

**INTERVENTION STRATEGIES FOR STUNTING BASED ON ANALYTIC NETWORK PROCESS IN BANGKA BELITUNG PROVINCE OF INDONESIA****Wardani Z<sup>1,2\*</sup>, Sukandar D<sup>1</sup>, Baliwati YF<sup>1</sup>, Riyadi H<sup>1</sup>****Zenderi Wardani**

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## ABSTRACT

Stunting affects stature with all the consequences of disruption of growth and development and also affects economic productivity. In Indonesia, which is mostly archipelago, stunting interventions require a multi-sectoral convergence strategy. Difficulties often occur in coordinating multi-sectoral cooperation in the policy process. It is even more challenging to formulate and define intervention strategies at different administrative levels. The Multi-Criteria Decision Making (MCDM) approach, such as Analytic Network Process (ANP), is one of the multi-criteria measurement approaches used to obtain the relative priority scale of individual evaluations relative dependence between elements. This approach is possible for use in the public sector, such as stunting interventions, with a high amount of information, interactions, and complexity levels. Therefore, this research aimed to develop an institutional strategy model for stunting intervention in the archipelago. The study was located at Institut Pertanian Bogor (IPB) University, Bogor and Bangka Belitung Island Province (Bangka and West Bangka Regency). The research method used pairwise comparison techniques with the ANP approach of 15 expert informants selected purposively based on their expertise, position and work. The framework model's construction in this study was carried out through a literature review of strategic issues consisting of criteria and indicators in decision-making for stunting reduction. Data analysis utilized Superdecisions version 2.8 software. The study results emphasized the priority strategies for nutrition-specific interventions in the initial phase of the first 1000 days of life, namely the conception period, pregnancy, and children under two years. Also, priority strategies for nutrition-sensitive interventions emphasized the importance of integrative holistic care patterns with access to safe water and improved sanitation. Based on this research, it can be concluded that the priority strategy model for stunting reduction in Indonesia, especially the archipelago, requires simultaneous multi-sectoral convergence. Recommendations for further research are to develop an intervention model in the practice of nutritious feeding with integrated, holistic, clean water, and improved sanitation access by the characteristics of the research location.

**Key words:** Stunting, Analytic Network Process, intervention strategies, multi-sectoral convergence, archipelago, Indonesia



## INTRODUCTION

Global Nutrition Report in 2020 reported that around 149 million or 21.9 % of children under five were stunted worldwide and most of them, 81.7 million children under five or 54.8% were in the Asian region. World Health Organization (WHO) has set a target of reducing stunting by 40% by 2025. However, Indonesia's Basic Health Research results showed that the proportion of stunting in Indonesia from 2007 to 2013 had not yet decreased significantly. The stunting ratio for children under five in 2007 was 37.6% and falling in 2010 to 35.8%. There was an increase in stunting again to 37.2% in 2013 [1], and then a decline to 30.8% in 2018. On the other hand, the proportion of stunting for children under two years increased from 28.0% in 2013 to 29.9% in 2018 [2].

A primary health research study found that the proportion of stunting decreased from 28.7% in 2013 to around 24.0% in 2018 in the Bangka Belitung Province, an archipelago [2]. However, the Nutritional Status Monitoring Survey 2017 showed an increase in the proportion of stunting from 22.0% in 2016 to 25.6% in 2017 [3]. There are two districts in this province of Bangka Belitung, namely West Bangka Regency and Bangka Regency, which became priority areas for national stunting interventions. They had a stunting prevalence of 39.1% and 32.3%, respectively [4].

The prevalence of stunting in Indonesia and Bangka Belitung Province above 20% indicated both chronic nutritional problems and public health problems and risks slowing children's growth and development. At the same time, the impact that occurs in stunted children disrupts body composition, especially in the size of the arm muscle [5], which hinders children's motor development [6], failure of physical growth, and neurocognitive damage [7]. Stunting affects the completion of education and the level of knowledge of school children, in addition to contributing to their short stature [5, 8].

Furthermore, in adulthood, these children who were stunted have lower household performance and expenditure per capita. Most of them live in poverty due to healthcare costs and social problems [9, 10]. The World Bank estimates a decline in economic productivity of 1.4% due to a 1% loss in height caused by stunting [11]. The World Bank also estimates losses due to malnutrition around 2.5% of a country's Gross Domestic Product (GDP) [12]. Simultaneously, Indonesia's malnutrition causes a loss of economic potential of 0.27 - 1.21% of GDP [13] and 0.04 - 0.16% of total GDP because of stunting [14].

Stunting is still a public health problem, and the broad spectrum of the impact caused by the case requires a multi-sectoral or institutional convergence strategy. Likewise, Indonesia's geographical environment, an archipelagic country, is another challenge at every administrative and operational level. Multi-sectoral convergence is also needed to avoid competition in obtaining resource allocations, especially in the regions [15]. There are often difficulties in cooperation at various administrative levels involved in several different policy process functions [16], especially in the formulation and determination of intervention strategies [17]. Multiple approaches and instruments can ensure coordination in different situations to produce different results [16].

The Multi-Criteria Decision Making (MCDM) approach, such as Analytic Network Process (ANP), is one of the multi-criteria measurement approaches used to obtain the relative priority scale of individual evaluation relative dependence between elements. Stunting interventions with complexity in the amount of information and interactions make it possible to use this approach [18,19]. Furthermore, this study aimed to develop an institutional strategy model for stunting interventions using the ANP approach, especially in the island region, such as the Bangka Belitung Province.

## METHODS

This research was conducted from May to June 2019 at the Department of Community Nutrition, Faculty of Human Ecology, IPB University Bogor and Bangka Belitung Island Province (Bangka Regency and West Bangka Regency). The framework model's construction in this study was carried out through a literature review of strategic issues consisting of criteria and indicators in decision-making for stunting reduction (Figure 1) [20-25]. This study used experts and practitioners' opinions in stunting prevention in Indonesia at the national and regional levels. Furthermore, the framework model quantification used a pairwise comparison technique of experts and practitioners who participated in stunting interventions at the national, provincial, and district levels. The experts and practitioners were from universities, World Health Organization Indonesia offices, and practitioners directly involved in stunting prevention in Indonesia. Fifteen experts and practitioners as key informants were selected purposively based on their expertise and involvement in stunting. Their answers to structured questions related to stunting interventions were analyzed using Super decisions software version 2.8. The priority strategy models were obtained from each cluster and node contained in the framework model. The greater the weight generated, the higher the strategic priority of the variable. The next step was to calculate the rater agreement to assess the suitability of key informants' answers in one cluster using Kendall's concordance coefficient (W) [19].

The Research Ethics Commission approved this study at the Institute for Research and Community Service - IPB University Number 217/IT3.KEPMSM-IPB/SK/2019.



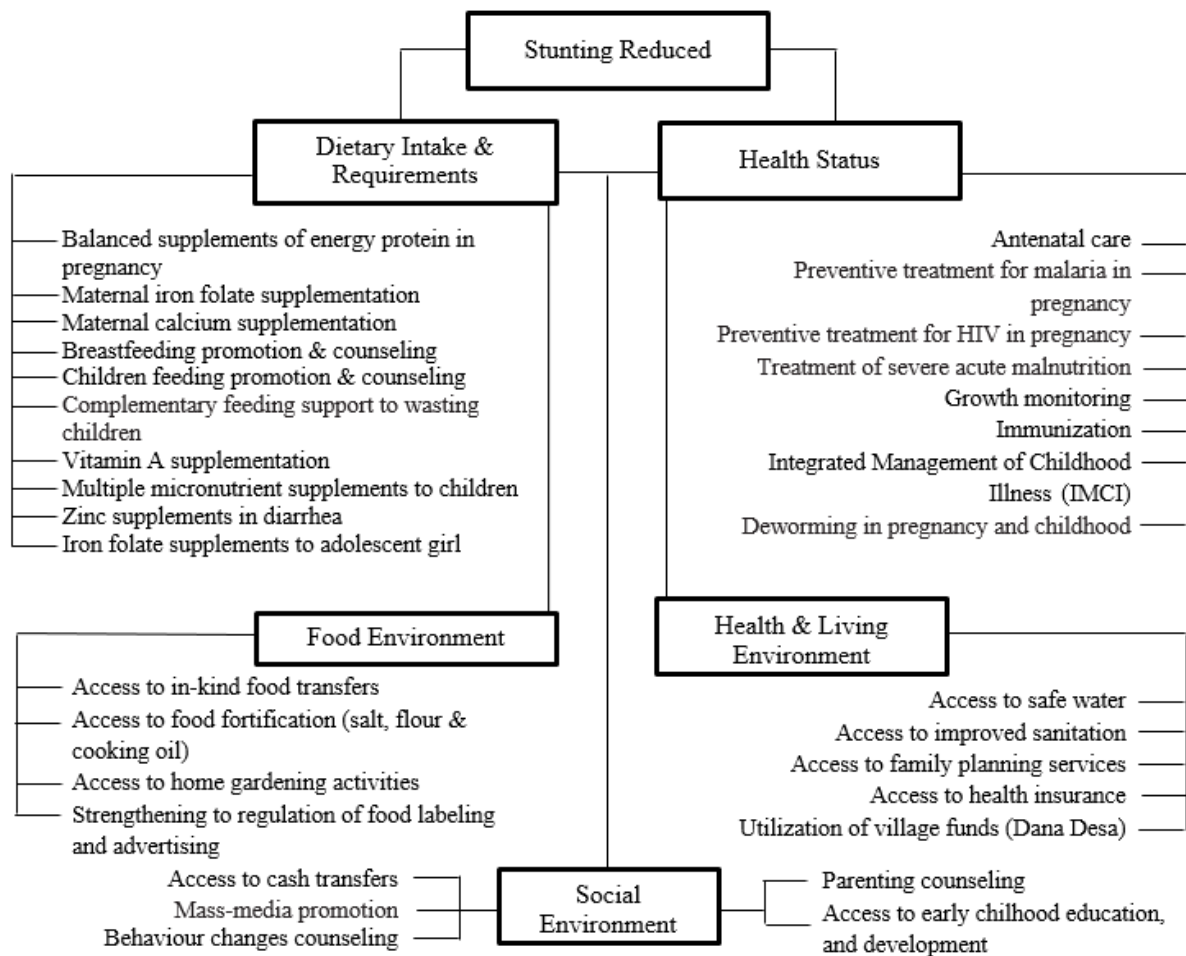


Figure 1: Analytic Network Process framework model of stunting decline [20-25]

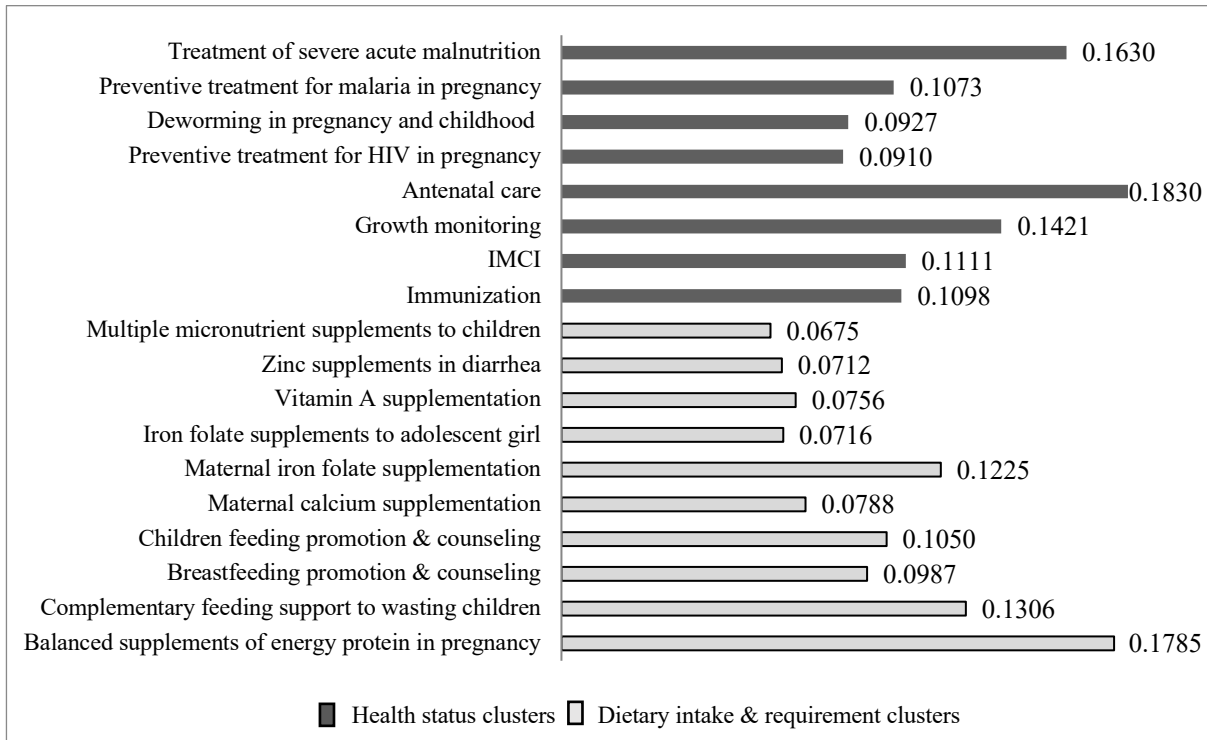
## RESULTS AND DISCUSSION

The dietary intake and requirements are still the main priority strategies for stunting reduction in Indonesia, especially in the Province of Bangka Belitung, by 61.7% and health status factor (38.3%) was the next priority. The rater agreement assessment results showed that the W-value was 0.3600, which means that 36% of the key informants stated that the primary priority strategy for stunting reduction was dietary intake and requirements.

In general, protein-energy malnutrition is a major cause of stunting in children under five in developing countries [23]. Energy and protein deficiency occurs even before conception and pregnancy, so it becomes a risk factor for stunting. Studies in Indonesia showed a significant relationship between malnutrition in mothers during pregnancy and stunting [26, 27].

Figure 2 explains that balanced supplementary feeding during pregnancy was a priority strategy for reducing stunting in specific nutrition intervention clusters. The next priority strategy was complementary feeding to wasting children (13.1%), iron-folate supplementation during pregnancy (12.3%), and promotion and counselling of

children's feeding (10.5%). The current study also placed supplementary feeding in pregnancy, and wasting children as a priority strategy of short-term intervention to stunting reduction with a significant rater agreement ( $W=33.4\%$ ).



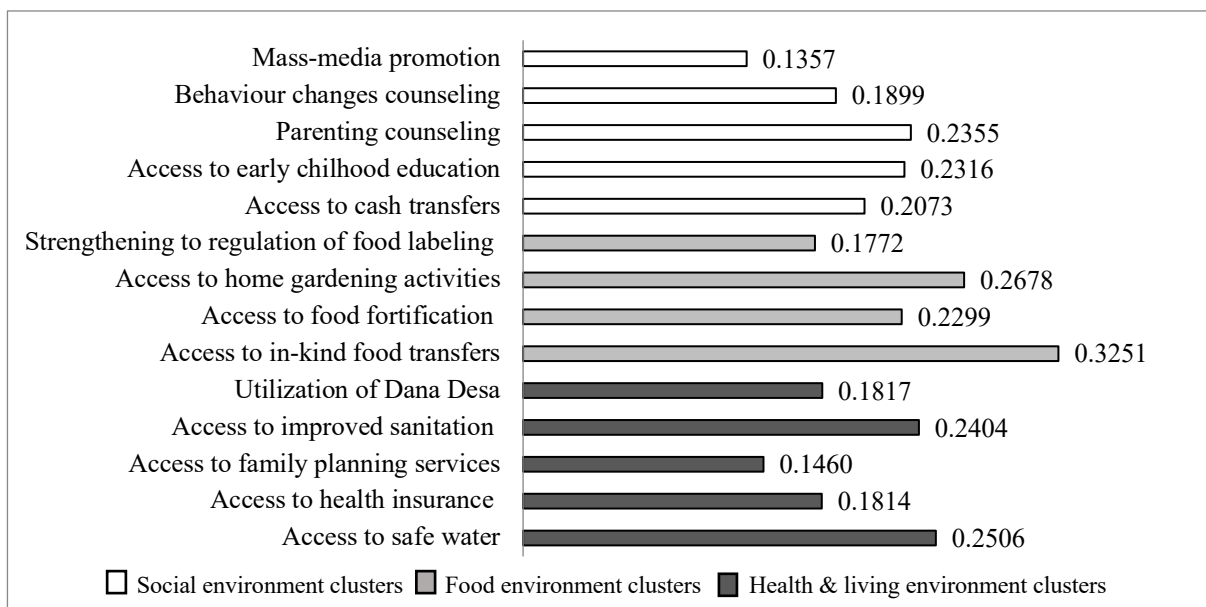
**Figure 2: Priority strategy for nutrition-specific intervention clusters**

Stunting and malnutrition remain a public health problem, despite increasing socioeconomic and community food reserves [26, 27]. The high prevalence of stunting in Indonesia showed a lack of attention during the first 1000 days of life. Attention to the early phases of life starting at pregnancy became a priority strategy for nutrition-specific intervention cluster health status to reduce stunting by 18.3%, followed by treatment of severe acute malnutrition (16.3%), growth monitoring (14.2%), and Integrated Management of Childhood Illness (IMCI) by 11.1% (Figure 2). Rater agreement assessment results showed that the  $W$ -value was 0.2202, which means 22.0% of the key informants stated that this cluster's primary priority strategy was antenatal care.

Nutritional supplements based on protein energy supplementation in 36 countries only reduce stunting prevalence in children aged 36 months by 0.3%. Simultaneously, nutritional interventions accompanied by micronutrient supplementation succeeded in reducing the same by 17% [28]. Supplementary feeding recovery of Small-Quantity Lipid-Based Nutrient Supplements (SQ-LNS) in rural Indonesia also can reduce the incidence of stunting in children. Increasing the intake of micronutrients and macronutrients during the critical growth period in the early stages of life allows for an increase in nutritional status [29].

Often, food availability and balanced nutritional quality become a problem, especially for low-income families. Low household spending on quality food, such as animal food, increases malnutrition risk, especially stunting in Indonesia [30]. In line with this study, in-kind food transfer in low-income families was a top priority strategy (32.5%) in the food environment cluster (Figure 3). This priority strategy was undoubtedly followed by increasing household access to home gardening activities, access to food fortification, and strengthening food labelling and advertising regulation by 26.8%, 22.9%, and 17.7%, respectively. The rater agreement assessment results showed that the W-value was 0.1364, which means that 13.6% of key informants stated that the primary priority strategy for reducing stunting through the food environment cluster was the sensitive intervention of access to in-kind food transfers.

Access to in-kind food transfers and home gardening activities improved household food security in Bangladesh. These activities improved food diversity and the nutritional status of children [31]. Home gardening has also been shown to increase food security and diversity in rural households in developing countries [32, 33].



**Figure 3: Priority strategy for nutrition-sensitive intervention clusters**

Furthermore, parenting counselling for parents related to preparation and feeding children was a priority in the social environment cluster as in this study's findings. Figure 3 showed that parenting counselling for parents (23.6%) and access to early childhood education and development (23.2%) are priority strategies for nutrition-sensitive interventions in the social environment cluster to reduce stunting. The next priority strategy is access to cash transfers, behaviour change counselling, mass-media promotion, at 20.7%, 18.9%, and 13.6%, respectively. The rater agreement assessment results showed that the W-value was 0.1738, which means 17.4% of key informants stated that the social environment cluster's main priority strategies were parenting counselling for parents and access to early childhood education and development.

Counselling mothers on child feeding practices may be effective in reducing the prevalence of stunting among under-five children. The finding emphasizes the need to formulate policies on providing nutritional counselling training for cadres of community social workers that effectively motivate mothers to ensure adequate feeding practices [34]. Food parenting was not enough to provide sufficient growth and development in children. Cambodia's study results state that cognitive parenting significantly influences language skills and numeracy of stunting children [35].

Therefore, the priority strategies for stunting interventions equally important in this study's social environment cluster were early childhood education and development access. The finding is similar to the research results in rural Colombia that the application of structured early stimulation curriculum and nutritional interventions through family care has a positive and significant effect on reducing the risk of stunting, especially in children from low-income families [36].

Finally, efforts to encourage responsive care and learning environments for children are key to strengthening cognitive and performance in their critical age period. Precautions and early intervention are more effective in dealing with stunting starting before conception and during pregnancy. The findings from this study confirm that a combination of effective interventions is needed to support children's development, especially in underprivileged families.

Access to safe water (Figure 3) is a priority strategy for clustering the health and living environment by 25.1%, followed by access to improved sanitation (24.0%), utilization of transfer from central government to villages/ *Dana Desa* (18.2%), and access to health insurance (18.1%). The rater agreement assessment results showed that the W value was 0.1364, which means 13.6% of key informants stated that the health and environment cluster's priority strategy is access to safe water. This study reaffirms that reducing stunting is not just increasing household access to food, which requires multi-sectoral support and cooperation. However, a multi-sectoral approach is also needed to simultaneously address various determinants, including increasing access to health and living environments. Brazil has succeeded in reducing stunting in three decades. Their sustainable interventions in multi sectors point to lessons learned, especially in the food, health, social protection, safe water, and sanitation sectors [37].

Previous research in Indonesia found a significant interaction between sanitation facilities and household water treatment with stunting [38]. Children who lived in homes without latrines compared to those with toilets had a higher stunting prevalence of 35.3% and 24.0%, respectively. Households that did not use soap to wash their hands compared to washing hands without soap had a stunting prevalence of 31.6% and 25.8%, respectively. The absence of sanitation facilities in the household encourages improper safety after defecation and preparing children's food. Furthermore, an increase in diarrhoea and helminthiasis are then reflected in the nutritional status of children. Exposure to bacteria and parasites has increased the risk of both diseases [39,40].



## CONCLUSION

This research has confirmed the importance of access to safe water and improved sanitation as a priority strategy. Supplementary feeding for mothers and children during the first 1000 days of life will significantly impact when water, sanitation, and hygiene interventions are recognized as integrated program interventions.

Furthermore, the priority strategy model for stunting reduction in Indonesia, especially the archipelago, requires simultaneous multi-sectoral convergence. The present study results emphasized the importance of priority strategies for nutrition-specific interventions in the 1000 days of life, namely conception, pregnancy, and children under two years of age.

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