

# Modeling environmental interactions and collaborative interventions for childhood stunting: A case from Indonesia

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## ARTICLE INFO

**Keywords:**  
Indonesia  
Public health  
Stakeholder  
Stunting

## ABSTRACT

Child stunting is a significant problem in Indonesia and requires special attention even though the government has implemented various programs to overcome it. The formulation of this study is: 1) How is the management of stunting handling based on the government's perspective? 2) What is the role of parties involved in the prevention and handling of stunting? 3) What is an effective stunting management model? The objectives of this research are: 1) The implementation of local government stunting handling policies; 2) Analyze cross-sector collaboration and active participation of all stakeholders; and 3) Formulate an integrated model for handling stunting and the implementation of system synergy. The design of this study uses a qualitative approach with a phenomenological which was carried out in the period from January 2023 to September 2024 in Indonesia. The informants interviewed in this study were 60 people recruited using the purposive sampling method also involving Focus Group Discussions (FGD). The results of this study identify that the success of stunting reduction efforts depends on effective collaboration between various stakeholders. The study highlights that social capital, which consists of social networks, collective norms, and trusts, plays an important role in strengthening stunting reduction efforts. Further research is needed to explore the specific impacts of social capital in other contexts in Indonesia and to develop more adaptive intervention models to local social and cultural dynamics.

## 1. Introduction

Stunting is a condition of failure to grow in children under the age of five caused by chronic malnutrition, recurrent infections, and lack of adequate psychosocial stimulation [1]. Technically, stunting is defined as the length or height of a child who is below minus two standard deviations from the median of the WHO Child Growth Standards for the same age and sex [2,3]. This condition is often the result of complex interactions between various biological, environmental, socio-economic, and behavioral factors. Stunting not only reflects a disturbance in physical growth but also has a significant impact on a child's cognitive development and long-term health, which can reduce their quality of life as well as potential future productivity. Children who are stunted tend to have lower levels of immunity, are susceptible to infectious diseases, and have a higher risk of various other health problems such as non-communicable diseases later in life [4,5]. In addition, stunting in children has been shown to be associated with decreased learning ability and educational performance, which in turn can affect a

country's economic productivity and competitiveness in the future. The problem of stunting is not only an individual health problem but also a broader development problem that affects society and the economy as a whole. (See Fig. 1.)

In Indonesia, stunting is an urgent public health problem and has become a major focus on the national health agenda. Data from the Ministry of Health of the Republic of Indonesia shows that the prevalence of stunting in children under the age of five reached 27.6 % in 2020, which means that almost one in three children in Indonesia is stunted [6]. This prevalence is alarming because it exceeds the World Health Organization's target. This high rate of stunting not only indicates a lack of adequate nutritional intake among children, but also reflects an imbalance in access to basic health services, clean water, sanitation, and proper feeding practices. At the global level, stunting affects about 144 million children under the age of five, with the highest prevalence occurring in South Asia and Sub-Saharan Africa [7]. This situation exposes stark disparities in the health and well-being of children around the world, reflecting social and economic inequalities

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<https://doi.org/10.1016/j.dialog.2025.100206>

Received 30 September 2024; Received in revised form 3 December 2024; Accepted 14 January 2025

Available online 18 January 2025

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between countries and within communities. As one of the most important nutritional indicators, stunting is often used as a measure to assess a country’s progress or setbacks in achieving the Sustainable Development Goals (SDGs), especially the goal of ending all forms of malnutrition by 2030. Results Lestari et al., [8] showed that parental income had a significant relationship with stunting with 51.7 % of children from low-income families experiencing stunting compared to 28.6 % in high-income families. Concerns about stunting problems were shown by 53.9 % of children with low energy intake who would be stunted and 51.4 % of children with low protein intake who were stunted. Based on the low birth weight (LBW) model of 559 children analyzed, 20.8 % experienced stunting, where a significant increase in baby weight < 2500 g at birth. [9].

The Government of Indonesia has a national target to reduce the prevalence of stunting as stated in Presidential Regulation Number 72 of 2021. At least in the legality of the law, it establishes a team to accelerate stunting reduction at the national level. Furthermore, there are five pillars in the National Strategy for the Acceleration of Stunting Reduction as the basis for achieving sustainable development targets and objectives, namely: 1) Increasing the commitment and vision of the leadership of Ministries/Institutions, provincial local governments, district/city local governments and village governments; 2) Improving communication of behavior change and community empowerment; 3) Increase the convergence of specific interventions and sensitive interventions in Ministries/Institutions, provincial governments, district/city governments and village governments; 4) Increasing food security and nutrition at the individual, family and community levels; 5) Strengthening and developing systems, data, information, research and innovation.

Programs to reduce the prevalence of stunting have been implemented by the government and local health organizations. Supplementary feeding (PMT) and micronutrient supplementation programs have been carried out in many districts with a focus on fulfilling child nutrition from pregnancy to two years of age [10]. In addition, initiatives to increase access to clean water and sanitation, as well as strengthening immunization programs and prevention of infectious diseases, are integral parts of efforts to reduce the stunting rate [11]. The

Indonesian government has also launched stunting alleviation programs involving various sectors, such as health, education, and community empowerment, to provide a more holistic approach. Assessments of the effectiveness and efficiency of these measures show mixed results. Supplementary feeding (PMT) programs have proven to be effective in improving children’s nutritional status, but the main challenge lies in uneven distribution, especially in remote areas [12]. Although nutrition and sanitation-based interventions have the potential to reduce stunting rates, their success is often influenced by socio-economic factors such as family income levels and awareness of the importance of balanced nutrition [13]. These poor health conditions add to the financial burden on families and increase state spending on preventive and curative health care. This research is important for policymakers because it provides a strong evidence basis for designing more effective and targeted interventions to address stunting in Indonesia. By understanding the interaction between environmental factors and existing interventions, the resulting policies can be more holistic and coordinated, involving various sectors such as health, education, and sanitation. For practitioners, the results of this study offer practical guidance for designing and evaluating intervention programs in the field. Using clear data and models, practitioners can develop more effective strategies to reduce the prevalence of stunting and improve children’s quality of life. Furthermore, this study refers to the formulation of the problem, namely: 1) How is the governance of stunting handling based on the government’s perspective? 2) What is the role of parties involved in the prevention and handling of stunting? 3) What is an effective stunting management model? The objectives of this research are: 1) The implementation of local government stunting handling policies; 2) Analyze cross-sector collaboration and active participation of all stakeholders; and 3) Formulate an integrated model for handling stunting and the implementation of system synergy.

The next part of this article is the use of literature review including the theory applied. The next part is the research method used by the researcher, the next is the content of the discussion of the research results and discussion comprehensively. The final part of this study contains the conclusions and limitations of the research.

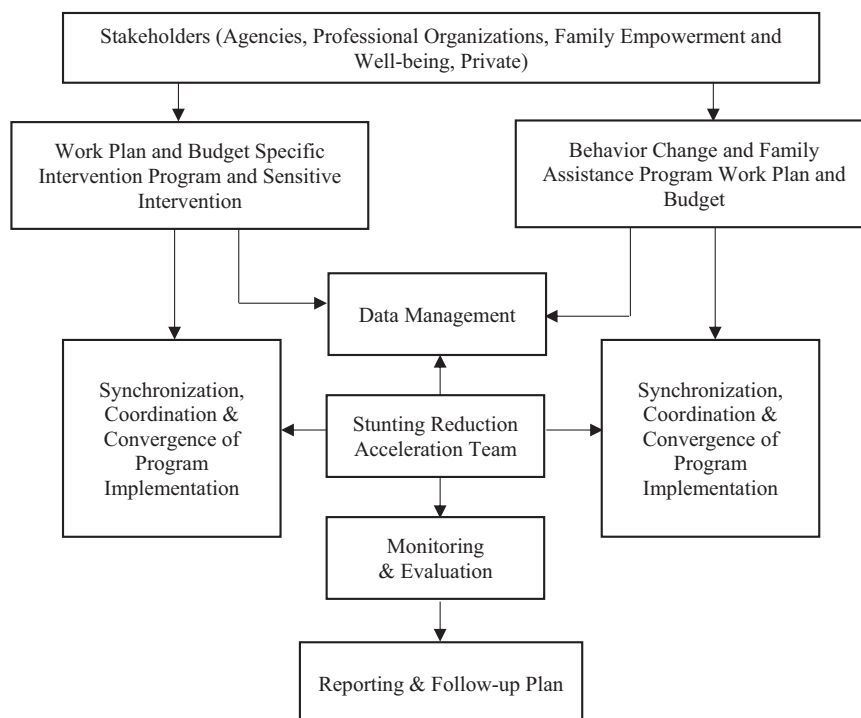


Fig. 1. Collaborated Integrative Environment Model for Handling Stunting.

## 2. Literature review

### 2.1. Social capital theory

Social Capital Theory is a concept that explains the importance of social networks, norms, and beliefs that facilitate cooperative and collaborative actions in society [14,15]. In the context of public health, including stunting management, social capital can play a key role in optimizing interventions and programs designed to reduce the prevalence of stunting in children. Social capital involves a strong network of social relationships between individuals and groups in society. In handling stunting, this network can be in the form of partnerships between families, communities, non-governmental organizations, and health institutions. Effective collaboration among these various stakeholders can improve access to health services, nutrition education, and sanitation programs that are important factors in preventing and reducing stunting.

Social capital theory also highlights the importance of shared norms and beliefs in the community that encourage proactive behavior and adherence to health interventions [16]. In Indonesia, where community values and social solidarity are still strong, these norms can be used to promote good feeding practices, hygiene, and broader use of health services. Collective trust in government programs and health institutions can also increase public participation in stunting reduction programs. Social capital allows for easier access to resources and information needed to prevent stunting [17]. For example, communities with high social capital tend to have better access to information about the importance of balanced nutrition and good health practices. This is especially important in rural and remote areas of Indonesia, where information may be difficult to access and knowledge about nutrition is still limited. Social capital theory can also help explain how cross-sector collaboration can be improved in the context of handling stunting. Social capital can promote better coordination between different sectors, ensuring that interventions implemented are more integrated and holistic, in accordance with local needs and evidence-based.

In Indonesia, the application of social capital theory in stunting management can strengthen a community-based approach involving a variety of local actors, including health cadres, community leaders, and civil society organizations [18]. Utilizing existing social networks and strengthening social capital through training and community empowerment, efforts to reduce stunting can be more effective. Programs such as Posyandu are examples of how social capital can be used to strengthen health interventions at the community level. In addition, increasing social capital through activities that increase social interaction and build trust, such as mutual cooperation activities and economic empowerment programs, can improve the welfare of the community as a whole, which in turn will have a positive impact on reducing stunting rates.

Ehsan et al., [19] argues that social capital can strengthen health outcomes by improving access to information, reinforcing positive health norms, and providing social support. They highlight how strong social networks and interpersonal trust can increase participation in health programs, such as immunizations or disease prevention initiatives, which in turn can reduce the prevalence of conditions such as stunting in children. On the other hand, some experts criticize this idea by pointing out that social capital does not always lead to positive health outcomes [20]. They argue that social capital can reinforce harmful norms or unhealthy behaviors in some communities. For example, in societies where there is a strong belief in traditional medicine rather than modern health services, high social capital can be a barrier to accessing more effective health care.

Economists Thompson [21] argue that social capital can improve economic development by facilitating collaboration and cooperation leading to innovation and higher productivity. They point out that social capital allows for better access to economic resources and job opportunities, which can help reduce poverty and social inequality. However,

critics will argue that social capital alone is not enough to address the underlying structural problems of poverty and inequality. They emphasize that social capital is often based on informal networks that are not always compatible with formal economic structures. In many cases, close social networks can exclude those outside a particular group or community, which can actually exacerbate inequality [22,23].

Wang et al., [24] emphasizes that social capital can be measured through clear indicators such as participation in community organizations, interpersonal trust, and adherence to social norms. Criticism of this theory often highlights the challenges of accurately measuring social capital [25,26]. Social capital is a complex and multidimensional concept that is difficult to measure in a consistent and reliable way. They emphasized that many existing measures of social capital tend to be subjective and rely on individual interpretations, which makes them vulnerable to bias and unreliable as a policy tool. Social capital plays an important role in building community resilience to crises such as natural disasters or epidemics [27]. They show that communities with high social capital are more likely to help each other and recover faster from crises. On the other hand, social capital can also be a source of vulnerability [28,29]. For example, in situations where communities rely heavily on their social networks for survival, the loss of social capital (for example, through migration or conflict) can have a very damaging effect. Additionally, high social capital within the group can lead to isolation from external networks, which reduces access to broader resources and support. The effectiveness of social capital is highly dependent on the specific context in which it is applied, and it is important for policymakers, practitioners, and academics to consider this complexity when designing and implementing social capital-based interventions. For stunting management in Indonesia, optimizing social capital requires a holistic and adaptive approach, which takes into account the strengths and weaknesses of social networks in various communities.

### 2.2. Stakeholder theory

Stakeholder theory was introduced by R. Edward Freeman in 1984, emphasizing the importance of identifying and managing the interests of all parties involved or affected by an organization or program [30]. In the context of tackling stunting, this theory is particularly relevant because it involves a wide range of stakeholders from various sectors—governments, health institutions, non-governmental organizations, local communities, the private sector, and international donors who contribute to the fight against stunting. Stakeholder theory allows these stakeholders to collaborate more effectively by clarifying their respective roles, responsibilities, and contributions in efforts to reduce stunting. Stunting management is carried out to identify key stakeholders who have a direct or indirect role in influencing outcomes. This includes central and local governments, health institutions, non-governmental organizations (which focus on nutrition, sanitation, and economic empowerment), local communities, and donors and international organizations.

Clear identification helps in organizing the coordination and distribution of tasks, which ensures that each stakeholder has an appropriate role and is involved in the decision-making process. Various stakeholders in handling stunting have different interests and priorities. Governments may focus more on public policy and budget allocation, while health institutions focus more on medical interventions and child health monitoring [31]. Non-governmental organizations may focus on community empowerment and education, while the private sector may see potential in supporting programs that strengthen their corporate image. Stakeholder theory helps in managing these diverse interests by ensuring that all interests are considered in the planning and implementation of the program [32]. It also helps to avoid conflicts that may arise from different priorities and ensures that all parties are working towards a common goal. This collaboration can also involve the private sector in supporting health programs, such as the provision of nutritious

food or financial support for stunting intervention programs.

Stakeholder theory also emphasizes the importance of the participation of all stakeholders in the monitoring and evaluation of programs [33,34]. Moreno et al., [18] argues that stakeholder analysis is a very effective tool to understand and manage the complexities involved in handling complex social problems such as stunting. They emphasized that by involving various stakeholders in the decision-making process, health programs can be designed to be more inclusive and responsive to the needs of the community. According to Winowiecki et al., [35] stakeholder analysis allows for the formulation of a more holistic and evidence-based strategy, because it considers input from various parties with different interests and expertise. This is very important in the context of stunting, where the causes and potential solutions are multidimensional.

On the other hand, criticism of stakeholder analysis often highlights the challenges of determining who really is a “stakeholder” and how much of a role or influence they play in the decision-making process. Bridoux & Vishwanathan [36] argues that not all stakeholders have the same level of influence or interests, and this could lead to injustice or imbalance in how their interests are prioritized. The study van Rees et al., [37] shows that a stakeholder-based approach can be too normative and less pragmatic in situations where resources are limited or where there is strong political pressure. In the context of stunting, where resources are often limited, this approach may face difficulties in managing conflicts between stakeholders or in reaching consensus on the priorities of interventions.

### 3. Methodology

This research focuses on modeling environmental interactions and collaborative interventions to overcome the problem of stunting in children in Indonesia. Through this study, we aim to understand how physical, social, and economic environmental factors interact and how collaboration between various stakeholders can contribute to reducing the prevalence of stunting in the study area. The purpose of this study is to identify and map environmental factors that contribute to stunting, in addition to analyzing collaborative interventions that can be followed up to reduce stunting with a participatory approach. To this end, a qualitative study was used on relevant stakeholders in Indonesia to analyze the role of social capital in building collaboration between stakeholders such as the government, local communities, health institutions and non-governmental organizations. In the next section, the methodology and design of the research are carefully examined with discussions related to the purpose and design of the research, the location and participants of the study, data collection, data analysis and ethical considerations.

#### 3.1. Study site and participants

This research was carried out in the period January 2023 to September 2024 in Indonesia. The choice of this country as the location of the study is due to the serious problems faced related to the prevalence of stunting in children, which has a direct impact on the development of human resources and long-term economic potential. This research was carried out in Jember Regency, which was chosen as the location of the study because the prevalence of stunting in this area is one of the highest in Indonesia. Jember Regency faces serious challenges in terms of reducing stunting rates, which reflects the problem of malnutrition and lack of access to optimal health services. This condition makes Jember Regency a relevant context to analyze the dynamics of stunting control and enrich understanding of the implementation of health policies in areas with major challenges in the field of nutrition. Based on data from the Ministry of Health of the Republic of Indonesia and international organizations such as United Nations Children’s Fund (UNICEF), stunting rates in Indonesia are still at an alarming level. To date, the prevalence of stunting in Indonesia was recorded at 21.6 % in

2022 according to the Ministry of Health, although there have been continuous efforts to reduce it because it has a very wide social, cultural, and geographical diversity, which plays a major role in influencing the variation of stunting patterns and determinants in various regions. Factors such as access to health services, sanitation, parenting, and nutritional intake greatly influence regional differences in stunting prevalence. Some areas with better access to health services and higher nutritional awareness show a lower prevalence of stunting than areas that are less developed in terms of infrastructure and accessibility.

With an estimated population of 275.5 million people, Indonesia faces major challenges in overcoming the stunting problem that requires collaboration from various stakeholders [38]. The number of informants interviewed was 60 people selected using the purposive sampling method. Participants consisted of three main categories: health workers, civil servants, and the public. The category of health workers includes professionals who are directly involved in stunting intervention programs, such as doctors, nurses, and nutritionists. The civil servant category involves government officials who play a role in formulating and implementing policies related to stunting, both at the local and national levels. Meanwhile, the community category consists of families and individuals who are beneficiaries of stunting prevention programs, which provides insight into the impact of these policies and interventions on the individual and family level.

#### 3.2. Research design

The design of this study is a phenomenological study with a qualitative approach that allows for an in-depth exploration of individual experiences, both as policymakers and as beneficiaries of stunting intervention programs. This approach focuses on understanding the subjective perspective and context behind their experience in handling stunting. The main objective is to deeply understand the experiences and perspectives of stakeholders involved in collaborative efforts to address the problem of stunting in Indonesia. Phenomenology aims to explore the essence of an individual’s subjective experience related to the phenomenon being studied [39,40]. In this case, stakeholder experiences regarding collaboration between institutions and their impact on stunting alleviation are the main focus. This approach allows us to dig deeper into how policies and programs are interpreted, implemented, and perceived by various parties. The usefulness of phenomenological studies in this study lies in their ability to provide in-depth insights into the realities experienced by key actors, including governments, health workers, and society. This provides a more comprehensive perspective on how environmental collaboration and interaction in the context of stunting is understood by those directly involved.

The importance of using a phenomenological approach in this study is based on the complexity of the stunting problem, which involves various aspects of social, cultural, economic, and health. Phenomenology provides space to explore personal experiences that are often not revealed through a quantitative approach. Through in-depth interviews, we were able to capture emotional nuances, perceptions, and meanings that may differ between individuals and regions, as well as how these affect the effectiveness of stunting interventions. The contribution of this research through a phenomenological approach is very significant for the object of research, namely efforts to alleviate stunting through collaborative interventions. The study not only offers data on program outcomes, but also provides a holistic understanding of the collaboration process itself, including the challenges, obstacles, and dynamics that occur among stakeholders.

The research team consists of academics in Indonesia who have worked with policymakers who have been working with policy holders seeking to reduce stunting over the past decade. It should be noted that the research team not only gathered and left, but after the interview the participants were invited to continue the focus group discussion conducted by the Assoc. Professor team and students of Wijaya Putra University. The main idea is to comprehensively know the empirical

conditions of the research object and the opinions of experts to reduce the stunting rate effectively.

### 3.3. Data collection and analysis

This study uses a qualitative approach in data collection and analysis to explore in depth the experiences, perceptions, and views of stakeholders in collaborative efforts to overcome stunting. The qualitative approach was chosen because it provides a rich and deep understanding of the social and cultural context that influences the policy and implementation of stunting interventions in Indonesia. Through in-depth interviews and focus group discussions, this approach allows us to gain better insights into how environmental interactions and collaborations are perceived and interpreted by the actors involved [41,42].

The selected individuals are those who occupy public positions and have a direct role in implementing policies related to stunting. Before each interview, the participant's rights are explained in detail, including the right not to answer certain questions or to stop the interview at any time. Written consent is obtained from each participant, stating that they understand the purpose of the research and are willing to participate voluntarily. Interviews are conducted in a closed atmosphere to ensure the privacy and comfort of participants, lasting for 40–50 min per session. The research data collected was also based on the involvement of several participants in the Focus Group Discussion (FGD) which lasted at least 120 min. This FGD is designed to explore interactions between stakeholders and gain a collective perspective on collaborative strategies in overcoming stunting. All interview and Focus Group Discussion (FGD) participants agreed to the audio recording, which was then transcribed verbatim. To maintain confidentiality, the names of participants are redacted in transcripts, and all personal information is kept secure. Once the transcription process is complete, the next step is to encode the data. Coding is done to identify patterns and themes that emerge from the results of interviews and discussions. This process is important for organizing qualitative data so that it is easier to analyze, while also helping to reveal key themes relevant to the research question. Coding also allows researchers to identify key variables that contribute to understanding environmental interactions and collaborative interventions.

The research instrument used is field notes that allow researchers to record direct observations during interviews and focus group discussions (FGDs). In addition, voice recorders are used to record in-depth interviews with informants, allowing for accurate transcription and more systematic data processing. The use of voice recorders also gives researchers the flexibility to focus on the content of the conversation without losing important details. To ensure the quality of the data, all interviews and FGDs are conducted with the permission and approval of the informant, and confidentiality is maintained. The identification of subthemes and themes that emerge from the collected data will be carried out through a thematic analysis process. Data obtained from in-depth interviews and focus group discussions (FGDs) will be analyzed to find key patterns related to the research objectives. Some of the main themes that are expected to emerge include stunting policy management, the role of stakeholders in stunting control, access and distribution of health services, and socio-economic influences on stunting. More specific subthemes will include aspects such as intersectoral collaboration, community involvement in health programs, challenges in policy implementation, and the effectiveness of nutrition-based interventions. This identification process aims to link the findings to the research objectives, which focuses on a dynamic understanding of stunting control interventions and their effectiveness in local contexts, as well as to ensure continuity between research results and further discussions in policy analysis.

In data analysis, a more open interpretive approach is carried out to place the data in a broader context, covering cultural aspects, external variables, and the theory underlying the research. This analysis allows researchers to relate the results of interviews to Social Capital theory and Stakeholder Theory, thus providing a more comprehensive insight

into how collaboration between stakeholders can affect stunting alleviation efforts. Some similarities in comments that emerged from the interview were also analyzed to assess the consistency of perception between informants.

### 3.4. Ethical considerations

During the study, the research team maintained a close but professional relationship with the informants, who acted as the main participants in the study. This closeness is built through intensive and open communication, which allows the team to build trust with participants so that they feel comfortable sharing views and experiences. However, one of the main challenges faced by the research team is the difference in perception and awareness among participants regarding the importance of collaboration in overcoming stunting. Some participants showed hesitation and resistance in providing information, which led to the limitation of available data. To address these issues, the research team adopted an empathetic and flexible approach by providing a more in-depth explanation of the objectives of the study, as well as showing how the results of this research will contribute to future public health policy. These steps help increase the credibility of the research and the validity of the data obtained, as participants become more open in sharing information.

The research team also sets standards for research trustworthiness through validity, credibility, and transferability. The validity of this research is determined by the fairness and justification of the findings which can later be assessed objectively by readers. We ensure that the findings produced can be justified with solid data and supported by clear arguments. Throughout the research process, the team maintained a reflective attitude, by critically evaluating the influence of the researcher's subjectivity on the interpretation of the data, thus maintaining the integrity of the entire process. In terms of credibility, the presentation of findings is carried out thoroughly and transparently, without underestimating any information. Data coding and analysis are carefully carried out to maintain the credibility of the data throughout the analysis process. Source triangulation and data triangulation are used to ensure that the resulting findings are supported by various viewpoints and data types, thus strengthening the accuracy of the findings. Before and after the development of interview questions and during the data analysis process, questions and answers and peer reviews are carried out to ensure the objectivity and quality of the data. Transferability is ensured through the preparation of useful and relevant findings for other similar contexts. The findings resulting from this study are applicable and serve as a reference for other studies that focus on collaborative interventions in developing countries, particularly related to child health issues.

Although this study succeeded in achieving its objectives, there were limitations in terms of data collection time and variation of respondents, which could affect the generalization of the findings. Therefore, further studies with a more diverse sample are needed to expand the application of the results of this study. All participants in the study had signed a written consent form, stating that they understood the purpose of the study and were willing to participate voluntarily. In addition, ethical approval from the research ethics committee has also been received before the implementation of the research begins, thus ensuring that this research is carried out in accordance with applicable ethical standards.

## 4. Result and discussion

Social Capital Theory, which focuses on the role of social networks, norms, and beliefs in shaping collective action, provides significant insights into understanding and overcoming the stunting phenomenon in Indonesia. Stunting is not only an individual health problem caused by chronic malnutrition but also a social problem that is affected by dynamic interactions between members of society, families, institutions, and communities. In this context, social capital can be a key factor that

strengthens or hinders stunting reduction efforts. Strong social networks within the community can serve as an effective platform for the dissemination of information related to good health and nutrition practices. Mishra [43] argued that social networks play an important role in facilitating useful information and mutual support among their members. In the context of stunting reduction, social networks can help disseminate information about the importance of proper nutrition for pregnant women and children, good feeding techniques, and the importance of access to health services. The results of the interview with participant informan (SPH) as Head of Women's Empowerment, Child Protection and Population Office (DP3AK) will be explained as follows:

"In many regions, we see that the involvement of community leaders, health cadres, and local volunteers is very helpful in disseminating information and education about the importance of balanced nutrition for pregnant women and children. Strong social networks allow for wider and faster distribution of information, so that people can more easily access the knowledge and resources needed to prevent stunting. This cross-sectoral cooperation is important to ensure that our interventions are well coordinated and complementary."

In addition, social networks can facilitate access to resources necessary to prevent stunting, such as nutritious food, clean water, and adequate sanitation. According to Ali [44] a close-knit social network allows individuals and families to get support in the form of food loans or financial assistance from other community members during difficult times, which can ultimately prevent malnutrition that leads to stunting. Furthermore, the results of the interview with participant informant (MFB) as Deputy Regent of Jember Regency will be reviewed as follows:

"Public trust in the government and our programmes greatly influences the level of participation and the success of interventions. For example, in Posyandu activities, we involve mothers and families in the process of monitoring children's growth and providing additional food. By engaging them directly, we build their trust and commitment to continue participating in the program. This trust is built through a transparent and inclusive approach, where the community is involved from the planning stage to the evaluation of the program."

Trust between community members and trust in health institutions is an important element of social capital that can encourage participation in health programs. Fehr & Schurtenberger [45] shows that a high level of trust in society allows for more effective cooperation and greater participation in collective activities. In the context of stunting reduction, trust in government intervention programs and non-governmental health organizations is essential to encourage people to participate in nutrition education programs, immunizations, and other child health programs. Furthermore, the results of interviews with participant informant (SW) as Jember Regency Social Service will be reviewed as follows:

"The success of stunting reduction programs is highly dependent on collective norms that encourage positive health practices within the community. We strive to change social norms related to diet and hygiene through educational campaigns that focus on the importance of adequate nutrition and good sanitation."

The same thing was also stated by participant informan (KA) as Child Protection Division Women's Empowerment, Child Protection and Population Office (DP3AK) Jember Regency as follows:

"Women's Empowerment, Child Protection and Population Office (DP3AK) hopes to change people's behaviour in the long term and ensure that good health practices become part of the community's culture. SPH said that this change in norms is not easy to achieve and requires consistent time and effort. However, with the support of a strong social network and the trust of the community, we are optimistic that this change can be achieved."

Collective norms that support good health practices and feeding can strengthen stunting reduction efforts. In communities with high social capital, these norms tend to be stronger and more adhered to by community members. This is in line with findings Cislighi & Heise [46] suggesting that social norms can encourage individual behavior that is

consistent with broader public health interests. Social capital allows community mobilization to support community-based intervention programs aimed at reducing stunting. Igalla et al., [47] underlines that community social capital, through active involvement in local organizations and collective activities, can strengthen the capacity of communities to participate in and support targeted health programs. In Indonesia, programs such as Posyandu (Integrated Service Post) have leveraged social capital to encourage active community participation in child health monitoring and nutrition education. Furthermore, the results of the interview conducted with participant informant (IGS) as the Head of Tegallingah Village are as follows:

"One of the biggest challenges is ensuring the inclusivity of social networks. Sometimes, marginalized groups or poorer individuals do not have the same access to these networks. This shows the importance of ensuring that all groups of people, including the most vulnerable, are engaged in social networks and benefit from existing programs."

In addition, a similar opinion was expressed by participant informant (DL) as the Head of National Population and Family Planning Agency (BKKBN) as follows:

"I see a great opportunity in strengthening social capital to support stunting reduction efforts. By building and strengthening social capital, we not only increase the effectiveness of our programs, but also empower communities to actively participate in keeping their children healthy." (Interview conducted in June 2024).

According to Wong & Kohler [48] social capital has great potential to improve health outcomes through increased social support and access to relevant information about health. They argue that social capital can strengthen people's capacity to collectively address health problems, including stunting, by increasing community involvement in health programs. Lee et al., [49] also stated that social capital can contribute significantly to stunting reduction by strengthening social support networks that can help families in overcoming nutritional and child health challenges. They highlighted the importance of social networks in supporting access to health services and the assistance needed to prevent stunting.

Although many support the application of social capital in handling stunting, experts warn about the risk of over-reliance on social capital [50]. They point out that in some cases, strong social networks can reinforce negative or exclusive norms that may be contrary to public health goals. For example, if a community relies heavily on traditional treatments that are not scientifically proven, this can hinder access to more effective medical care. Campbell [51] highlights potential inequalities in the distribution of social capital, where more marginalized or disadvantaged groups may have more limited access to supportive social networks and health services. This suggests that social capital is not always evenly distributed across communities, and some groups may remain vulnerable to stunting despite intervention efforts focused on social capital. Furthermore, the results of the interview with participant informant (SPH) as Head of Women's Empowerment, Child Protection and Population Office (DP3AK) will be reviewed as follows:

"Proper stakeholder identification is a very important first step in designing and implementing stunting reduction programs. We must ensure that all parties affected and affected by this program are clearly identified. Stakeholders involved include various government agencies such as the Health Office, Education Office, and Social Service, as well as non-governmental organizations, the private sector, and local communities."

Stakeholder identification is very important in the application of stakeholder theory explained by participant informant (MFB) as Deputy Regent of Jember Regency as follows:

"Each stakeholder has a specific role in supporting this program. For example, the Health Office is responsible for providing health services and nutrition education, while the Education Office plays a role in integrating education about nutrition and health into the school curriculum. We also engage the private sector, especially food and beverage companies, to contribute to providing nutritious food at affordable

prices.”

Identifying key stakeholders is essential to ensure that every party involved in the children’s health ecosystem understands their roles and responsibilities. Kujala et al., [52] emphasizes that stakeholders include anyone who can influence or be influenced by the achievement of the goals of an organization or program. In this case, stakeholders include central and local governments, health offices, educational institutions, civil society organizations, the private sector (such as food companies), and families and communities themselves. This stakeholder identification allows for a clear allocation of roles and responsibilities, so that all parties can work synergistically and without overlapping. For example, governments can facilitate policy frameworks and funding, while NGOs can focus on implementing programs at the community level, and the private sector can provide the necessary resources and technology. Furthermore, the results of the interview with SW as the Jember regency Social Service will be presented as follows:

“Stunting reduction requires close cross-sector collaboration. Stunting is not a problem that can be overcome by one sector alone. This requires collaboration between different sectors to create comprehensive interventions. Another example is DP3AK working with the Public Works Office to improve water and sanitation infrastructure that affects the health of children in remote areas.”

Support for this statement was also expressed by participant informant (KA) as the Child Protection Division of Women’s Empowerment, Child Protection and Population Office (DP3AK) Jember Regency as follows:

“The importance of coordination between local and central governments to ensure that policies and programs go hand in hand and do not overlap. There is a need to coordinate efforts at the national and local levels to ensure that resources are used efficiently and program targets are achieved. Coordination and collaboration between stakeholders is key to achieving common goals in a project or program.”

Stakeholder theory emphasizes the importance of cross-sector collaboration to achieve common goals. Hinton et al., [53] the effectiveness of cross-sectoral collaboration depends on the recognition of the various interests and priorities of each stakeholder. In the context of stunting reduction, this collaboration can involve the government that makes nutrition and sanitation policies, the health sector that provides health services, and the education sector that educates the public about balanced nutrition. This collaboration ensures that the interventions carried out are comprehensive and complementary. For example, education programs on nutrition will not be effective if they are not supported by adequate access to nutritious foods. Therefore, the role of the private sector in providing access to affordable food is very important. This coordination also helps to avoid duplication of efforts and maximize the use of available resources. Another statement in the interview showed that:

“We ensure that the community, especially mothers and families, are involved in every step of the program. This involvement not only increases the effectiveness of the program but also increases the sense of ownership and responsibility for the success of the program.”

The argument is also stated by participant informant (IGS) as the Head of Tegallingkah Village as follows:

“Local Posyandu (Integrated Service Post) involves health cadres and mothers in the community to monitor children’s growth and provide education about nutrition. By engaging them, we not only increase their knowledge but also build a strong support network within the community. This implements the importance of social capital in strengthening public health programs through active involvement and community participation.”

Stakeholder theory also highlights the importance of active participation of local communities in stunting reduction programs. Brady et al., [54] argued that community engagement not only increases program effectiveness but also increases the sense of belonging and sustainability of the intervention. In the case of stunting, programs designed to involve local communities are more likely to succeed because they consider

relevant cultural and social norms and use approaches that are appropriate to the local context. Community empowerment is also important in reducing stunting. By involving communities in the planning and implementation of programs, communities can develop their own capacity to address stunting problems and sustain the outcomes achieved. For example, through the training of local health cadres and the empowerment of mothers as agents of change, stunting reduction programs can produce a more sustainable impact. Furthermore, the interview conducted with participant informant (DL) as Head of National Population and Family Planning Agency (BKKBN) is as follows:

“There are challenges in managing the diverse interests of various stakeholders. Each party has its own priorities and agendas, and sometimes these can be a source of conflict. There are times when central government policies are not fully aligned with local needs and priorities.”

The solution statement on this problem was delivered by participant informant (SPH) as Head of Women’s Empowerment, Child Protection and Population Office (DP3AK) as follows:

“The main thing is open and transparent communication and effective coordination mechanisms. We regularly hold discussion forums and coordination meetings with all stakeholders to ensure that all voices are heard and all decisions are taken by consensus. The management of diverse interests requires effective communication and ongoing negotiations.”

One of the main challenges in the application of Stakeholder Theory is the management of conflicts of interest that may arise among stakeholders. Roberts [55] emphasized that conflicts of interest are inevitable but can be managed well through transparent communication and ongoing negotiations. In the context of stunting reduction, there may be conflicts between stakeholders who have different priorities, such as between governments that focus on national policies and Non-governmental organizations (NGO’s) that work on local interventions. To address these conflicts, it is important to create dialogue forums and coordination mechanisms that allow all stakeholders to voice their interests and work towards a common consensus. In this way, stunting reduction programs can be designed and implemented by considering various perspectives and interests, thus increasing their chances of success.

Prasetyo et al., [56] supports the use of Stakeholder theory for complex problems such as stunting, where many interrelated factors require a coordinated approach. A stakeholder-based approach allows all relevant parties to be involved and ensures that intervention strategies are more responsive to local needs and sustainable. Meanwhile Soma et al., [57] argues that a stakeholder-based approach can enhance the legitimacy of programs and support the successful implementation of public health policies by ensuring broader and inclusive participation of various community groups. However, some experts have criticized Stakeholder Theory, stating that this approach can be too complex and difficult to implement in practice. Banerjee [58] warns that the management of diverse interests of various stakeholders can be a major challenge, especially in situations where resources are limited and there are political or economic pressures. Schwab [59] also points out that in some cases, a stakeholder-based approach may fail to address the problem of unbalanced power among stakeholders. For example, in the context of stunting, poor and marginalized groups may not have enough influence to ensure that their interests are prioritized in stunting reduction programs.

#### 4.1. Governance of stunting handling based on the government’s perspective

Governance of stunting handling in Indonesia has become the main focus in public health policy, considering the high prevalence of stunting which has implications for the quality of human resources in the future. From the government’s perspective, stunting management involves not only health interventions but also cross-sector integration that includes

education, sanitation, food security, and economic development. The Government of Indonesia has adopted a holistic and integrated governance approach to address this issue, with the aim of achieving a significant reduction in the prevalence of stunting in children across the country. The government of Indonesia through various ministries and institutions, has developed a number of policies and strategies to deal with stunting. One of the main policy frameworks is the National Action Plan for Stunting Rate Reduction (RAN-PASTI), which is prepared for the 2018–2024 period. National Action Plan for Stunting Rate Reduction (RAN-PASTI) targets to reduce the prevalence of stunting by up to 14 % by 2024 through various specific and nutritionally sensitive interventions.

Beyond specific interventions, the government also emphasizes the importance of nutrition-sensitive interventions that include improved access to clean water, sanitation, improved education, and economic empowerment. The Ministry of Public Works and Public Housing, for example, is involved in the development of sanitation and clean water infrastructure, while the Ministry of Education integrates nutrition education into the primary school curriculum. These interventions are designed to address the wider social determinants of stunting, creating an environment conducive to the healthy growth of children. In the governance of stunting handling, cross-sector coordination is a key factor in success. The government has established the National Team for the Acceleration of Poverty Alleviation (TNP2K) which serves as the main coordinating body to facilitate collaboration between ministries, local governments, and other stakeholders. One of the important components of effective governance is the use of data and technology for program monitoring and evaluation. The government has developed an Integrated Stunting Information System (SIST) that integrates data from various sources, such as health data, demographic data, and economic data, to monitor the prevalence of stunting and evaluate the effectiveness of the program.

The government faces several significant challenges that need to be overcome to achieve the stunting reduction target. One of the main challenges is the disparity in capacity between local governments in implementing stunting reduction programs. Some regions, especially in remote and underdeveloped areas, have limited human and financial resources, as well as inadequate infrastructure, which can hinder the effective implementation of programs. Cross-sectoral coordination, while essential, is often a challenge due to differences in priorities and interests between ministries and agencies. This requires stronger coordination mechanisms and decisive leadership to ensure that all stakeholders work synergistically and in line with national goals. Social changes and cultural norms are also challenges in the implementation of stunting reduction programs. For example, traditional feeding practices that are not in accordance with modern nutritional standards are still found in some communities. Therefore, there is a need for a more contextual and culture-based approach in designing health and nutrition interventions.

Based on the government's perspective, the governance of stunting handling in Indonesia involves a holistic, multi-sectoral, and data-based approach. The policies and strategies implemented include nutrition-specific and sensitive interventions, cross-sectoral coordination, the use of technology for monitoring, and decentralization that drives local initiatives. Although there are several challenges that need to be addressed, such as regional capacity inequality, coordination complexity, and social change, the government remains committed to reducing the prevalence of stunting through better governance and closer collaboration with all stakeholders. By strengthening governance and increasing the effectiveness of the program, Indonesia has the opportunity to achieve the stunting reduction targets that have been set and improve the quality of life of children throughout the country.

#### 4.2. The role of stakeholders in stunting prevention and handling

Prevention and handling of stunting in Indonesia is a shared

responsibility involving various stakeholders from various sectors. Stakeholder Theory, which emphasizes the importance of identifying, managing, and coordinating the interests of all parties involved or affected by a policy or program, is particularly relevant in this context. Stakeholders involved in stunting reduction efforts in Indonesia include the government, non-governmental organizations (NGOs), the private sector, local communities, international institutions, and the community itself. Each stakeholder plays a specific, complementary role to achieve a common goal, which is to reduce the prevalence of stunting across the country. The government, both at the central and regional levels, plays a role as the coordinator and main driver in efforts to prevent and handle stunting. The government is responsible for developing policies, allocating resources, and ensuring the implementation of programs at various levels.

The government also plays a role in strengthening the capacity of local governments to implement stunting reduction programs effectively. Through the Special Allocation Fund (DAK) and Village Fund mechanisms, the central government provides funds to support local initiatives that are relevant to local conditions and needs. The government acts as a facilitator to ensure effective coordination between various ministries and agencies, such as the Ministry of Public Works for sanitation, the Ministry of Education for nutrition education, and the National Population and Family Planning Agency (BKKBN) for reproductive health programs. This is in accordance with the recommendation of Freeman (1984) in Stakeholder Theory, which emphasizes the importance of coordination and collaboration between stakeholders to achieve optimal results.

Non-governmental organizations (NGOs) play an important role as service providers on the ground and advocacy agencies to raise awareness about stunting and nutrition. NGOs are often at the forefront of providing direct services to the community, such as nutrition education programs, health counseling, and supplemental feeding. They also play a role in monitoring children's growth and providing direct intervention to families at risk. This allows for closer monitoring and a faster response to the needs of the local community. In addition, NGOs act as advocacy agents that promote the importance of stunting prevention through public campaigns and cooperation with the media. They seek to raise public awareness and encourage behavioral change that supports the health of children and mothers.

The role of various stakeholders in stunting prevention and handling is crucial and complementary. Governments act as lead coordinators, Non-governmental organizations (NGOs) and the private sector play a role in service delivery and innovation, local communities are key actors in the implementation of programs on the ground, and international agencies provide financial and technical support. Strong cross-sectoral collaboration and active participation from all stakeholders are essential to ensure that stunting reduction efforts can be effective, efficient, and sustainable. However, to achieve the desired outcomes, an integrated and adaptive approach that takes into account local contexts, strengthens local capacity, and addresses existing challenges.

#### 4.3. Stunting management model

The governance model for handling stunting in Indonesia is designed to integrate various efforts and interventions across sectors that are coordinated, holistic, and evidence-based. Stunting, which results from chronic malnutrition in children, is a complex public health problem that requires a multi-sectoral and participatory approach. The governance model implemented by the Indonesia government includes various mechanisms and structures that ensure the active involvement of all stakeholders, effective coordination between various sectors, and the use of accurate data for monitoring and evaluation. The governance model for handling stunting in Indonesia is based on a cross-sectoral coordination structure involving various ministries, local governments, non-governmental organizations, the private sector, and the community. This structure is designed to ensure that all stakeholders

contribute effectively to the achievement of the common goal, which is to reduce the prevalence of stunting.

Stunting governance adopts a multi-sectoral approach that involves the integration of nutrition-specific interventions, such as supplementation and immunization, with nutrition-sensitive interventions, such as improved access to clean water, sanitation, education, and economic empowerment. This cross-sectoral coordination ensures that the social determinants of stunting can be comprehensively addressed. Within the framework of decentralization, the central government provides flexibility to local governments to develop stunting reduction programs that are in accordance with local conditions. Local governments are given the responsibility to design and implement community-based programs with funding support from the Special Allocation Fund (DAK) and Village Funds. This approach allows for a more contextual and adaptive response to local needs. The governance model for handling stunting in Indonesia emphasizes the importance of using accurate data and appropriate technology for program monitoring and evaluation. Technology is also used in the implementation of programs in the field, such as the use of mobile applications by health cadres to monitor children's growth and report health data to the center. This technology improves the efficiency and effectiveness of interventions by accelerating the flow of information and improving data accuracy. The researcher will then provide a review of the governance model for handling stunting as follows:

The formulation of an integrated model for handling stunting is a stage of design and implementation that describes the synergy of the system formed. This design stage has the main objectives, namely: 1) Meet the needs of system users based on problem analysis; and 2) Provide a clear overview of comprehensive design to programmers so that the creation of computer information systems can be more effective. The stunting reduction program also includes educational activities and behavior change targeted at mothers, families, and communities. Education on good feeding practices, the importance of balanced nutrition, and good sanitation are integral parts of this governance model. Through this activity, it is hoped that the community can adopt better and sustainable health practices. The government encourages the private sector to engage in stunting reduction programs through corporate social responsibility (CSR) initiatives and public-private partnerships. Food and beverage companies, for example, can play a role in providing nutritious food products at affordable prices, while technology companies can assist in the development of technology-based monitoring and evaluation systems. Although the governance model implemented has shown some success, there are several significant challenges that need to be overcome to achieve stunting reduction targets, namely: 1) Cross-sector coordination, while important, often faces challenges due to differences in priorities, objectives, and interests between various ministries and institutions; 2) Capacity inequality between local governments is another challenge in the implementation of stunting reduction programs; 3) Social changes and cultural norms related to maternal and child feeding and health practices are also challenges in the implementation of stunting reduction programs.

This research has a major strength in its in-depth and comprehensive approach using phenomenological methods, which allows for a richer understanding of the subjective experiences of participants, both from the perspectives of policymakers, health workers, and the public. The use of in-depth interviews and Focus Group Discussions (FGD) provides more contextual and relevant data on stunting control policies and the dynamics of collaboration between stakeholders. In addition, the selection of Jember Regency as a research location that has a high prevalence of stunting provides added value to the relevance of the findings in the context of real and urgent problems. However, this study also has limitations. First, a limited number of informants (60 people) may limit the generalization of the findings to a wider population. Second, the use of the purposive sampling method in the selection of participants may result in bias, because only individuals with certain criteria are involved, which can affect the diversity of perspectives obtained. In addition,

while qualitative data provide in-depth insights, the results of this study are more descriptive and may not be able to cover all the factors that contribute to stunting, especially those that are more systemic or structural.

## 5. Conclusion and policy implication

This research makes an important contribution in understanding governance, the role of stakeholders, and the application of social capital theory in the context of stunting reduction in Indonesia. The study identifies that the success of stunting reduction efforts depends on effective collaboration between various stakeholders. The study highlights that social capital, which consists of social networks, collective norms, and trusts, plays an important role in strengthening stunting reduction efforts. The governance model implemented includes the use of data for monitoring and evaluation, community empowerment through a participatory approach, and collaboration with the private sector and international institutions. Despite challenges in cross-sectoral coordination and local capacity inequality, the model provides a robust framework to reduce the prevalence of stunting and improve the quality of life of children in Indonesia. The findings show that access to affordable health services and the provision of nutritious food from pregnancy to the age of two years have a significant impact on reducing the prevalence of stunting. Furthermore, strengthening nutrition-based intervention programs and improving the quality of health services more evenly throughout Indonesia is a strategic step that can accelerate the reduction of stunting rates effectively and efficiently. Further research is needed to explore the specific impacts of social capital in other contexts in Indonesia and to develop more adaptive intervention models to local social and cultural dynamics. Longitudinal studies are also needed to measure the long-term impact of stunting reduction interventions and to assess the sustainability of existing governance models.

## Funding

This work was supported by the Ministry of Education, Culture, Research, and Technology Indonesia [01.14/KP/LPPM-UWP/VI/2024].

## Author contributions

Methodology, SJWA; data curation, SJWA; conceptualization, SJWA; methodology, SJWA; software, SSD; writing—review and editing, SSD; investigation, SSD; data curation, SA; methodology, SA; data curation, SA; supervision funding, SA. All authors have read and agreed to the published version of the manuscript.

## Declaration of competing interest

The authors declare no conflict of interest.

## Acknowledgments

The author would like to thank reviewers and editors for the comments and suggestions for the improvement of this paper.

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