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DETERMINANTS OF STUNTING PROBABILITY AMONG CHILDREN IN BELU DISTRICT AND NORTH CENTRAL TIMOR, EAST NUSA TENGGARA PROVINCE

Sirilius Seran[1], Maria Yanti Akoit[2], and Maria F.W.A. Fouk[3]

[1]Timor University, Department of Economic and Business,
El Tari Street Km 09 Sasi-Kefamenanu, East Nusa Tenggara, Indonesia

[2]Timor University, Department of Economic and Business,
El Tari Street Km 09 Sasi-Kefamenanu, East Nusa Tenggara, Indonesia

[3]Timor University, Department of Agriculture,
El Tari Street Km 09 Sasi-Kefamenanu, East Nusa Tenggara, Indonesia

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ABSTRACT

Children with stunting are noticeably shorter in height and are skinnier than their peers. This condition arises from the malnourishment they encounter during their time in the womb and the two years following their birth. The parents' socio-economic conditions can be one of the contributing factors that enhances the likelihood of a child experiencing stunting. This paper utilizes a sample of 300 households from North Central Timor and Belu regions as respondents. In this paper, the probability of stunting is labeled as variable category 1 and 0. As a result, the appropriate inferential analysis tool to be employed is logistic regression. On the other hand, the independent variables are as follows: 1) income, 2) wife's employment status, 3) wife's education, 4) husband's education, 5) birth spacing. The analysis result proves that only the birth spacing variable has a negative relationship (-0.332) but is not statistically significant (Sign.) in relation to the probability of stunting in children under five years olds. The likelihood of children experiencing stunting is higher when the parents have a low income, 3 to 4 times higher than parents with higher income. On the other hand, the risk of stunting for children with fathers having low educational level is 3,759 times higher compared to those with higher education.

KEYWORDS: Education, job, income, stunting, birth.

1. INTRODUCTION

Stunting is a chronic illness experience by children under five where they are significantly below average in height. The prevalence of stunting in Indonesia reaches 31.8 percent in 2020, which makes it the second highest rate in South East Asia, follows by Timor Leste with 48.8 percent. Meanwhile Singapore has the lowest prevalence of stunting at 2.8 percent (Asian Development Bank, 2021). In 2018, East Nusa Tenggara (NTT) had the highest percentage of children under five years old

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classified as severely short and short in height, surpassing that of the national average height in Indonesia. The prevalence of severely short children was 16 percent, while the prevalence of short children was 26.70 percent. Comparatively, the national average for severely short children was 19.30 percent, and for short children, it was 11.50 percent (Riskesdas, 2018 danBalitbangkes RI, 2019).

Several factors that are strongly believed to contribute to stunting include socio-economic and population-related factors. Poverty can be defined as a condition where the lack of income causing some individuals to struggle in meeting their basic needs. The province of East Nusa Tenggara (NTT) ranks as the third poorest province in Indonesia, following Papua and West Papua provinces. In 2018, the province of NTT had the highest rate of undernourished children aged 0-59 months, with 7.30 percent classified as severely undernourished and 22.20 percent moderately undernourished. These figures exceeded the national rated of 3.90 percent for severe undernourishment and 13.80 percent for moderate undernourishment. (Riskesdas, 2018 danBalitbangkes RI, 2019).

In general, people under poverty often live in the unsanitary environment with inadequate sanitary facilities, substandard housing conditions, the high level of waste and drinking water that does not meet the health standards. All of these factors contribute to the high number of stunting observed currently. In a study conducted by Agustin and Dian Rasmawati in 2021, using the primary data in the East Semarang District, it was found that 67.9 percent of stunting cases came from families with income below the minimum wage (UMR), while the remaining 27.3 percent came from families with income equal to or above the UMR. The result of inferential statistics shows that the risk of children from low-income families experiencing stunting was 17.8 times higher than those who are from high-income families. The same case was also discovered by Nasikah in 2012, and Fikadue,et al 2014, in which they found there’s a significant relationship between income and the occurrence of stunting. The number of dependent children in a family can increase the amount of consumption. When a family lacks a stable income, their food consumption revolves around meeting the basic huger needs rather than prioritizing nutritional adequacy. The expenditure for education and healthcare alike are also being neglected. Consequently, children born into such circumstances have more potential to be unhealthy and even include the risk of being born with stunting.

A population factor also presents another challenge in addressing the issue of stunting. The birth spacing between children being less than two years not only affects the health of the mother but also increases the potential for stunting in newborns and even raises the risk of mortality. Birth spacing that is relatively close to each other would not provide mothers with the opportunity to exclusively breastfeed their children, leading to compromised child health. Adelina, et al. (2017), in their research discover that In Indonesia, the birth space that is shorter than 18-months was associated with a 2.86 times higher risk of infant mortality and a 3.58 times higher risk in Cambodia compared to birth spacing of 36-months or longer. Aryu (2013) also found that birth spacing of less than two years has an 11.65 times higher risk of stunting than birth spacing of more than two years. Similarly, Jayanti and Ernawati (2021) found a significant relationship (p-value 0.0004) between birth spacing and the occurrence of stunting in children. The risk of children born with stunting is 0.5000 times higher when the birth interval is shorter than two years.

2. RESEARCH METHODOLOGY

2.1 Population and Sample

A total of 550 households with couples of reproductive age (PUS) who have children under five were used in the study. Using the criteria of five percent alpha (Seran,2020), the appropriate number of sample size is 300 households. The socio-economic status of each population/sample is relatively homogenous, ensuring that each of them has an equal opportunity to be selected as a respondent.

2.2 Data and Treatment of Research Variables

This research is being done to six variables, consisting of five independent variables (X) and one dependent variable (Y). The treatment of each variable is outlined in the following table (Table 1.1)

Table 1.1: Treatment of Research Variable Data

No	Variable	Category	Data Scale	Type of Data	Source
1	Family Income (X1)	Low Medium High	Interval	Quantitative	Primary Data
2	Wife's employment status (X2)	Employed Unemployed	Nominal	Qualitative	
3	Wife's education (X3)	< Middle School < High School University	Ordinal	Qualitative	
4	Husband's education (X4)	< Middle School < High School University	Ordinal	Qualitative	
5	Birth Space (X4)	Short Period Long Period	Interval	Quantitative	
6	Probability of Stunting (Y)	Yes No	Nominal	Qualitative	

2.3 Analysis Technique and Modeling

There are two approaches being used in this study for data analyzing techniques, including: descriptive and inferential techniques. The inferential analysis technique involves logistic regression analysis, which is suitable for the scale of the dependent variable (category 1, and 0). The logistic regression model used in the analysis is as follows:

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$$Ln\left(\frac{P}{1-P}\right) = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \varepsilon i \qquad (1)$$

Description:

$Ln\left(\frac{P}{1-P}\right)$= Probability of stunting in children under five

$\beta 0$ = Constant/Intercept

$\beta 1X1$ = Coefficient of the family income variable parameter

$\beta 2X2$ = Coefficient of the wife's employment status variable parameter

$\beta 3X3$ = Coefficient of the wife's education variable parameter

$\beta 4X4$ = Coefficient of the husband's education variable parameter

$\beta 5X5$ = Coefficient of the birth space between each child

εi = Error

3. RESULTS OF STATISTICAL ANALYSIS

3.1 Descriptive Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Family Income * Probability of Stunting	300	100.0%	0	0.0%	300	100.0%

Family Income * Probability of Stunting Cross tabulation

Count

		Probability of Stunting		
		Not Stunting	Stunting	Total
Family Income	250-299	84	160	244
	3000-5749	16	28	44
	5750-8500	8	4	12
Total		108	192	300

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Wife's Employment Status * Probability of Stunting Crosstabulation

Count

		Probability of Stunting		
		Not Stunting	Stunting	Total
Wife's Employment Status	Unemployed	88	151	239
	Employed	20	41	61
Total		108	192	300

Wife's Education * Probability of Stunting Crosstabulation

Count

		Probability of Stunting		
		Not Stunting	Stunting	Total
Wife's Education	≤ Middle School	54	114	168
	High School	40	56	96
	University	14	22	36
Total		108	192	300

Husband's Education * Probability Stunting Crosstabulation

Count

		Probability of Stunting		
		Not Stunting	Stunting	Total
Husband's Education	≤ Middle School	50	111	161
	High School	38	66	104
	University	20	15	35
Total		108	192	300

Birth Spacing * Probability of Stunting Crosstabulation

Count

		Probability of Stunting		
		Not Stunting	Stunting	Total
Birth Spacing	1-2 (Year)	55	114	169
	3-4 (Year)	53	78	131
Total		108	192	300

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3.2 Inferential Analysis

Classification Table[a,b]

Observed			Predicted: Probability of Stunting – Not Stunting	Predicted: Probability of Stunting – Stunting	Percentage Correct
Step 0	Probability of Stunting	Not Stunting	0	108	.0
		Stunting	0	192	100.0
	Overall Percentage				64.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.575	.120	22.882	1	.000	1.778

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Family Income	3.205	1	.073
		Wife's Employment Status	.343	1	.558
		Wife's Education	1.682	1	.195
		Husband's Education	7.157	1	.007
		Birth Spacing	2.006	1	.157
	Overall Statistics		13.924	5	.016

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	14.041	5	.015
	Block	14.041	5	.015
	Model	14.041	5	.015

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	378.010[a]	.046	.063

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted: Probability of Stunting – Not Stunting	Predicted: Probability of Stunting – Stunting	Predicted: Percentage Correct
Step 1	Probability of Stunting	Not Stunting	15	93	13.9
		Stunting	10	182	94.8
	Overall Percentage				65.7

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Family Income	-.432	.243	3.154	1	.046	.649
	Wife's Employment Status	.562	.355	2.501	1	.014	1.753
	Wife's Education	-.067	.221	.093	1	.050	.935
	Husband's Education	-.487	.213	5.244	1	.022	.614
	Birth Spacing	-.332	.250	1.764	1	.184	.718
	Constant	2.370	.593	15.977	1	.000	10.694

a. Variable(s) entered on step 1: Family Income, Wife's Working Status, Wife's Education, Husband's Education, Birth Spacing.

Logistic Regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	300	100.0
	Missing Cases	0	.0
	Total	300	100.0
Unselected Cases		0	.0
Total		300	100.0

a. If weight is in effect, see classification table for the total number of cases.

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Categorical Variables Coding

		Frequency	Parameter coding (1)	Parameter coding (2)
Wife's Education	≤ Middle School	168	1.000	.000
	High School	96	.000	1.000
	University	36	.000	.000
Family Income	250-299	244	1.000	.000
	3000-5749	44	.000	1.000
	5750-8500	12	.000	.000
Husband's Education	≤ Middle School	161	1.000	.000
	High School	104	.000	1.000
	University	35	.000	.000
Wife's Employment Status	Unemployed	239	1.000	
	Employed	61	.000	
Birth Spacing	1-2(Year)	169	1.000	
	3-4(Year)	131	.000	

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted: Probability of Stunting – Not Stunting	Predicted: Probability of Stunting – Stunting	Predicted: Percentage Correct
Step 0	Probability of Stunting	Not Stunting	0	108	.0
		Stunting	0	192	100.0
	Overall Percentage				64.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.575	.120	22.882	1	.000	1.778

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Family Income	5.163	2	.076
		Family Income (1)	1.405	1	.236
		Family Income (2)	.003	1	.957
		Wife's Employment Status (1)	.343	1	.558
		Wife's Education	2.553	2	.279
		Wife's _Education (1)	2.466	1	.116
		Wife's _Education (2)	1.968	1	.161
		Husband's Education	8.512	2	.014
		Husband's _Education (1)	3.687	1	.055
		Husband's Education (2)	.020	1	.887
		Birth Spacing (1)	2.006	1	.157
	Overall Statistics		Constant	8	.018

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	18.362	8	.019
	Block	18.362	8	.019
	Model	18.362	8	.019

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	373.689[a]	.059	.081

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

			Predicted		
			Probability of Stunting		Percentage Correct
	Observed		Not Stunting	Stunting	
Step 1	Probability of Stunting	Not_ Stunting	17	91	15.7
		Stunting	12	180	93.8
	Overall Percentage				65.7

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Family Income			4.126	2	.127	
	Family Income (1)	1.315	.650	4.096	1	.043	3.725
	Family Income (2)	1.193	.721	2.738	1	.098	3.298
	Wife's Employment Status (1)	-.502	.382	1.729	1	.189	.605
	Wife's Education			.652	2	.722	
	Wife's _Education (1)	-.120	.536	.050	1	.823	.887
	Wife's _Education (2)	-.316	.524	.362	1	.547	.729
	Husband's Education			7.092	2	.029	
	Husband's _Education (1)	1.324	.498	7.061	1	.008	3.759
	Husband's Education (2)	1.109	.481	5.316	1	.021	3.031
	Birth Spacing (1)	.374	.253	2.181	1	.140	1.454
	Constant	-1.384	.782	3.132	1	.077	.251

a. Variable(s) entered on step 1: Family Income, Wife's Employment Status, Wife's Education, Husband's Education, Birth Spacing

4. DISCUSSION

4.1 The Relationship between Income and Probability of Stunting

One of the indicators of household capability of meeting their basic needs is income. Income in general is use for two purposes, consumption and savings. If income is seen as constant, there is a tradeoff between income and savings, meaning that an increase in one will result in a decrease in the other. Each household makes different choices, influenced by desires to consume, prices, preferences, and the social status of the individuals. Wealthy individuals have more flexibility in utilizing their income to fulfill such purposes. Mathematically, it can be written as follows:

$$Yd=C+S \qquad (2)$$

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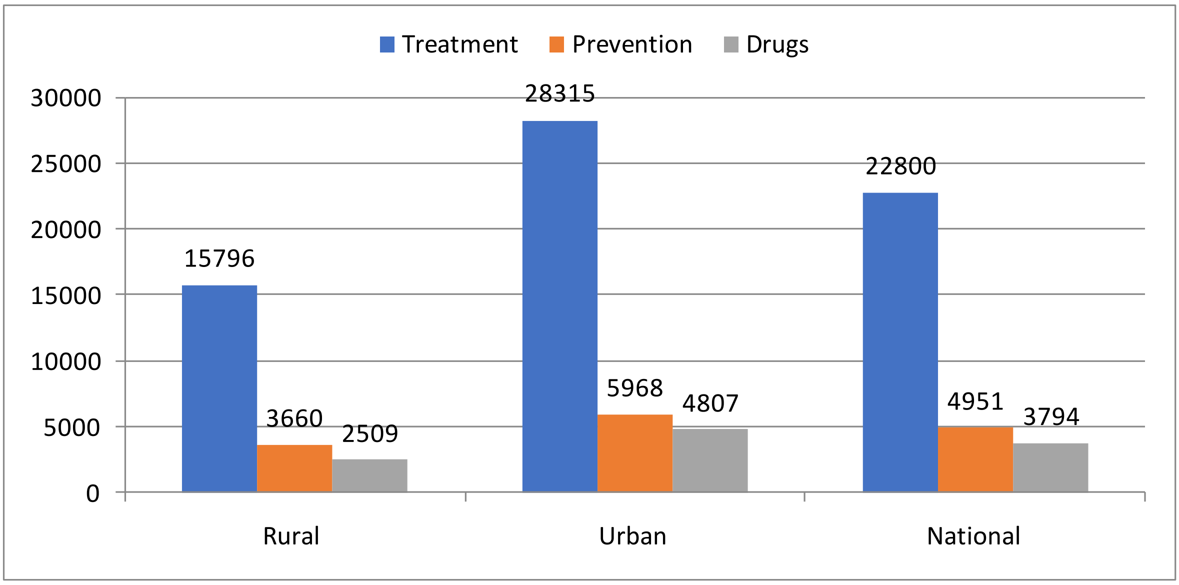
Ct=C+(MPC) (Yd) (3)

Description:
S = Saving
Ct = Consumption
MPC = Marginal Propensity to Consume
Yd = Disposable Income

The income expenses use for consumption purpose is not only related to the needs of food, clothing and education, but also includes healthcare expenses. Statistic Indonesia (BPS) in 2020 recorded that the average per capita monthly expenditure for healthcare, prevention, and medication by urban communities was relatively higher than that of rural communities and the national average (Graph 1.1). This condition occurs because urban communities generally have higher income compared to rural communities. This leads to a higher number of children from low-income families experiencing stunting compared to those from higher-income families. The inferential analysis in this study yielded results showing that a one-unit increase in income has the potential to reduce the probability of a child experiencing stunting by 0.432. The resulting significance value is 0.046, indicating that the relationship is significant.

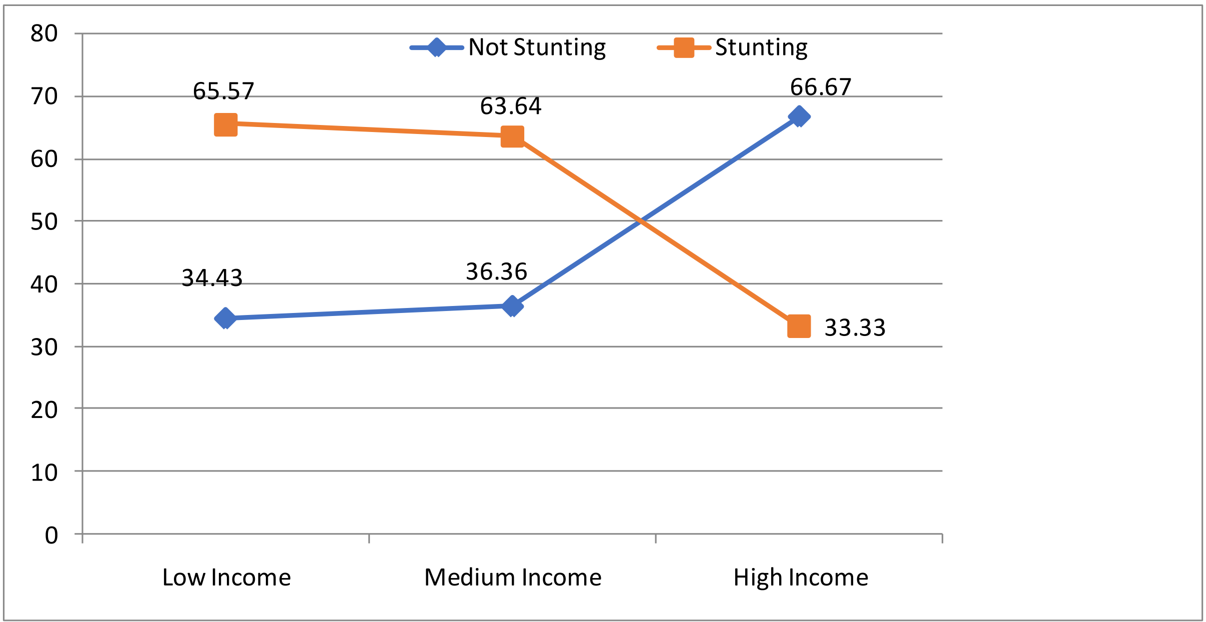
Graph 1. 1 The Average Expenditure Monthly Per Capita of Population on Healthcare in 2020



Source: bps.databoks.katadata.co.id/

Income is classified into three categories: low (Rp. 500,000-2,990,000), medium (Rp. 3,000,000-5,749,000), and high (Rp. 5,750,000-8,500,000). The low-income population has a tendency ratio of experiencing stunting 3,725 times higher than the high-income population, which is higher than the medium-income population at 3,298 times.

Graph 1. 2 Percentage Probability of Children with Stunting Children Based on Parental Income Level in Year 2023



Source: Primary Data

Descriptive analysis reveals a similar trend, where out of 244 parents with low income, 65.57 percent (160) children experience stunting, which is higher compared to the moderate and high-income categories (Graph 1.2).

4.2 The Relationship between Wife's Employment Status and Probability of Stunting

The causes of stunting are not only related to economic and environmental factors but also to parenting styles. The frequency of breastfeeding and fulfilling other needs of the child can be disrupted if a mother is engaged in activities outside the home at the same time. The average frequency of breastfeeding by mothers who work outside the home is lower compared to mothers who do not work. Among 80 stay-at-home mothers, 57.5 percent (46) exclusively breastfeed their babies, which is higher than those who do not provide exclusive breastfeeding (27 or 33.8 percent). On the other hand, among the 34 working mothers, only 12.5 percent (10) provide exclusive breastfeeding, while 30 percent (24) do not provide exclusive breastfeeding (Puteri et al., 2021).

In their study in Bangladesh, Win Hayman et al. (2020) found that children from working mothers had a nearly two times increased risk of stunting compared to children whose mothers did not work, with an Odds Ratio (OR) of 1.84. The study also revealed that the risk of stunting among children varied based on the mother's employment status. Children with working mothers had a 0.605-fold risk of stunting compared to children with non-working parents. Consistent with its positive parameter value (0.562), it indicates that the likelihood of a child experiencing stunting is higher when their mother is working. This relationship is significant, as evidenced by the probability value of 0.014, which is smaller than the alpha value of 0.05. However, the descriptive analysis generates contrasting results: out of 192 stunted children, 151 (78.65 percent) of them come from non-working parents (mothers), while the remaining 41 (21.35 percent) stunted children have working parents. This phenomenon suggests that working mothers generally have the ability (income) to meet their children's needs for quality and nutritious food as well as healthcare.

4.3 The Relationship between Wife's Education and Probability of Stunting

Education expands people's knowledge and awareness about various aspects of life. It helps individuals understand the importance of a healthy and quality lifestyle. This understanding leads to a sense of self-protection against negative factors that could harm themselves and their families. People who receive education, especially those who pursue higher education, tend to be more conscious about their lifestyle choices. They strive to live a healthy life and actively avoid consuming food that could negatively impact their health. Children, especially those born into educated families, are more likely to receive quality healthcare and nutritious food. This leads to healthier growth and cognitive development in children. Conversely, children born to parents with low education or no schooling face challenges in providing proper healthcare and nutritious food. Their limited knowledge and understanding of a healthy lifestyle hinder them from fulfilling their health needs, neglecting the importance of quality. As a result, these children may experience poor health conditions and are more susceptible to illnesses.

Based on secondary data from Indonesia and Bangladesh, a study conducted by Semba et al. (2008) found that in Indonesia, higher levels of formal education among mothers were associated with a decrease in stunting prevalence ranging from 4.4 percent to 5.0 percent. Similarly, in Bangladesh, higher levels of formal education among mothers were associated with a decrease in stunting prevalence of 4.6 percent. Additionally, the study found that longer formal education among fathers was associated with a decrease in stunting prevalence of 3 percent in Indonesia and ranging from 2.9 percent to 5.4 percent in Bangladesh. These findings highlight the positive impact of formal education, both for mothers and fathers, in reducing stunting rates among children in both countries.

The descriptive analysis from this study also yielded similar results for both maternal and paternal formal education. Out of the 192 children with stunting, 114 (59.37 percent) had mothers with low education (≤ junior high school), followed by mothers who completed high school with 56 (29.18 percent) stunted children, and only 22 (11.45 percent) stunted children had mothers who completed tertiary education. Paternal education also had an influence in reducing the prevalence of stunting among children. Out of the 192 stunted children, 57.81 percent (111) had fathers with low education (≤ junior high school), 34.38 percent (66) had fathers who completed high school, while only 7.81

percent (15) of stunted children had fathers with higher education. These findings indicate the importance of both maternal and paternal formal education in reducing the risk of stunting among children. Higher levels of education among parents are associated with lower prevalence of stunting, highlighting the role of education in improving child health outcomes.

The inferential analysis confirms that a higher level of formal education completed by either the mother or father reduces the occurrence of stunting among children. The parameter value for maternal education is -0.067, and for paternal education it is -0.487. Both parameter values yield probability values of 0.050 (maternal education) and 0.022 (paternal education), indicating a significant (negative) relationship between formal education of the mother and/or father and the occurrence of stunting. The odds ratios further reinforce that children of mothers with low education have a 0.887 times higher risk of stunting compared to those with moderate education (0.729). Similarly, children of fathers with low education have a 3.759 times higher risk of stunting compared to those with moderate education (3.031) and those with higher education.

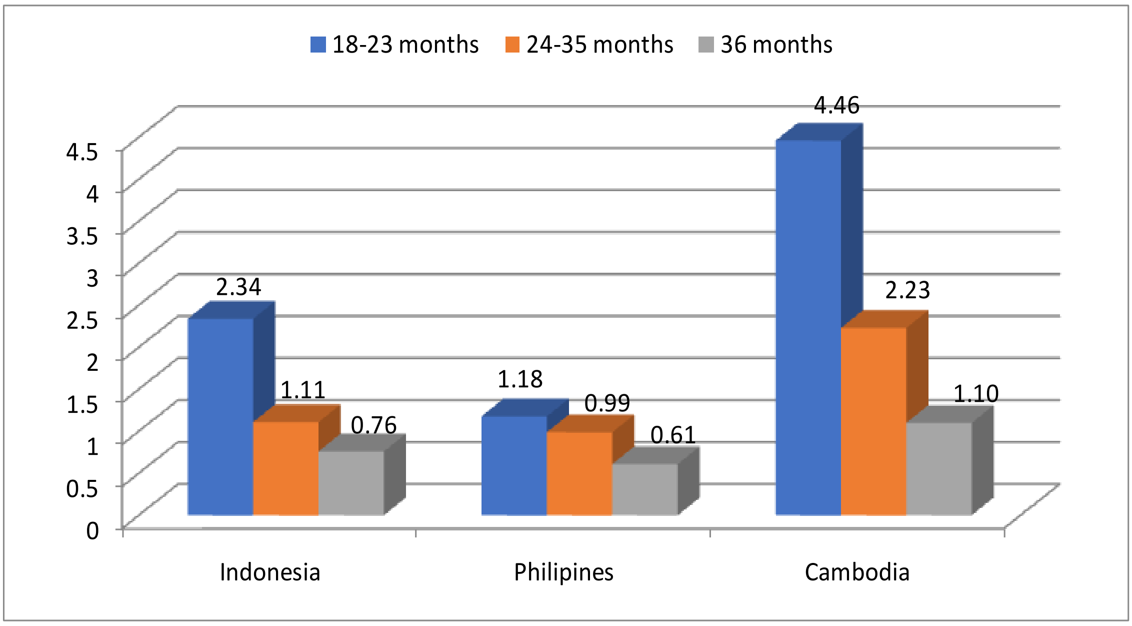
These findings emphasize the importance of formal education for both mothers and fathers in reducing the risk of stunting among young children. Higher levels of education for parents are associated with a lower likelihood of stunting, as indicated by the negative relationship and odds ratios obtained from the inferential analysis.

4.4 The Relationship between Birth Space and Probability of Stunting

The short birth spacing between children has a negative impact on the health of both the mother and the child. According to the World Health Organization (WHO), the ideal birth spacing is between 18 to 24 months, while the National Family Planning Coordinating Board (BKKBN) recommends a spacing of 36 months (3 years).

Using data from the Indonesian Demographic and Health Survey (SDKI) 2012, the Philippines (2013), and Cambodia (2014), Fitri et al. (2017) found a negative relationship between the risk of mortality in children under five and the birth spacing between each child. In Indonesia, the highest risk of mortality in children under five was observed for birth spacing between 18-23 months, with an odds ratio (OR) of 2.34 compared to birth spacing of 24-35 months, which had an OR of 1.11 compared to birth spacing of ≥36 months. Similar trends were observed in the Philippines and Cambodia. The risk of mortality for birth spacing between 18-23 months in the Philippines was 1.18, while in Cambodia it was 4.46 times higher compared to birth spacing of ≥36 months (Graph 1.3). The further the birth spacing, the lower the risk of mortality in children under five.

Graph 1. 3 The Relationship between Birth Spacing and the Risk of Child Mortality



Source: Fitri et al (2017)

The descriptive analysis from this study also found a similar trend. Out of 192 stunted children under five, 51.38 percent (114) were born with an average birth spacing between 1-2 years, which was higher than the percentage of stunted children with a birth spacing between 3-4 years, which was 40.62 percent (78). The inferential statistics of the two variables (birth spacing and probability of stunting) showed a negative relationship (-0.332), but it was not statistically significant (p-value of 0.184) for the population. The risk of stunting in children under five with an average birth spacing of 1-2 years was 1.45 times higher compared to those with an average birth spacing of 3-4 years.

The five variables studied (family income, maternal employment status, education of both spouses, and birth spacing) accounted for only 8.1 percent of the likelihood of a child under five experiencing stunting, while the majority, 91.9 percent, was influenced by other variables that were not included in the model.

5. CONCLUSION

This study generates several conclusions as follows:

1. The independent variables: family income, maternal employment status, education (of both mother and father), and birth spacing have a relationship with the probability of stunting, although each variable has varying coefficient values.
2. Family income, maternal education, paternal education, and birth spacing each have a negative relationship with the probability of stunting, except for maternal employment status, which has a positive relationship.

3. The risk of a child experiencing stunting from low and moderate-income families is 3 to 4 times higher compared to children from high-income families.
4. Children with working mothers have a 0.605 times higher risk of experiencing stunting compared to those with non-working mothers, while birth spacing between 1-2 years increases the risk of stunting by 1.454 times compared to birth spacing between 3-4 years.
5. Children born to mothers with low education (≤ junior high school) have a 0.887 higher risk of experiencing stunting compared to those with senior high school education, and a 0.729 higher risk compared to children with parents who have higher education (diploma and bachelor's degree).
6. Children born to fathers with low education (≤ junior high school) have a 3.759 higher risk of experiencing stunting compared to those with senior high school education, and a 3.031 higher risk compared to children with parents who have higher education (diploma and bachelor's degree).

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