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Exploring the effects of universal health coverage on stunting in West Java: an ecological study

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ABSTRAK

Latar Belakang: *Stunting merupakan indikator penting yang mencerminkan ketimpangan kesehatan anak yang disebabkan oleh berbagai faktor seperti malnutrisi, penyakit infeksi, dan kurangnya stimulasi sosial. Selain itu, faktor sosial ekonomi juga berperan penting dalam memengaruhi status gizi anak.*
Tujuan: *Penelitian ini bertujuan untuk menentukan faktor risiko stunting di Provinsi Jawa Barat pada tahun 2022.*
Metode: *Desain penelitian yang digunakan adalah studi ekologi dengan unit sampel analisis menggunakan 27 kabupaten/kota di Provinsi Jawa Barat. Data diperoleh dari laporan Survei Status Gizi Indonesia (SSGI) tahun 2022 dan Badan Pusat Statistik (BPS) Jawa Barat. Analisis bivariat menggunakan korelasi Pearson diterapkan untuk data berdistribusi normal, sedangkan korelasi Spearman digunakan untuk data tidak normal. Hubungan dianggap signifikan jika nilai p-value <0,05. Analisis regresi logistik digunakan untuk menentukan Odds Ratio (OR) guna mengidentifikasi faktor risiko stunting.*
Hasil: *Hasil penelitian menunjukkan bahwa prevalensi stunting di Jawa Barat mencapai 20.2% dengan 16 wilayah memiliki prevalensi stunting tinggi (>19.2%). Analisis korelasi menunjukkan adanya hubungan signifikan antara kemiskinan dan prevalensi stunting (r=0,423, p=0,028), asuransi kesehatan dan stunting (r=-0,570, p=0,002), partisipasi keluarga berencana dan stunting (r=-0,589, p=0,001), pernikahan dini dan stunting (r=0,528, p=0,005), serta prevalensi diare dan stunting (r=0,647, p=0,001). Asuransi kesehatan berperan sebagai faktor protektif terhadap stunting, wilayah yang memiliki jaminan kesehatan memiliki penurunan risiko terkena stunting sebesar 38,2% dibandingkan dengan wilayah yang tidak memiliki jaminan kesehatan. Sementara wilayah dengan diare memiliki risiko 1,84 kali lebih tinggi untuk mengalami stunting dibandingkan dengan wilayah tanpa diare.*
Kesimpulan: *Prevalensi stunting di Jawa Barat menunjukkan pola distribusi yang tidak merata, dengan konsentrasi tinggi di wilayah barat, timur, dan tenggara. Wilayah barat dan timur menghadapi kendala spesifik terkait kemiskinan, pernikahan dini, diare, serta cakupan asuransi kesehatan. Strategi penurunan prevalensi stunting harus melibatkan peningkatan kesejahteraan ekonomi, perluasan cakupan asuransi kesehatan, serta akses ke sanitasi untuk mengendalikan diare. Intervensi komprehensif dan terintegrasi diperlukan untuk mengurangi prevalensi stunting di Jawa Barat.*

KATA KUNCI*: cakupan kesehatan universal; diare; kemiskinan; pernikahan dini; pneunomia; stunting*

ABSTRACT

Background: *Stunting is an important indicator reflecting children's health disparities, caused by various factors such as malnutrition, infectious diseases, and a lack of social stimulation. Additionally, socioeconomic factors play a crucial role in influencing the nutritional status of children..*

Objectives: *This study aims to determine the risk factors of stunting in West Java Province in 2022.*

Methods: *The study design was an ecological study using data from 27 districts/cities in West Java Province. The data were obtained from the 2022 Indonesian Nutrition Status Survey (SSGI) report and the Statistics of West Java Province. Bivariat analysis with Pearson correlation is applied for normally distributed data, while Spearman correlation is used for non-normal data. Variables are considered significantly related if the p-value is <0.05. Logistic regression analysis determines Odds Ratios (OR) to identify risk factors for stunting.*

Results: *The results revealed that stunting prevalence in West Java reached 20.2% with 16 regions showing a high prevalence of stunting (>19.2%). Correlation analysis showed significant association between poverty and stunting prevalence (r= 0.423, p=0.028), health insurance and stunting prevalence (r = -0.570, p = 0.002), family planning and stunting prevalence (r = -0.589, p = 0.001), early marriage and stunting (r= 0.528, p= 0.005), diarrhea prevalence and stunting (r= 0.647, p=0.001). Health insurance as a protective factor of stunting. Regions with health insurance have 38.2% lower risk of stunting compared to regions without health insurance (OR = 0.618, 95% CI: 0.369–0.535). Diarrhea as a risk factor of stunting, regions with diarrhea had 1,84 times higher risk of stunting than regions without diarrhea (OR = 1.841, 95% CI: 1.091–3.106).*

Conclusions: *Prevalence of stunting in West Java shows a widespread distribution pattern with high concentrations in the eastern, western, and southeastern regions of West Java. The western and eastern regions have specific obstacles related to poverty, early marriage, diarrhea and having health insurance. Strategies to reduce the prevalence of stunting must involve increasing economic prosperity, expanding health insurance coverage, and increasing access to sanitation to control diarrhea. Comprehensive and integrated interventions are needed to reduce prevalence of stunting.*

KEYWORD*: diarrhea; early marriage; pneumonia; poverty; stunting; universal health coverage*

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INTRODUCTION

Stunting depicts children's health disparities, reflecting impaired cumulative linear growth from prenatal stages to the first 1000 days of life (1). Many countries have implemented programs to improve public health and reduce disparities in accessing health services due to the prevalence of stunting. Stunting is characterized by children's height being inappropriately low for their age, often caused by malnutrition, recurring illnesses, and lack of social stimulation (2). Economic issues also play a crucial role because the socioeconomic conditions at the household level significantly influence children's nutritional status (3). Low-income families have limited access to nutritious food, which prevents children from receiving adequate nutrition. Economic inequality exacerbates this situation, limiting access to resources and opportunities for only a few (4). Stunting has significant impacts on health, welfare, physical and cognitive development, and human productivity, thereby affecting the overall economic development of countries (5).

The Sustainable Development Goals (SDGs) aim to address youth-related issues, including child marriage. Adolescence, as defined by the WHO, is a period of significant physical, psychological, and social changes. Globally, there are 1.2 billion adolescents, many of whom face

challenges such as poverty, early marriage, and limited healthcare access. These factors not only affect adolescent health but also contribute to child stunting, highlighting the need for comprehensive health coverage and social interventions (6). UNICEF has reported that Indonesia currently ranks 8th in the world for child marriage, with 1,459,000 cases. Early marriage presents a fundamental obstacle to achieving international development commitments. Teenage pregnancy, a global health issue, significantly impacts adolescents well-being financially, emotionally, and physically placing them at higher risk of nutritional problems such as malnutrition (7).

According to the 2020-2024 Rencana Pembangunan Jangka Menengah Nasional (RPJMN), one public health program focuses on reducing stunting prevalence by directing policies to strengthen the health system, as outlined in Universal Health Coverage this initiative targets sustainability by enhancing health systems and security, strengthening maternal and child health services, family planning and reproductive health services, nutrition services, elderly health services, and disease control, supported by health promotion and preventive efforts (8). This program, with a focus on universal health coverage for vulnerable populations, aims to ensure access to promotive, preventive, curative, and rehabilitative health services of adequate quality, effectively meeting recipients' needs without causing financial hardship. On the other hand, infectious diseases have a direct impact on children's nutritional status. They affect the body's ability to absorb nutrients and disrupt normal metabolism, which ultimately leads to stunting. Repeated infections worsen nutritional status and hinder growth, contributing to high stunting rates in vulnerable populations. Diarrhea and pneumonia remain the leading causes of death among children, especially toddlers (9).

The impact of infectious diseases on child nutrition highlights the critical need for comprehensive health interventions, particularly within the framework of Universal Health Coverage (UHC). Ensuring equitable access to essential health services, especially for vulnerable populations, is a key strategy in mitigating the effects of repeated infections and improving overall child health outcomes. In this context, community-based health insurance (CBHI) plays an increasingly important role in strengthening financial protection and healthcare access.

Despite the growing role of community-based health insurance (CBHI) in the health financing landscape of developing countries, research on its impact on health outcomes, particularly child stunting, remains limited. Previous studies, such as research conducted in rural south-western Uganda, indicate that household participation in CBHI is associated with a reduced probability of stunting in children under five (10). However, the extent to which these findings apply to broader health financing schemes, such as Universal Health Coverage (UHC), remains unclear. Given that UHC aims to ensure equitable access to essential health services, further research is needed to explore how UHC implementation, along with factors like socio-economic factors and infectious diseases or health factors, influences child stunting.

MATERIALS AND METHODS

This study employs an ecological approach to examine the factors influencing stunting at the population level rather than on an individual basis. The data used are aggregated at the district/city level. According to Laksono & Kusrini 2020 variables in ecological studies can be classified as aggregate, environmental, or global measures (11). By adopting an ecological perspective, this study provides a broader understanding of the determinants of public health, including socioeconomic conditions, healthcare accessibility, and sanitation, all of which contribute to stunting. This approach enables an analysis of the association between population-level risk factors and stunting prevalence within a defined geographic area. The findings offer valuable insights for public policy, as population-based analyses align with the scope of policy interventions. The ecological analysis in this research seeks to assess the impact of infectious diseases, healthcare access, and socioeconomic conditions on stunting prevalence at the district/city level in West Java Province.

In this research applied quantitative method with an ecological study design and analyzed at the level of regencies/cities in West Java Province, with 27 regencies/cities unit sampling. This study

utilized secondary data, the data source for this study was the 2022 Indonesian Nutrition Status Survey (SSGI), compiled by the Indonesian Ministry of Health. The variables in this research included stunting prevalence, universal health coverage (measured by health insurance ownership and participation in family planning), infection diseases (include diarrhea and pneumonia) obtained from the 2022 Indonesian Nutrition Status Survey results). Additionally, the early marriage and poverty was sourced from the Statistics of West Java Province. The variables were categorized based on Rencana Pembangunan Jangka Menengah Daerah (RPJMD) 2018-2023 in West Java to assess areas that require further attention in each program due to their failure to meet the established targets.

The prevalence of infectious diseases, including pneumonia, was assessed based on the percentage of children under five years old who suffer from pneumonic and non-pneumonic coughs in each region. Similarly, diarrhea prevalence was assessed by the percentage of children under five who had experienced diarrhea more than three times in the past month. Both variables were categorized according to the average provincial prevalence. Furthermore, the percentage of health insurance ownership was assessed as the percentage of the population covered by health insurance, which provides financial protection for accessing healthcare services and meeting basic health needs, either through self-payment or government assistance. The classification was based on the target set by Rencana Pembangunan Jangka Menengah Daerah (RPJMD) in West Java (95%).

Additionally, the percentage of family planning was assessed as the percentage of couples of childbearing age using contraceptives to regulate the number of children and ensure proper birth spacing in each region. The classification was based on the target set by the Rencana Pembangunan Jangka Menengah Daerah in West Java (74.9%). Moreover, the percentage of Maternal and Child Health (KIA) book ownership was assessed as the percentage of individuals ownning a KIA book in each region. The classification was based on the target set by the Rencana Pembangunan Jangka Menengah Daerah in West Java (100%)."

The poverty percentage was assessed as the percentage of the population with an average monthly per capita expenditure below the poverty line in each region. It was categorized based on the target of Rencana Pembangunan Jangka Menengah Daerah (RPJMD) in West Java (7.6%). For early marriage percentage was assessed as the percentage of marriages involving women under the age of 19. Classification was based on the target set by the Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2020–2024 is 8.74%.

Univariate data analysis was chosen for this study to determine the statistical values and distribution of each variable. Bivariate analysis using Pearson correlation was applied when the data followed a normal distribution, and Spearman correlation was used for non-normally distributed data. Variables were considered to have a significant relationship when the p-value was less than 0.05. Logistic Regression Analysis is used to obtain Odds Ratio (OR) values which indicate which variables are risk factors for stunting. Mapping activities were also conducted to visualize the data distribution across each regency/city in West Java Province.

Statistical analysis was performed using SPSS software version 26, while mapping was carried out using QGIS software version 3.38. The data were categorized based on stunting prevalence, prevalence of infectious diseases, percentage of health insurance ownership, percentage of Maternal and Child Handbook ownership, percentage participation in family planning, percentage early marriage, percentage of poverty according to the Rencana Pembangunan Jangka Menengah Daerah (RPJMD) 2018-2023 in West Java and Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2020-2024.

RESULT AND DISCUSSION

An overview of the analysis units in this study is shown in **Table 1**. The lowest stunting prevalence in Bekasi City (6%), while the highest prevalence is in Sumedang Regency (27.6%). According to **Figure 1**, 16 regions in West Java Province still have a high prevalence of stunting (>19.2%).

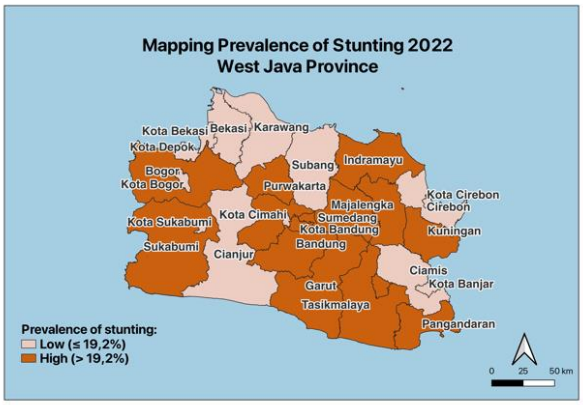

Figure 1. Mapping prevalence of stunting 2022 in West Java

The relationship between percentage of poverty and prevalence of stunting accros regions provides critical insight into public health disparities. **Figure 2** shows that 24 regions in West Java Province exhibit a high percentage of poverty (>7.6%) which corresponds with a high prevalence of stunting in these areas. **Table 1** indicates the lowest percentage of poverty in Depok City (2.5%), whereas the highest prevalence is in Indramayu Regency (12.7%). In contrast, Depok City, with the lowest percentage of poverty it shown 2.5%, has fewer barriers to essential services, likely contributing to its comparatively lower stunting rates. Depok City benefits from better infrastructure, more economic opportunities, and greater accessibility to healthcare, which collectively enhance public health outcomes. Conversely, Indramayu Regency, with a poverty rate of 12.7%, high poverty in this region restricts access to proper nutrition, clean water, and sanitation facilities. Which are essential for healthy growth and development in early childhood, faces considerable challenges that elevate stunting risks

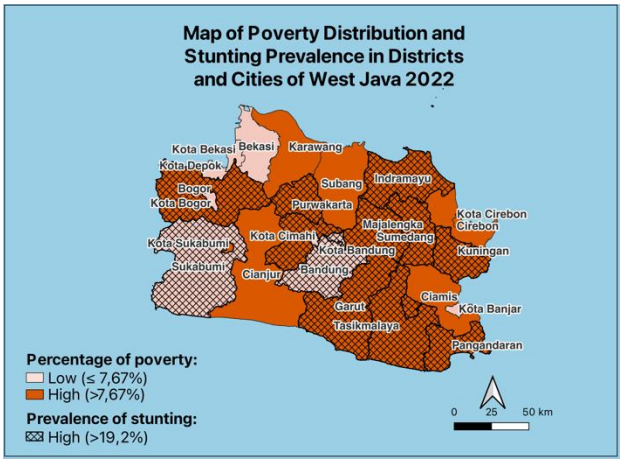

Figure 2. Mapping percentage of poverty and prevalence of stunting 2022 in West Java

Early marriage represents a crucial factor influencing maternal and child health outcomes, particularly in relation to the prevalence of stunting. Stunting is a pressing public health issue that affects children's growth and development, leading to long-term adverse effects on their health and well-being. In West Java, as illustrated in **Figure 3**, 16 areas exhibit significantly high prevalence of stunting. The overall percentage of early marriages accros districts and cities in West Java is marked by considerable variability, with Cimahi City the lowest percentage (9.16%) and Garut Regency the highest (29.88%). This correlation suggests that regions with higher

percentage of early marriage also experience elevated levels prevalence of stunting, highlighting the critical need for comprehensive strategies to address both early marriage and its impact on child health.

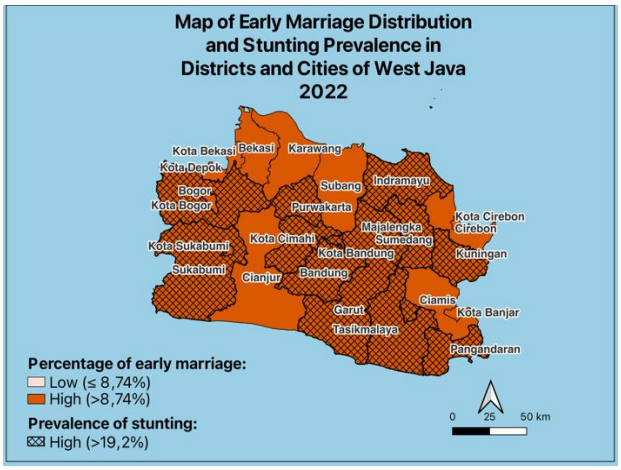

Figure 3. Mapping percentage of early marriage and prevalence of stunting 2022 in West Java

According to **Figure 4**, the percentage ownership of National Health Insurance and Maternal and Child Handbooks in 24 regions of West Java Province are low. Sumedang Regency has the lowest percentage of maternal and child handbook ownership (0.3%) and family planning participation (57.9%) in West Java Province. Tasikmalaya Regency has the lowest percentage of National Health Insurance ownership (20.9%). The study assessed universal health coverage through family planning participation family planning participation (87.7%).

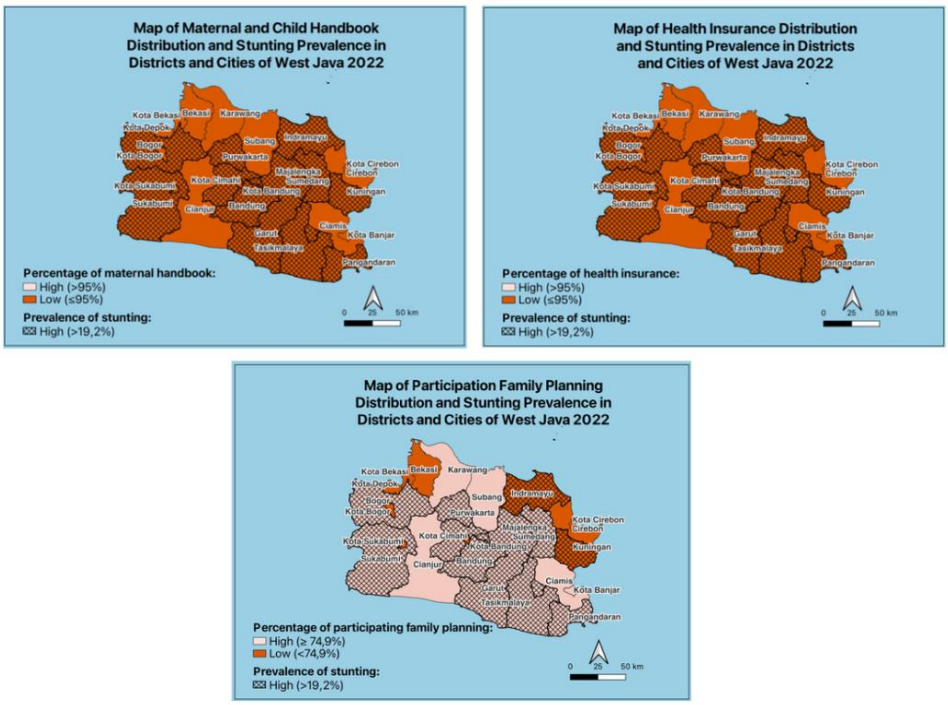

Figure 4. Mapping percentage of maternal and child handbook, health insurance, family planning and prevalence of stunting 2022 in West Java

According to **Figure 5**, Garut Regency exhibits the highest prevalence of pneumonia cases at 20.52%, indicating a significant public health concern in this region. Pneumonia, a leading cause of morbidity and mortality among children, necessitates targeted interventions to reduce its prevalence and improve health outcomes. In contrast, Subang Regency reports an exceptionally high incidence of diarrhea, with a prevalence of diarrhea 70.69%. Diarrhea, particularly in young children, can lead to severe dehydration and has long-term implications for growth and development. The elevated rates of both pneumonia and diarrhea in these regions underscore the urgent need for comprehensive health strategies aimed at addressing these critical infectious diseases and their associated risks, particularly in vulnerable populations.

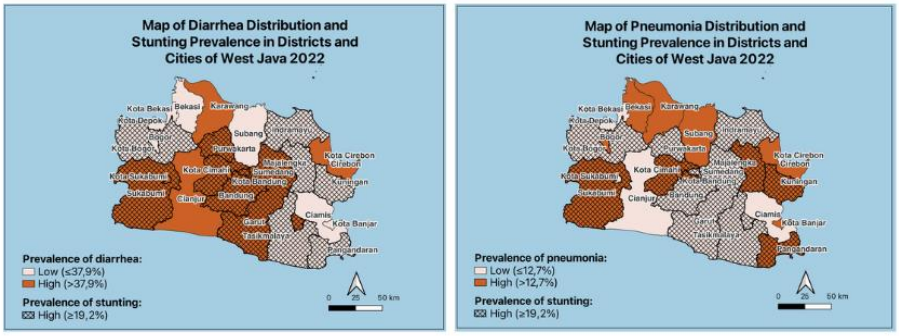

Figure 5. Mapping prevalence of infectious diseases and prevalence of stunting 2022 in West Java

The prevalence of stunting is an indicator of the health and welfare conditions in a region. Based on the mapping of stunting prevalence, it is evident that high stunting rates are geographically scattered. Areas with a high prevalence of stunting are mainly located in the eastern and western regions. Additionally, Pangandaran district in the southeast is also classified as having a high prevalence, as is Indramayu in the northeast. The western region of West Java generally has a high percentage of poverty and early marriage, as well as low ownership of maternal and child health handbooks and health insurance. Meanwhile, the eastern region also has high percentages of early marriage and poverty. The areas in western and central West Java experience high levels of infectious diseases, such as diarrhea.

The **Table 1** provides insights into the factors potentially influencing stunting across 27 districts/cities. The average prevalence of stunting is 19.9%, with significant variability (ranging from 32.8% to 69.3%), reflecting differences in health and nutrition outcomes. The percentage of early marriage, a known risk factor for stunting, has an average rate of 19.5%, indicating its potential contribution to poor maternal and child health. Universal health coverage indicators show that percentage of family planning participation is low (mean 23.3%) and percentage of national health insurance coverage is moderate (mean 53.5%), potentially limiting access to necessary healthcare services. The percentage ownership of maternal and child health handbooks, critical for monitoring child development, is low (mean 4.5%), indicating poor access to essential health resources. Infectious diseases, such as prevalence of pneumonia (mean prevalence 12.8%) and prevalence of diarrhea (mean prevalence 38.8%), are also prevalent, which may exacerbate stunting by impairing nutrient absorption and overall health. The percentage of poverty, with an average rate of 8.6%, further complicates the situation by limiting access to nutrition and healthcare, both of which are essential for preventing stunting. These factors collectively suggest that a combination of socioeconomic, health, and environmental issues may be driving the high stunting rates in these regions. Based on **Table 2**, all regions with both high and low prevalence of stunting have a high percentage of early marriages. The data on early marriage reveals a stark contrast areas with a high percentage of early marriage exhibit a 100% prevalence of stunting, while areas with a low percentage of early marriage show no cases of stunting (0%). This suggests a strong association

between early marriage and the incidence of stunting in the study area. The relationship between percentage of early marriage and stunting prevalence shows a p-value of 0.005, indicating a significant relationship between percentage of early marriage and prevalence of stunting in West Java Province. The positive r (r = 0.528) means that the higher the proportion of early marriages, the higher the prevalence of stunting in West Java.

Table 1. Statistical description of stunting risk factors in West Java 2022

Variable	n	%	Mean ± SD	Median	Min	Max
Prevalence of Stunting						
Low	11	40.7	19.9 ± 5.1	19.4	6	27.6
High	16	59.3				
Percentage of Poverty						
Low	9	33.3	8.6 ± 2.8	8.7	2,.	12.8
High	18	66.7				
Percentage of Early Marriage						
Low	0	0	19.5 ± 6.1	17.5	9.16	29.8
High	27	100				
Percentage Participation of family planning						
Low	10	37	76.6 ± 7.8	78.2	57.9	87.7
High	17	63				
Percentage of Health insurance ownership						
Low	27	100	43.4 ± 16.7	46.7	20.9	76.5
High	0	0				
Percentage of Maternal and child handbook ownership						
Low	27	100	95.4 ± 4.1	96.7	80.3	99.6
High	0	0				
Prevalence of Diarrhea						
Low	14	51,9	38.8 ± 15.6	37.9	154	70.6
High	13	48,1				
Prevalence of Pneumonia						
Low	14	51,9	12.8 ± 3.6	12.5	6.6	20.5
High	13	48,1				

Early marriage often leads to adolescent pregnancy, which increases the risk of poor maternal nutrition and inadequate weight gain during pregnancy. Adolescent mothers are still in their own growth phase, creating competition for nutrients between the mother and fetus, which can result in low birth weight and impaired fetal development both major risk factors for stunting (12). Additionally, young mothers may have limited access to healthcare services, including antenatal care and skilled birth attendants, due to economic or social constraints. Overall, the eastern part of West Java shows that most districts/cities experience high rates of early marriage. Several regions, such as Cirebon, Kuningan, and Ciamis, also face additional challenges, including a high prevalence of stunting, which requires special attention in health and social intervention programs. Early marriage often occurs among teenagers with low education levels. It impacts the mother's physical condition, as being too young to become pregnant increases the risk of giving birth to stunted children. This finding aligns with other research, where early marriage has a significant relationship with stunting (p = 0.005) (13).

These findings highlight the importance of addressing early marriage as part of stunting reduction efforts. Policies aimed at delaying marriage age, strengthening reproductive health services, and expanding maternal and child healthcare access can be effective strategies in

reducing stunting prevalence. Integrating nutrition education and social protection programs targeting vulnerable populations may further mitigate the long-term impacts of early marriage on child growth and development. By addressing these interconnected factors, regions with high early marriage rates may see significant improvements in child nutritional status and overall public health outcomes (14). Building on this, poverty itself plays a crucial role in shaping child health outcomes. The relationship between the percentage of poverty and stunting prevalence shows a p-value of 0.028 (r = 0.423), indicating a significant relationship between percentage of poverty and prevalence of stunting in West Java Province.

Poverty affects multiple determinants of nutrition, including food security, access to healthcare, and maternal education. Economic is root of malnutrition problem (15), households with limited financial resources often struggle to provide sufficient and diverse diets, increasing the risk of malnutrition and stunting in children (16). Additionally, poor families may have inadequate access to healthcare services, delaying treatment for infections and other health conditions that contribute to growth faltering. The high poverty rates across all districts in West Java highlight the persistent disparities between urban and rural areas, where infrastructure, health facilities, and economic opportunities are often limited. These findings emphasize the importance of poverty alleviation programs, social protection policies, and targeted nutritional interventions to reduce stunting prevalence. Strengthening economic opportunities, expanding healthcare access, and improving maternal and child nutrition programs in impoverished areas are essential steps toward breaking the link between poverty and stunting.

Focusing on regions with a high prevalence of stunting, there are 11 such regions, almost all of which have a high percentage of poverty (75%). In the eastern part of West Java, Indramayu stands out with both the highest prevalence of stunting and the highest percentage of poverty. High poverty can result from low income, which limits access to basic needs such as nutritious food essential for preventing stunting. Poverty within a family threatens household food security, restricting both access to and the affordability of food. This increases the risk of children facing nutritional problems, including stunting (17). This finding aligns with other research showing that poverty is directly related to the incidence of stunting (p = 0.023) (18), and affects long-term economic growth, which is estimated at 0.06% (19).

The results presented in **Table 1** show that 16 regions with a high prevalence of stunting also have low percentage of health insurance coverage. The relationship between percentage of health insurance ownership and stunting prevalence shows a p-value of 0.002, indicating a significant relationship between the two in West Java Province. The negative r (r = -0.570) suggests that higher percentage of health insurance ownership are associated with lower stunting prevalence in the province. The findings indicate a strong and statistically significant inverse relationship between family planning and stunting prevalence across regions in West Java, with a p-value of 0.001 and a correlation coefficient of r = -0.589.

This suggests that regions with higher family planning participation tend to have lower stunting prevalence. When examining key policy, strategy, and programmatic investments adopted by countries to reduce child stunting, reproductive health practices play a crucial role. Effective initiatives include improving maternal nutrition, enhancing newborn health, promoting early and exclusive breastfeeding, and ensuring optimal complementary feeding practices. Investments in family planning, such as increasing contraceptive use, delaying first pregnancy, and promoting adequate birth spacing, contribute to better child growth and nutrition, reinforcing the importance of integrating reproductive health into stunting reduction strategies at the regional level (20). Family Planning Program aims to reduce the rate of population growth. Family planning indirectly influences nutrition through child-feeding practices, which are closely related to child-rearing patterns. Participation in family planning is linked to better family planning practices, resulting in more optimal maintenance of children's nutrition and health. Planned births allow for sufficient resources to support a child's health and development, thereby reducing the risk of stunting (21).

The maternal and child handbook data in this study, as shown in **Table 2**, reveals that 16 areas have a high prevalence of stunting and low of percentage ownership of maternal and child handbooks. However, there is no significant relationship between handbook ownership and stunting prevalence. Based on the statistical test results, this may be linked to efforts to achieve Universal Health Coverage (UHC). The Indonesian government, through the National Health Insurance program, aims to provide access to health services, which is expected to help reduce stunting. These efforts are focused on improving health status to ensure the basic needs of a decent life are met. The findings of this study align with other research, which also found that health insurance ownership is significantly related to stunting (22).

Evidence suggests that the interrelationship between diarrheal diseases and stunting is critical in understanding child health outcomes. **Table 2** shows that in 8 areas with a high prevalence of stunting, there is also a high prevalence of diarrhea (57,1%). A statistically significant relationship exists between the prevalence of diarrhea and stunting in West Java Province (p = 0.001). The positive correlation coefficient (r = 0.647) indicates that as the prevalence of diarrhea increases, the prevalence of stunting also rises. Diarhea diseases contribute to stunting through multiple pathways, including chronic nutrient loss, malabsorption, and increased metabolic demands due to repeated infections (23). In regions with high stunting prevalence, the high burden of diarrhea further exacerbates nutritional deficiencies, weakening immune function and perpetuating a cycle of poor health outcomes. These findings emphasize the need for integrated health strategies that combine improved sanitation, access to clean water, enhanced nutrition programs, and strengthened healthcare services to reduce both diarrheal diseases and stunting (24). Addressing these interlinked factors is essential to breaking the cycle of malnutrition and improving long-term child health in vulnerable regions.

Table 2. Association between each variable and the prevalence of stunting

Variables	*r*	*P value*
Percentage of Poverty	0.423	0.028*
Percentage of Early Marriage	0.528	0.005*
Percentage Participation of family planning	-0.589	0.001*
Percentage of Health insurance ownership	-0.570	0.002*
Percentage of Maternal and child handbook ownership	-0.107	0.595
Prevalence of Diarrhea	0.647	0.001*
Prevalence of Pneumonia	0.010	0.960

**) p-value <0.05*

The results in **Table 2** also show that areas with a high prevalence of stunting have a high prevalence of pneumonia, and there is no significant relationship between latrine ownership and the prevalence of stunting (p = 0.960). Infectious diseases have a direct impact on children's nutritional status, as they affect the body's ability to absorb nutrients and disrupt normal metabolism, ultimately leading to stunting. Repeated infections worsen nutritional status and hinder growth, contributing to high stunting rates in vulnerable populations.

Diarrhea and pneumonia remain the leading causes of death in children, particularly toddlers. Based on **Table 3**, presents the final logistic regression model obtained using the forward stepwise method. The goodness-of-fit of the final model was evaluated using the Hosmer-Lemeshow test, confirming its adequacy in explaining the variation in stunting prevalence (p-value>0.05).

Additionally, Nagelkerke's R^2 demonstrated the model's explanatory power. These findings highlight the importance of expanding health insurance coverage and implementing diarrhea prevention strategies in efforts to reduce stunting prevalence. The results indicate that the prevalence of diarrhea and the percentage of health insurance ownership remained significant predictors of stunting. This study found that percentage ownership of health insurance influences the incidence of stunting. Having health

insurance is a protective factor against stunting, meaning that areas with health insurance have a 38.2% reduced risk of stunting compared to those areas without health insurance (AOR = 0.618, 95% CI: 0.369–0.535). Health insurance provides better access to health services, including monitoring children's growth and development and offering early treatment for nutritional problems. This aligns with one of the goals of Universal Health Coverage (UHC), which is to ensure equal access to health services for everyone, not just those who can afford to pay. In West Java, where the percentage of health insurance ownership remains below from the RPJMD target in some regions, expanding coverage holds the potential to reduce stunting rates. The implementation of UHC should be seen not only in terms of expanding health insurance coverage but also in fostering broader social and environmental conditions that support better health outcomes (25). In the case of stunting, UHC's role should go beyond simply providing medical care and should encompass the provision of public health interventions such as sanitation improvements, water purification, and access to nutritional education.

The core idea of UHC is that expanding health insurance coverage, increasing accessibility to healthcare, and removing financial barriers would reduce health disparities, improve health outcomes, and contribute to poverty reduction (26). However, the persistent high rates of stunting in certain regions of Indonesia, despite the ongoing efforts to implement UHC through the National Health Insurance (JKN) program, raises important questions about the adequacy and effectiveness of UHC in addressing complex health issues like stunting. Stunting, a condition caused by chronic malnutrition, results from multiple factors, including insufficient maternal nutrition, intrauterine undernutrition, lack of exclusive breastfeeding for the first six months, delayed introduction of complementary feeding, and inadequate complementary feeding in terms of both quantity and quality.

Table 3. Final logistic regression model with stunting prevalence 2022 in West Java

Variable	AOR (95% CI)	*p-value*
Diarrhea	1.841(1.091-3.106)	0.022*
Health Insurance	0.618 (0.369-0.535)	0.047*
Constant	0.19	0.245

**) p-value <0.05*

It is a multifactorial issue that extends beyond healthcare access, encompassing nutrition, sanitation, education, and socio-economic conditions (27). It's prevalence varies between urban and rural areas, highlighting disparities in essential resources and services. These differences underscore the need for targeted interventions that address the specific challenges faced by each region to effectively reduce stunting (28). In Indonesia, regions with high stunting rates often also face other significant barriers, including poverty, low education levels, and poor access to clean water (29) and sanitation. In these contexts, expanding health insurance alone may not be enough to address the root causes of stunting. While health insurance can provide better access to healthcare services such as regular check-ups, growth monitoring, nutritional counseling, and early interventions for children it does not directly address other critical factors contributing to stunting (30). Although UHC policies have been implemented to reduce stunting in West Java, challenges remain, including uneven distribution of healthcare services, low public participation in health insurance, and administrative barriers. An integrated approach is needed, focusing on improving access to healthcare, enhancing health education, and strengthening cross-sectoral coordination to ensure effective and sustainable interventions. **Table 3** also shows that prevalence of diarrhea influence the incidence of stunting. High prevalence of diarrhea are a risk factor for stunting, meaning that areas having prevalences of diarrhea are 1.841 times more likely to develop prevalence of stunting than areas without diarrhea (aOR = 1.841, 95% CI: 1.091–3.106). Repeated or prolonged diarrhea increases the risk of stunting because the body cannot absorb nutrients effectively. Diarrhea during critical growth periods, such as in children under five, has a greater impact on long-term growth. Poor sanitation is directly related to high rates of diarrhea, which in

turn increases the risk of stunting (31). Lack of access to clean water, inadequate sanitation, and poor handwashing habits contribute to the spread of diseases like diarrhea.

This aligns with the broader understanding that environmental enteropathy, caused by chronic exposure to unsanitary conditions, leads to inflammation of the gut, reducing its capacity to absorb nutrients effectively. Consequently, improving sanitation infrastructure, ensuring clean water availability, and promoting hygiene practices such as handwashing with soap are crucial steps in breaking this cycle. An unclean environment increases children's exposure to pathogens that cause intestinal infections, which interfere with the body's ability to absorb nutrients (32). Therefore, improving sanitation, including access to proper latrines and clean water, is essential for preventing diarrhea and reducing the prevalence of stunting (33). To effectively reduce stunting rates, strengthening policies that integrate health and sanitation programs can significantly reduce diarrheal disease prevalence, ultimately lowering stunting rates. Targeted investments in water, sanitation and hygiene (WASH) infrastructure, combined with public health campaigns promoting hygiene education, can create sustainable improvements in child health and nutrition outcomes, particularly in high-risk areas for diarrhea.

One critical aspect that has emerged from this discussion is the need for a comprehensive UHC strategy that includes cross-sectoral collaborations with other government sectors, such as education, and sanitation. By addressing the full spectrum of determinants of health, including access to quality healthcare services, clean water, and proper nutrition, UHC can better tackle issues like stunting. This could involve integrating nutrition and sanitation policies into the healthcare framework, ensuring that vulnerable populations in high-risk areas, particularly those in remote or rural regions, can benefit from both preventive and curative services. A limitation of this study is its reliance on secondary data, which may not capture the most recent or localized variations in stunting. Further research, incorporating region specific data, could provide a deeper understanding of the regional factors affecting stunting.

CONCLUSIONS AND RECOMMENDATIONS

This study shows that half of elementary school children in Bekasi City often consume snacks, only 30% of students do not buy snacks at school, and 75% of students are used to buying snacks in plastic packaging. Almost 80% of students were buying snacks at two or three food vendors, such as school canteens, street vendors, and food stalls. The frequency of snack consumption was not related to factors attributable to students' characteristics and parents' education. This study shows how school-age children are close to food sellers who provide many snacks that can increase the risk of obesity. Promoting healthy snacking behavior should be strengthened among school-age children in urban areas, followed by strong policies from schools and governments. The regulation about food sellers near school can addressed. Schools can also improve the canteen inside the school area with nutritious snack options, such as limiting fried food and sugary beverages. Teachers regularly remind children to bring homemade snacks or buy food and beverages that are considered healthy snacks during school and to eat them in moderation portions.

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Based on this study, stunting prevalence in West Java remains a complex public health issue, with an uneven distribution and high concentrations in the eastern, western, and southeastern regions. Key contributing factors include poverty, early marriage, high diarrhea prevalence, and low health insurance coverage. These disparities indicate that stunting is not merely a nutritional issue but also a reflection of social, economic, and healthcare access inequalities. A multisectoral approach is essential in stunting reduction efforts, emphasizing economic improvement, equitable access to healthcare services, and sanitation infrastructure enhancement. Evidence suggests that health insurance ownership serves as a protective factor against stunting, reinforcing the importance of expanding the coverage of the National Health Insurance (JKN) to reach vulnerable populations. Additionally, targeted interventions aimed at preventing and managing diarrhea such as improving sanitation, increasing access to clean water, and promoting hygiene education are

crucial in reducing stunting risk, particularly in high diarrhea prevalence areas.

With several districts and cities still reporting stunting rates above the national target, a more robust monitoring system and data-driven evaluation are necessary to assess the effectiveness of current interventions. Adaptive, evidence-based policies should be developed to ensure that stunting reduction programs are not only short-term solutions but also create sustainable impacts. This study's findings can serve as a foundation for policymakers to optimize stunting reduction strategies, ensuring that interventions are tailored to the specific characteristics and needs of each region while strengthening cross-sectoral collaboration. By doing so, it is possible to foster an environment that supports optimal child growth and development across West Java.

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