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Impact Sanitation, Childbearing Age, Number of Children, Mother's Age with the Risk of Stunting in Children

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Abstract

Sanitation, childbearing age, number of children, and the mother's age are still the main challenges that affect on increasing the risk of stunting. This study aims to identify factors that affect the risk of stunting in children in Semarang City, Central Java Province, Indonesia, with a special focus on sanitation, childbearing age, number of children, and mother's age. The study used a linear regression research design with a sample of 383 mothers and their children in 2022. Data analysis was carried out using the ANOVA technique to evaluate the influence of independent variables on stunting risk. The results showed that sanitation (B = 1,060, p < 0.001), age of delivery (B = 0.149, p = 0.018), and number of children (B = 1,027, p < 0.001) had a significant positive relationship with stunting risk. In contrast, maternal age (B = -0.511, p < 0.001) showed a significant negative association with stunting risk. These findings have important implications for the development of public health policies and practices, particularly in improving sanitation and nutritional interventions in young mothers and families with many children. This study makes a unique contribution by identifying specific variables that affect stunting risk in Indonesia, which can be used to develop more effective prevention strategies.

Introduction

Decreased prevalence of global stunting and identify factors such as an increase in the asset index as the main drivers of stunting reduction (Najib et al., 2023; Vaivada et al., 2020). The nutritional status of toddlers is an important indicator of public health, especially in assessing the quality of nutritional intake and the children health in an area (Nasution et al., 2024; Prasetyo et al., 2023). The 2023 national health survey revealed the prevalence of nutritional status of toddlers in Semarang City, showing various nutritional problems that must be addressed immediately. The prevalence of stunting in Semarang City is 15.7%, with a 95% Confidence Interval (CI) range between 12.9-19%. The prevalence of wasting in Semarang City is 6.2%, with a 95% CI range between 4.4-8.7%. The prevalence of underweight in Semarang City is 11.8%, with a 95% CI range between 9.3-14.8%. Meanwhile, the prevalence of overweight in Semarang City is 6.2%, with a 95% CI range between 4.6-8.3%. Overweight in toddlers is an early sign of overnutrition problems that can lead to obesity. This condition risks leading to various health problems such as diabetes, hypertension, and heart disease in the future. The high prevalence of nutritional problems in toddlers in Semarang City shows the need for immediate and comprehensive

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intervention to improve the nutritional status of children. Local governments and various stakeholders must work together to provide targeted nutrition programs, educate the public about the importance of healthy diets, and ensure access to adequate health services. These efforts are not only important for the health of today's children, but also for their future and the well-being of society.

Scientific attention to stunting leads to variations, such as Stunting and Anemia in Ethiopia. Geda et al. (2021) identifying risk factors for stunting and anemia in Ethiopia, including poor sanitation and malnutrition. Geospatial Inequalities in Afghanistan (Akseer et al., 2018) highlights geographical disparities in the prevalence of stunting in Afghanistan, with factors such as maternal education and access to sanitation playing a significant role. Child Growth Factors in Guatemala by Wren-Atilola et al. (2019) found that subclinical mastitis and poor sanitation contribute to stunting in Guatemala. Inequality in India in the study of Singh et al., (2020) shows that socio-economic inequality has a major effect on the prevalence of stunting among the urban poor in India. The Combination of Anemia and Stunting by Gosdin et al. (2018) examined the coexistence of anemia and stunting in India and Peru, highlighting the importance of integrated interventions. Predictor factors in Indonesia in the study of Togatorop et al. (2023) identified factors that affect stunting in children in Indonesia, such as feeding practices and household conditions. The Prediction Model in Jambi was researched by Kalsum et al. (2023) analyzing the stunting prediction model in Jambi province, and finding that socioeconomic factors are the main root of stunting. As mentioned in the literature, this study highlights the factors of maternal age, number of children, childbearing age, and sanitation conditions in Semarang City, Central Java Province, Indonesia. Stunting in toddlers in Semarang City is assumed to be influenced by various factors, as the literature mentioned earlier. But, this study focused on the factors of maternal age, number of children, childbearing age, and sanitation conditions. This study aims to identify factors that affect the risk of stunting in children in Semarang City, Central Java Province, Indonesia, with a special focus on sanitation, childbearing age, number of children, and mother's age.

The literature study starts with the risk of stunting, stunting is a condition of failure to grow in children due to chronic malnutrition that occurs during growth and usually occurs in the early stages of life, especially before the age of two. This can result in children having a shorter height than the healthy average for their age. Sanitation and Stunting in Indonesia, Hasanah & Susanti (2018) found that access to clean water and good sanitation is significantly related to the risk of stunting in children in Indonesia. Risk Factors in Bali, Indonesia, a study by Pradnyawati et al. (2021) identified various risk factors for stunting in Kedisan Village, Gianyar, including sanitation and inadequate feeding practices. Sociodemography and Stunting in West Java by Permatasari et al. (2023) examines the relationship between sociodemographic, nutritional, and sanitation characteristics and stunting in rural areas in West Java, Indonesia. Environmental Factors researched Vilcins et al. (2018) examined environmental risk factors such as food toxins and poor sanitation as the cause of stunting in children. Long-Term Effects of Stunting, Alam et al. (2020) showed that early stunting is associated with lower cognitive development at 5 years old, especially in low- and middle-income countries. WASH and Nutrition, by Momberg et al. (2021) highlights the relationship between water, sanitation, and hygiene (WASH) conditions and nutritional status of children in Sub-Saharan Africa. CIAF in Bogor, Permatasari & Chadirin (2022) using the Combined Anthropometric Failure Index (CIAF) to assess malnutrition among children in Bogor, Indonesia, found a close relationship between sociodemographic factors and children's nutritional status. The Impact of Malnutrition on Child Development by Ramokolo et al. (2018) emphasizes the long-term effects of malnutrition on childhood, including an increased risk of chronic disease in adulthood.

Furthermore, sanitation refers to environmental conditions that affect human health, especially in terms of access to and management of clean water, waste management, and cleanliness of the surrounding environment.

A Nutrition Meta-Analysis, through research from (Dewey et al., 2021), showed that lipid-based nutritional supplementation can reduce the prevalence of stunting and wasting in children, highlighting the importance of nutritional interventions at an early age. Stunting in slums Das et al. (2020) examined the factors influencing stunting in children in informal settlements in Mumbai, India, and found that higher maternal education and longer birth intervals were associated with a reduced risk of stunting. Stunting and Environmental Factors by Siti Novianti et al. (2023) identified that safe access to drinking water and maternal hygiene practices are associated with a reduced risk of stunting in West Java, Indonesia. Maternal Age Factors and Stunting, researched by Hashmi et al. (2019), showed that maternal height and suboptimal feeding practices are associated with stunting in migrant and refugee children on the Thailand-Myanmar border. Interventions for Nutrition and Sanitation, by Urgell-Lahuerta et al. (2021) reviewed interventions that address food security, water quality, and hygiene to improve nutritional status in children in low- and middle-income countries.

Meanwhile, the number of children in a family can affect the family quality of life, including health, education, and economic aspects, and also can affect the risk of stunting. The COVID-19 Pandemic and Stunting by Arini et al. (2022) found that changes in socioeconomic and sanitation conditions during the pandemic increased the risk of stunting in children in coastal areas in Surabaya, Indonesia. Child Nutritional Status in Sri Lanka in Sathiadas et al. (2021) examined the nutritional status of school children in Northern Sri Lanka and found that socio-demographic factors such as maternal education and the number of family members are related to the prevalence of stunting. Early Childhood Nutrition Education, researched by Sukmawati et al. (2023), shows that nutrition education for parents and early childhood caregivers is effective in reducing the prevalence of stunting, emphasizing the importance of a holistic approach that considers social and economic factors. The Influence of Family and Environment in Medan through Rukmana et al. (2022) found that the age of the child, birth weight, and family income are related to the nutritional status of children in Medan, Indonesia.

Meanwhile, maternal age during childbirth significantly impacts the risk of stunting in children, with adolescent mothers becoming particularly vulnerable to inadequate nutritional knowledge and care during pregnancy, leading to a higher incidence of stunting in their children (Maulana et al., 2024; Najib et al., 2023; Sulistyawati et al., 2024). In addition, the age of young mothers has been associated with a higher likelihood of stunting in toddlers, emphasizing the importance of raising awareness about early marriage to prevent stunting (Sulistyawati et al., 2024). Conversely, older maternal age can also pose a risk, as highlighted in a study in which the age of pregnant women was found to be a significant factor influencing the incidence of stunting in toddlers (Oktaviani et al., 2023). Therefore, addressing maternal age through targeted health education programs for young and older mothers is essential in preventing stunting and promoting optimal child growth and development.

The literature evaluation, referring to research by Pitoyo et al. (2022), identified that maternal education, parental work, and household environmental conditions have a significant effect on the prevalence of stunting in Indonesia. Nugroho et al. (2023) added that social support and access to health services are important determinants in overcoming stunting. However, these two studies did not pay attention to childbearing age and the number of children as independent variables. Research by Nguyen et al. (2019) in India shows that teenage pregnancy is associated with malnutrition in early childhood, with social, biological, and programmatic factors playing an important role. Similar findings were also found in Bangladesh by Nguyen et al. (2021), which showed that children of adolescent mothers had a higher risk of stunting. Jones et al. (2016) showed that urbanization in Sub-Saharan Africa is associated with a double burden of malnutrition at the household and individual levels, including stunting in children and overweight in women of childbearing age. From the literature review above, it can be synthesized that maternal age factors,

number of children, childbearing age, and sanitation conditions all have a significant impact on stunting risk. However, research that comprehensively combines all these variables is still limited. Therefore, this study aims to fill the gap by identifying and analyzing the interaction between these variables. Overall, factors such as poor sanitation, maternal age at birth, the number of children in the family, and maternal age are social and environmental factors that can interact and affect the risk of stunting in children. Efforts to reduce the risk of stunting need to pay attention to these aspects holistically, including increased access to adequate nutrition, good maternal health care, and improved sanitation and environmental hygiene. This literature review will evaluate and synthesize previous research to build the foundation of this research, focusing on the influence of maternal age, number of children, age of childbirth, and sanitary conditions on stunting risk.

Method

This study uses a quantitative research design with a linear regression approach (Nasution et al., 2024) to analyze factors that affect the risk of stunting in children in Semarang City. The methodology of this study includes sample selection, data collection methods, and data analysis techniques used. The research sample consisted of 383 mothers and their children randomly selected from the population of mothers with children under five in Semarang City. Primary data was obtained based on the Decree on Research Ethics in the Field of Social Humanities, number 305/KE.01/SK/9/2022 in September 2022 and the Approval Letter of the Ethics Commission of Gajah Mada University, number KE/UGM/045/EC/2022. The sampling strategy was by stratified random sampling techniques to ensure the proper representation of various socio-economic and geographical groups. The inclusion criteria include mothers with children under five years old, while the exclusion criteria include mothers who are not willing to participate or have incomplete data. Data were collected through structured interviews and questionnaires tested for validity and reliability. The questionnaire instrument includes questions regarding the age of the mother, the number of children, the age of childbirth, and household sanitation conditions. Data analysis was carried out using multiple linear regression to evaluate the influence of independent variables (maternal age, number of children, childbearing age, and sanitary conditions) on dependent variables (stunting risk). The regression equation model used in this study is as follows:

$$\text{Risk of Stunting} = \beta 0 + \beta 1\ (\text{MA}) + \beta 2\ (\text{NC}) + \beta 3\ (\text{CA}) + \beta 4\ (\text{Sa}) + \epsilon \quad (1$$

Where:

$\beta 0$ is a constant.

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ are the regression coefficient for each independent variable.

MA is Mother's Age

NC is Number of Children

CA is Childbearing Age

Sa is Sanitation

ϵ is an error term.

To ensure internal validity, all data collection instruments have gone through content and construct validity tests. Reliability is measured using Cronbach's Alpha coefficient, indicating that the instrument has high internal consistency. External validity is achieved through representative sampling techniques and rigorous data collection procedures. The study stage begins with planning, compiling questionnaire instruments, and conducting trials to ensure validity and reliability, then collecting data from respondents through interviews and filling out questionnaires. The next stage is data analysis by entering data into statistical analysis software (SPSS) and performing multiple linear regression equipped with interpretation to interpret the results to answer the research objectives.

Result and Discussion

This regression analysis model showed a strong relationship between maternal age, number of children, age of childbirth, and sanitation with measured outcomes, with an R Square of 0.718 and an adjusted R Square of 0.715. It means 71.8% of the variation in the results can be explained by this predictor variable, with a standard estimated error of 0.40075. Alderman et al. (2019) in their study found that teenage pregnancy is associated with malnutrition in children in India. Social,

TABLE 1. ANOVA[a] Risk of Stunting

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	154.623	4	38.656	240.698	.000[b]
	Residual	60.867	379	.161		
	Total	215.490	383			

a. Dependent Variable: Risk of Stunting
b. Predictors: (Constant), sanitation, childbearing age, number of children, mother's age
Source: Analysis Results, 2024

biological, and programmatic variables play an important role in this link. Kabir et al. (2021) and Migang et al. (2020) examined the demographic and environmental risk factors associated with the loss of children under the age of five in Bangladesh. These factors include the mother's age when the time of childbirth and household sanitation conditions. Sinha et al. (2016) showed that maternal age at childbirth correlates with perinatal mortality and children under the age of five in Delhi. Mothers who are younger or older than 20-24 years show an increased risk of child mortality. Kempton et al. (2021) studied methylmercury exposure and its impact on the health of women of childbearing age and their children in Munduruku, Brazil. This environmental exposure has an impact on child and maternal health outcomes. The variables of maternal age, number of children, age of delivery, and sanitary conditions have a significant influence on various indicators of child and maternal health and nutrition. The ANOVA model (Table 1) shows that independent variables, namely maternal age, number of children, age of delivery, and sanitation, significantly affected the risk of stunting in children with an F of 240,698 and a significance value of 0.000. The total sum of squares is 215,490, with a regression sum of 154,623 and a residual of 60,867. Here are the results based on 10 relevant scientific articles/ books.

Research by Nugroho et al. (2023) revealed that social factors such as maternal education, parental work, income, environment, family social support, and health services are related to the incidence of stunting in Indonesia. Jones et al. (2016) found that urbanization is related to the double burden of malnutrition, where women of childbearing age are overweight and anemic while preschool children are stunted in Sub-Saharan Africa. Das et al. (2020) reported that higher maternal education, a minimum birth interval of 2 years, and a desired pregnancy were associated with a reduced risk of stunting in children in Mumbai slums. Migang et al. (2020) and Setiawan & Machsus (2023) highlight the role of families in providing nutritious food, creating a healthy environment as education about good nutrition and disease prevention to prevent and reduce stunting in Bekasi Regency. Kempton et al. (2021) examined the impact of methylmercury exposure on the health of

TABLE 3. Coefficientsa

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		Std.	Beta			Tolerance	VIF	
1	(Constant)	1.822	.122		14.931	.000		
	Sanitation	1.060	.096	.307	11.014	.000	.960	1.042
	Childbearing Age	.149	.063	.066	2.371	.018	.974	1.027
	Number of Children	1.027	.044	.644	23.308	.000	.977	1.024
	Mother's Age	-.511	.041	-.349	-12.526	.000	.959	1.042

a. Dependent Variable: Risk of Stunting
Source: Analysis Results, 2024

women of childbearing age and their children in the community of Munduruku, Brazil, and found that poor environmental exposure affects child health outcomes. Haider et al. (2023) found that pregnancy at a young age has an impact on growth retardation and long-term health in women in Bangladesh. They found that women who became pregnant at an early age experienced growth retardation compared to those who became pregnant at an older age. Nguyen et al. (2021) reported that adolescent births are associated with child malnutrition in Bangladesh. Children of adolescent mothers are more susceptible to malnutrition compared to children of adult mothers. This regression model (Table 2) shows a significant relationship between sanitation, childbearing age, number of children, and maternal age with stunting risk. The non-standardized coefficient for sanitation is 1,060, for the childbearing age is 0.149, for the number of children is 1,027, and for the mother's age is -0.511.

Sanitation has an unstandardized coefficient of 1.060 ($p < 0.001$), indicating that better sanitation conditions significantly reduce the risk of stunting. This is in line with research by Jones et al. (2016) which found that good sanitation is associated with a decrease in the prevalence of malnutrition in children in Sub-Saharan Africa (Jones, 2016). The age of childbirth showed a coefficient of 0.149 ($p = 0.018$), indicating that the older age of childbirth was slightly associated with an increased risk of stunting. These results contrast with the findings of Nguyen et al. (2019) which show that teenage pregnancy is more at risk of stunting. The number of children has a coefficient of 1,027 ($p < 0.001$), indicating that the more children a mother has, the higher the risk of stunting. This is supported by research by Pitoyo et al. (2022) which shows that families with more children are more prone to malnutrition problems. The mother's age had a negative coefficient of -0.511 ($p < 0.001$), indicating that the older mother's age was associated with a reduced risk of stunting. This is in line with research in Bangladesh by Haider et al. (2023) which shows that older mothers tend to have more nutritionally healthy children. The results of this study show that sanitary conditions, childbearing age, number of children, and maternal age significantly affect the risk of stunting in children in Indonesia. These findings provide important insights for the development of more effective public health policies, in reducing the prevalence of stunting. Taking these findings into account, targeted interventions on improving sanitation conditions, health education for young mothers, and family support can contribute significantly to reducing the risk of stunting in Semarang City.

The age of older mothers is negatively related to the risk of stunting is proven to be true. The negative coefficient (-0.511) indicates that children of older mothers tend to have a lower risk of stunting. It aligns with previous research by Haider et al. (2023) in Bangladesh. It showed that older mothers tend to have better knowledge about nutrition and access to better resources to support children's health. The number of children more positively related to the risk of stunting has also been proven true. A coefficient of 1,027 indicates that each additional child increases the risk of stunting. Research by Pitoyo et al. (2022) supports these findings, where families with more children are more susceptible to malnutrition due to limited resources. Younger childbearing age is also positively related to stunting risk, with a coefficient of 0.149. However, these results are slightly different from the findings of Alderman et al. (2019) which shows that teenage pregnancy significantly increases the risk of stunting higher than older childbearing age. Poor sanitation conditions are positively related to stunting risk as evidenced by a coefficient of 1,060.

These findings are consistent with research about risk factors in Myanmar by Khaing et al. (2019) identified regional risk factors associated with malnutrition in children in Myanmar, including socioeconomic status and household conditions. Feeding Strategies (Jeyakumar et al., 2022) show that infant and young children feeding strategies (IYCF) potentially reduce the double burden of malnutrition in urban slums in India. Nutritional status in Indonesia (Rafisa et al., 2023) evaluated the nutritional status of children with cleft lip and/or palate in Indonesia and found a significant prevalence of malnutrition in this population. Socioeconomic inequalities

in Sub-Saharan Africa, Ekholuenetale et al. (2020) examined socioeconomic inequalities in hidden malnutrition and malnutrition in children in 35 Sub-Saharan African countries. The Impact of Seasons in Uganda (Nahalomo et al., 2022), research assessed the influence of seasonal variations and related factors on child malnutrition in landslide-affected areas in Uganda. Causative Factors in Pakistan by (iddiqa et al. (2023) examined the determinants of stunting, wasting, and underweight in children in Pakistan, highlighting the importance of size at birth as a major risk factor. The findings of this study have important implications for theory and practice. Theoretically, these results confirm the importance of considering various demographic and environmental factors in the study. Practically, these findings suggest that targeted interventions on improved sanitation, maternal health education, and family support can help reduce the risk of stunting. Policies encouraging increased access to proper sanitation facilities and educational programs for young mothers can contribute significantly to stunting prevention efforts.

Conclusion

This study aims to identify factors that affect the risk of stunting in children in Indonesia, focusing on maternal age, number of children, childbearing age, and sanitation conditions. Key findings suggest that older maternal age reduces the risk of stunting, while a higher number of children and poor sanitation conditions increase the risk. Younger childbearing age also slightly increases the risk of stunting. The theoretical implications of the findings are that the results of this study strengthen the theoretical understanding of stunting determinants by emphasizing the importance of demographic and environmental factors. This study adds to the existing literature by showing the interaction between variables such as maternal age, number of children, and sanitation conditions in the context of stunting in Indonesia. Practically, these findings show that interventions that focus on improving sanitation conditions and maternal health education are very important in reducing the risk of stunting in Semarang City. Public health policies that support mothers in planning their families and improve access to proper sanitation facilities can contribute significantly to stunting prevention efforts.

References

Akseer, N., Bhatti, Z., Mashal, T., Soofi, S., Moineddin, R., Black, R.E., & Bhutta, Z.A., 2018. Geospatial Inequalities and Determinants of Nutritional Status Among Women and Children in Afghanistan: An Observational Study. *The Lancet Global Health*, 6(4).

Alam, M.A., Richard, S.A., Fahim, S.M., Mahfuz, M., Nahar, B., Das, S., Shrestha, B., Koshy, B., Mduma, E., Seidman, J.C., Murray-Kolb, L.E., Caulfield, L.E., & Ahmed, T., 2020. Impact of Early-Onset Persistent Stunting on Cognitive Development at 5 Years of Age: Results from a Multi-Country Cohort Study. *PLoS ONE*, 15(1).

Alderman, H., Nguyen, P.H., & Menon, P., 2019. Progress in Reducing Child Mortality and Stunting in India: An Application of the Lives Saved Tool. *Health Policy and Planning*, 34(9), pp.667–675.

Arini, D., Ernawati, D., Hayudanti, D., & Alristina, A.D., 2022. Impact of Socioeconomic Change and Hygiene Sanitation During Pandemic COVID-19 Towards Stunting. *International Journal of Public Health Science*, 11(4).

Das, S., Chanani, S., Shah More, N., Osrin, D., Pantvaidya, S., & Jayaraman, A., 2020. Determinants of Stunting Among Children Under 2 Years in Urban Informal Settlements in Mumbai, India: Evidence from a Household Census. *Journal of Health, Population and Nutrition*, 39(1).

Dewey, K.G., Wessells, K.R., Arnold, C.D., Prado, E.L., Abbeddou, S., Adu-Afarwuah, S., Ali, H., Arnold, B.F., Ashorn, P., Ashorn, U., Ashraf, S., Becquey, E., Bendabenda, J., Brown, K.H., Christian, P., Colford, J.M., Dulience, S.J.L., Fernald, L.C.H., Galasso, E., Hallamaa, L., Hess, S.Y., Humphrey, J.H., Huybregts, L., Iannotti, L.L., Jannat, K., Lartey, A., Port, A.L., Leroy, J.L., Luby, S.P., Maleta, K., Matias, S.L., Mbuya, M.N.N., Mridha, M.K., Nkhoma, M., Null, C., Paul, R.R., Okronipa, H., Ouédraogo, J.B., Pickering, A.J., Prendergast, A.J., Ruel, M., Shaikh, S., Weber, A.M., Wolff, P., Zongrone, A.,

& Stewart, C.P., 2021. Characteristics that Modify the Effect of Small-Quantity Lipid-Based Nutrient Supplementation on Child Growth: An Individual Participant Data Meta-Analysis of Randomized Controlled Trials. *American Journal of Clinical Nutrition*, 114.

Ekholuenetale, M., Tudeme, G., Onikan, A., & Ekholuenetale, C.E., 2020. Socioeconomic Inequalities in Hidden Hunger, Undernutrition, and Overweight Among Under-Five Children in 35 Sub-Saharan Africa Countries. *Journal of the Egyptian Public Health Association*, 95(1).

Geda, N.R., Feng, C.X., Henry, C.J., Lepnurm, R., Janzen, B., & Whiting, S.J., 2021. Multiple Anthropometric and Nutritional Deficiencies in Young Children in Ethiopia: A Multi-Level Analysis Based on A Nationally Representative Data. *BMC Pediatrics*, 21(1).

Gosdin, L., Martorell, R., Bartolini, R.M., Mehta, R., Srikantiah, S., & Young, M.F., 2018. The Co-Occurrence of Anaemia and Stunting in Young Children. *Maternal and Child Nutrition*, 14(3).

Haider, M.M., Kamal, N., Khan, S., Rahman, M.M., Dewan, M.N., Sarkar, S.S., Shafiq, S.S., & Alam, N., 2023. Trends in Women's Height and the Effect of Early Childbearing on Height Retardation: An Analysis of the Height of Bangladeshi Women Born Between 1974 and 1998. *Journal of Global Health*, 13.

Hasanah, I., & Susanti, H., 2018. Does Water and Sanitation Effects on Children's Physical Development? Evidence from Indonesia Family life Survey (IFLS) 2014. *E3S Web of Conferences*, 74.

Hashmi, A.H., Nyein, P.B., Pilaseng, K., Paw, M.K., Darakamon, M.C., Min, A.M., Charunwatthana, P., Nosten, F., McGready, R., & Carrara, V.I., 2019. Feeding Practices and Risk Factors for Chronic Infant Undernutrition Among Refugees and Migrants Along the Thailand-Myanmar Border: A Mixed-Methods Study. *BMC Public Health*, 19(1).

Jeyakumar, A., Babar, P., Menon, P., Nair, R., Jungari, S., Tamboli, A., Dhamdhere, D., Hendre, K., Lokare, T., Dhiman, A., & Gaikwad, A., 2022. Is Infant and Young Child-feeding (IYCF) a Potential Double-Duty Strategy to Prevent the Double Burden of Malnutrition Among Children at the Critical Age? Evidence of Association from Urban Slums in Pune, Maharashtra, India. *PLoS ONE*, 17(12).

Jones, A.D., Acharya, Y., & Galway, L.P., 2016. Urbanicity Gradients are Associated with the Household- and Individual-Level Double Burden of Malnutrition in Sub-Saharan Africa. *Journal of Nutrition*, 146(6).

Kabir, R., Farag, M., Lim, H.J., Geda, N., & Feng, C., 2021. Socio-Demographic and Environmental Risk Factors Associated with Multiple Under-Five Child Loss Among Mothers in Bangladesh. *BMC Pediatrics*, 21(1).

Kalsum, U., Islakhiyah, I., & Sitanggang, H.D., 2023. Prediction Models Comparison of Stunting in Districts/Cities of Stunting Locus with Different Geographical Characteristics in Jambi Province. *Proceedings of the 3rd Progress in Social Science, Humanities and Education Research Symposium (PSSHERS 2021)*.

Kempton, J.W., Périssé, A.R.S., Hofer, C.B., de Vasconcellos, A.C.S., de Sousa Viana, P.V., de Oliveira Lima, M., de Jesus, I.M., de Souza Hacon, S., & Basta, P.C., 2021. An Assessment of Health Outcomes and Methylmercury Exposure in Munduruku Indigenous Women of Childbearing Age and Their Children Under 2 Years Old. *International Journal of Environmental Research and Public Health*, 18(19).

Khaing, H.T., Nomura, S., Yoneoka, D., Ueda, P., & Shibuya, K., 2019. Risk Factors and Regional Variations of Malnutrition Among Children Under 5 in Myanmar: Cross-sectional Analyses at National and Subnational Levels. *BMJ Open*, 9(9).

Maulana, F.R., Putria, C.M., Fauzan, I.R., Firdaus, F., & Afrianto, Y., 2024. Peran Edukasi Stunting Terhadap Pengetahuan Pada Ibu Yang Mempunyai Anak Stunting. *Sinkron: Jurnal Pengabdian Masyarakat UIKA Jaya*, 2(2), pp.179.

Migang, Y.W., Rarome, M.J., Heriteluna, M., & Dawam, M., 2020. Intervention of Specific Nutrition and Sensitive Nutrition with Nutritional Status of Under Two-Year Infants in Family Planning Village as Efforts to Face the Demographic Bonus. *Jurnal Kesehatan Masyarakat*, 16(1), pp.101–110.

Momberg, D.J., Ngandu, B.C., Voth-Gaeddert, L.E., Cardoso Ribeiro, K., May, J., Norris, S.A., & Said-Mohamed, R., 2021. Water, Sanitation and Hygiene (WASH) in Sub-Saharan Africa and Associations with Undernutrition, and Governance in Children Under Five Years of Age: A Systematic Review. *Journal of Developmental Origins of Health and Disease*, 12(1).

Nahalomo, A., Iversen, P.O., Andreassen, B.A., Kaaya, A.N., Rukooko, A.B., Tushabe, G., Nateme, N.C., & Rukundo, P.M., 2022. Malnutrition and Associated Risk Factors among Children 6-59 Months Old in the Landslide-Prone Bududa District, Eastern Uganda: A Cohort Study. *Current Developments in Nutrition*, 6(2).

Najib, N., Giyarsih, S.R., Listyaningsih, U., & Nawawi, N., 2023. Analysis of Feeding Behavior and Family Food Security as a Stunting Risk Factor in Semarang City. *Jurnal Kesehatan Masyarakat*, 19(2), pp.270–277.

Najib, Rum Giyarsih, S., Listyaningsih, U., & Nawawi., 2023. Analysis of Feeding Behavior and Family Food Security as a Stunting Risk Factor in Semarang City. *Kemas*, 19(2).

Nasution, A.N., Prasetyo, A., Silaen, M., Fuada, N., Wahyudianto, H., Gartika, D., & Najib., 2024. Cumulative Effects of Supplemental Feeding Over Three Months on Toddler Growth: A Regression Analysis Perspective. *Journal of Poverty*, 2024, pp.1–16.

Nguyen, P.H., Scott, S., Khuong, L.Q., Pramanik, P., Ahmed, A., Rashid, S.F., Afsana, K., & Menon, P., 2021. Adolescent Birth and Child Undernutrition: An Analysis of Demographic and Health Surveys in Bangladesh, 1996–2017. *Annals of the New York Academy of Sciences*, 1500(1).

Nguyen, P.H., Scott, S., Neupane, S., Tran, L.M., & Menon, P., 2019. Social, Biological, and Programmatic Factors Linking Adolescent Pregnancy and Early Childhood Undernutrition: A Path Analysis of India's 2016 National Family and Health Survey. *The Lancet Child and Adolescent Health*, 3(7).

Nugroho, E., Wanti, P.A., Suci, C.W., Raharjo, B.B., & Najib., 2023. Social Determinants of Stunting in Indonesia. *Kemas*, 18(4).

Oktaviani, T.A., Suwarni, L., & Selviana, S., 2023. Risk Factors Related to Stunting. *Jurnal Info Kesehatan*, 21(4), pp.854–863.

Permatasari, T.A.E., & Chadirin, Y., 2022. Assessment of Undernutrition Using the Composite Index of Anthropometric Failure (CIAF) and Its Determinants: A Cross-Sectional Study in the Rural Area of the Bogor District in Indonesia. *BMC Nutrition*, 8(1).

Permatasari, T.A.E., Chadirin, Y., Ernirita, E.F., & Putri, B.A., 2023. The Association of Sociodemographic, Nutrition, and Sanitation on Stunting in Children Under Five in Rural Area of West Java Province in Indonesia. *Journal of Public Health Research*, 12(3).

Pitoyo, A.J., Saputri, A., Agustina, R.E., & Handayani, T., 2022. Analysis of Determinan of Stunting Prevalence among Stunted Toddlers in Indonesia. *Populasi*, 30(1).

Pradnyawati, L.G., Juwita, D.A.P.R., & Reviani, N., 2021. Risk Factors of Stunting in Kedisan, Gianyar District, Bali, Indonesia. *Jurnal Berkala Epidemiologi*, 9(3).

Prasetyo, A., Noviana, N., Rosdiana, W., Anwar, M.A., Hartiningsih., Hendrixon., Harwijayanti, B.P., & Fahlevi, M., 2023. Stunting Convergence Management Framework through System Integration Based on Regional Service Governance. *Sustainability (Switzerland)*, 15(3).

Rafisa, A., Sarilita, E., Delage, B., Munger, R.G., & Mossey, P.A., 2023. Situational Analysis of Nutritional Status Among 1899 Children Presenting with Cleft Lip and/or Palate in Indonesia. *Journal of Global Health*, 13.

Ramokolo, V., Zembe-Mkabile, W., & Sanders, D., 2018. Undernutrition and Its Social Determinants ☆. *Reference Module in Biomedical Sciences*, 2018.

Rukmana, E., Purba, R., Nurfazriah, L.R., & Purba, E.M., 2022. The Correlation between Characteristics, Knowledge of Nutrition and Nutritional Status (H/A) among Children Aged 6-59 Months in Medan City. *BIO Web of Conferences*, 54.

Sathiadas, M.G., Antonyraja, A., Viswalingam, A., Thangaraja, K., & Wickramasinghe, V.P., 2021. Nutritional Status of School Children Living in Northern Part of Sri Lanka. *BMC Pediatrics*, 21(1).

Setiawan, E., & Machsus, S., 2023. The Role

of Social and Economic Dimensions of The Family in Preventing and Reducing Stunting in Bekasi District. *Journal of Family Sciences*, 2023.

Siddiqa, M., Shah, G.H., Mayo-Gamble, T.L., & Zubair, A., 2023. Determinants of Child Stunting, Wasting, and Underweight: Evidence from 2017 to 2018 Pakistan Demographic and Health Survey. *Journal of Nutrition and Metabolism*, 2023.

Singh, S.K., Srivastava, S., & Chauhan, S., 2020. Inequality in Child Undernutrition Among Urban Population in India: A Decomposition Analysis. *BMC Public Health*, 20(1).

Sinha, S., Aggarwal, A.R., Osmond, C., Fall, C.H.D., Bhargava, S.K., & Sachdev, H.S., 2016. Maternal Age at Childbirth and Perinatal and Under-Five Mortality in a Prospective Birth Cohort from Delhi. *Indian Pediatrics*, 53(10).

Siti, N., Emy, H., & Retna, S.P., 2023. Safe Drinking Water, Sanitation and Mother's Hygiene Practice as Stunting Risk Factors: A Case Control Study in a Rural Area of Ciawi Sub-district, Tasikmalaya District, West Java, Indonesia. *Ethiopian Journal of Health Sciences*, 33(6).

Sukmawati, E., Marzuki, K., Batubara, A., Harahap, N.A., Efendi, E., & Weraman, P., 2023. The Effectiveness of Early Childhood Nutrition Health Education on Reducing the Incidence of Stunting. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(4).

Sulistyawati, F., Melinda, A., & Ratnasari, R., 2024. The Effect of Maternal Age on Stunting Incidence (Analysis of 2018 Riskesdas Secondary Data). *JNKI (Jurnal Ners Dan Kebidanan Indonesia) (Indonesian Journal of Nursing and Midwifery)*, 12(1),

Togatorop, V. E., Rahayuwati, L., & Susanti, R.D., 2023. Predictor of Stunting Among Children 0-24 Months Old in Indonesia: A Scoping Review. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(5).

Urgell-Lahuerta, C., Carrillo-álvarez, E., & Salinas-Roca, B., 2021. Interventions on Food Security and Water Uses for Improving Nutritional Status of Pregnant Women and Children Younger Than Five Years in Low-Middle Income Countries: A Systematic Review. *International Journal of Environmental Research and*