

Association between Poverty Rate and Stunting Prevalence in Central Java

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ABSTRACT

Stunting refers to impaired growth and development in children resulting from chronic nutritional deficiencies, especially during the critical period of the first 1,000 days of life. This study aimed to generate more comprehensive empirical evidence on the association between poverty prevalence and stunting rates among districts and municipalities in Central Java. This study using a quantitative approach, this study analyzed secondary data through a correlational framework. The dataset covered all 36 administrative regions in Central Java Province, where district-level poverty rates and stunting prevalence served as the primary variables of analysis. The relationship between poverty and stunting identified should be interpreted as an association rather than a direct causal link. The findings suggest that poverty contributes to variations in child nutritional status, although it does not fully account for the complexity of underlying determinants. Therefore, poverty should be regarded as an important, yet not exclusive, factor. This study provides evidence of a significant positive association between district-level poverty rates and stunting prevalence in Central Java. The moderate correlation indicates that regions with higher poverty rates are more likely to have elevated stunting prevalence.

Keyword : Child growth; poverty; socioeconomic status; stunting; undernutrition;

Introduction

Childhood stunting occurs when prolonged inadequate nutrition during the early stages of life, particularly within the first 1,000 days, disrupts normal physical growth and development¹. This is a serious public health issue as it increases the risk of disease, results in children being shorter than the standard height for their age, and may have long-term consequences on cognitive function, potentially limiting productivity and performance

during adult life. One of the key determinants associated with stunting prevalence is the high level of poverty within a region, as poor economic conditions can lead to limited access to food with adequate nutrition for both children and pregnant women; inadequate education among lower-middle-income groups also influences the provision of proper nutrition². The 2025 edition of the Joint Child Malnutrition Estimates by UNICEF and WHO reported that stunting affected around 150.2 million children aged below five years worldwide in 2024; this is a significant figure as 51% of this number originated from the Asian region, with the fact that boys are more affected by stunting³. In 2024, Indonesia recorded a stunting prevalence of 19.8% as reported by the Ministry of Health of the Republic of Indonesia⁴. Prior research has investigated the potential association between socioeconomic conditions, particularly poverty, and stunting prevalence across Indonesia⁵. Based on secondary data from 2019, it was found that food expenditure, research findings indicate that protein intake adequacy and dietary pattern characteristics may play important roles in determining stunting risk in Indonesia. Previous research also indicates that areas with high poverty rates also have high prevalence rates of stunting, particularly in eastern Indonesia, which is linked to low purchasing power for nutritious food. This is consistent with the fact that the number of near-poor households, which stands at 38,886,147 in Indonesia, has a positive influence on the prevalence of stunting, accounting for 96.7%⁶. These conditions are associated with the vulnerability of near-poor families, who frequently face economic constraints, poor housing quality, challenges in accessing clean water, and limited educational backgrounds among parents⁷. Although previous studies have made an important contribution, there are several research gaps that underpin the need for further studies on the relationship between stunting and poverty rates, particularly in Central Java. This was undertaken to complement previous research that generally utilized national-level data⁶. Which was regarded as inadequate for identifying intra-provincial disparities among regencies and municipalities, particularly in Central Java, where consistently high poverty levels across districts may be associated with comparatively low regional minimum wages⁶. Previous research was also deemed to lack an understanding of the specific dynamics occurring in Central Java, a province with diverse poverty and urban characteristics that cannot be explained in depth. Previous research also explicitly recommended that future studies be conducted down to the district/city level to yield findings that are more targeted and focused⁸. Based on several gaps in previous research, it can be concluded that there has been no specific study utilizing data from the Central Java region using a data-driven ecological approach. By contributing context-specific empirical evidence on the association between regional poverty conditions

and stunting prevalence at the sub-provincial level in Central Java. This study selected Central Java as the region to be examined because it is one of the provinces with the largest number of poor people in Indonesia due to its low regional minimum wage and significant variations in stunting prevalence across its districts and cities. Furthermore, this study was conducted to complement previous research, which is expected to serve as a reference for future policy-making and measures to address stunting based on evidence from the Central Java region. Therefore, this study was conducted to explore the distribution of poverty rates and stunting prevalence among districts and municipalities in Central Java Province, investigate their potential association, and provide empirical insights that may inform strategies for stunting prevention and control.

Material and Methods

This research applied a quantitative cross-sectional correlational methodology to analyze the association between poverty rates and stunting prevalence in Central Java. This correlational design was employed without intervening in the research subjects to determine the relationship between the two variables. As the data used were not individual-level data but rather aggregate data at the district and city levels, this study also falls within the category of ecological research. In this study, poverty rate was considered the independent variable and was measured as the proportion of the population living below the poverty threshold. The dependent variable was stunting prevalence, defined as the percentage of children under five years of age affected by stunting. As an observational study, this research was designed, conducted, and reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

This study analyzed data from Central Java Province, comprising 35 regencies and municipalities, with each administrative area considered as the unit of observation. Central Java was selected for analysis due to its large population and the considerable variation in poverty levels and stunting prevalence across its regions. The study included all 35 regencies and municipalities in Central Java Province, with each administrative region considered as the unit of analysis. All populations meeting the criteria were included as samples in the study. Inclusion criteria encompassed every regency or city possessing complete data on stunting prevalence in 2024 and poverty levels in 2025 from official government sources. Areas with incomplete data were excluded from the study. All 35 regencies/cities met the criteria, so the final analysis was conducted for all of them.

The secondary data used in this study were sourced from official government sources. Stunting prevalence data were obtained from the 2024 Central Java Province dataset, which

shows the percentage of stunted under-fives in each regency or city, Data on poverty rates were sourced from the 2025 official report published by the Central Statistics Agency (BPS) of Central Java Province, which provides information on the proportion of the population experiencing poverty across each administrative area. The data were collected by accessing relevant databases, downloading the available records, and organizing the information from official sources. The data were then checked for completeness, consistency, and suitability. Poverty rate was analyzed as the independent variable, with stunting prevalence serving as the dependent variable.

The accuracy of the measurements was ensured by utilizing nationally standardized official datasets obtained from authorized sources. Poverty data from the Central Statistics Agency (BPS) were obtained using the national poverty line method, while stunting data were obtained through the government's health surveillance system, which employs anthropometric standards aligned with WHO growth references. Once the data had been collected, Microsoft Excel was used to perform data cleaning, cross-checking, and formatting adjustments prior to statistical analysis. Data management and statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software version 25.

Data analysis commenced with descriptive statistics to describe the prevalence of stunting and the distribution of poverty rates across the 35 regencies and municipalities in Central Java Province. This analysis involved the use of mean, minimum, maximum, and standard deviation values. The normality test of the two variables was assessed using the Shapiro-Wilk test. A p -value greater than 0,05 was considered to indicate the absence of a statistically significant deviation from the normal distribution. Pearson's Product-Moment correlation analysis was used to examine the relationship between poverty levels and the prevalence of stunting. The correlation coefficient (r) was calculated to determine the direction and strength of the relationship between poverty levels and stunting prevalence, using $p < 0.05$ as the criterion for statistical significance.

This study utilised publicly available secondary data without involving direct contact with individuals or personal identification data; therefore, no ethical clearance was required. All authors have acknowledged and agreed upon their respective contributions to the preparation of this manuscript in accordance with the guidelines established by the International Committee of Medical Journal Editors (ICMJE).

Results

To provide an overview of the distribution of poverty and stunting across various districts and cities in Central Java, descriptive statistics were calculated first. The analysis included mean, standard deviation, and minimum and maximum values for poverty rates and stunting prevalences. These descriptive measures provide an initial indication of the variation in socioeconomic conditions and the burden of stunting in the study areas. Table 1 presents the descriptive statistics of poverty rates and stunting prevalence among districts and municipalities in Central Java Province.

Table 1. Descriptive statistics of poverty rate and stunting prevalence in Central Java, Indonesia (n = 35)

Variable	Mean	SD	Min	Max
Poverty rate (%)	9.19	2.82	3.80	14.15
Stunting prevalence (%)	10.08	4.25	2.54	18.24

Note: SD = standard deviation

The average poverty rate across the 35 districts/cities was 9.19%, with a standard deviation of 2.82%. The values ranged from 3.80% to 14.15%, indicating a relatively wide spread of data. Several districts were observed to have poverty rates below the mean, while others exceeded the average, reflecting variability in economic conditions across regions. The difference between the minimum and maximum values suggests that the gap in poverty levels between districts is substantial.

Similarly, the average stunting prevalence was 10.08%, with a standard deviation of 4.25%. The minimum value recorded was 2.54%, while the maximum reached 18.24%, showing an even wider distribution compared to poverty rates. A number of districts had stunting prevalence below the mean, whereas others showed considerably higher values. This indicates that the burden of stunting is not evenly distributed across districts.

Overall, both variables demonstrate noticeable variation at the district level. The relatively large range and standard deviation values suggest heterogeneity in both poverty levels and stunting prevalence across districts in Central Java. This variation provides an initial overview of the differences in socioeconomic conditions and health outcomes across regions. The Shapiro-Wilk test showed no significant deviation from normality for either the poverty rates ($p=0.346$) or the prevalence of stunting ($p=0.622$). Therefore, the assumption of normality is considered to be met for the subsequent Pearson correlation analysis. The normality Table 2 presents the correlation analysis between poverty rates and stunting prevalence.

Table 2. Correlation analysis between poverty rates and stunting prevalence in Central Java Province, Indonesia (n=35)

Variable	Poverty rate (%)	Stunting prevalence (%)
Poverty rate (%)	1	0.481**
Stunting prevalence (%)	0.481**	1

Note: ** $p < 0.05$ ($p = 0.003$)

A statistically significant moderate positive relationship was identified between poverty rates and stunting prevalence ($r = 0.481$, $p = 0.003$). This indicates that the relationship between the two variables is statistically significant. The correlation coefficient value suggests a moderate level of association, with both variables moving in the same direction.

Across the 35 districts/cities, areas with higher poverty rates were generally observed to have higher stunting prevalence, whereas areas with lower poverty rates tended to have lower stunting levels. This pattern is reflected in the positive correlation coefficient, indicating that increases in poverty rate are accompanied by increases in stunting prevalence.

Statistical significance ($p < 0.05$) indicates that the observed correlation is unlikely to have resulted from random sampling variation. Although the strength of the relationship is moderate, the consistency of the pattern across districts suggests a clear association between the two variables at the population level. Figure 1 shows the scatter plot of poverty rate and stunting prevalence.

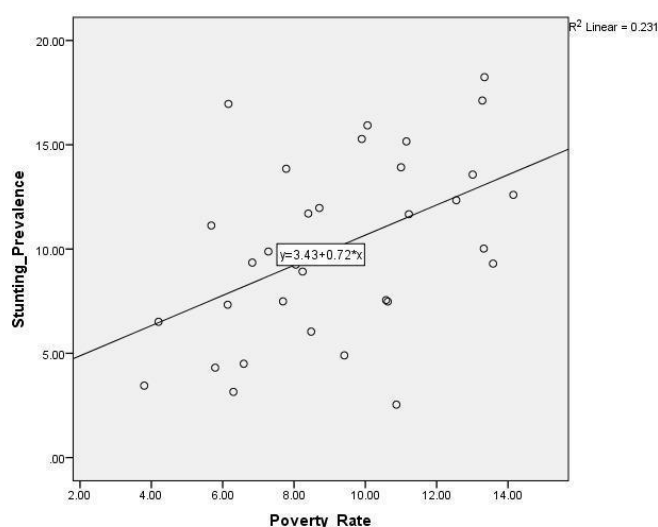


Figure 1. Scatter plot depicting the association between poverty rates and stunting prevalence across districts and municipalities in Central Java Province, Indonesia

Figure 1 presents the distribution of stunting prevalence in relation to poverty rates across the districts and municipalities of Central Java Province. The scatter plot demonstrates a generally positive trend, suggesting that areas with higher poverty rates tend to exhibit higher levels of stunting prevalence. Most data points are distributed along this increasing pattern, although some variability is observed across districts. A number of observations are located close to the central trend, while others are more dispersed, reflecting differences in the magnitude of stunting prevalence at similar poverty levels.

The fitted linear trend line ($y = 3.43 + 0.72x$) further demonstrates the positive relationship between the two variables. The positive slope of the regression line indicates that higher poverty rates tend to be accompanied by increased stunting prevalence. Furthermore, the coefficient of determination ($R^2 = 0.231$) indicates that poverty rate accounts for approximately 23.1% of the observed variation in stunting prevalence, whereas the remaining 76.9% may be explained by other factors not examined in the present study.

Overall, the visual pattern observed in the scatter plot is consistent with the results of the correlation analysis presented in Table 2, showing a moderate positive relationship between poverty rate and stunting prevalence across districts. Table 3 shows the comparison of stunting prevalence based on poverty level categories.

Table 3. Comparison of Stunting Prevalence Across Poverty Level Categories in Central Java, Indonesia (n=35)

Poverty level	Mean stunting (%)	SD
Low poverty	8.44	3.72
High poverty	11.63	4.21

Note: Categorized based on median (8.71%), SD = standard deviation

Districts were categorized into low and high poverty groups based on the median value of poverty rate (median = 8.71%). Of the 35 districts/cities, approximately half were classified into each category. The results show that districts in the low-poverty group had an average stunting prevalence of 8.44%. In contrast, the high-poverty group exhibited a higher mean stunting prevalence of 11.63%.

The standard deviation values indicate variability within each group, with slightly greater variation observed in the high-poverty group (SD = 4.21) compared to the low-poverty group (SD = 3.72). This suggests that although the average stunting prevalence is higher in the high-poverty group, the distribution of values within that group is also more dispersed.

Overall, the comparison demonstrates a clear difference in average stunting prevalence

between the two categories. Districts classified in the higher poverty group consistently show higher stunting prevalence compared to those in the lower poverty group. Despite the variability within groups, the general pattern indicates higher levels of stunting among districts with higher poverty rates.

Discussion

This study highlights that poverty is a structural determinant that contributes to the distribution of stunting risk at the population level. However, the relationship identified should be interpreted as an association rather than a direct causal link. The findings suggest that poverty contributes to variations in child nutritional status, although it does not fully account for the complexity of underlying determinants. Therefore, poverty should be regarded as an important, yet not exclusive, factor. This perspective is important to prevent an overly simplistic interpretation, as stunting is a multifactorial condition influenced by the complex interplay of social, economic, behavioral, and environmental determinants. In this context, poverty can be understood as having a meaningful, yet partial, contribution in explaining variations in stunting prevalence across regions. This interpretation also aligns with broader conceptual frameworks in public health, which emphasize that structural determinants shape health outcomes through intermediate pathways rather than acting in isolation⁹.

The findings reinforce the importance of developing comprehensive, multisectoral, and integrated public health interventions to reduce the burden of stunting.. Efforts to reduce stunting should not rely solely on economic improvement but must also address access to healthcare services, nutrition literacy, and environmental conditions. Empirical evidence from Indonesia indicates that determinants such as maternal education, sanitation, and healthcare access play a significant role in shaping child nutritional outcomes¹. Furthermore, emphasize the critical contribution of water, sanitation, and hygiene (WASH) in reducing stunting by limiting exposure to recurrent infections¹⁰. Accordingly, public health programs should integrate nutrition-specific interventions with broader, nutrition-sensitive approaches that address environmental and behavioral determinants. This integrated approach is particularly important in settings where improvements in income do not automatically translate into better nutritional outcomes due to gaps in knowledge, service utilization, or environmental conditions.

In addition, the findings highlight the importance of adopting area-based approaches in program implementation. Variations across regions indicate that uniform strategies may not be effective, and interventions should therefore be tailored to local contexts. This can be

achieved through the identification of high-risk areas and the integration of multisectoral data, including poverty, health, and sanitation indicators^{11,12,13}. Moreover, decentralized planning and local stakeholder engagement are essential to ensure that interventions are responsive to community-specific needs. Strengthening interventions during the first 1,000 days of life represents a key strategy for stunting prevention. This critical period, spanning from pregnancy to two years of age, plays a fundamental role in determining child growth and development¹⁴. Nutritional deficiencies and infections during this phase may lead to long-term and often irreversible consequences. Therefore, comprehensive intervention efforts should prioritize maternal nutritional improvement, exclusive breastfeeding promotion, appropriate complementary feeding practices, and effective prevention of childhood infections within an integrated public health framework. The effectiveness of these interventions can be further enhanced through community-based platforms, such as primary healthcare services and local health posts, which facilitate early detection and continuous monitoring of child growth.

From a broader societal perspective, stunting is not only a health issue but also reflects underlying social inequalities. Children affected by stunting are at increased risk of impaired cognitive development, lower educational attainment, and reduced productivity in adulthood. This condition may perpetuate intergenerational cycles of poverty and hinder overall economic development. Beyond individual consequences, high levels of stunting may also impose a significant burden on national development by reducing workforce capacity and increasing long-term healthcare costs. Therefore, addressing stunting should be viewed as a strategic investment in human capital, in line with global frameworks emphasizing the importance of child nutrition for long-term development outcomes¹⁵. This perspective reinforces the need to position stunting reduction not only within the health sector but also within broader development agendas.

Future research should expand upon these findings through more comprehensive study designs that account for a wider range of socioeconomic, nutritional, and environmental mediators underlying the association between poverty and stunting. Longitudinal study designs are needed to clarify causal pathways, while evaluation studies are essential to assess the effectiveness of program implementation at the local level. Additionally, mixed-methods approaches may provide deeper insights into socio-cultural and behavioral determinants, thereby supporting the development of more context-specific and effective interventions. Further research is also needed to explore the role of governance, program implementation quality, and intersectoral coordination, as these factors may influence the effectiveness of

stunting reduction strategies.

Several limitations should be recognized in this study, as they may affect the extent to which the findings can be interpreted and generalized. The use of secondary data limits the ability to control for important variables, which may result in residual confounding. In addition, the cross-sectional design precludes causal inference. The use of aggregate-level data may also introduce ecological bias and obscure within-area heterogeneity. These limitations highlight the need for cautious interpretation, particularly when translating findings into policy recommendations. Nevertheless, this study provides valuable insights into the association between poverty and stunting and reinforces the importance of adopting integrated, evidence-based, and context-specific strategies that account for the complexity of underlying determinants across regions.

Conclusion

This study revealed a significant positive correlation between poverty rates and stunting prevalence among districts and municipalities in Central Java Province. The correlation analysis showed a moderate relationship, indicating that higher poverty rates are associated with higher stunting prevalence. This finding is consistent with the group comparison results, which show that districts with higher poverty levels have a higher mean stunting prevalence compared to districts with lower poverty levels. These findings emphasize the important role of socioeconomic conditions in shaping child nutritional outcomes across regions. From a public health perspective, these results suggest that stunting reduction strategies should adopt an integrated approach that not only focuses on nutrition-specific interventions but also addresses upstream socioeconomic determinants, particularly poverty. Multisectoral collaboration involving health, social, and economic sectors is essential to reduce regional disparities in stunting prevalence. Targeted interventions in high-poverty districts should be prioritized to improve child health outcomes and reduce inequality between regions.

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