbon dioxide emissions in thousands of tons of CO_2
HEXP	Health expenditures as a percentage of government expenditure

Findings

Descriptive Statistics

Table 2 summarizes the results of the descriptive analysis of each variable in this study. The variable poverty has a mean of 14.31 and a standard deviation of 0.316. The variable of child stunting ranges from 3.290 to 35.77 and has a mean of 12.23 with 0.373 standard deviation. It is reported that the variable of the child wasting has a range from 4.158 to 28.145. The mean and standard deviation are 7.129 and 0.49, respectively. The minimum range of variable source of household drinking water is 3.56, and the maximum range is 4.72, with 4.32 mean and 3.56 standard deviation. As for the variable of household with source of electricity, it ranges from 3.57 to 4.6 with 4.49 mean and 0.177 standard deviation.

Table 2
Descriptive statistics

Variable	Mean	SD	Min	Max
lnPOV	14.310	0.316	13.125	15.021
lnCH				
lnCHS	12.230	0.373	3.290	35.777
lnCHW	7.129	0.489	4.158	28.145
lnUTIL				
lnHHDW	4.302	0.212	3.560	4.715
lnELDI	7.798	1.377	5.196	19.905
lnHELS	4.490	0.178	3.575	4.607
lnGDRP	11.909	1.153	9.750	14.49
lnCOPR	4.040	0.125	3.501	4.341
lnCPI	4.895	0.146	4.491	5.280
$lnCO_2$	14.370	0.268	14.034	15.301
lnHEXP	1.472	0.480	0.434	2.104

Regression Analysis

Table 3

GMM Regression Result (DV: lnPOV; CH=CHS and UTIL=HHDW)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.500(0.000)***	-0.391(0.000)***	0.330 (0.000)***	0.450 (0.000)***
lnCH	-0.186(0.026)**	-0.101 (0.141)	0.005(0.053)*	0.009 (0.008)***
lnUTIL	-0.084(0.582)	-0.164(0.323)	-0.120(0.010)**	-0.095(0.005)***
lnGDRP	0.067(0.853)	0.260(0.402)	-0.002(0.917)	0.002(0.912)
lnCOPR	3.386(0.000)***	2.700(0.000)***	0.167(0.045)**	0.075(0.053)*
lnCPI	0.491(0.195)	0.383(0.153)	0.488(0.059)*	0.397(0.063)*
lnHEXP	0.225(0.000)***	0.232(0.000)***	0.250(0.000)***	0.219(0.000)***
lnCO2	0.001(0.968)	-0.015(0.619)	-0.080(0.000)***	-0.084(0.000)***
	Model Criteria			
AR(1)	0.005	0.000	0.000	0.000
AR(2)	0.598	0.581	0.856	0.996
Hansen	0.992	0.994	0.998	0.996

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

The aforementioned and further tables elaborate the results of regression using GMM. The differenced and system GMM are being used to check for endogeneity and fixed effects in panel data. Both differenced and system comprises one and two-step methods for weighing the matrix of the models. The serial correlation and Hansen tests are being used to test for the validity of GMM estimator. First, the Hansen test does not reject the null hypothesis of over-identification restriction and conclude that the model has a valid instrument. The next step to test for serial correlation is AR (1), it rejects the null-hypothesis of the non-existence of first order autocorrelation but fails to reject the null hypothesis on second-order autocorrelation. This study defines the results from the two-step SYS-GMM estimator because this estimator is more efficient than one-step GMM estimator.

From the regression results on Table 2 in which poverty (POV) acts as a dependent variable, we found a significant and positive effect of child stunting affecting poverty rate while it negatively significant on affecting the household drinking water (HHDW) which counts for utilities to support children's life. The explanation from these results is the increase in child stunting rate level will confirm the increase in the poverty rate significantly. The drop in the rate of access to household drinking water will likely increase the rate of poverty. A slight 1% drop in access to household drinking water will incline the poverty rate close to 9.5%. On the other hand, 1% increase on child stunting will increase poverty rate by nearly 1%. The finding is similar with the finding from Adeyeye et al. 2023; Rahman et al 2021; Ma et al. 2022) which confirms that poverty is the main cause of hunger that leads to malnutrition, They tend to have more risk to suffer in at least one form of malnutrition while it this situation will be a rooted of poverty.

Table 4
GMM Regression Result (DV: lnPOV; CH=CHS and UTIL=ELDI)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.454 (0.000)***	-0.353(0.000)***	0.183(0.000)***	0.357(0.000)***
lnCH	-0.153(0.034)**	-0.070(0.233)	0.047(0.029)**	0.053(0.058)*
lnUTIL	-0.351(0.026)**	-0.282(0.016)**	-0.241(0.000)***	-0.147(0.000)***
lnGDRP	0.193 (0.581)	0.274(0.191)	0.254(0.000)***	0.155(0.000)***
lnCOPR	3.454(0.000)***	2.796(0.000)***	0.695(0.001)***	0.292(0.022)**
lnCPI	0.434(0.219)	0.320(0.194)	0.400(0.100)*	0.395(0.036)**
lnHEXP	0.242(0.000)***	0.257(0.000)***	0.267(0.000)***	0.234(0.000)***
lnCO2	0.0002(0.993)	-0.035(0.259)	-0.095(0.000)***	-0.101(0.000)***
	Model Criteria			
AR(1)	0.002	0.000	0.000	0.000
AR(2)	0.885	0.526	0.921	0.524
Hansen	0.992	0.889	0.997	0.923

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

The results from the regression on Table 3 explains the poverty (POV) as a dependent variable with child stunting rate (CHS) and utilities which translated as electricity distributed (ELDI) as a main dependent variable. On this model, amount of electricity distributed is strongly significant and has a negative association with poverty rate. While child stunting rate has a slight significant and positive affected poverty rate. The increase in 1% of stunting rate will lead to rise in 5.3% of poverty rate. On the other hand, a drop in 1% of electricity distributed will increase the poverty rate by 14.7%..

The result of study from Leseba et al. (2025) that children from communities with high community poverty were two times riskier to be suffer from stunting. Related to amount of electricity distributed, study from Saputri et al. (2024) supports the finding. This research found the energy poverty is positively associated with electricity prices. It is undoubtedly recognized that due to huge electricity prices it will lead to drop in the number of electricity distributed to unaffordability of household fulfilling their needs. This condition supports the results of increase in poverty adversely related to amount of electricity distributed.

Table 5
GMM Regression Result (DV: lnPOV; CH=CHS and UTIL=HELS)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.512 (0.000)***	-0.377(0.000)***	0.296 (0.000)***	0.437(0.000)***
lnCH	-0.246(0.000)***	-0.138(0.018)**	0.041(0.023)**	0.041(0.015)**
lnUTIL	0.575(0.118)	0.268(0.361)	-0.430(0.000)***	-0.282(0.001)***
lnGDRP	-0.089(0.792)	0.048(0.833)	-0.004(0.881)	-0.006(0.765)
lnCOPR	3.020(0.000)***	2.541(0.000)***	0.597(0.011)**	0.316(0.083)*
lnCPI	0.790(0.064)*	0.550(0.056)*	0.332(0.223)	0.310(0.172)
lnHEXP	0.188(0.000)***	0.214(0.000)***	0.260(0.000)***	0.221(0.000)***
lnCO2	-0.021(0.469)	-0.046(0.135)	-0.082(0.000)***	-0.090(0.000)***
	Model Criteria			
AR(1)	0.006	0.000	0.000	0.000
AR(2)	0.107	0.820	0.855	0.922
Hansen	0.999	0.996	0.933	0.944

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

On regression table 5, the main variable of poverty (POV) is being regressed over the main independent variables of child stunting (CHS) and percentage of household with access to electricity (HELS). The main variable of child stunting rate and household access to electricity is significantly affected the poverty rate. The first variable denotes the positive association with translated as 1% increase in the stunting rate will escalate the poverty rate by 4.1%. The latter variable explains the negative effect of 1% drop in household electricity will contribute to increase in poverty rate by 28.2%.

Kassie & Asgedom (2025) confirms that the condition of severe stunting is exist among children living in areas with high poverty rates. The healthcare quality also associated with the condition of children specifically lived in poor clusters in which the healthcare expenditure may spend to fulfil vaccination coverage and care-seeking for children with acute respiratory infections (Tebeje et al., 2025). For the household access to electricity, study from Saputri et al. (2024) supports this finding. This research found the energy poverty is positively associated with electricity prices. It is shown that high electricity prices will lead to drop in the number of electricity distributed due to unaffordability of household fulfilling their needs.

Table 6
GMM Regression Result (DV: lnPOV; CH=CHW and UTIL=HHDW)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.492(0.000)***	-0.395(0.000)***	0.333(0.000)***	0.460(0.000)***
lnCH	0.080(0.033)**	0.062(0.029)**	0.038(0.000)***	0.027(0.015)**
lnUTIL	-0.173(0.219)	-0.203(0.152)	-0.087(0.028)**	-0.087(0.042)**
lnGDRP	0.231(0.517)	0.324(0.287)	-0.016(0.532)	-0.008(0.640)
lnCOPR	2.933(0.000)***	2.643(0.000)***	0.3222(0.113)	0.147(0.324)
lnCPI	0.353(0.325)	0.255(0.382)	0.470(0.073)*	0.406(0.060)*
lnHEXP	0.230(0.000)***	0.240(0.000)***	0.223(0.000)***	0.196(0.000)***
lnCO2	-0.003(0.927)	-0.011(0.706)	-0.074(0.000)***	-0.080(0.000)***
	Model Criteria			
AR(1)	0.009	0.000	0.000	0.000
AR(2)	0.995	0.864	0.998	0.996
Hansen	0.995	0.996	0.994	0.992

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

In the regression table 6, the main variable of poverty (POV) is being regressed over the main independent variables of child wasting (CHW) and percentage of household with access to clean drinking water. Both variables are significantly affected the poverty rate. The child wasting rate denotes the positive association in which 1% increase in the child wasting rate will escalate the poverty rate by 2.7%. The rate of household with access to clean drinking water explains the negative effect of 1% drop in access to clean drinking water will contribute to rise in poverty rate by 8.7%.

These results are aligned with the finding from (Ogayi & Onwe, 2025) which states that multidimensional poverty has a serious implications for health security. The access to essentials healthcare services, nutritious food, clean water and sanitation are often limited due to poverty. The study that supports finding that poverty is inversely related to source household of drinking water is the research by Yuliana et al. (2024) about open defecation practice and factors association of poverty in Palembang, Indonesia. They elaborate that households with low income tend to practice open defecation. From this unhealthy practice, the source of water which may use as a drinking source will contaminated with bacteria which may cause worsened health outcome.

Table 7
GMM Regression Result (DV: lnPOV; CH=CHW and UTIL=ELDI)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.449 (0.000)***	-0.374 (0.000)***	0.200(0.000)***	0.371 (0.000)***
lnCH	0.069 (0.050)**	0.780(0.006)***	0.0002(0.008)***	0.003(0.020)**
lnUTIL	-0.480(0.000)***	-0.346(0.001)***	-0.234(0.000)***	-0.152(0.000)***
lnGDRP	0.496(0.162)	0.390(0.109)	0.242(0.000)***	0.160(0.000)***
lnCOPR	3.290(0.000)***	2.790(0.000)***	0.829(0.001)***	0.355(0.023)**
lnCPI	0.105(0.752)	0.192(0.462)	0.330(0.175)	0.376(0.033)**
lnHEXP	0.271(0.000)***	0.273(0.000)***	0.242(0.000)***	0.206(0.000)***
lnCO2	-0.014(0.643)	-0.031(0.292)	-0.093(0.000)***	-0.105(0.000)***
	Model Criteria			
AR(1)	0.002	0.000	0.000	0.000
AR(2)	0.567	0.889	0.992	0.997
Hansen	0.999	0.998	1.000	0.965

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

Regression table 6 denotes the main variable of poverty (POV) is being regressed over the main independent variables of child wasting (CHW) and amount electricity distributed (ELDI). Both variables are significantly affected the poverty rate. The child wasting rate denotes the positive association in which 1% increase in child wasting rate will escalate the poverty rate by 2%. The amount of electricity distributed explains the negative effect of 1% decrease in amount of electricity distributed will contribute to drop in poverty rate by 15.2%.

The finding is revealed by the result from Petry et al. (2025) that highest odds of stunting were occurred in the children from the poorest households. They also prone to anemia, iron deficiency and wasting. For the household access to electricity, study from Saputri et al. (2024) supports this finding. This research found the energy poverty is positively associated with electricity prices. It is proven that the spike in electricity prices will lead to decline in the number of electricity distribution. This condition is aligned with the claim that results of increase in poverty is negatively related to the household access to electricity.

Table 8
GMM Regression Result (DV: lnPOV; CH=CHW and UTIL=HELS)

	Difference GMM		System GMM	
	1-Step	2-Step	1-Step	2-Step
$lnPOV_{t-1}$	-0.478(0.000)***	-0.376(0.000)***	0.322(0.000)***	0.460(0.000)***
lnCH	0.103(0.004)***	0.079(0.006)***	0.019(0.063)*	0.014(0.021)**
lnUTIL	0.173(0.604)	0.137(0.606)	-0.364(0.003)***	-0.244(0.003)***
lnGDRP	0.135(0.679)	0.121(0.621)	-0.008(0.767)	-0.005(0.771)
lnCOPR	2.730(0.000)***	2.450(0.000)***	0.609(0.019)**	0.317(0.100)*
lnCPI	0.391(0.260)	0.355(0.192)	0.320(0.238)	0.318(0.161)
lnHEXP	2.730(0.000)***	2.450(0.000)***	0.609(0.019)**	0.317(0.100)*
lnCO2	-0.042(0.099)*	-0.051(0.074)*	0.082(0.000)***	-0.092(0.000)***
	Model Criteria			
AR(1)	0.004	0.000	0.000	0.000
AR(2)	0.995	0.864	0.884	0.927
Hansen	0.999	0.996	0.994	0.922

Note: Number in parantheses denote p-values with *,**, and *** denote 10%, 5%, and 1% level of significance, respectively. AR and Hansen refer to p-value.

The next regression table 8 elaborates the main variable of poverty (POV) is being regressed over the main independent variables of child wasting (CHW) and household access to electricity (HELS). Both variables are significantly affected the poverty rate. The poverty rate denotes the positive significant sign with child wasting rate in which 1% increase in the child wasting rate will escalate poverty rate by 2.1%. The household amount of electricity access describes the negative effect of 1% drop in amount of electricity accessed will contribute to rise in poverty by 24.4%.

The finding is supported by Ndagijimana et al. (2025) which use concentration index to count for weath-related inequalities in stunting. This index revealed that stunting was concentrated in poorer households. For the household access to electricity, study from Saputri et al. (2024) supports this finding. This research found the energy poverty is positively associated with electricity prices. It is proven that high electricity prices will lead to decrease in the number of electricity distribution. This condition is aligned with the claim that results of increase in poverty is negatively related to the household access to electricity**.**

Discussion and Conclusion

Theoretical Implications

This study supports the explanation on how child health and household poverty has a interconnected relationship. Past studies found that child health outcomes as a result of poverty and other socioeconomic factors. This research also gives a new insight by showing how poor child health outcome may contribute to worsened poverty. By analyzing the reversed pathway, the new evidence on human capital, including child health plays a vital role in economic outcomes is revealed.

Practical and Social Implications

The findings give an insight for a policymaker to conduct a relevant policy. Better child health outcome is not only a social issue but also an economic investment that can alleviate poverty. Conducting a nutrition programs, providing better healthcare access and intervening childhood development may help household to avoid poor health. For individual and communities, the need to give priority to children's welfare in national development is being stressed. This policy aims to give opportunity for children to grow into productive individuals in the future to have better earnings and welfare.

Limitations and Suggestions for Future Research

This study has a several limitations. There are some unavailable data for all provinces in Indonesia, especially some new provinces. Some variables could be added to strengthen the analysis, such as household behaviour including smoking habit. The study focuses on national level data which may not represent local variations. Future research can fix these limitations by using more complete primary data, explore the role of community support systems or health services quality to have a better understanding in exploring how child health affects poverty among different issues.

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