

Determinants of Undernutrition among Children under Five Years of Age in Indonesia: A Literature Review

Barra Renita

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Vrije Universiteit Amsterdam (VU)

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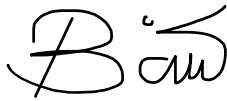
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Abstract

Background: Undernutrition among children under five years is a public health issue in Indonesia. Bali is the only province that has decreased the undernutrition prevalence and met the national targets. While Nusa Tenggara Timur has the highest prevalence of undernutrition and has not met the national targets. This thesis aims to identify the determinants of undernutrition among children under five years in Indonesia and to give insight into the undernutrition prevention program in Bali and Nusa Tenggara Timur province.

Methods: This descriptive study used a literature review of available data. The United Nations Children’s Fund framework on childhood undernutrition was adopted as guidance.

Findings: Children under five years in Indonesia receive inadequate food intake. Cultural influence, lack of knowledge, mothers having less autonomy, and poverty led to inappropriate feeding practices and less health care for children. Girls and boys receive equal food. However, household size and child marriage contribute to stunting. Moreover, low coverage of immunization; limited access to clean water, sanitation, and hygiene; pollution; and delayed monsoon onset cause children to be more susceptible to upper respiratory infection and diarrhea that further manifest as undernutrition. Lessons from the intervention program in Bali, the governments have strong coordination, attention to capacity building, monitoring, and evaluation, in contrast with Nusa Tenggara Timur.

Conclusion: The undernutrition interventions are relevant to solving the determinants in the Indonesian context. However, the ability of local governments in Nusa Tenggara Timur to implement remains an issue to be addressed.

Keywords: Undernutrition, Stunting, Wasting, Underweight, Indonesia

Word Count: 12,778

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Abbreviations

CED	Chronic Energy Deficiency
EIB	Early Initiation of Breastfeeding
HDI	Human Development Index
IFA	Iron and Folic Acid
IFLS	Indonesia Family Life Survey
IMCI	Integrated Management of Childhood Illness
IYCF	Infant and Young Child Feeding
LBW	Low Birth Weight
MoH	Ministry of Health
MUAC	Mid-upper Arm Circumference
NTT	Nusa Tenggara Timur
PHC	Primary Health Care
PHO	Provincial Health Office
Posyandu	<i>Pos Layanan Terpadu</i> (Integrated Health Service Post)
RDA	Recommended Dietary Allowance
RPJMN	<i>Rencana Pembangunan Jangka Menengah Nasional</i> (Medium Term National Development Plan)
RVA	Rotavirus A
SHS	Second-hand Smoke
TFC	Therapeutic Feeding Center
URI	Upper Respiratory Infection
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Key Terms

- Undernutrition** : a manifestation of deficiencies in a person's intake of energy and/or nutrients to supply their body's demands to ensure optimal growth and function (1,2)
- Stunting** : a condition in children with height-for-age deviate more than 2SD below the WHO Child Growth Standards (3)
- Wasting** : a condition in children with weight-for-height deviate more than 2SD below the WHO Child Growth Standards (3)
- Underweight** : a condition in children weight-for-age deviate more than 2SD below the WHO Child Growth Standards (3)

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1 CHAPTER 1: GENERAL INTRODUCTION TO CHILDHOOD UNDERNUTRITION

Worldwide, approximately 45% of deaths among children under five years of age are attributable to undernutrition (1). Undernutrition is a manifestation of deficiencies in a person's intake of energy and/or nutrients to supply their body's demands to ensure optimal growth and function (1,2). Undernutrition is a serious public health problem that contributes to child mortality and morbidity. Globally, there were 149.2 million stunted children and 45.4 million children under 5 suffering from wasting in 2020. Since 2000, the prevalence of stunting in children under 5 has fallen by one-third to 22%, and the number of stunted children in Asia has decreased significantly. However, the progress is too slow to achieve the 2030 global nutrition target on stunting. The prevalence and burden of wasting are also high, affecting 6.7% of children under 5. More than half of these children live in South Asia where poverty is widespread and access to nutritious diets and essential nutrition services is limited (4).

Undernutrition can lead to serious health issues in the immediate and long term. Impaired brain development and lower Intelligence Quotient, premature death, low birth weight, and weak immune system are the immediate consequences of undernutrition. In the long-term, chronically undernourished children have a higher propensity to become overweight or obese adults, face metabolic and cardiovascular diseases, and lower economic productivity and income in later life (5). Children suffering from wasting have a weak immune system, which can lead to a higher risk of death if it is not treated properly. If they do survive, they become more susceptible to stunted growth and long-term developmental delays (1,4). Stunting can increase children's morbidity and mortality; poor child development and learning capacity; increased risk of infections; and non-communicable diseases (6).

Given the immediate and long-term consequences of undernutrition in children, it is necessary to prevent the occurrence of undernutrition from the conception period. The intrauterine period is well known to be particularly critical for the future health and brain development of children (6,7). The developing brain is particularly vulnerable to nutrient insufficiency between 24 and 42 weeks of gestation because of the rapid course of several neurologic processes, including synapse formation and myelination. Optimal maternal nutrition and the supply of essential nutrients, such as vitamins and minerals, are essential components for fetal and infant development (6). The crucial period from conception through the age of two years for the growth and development of the fetus and child and its long-term health outcomes is called the first 1000 days of life. Poor nutrition in the first 1000 days of life can lead to permanent damage (5).

According to the United Nations Children's Fund (UNICEF) childhood undernutrition conceptual framework (Figure 1), the causes are classified as immediate (individual level), underlying (household or family level), and basic causes (societal level). These causes are interrelated to each other. Therefore, it needs a series of approaches, multifaceted, and multisectoral, to tackle this problem. Inadequate dietary intake and illness are the most significant immediate causes of undernutrition (8). Inadequate dietary intake and illness are attributed to food insecurity, inadequate care for children, insufficient health services, and unsanitary environments. These underlying causes are caused by conflict, inadequate education, poverty, gender inequality, inadequate infrastructure, politics, culture, religion, and technology (5,8).

2 CHAPTER 2: BACKGROUND

2.1 Childhood Undernutrition

According to World Health Organization (WHO), undernutrition is classified into three sub-forms: wasting, stunting, and underweight. Globally, at least one in three children suffer from one or more forms of undernutrition in 2020 (1,4). Wasting is a condition in children with weight-for-height deviate more than 2SD below the WHO Child Growth Standards (3). This is the result of the recent and severe process of weight loss or the failure to gain weight, which is often associated with acute starvation and/or prolonged illness (1,2,9). Stunting is a condition in children with height-for-age deviate more than 2SD below the WHO Child Growth Standards, which reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions (2,3). A high level of stunting is associated with poor nutrition in utero, poor nutrient intake in early childhood, repeated infection, and inadequate psychosocial stimulation (4,10). Underweight is defined as the weight-for-age deviate more than 2SD below the WHO Child Growth Standards, which reflects body mass relative to chronological age (2,3). It can also be seen as a sign of wasting or stunting or a combination of both (1).

2.2 Background Information of Indonesia: Bali and Nusa Tenggara Timur Province

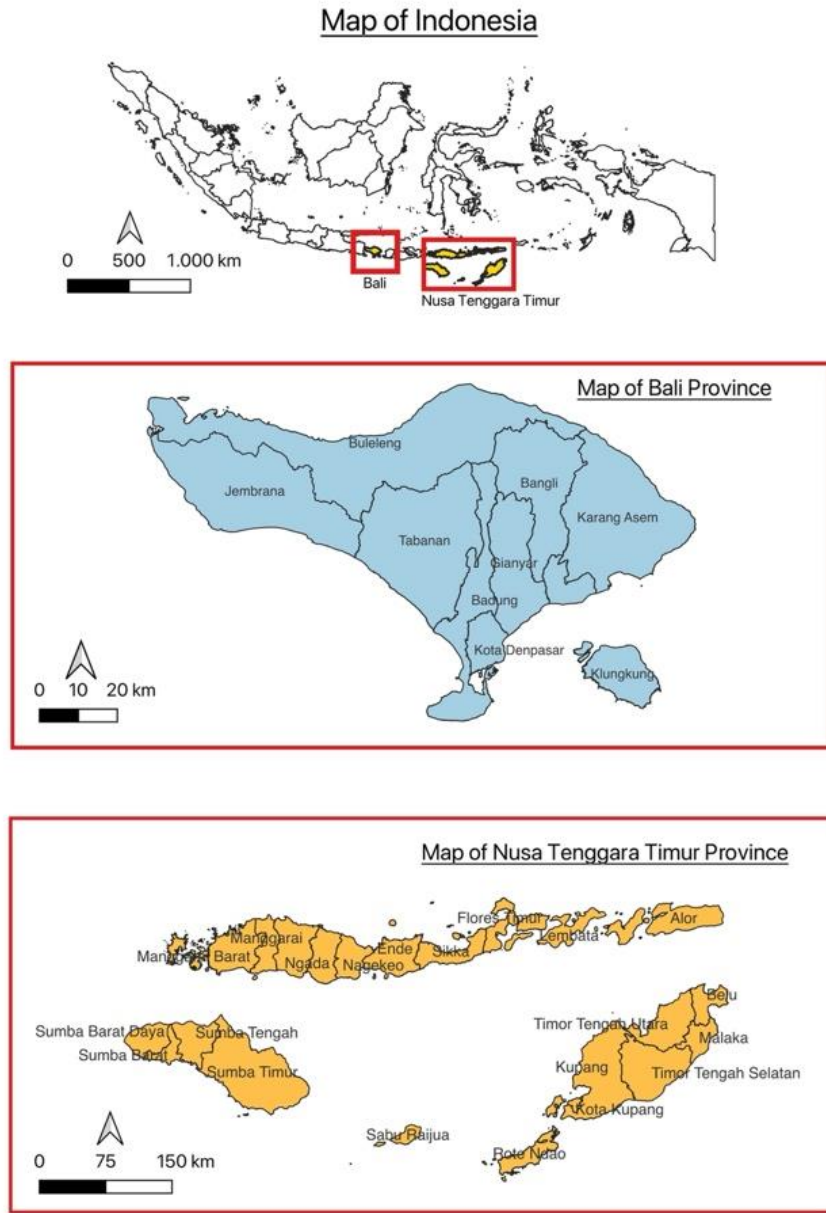
2.2.1 Geography of Indonesia: Bali and Nusa Tenggara Timur Province

The Republic of Indonesia is a densely populated (275,773,800 inhabitants) country located in Southeast Asia which comprises almost 17,000 islands with five main islands: Sumatra, Java, Kalimantan, Sulawesi, and Papua (11). Administratively, Indonesia has 34 provinces, and the capital city is situated in Jakarta. Its position at the equator line gives Indonesia a tropical climate with dry and rainy seasons. This influences agriculture conditions in Indonesia.

Indonesia is known for its rich cultural diversity, where every region has its own culture, ethnicity, local language, and religious festivals. Officially, there are six religions: Islam, as majority (86.9% of Indonesian population); Protestant (7.5%); Catholic (3.1%); Hindu (1.7%); Khong Hu Chu (0,05%); and Buddhist (0,03%) (12). These diversities influence Indonesian people in terms of food consumption, feeding practice, and childcare.

Bali province is situated between Java and Nusa Tenggara Island. It has a 5,780.06 km² area with 9 regencies or cities. Topographically, in the middle of Bali Island, a mountainy area with volcanoes can be found (13). As a world-tourist destination, Bali is one of the economic centers of Indonesia instead of Java (14). The majority religion in Bali is Hindu.

Nusa Tenggara Timur (NTT) province is an archipelago that has 1,192 islands. It has 47,931.54 km² with a population density of 111 inhabitants per km² (15). NTT has 22 regencies or cities, most of them having savanna climates with large tropical grasslands. NTT experiences long dry seasons of around 8 months (16). The majority religion is Christian.



Picture 1. Maps of Indonesia: Bali and Nusa Tenggara Timur Province 2020
 The United Nations Office for the Coordination of Humanitarian Affairs provides the shapefile; The author created the map in QGIS 3.26.

2.2.2 Demography and Socio-economic Status of Indonesia: Bali and Nusa Tenggara Timur Province

According to the Indonesian Ministry of Health (MoH) 2020 report (17), at the national level, the number of children under 5 in 2020 was 21,952,000 and it is expected to be slightly decreasing to 21,858,400 in 2024. There is wide health disparity based on socio-economic status, region, and rural and urban areas. Child mortality among poor families is four times higher than among rich families. Moreover, infant and maternal mortality is higher in rural, eastern Indonesia, and is related to low education levels (17).

The health system in Indonesia is decentralized from the MoH to provincial and district governments. The responsibilities of MoH are regulating, ensuring the availability of resources, including human resources, and supervising social insurance schemes. The provincial governments are responsible for the provincial hospitals and organizing the health services within the province and across districts through the provincial health office (PHO). The district health offices will operate health services through primary health care (PHC) and integrated health service posts (Posyandu; Pos Layanan Terpadu in the Indonesian language). In the decentralized health system, each level has its mandates and areas of authority. The PHO is responsible to the provincial governor, not the MoH. However, the MoH has some “vertical” programs such as immunization that operate directly at the provincial and district level (18).

The neonatal and child mortality in Bali accounted for 4.3 and 6.4 per 1,000 livebirths respectively in 2021 with the highest prevalence caused by low birth weight for neonatal while pneumonia and diarrhea for children (13). The literacy rate for both males and females above 15 years was 99.9% in 2021 with no difference between genders. The majority of the people reached secondary school for the education level. The human development index (HDI) in Bali is persistently above the national HDI, which accounted for 75.7 in 2021 (Indonesia’s HDI in 2021 was 72.3) (19).

In contrast, the neonatal and child mortality in NTT accounted for 45 and 58 per 1,000 livebirths respectively in 2012 (20), and in absolute numbers, the neonatal and child mortality cases in 2021 were 955 and 119 respectively (21). The literacy rate among the age group above 15 years was 97.8%, for males 1% higher than for females (22). The HDI in NTT was 65.3, lower than the national HDI in 2021 (19).

3 CHAPTER 3: PROBLEM STATEMENT, JUSTIFICATION, OBJECTIVES, AND METHODOLOGY

3.1 Problem Statement

Indonesia is one of the countries in which undernutrition is a serious public health issue across all provinces, both in urban and rural areas (23). The Indonesian government commits to decreasing the prevalence of undernutrition in Indonesia. The prevalence of wasting, stunting, and underweight in Indonesia in 2019 accounted for 7.4%, 27.7%, and 16.3%, respectively. In 2021, there was decreased percentage of stunting and wasting in children, but an increased percentage of underweight children, namely 7.1%, 24.4%, and 17% respectively (24). These achievements do still not meet the target. It is projected that a decrease of 2.7% per year is needed to achieve the goal of 14% prevalence of stunting in 2024 according to President Decree Number 72 the Year 2021; there is a 7% prevalence target for wasting; and a 12% prevalence target for underweight in 2024 (23,25,26) (Figure 1).

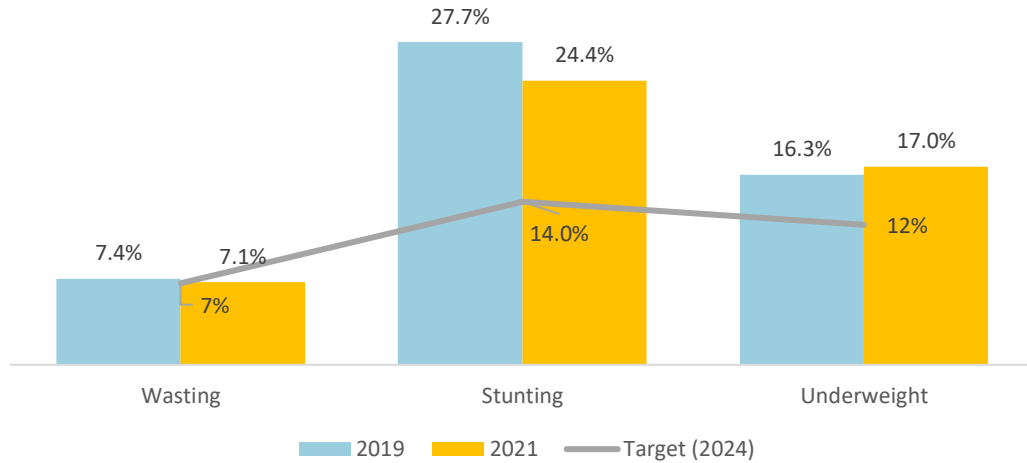
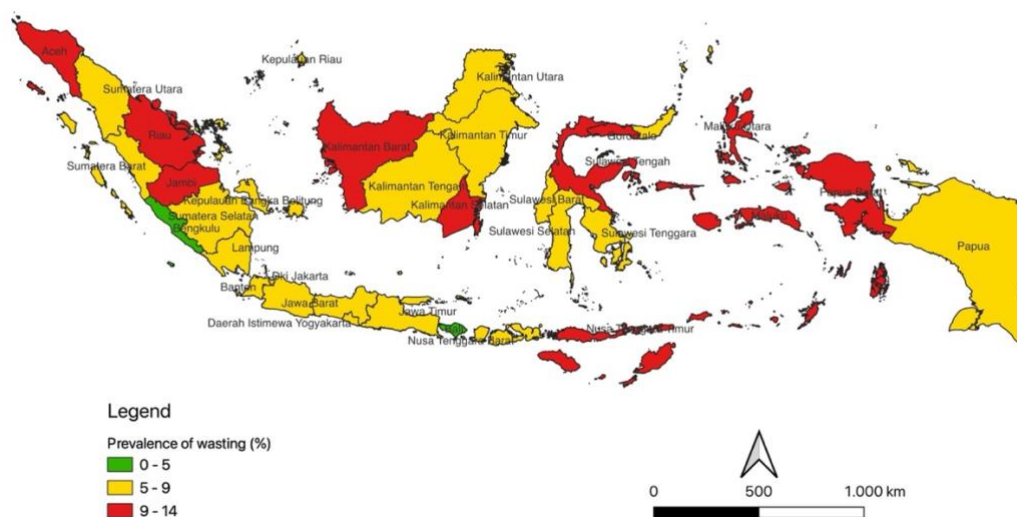


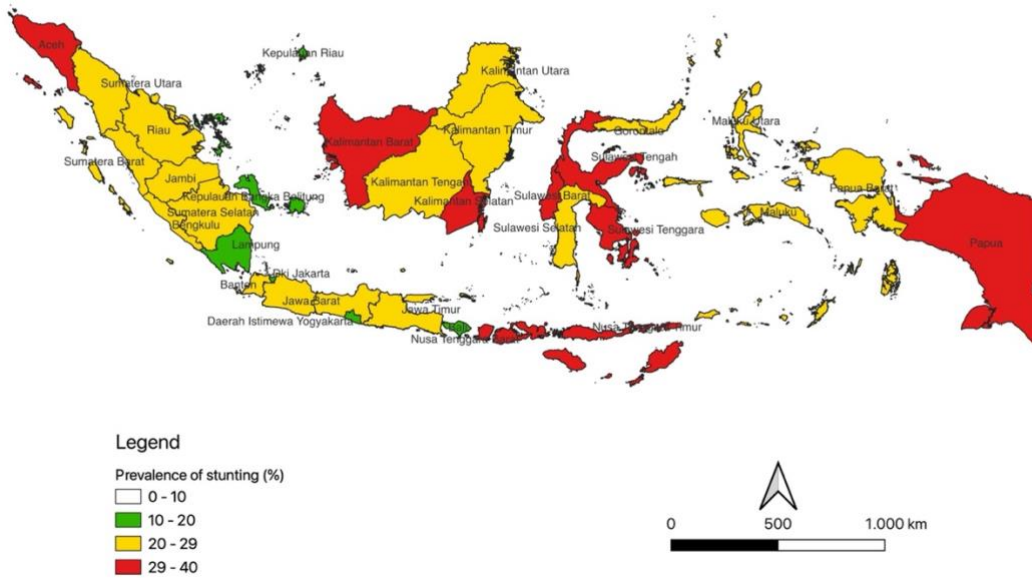
Figure 1. Prevalence of wasting, stunting, and underweight among children under 5 in Indonesia between 2019 and 2021, and its target in 2024 (24,26)

NTT was a province that has the highest prevalence of stunting and underweight among other provinces, 37.8%, and 29.3% respectively, also the prevalence of wasting (10.1%) was higher than the national standard in 2021 (24). On the other hand, Bali was the only province that successfully achieved the national target to decrease stunting, wasting, and underweight prevalence in 2021. The Indonesian government has put efforts and made commitments to decrease undernutrition through the national agenda and strategies. The achievement so far is showing slow progress. The pictures below depict the prevalence of stunting, wasting, and underweight by provinces in Indonesia in 2021 (24).

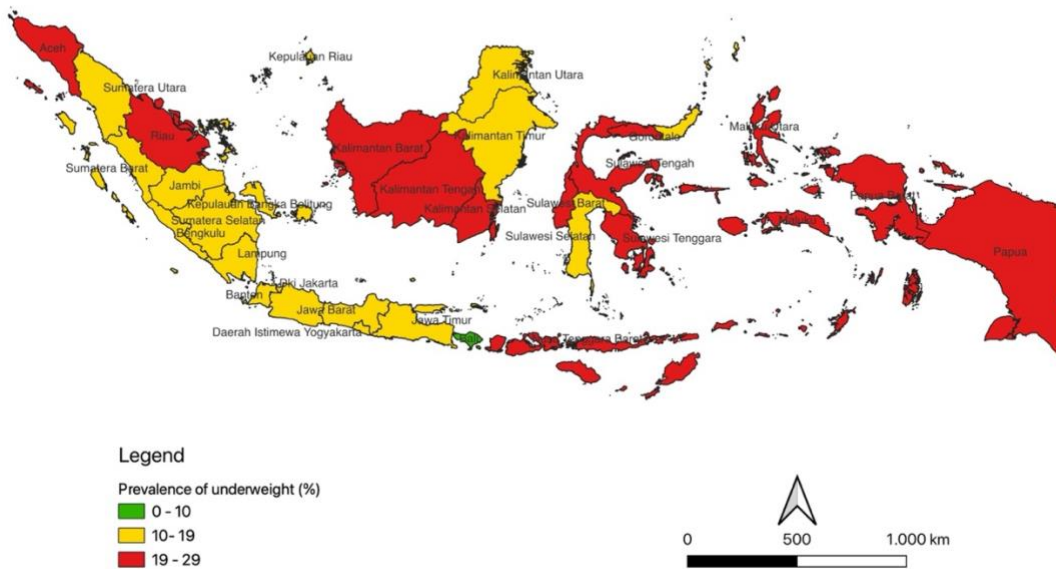
The prevalence of wasting among children under five by provinces in Indonesia, 2021



The prevalence of stunting among children under five by provinces in Indonesia, 2021



The prevalence of underweight among children under five by provinces in Indonesia, 2021



Picture 2. The prevalence of stunting, wasting and underweight by provinces in Indonesia in 2021 (24)

The United Nations Office for the Coordination of Humanitarian Affairs provides the shapefile; The author created the map in QGIS 3.26.

3.2 Justification of The Study

Under the national strategy to accelerate undernutrition reduction, Indonesia is also aiming to achieve Sustainable Development Goals 2.2, which aims to end all forms of undernutrition by 2030, and to achieve the internationally agreed targets on stunting and wasting in children under 5 by 2025. Furthermore, the intervention during the first 1000 days of life is a crucial period to prevent undernutrition in children, in line with support from cross-sectoral collaboration.

A comprehensive picture of the social determinants of undernutrition among children under 5 in Indonesia is limited. There is a need to explore social determinants of undernutrition among children under 5 in Indonesia, which involves not only focusing on the health sector but also identifying other factors that contribute to or increase undernutrition. Moreover, based on the national nutrition status survey conducted in 2021 (24), only one province (Bali) among 34 provinces in Indonesia has achieved the national target. Exploring what has been done in the province where the undernutrition prevention program was done well is needed to provide lessons for other provinces. Furthermore, it can be a reference for future researchers on this subject matter.

3.3 Study Objectives

a. General Objective

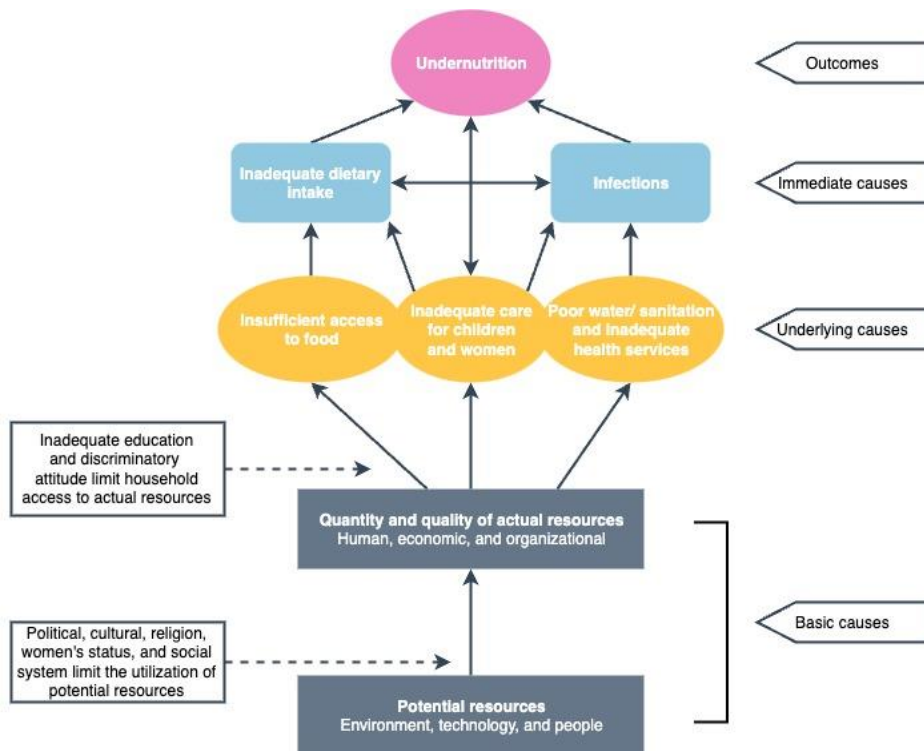
To identify the determinants of undernutrition in children under 5 years in Indonesia to give recommendations to policymakers on improving undernutrition prevention implementation in Indonesia.

b. Specific Objectives

1. To explore the determinants of undernutrition in children under 5 in Indonesia in general and specifically in Bali and Nusa Tenggara Timur provinces.
2. To give insight into the undernutrition prevention program in Bali (has reached the national target) compared to Nusa Tenggara Timur (has not reached the national target).
3. To develop recommendations for the Indonesian Ministry of Health and relevant stakeholders to address and improve the undernutrition prevention implementation in Indonesia.

3.4 Methodology

The study is a descriptive study based on a literature review. The literature review was the method used to address the objectives of the thesis using the UNICEF childhood undernutrition conceptual framework (Picture 3). The framework serves as a guide in assessing and analyzing the causes of the nutrition problem (multisectoral, embracing food, health, and caring practices) and helps in identifying the most appropriate mixture of actions. This framework is used at the national, district, and local levels to plan effective nutrition interventions (8).



Picture 3. The Conceptual Framework from UNICEF, 1998 (8)

At the individual level, inadequate dietary intake and infection are immediate causes of undernutrition, which often occur simultaneously and reinforce one another (Figure 2) (27,28). Children with poor diets are more susceptible to infection and have a lower immune response to invading pathogens (27).

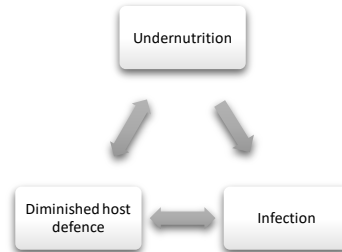


Figure 2. The cycle between undernutrition and infection (27)

The complementary feeding period, when infants are introduced to food and liquids other than breast milk, is the high-risk period for children to undergo undernutrition and infection (28). The increased mortality among children under 5 associated with undernutrition is almost entirely caused by a high risk of death from infectious diseases such as pneumonia, diarrhea, helminths, malaria, and measles (29,30). Infection results in reduced nutrient intake, reduced nutrient absorption, nutrient losses, and increased nutrient requirement via anorexia, malabsorption, and inflammatory response (Figure 3) (27). Episodes of infection, especially chronic infections or inflammation or gut mucosal damage including HIV, tuberculosis, cryptosporidiosis, and giardiasis, can cause both linear and ponderal growth impairment (29). Another study reported fever and immunization status are associated with the incidence of stunting (31).

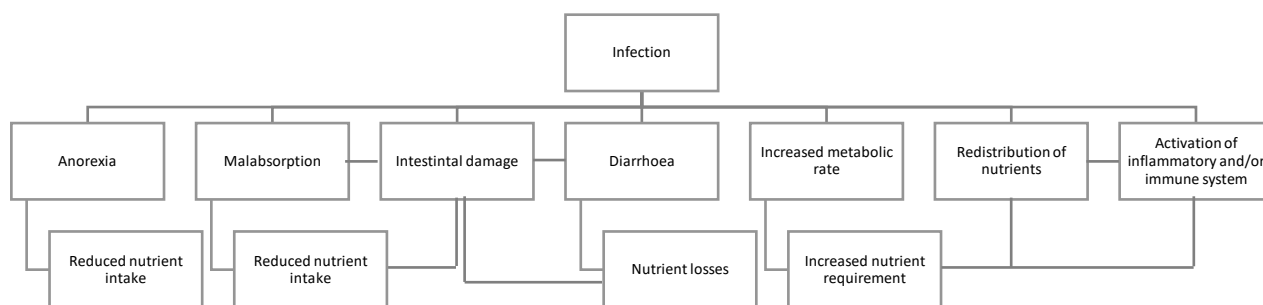


Figure 3. The infection causes a decrease in nutrient status (27)

There are three underlying causes: inadequate access to food, inadequate care for women and children, and insufficient health service and unhealthy environment. Household food security depends on access to food and utilizes the food, for instance, people in rural areas will depend on access to land and agricultural resources to have sufficient domestic food sources, and people in urban areas will depend on the affordability price of the market to purchase foods. Another essential element of good health is access to affordable and good quality of curative and preventive health services. However, even though there is adequate access to food and health services, children can still be undernourished if there is inadequate care for both mother and children. Care for children encompasses all practices and behaviors that are needed for child growth and development. Good support and care for mothers will enable them to give better care to young children (8).

In the basic causes, poverty is not the main reason for the incidence of undernourished children, because it can happen in rich families. Political, legal, and cultural factors are also important to take into consideration. It includes the rights of women and girls to access education, health services, and food distribution in the households, and how the political and economic system determines income standards for female workers (8).

Based on this conceptual framework, this review was done through a literature search using PubMed and the VU library databases. Other websites such as MoH, WHO, UNICEF, and World Bank were also used to collect relevant data on undernutrition among children under 5 to accomplish the objective of the thesis. Also, relevant English and Indonesian literature on the determinants, intervention programs, and program implementation of undernutrition among children under 5 was reviewed. The following combination of keywords was used to search for appropriate literature (Table 1).

Table 1. Keywords used for searching the literature

	Problem/ Issue terms		Factor-related terms		Geographical scope terms
	Undernutrition		Inadequate food intake		(Southeast) Asia
	Stunting		Infections		Indonesia
	Underweight		Inadequate access to food		Bali
	Wasting		Care for children		Nusa Tenggara Timur
	Weight-for-height		Care for women		

OR	Weight-for-age	AND	Health service	AND	
	Height-for-age		Environment		
			Education		
			Economic		
			Women's empowerment		
			Gender inequality		
			Culture		
			Religion		
			Household type		
			Child Marriage		
			Health Insurance		
			Climate change		
			Politic		
			Technology		

Inclusion criteria:

1. Studies on determinants of undernutrition, risk factors, management of undernutrition forms, and evidence-based interventions for children under 5.
2. Studies were conducted in the last ten years (2012-2022). Using the snowball technique, the references of the selected studies were considered as additional sources even though they were published before 2012.
3. Relevant documents, reports, and unpublished literature were included.

Exclusion criteria:

1. Studies on school children (above the age of five).
2. Studies on over-nutrition and overweight among children under 5.

4 Chapter 4: RESULTS

4.1 Objective 1: Determinants of Undernutrition in Children under 5 in Indonesia

The relevant literature found in this result section is described according to the UNICEF framework on undernutrition among children under five years of age. The presentation of results will be started from immediate causes, followed by underlying, then basic causes.

4.1.1 Immediate Causes

4.1.1.1 Inadequate dietary intake

Table 2 shows the nutrient intake of children under 5 in Indonesia, Bali, and NTT compared to the Recommended Dietary Allowances (RDAs) (32,33) issued by MoH. The available data is from 2014, the year in which the last survey on feeding patterns and nutrient intake especially micronutrient intake in children in Indonesia was performed. The collation of dietary information has been a challenge due to the complexity and variety of Indonesian diets, and the seasonality of food availability (34).

Table 2. The nutrient intake of children under 5 in Indonesia, Bali, and Nusa Tenggara Timur

Nutrients	RDA	Indonesia	Bali	Nusa Tenggara Timur
Energy (kcal)	1375	1118	1194	1014
Protein (g)	17.25	25.5	27.1	23.2
Fat (g)	38.67	41.9	42.9	19.4
Carbohydrate (g)	149.75	148	157.5	138.5
Fiber (g)	12.5	18.55		
Vitamin A (µg)	406.25	298		
Vitamin D (µg)	12.5	3.7		
Vitamin E (mg)	5.5	2.05		
Vitamin B1 (mg)	0.4	[0.08-0.63]		
Vitamin B2 (mg)	0.45	[0.09-0.93]		
Vitamin B3 (mg)	5	[0.6-3.9]		
Vitamin B6 (mg)	0.38	[0.41-0.85]		
Folic acid (µg)	130	[34.54-122.6]		
Vitamin B12 (µg)	1.2	[1.59-1.99]		
Vitamin C (mg)	43.75	[2.2-45]		
Calcium (mg)	530	234.46		
Phosphor (mg)	334	[540-852]		
Sodium (mg)	547.5	888		
Iron (mg)	7	4.6		
Zinc (mg)	2.76	3.3		

Sources: Siswanto, 2014; Arini et al, 2022; Edith et al, 2016 ; Valentina et al, 2014 (35–38)

The data from Table 2 shows that children under 5 in Indonesia at the national level were reported to have an adequate macronutrient intake except for energy intake which accounted for 81% of RDAs. In NTT, children under 5 with deficit energy intake had 8.9 times higher risk to be undernourished compared with children with sufficient energy intake (39). Micronutrient deficiencies, especially for vitamin A, vitamin D, vitamin E, vitamin B3, folic acid, calcium, and iron, were reported at a national level (35–38). This deficiency may be caused by the low consumption of fruits and animal-source foods (35). Several studies comparing micronutrient intake between stunted and non-stunted children under 5 found that vitamin A, vitamin D, Zinc, and iron deficiency were significantly contributing to the stunting incidence in Indonesia (40–43). While, macronutrient deficiency particularly energy, carbohydrate, protein, and fat was found as a determinant factor of wasting (44,45).

4.1.1.2 Infection

In Indonesia, the most common infections among children under 5 in 2021 were Upper Respiratory Infection (URI), diarrhea, measles, helminths, and pneumonia (Figure 4). Malaria is only found with high prevalence in some provinces such as Papua, West Papua, NTT, Bengkulu, and North Maluku (24). However, the data on malaria among children under 5 is not available at the province level. In addition, TB cases among children under 5 are found in Indonesia which accounted for 22 per 10,000 children under 5 (46).

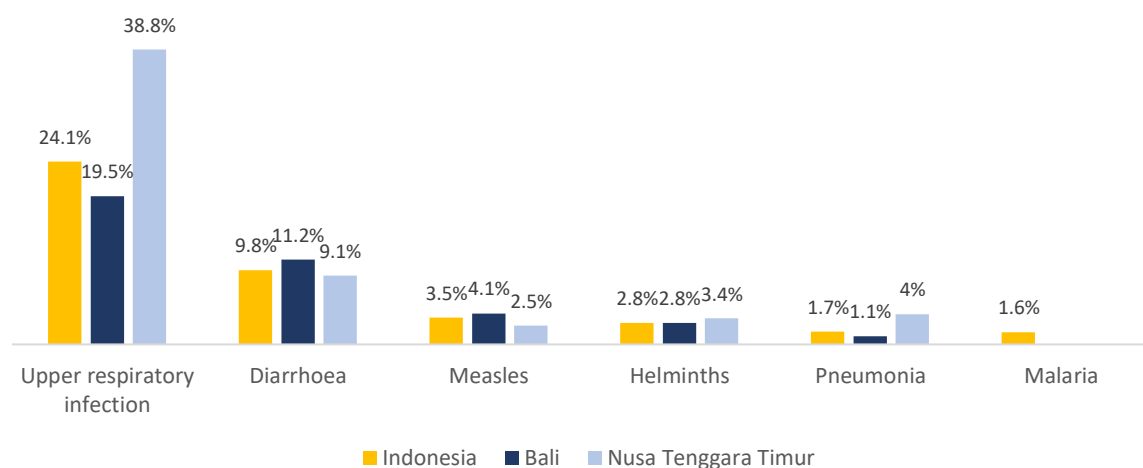


Figure 4. The percentage of infections among children 0-59 months, in 2021 (24)

Children under 5 who are suffering from acute diarrhea (more than three times a day) have a 1.3 times higher risk of being stunted (47). Children under 2 with an infection history are 3.7 times more likely to be stunted compared with children under 2 who never got an infection. In addition, frequency of illness is found to be significantly associated with undernutrition among children under 5 in NTT (48,49). The same finding in Bali, children of age 24-59 months with infectious disease history (namely URI and diarrhea) are 5.4 times more likely to be stunted (50). Moreover, evidence shows that immunization status is associated with infection occurrence among children under 5 in Indonesia (31).

4.1.2 Underlying Causes

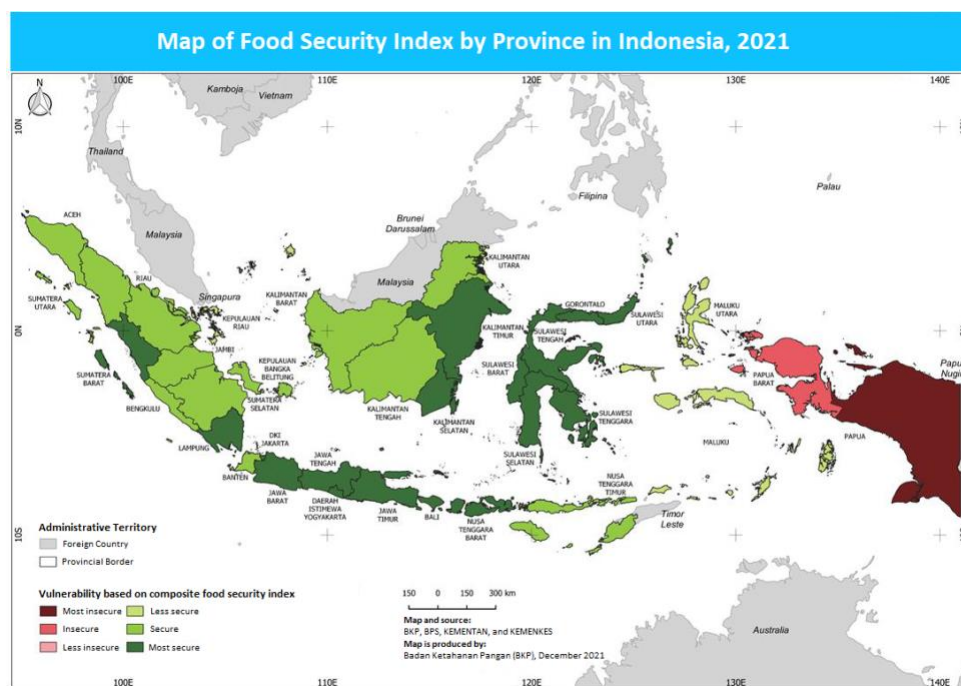
4.1.2.1 Inadequate access to food

The Indonesian Food Security Council classifies the food security index into six categories. The classification uses nine indicators covering the food availability, accessibility, and utilization analysis based on the food and nutrition security conceptual framework. The first category is the least food and nutrition secure, and the sixth category is the most food and nutrition secure (Table 3). Across the country, the eastern part of Indonesia had a lower index compared with the western part of Indonesia. Only Papua province was categorized as most insecure and West Papua province as insecure (Picture 4). In contrast, Bali was categorized as the most food and nutrition secure (score 83.82) among other provinces in 2021 (51).

Table 3. The food security index classification at the province level

	Food Security Category	Score (0-100)	Status
↑ Vulnerability	1	≤ 37.61	Most insecure
	2	>37.61 – 48.27	Insecure
	3	>48.27 – 57.11	Less insecure
	4	>57.11 – 65.96	Less secure
	5	>65.96 – 74.40	Secure
	6	>74.40	Most secure

Source: Badan Ketahanan Pangan, Kementerian Pertanian RI 2021 (51)



Picture 4. Map of Food Security Index by Province in Indonesia, 2021

Source: Badan Ketahanan Pangan, Kementerian Pertanian RI 2021 (51)

- Food availability
Food production on a national scale is known and used as a proxy for food availability. Rice is the main staple food, although, in some parts of Indonesia, people consume maize, cassava, and sweet potato as the main staple food. Unfortunately, rice and other staple food commodities production take mainly place in Sumatra, Java, and Bali Island, while most rural districts in the Eastern part of Indonesia experience a deficit in the production of cereals and tubers (14,52).
- Food accessibility
The ability of households to access food is strongly related to poverty. The national poverty line in Indonesia between 2000 and 2018 has declined from 20% to 9.8%, but in absolute numbers, 25.9 million people were still living in poverty (53). The gap between poor and rich is wide, which is shown in the Gini index, 0.381 in 2021 (54). Papua and NTT provinces are the provinces with the highest

percentage of poverty (55). Lack of access to electricity, roads, and transport via water are the issues found in most villages in these provinces (52).

- Food utilization

Food utilization includes the way food is stored, processed, and prepared; the cooking water and safe drinking water; and the hygiene condition. Therefore, access to safe drinking water and electricity is important (52). The province with the highest number of households without access to electricity was NTT then followed by Papua in 2010. Provinces without access to safe drinking water were noticed in the Eastern part of Indonesia (14). Another factor that is also important is women who have good knowledge and skill in nutritious food and food security. It is because the mother is the main caregiver who prepares the food for the children (51).

Children under 5 living in provinces categorized in the most food and nutrition insecure status were 2.1 times more likely to be underweight and 1.7 times more likely to be stunted than children under 5 living in the food and nutrition secure provinces (56). Although this study was conducted in 2010 using data from the 2010 Basic Health Research, it is still relevant to the current situation. For example, Bali is classified as the most secure province, it has the lowest prevalence of stunting, wasting, and underweight in Indonesia.

4.1.2.2 Inadequate care for women and children

Indirectly, care for children is started since pregnancy. Adequate care for pregnant women will contribute to healthy infants and prevent the occurrence of giving birth to a low-birthweight (LBW) newborn. Inadequate dietary intake including iron tablet consumption, low antenatal care (ANC) visits, and malaria in pregnancy are factors contributing to the occurrence of LBW. In NTT in 2019, a study found there was a significant association between LBW and the occurrence of stunting among children under 5 (57). It is because LBW newborns are vulnerable to infections. In addition, with a weight of <2500 grams, they do not meet the standard of procedure to receive the first immunization, namely Hepatitis B.

The most critical aspect of care behavior for children are feeding and protecting children's health.

Feeding:

For infants less than 6 months, exclusive breastfeeding is the only food source recommended by WHO. The percentage of infants who had Early Initiation of Breastfeeding (EIB) at the national level according to Indonesian nutrition status research 2021, was lower than the national target. Bali province has achieved the national target while NTT remained lower as shown in figure 5. However, the prevalence of exclusive breastfeeding among children under 6 months at the national level and in both Bali and NTT was higher than the national target as shown in figure 6 (24).

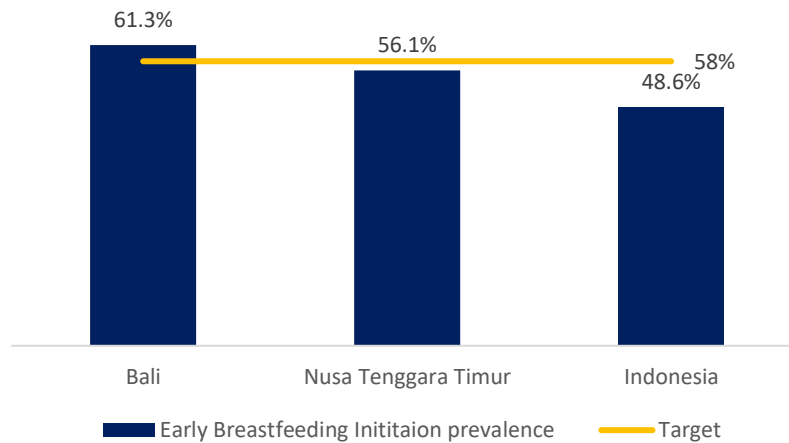


Figure 5. Prevalence of children who receive early initiation of breastfeeding in Bali and Nusa Tenggara Timur, 2021 (24,26)

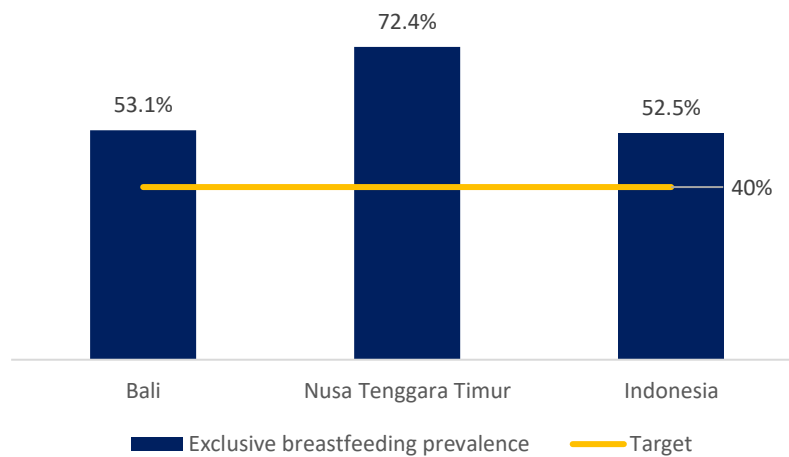


Figure 6. Prevalence of children under 6 months who receive exclusive breastfeeding in Bali and Nusa Tenggara Timur, 2021 (24,26)

A study was conducted to see the association between the duration of EIB; colostrum administration; starting breastfeeding in the first 1 hour; breastfeeding until the age of 23 months and undernutrition among children under 2, using data from the 2018 Indonesian Basic Health Survey, found that the higher the proportion of these four factors in a province, the lower the undernutrition level among children under 2 (58).

For children around the age of 6 months, the energy and nutrients provided by breast milk are insufficient to meet their needs, so complementary food is needed to be introduced at this phase (59). Good information, knowledge, and free cultural bias of caregivers related to feeding practice is the important thing (8). For instance, a study conducted in Nias Island, Indonesia, depicting a rural area, reported that among 215 children that were categorized as mildly wasted, 74% of them were introduced to liquid foods besides breast milk during the first seven days of life, 48% of them did not experience EIB, and 14% of infants were introduced to supplementary liquids between 8 days and 6 months. Infant formula and tea were preferred as supplementary liquids (60). The early introduction of complementary feeding also happened on Madura

Island in Indonesia. Mothers feed bananas mixed with rice to their infants on the seventh day after birth. The misperception is that the baby is starving because they were not given bananas mixed with rice (61). A study conducted in NTT has found that children under 5 who received early complementary food were 34.5 times more likely to be undernourished compared with children who received complementary food at the age of 6 months (39). In addition, hygiene in food preparation and storage is important in this stage.

Son preference in most Asian countries is a predictor of the occurrence of undernutrition, but there is less evidence in Indonesia. An analysis study using the 1993 and 1997 Indonesia Family Life Survey (IFLS) investigated whether there is unequal allocation of food between boys and girls. The study found that there was no unfavorable allocation of food to girls between 1993 and 1997 (62). A qualitative study from an urban and rural area in Indonesia in 2020 also revealed that both boys and girls within families receive equal food and treatment (63).

Protecting Children's Health

Immunization status is closely linked to the occurrence of infection among children under 5. At the national level, the prevalence of children under 2 who have received complete basic immunization in 2021 accounted for 65.8%. The graph below (Figure 7) shows the coverage in Bali was higher than NTT (24). A cross-sectional study using data from the IFLS 2014-2015 showed that children with uncompleted basic immunization are 1.8 times more at risk of stunting compared with children who received complete basic immunization in Indonesia (64).

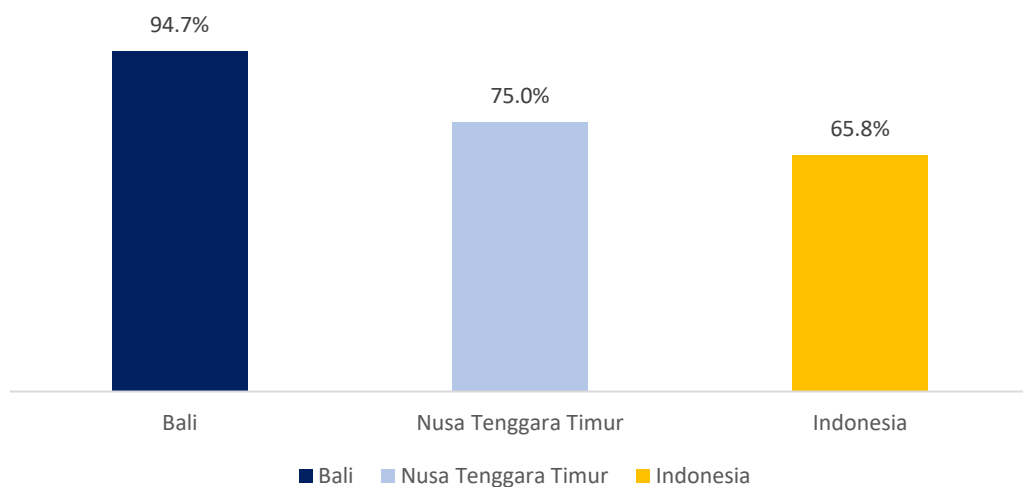


Figure 7. Prevalence of children under 2 receiving complete basic immunization in Bali and Nusa Tenggara Timur, 2021 (24)

The health-seeking behavior of caregivers is also an important thing. A study on factors associated with the utilization of health care services among children under 5 with acute respiratory infection symptoms using data from the 2012 and 2017 Indonesia Demographic and Health Survey found four factors contributing to the children receiving medical care. First, children born in rich households were 2.3 times more likely to receive medical care compared with children born in poor households. Second, children aged 2 years or older received less healthcare compared with

children under 2 due to the perception that children under 2 are vulnerable and have more priority to receive medical care. Third, children received less medical care who were born from a mother who was not assisted by a skilled birth attendant or did not attend ANC. It is because mothers did not have information related to children's health and lacked trust in the healthcare provider. Lastly, children received less medical care if their mothers were not permitted by husbands to visit health care services (65).

4.1.2.3 Unhealthy household environment and inadequate health service

Environmental problems, such as inadequate water, sanitation, and hygiene which are common in low-middle-income countries are increasingly recognized to affect children's nutritional status. Waterborne diseases such as diarrhea which was the top gastrointestinal infection among children under 5 in Indonesia in 2021 manifest through exposure to a fecal contaminant found in water, soil, and food. Hand-to-mouth contact, eating soil (geophagy), and object mouthing for infants and crawling children are the reason children under 5 are at risk of fecal-oral contamination (66). According to data from the WHO/UNICEF Joint Monitoring Program for water supply, sanitation, and hygiene (2020), 6% of inhabitants in Indonesia still practice open defecation with a higher proportion in rural areas (67). According to data from the 2018 Indonesia Basic Health Research, the province with the lowest proportion of having basic sanitation was Papua (55,8%). Around 85.8% of the population in NTT and 94.1% of the population in Bali had basic sanitation (68).

The national survey conducted by the Indonesian MoH on household drinking water in 2020, found that in 81,9% of 19.906 households sample, the drinking water in Indonesia was contaminated with *E.coli* (Figure 8).

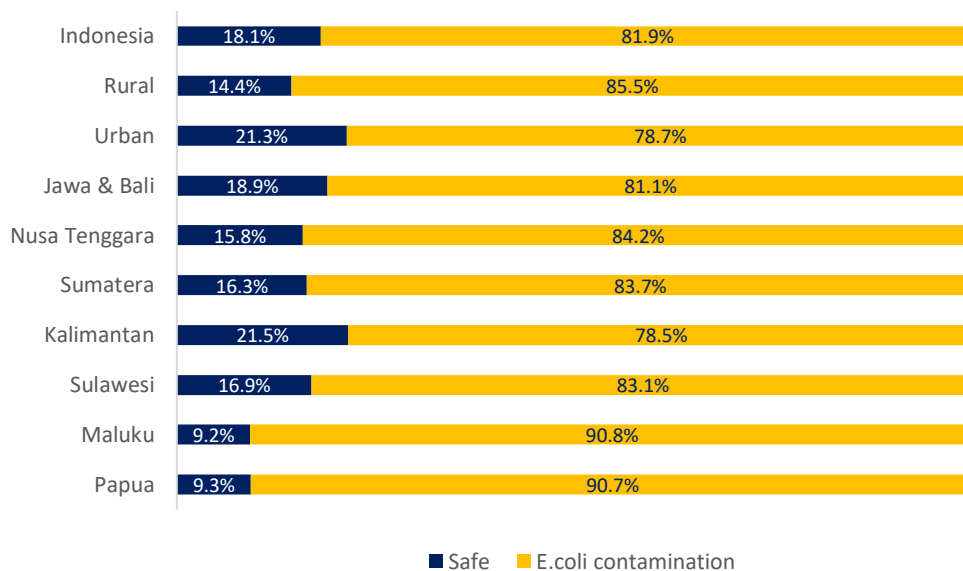


Figure 8. Prevalence of safe and *E.coli* contaminated drinking water in Indonesia, 2020 (69)

Even though there is significant progress in improving basic sanitation which accounted for 92% in 2020, only 77.3% of the households have a toilet connected to

a septic tank (69). This contributes to the poor management of feces that can seep into nearby water sources (70).

Based on the 2013 Indonesian Basic Health Research Report, 33% of 9,688 children under two were stunted. The analysis identified that families practicing open defecation were 1.4 times more likely to have a stunted child compared with families who have basic sanitation. The odds ratio between households drinking water from unimproved water sources and stunting was 1.3, and the odds ratio between poor hygiene and stunting was 1.1. Additionally, families who practiced poor waste management (for example waste burnt or disposed of in a ditch or the river) were 1.2 times more likely to have a stunted child compared with families who managed their waste well (71).

Furthermore, second-hand smoke (SHS) was found to increase the incidence of stunting among children under 5. A study showed that the duration of exposure to cigarette smoke more than 3 hours per day increased the incidence of stunting by 10 times among children 25-59 months (72). SHS is an important public health issue in Indonesia because 78.4% of Indonesian households smoked inside the house in 2017 (73). Children under 5 are one of the vulnerable groups to SHS due to nicotine contained in cigarette smoke, which can decline the oxygen supply by approximately 30-40% and disturb the absorption of micronutrients that are important for the growth development of children under 5 (72).

Improved access and health care utilization were found to be associated with higher height-for-age z-scores and are inversely associated with early childhood stunting (74). The existence of PHC within 5 km of the population is categorized as good access to health care. Approximately, 95.5% of the villages across Indonesia had access to a health facility within 5 km except for some districts in Papua in 2013 (52). Moreover, the role of Posyandu contributes to maternal and child health. However, Posyandu was not actively operated, for example in NTT, only 50.8% of Posyandu were active in 2017.

4.1.3 Basic Causes

4.1.3.1 Education

Parental education for both fathers and mothers has been shown to significantly lower the risk of having stunted children (47,74). The association between parental education and child nutrition status can be influenced by factors such as practices concerning nutritious food intake, feeding practice, childcare, children immunized, household healthy environment, and providing them with vitamin A and other important micronutrients, which would prevent from undernutrition. Vollmer et al. examined the comparison of the role of paternal and maternal education to childhood undernutrition in 62 low-middle income countries between 1990 and 2014. The study found that the association was stronger for maternal education to reduce childhood undernutrition (75). A mother's education is more important than a father's education because more educated women with health-related knowledge will be open to modern medicine and know how to seek health care for their children (74). Another study found that the number of maternal years of schooling, 8.5 years, lowered the risk by 4% of having stunted children in Indonesia (47). In the Indonesian education system, 8 years of school is categorized as junior high school level. Therefore, mothers

who have completed primary school are expected to be able to read and better understand to receive information. A better-educated caregiver is perceived to have appropriate nutritional knowledge and tends to engage in more protective caregiving (47). Nowadays, caregivers are not only limited to parents or family members but can also be untrained and less-educated domestic paid caregivers. It can be a factor for families at risk of having undernourished children related to inadequate child-care support (76).

4.1.3.2 Economic factors

Household poverty has been known as an indicator of socioeconomic status that is directly linked to stunting among children under 5 in Indonesia. In addition, it is related to maternal education, inadequate access to food, lack of access to health care, and unhealthy environments (77).

A study using data from the 2018 National Socioeconomic Survey and the 2018 Basic Health Research found that the proportion of food expenditure is significantly associated with the prevalence of stunting at the province level ($p = 0.007$). The province with a higher prevalence of stunted children under 5 spent a higher proportion of the household income on food expenditure (77). As Engel's Law states that the percentage of income allocated for food purchases declines when income rises (78). Another finding according to the 2017 IDHS data is that children under 5 of women who had husbands not working in agriculture were 2 times more likely to receive diversified food. Non-agricultural occupation is linked to a fixed monthly income, which means families can afford diversified food for their children (79). Family income is the factor that is significantly associated with the occurrence of stunting among children 0-23 months old in both Bali and NTT provinces (80).

The existence and quality of education and health sector infrastructure in a province also contribute to the undernutrition prevention program. For example, schools, health facilities, and other public places that provide a nursing room and promote breastfeeding. Good access to health care facilities in terms of timing and costs also plays a role in preventing undernutrition.

4.1.3.3 Women's empowerment and gender inequality

The role of mothers or women in households as primary caregivers is an important determinant to improve the nutrition status of children under 5. Women who are empowered by three things, resource, agency, and achievement, will have control, participate in decision making, and act for good behavior on their children (81). A study using the 2017 Indonesian DHS data to see the association between women's empowerment and Infant and Young Child Feeding (IYCF) practice revealed that women's empowerment is significantly associated with appropriate IYCF practices. Children of women with a high level of empowerment are 1.3 times more likely to receive a diversified diet compared with children of women with a low level of empowerment. Economically empowered women have a better ability to purchase food and distribute it to their children. Moreover, women could make better decisions for their children if they have higher self-confidence (79).

Women's empowerment is closely linked to gender relations between men and women. A qualitative study conducted in Indonesia with informants from rural and

urban areas revealed that the man is dominant within households and influences family eating behavior. According to informants, culture and religion consider men as leaders, while women are companions for men and a wife's role is to keep their husband's wealth (63). The culture mentioned in this context is Javanese, which is also the first majority ethnicity among 1331 ethnicities in Indonesia, and accounted for 40% of the Indonesian inhabitants in 2010 (82). If the husbands have less knowledge about childcare, the wives could follow the wrong practice. However, another study revealed that children of female-headed households are 1.5 times more likely to experience concurrent stunting compared with children of male-headed households. It is because, in many developing countries, female-headed households are prone to poverty, and they have less access to job opportunities and government services (83).

4.1.3.4 Myths, beliefs, and culture

Myths, beliefs, and culture related to food taboo for children, pregnant women, and lactating women are still practiced across Indonesia, both rural and urban areas. Some qualitative studies showed inappropriate feeding practices among stunted children in different provinces and ethnicities. For instance, for children 9-23 months in Sasak ethnicity in West Nusa Tenggara province, parents only give them rice with egg or fish and soup or only rice, and for children over 24 months, they eat the same food as other family members eat or only rice with salty water. Sick children are not allowed to eat bananas, fish, eggs, and chicken. The restricted foods to eat for lactating women are bananas, fish, and pumpkin (84). In Madurese ethnicity, children are not allowed to receive an immunization (85).

About religion, a study using data from IFLS investigated the association between Ramadhan fasting exposure during pregnancy and stunting in childhood and adolescence (0-19 years). This study found that children who were prenatally exposed to fasting in the first trimester of pregnancy from religious mothers were shorter in the adolescence period (15-19) compared to their unexposed siblings. Even though the outcome is found in adolescence, this finding is still relevant to be included to put more attention on pregnant women's food intake during Ramadhan fasting (86).

4.1.3.5 Household's type and size

The household type which is divided into nuclear two-parent (consists of parents and children), nuclear one-parent, extended, and grand families were researched to see the association of household type with concurrent stunting among children under five in Indonesia. The evidence shows there is no significant association between concurrent stunting with household type in Indonesia. The household size, however, is marginally significantly associated with concurrent stunting. The bigger household size is 1.3 times more likely to have concurrent stunted children compared with 2-4 household size (83).

4.1.3.6 Child marriage and teenage pregnancy

Another factor that is also important to the occurrence of stunting is the development of the fetus *in utero*. Early marriage among adolescents as part of traditional practices is an issue in most low-middle income countries including

Indonesia. The teenage pregnancy period linked to early marriage becomes riskier due to iron deficiency anemia. In the labor stage, they will give birth to a low-birth-weight newborn who later has more risk to be a stunted child. Evidence shows that teenage girls who experience early marriage under 20 years old are 1.7 times more likely to have stunted children (87).

4.1.3.7 Ownership of health insurance

One of the barriers to seeking health care for children is the financial issue specifically for poor families. The Indonesian government launched a health insurance program for poor families (called ASKESKIN) to tackle this problem. A study investigated the effectiveness of the program using data from the 1993-2007 IFLS. The study found that children under 2 years from families who had private health insurance or labor insurance were protected from stunting. But there was no difference in risk between children from a family who had ASKESKIN and without any health insurance (88). Even though the detailed analysis was not mentioned in the discussion of the study, another study explained that out-of-pocket health payments increased in the ASKESKIN program (89). Later in 2014, the Indonesian government launched national health insurance toward universal health coverage in 2030. However, there is a limited study to examine the new national health insurance system for undernutrition among children under 5 in Indonesia. Herman et al. reported that the national health insurance provides benefits in undernutrition prevention in Balikpapan province, Indonesia in 2019 (90).

4.1.3.8 Climate change

Global climate change is potentially disrupting the agriculture system, socioeconomic status, and the prevalence and distribution of diseases. For instance, increased temperature and variability of precipitation (monsoon onset) affect the crop's yield which can influence food availability, especially in case there is extreme drought, flood, and other disasters which will reduce a household's ability to access food. The high price of food due to lack of food availability in the markets gives an adverse impact on households' access to food, which then affects the children's nutrition status. Data from the IFLS which were collected in 1993-4, 1997-8, 2000, 2007-8, and 2014-5 showed that delayed monsoon onset significantly contributes to the occurrence of stunting among children 24-59 months and wasting among children under 2 (91).

4.2 Objective 2: Insight into the Undernutrition Prevention Program in Bali and NTT

Due to the seriousness of undernutrition in Indonesia and as a commitment to overcome this, the Indonesian government has set out the stunting prevention acceleration program as one of the priorities in the 2020-2024 Medium Term National Development Plan or *Rencana Pembangunan Jangka Menengah Nasional (RPJMN)* in the Indonesian language which is aligned with the SDG 2 targets. Even though the title is mentioned as stunting prevention, the interventions of this program also reduce the prevalence of wasting and underweight.

- There are five pillars in the stunting prevention acceleration program, namely:
1. Commitment and leadership at the national and local (province, district, and village) level
 2. Campaign and behavioral change
 3. Specific and sensitive intervention program convergence at the national and regional (province, regency, and village) level
 4. Food security at the individual, household, and community level
 5. Monitoring and evaluation

The Indonesian government focuses on specific and sensitive nutrition interventions as its effort to tackle the problems that are also reflected in the UNICEF framework. Initially, the stunting prevention program has become a priority and was set out in the 2015-2019 RPJMN. However, some challenges were faced such as the specific and sensitive interventions from national and regional were not convergent (planning, process, monitoring, and evaluation), policy and program implemented in multi-sectoral did not prioritize the effective interventions, budget allocation and utilization were not effective and efficient, lack of advocacy, campaign, counseling, and promotion program, and generally low coordination in all government levels (92).

Based on these learnings, pillar 3 in the 2020-2024 program supports local governments to implement the specific and sensitive intervention program more structured, effective, and efficient through 8 actions (Figure 9). The target groups in interventions are pregnant women, lactating mothers, children under 5, adolescent girls, and pre-marriage couples.

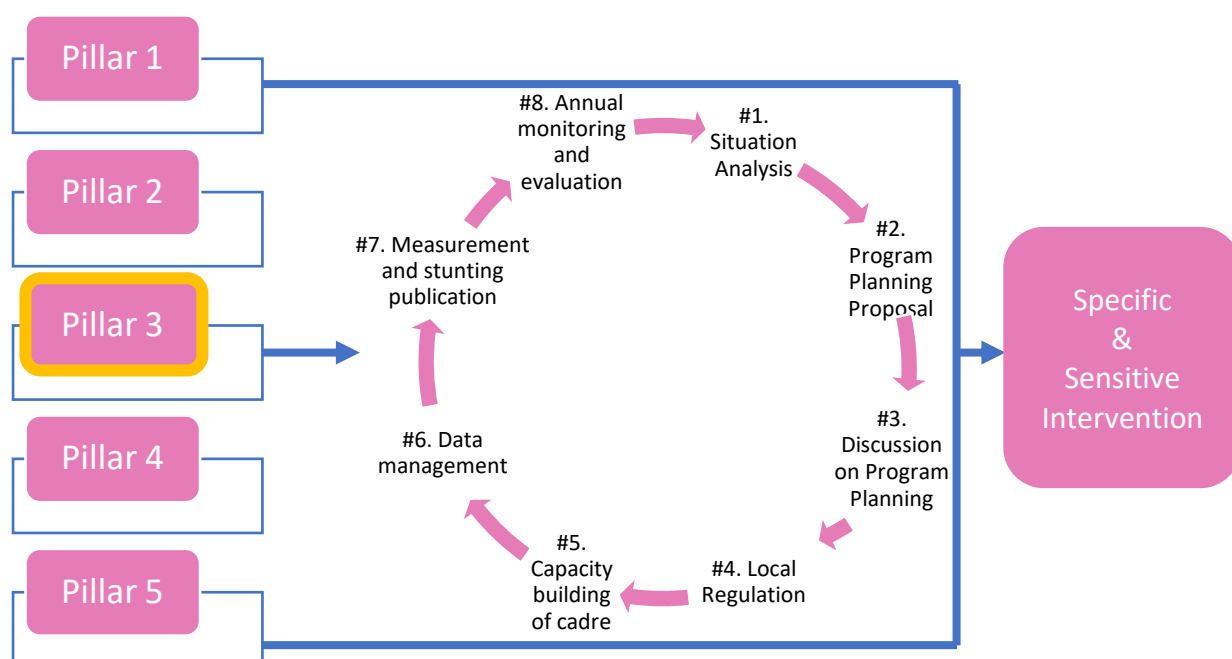


Figure 9. Pillars of stunting prevention acceleration program (92)

Built on the specific nutrition intervention that is under the responsibility of the MoH, the stunting prevention acceleration program aims to overcome the immediate causes as described above. There are nine points in the specific nutrition intervention in Indonesia, namely:

1. Supplementary food for pregnant women with Chronic Energy Deficiency (CED) and underweight children

The distribution of supplementary food is focused to fulfill the macro and micronutrient needs of pregnant women to prevent LBW and for children 6-59 months old to prevent stunting. The target group is pregnant women with CED who have mid-upper arm circumference (MUAC) less than 23.5 cm and underweight children who have a weight-for-height below 2SD. Supplementary food for pregnant women with CED is nutritional supplementation in the form of biscuits made with a special formulation and fortified with vitamins (A, D, E, B1, B2, B3, B5, B6, B12, C, Folic acid) and minerals (Iron, Calcium, Natrium, Zinc, Iodium, Phosphor, and Selenium). Supplementary food for underweight children contains energy, protein, fat, vitamins (A, D, E, K, B1, B2, B3, B6, B12, Folic acid), and minerals (Iron, Iodium, Zinc, Calcium, Natrium, Selenium, Phosphor). The supplementary food is distributed from national to province then regency or city and PHC, next will be distributed to target groups directly from PHC or Posyandu (93).



Picture 5. Supplementary food for underweight children (left) and pregnant women with CED (right)

Source: Petunjuk Teknis Pemberian Makanan Tambahan, 2017 (93)

2. Iron and Folic Acid (IFA) supplementation for adolescent girls and pregnant women

Iron and Folic Acid supplementation is targeted at adolescent girls and pregnant women to increase their hemoglobin levels and prevent iron deficiency anemia. All adolescent girls and pregnant women should receive IFA supplementation without any criteria. It contains at least 60 mg Fe and 400 mcg Folic Acid. The distribution to target groups can be in health facilities, schools, and working places (94).

3. Breastfeeding counseling and education

Every workplace and public place including health facilities should provide a nursing room. Health facilities should have a breastfeeding counselor to give counseling and education to clients. The promotion media in a nursing room can be a poster, brochures, pictures, electronic media, and social media. Instead of facility-based service, breastfeeding counseling and education also can be held in community-based service (95).

4. Complementary feeding counseling and education

Efforts to improve the nutritional status are not only sufficient from health facility services, but it needs to be in line with the community's knowledge and skills about complementary feeding. The role of community health workers or 'cadre' in Indonesia is crucial because they are close to the community, therefore they need to gain

knowledge and skills on complementary feeding to work independently to promote, educate, and give counseling to mothers (96).

5. Treatment for undernourished children under 5

Undernourished children need to be treated immediately with interventions using either individual or community-based approaches. Generally, the intervention for undernourished children without comorbid is only supplementary food. In the area with a high prevalence of undernourished children, there is a Therapeutic Feeding Center (TFC) to treat undernourished children (97).

6. Growth monitoring for children under 6

In Indonesia, growth monitoring is focused on children at age 0-72 months old. The weight measurement is done once a month, and the length or height measurement is done once every 3 months. The location is at primary health facilities, in Indonesia, it is commonly held in Posyandu and preschool (98). The aim is as early detection to prevent stunting, wasting, and underweight among children under 6.

7. Micronutrient supplementation

Micronutrient supplementation consists of calcium supplementation for pregnant women and Vitamin A for children under 5. In addition, there is multivitamin and mineral supplementation in powder form to be given during breakfast to children under 5 and priority under 2. Technically, vitamin A is given twice a year which is in February and August.

8. ANC and Immunization

ANC is ideally recommended four times during pregnancy, once in the first trimester, once in the second trimester, and twice in the third trimester. Pregnant women should have received Tetanus Toxoid immunization to prevent tetanus neonatorum. During the first pregnancy, pregnant women should have at least a second shot.

9. Integrated Management of Childhood Illness (IMCI)

IMCI services are carried out by nurses or midwives under the supervision of a trained doctor in PHC. In areas where access to health facilities is limited, non-health workers are allowed to provide limited curative services with a community-based IMCI approach (99).

The sensitive nutrition intervention is under the responsibility of other ministries. The sensitive undernutrition intervention will tackle the underlying and basic causes. It is divided into four types: improving drinking water and sanitation; improving access to nutrition and health care; Increasing awareness, commitment, and adequate care for mother and children; and Improving access to nutritious food (Appendix) (92).

At the provincial level, provinces are responsible to adapt these interventions in their strategic planning and implementation in their area. As mentioned in the previous section, Bali is the only province in Indonesia that has successfully decreased the prevalence of stunting, wasting, and underweight in 2021. Getting information and having comprehensive insight from Bali province about the implementation of the undernutrition prevention program is needed for lessons to other provinces, especially NTT province. The next two chapters will therefore focus on the progress of the program in Bali and NTT province.

4.2.1 Best Practice from Bali Province

The following information is based on the report of the stunting prevention acceleration program supervision in Bali province by the Indonesian Parliament Commission IX (100). The responsibility of the Bali province government for the stunting prevention program that is in accordance as regulated in the 2020-2024 RPJMN are:

1. Meetings every 3 months to discuss the stunting prevention program, such as policy alignment of provincial targets and national policy
2. Advocating and promoting
3. Campaign through media
4. Reallocate sources, such as human resources and budget
5. Partnership with the private sector and assisting district offices

According to budget allocation, Table 1 shows that Bali province put specific attention to capacity building, improving coordination, and monitoring and evaluation. Therefore, the implementation of programs is more effective and efficient.

Table 4. Budget allocation on programs in 2020 and 2021

Budget source	2020	2021
Provincial budget	Monitoring and evaluation	<ul style="list-style-type: none"> • Procurement of Iodine test • A meeting to strengthen inter-program and sectoral • Technical assistance with nutrition interventions
Health Operational Subsidy Budget	<ul style="list-style-type: none"> • A meeting for inter-program and sectoral coordination and consolidation • Tracing and confirmation of undernutrition cases • Training of feeding practice • Training in undernutrition management 	<ul style="list-style-type: none"> • Coordination meeting on stunting prevention program • Introduction of supplementation food • Assist the nutritional surveillance • Confirmation of undernutrition cases • Monitoring and evaluation
Specific Allocation Budget	<ul style="list-style-type: none"> • Supplementation food for pregnant women with CED (2050 packs for 2050 target) • Supplementation food for underweight children under 5 (1964 packs for 1964 target) 	<ul style="list-style-type: none"> • Supplementation food for pregnant women with CED (2505 packs for 2050 target) • Supplementation food for underweight children under 5 (1510 packs for 1510 target)

Bali has the most active Posyandu among 34 provinces in Indonesia (100). Considering that Posyandu plays an important role to support the implementation of supplementary food distribution, micronutrient supplementation distribution, growth monitoring, breastfeeding counseling and education, and complementary feeding counseling and education. Especially during the Covid-19 pandemic, the growth monitoring for children under 5 in Posyandu was still held but only in the safer zone, while in the higher risk of the Covid-19 zone, it was held by appointment in PHC (100). The Family Welfare Empowerment also plays a role in promotive and preventive, therefore all cadres have good knowledge and skill in the theory of the first 1000 days of life. In the context of Covid-19, the adjustment in program implementation was applied, such as human resource capacity building was done online or face to face with health protocol rules and the Indonesia Nutrition Status Survey was done with health protocol rules.

Due to refocusing the budget on Covid-19 management in 2020, there was a remaining budget in the stunting prevention program amount of 8,579 USD. In the 2021 period, the Bali province government put the budget on the stunting prevention program which source is from the national budget with a total amount of 137,231 USD (Table 2). Bali province has put prioritized improving nutritional surveillance, therefore it can give detailed, quick, and accurate information that can be used to monitor and evaluate programs or policies. Counseling and educating individuals and the community also become a priority so that the implementation of the programs is more effective.

Table 5. Budget plan for stunting prevention program in Bali province for period 2021

No.	Program	Budget (in IDR)
1	Improved nutritional surveillance	410,000,000
2	Training on feeding practice for healthcare providers	163,200,000
3	Introducing TB management in workplaces	294,000,000
4	Facilitating and training occupational health	124,310,000
5	Facilitating and training TB management in workplaces	119,580,000
6	Facilitating and training student's physical activity	195,850,000
7	Monitoring maternal and child health service	98,612,000
8	Maximizing local government's role in monitoring and evaluating health protocols in school	163,810,000
9	Mother and child class	239,560,000
10	Orientation about the management of PHC with basic obstetric and neonatal emergency	146,820,000
11	Orientation about adolescence health management	88,440,000
	Total	2,044,182,000 (137.231 USD)

The Indonesia National Health Insurance covers ANC and postnatal care services which can be billed as non-capitation by health facilities. It will drive healthcare providers to give optimum service to assist pregnant and lactating women to prevent

stunting because they can send the bill based on the number of patients. The capitation paid by the Health Social Security Agency to primary health facilities can be used to support nutritional surveillance and undernutrition case tracing programs.

4.2.2 Challenges in Nusa Tenggara Timur

In pillar 1, commitment and leadership at the national and local level, there is a provincial policy to support the national strategy to decrease stunting prevalence in NTT. According to the audit report in 2020 (101), there was a lack of coordination inter-sectoral and non-governmental partnerships due to the absence of guidance. As a result, some programs were not implemented yet, such as education, counseling, and behavior change programs (a class for caregivers and early childhood education program). It is because there was no coordination between the MoH and the Ministry of Communication and Multimedia. Mapping on priority areas for safe water installment also has not been done. In addition, lack of monitoring is a challenge generally in NTT.

Reflecting on pillar 2, campaign and behavioral change, that supports the effectiveness of other programs in the specific and sensitive intervention, the audit in 2020 reported that five regencies in NTT did not have regulations on a program to promote a healthy lifestyle. 11 regencies did not have regulation on behavioral change communication. This caused a lack of awareness among people on healthy lifestyles and stunting prevention.

Moving to the next pillar, the analysis of supplementary food in 2016 conducted by MoH, summarized that there was no budget to transport supplementary food from district health departments to PHCs, and there was no monitoring and evaluation of the distribution from PHCs and Posyandu to target groups, and there was a delay on reporting. Technically, the distribution of supplementary food from PHC or Posyandu did not follow the guidance because of a lack of information among health workers. It was because there was no coordination between the provincial government to district and village governments. For instance, the regency of Timur Tengah Selatan, distributed supplementary food to all children who visited Posyandu. On the other hand in PHCs had a higher number of underweight children than the supplementary food stock, consequently, many underweight children did not get the supplementary food. In general, there was a lack of information and guidance on the criteria of the target group, therefore in the planning step, PHCs reported a projection number of the target groups to the national and there was a mismatch between the real number of the target group and the supplementary food they received from national (102). The same problem was faced in 2021 when the number of the target group reported was a projection calculation, not the real number so there was again a mismatch in supplementary food stock. Moreover, there was no budget allocation for monitoring and evaluation in Posyandu (101). It indicates that NTT needs to improve the 8 convergence actions which are reflected in pillar 3 to have good planning, effective and efficient intervention, and be able to reach the target output.

The ineffective and inefficient intervention also happened in the agriculture department. For the sensitive intervention, the agriculture department has a program to facilitate 88 groups of households with land for horticulture which aims to provide households with access to nutritious food. This program did not work effectively

because the climate conditions destroyed the plants, and people could not buy new seeds and pests. The agriculture department did not allocate a budget for capacity building, therefore, people had no information or skills to manage the crops. The audit also found that 12 locations were not included as a priority area, receiving the facilitation. Monitoring and evaluation have not been done yet on this program. Instead of reflecting on pillar 3, it also reflects on pillar 4 about food security.



Picture 6. Land for horticulture farming in the community

Source: Badan Pemeriksa Keuangan Republik Indonesia, 2021 (101)

The same condition was seen in the animal husbandry department, there was no monitoring and evaluation of the program periodically and did not educate people on how to raise cattle and poultry. The problem found is the cattle were dead or got stolen. This program did not work effectively.



Picture 7. Cows from the animal husbandry department (left) and a broken chicken coop (right)

Source: Badan Pemeriksa Keuangan Republik Indonesia, 2021 (101)

5 CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Discussion

This thesis aims to identify the determinants of undernutrition in children under 5 years in Indonesia and to give insight into the undernutrition prevention program in Bali province (which has reached the national target) compared to Nusa Tenggara Timur province (which has not reached the national target).

Immediate causes

From the findings, it can be highlighted that macronutrient and micronutrient deficiency is the determinant factor for undernutrition among children under 5 in Indonesia. The adequacy of energy, vitamin A, vitamin D, vitamin E, vitamin B3, folic acid, calcium, and iron was reported below the Indonesian RDAs. Henry et al. investigated that the most complementary foods in developing countries are very low energy density, high viscosity, and poor palatability (103). This finding is supported by another study by Maciel et al. The study found that complementary foods in South Asia are mainly cereal-based and low consumption of food of animal origin. Low-density meals and lack of animal sources of foods are predictors to lower energy intake from complementary food found in South Asia (104).

Micronutrient deficiencies are often referred to as hidden hunger because it invisibly affects health and growth development. Lack of adequacy of iron, vitamin A, and zinc is found significant in South Asia. More than 40% of children under 5 in all South Asia regions except Sri Lanka experienced iron deficiency anemia. Vitamin A deficiency and undernutrition constituted one-third of the mortality rate in Bangladesh and India (105). In Brazil and South Africa, a study by Maciel et al. revealed higher zinc intake among children under 2. It is because of the increased consumption of cereals fortified with zinc, iron, and vitamins in Brazil, and maize fortified with zinc and other micronutrients in South Africa (104).

This literature review found a limited survey and report on micronutrient intake at the national and regional levels in Indonesia. Henry et al. mentioned in their study that the assessment of macro and micronutrients among children under 5 in Asia is challenging for some reasons. Rice, the main staple food in the Asian diet, is usually made into a gruel for complementary food. The ratio of water added to rice is considered to vary between families, therefore the assessment of macro and micronutrient intake for children under 5 has accuracy issues. Another challenge is difficulty in defining a "normal" diet because of the food availability between the dry and wet seasons (34). To respond to this factor, the Indonesian government has made effective interventions such as supplementary food that contains energy, protein, fat, and other micronutrients for underweight children, IFA and vitamin A supplementation, and EIB and exclusive breastfeeding promotion.

As a vicious cycle, inadequate dietary intake will decrease the working of antibodies against the pathogen making children under 5 more susceptible to infections and further can lead to undernutrition. The most infections among children under 5 in 2021 in Indonesia that have an association with undernutrition are URI and diarrhea. The role of vitamin C was found can decrease the incidence and severity of URI and zinc can decrease the incidence of diarrhea (106,107). Even though the adequacy of vitamin C and zinc are above the RDAs in Indonesia, other factors can contribute to the incidence of URI and diarrhea. The high prevalence of households

smoking inside the house might contribute to the higher prevalence of URI among children under 5, and water, sanitation, and hygiene contribute to the incidence of diarrhea.

The children's immune system is not fully developed at an early age. However, a newborn baby received antibodies shared from the mother during the third trimester of pregnancy through the placenta, therefore they are protected against bacteria or viruses when they are born. Breast milk especially colostrum is important to be given to infants because it contains antibodies. However, myth and culture have influenced the breastfeeding practice in Indonesia by giving other liquids to infants.

The trend of infections among children under 5 in low-middle income countries in 2019 was pneumonia, diarrhea, and malaria which have a high prevalence. It also applies in Sub-Saharan Africa, where diarrhea, pneumonia, and malaria have a high prevalence in 2019 (108). Most infections are preventable by vaccination. A study in Mozambique investigated the frequency and potential risk of Rotavirus A (RVA) infection in undernourished children under 5 with diarrhea. RVA infection is a major cause of diarrhea among children under 5 worldwide. The study found that the RVA vaccine can decline the RVA infection in undernourished children under 5 in Mozambique (109). In responding to this, the Indonesian government has added the RVA vaccine to the national immunization program that started in 2022 in several provinces and is expected implemented across the country by 2024 (110). In addition, the role of vitamin A was found can support the immune system (107). The vitamin A supplementation intervention is an effort of the Indonesian government to decrease child mortality.

Underlying causes

The adequacy of the dietary intake of children is closely linked to the household's food security. In Indonesia, the food security at the province level varied across the country, however, the eastern part of Indonesia, especially Papua and West Papua provinces, experienced food insecurity. Children living in a food-insecure province in Indonesia are at risk of being underweight and stunted. The production area of staple foods is mainly in the western part of Indonesia; the high prevalence of poverty; lack of access to roads; and lack of access to safe water and electricity to utilize food are the factors that cause the eastern part of Indonesia to experience food insecurity.

In rural areas in Asia and Africa, most people are smallholder farm households that depend on agriculture production to access foods. Many studies found that increased farm production diversity had a positive effect on diverse diets. Some barriers regarding small landholdings, limited access to technologies, and climatic and soil biophysical conditions hinder households from diversifying farm production are found in developing countries, hence the farm losing its benefit to provide food (111). The same challenges were found in the agriculture department intervention program in NTT. Nandi et al. showed that a farm household's market access to purchase food is positively associated with increased dietary diversity (111). It is important that the government has a policy or regulation and monitor the price and the food stocks in the market, especially during festivals such as Eid, Ramadan, Christmas, and New Year's.

Similar situation to Yemen, a study using the 2013 UNICEF Yemen Baseline Survey of Maternal and Child Health data by Al-Sobaihi et al. showed a different result. Yemen

is one of the poorest countries in the Middle East and North Africa region and approximately 41.1% of the population was subjected to food insecurity in 2012 because of political instability, poverty, low education, and low agriculture productivity. Their study revealed that children in the households where children received adequate care (feeding practice and the use of ANC) independent of households' wealth had a lower risk to be undernourished (112). This shows the importance of the feeding practice counseling and education program to improve the nutritional status in a place where food insufficiency exists and a high prevalence of undernourished children.

Nutrition and health care for children and women in Indonesia are mainly affected by misperception in society. Breastfeeding and complementary feeding practice in Indonesia is reported inappropriate in terms of the time of introduction which is early in some cultural context. Moreover, the age-specific of children (more than 2 years old) have less priority to receive medical care. This situation also happens in other countries, for example in Yemen, the study reported misperception about breastfeeding practice has shifted mothers to give formula milk to their infants (113). This is closely linked with the knowledge of caregivers that they get from participation in ANC, postnatal care, and mother and child health programs. Studies in Armenia and Northwest Ethiopia revealed that adequate care for Infant and Young Child Feeding, and support and care to women before, during, and after pregnancy is important to prevent undernutrition among children under 5 (114,115). Pokhrel et al. from Nepal also said providing health and nutrition counseling on IYCF in ANC and postnatal care services is recommended for achieving dietary diversity (116). The Indonesian government has initiated the intervention of breastfeeding and complementary feeding practice counseling and education in the stunting prevention acceleration program. The implementation adapts facility and community-based approaches and maximizes the role of community health workers. However, men or husbands are not included in the target groups. Including husband's or men's participation in ANC, postnatal care, and mother and child health programs are crucial to increase support in children and women's care.

Good access to a community health facility that provides curative, preventive, and promotive services is important. PHC and Posyandu are essential health facilities in Indonesia as a starting point where people get information about the stunting prevention program. In Indonesia, ANC and postnatal care services are covering nutritional status screening, IFA distribution, breastfeeding, and complementary feeding practice counseling and education. In addition, mental health is included in the ANC service as mentioned in the guideline from the Indonesian MoH (117). Studies in Bangladesh, Vietnam, and Ethiopia reported that maternal common mental disorder was strongly associated with childhood illness (118). However, there is a lack of study done in Indonesia to investigate the association between maternal mental health with undernutrition. In addition, regarding the benefit of services provided in PHC and Posyandu, the government should have attention to the capacity building of health workers. As lessons from NTT, lack of information among health workers regarding specific and sensitive intervention programs has turned the program to run ineffectively.

Furthermore, unhealthy environments such as open defecation practices, basic sanitation unconnected to a septic tank, unsafe drinking water, poor waste

management, and second-hand smoke are found as determinants of stunting in Indonesia. Laillou et al. reported that poor water, sanitation, and hygiene were the second major predictor of undernutrition among children under 5 in Cambodia in 2017 (119). Keeping animals (chickens, goats, buffalos, cows, cats, and dogs) inside the house overnight and households with a floor made of mud painted with animal dung were reported as predictors of undernutrition among children in Nepal (120). This study is relevant to the situation in a rural area in Indonesia where people keep their cattle inside the house and Sasak ethnic tradition in Sade village, West Nusa Tenggara province to paint the mud floor with buffalo or cow dung. Reflecting on the sensitive interventions, the Indonesian government is focusing on water, sanitation, and hygiene improvement while solving air pollution exposure has not been included in the program. As Sinharoy et al. said that air pollution including outdoor (agriculture and industrial) and indoor (cooking with solid biomass fuels) exposure has been largely ignored as an important factor causing stunting (121).

Basic causes

Mother's education, 8.5 years of schooling, is an important factor to lower the risk by 4% having stunted children in Indonesia. Makoka et al. investigated that the minimum threshold level of a mother's education that is significant to reducing stunting in Malawi, Zimbabwe, and Tanzania is more than 10 years of schooling. Despite having the necessary health knowledge and being able to practice the recommended feeding practice for their children, these women can earn money to support their households' income (122). According to Law Number 13 the Year 2003 about the workforce, maternal leave in Indonesia is 3 months in total which is divided into 1.5 months before the due date and 1.5 months after giving birth (123). It is one of the reasons many households in Indonesia hire untrained and less-educated domestic paid caregivers to take care of infants while the mothers are back to work. If the workplace does not provide a nursing room, it is also a predictor for women to stop giving breast milk.

Women who are economically empowered and have self-confidence have a better ability to purchase food, distribute the food to children, and make better decisions for their children. Indonesia generally has a bilateral kinship system where women's and men's sides in a family are equal. It can be seen from the diverse religions, cultures, and ethnicities do not seem to undervalue women. However, after the new order regime ruled in Indonesia between 1968-1998 when the regime encouraged family planning to promote the small family norm with two children in a family, this norm shifted the role of the father as the main income earner and the mother as the husband's supporter and caretaker of the family (86). This gender division still exists today.

Gender relation between husband and wife which consider the husband as a leader is an issue that influences the nutrition and health of their children in Indonesia. High woman's autonomy was reported to lower the risk of having stunted children in Ghana (124), and lower the risk of maternal undernutrition and delivering LBW infants in Bangladesh (125). To increase women's empowerment, the Indonesian government has implemented a program through Family Welfare Empowerment, as Bali does.

Moreover, early marriage and teenage pregnancy less than 20 years old are found significantly increase the risk to have stunted children. However, according to Law

Number 16 the Year 2019, the minimum age of marriage in Indonesia is 19 years old (126). In addition, there is no specific law about teenage pregnancy in Indonesia. Another factor that can contribute to teenage pregnancy is that unmarried couples have no access to contraception in Indonesia. For a married couple, knowledge about modern contraceptives for spacing children is important because household size is a factor determinant of stunting in Indonesia.

Another factor that causes undernutrition incidence and is closely linked to the ability of households to access food and health care is income. Households who have fixed monthly incomes were found to have better access to food and provide diversified food for the children in Indonesia. Similar findings were found in Ghana and Nepal in which household income was found to be an important factor determinant of stunting (124,127). Responding to this, the Indonesian government has initiated a cash assistance program for poor families (92). In addition, the government also have an intervention to improve access to health insurance for all, including poor family, to achieve universal health coverage in 2030.

Furthermore, despite food taboo being practiced in some ethnicities in Indonesia, Ramadan fasting exposure since the first-trimester pregnancy was found as a predictor of stunting in adolescence. The study in the Netherlands found that children of mothers who fasted in the first trimester of pregnancy were lighter at birth compared with those whose mothers had not fasted. However, there was no difference in birth weight between children whose mothers had or had not fasted in the second or third trimester of pregnancy (128). In contrast, Seiermann et al. investigated that the Muslim women in Bangladesh had more diverse diets during Ramadan and increased consumption of pulses, airy, fruit, and large fish. Hence, Seiermann et al. recommended interpreting findings from studies on Ramadan fasting exposure on later-life outcomes and will contribute to a better understanding of intrauterine influences of maternal nutrition on healthy child development (129). Similar to the situation of Ramadan in Indonesia, the annual bonus for employees is given during Ramadan as *Tunjangan Hari Raya*, which might be a reason to improve their diet quality (86).

The last factor that contributes to the occurrence of stunting among children under 5 in Indonesia is delayed monsoon onset. The impact of delayed monsoon onset in this context is on the agriculture sector which affects food availability. A study from Ethiopia found that higher temperature in utero during the first and second trimester and more rainfall in the third of pregnancy are significantly associated with severe stunting. The potential evidence to explain the relationship between weather and child nutrition status are agricultural, heat stress, and infectious disease transmission (130).

Most factors from immediate, underlying, and basic causes mentioned above are interrelated. Therefore, the undernutrition problem should not be solved separately. The governments at different levels and ministries should have strong coordination to plan the programs so that the implementation is more effective and efficient to achieve the targets as Bali does. Learning from Nepal that has achieved the fastest recorded reduced stunting prevalence in the world from 2001 to 2011 in the situation of large-scale conflict and political instability, the four major drivers of change were rapid growth of households income, health and nutrition interventions, maternal educational gain, and improvement in sanitation (127).

Strengths and limitations of the study or literature review

Most of the findings found in Indonesia are the latest survey or research that was conducted in 2021. It gives new updated information about the undernutrition situation in Indonesia, and it is relevant data to improve the policy or program that is ongoing towards the goals in 2024. The UNICEF framework on childhood undernutrition adapted to analyze the immediate, underlying, and basic causes of undernutrition among children under 5 in Indonesia for this review is useful to determine a broad range of the determinants. However, it neglects the influence of air pollution. Politics, technology, and discriminatory attitude are not discussed in this thesis due to the limitation of data sources. Moreover, Indonesia administratively is very large and the determinants of undernutrition among children under 5 vary between provinces. The findings of this literature review might therefore not apply to other provinces. One of the objectives of this literature review is specifically to see the determinants in Bali and NTT provinces, however, data at the provincial level is limited so the author needed to compare with other provinces that have similar contexts to Bali or NTT.

5.2 Conclusion

Undernutrition among children under 5 is a public health problem that is included in the 2020-2024 Indonesian Medium Term National Development Plan to accelerate the stunting prevention program. The determinants that significantly contribute to undernutrition in Indonesia are deficiency of macro and micronutrients; upper respiratory infection and diarrhea; food insecurity (accessibility, availability, and utilization); inappropriate breastfeeding and complementary feeding practice; health-seeking behavior; availability and quality of health care services; water, sanitation, hygiene, and indoor pollution; maternal education; poverty; women's empowerment; culture and religion; household size; child marriage and teenage pregnancy; and monsoon onset delay.

The specific and sensitive nutrition interventions under the MoH and other ministries' responsibilities are relevant to solving the determinants. However, the ability of local governments of NTT to implement remains an issue to be addressed. Taking lessons from Bali province where stunting, wasting, and underweight prevalence has successfully declined, the Bali government put specific attention to the 8 convergence actions, such as capacity building and training for health workers, strong coordination, and monitoring and evaluation. In contrast, NTT province put less attention on training for health workers, weak coordination, and lack of monitoring and evaluation, hence, the implementation of the intervention program is ineffective and inefficient.

5.3 Recommendations

Based on the findings from this literature review and the analysis of the sensitive nutrition intervention in Bali and NTT provinces, the following recommendations were formulated:

Policies

- The Indonesian government should reassess Law Number 16 the Year 2019 about the minimum age for marriage is 19 years old, while the evidence shows that early marriage less than 20 years old is a factor having stunted children in Indonesia.
- The Indonesian government should reassess Law Number 13 the Year 2003 about maternal leave in Indonesia. To increase breastfeeding and consider the importance of the first 1000 days of life, maternal leave should be given for at least 6 months.

Interventions

- The Indonesian government should improve the convergence of stunting prevention acceleration programs through coordination between national and local governments.
- The MoH and other ministries should improve coordination in the implementation of specific and sensitive interventions. For instance, the implementation of the awareness, commitment, and adequate care for mother and children program needs coordination between the MoH and the Ministry of Communication and Multimedia.
- The local governments should allocate a budget for capacity building and training of health workers, surveillance, and monitoring and evaluation to increase the effectiveness and efficiency of the program.
- The MoH should improve the quality of services in PHC and Posyandu as the primary health facility for mother and child health. Infrastructure and health-kit provided to support health care workers to give health services should be maintained.

Research

- The MoH should conduct the micronutrient intake at the national and provincial levels because it becomes the first data needed to assess food adequacy. The result of the study will be used to improve fortified food.
- The MoH should assess the relation between air pollution and childhood stunting to have a better understanding of the effect of air pollution on child growth health.
- The MoH should conduct a qualitative study related to care for children and women. Culture, myths, and beliefs are influencing the feeding practice which is a significant determinant of undernutrition in Indonesia. The result of the study will show a better understanding of the character of people to give effective interventions.

Appendix

Specific and Sensitive Interventions in Stunting Prevention Acceleration Program

Specific Intervention			
Target Groups	Priority Intervention	Supplementary Intervention	Situation intervention
Priority Target			
Pregnant women	Supplementary food for pregnant women with Chronic Energy Deficiency (CED)	Calcium supplementation	Malaria in pregnancy prevention
	Iron and Folic Acid (IFA) supplementation	ANC	HIV prevention
Lactating women and children under 2	Exclusive breastfeeding counseling and education	Vitamin A supplementation	Helminths prevention
	Infant and Young Children Feeding practice counseling and education	Multivitamin and mineral supplementation	
	Undernutrition management	Immunization	
	Supplementary food for underweight children	Zinc supplementation for diarrhea management	
	Growth monitoring	Integrated management of childhood illness	
Important Target			
Teenage girls	Iron tablet supplementation		
Children 24-59 months old	Undernutrition management	Vitamin A supplementation	Helminths prevention
	Supplementary food for underweight children	Multivitamin and mineral supplementation	
	Growth monitoring	Immunization	
		Zinc supplementation for diarrhea management	
		Integrated management of childhood illness	
Sensitive Intervention			
Intervention		Program	
Improving drinking water and sanitation		<ul style="list-style-type: none"> - Access to safe drinking water - Access to basic sanitation 	
Improving access and quality of nutrition and health care		<ul style="list-style-type: none"> - Access to family planning - Access to health insurance - Access to cash assistance for the poor family 	
Increasing awareness, commitment, and adequate care for mothers and children		<ul style="list-style-type: none"> - Campaign through media - Behavior change counseling - Children care counseling - Access to early childhood education and growth and development monitoring - Reproductive health counseling for adolescents - Women empowerment and child protection 	
Improving access to nutritious food		<ul style="list-style-type: none"> - Non-cash assistance for the poor family - Access to fortified food - Access to agricultural households group empowerment - Strengthening regulation on food labelling and advertisement 	

Source: Strategi Nasional Percepatan Pencegahan Anak Kerdil (Stunting) 2018-2024 (92)

REFERENCES

1. World Health Organization. Malnutrition [Internet]. World Health Organization. 2022 [cited 2022 Feb 9]. Available from: https://www.who.int/health-topics/malnutrition#tab=tab_1
2. De Onis M, Blössner M. WHO Global Database on Child Growth and Malnutrition. World Health Organization Geneva. Geneva; 1997.
3. Onis M de, Borghi E, Arimond M, Webb P, Croft T, Saha K, et al. Prevalence thresholds for wasting, overweight and stunting in children under 5 years. *Public Health Nutr.* 2019;22(1):175–9.
4. United Nations Children’s Fund (UNICEF). Fed to Fail? The Crisis of Children’s Diets in Early Life [Internet]. New York; 2021 Sep [cited 2022 Jan 22]. Available from: <https://www.unicef.org/reports/fed-to-fail-child-nutrition>
5. Sablah M. Causes and Impacts of Undernutrition over the Life Course. New York; 2019 Sep.
6. Soliman A, De Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N, et al. Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood. *Acta Biomed* [Internet]. 2021 [cited 2022 Jan 22];92:2021168. Available from: www.actabiomedica.it
7. Ministry of National Development Planning. LAPORAN VOLUNTARY NATIONAL REVIEW (VNR) INDONESIA 2021 | [Internet]. Jakarta; 2021 Jun [cited 2022 Jan 22]. Available from: <https://sdgs.bappenas.go.id/laporan-voluntary-national-review-vnr-indonesia-2021/>
8. UNICEF. The State of The World’s Children 1998 [Internet]. Oxford University Press for UNICEF. Oxford and New York; 1998 [cited 2022 Mar 2]. Available from: <https://www.unicef.org/media/84766/file/SOWC-1998.pdf>
9. UNICEF. Malnutrition in Children - UNICEF DATA [Internet]. UNICEF. 2021 [cited 2022 Mar 12]. Available from: <https://data.unicef.org/topic/nutrition/malnutrition/>
10. World Health Organization. Stunting in a nutshell [Internet]. The World Health Organization. 2015 [cited 2022 Jan 22]. Available from: <https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell>
11. Eye on Asia. Indonesia - A country profile [Internet]. Eye on Asia. 2022 [cited 2022 Jul 15]. Available from: <https://www.eyeonasia.gov.sg/asean-countries/know/overview-of-asean-countries/indonesia-a-country-profile/>
12. Kusnandar VB. Sebanyak 86,93% Penduduk Indonesia Beragama Islam pada 31 Desember 2021 | Databoks [Internet]. Databoks. 2022 [cited 2022 Jul 15]. Available from: <https://databoks.katadata.co.id/datapublish/2022/02/12/sebanyak-8693-penduduk-indonesia-beragama-islam-pada-31-desember-2021>
13. Dinas Kesehatan Provinsi Bali. Profil Kesehatan Provinsi Bali 2021. 2022.
14. Wiranthi PE, Suwarsinah HK, Adhi AK. Determinants of Household Food Security: a Comparative Analysis of Eastern and Western Indonesia. *Indones J Agric Sci.* 2014;15(1):17.
15. Bappelitbangda Provinsi NTT. Provinsi Nusa Tenggara Timur - LOCALISE SDGs Indonesia [Internet]. Localise SDGs. 2022 [cited 2022 Jul 15]. Available from: <https://localisesdgs-indonesia.org/profil-tpb/profil-daerah/17>
16. Faishal MI. Analisis Pola Curah Hujan Wilayah Dan Indeks Kekeringan Berbasis Geographic Information System (GIS) Di Provinsi Nusa Tenggara Timur (NTT)

- [Internet]. [Daerah Istimewa Yogyakarta]: Universitas Gadjah Mada; 2017 [cited 2022 Jul 15]. Available from: <http://etd.repository.ugm.ac.id/penelitian/detail/115817>
17. Kementerian Kesehatan Republik Indonesia. Laporan Kinerja Kementrian Kesehatan Tahun 2020. Kementeri Kesehat Republik Indones Tahun 2021. 2021;1–224.
 18. Mahendradhata Y, Trisnantoro L, Listyadewi S, Soewondo P, MArthias T, Harimurti P, et al. The Republic of Indonesia Health System Review. Vol. 7. World Health Organization; 2017. 328 p.
 19. Badan Pusat Statistik. Indeks Pembangunan Manusia menurut Provinsi 2019-2021 [Internet]. Badan Pusat Statistik. 2022 [cited 2022 Jul 15]. Available from: <https://www.bps.go.id/indicator/26/494/1/-metode-baru-indeks-pembangunan-manusia-menurut-provinsi.html>
 20. Dinas Kesahatan Provinsi NTT. Rencana Strategis Dinas Kesehatan Provinsi Nusa Tenggara Timur Tahun 2019-2023. 2019.
 21. Badan Pusat Statistik Provinsi Nusa Tenggara Timur. Jumlah Kematian Bayi dan Balita (Jiwa), 2019-2021 [Internet]. Badan Pusat Statistik Provinsi Nusa Tenggara Timur. 2022 [cited 2022 Jul 15]. Available from: <https://ntt.bps.go.id/indicator/30/582/1/jumlah-kematian-bayi-dan-balita.html>
 22. Badan Pusat Statistik. Persentase Penduduk Berumur 15 Tahun Ke Atas yang Melek Huruf menurut Provinsi, Daerah Tempat Tinggal, dan Jenis Kelamin, 2009-2021 [Internet]. 2022. [cited 2022 Jul 15]. Available from: <https://www.bps.go.id/statictable/2012/04/20/1609/persentase-penduduk-berumur-15-tahun-ke-atas-yang-melek-huruf-menurut-provinsi-daerah-tempat-tinggal-dan-jenis-kelamin-2009-2021.html>
 23. Pusat Data dan Informasi Kementrian Kesehatan RI. Buletin Jendela Data dan Informasi Kesehatan, Situasi Balita Pendek (Stunting) di Indonesia [Internet]. Jakarta; 2020 [cited 2022 Jan 20]. Available from: https://pusdatin.kemkes.go.id/resources/download/pusdatin/buletin/buletin-Situasi-Stunting-di-Indonesia_opt.pdf
 24. SSGI. Buku Saku Hasil Studi Status Gizi Indonesia Tingkat Nasional, Provinsi, dan Kabupaten/ Kota Tahun 2021 [Internet]. Kementerian Kesehatan Republik Indonesia. Jakarta; 2021 Dec [cited 2022 Feb 9]. Available from: <https://drive.google.com/file/d/1p5fAfI53U0sStfaLDCTmbUmF92RDRhms/view>
 25. Kementerian Sekretariat Negara RI. Angka Prevalensi Stunting tahun 2020 Diprediksi Turun - Stunting [Internet]. Sekretariat Wakil Presiden. 2021 [cited 2022 Jan 23]. Available from: <https://stunting.go.id/angka-prevalensi-stunting-tahun-2020-diprediksi-turun/>
 26. Direktorat Gizi Masyarakat. Rencana Aksi Kegiatan [Internet]. Jakarta; 2020 [cited 2022 Feb 9]. Available from: <https://e-renggar.kemkes.go.id/file2018/e-performance/1-466034-4tahunan-308.pdf>
 27. Calder PC, Jackson AA. Undernutrition, infection and immune function. *Nutr Res Rev.* 2000;13(1):3–29.
 28. Indonesia Ministry of Health. Indonesia Minimum Service Standards for Nutrition: Technical Brief for District Health Administrators. Jakarta; 2017.
 29. Jones KD, Thitiri J, Ngari M, Berkley JA. Childhood malnutrition: Toward an understanding of infections, inflammation, and antimicrobials. *Food Nutr Bull.* 2014;35(2):S64–70.
 30. World Health Organization. Stunted Growth and Development [Internet]. Vol. 6.

- Geneva; 2017. Available from:
https://www.who.int/nutrition/childhood_stunting_framework_leaflet_en.pdf
31. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in Indonesia. *Matern Child Nutr.* 2018;14(4):11.
 32. Palmer S. Recommended dietary allowances, tenth edition. 10th ed. Vol. 44, *European Journal of Clinical Nutrition.* Washington, DC: National Academy of Sciences; 1990. 298 p.
 33. National Institutes of Health. Nutrient Recommendations : Dietary Reference Intakes (DRI) [Internet]. National Institutes of Health Office of Dietary Supplements. 2022 [cited 2022 Jun 5]. Available from:
https://ods.od.nih.gov/HealthInformation/Dietary_Reference_Intakes.aspx#
 34. Henry CJ. Dietary intake research in Asian children: Significance and challenges. *J Nutr Sci Vitaminol (Tokyo).* 2015;61:S189–91.
 35. Siswanto. *Buku Studi Diet Total: Survei Konsumsi Makanan Individu Indonesia 2014.* Ministry of Health Republic of Indonesia. Jakarta; 2014.
 36. Arini HRB, Hadju V, Thomas P, Ferguson M. Nutrient and Food Intake of Indonesian Children Under 5 Years of Age: A Systematic Review. *Asia Pacific J Public Heal* [Internet]. 2022;34(1):25–35. Available from:
<https://doi.org/10.1177/10105395211041001>
 37. Sumedi E, Sandjaja S. ASUPAN ZAT BESI, VITAMIN A DAN ZINK ANAK INDONESIA UMUR 6-23 BULAN. *Penelit Gizi dan Makanan (The J Nutr Food Res.* 2016 Sep 28;38(2).
 38. Valentina V, Sri Palupi N, Andarwulan N. Asupan Kalsium Dan Vitamin D Pada Anak Indonesia Usia 2 – 12 Tahun. *J Teknol dan Ind Pangan.* 2014;25(1):83–9.
 39. Betan Y, Hemchayat M, Wetasin K. Factors Influencing Malnutrition of Children Aged 24-60 Months Old in Flores, Nusa Tenggara Timur. *Unnes J Public Heal.* 2022;11(17):46–57.
 40. Wulandary W, Sudiarti T. Nutrition Intake and Stunting of Under-Five Children in Bogor West Java, Indonesia. *J Food Sci Nutr* [Internet]. 2021 May 29 [cited 2022 Apr 17];7(104):1–7. Available from:
https://www.heraldopenaccess.us/article_pdf/33/nutrition-intake-and-stunting-of-under-five-children-in-bogor-west-java-indonesia.pdf
 41. Nurhayati E, Paramashanti BA, Astiti D, Aji AS. Dietary diversity, vitamin D intake and childhood stunting: A case-control study in Bantul, Indonesia. *Malays J Nutr.* 2020;26(2):273–87.
 42. Fatimah NSH, Wirjatma RB. Tingkat Kecukupan Vitamin A, Seng Dan Zat Besi Serta Frekuensi Infeksi Pada Balita Stunting Dan Non Stunting. *Media Gizi Indones* [Internet]. 2018 [cited 2022 Apr 17];13(2):168–75. Available from: <https://e-journal.unair.ac.id/MGI/article/view/7062/5531>
 43. Sirajuddin S, Rauf S, Nursalim N. Asupan Zat Besi Berkorelasi Dengan Kejadian Stunting Balita Di Kecamatan Maros Baru. *Gizi Indones.* 2020;43(2):109–18.
 44. Soedarsono AM, Sumarmi S. Faktor yang Mempengaruhi Kejadian Wasting pada Balita di Wilayah Kerja Puskesmas Simomulyo Surabaya. *Media Gizi Kesmas.* 2021;10(2):237.
 45. Putri DSK, Wahyono TYM. Faktor Langsung dan Tidak Langsung Yang Berhubungan Dengan Kejadian Wasting Pada Anak Umur 6 – 59 Bulan Di Indonesia Tahun 2010. *Media Litbangkes.* 2013;23(3):110–21.

46. Kementerian Kesehatan Republik Indonesia. Dashboard TB - TBC Indonesia [Internet]. Kementerian Kesehatan Republik Indonesia. 2022 [cited 2022 Jul 14]. Available from: <https://tbindonesia.or.id/pustaka-tbc/dashboard-tb/>
47. Mulyaningsih T, Mohanty I, Widyaningsih V, Gebremedhin TA, Miranti R, Wiyono VH. Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. *PLoS One*. 2021;16(11 November):1–19.
48. Ariesthi KD. Faktor Risiko Gizi Kurang Pada Balita Di Nusa Tenggara Timur. Vol. 3, Sekolah Tinggi Ilmu Kesehatan Citra Husada Mandiri Kupang. Sekolah Tinggi Ilmu Kesehatan Citra Husada Mandiri Kupang; 2019.
49. Hina SBGJ, Picauly I. Hubungan Faktor Asupan Gizi, Riwayat Penyakit Infeksi dan Riwayat ASI Eksklusif dengan Kejadian Stunting di Kabupaten Kupang. *J PAZIH_Pergizi Pangan DPD NTT* [Internet]. 2021;10(2):61–70. Available from: <https://pergizipanganntt.id/ejpazih/index.php/filejurnal/article/view/155>
50. Dewi IA, Adhi KT. Pengaruh Konsumsi Protein Dan Seng Serta Riwayat Penyakit Infeksi Terhadap Kejadian Pendek Pada Anak Balita Umur 24-59 Bulan Di Wilayah Kerja Puskesmas Nusa Penida III. *Arc Com Heal*. 2016;3(1):36–46.
51. Badan Ketahanan Pangan Kementerian Pertanian RI. Indeks Ketahanan Pangan 2021. Badan Ketahanan Pangan. Jakarta; 2021.
52. Dewan Ketahanan Pangan - Kementerian Pertanian, World Food Programme. Food Security and Vulnerability Atlas of Indonesia 2015. Jakarta; 2015.
53. Simler K. Poverty & Equity Brief (Indonesia) [Internet]. World Bank Group. 2022. Available from: https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_BRA.pdf
54. Badan Pusat Statistik. Gini Ratio Menurut Provinsi dan Daerah 2020-2021 [Internet]. Badan Pusat Statistik. 2022 [cited 2022 Jul 7]. Available from: <https://www.bps.go.id/indicator/23/98/1/gini-ratio-menurut-provinsi-dan-daerah.html>
55. Badan Pusat Statistik. Persentase Penduduk Miskin (P0) Menurut Provinsi dan Daerah 2020-2021 [Internet]. Badan Pusat Statistik. 2022 [cited 2022 Jul 7]. Available from: <https://www.bps.go.id/indicator/23/192/1/persentase-penduduk-miskin-menurut-provinsi.html>
56. Adi AC, Andrias dini ririn. Balita Pada Rumah Tangga Miskin di Kabupaten Prioritas Kerawanan Pangan di Indonesia Lebih Rentan Mengalami Gangguan Gizi. Departemen Gizi Fakultas Kesehatan Masyarakat, Universitas Airlangga. Universitas Airlangga; 2010.
57. Tamung E, Sudarman S. Faktor Yang Mempengaruhi Kejadian Stunting Pada Balita Di Wilayah Kerja Puskesmas Sita Kecamatan Rana Mese Kabupaten Manggarai Timur NTT. *J Promot Prev*. 2019;1(2):43–53.
58. Perdani FP, Laksono AD, Chalidyanto D, Perdani FP. The Undernutrition Prevalence of Under-Two-Years Infant in Indonesia: Do breastfeeding Practices Ecologically Matter? *Indian J Forensic Med Toxicol*. 2021;15(4):1113–9.
59. World Health Organization. Complementary feeding [Internet]. World Health Organization. 2022 [cited 2022 Jul 18]. Available from: https://www.who.int/health-topics/complementary-feeding#tab=tab_1
60. Inayati DA, Scherbaum V, Purwestri RC, Hormann E, Wirawan NN, Suryantan J, et al. Infant feeding practices among mildly wasted children: A retrospective study on Nias Island, Indonesia. *Int Breastfeed J*. 2012;7(7):3.

61. Hidayat AAA, Uliyah M. The effect of the nursing care model based on culture to improve the care of malnourished madurese children in Indonesia. *Open Access Maced J Med Sci.* 2019;7(7):1220–5.
62. Kevane M, Levine D, Ames AM, Barber S, Blackburn S, Blalock G, et al. *The Changing Status of Daughters in Indonesia.* Santa Clara and Berkeley; 2001.
63. Vaezghasemi M, Öhman A, Ng N, Hakimi M, Eriksson M. Concerned and conscious, but defenceless - the intersection of gender and generation in child malnutrition in Indonesia: a qualitative grounded theory study. *Glob Health Action* [Internet]. 2020;13(1). Available from: <https://doi.org/10.1080/16549716.2020.1744214>
64. Fajariyah RN, Hidajah AC. Correlation Between Immunization Status and Mother's Height, and Stunting in Children 2–5 Years in Indonesia. *J Berk Epidemiol.* 2020;8(1):89.
65. Titaley CR, Que BJ, de Lima FVI, Angkejaya OW, de Lima FVI, Maelissa MM, et al. Health Care–Seeking Behavior of Children With Acute Respiratory Infections Symptoms: Analysis of the 2012 and 2017 Indonesia Demographic and Health Surveys. *Asia-Pacific J Public Heal.* 2020;32(6–7):310–9.
66. Cameron L, Chase C, Haque S, Joseph G, Pinto R, Wang Q. Childhood stunting and cognitive effects of water and sanitation in Indonesia. *Econ Hum Biol* [Internet]. 2021;40:100944. Available from: <https://doi.org/10.1016/j.ehb.2020.100944>
67. World Health Organization, UNICEF. WHO/UNICEF Joint Monitoring Programme [Internet]. 2020 [cited 2022 Jun 25]. Available from: <https://washdata.org/data/household#!/idn>
68. Badan Penelitian dan Pengembangan Kesehatan. *Laporan Nasional RISKESDAS 2018.* Lembaga Penerbit Badan Penelitian dan Pengembangan. Jakarta; 2019.
69. Irianto J, Anwar DA, Yuniarto A, Laelasari E, Marina R. *Studi Kualitas Air Minum Rumah Tangga Di Indonesia.* Jakarta; 2021.
70. UNICEF. Indonesia: Nearly 70 per cent of household drinking water sources contaminated by faecal waste [Internet]. UNICEF. 2022 [cited 2022 Jun 25]. Available from: <https://www.unicef.org/indonesia/press-releases/indonesia-nearly-70-cent-household-drinking-water-sources-contaminated-faecal-waste>
71. Badriyah L, Syafiq A. The Association Between Sanitation, Hygiene, and Stunting in Children Under Two-Years (An Analysis of Indonesia's Basic Health Research, 2013). *Makara J Heal Res.* 2017;21(2):35–41.
72. Astuti DD, Handayani TW, Astuti DP. Cigarette smoke exposure and increased risks of stunting among under-five children. *Clin Epidemiol Glob Heal* [Internet]. 2020;8(3):943–8. Available from: <https://doi.org/10.1016/j.cegh.2020.02.029>
73. Andriani H. Second-Hand Smoke Exposure inside the House and Adverse Birth Outcomes in Indonesia: Evidence from Demographic and Health Survey 2017. *medRxiv.* 2021;11(20):1–10.
74. De Silva I, Sumarto S. Child Malnutrition in Indonesia: Can Education, Sanitation and Healthcare Augment the Role of Income? *J Int Dev.* 2018;30(5):837–64.
75. Vollmer S, Bommer C, Krishna A, Harttgen K, Subramanian S. The association of parental education with childhood undernutrition in low- and middle-income countries: comparing the role of paternal and maternal education. *Int Epidemiol Assoc.* 2017;46(1):312–23.
76. Roshita A, Schubert E, Whittaker M. Child-care and feeding practices of urban middle class working and non-working Indonesian mothers_ a qualitative study of the socio-

- economic and cultural environment _ . *Matern Child Nutr.* 2012;8:299–314.
77. Mauludyani AVR, Suryana EA, Ariani M. Factors associated with undernutrition and improvement in Indonesia. *IOP Conf Ser Earth Environ Sci.* 2021;892(1):4–9.
 78. Hayes A. Engel’s Law Definition [Internet]. Investopedia. 2022 [cited 2022 Jul 5]. Available from: <https://www.investopedia.com/terms/e/engels-law.asp>
 79. Has EMM, Efendi F, Wahyuni SD, Mahmudah IZ, Chotimah K. Women’s Empowerment and Socio Demographic Characteristics as Determinant of Infant and Young Child Feeding Practice in Indonesia. *Curr Res Nutr Food Sci* [Internet]. 2022 Jul 17 [cited 2022 Jul 5];10(2). Available from: <https://www.foodandnutritionjournal.org/volume10number2/womens-empowerment-and-socio-demographic-characteristics-as-determinant-of-infant-and-young-child-feeding-practice-in-indonesia/>
 80. Nadiyah, Briawan D, Martianto D. Faktor Risiko Stunting Pada Anak Usia 0 — 23 Bulan Di Provinsi Bali, Jawa Barat, Dan Nusa Tenggara Timur. *J Gizi dan Pangan.* 2014;9(2):125–32.
 81. Kabeer N. Resources, Agency, Achievements: Reflections on the Measurement of Women’s Empowerment. *Dev Change* [Internet]. 1999 Jul 1 [cited 2022 Jul 6];30(3):435–64. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/1467-7660.00125>
 82. Badan Pusat Statistik. Mengulik Data Suku di Indonesia [Internet]. Badan Pusat Statistik. 2022 [cited 2022 Jul 6]. Available from: <https://www.bps.go.id/news/2015/11/18/127/mengulik-data-suku-di-indonesia.html>
 83. Ciptanurani C, Chen HJ. Household structure and concurrent stunting and overweight among young children in Indonesia. *Public Health Nutr.* 2021;24(9):2629–39.
 84. Nurbaiti L, Adi AC, Devi SR, Harthana T. Kebiasaan makan balita stunting pada masyarakat Suku Sasak: Tinjauan 1000 hari pertama kehidupan. *Masyarakat, Kebudayaan dan Polit.* 2014;27(2):104–12.
 85. Kurnia Illahi R, Muniroh L. Gambaran Sosio Budaya Gizi Etnik Madura dan Kejadian Stunting Balita Usia 24-59 Bulan di Bangkalan. *Media Gizi Indones.* 2016;11(2):135–43.
 86. Kunto YS. Gender, Religion, and Ethnicity: A sociocultural perspective on child nutritional status in Indonesia. Wageningen University; 2021.
 87. Kasjono HS, Wijanarko A, Amelia R, Fadillah D, Wijanarko W, Sutaryono. Impact of Early Marriage on Childhood Stunting. *Adv Heal Sci Res.* 2020;27:172–4.
 88. Desma Simbolon. Pengaruh Kepemilikan Jaminan Kesehatan Masyarakat Miskin Terhadap Status Kelahiran Dan Kejadian Stunting Pada Baduta Indonesia (Analisis Data IFLS 1993-2007). *J Kebijak Kesehat Indones.* 2014;03(02):55–65.
 89. Sparrow R, Suryahadi A, Widyanti W. Social health insurance for the poor: Targeting and impact of Indonesia’s Askeskin programme. *Soc Sci Med.* 2013;96:264–71.
 90. Herman B, Pongpanich S, Viwattanakulvanid P. National health insurance impact on malnutrition in under-five years old children in Indonesia. *Eur J Public Health.* 2020;30(5).
 91. Thiede BC, Gray C. Climate exposures and child undernutrition: Evidence from Indonesia. *Soc Sci Med* [Internet]. 2020;265(July):113298. Available from: <https://doi.org/10.1016/j.socscimed.2020.113298>
 92. Sekretariat Wakil Presiden Republik Indonesia. Strategi Nasional Percepatan Pencegahan Anak Kerdil (Stunting) Periode 2018-2024. Jakarta Pusat; 2019.

93. Kementerian Kesehatan RI. Petunjuk Teknis Pemberian Makanan Tambahan. Kementerian Kesehatan Republik Indonesia. Jakarta; 2017. 1–22 p.
94. Kementerian Kesehatan Republik Indonesia. Pedoman pencegahan dan penanggulangan anemia pada remaja putri dan WUS [Guidelines for the iron deficiency anemia prevention program in adolescent girls and women at reproductive age]. Direktorat Gizi Masyarakat. Jakarta; 2016. 97 p.
95. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 15 Tahun 2013 Tata Cara Penyediaan Fasilitas Khusus Menyusui dan/atau Memerah Air Susu Ibu [Internet]. Peraturan Menteri Kesehatan, 15 Year 2013 Republic of Indonesia; 2013 p. 9. Available from: <http://www.gizikia.depkes.go.id/wp-content/uploads/downloads/2013/08/Permenkes-No.-15-th-2013-ttg-Fasilitas-Khusus-Menyusui-dan-Memerah-ASI.pdf>
96. Kementerian Kesehatan Republik Indonesia. Panduan Fasilitator : Modul Pelatihan Konseling Pemberian Makan Bayi dan Anak. Jakarta; 2014. 205 p.
97. Kementerian Perencanaan Pembangunan Nasional. Tata Laksana Gizi Buruk | Cegah Stunting [Internet]. Badan Perencanaan Pembangunan Nasional. 2022 [cited 2022 Jul 28]. Available from: <https://cegahstunting.id/intervensi/intervensi-spesifik/tata-laksana-gizi-buruk/>
98. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan RI Nomor 66 Tahun 2014 Tentang Pemantauan pertumbuhan, perkembangan, dan gangguan tumbuh kembang anak. Berita Negara Republik Indonesia Tahun 2014 Nomor 1524, 66 Year 2014 Republik Indonesia; 2014 p. 15.
99. Kementerian Perencanaan Pembangunan Nasional. Manajemen Terpadu Balita Sakit | Cegah Stunting [Internet]. Badan Perencanaan Pembangunan Nasional. 2022 [cited 2022 Jul 28]. Available from: <https://cegahstunting.id/intervensi/intervensi-spesifik/manajemen-terpadu-balita-sakit/>
100. DPR RI. Kunjungan Kerja Spesifik Komisi IX DPR RI Pengawasan Penanganan Stunting Ke Provinsi Bali [Internet]. Dewan Perwakilan Rakyat Republik Indonesia. Jakarta; 2020. Available from: <https://www.kemenpppa.go.id/index.php/page/read/29/2929/pandemi-covid-19-stunting-masih-menjadi-tantangan-besar-bangsa>
101. Audit Utama Keuangan Negara VI Perwakilan Provinsi Nusa Tenggara Timur. Laporan Hasil Pemeriksaan Kinerja atas Efektivitas Upaya Pemerintah Provinsi Nusa Tenggara Timur dalam Mendukung Percepatan Pencegahan Stunting pada Wilayah Provinsi Nusa Tenggara Timur TA 2018-2020. Jakarta; 2021.
102. Badan Penelitian dan Pengembangan Kesehatan. Evaluasi Pelaksanaan Program Pemberian Makanan Tambahan (PMT) untuk Balita Kurus dan Ibu Hamil Kurang Energi Kronik (KEK). Jakarta; 2017.
103. Henry CJ. What Children Eat in Developing Countries: Diet in the Etiology of Undernutrition? Nestle Nutr Inst Workshop Ser [Internet]. 2019 [cited 2022 Jul 30];91:43–53. Available from: <https://www.karger.com/Article/FullText/493693>
104. Maclell BLL, Costa PN, Filho JQ, Ribeiro SA, Rodrigues FAP, Soares AM, et al. Higher Energy and Zinc Intakes from Complementary Feeding Are Associated with Decreased Risk of Undernutrition in Children from South America, Africa, and Asia. *J Nutr*. 2021;151(1):170–8.
105. Wali N, Agho K, Renzaho AMN. Past drivers of and priorities for child undernutrition

- in South Asia: A mixed methods systematic review protocol. *Syst Rev*. 2019;8(1).
106. Tam E, Keats EC, Rind F, Das JK, Bhutta ZA. Micronutrient Supplementation and Fortification Interventions on Health and Development Outcomes among Children Under-Five in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. *Nutrients*. 2020;12(289):1–30.
 107. Pecora F, Persico F, Argentiero A, Neglia C, Esposito S. The role of micronutrients in support of the immune response against viral infections. *Nutrients*. 2020;12(10):1–45.
 108. Institute for Health Metrics and Evaluation. DALYs of children 5 years in 2019 [Internet]. IHME. 2019 [cited 2022 Jul 31]. Available from: <https://vizhub.healthdata.org/gbd-compare/>
 109. Chissaque A, Cassocera M, Gasparinho C, Langa JS, Bauhofer AFL, Chilaúle JJ, et al. Rotavirus A infection in children under five years old with a double health problem: undernutrition and diarrhoea – a cross-sectional study in four provinces of Mozambique. *BMC Infect Dis*. 2021;21(1):1–13.
 110. Rokom. Kemenkes Tambah 3 Jenis Vaksin Imunisasi Rutin, Salah Satunya HPV – Sehat Negeriku [Internet]. Kementerian Kesehatan Republik Indonesia. 2022 [cited 2022 Jul 31]. Available from: <https://sehatnegeriku.kemkes.go.id/baca/rilis-media/20220423/2939708/39708/>
 111. Nandi R, Nedumaran S, Ravula P. The interplay between food market access and farm household dietary diversity in low and middle income countries : A systematic review of literature. *Glob Food Sec* [Internet]. 2021;28:100484. Available from: <https://doi.org/10.1016/j.gfs.2020.100484>
 112. Al-Sobaihi S, Nakamura K, Kizuki M. Undernutrition among children under 5 years of age in Yemen: Role of adequate childcare provided by adults under conditions of food insecurity. *J Rural Med*. 2016;11(2):47–57.
 113. De Souza LR. Correlates of child undernutrition in Yemen. *Bandung J Glob South*. 2017;4(1):1–27.
 114. Hovhannisyan L, Demirchyan A, Petrosyan V. Estimated prevalence and predictors of undernutrition among children aged 5-17 months in Yerevan, Armenia. *Public Health Nutr*. 2013;17(5):1046–53.
 115. Worku T, Gonete KA, Muhammad EA, Atnafu A. Sustainable under nutrition reduction program and dietary diversity among children’s aged 6-23 months, Northwest Ethiopia: Comparative cross-sectional study. *Int J Equity Health*. 2020;19(1):1–11.
 116. Pokhrel K, Nanishi K, Poudel KC, Pokhrel KG, Tiwari K, Jimba M. Undernutrition Among Infants and Children in Nepal: Maternal Health Services and Their Roles to Prevent it. *Matern Child Heal J* 2016 2010 [Internet]. 2016 May 28 [cited 2022 Aug 1];20(10):2037–49. Available from: <https://link.springer.com/article/10.1007/s10995-016-2023-z>
 117. Kementerian Kesehatan RI DJKM. Pedoman Pelayanan Antenatal Terpadu, edisi 3. 3rd ed. Jakarta: Direktorat Jenderal Kesehatan Masyarakat, Kementerian Kesehatan RI; 2020.
 118. Nguyen PH, Saha KK, Disha A, Menon P, Manohar S, Mai LT, et al. Maternal mental health is associated with child undernutrition and illness in Bangladesh, Vietnam and Ethiopia. *Publ*. 2013;17(6):1318–27.
 119. Laillou A, Gauthier L, Wieringa F, Berger J, Chea S, Poirot E. Reducing malnutrition in Cambodia. A modelling exercise to prioritize multisectoral interventions. *Matern*

- Child Nutr [Internet]. 2020;16(2):1–12. Available from:
<https://doi.org/10.1111/mcn.12770>
120. Shrestha A, Six J, Dahal D, Marks S, Meierhofer R. Association of nutrition, water, sanitation and hygiene practices with children’s nutritional status, intestinal parasitic infections and diarrhoea in rural Nepal: A cross-sectional study. *BMC Public Health*. 2020;20(1):1–21.
 121. Sinharoy SS, Clasen T, Martorell R. Air pollution and stunting: a missing link? *Lancet Glob Heal*. 2020 Apr 1;8(4):e472–5.
 122. Makoka D, Masibo PK. Is there a threshold level of maternal education sufficient to reduce child undernutrition? Evidence from Malawi, Tanzania and Zimbabwe. *BMC Pediatr* [Internet]. 2015;15(1):1–10. Available from:
<http://dx.doi.org/10.1186/s12887-015-0406-8>
 123. Kementrian Sekretariat Negara RI. Undang-Undang RI No 13 tahun 2003 Tentang Ketenagakerjaan. 13 Republic of Indonesia; 2003 p. 1–50.
 124. Boah M, Azupogo F, Amporfro DA, Abada LA. The epidemiology of undernutrition and its determinants in children under five years in Ghana. *PLoS One*. 2019;14(7):1–23.
 125. Kabir A, Rashid MM, Hossain K, Khan A, Sikder SS, Gidding HF. Women’s empowerment is associated with maternal nutrition and low birth weight: Evidence from Bangladesh Demographic Health Survey. *BMC Womens Health*. 2020;20(93):1–12.
 126. Kementrian Sekretariat Negara RI. Undang-Undang Nomor 16 Tahun 2019 Tentang Perkawinan [Internet]. Undang-undang Republik Indonesia No 16 Tahun 2019 Tentang Perubahan Undang-undang no 1 Tahun 1974 Tentang Perkawinan, 16 Republic of Indonesia; 2019 p. 1–8. Available from:
<https://peraturan.bpk.go.id/Home/Details/122740/uu-no-16-tahun-2019>
 127. Headey DD, Hoddinott J. Understanding the Rapid Reduction of Undernutrition in Nepal, 2001–2011. *PLoS One*. 2015;10(12):1–13.
 128. Savitri AI, Yadegari N, Bakker J, Ewijk RJG van, Grobbee DE, Painter RC, et al. Ramadan fasting and newborn’s birth weight in pregnant Muslim women in The Netherlands. *Br J Nutr*. 2014;112:1503–9.
 129. Seiermann AU, Al-Mufti H, Waid JL, Wendt AS, Sobhan S, Gabrysch S. Women’s fasting habits and dietary diversity during Ramadan in rural Bangladesh. *Matern Child Nutr*. 2021;17(3):1–13.
 130. Randell H, Gray C, Grace K. Stunted from the start: Early life weather conditions and child undernutrition in Ethiopia. *Soc Sci Med*. 2020 Sep 1;261:113234.