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ANALYSIS OF FOOD SECURITY, SOCIAL HEALTH, ENVIRONMENTAL AND HOUSEHOLD FOOD SECURITY ON STUNTING INCIDENCE OF CHILDREN AGED 12-59 MONTHS IN COASTAL HOUSEHOLDS IN BENGKULU PROVINCE

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ABSTRACT

The natural wealth of coastal areas is not accompanied by the welfare of the people who occupy a lower economic stratum than other land communities, including in fulfilling nutrition. The study aims to analyze the influence of food security and social, health, environmental and household food security factors on the incidence of stunting in children aged 12-59 months in coastal households in Bengkulu Province. The research methodology used a mixed approach, between quantitative and qualitative. Data analysis used Structural Equation Modeling (SEM). The study results showed that the policy aspect significantly affected food security (β=0.085; t=1.979; and p-value < 0.05) but is non-significant on stunting. There was a significant positive effect of health on food security with a value of β=0.237, value t = 7.157, and p-value <0.05. Health had no significant effect on stunting with a value of β=-0.040, value t = 0.963, and p-value > 0.05. Environmental aspects had a substantial adverse impact on food security (β=-0.492; t=12.846; and p-value <0.05) and a significant positive effect on stunting (β=0.155; t=2.781; and p-value < 0.05). The social aspect had a non-significant relationship with both food security and stunting. Food security was significantly related to stunting (β=0.441; t=7.971; and p-value <0.05). The research conclusion is that food security had a significant favorable association with stunting.

Keywords: food security, social, health, environment, stunting.

INTRODUCTION

Economic potential and wealth in coastal areas are accompanied by abundant marine products and other biodiversity. However, the natural wealth of coastal regions is not accompanied by the real welfare of the people's lives and occupies a low economic strata compared to other land communities, including in fulfilling nutrition (Leo *et al.*, 2018; Sutrisno, 2014) . Nutrition is essential for optimal growth and development (Auliya & Budiono, 2015). One of the determining factors of nutritional quality is food consumption patterns, which are influenced by the level of food availability, namely the type and amount of food consumed (Retnaningsih et al., 2011).

The impact of stunting on toddlers can also be caused directly by the mother's knowledge regarding nutrition, toddler eating patterns, cleanliness and sanitation at home (Nyoman Supariasa et al., 2022). People in coastal areas depend on using marine resources for their livelihoods. According to research by Baculu and Jufri (2017), a protein intake level of 96.43% is sufficient for toddlers on the coast of Donggala Regency. However, research by Lusiana & Maryanto (2014) shows that the poor nutritional status of toddlers from fishing families is 80% greater than that of toddlers from farming families. The risk factor most strongly associated with stunting in coastal areas is low levels of protein adequacy (Leo et al., 2018)

A strategy that can be implemented is to develop a local food movement based on various values and motivations, such as environmental preservation, healthy lifestyles, utilisation of local biological resources, respect for local farmers, and public awareness (Dwiartama et al., 2020; Khumaera, 2020). Society's social economy and culture can influence the nutritional intake of society and individuals. The environment has a major influence on energy and nutritional intake (Singh Sekhon, 2014).

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Socio-economic and cultural society can influence the nutritional intake of society and individuals. The environment significantly influences energy and nutritional intake (Singh Sekhon, 2014). The problem is whether the policies/strategies implemented are effective enough; therefore, research examining the relationship between policies and the prevalence of stunting is crucial.

Efforts to reduce nutritional problems must be handled cross-sector at all levels. Mothers and pregnant women must be provided with knowledge about nutrition and pregnancy and exclusive breastfeeding for healthy mothers. The prevalence of very short and stunted toddlers in Indonesia is 29.9%, and in Bengkulu Province is 27.9% (Ministry of Health, 2018).

There are various strategies to overcome the problem of stunting; one of the strategies for achieving food security is food diversification, which can be done with the Local Food Development program to increase food availability, quality and diversification by exploring the potential of local food in increasing availability to meet the consumption needs of quality, diverse and affordable food at the household level. Strategies that can be implemented in developing the local food movement are based on various values and motivations, such as environmental preservation, healthy lifestyle, utilization of local biological resources, respect for local farmers, and community awareness (Dwiartama et al., 2020; Khumaera, 2020).

METHODS

This study used a mixed method, quantitative and qualitative approach, combining them into one piece of information to interpret the overall results. This research was conducted using mixed methods, quantitative and qualitative approaches, combining the two into one piece of information to interpret the overall results. The research technique surveyed coastal families in 6 districts and one city in Bengkulu province with a sample of 478 households. A quantitative approach was taken to analyze food security, a determining factor in the incidence of stunting in toddlers. Data were collected using a list of questions arranged according to the topics collected through interviews, observations, and focus group discussions. Data analysis uses Partial Least Square Structural Equation Modeling (SEM PLS) analysis.

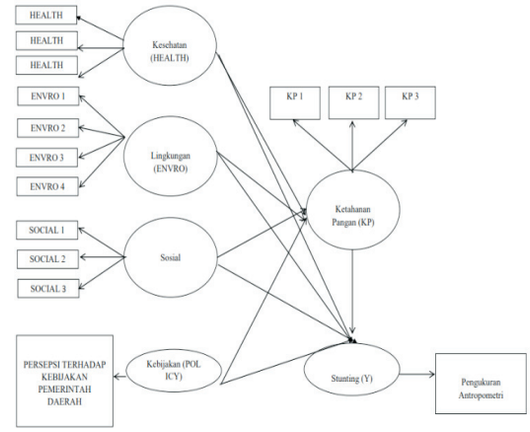

Figure 1. Development of a Research Hypothetical Model

Information:

KP : RT Food Security
KP1 : Diversity
KP2 : Food Quantity Analysis
KP3 : Food Quality Analysis
HEALTH : Health
HEALTH : Distance access to health facilities
HEALTH 2 : Access to healthcare facilities
HEALTH 3 : Ownership of Health Insurance
ENVRO : Environment
ENVRO 1 : Access to clean water
ENVRO 2 : Physical quality of water
ENVRO 3 : Access Sanitation
ENVRO 4 : Waste disposal
SOCIAL : Social Determinants
SOCIAL1 : Parental Education
SOCIAL2 : Mother Knowledge
SOCIAL3 : Level of Family Income
POLICY : Policy
POLICY1 : Perception of Local Government Policy
Y : Stunted
Y1 : Anthropometric Measurements

This study uses the Structural Equation Modeling (SEM) method with the Partial Least Square (PLS) approach, often called SEM-PLS. In the first condition of internal consistency, this

study uses a parameter, composite reliability (CR), which has a threshold value of 0.700, with each outer loading value. The indicator for each variable is at least 0.500. Then, it is necessary to test the multicollinearity of the indicators with the criterion value of the variance inflation factor (VIF) of less than five (<5). Indicators with an outer loading value of less than 0.500 and/or a VIF value greater than five (> 5) are excluded from the model.

RESULTS AND DISCUSSIONS

We are analyzing the influence of food security and social, health, environmental and household food security factors on stunting in children aged 12-59 months in coastal households in Bengkulu Province.

From the initial measurement model, some indicators do not meet the outer requirements loading and composite reliability requirements, such as the indicators h3_transportation and e1_air clean, which have outer values loading respectively of -0.229 and 0.072 which is far from the minimum limit of 0.500. These indicators need to be issued to produce a good model. Evaluation of measurement models that have issued indicators that do not meet internal consistency requirements is presented in Table 2, with all indicators of outer loadings, internal consistency, and non-multicollinearity fulfilling the requirements.

From Figure 2, the final model of the relationship between variables shows that nutritional status can be reflected from the anthropometric indicators of weight/height, weight/age and height/age. As expected, all the manifest variables from the nutritional status indicators had a positive effect. H/A contributed 0.779 to the incidence of stunting. Sanitation is an indicator that positively influences the environment, giving a contribution of 1,000. The distance from the house to the health facility can have a positive influence because the distance from the house that is too far can affect the condition of the community in obtaining health services, which will also affect the incidence of stunting. In contrast, food diversity (0.910) and food quality (0.644) affect food security (0.441), which is reflected in the incidence of stunting. Respondents' perceptions of society and government in policy negatively influence

Table 1. Evaluation of the Initial Measurement Model

Variable	Indicator	Outer Loading	CR	VIF
Stunting	W/H	0.923	0.851	1.897
	W/A	0.722		1.331
	H/A	0.775		1.640
Environment	e1_airclean	0.072	0.218	1.157
	e2_qualityair	-0.049		1.006
	e3_sanitation	0.994		1,010
	e4_trash	-0.105		1.153
Health	h1_insurance	-0.063	0.169	1.137
	h2_distance	0.940		1.035
	h3_ transportation	-0.229		1.106
Food security	kp1_ diversity_ food	0.903	0.667	1.124
	kp2_ quantity_ pangan	0.624		1,082
	kp3_kualitas_ pangan	0.315		1,043
Policy	p1_ community	0.711	0.733	1.136
	p2_ government	0.855		1.152
	p3_legislatif	0.483		1.072
Social	s1_ knowledge_ mother	0.891	0.746	1.051
	s2_revenue	0.639		1.051

From Table 1 above, the following equation can be derived:

Stunts = 0.923 (W/H) + 0.722 (W/A) – 0.775(H/A).....(1)

Environment = 0.072 e1_airClean – 0.049 e2_k.air + 0.994 e3_ sanitation – 0.105 e4_sampah.....….....(2)

Health = 0.063 h1_insurance + 0.940 h2_distance–0.229 h3_ transportation.....……..(3)

Food Security = 0.903 kp1_kerag_p + 0.624 kp2_quantity_p + .315 kp3_quality_p …...…..(4)

Policy = 0.711p 1_ Society + 0.855 P 2_ Government + 0.483_ legislature .....….…..….....(5)

Social = 0.891s 1_ mother_knowledge + 0.639s 2_ income .....…….....(6)

stunting and social variables related to mothers' knowledge and family income.

The second and third criteria are convergent validity and discriminant validity. Convergent validity evaluation uses average variance extracted (AVE) criteria with a threshold of

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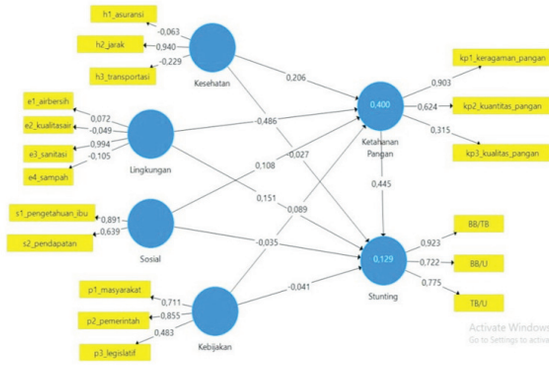

Figure 2. Initial Model of Relations Between Variables (Outer Loadings, Path Coefficients and P-Values).

Table 3. Evaluation of Convergent Validity

Variable	AVE
Policy	0.658
Health	1,000
Food security	0.621
Environment	1,000
Social	0.601
Stunt	0.658

Table 2. Evaluation of the Final Measurement Model

Variable	Indicator	Outer Loading	CR	VIF
Stunt	W/H	0.924	0.851	1,897
	W/A	0.715		1,331
	H/A	0.779		1,640
Environment	e3_sanitation	1,000	1,000	1,000
Health	h2_distance	1,000	1,000	1,000
Food security	kp1_diversity_food	0.910	0.761	1,078
	kp2_quantity_pangan	0.644		1,078
Policy	p1_community	0.748	0.793	1.116
	p2_government	0.869		1.116
Social	s1_knowledge_mother	0.889	0.746	1,051
	s2_revenue	0.641		1,051

Table 4. HTMT Discriminant Validity Evaluation

	Policy	Health	Food Security	Environment	Social	Stunt
Policy						
Health	0.195					
Food security	0.684	0.463				
Environment	0.524	0.074	0.819			
Social	0.764	0.194	0.779	0.456		
Stunt	0.064	0.072	0.461	0.079	0.196	

0.500. Discriminant validity evaluation can use Heterotrait-Monotrait (HTMT). HTMT is considered more reliable in identifying validity. The HTMT has a maximum threshold of 0.900.

Based on Table 3, it is obtained that all AVE values exceed 0.500. The following table presents the HTMT discriminant validity evaluation matrix. All values of the matrix have a range of less than 0.900, which means there is no problem with discriminant validity in this study.

The study used 2.000 bootstrapping analysis methods (random re-sampling) from the questionnaire data to evaluate the path coefficient and R^2. Aims to minimize the problem of abnormal research data. The path coefficient describes the formation of linkages between constructs, while R2 describes how much influence the construct has in explaining its endogenous variables. As the hypothesis is developed, the evaluation of the structural model uses a two-tailed p-value.

Table 5. Model Hypothesis Testing Results

Variable relationship	Betas (β)	Statistics t	p-values	Information
Food Security → Health	0.237	7.157	<0.001	Significant
Stunting → Health	-0.040	0.963	0.336	Non-significant
Food Security → Environment	-0.492	12.846	<0.001	Significant
Stunting →Environment	0.155	2.781	0.005	Significant
Social →Food Security	0.076	1.778	0.076	Non-significant
Social →Stunting	-0.021	0.346	0.729	Non-significant
Food Security →Policy	0.085	1.979	0.048	Significant
Stunting →Policy	-0.035	0.634	0.526	Non-significant
Food security→ stunt	0.441	7.971	<0.001	Significant

The processing results show a significant favorable influence on food security with a value of β = 0.237, t value = 7.157, and p-value <0.05. Health has no significant effect on stunting with a value of β= -0.040; t value = 0.963, and p-value > 0.05. Environmental aspects have a significant adverse effect on food security (β= -0.492; t value = 12.846; and p-value < 0.05) and a significant positive effect on stunting (β= 0.155; t value = 2.781; and p-value <0.05). The social aspect has a non-significant effect on both food security and stunting. The policy aspect positively affects food security (β= 0.085; t value = 1.979; and p-value <0.05) but is non-significant on stunting. Food security significantly affects stunting (β= 0.441; t value = 7.971; and p-value <0.05).

The R^2 value of the processing results was obtained at 0.398 for food security and 0.127 for stunting. Each of these values can be classified as moderate and weak. Specifically, this also means that health, environmental, social and policy aspects explain 39.8 % of the factors influencing food security in the research model. The health, environmental, social, policy, and food security aspects only explain 12.7% of the factors influencing stunting in the research model.

Structural Model Equations

Food security = 0.237 (health) + (-0.492) (environment) + 0.085 (policy) + 0.424 (error) = 0.27.....(1)

Based on the structural model equation above, it can be explained that food security against stunting is influenced by health by 0.237, environment by -0.492 and policy by 0.085 with an error rate of 0.424. Thus, overall food security is influenced by health, the environment and policies of 0.27.

Stunting = 0.005 (environment) + 0.000 (food security) + 0.393 (error)

= 0.398.....(2)

Evaluation of model fit Apart from the path coefficient and R2 value, several other criteria are used, especially to evaluate the suitability of the resulting model. Several parameters are used, such as the value of f two, which measures the effect of each exogenous variable on endogenous variables, standardized root mean square residual (SRMR), and Stone-Geisser (Q^2). These criteria are presented in Table 6.

All model fit criteria give good results. SRMR value of 0.094 is still below the threshold of 0.100. Q2 values for food security and stunting are all greater than zero as a threshold. Meanwhile, all f^2 values for the independent variables are in the range of 0.000-0.332, which means that the effect of exogenous on endogenous variables varies in the very low to large categories.

Table 6. Results of Evaluation of the Fit Model

Variable	R 2	SRMR	Q 2	f 2 Food security	f 2 stunt
Policy	-		-	0.010	0.001
Health	-		-	0.090	0.002
Food security	0.398		0.240	-	0.135
Environment	-		-	0.332	0.017
Social	-		-	0.008	0.000
Stunt	0.127	0.094	0.068	0.010	0.001

Outer loading result 1 shows an outer loading value still below 0.5, so indicators with an outer loading value below 0.5 must be removed. Research by Urke et al. (2013) shows that the highest incidence of stunting occurs in rural areas compared to urban and coastal areas. Research by Leo et al. (2018) and Ikhtiarti et al. (2019) shows that the risk factors for stunting in mountainous and coastal areas are based on energy adequacy levels, protein adequacy levels, Fe adequacy levels, low history of exclusive breastfeeding, environmental sanitation, health services, caregiver knowledge. The importance of a policy approach to achieving food security and stunting, Jiren et al. (2020) examined farmers in Ethiopia as an essential focus in ensuring food security. Food insecurity in the household and menu composition that is not nutritious, unbalanced and does not vary in quality and quantity can cause stunted growth and nutritional deficiencies in toddlers (Tessema et al., 2013).

Correctly mapping nutritional status problems for toddlers so that nutritional improvement programs do not increase nutritional problems at the next age. This strategy focuses on increasing household food security and food diversity using quantitative and qualitative analysis (Torlesse et al., 2016). Also, by taking a policy approach to achieve food security (Jiren et al., 2020), Transportation is crucial in supporting community access to health services. Ideally, community outreach to health service facilities should be carried out regularly.

Poor environmental sanitation with access to clean water, use of inadequate latrines and low compliance with hand washing behavior have contributed to the increase in infectious diseases. This infectious disease can cause impaired food absorption, which results in nutritional disorders and long-term impacts. Prolonged nutritional disorders affect the linear growth of toddlers, such as stunting (Tentama et al., 2020).

The research results showed that the research locations mostly had goose-neck latrines in areas with and without extensive water access. Access to clean water and water quality are primarily moderate and reasonable. Actions to improve the environment are necessary; the goal is to make the environment healthy for all living things. Thus, a healthy environment can influence the quality of life and health of those who live there (Celesta & Fitriyah, 2016). A poor environment in terms of sanitation, drinking air, and population density also stunts children's health due to unhealthy behavior and low health knowledge (Aisyah & Suyatno, 2019). Schmidt's (2014) research shows that in ASIAN countries, children who live without sanitation, hygiene, and clean drinking water do not grow well compared to children who receive these facilities. Environmental risk at different levels considers how the environment interacts with nutrition related to stunting (Vilcins et al., 2018).

Low family income is also possible because residents around the coast have a relatively low economic level; where during the western season, some fishermen do not go to sea, and most of them only depend on fish in the sea for their livelihood (Kristiyanti, 2016). Research by Arlius, Sudargo, and Subejo (2017) shows that food security and the nutritional status of children under five are closely related; if the family lacks food, it will affect their nutritional status. Toddlers need a balanced nutritional intake to prevent stunting by increasing maternal nutritional knowledge (Yuliantini et al., 2022). It is crucial for parents to pay more attention to parenting patterns, especially in the variety of food served (Aisyah, Suyatno, 2019). Low family income is also possible because residents around the coast have a relatively low economic level; where during the western season, some fishermen do not go to sea, and most of them only depend on fish in the sea for their livelihood (Kristiyanti, 2016). Research by Arlius, Sudargo, and Subejo (2017) shows that food security and the nutritional status of children under five are closely related; if the family lacks food, it will affect their nutritional status. Toddlers need a balanced nutritional intake to prevent stunting by increasing maternal nutritional knowledge (Yuliantini et al., 2022). It is crucial for parents to pay more attention to parenting patterns, especially in the variety of food served (Aisyah, Suyatno, 2019).

Research shows that coastal families in Bengkulu Province, both in locus and non-locus areas, are mainly secure due to food diversity and analysis of food quantity in the medium vulnerable and medium food quality categories, but almost half of the food quality analysis is not utilized.

Family food security is the family's ability to meet the food needs of household members in terms of quantity, quality, and variety by local culture. In contrast, family food security is reflected in the family's availability, purchasing power and affordability in fulfilling food (Natalia et al., 2013). Likewise, research by Roaedi et al. (2014) states that there is a relationship between the level of household food security and the nutritional status of children under five.

Research conducted by Damayanti and Khoirudin in 2016 stated that there are things that can influence food security in an area, namely income, the education level of the head of the household, and the number of individuals in the family. A good influence on food security if it is in a more positive direction. Income is an influential component when deciding the amount of financial use, the family can use to provide household food. If income increases, the food consumed can vary, which will determine better nutritional education (Aritonang et al., 2020). Household food insecurity, low maternal education and *Trichuris trichura* infection are some of Ethiopia's main factors causing malnutrition (Wolde et al., 2015). Based on the Spatial Error Model (SEM), seven parameters were significant at the 10% level. The SEM model produces an AIC of 165.11, considered better than the OLS method regression model, which produces an AIC of 175.53 (Revildy et al., 2020). Nur Susanti's research (Nur Susanti, 2022) shows that handling stunting needs to be carried out optimally by implementing two specific and sensitive interventions. Active involvement of all parties, including the minor elements of the village, starts from communizing perceptions and interests, which are communicated routinely and measurably (there is ongoing evaluation and monitoring to determine the progress of program development). The quality and quantity of human resources from technical implementers so that stunting can be handled quickly and precisely. So, the design of stunting prevention strategies in coastal households is strengthened by collaborative public action partnerships involving multiple factors, sectors and actors (PPN/Bappenas, 2019).

CONCLUSION

Analysis of food security and social, health, environmental and household food security factors on the incidence of stunting in children aged 12 - 59 months in coastal households in Bengkulu Province shows that food security significantly influences stunting.

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