

Analysis of problems and evaluation of stunting intervention programs in Jrah village, Boyolali Regency based on the System Thinking

Sutanta^{1*}, Muhammad Khotibudin¹, Arman Rifat Lette¹, Asruria Sani Fajriah¹, Tresia Umarianti¹, Rokhayati¹, Vitri Widyaningsih¹, Sri Mulyani²

¹Doctoral Study Program in Public Health, Faculty of Medicine, Sebelas Maret University, Surakarta Indonesia

²Department of Nursing Anesthesia, School of Vocation, Sebelas Maret University, Surakarta, Indonesia

*Corresponding author: paksutanta@gmail.com

ABSTRACT

Stunting is a major public health issue in Indonesia. Jrah Village, Boyolali District, is one of the areas facing challenges of stunting prevention and management. Despite the implementation of maternal and child health programs, stunting cases remain common among toddlers. This community service aimed to map the stunting problem in Jrah Village using a systems thinking approach and to evaluate the stunting intervention programs that have been implemented. The community service method involved data collection, information gathering, and providing recommendations to relevant stakeholders. The community service program was carried out from April to June 2026 in Jrah Village, Boyolali Regency. Thematic analysis results suggest that the stunting problem in Jrah Village, Boyolali, is complex and multidimensional. Factors of individual, family, environment, health service, and support system interact to influence stunting incidence. The program has been well implemented by the relevant agencies and community health centers, such as Supplementary feeding programs for children and pregnant women, child growth and development monitoring, health education, and cross-sectoral collaboration. However, challenges remain, including community behavior, environmental and cultural factors, personnel factors and service processes, and system and stakeholder factors. One finding is the persistence of a culture of early marriage, which can increase the risk factors for stunting in the community. Therefore, efforts to control stunting in Jrah Village require a comprehensive, integrated, and sustainable approach involving all elements of society and relevant stakeholders.

Keywords : Intervention Program, Problem Analysis, Stunting, Thinking System

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INTRODUCTION

Stunting is a public health issue that remains a major challenge in Indonesia. It is a condition where a child's height does not meet the standard for their age due to long-term malnutrition. This condition can be caused by maternal malnutrition during pregnancy or by

malnutrition in the child during their growth period (Marume et al., 2023) (Irdawati et al., 2024). A common case of stunting is that children with stunting don't appear to be physically impaired. However, upon closer inspection, there are issues with the body's metabolic system, which is not optimal, and not only cognitively but also physically (Goso et al., 2022; (Martony, 2023). Stunting has both short-term and long-term impacts on children. The short-term impacts include impaired brain development, intelligence, physical growth, and metabolism. The long-term ones are decreased cognitive abilities and academic achievement, a weakened immune system, a higher risk of diabetes, stroke, and disability in later life (Garcia et al., 2022)(Laily & Indarjo, 2023)(Mphangwe et al., 2024).

Globally, approximately 150.2 million children under five, or 23.2% of them, experienced stunting in 2024. This data shows that nearly one in four children in the world experienced chronic growth disorders, with most cases occurring in Asia and Africa (WHO, 2025). In Indonesia, stunting remains a major concern, despite showing a downward trend in recent years. The prevalence of stunting decreased from 27.7% in 2019 to approximately 21.5% in 2023, declined again to around 19.8% in 2024, and declined again to around 7,32% in 2025 (Kemenkes, 2026). The factors causing stunting are multifactorial (Azriani et al., 2024). The results of a study by (Zurhayati & Hidayah, 2022) suggested that education level, income, and antenatal care (ANC) visits were associated with the incidence of stunting. In addition, there is a relationship between Low Birth Weight (LBW), exclusive breastfeeding, iron and zinc adequacy levels, and incomplete basic immunization with the incidence of stunting (Rusliani et al., 2022). Besides, research by (Awais & Gideon, 2025) found that due to various socioeconomic barriers, inadequate WASH (Water, Sanitation, and Hygiene) conditions reinforce the cycle of disease and malnutrition.

The Indonesian government has made reducing the prevalence of stunting a national development priority through various specific and sensitive nutrition intervention programs. However, stunting persists across regions, with distinct causal characteristics. This situation indicates that stunting is not solely caused by malnutrition but a complex problem influenced by interacting factors, such as family socioeconomic conditions, parenting patterns, parental education, environmental sanitation, access to health services, community culture, and policy and institutional support. Numerous programs exist in Indonesia to address stunting cases. While all existing stunting programs have generally been running well, several obstacles remain, such as limited funding, a lack of human resources, and an inability to measure program effectiveness based on existing outputs. This should be taken into consideration in reducing stunting cases by increasing oversight of existing stunting programs (Yuda et al., 2023).

Jrakah Village in Boyolali Subdistrict is one of the areas that face challenges in preventing and addressing stunting. Despite the implementation of maternal and child health programs, stunting cases are found in toddlers. This condition indicates that some causal factors operate simultaneously and form a complex system. Therefore, a deeper understanding of the interrelationships between factors that cause stunting in the region is required. Current approaches to identifying stunting problems are generally partial and sectoral, often only able to identify causal factors in isolation. As a result, interventions have not fully addressed the underlying root causes of stunting. Therefore, an approach that can comprehensively examine the underlying factors is required.

One of the ideal approaches to use is Systems Thinking. It views a problem as part of a system consisting of various interconnected components that influence one another. Through this approach, researchers can identify causal patterns, leverage factors, and system dynamics that contribute to stunting. This approach enables the development of more effective intervention strategies by grounding them in an understanding of the root causes and the

relationships among factors within the system. Mapping the stunting problem in Jrah Village using the Systems Thinking approach could produce a comprehensive picture of the factors influencing stunting incidence and their interactions. The mapping results are expected to form the basis for formulating more targeted, integrated, and sustainable stunting prevention policies and programs tailored to the local conditions of the Jrah Village community.

METHOD

The community service method used was data collection, information gathering, and recommendations to relevant stakeholders. The author's initial preparations included coordinating and sending an official letter to the Department of Population Control, Family Planning, Women's Empowerment, and Child Protection (DP2KBP3A). Additionally, coordination was also conducted with the Boyolali Regency Health Office. It took place two weeks prior to the event and was conducted using a mobile phone. After approval from the office, the authors met with the office to align perceptions and explore the agency's needs in addressing stunting. Further coordination was also conducted with the Selo Community Health Center and Jrah Village, as directed by the DP2KBP3A. The authors coordinated to ensure the schedule, timing, and implementation of activities.

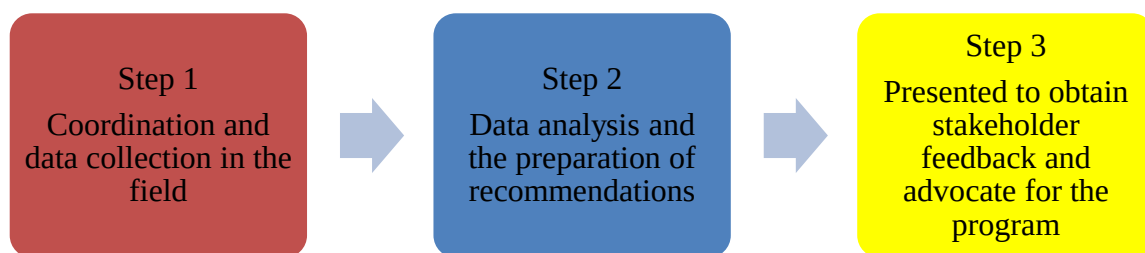


Figure.1 Stages of the community service activities

This community service activity would have been carried out for three months, from April to June 2026, in the Boyolali sub-district, specifically Jrah Village. The target of this service activity was the Department of DP2KBP3A, Selo Community Health Center, Boyolali Sub-district, and Jrah village community. Details of the service activity sequence were as follows: Coordination and alignment of perceptions with the service, coordination and alignment of perceptions with the community health center and village, data collection through FGD with related parties (community health center, cadres, midwives, mothers, and religious leaders), data analysis, and provision of recommendations.

In general, this community service activity is divided into three stages. The first stage is coordination and data collection in the field. Data collection was carried out after obtaining permission from the Selo Health Office and the Community Health Center. The collected data relate to the programs/interventions carried out, obstacles encountered in program implementation, and determinant factors causing stunting. The time for data collection was mutually agreed upon with informants after coordination. The second stage was data analysis and the preparation of recommendations. After the data were collected, the authors conducted quantitative and qualitative analyses to address the objectives of the community service. Data were displayed as images, graphs, and tables. Qualitative results were analyzed thematically. The authors also compiled them as reports and PowerPoint presentations. The third stage was the presentation of findings and recommendations. The third stage was conducted using the FGD method, in which the author presented the findings and analysis, as well as

recommendations. These results were presented to obtain stakeholder feedback and to advocate for the program. The prepared recommendations were discussed and agreed upon together.

RESULTS

The first activity was an introductory and mutual understanding meeting held on April 8, 2026, at the office. In this activity, the authors conveyed the objectives of the community service activities and requested input on locations and programs to be studied related to the problem of stunting in Boyolali Regency. The authors were directed to focus on analyzing problems and needs in Jrahah village, which has the highest number of stunting cases in Boyolali Regency. The authors then wrote to and approached the community health center and Jrahah village to collect data to analyze problems and needs that would form the basis for recommendations. The author then conducted data collection through Focus Group Discussions (FGDs) and in-depth interviews.

Table.1 Characteristics of informants

Characteristics	Number (n)	%
Gender		
Man	4	15.4
Woman	22	84.6
Age		
18-30 years old	13	50
31-40 years	10	37.5
41-50 years and above	3	12.5
Status		
Health workers	5	19.2
Cadre	8	30.7
Mothers with toddlers	12	46.3
Religious leaders	1	3.8

Based on Table 1, the characteristics of informants in the information-gathering process show that, by gender, most were women (22, 84.6%), and the fewest were men (4, 84.6%). By age, the largest category was 18-30 years old, with 13 people (50%), and the smallest was 41-50 and above, with 3 people (12.5%). By status, the most were mothers with toddlers, as many as 12 people (46.3%), and the fewest were religious figures, with as many as 1 person (3.8%).



Figure 2. FGD with the health center



Figure 3. FGD with midwives & cadres



Figure 4. FGD with mothers



Figure 5. Interview with religious leaders

Figure 1 shows the FGD process conducted with the community health center on Saturday, April 25, 2026. The community health center consisted of the head of the Selo community health center, the health promotion division, the maternal and child health division, and also a nutritionist. In this FGD, the policies and programs implemented by the community health center to address stunting were explored. In addition, obstacles to program implementation and determinants of stunting in the community were explored. Informants provided a lot of needed information. This information was recorded in a book or on a laptop.

Figure 2 shows the FGD process conducted with female cadres and midwives. This FGD also explored programs implemented to address stunting, obstacles in the field, and determinants of stunting in the community. Figure 3 shows the FGD process conducted with mothers with stunted children. This FGD also explored programs implemented to address stunting, obstacles in the field, and determinants of stunting in the community. FGDs were conducted with several informants to ensure data validity through source triangulation. Figure 4 shows the process of in-depth interviews conducted online with religious leaders in Jarakah Village. In addition to conducting FGDs with health workers, the authors also conducted FGDs with cadres, midwives, and mothers with stunted children. The author also conducted in-depth interviews with religious leaders. The results of the FGDs and in-depth interviews were then analyzed qualitatively.



Figure 6. Presentation of the findings



Figure 7. Discussion of the Findings

Figures 6 and 7 illustrate the process of presenting the findings from the fieldwork and discussing them with relevant stakeholders, including DP2KBP3A, the Health Office, the Education Office, the Ministry of Religious Affairs, subdistrict authorities, and the authorities of Jarakah Village. The authors presented the findings from the qualitative data collection as

well as the results of the secondary data analysis obtained at the study site. During the discussion, each representative provided their perspectives and input. Overall, the existing stunting intervention programs were considered to be well implemented. However, one of the issues highlighted was the high rate of early marriage in Jarakah Village, which was identified as one of the risk factors for stunting in the community. One of the key recommendations was to prevent early marriage in Jarakah Village. Each relevant government agency also committed to strengthening education and awareness efforts for both adolescent girls and parents. Overall, the results of the qualitative data analysis are presented in Table 2.

Table.2 Results of thematic analysis

Main Theme	Key Findings
Intervention Programs and Efforts	Education through digital media, counseling, advocacy, PMT, BRUS, Binwin, Nyuling Stunting, home visits, cross-program coordination, and collaboration with pediatricians.
Community Behavior Factors	Parents do not fully understand stunting; children eat based on satiety rather than nutritional quality; low protein consumption; smoking behavior in the home; incomplete ANC; and suboptimal care for young mothers.
Environmental and cultural factors	Early marriage, the culture of not allowing babies to leave the house for 40 days, limited clean water, poor house ventilation, and a social culture that prioritizes spending on traditional activities over the family's nutritional needs.
Cadre factors and service processes	Cadres lack self-confidence, the number of cadres is limited, training is irregular, incentives are low, measuring instruments are problematic, and the measuring and weighing processes are not always up to standard.
System and stakeholder barriers	The suboptimal involvement of religious leaders and village officials, differences in perceptions of stunting determination, geographical constraints in mountainous areas, and uneven cross-sector coordination.

Based on Table 1 The thematic analysis identified five major themes describing the existing conditions, intervention efforts, and challenges related to stunting prevention and management in Jarakah Village. These themes included intervention programs and efforts, community behavioral factors, environmental and cultural factors, cadre-related factors and service processes, and system and stakeholder barriers. Regarding intervention programs and efforts, various stunting prevention activities have been implemented, including education through digital media, counseling, advocacy, provision of supplementary food (PMT), BRUS, Bimwin, *Nyuling Stunting*, home visits, and cross-program coordination and collaboration with pediatricians. These findings indicate that stunting prevention efforts have involved multiple approaches and sectors, although several implementation challenges remain. For community behavioral factors, the findings indicated that some parents did not yet have a comprehensive understanding of stunting. Child feeding practices were still primarily focused on achieving satiety rather than ensuring adequate nutritional quality. In addition, low protein consumption, smoking inside the home, incomplete antenatal care (ANC) attendance, and suboptimal conditions among young mothers were identified as challenges in meeting maternal and child health and nutritional needs.

Environmental and cultural factors also emerged as important aspects influencing stunting prevention. The findings included early marriage, the cultural practice of not allowing

babies to leave the house for 40 days, limited access to clean water, inadequate household ventilation, and social practices in which traditional activities were prioritized over the nutritional needs of the family. These findings indicate that stunting is influenced not only by individual and family behaviors but also by environmental conditions and prevailing cultural practices. Regarding cadre-related factors and service processes, cadres faced several limitations, including low self-confidence, a limited number of cadres, irregular training, and relatively low incentives. In addition, some measurement instruments were inadequate, and growth measurement and weighing procedures were not always performed according to established standards. These conditions may affect the quality of growth monitoring and early detection of nutritional problems at the community level.

Meanwhile, system and stakeholder barriers included suboptimal involvement of religious leaders and village officials, differences in perceptions regarding the determinants of stunting, geographical barriers in mountainous areas, and uneven cross-sectoral coordination. These findings suggest that effective stunting prevention requires stronger multisectoral collaboration and more active involvement of relevant stakeholders. Overall, the findings indicate that stunting in Jrah Village is a multidimensional issue, involving intervention programs, family behaviors, environmental and cultural factors, cadre capacity, service quality, and stakeholder engagement and coordination. Therefore, stunting prevention interventions should be integrated and context-specific, addressing not only improvements in family knowledge and behavior but also strengthening cadre capacity, improving service delivery processes, and enhancing stakeholder engagement and cross-sectoral coordination.

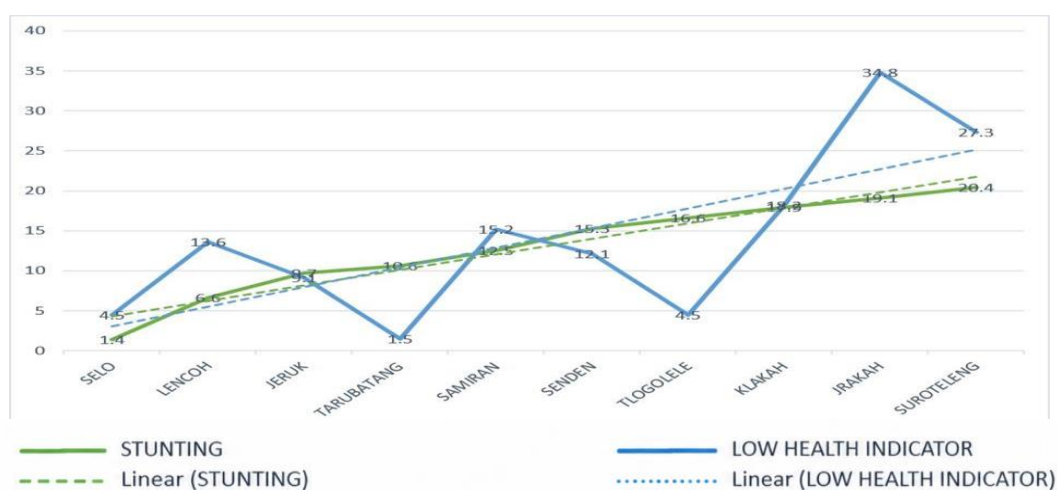


Figure.5 Results of quantitative data analysis on the number of stunting cases

Furthermore, quantitative data analysis indicates an increasing trend in stunting prevalence and low health indicators in several villages in Selo District. Suroteleng Village had the highest stunting prevalence at 20.4%, while Jrah Village had the highest proportion of low health indicators at 34.8%. Klakah, Jrah, and Suroteleng Village demonstrated high scores on both indicators, thus being designated as priority areas for health intervention programs.

Program Evaluation**Table.3** Evaluation of programs that have been carried out

Evaluation Components	Indicators/Aspects Assessed	FGD and Observation Findings	Interpretation
<i>Reach</i> (Program Coverage)	Posyandu (percentage of toddlers present)	Not all families come to the integrated health post regularly	Program reach is suboptimal
	Pregnant women (percentage of complete ANC)	There are still pregnant women who have not had a complete ANC	The target of pregnant women has not been fully reached
	Teenagers (reproductive education)	Education has been carried out but has not reached all at-risk youth.	Need to expand the scope of youth programs
	Bride and groom (bride and groom class)	The program has been running through KUA	Need to increase the scope and quality of education
<i>Fidelity</i> (Implementation Compliance)	Father (father class)	Fathers are still rarely involved in children's health activities	The target group of fathers has not been optimally reached
	Compliance with the integrated health post schedule	Posyandu runs according to schedule	As per guidelines
	Suitability of educational materials	Stunting education has been carried out	The material is still predominantly aimed at mothers
	PMT target accuracy	PMT has been given to the target	Need to evaluate the sustainability of impact
	Quality of counseling	Counseling has been carried out by cadres and health workers	The quality is not yet even
	Involvement of religious figures	Religious figures have been involved	Stunting material has not yet become the main theme of religious studies
<i>Dose Delivered</i> (Number of Interventions Given)	Integrated Health Post	Number of Posyandu activities per year	Routine programs have been running
	Home visit	Number of visits to families at risk of stunting	Implemented but needs target optimization
	Pregnant women's class	Number of meetings	Walk regularly
	Father's class	Number of meetings	Still limited

Evaluation Components	Indicators/Aspects Assessed	FGD and Observation Findings	Interpretation
<i>Dose Received</i> (Program Message Reception)	Stunting	Number of community education activities	It has been implemented but the material needs to be expanded.
	Public understanding of stunting	Some people still consider stunting to be a hereditary factor.	Some people still consider stunting to be a hereditary factor.
	Understanding eating patterns	The eating pattern of "the important thing is to be full" is still found.	The eating pattern of "the important thing is to be full" is still found.
<i>Context Evaluation</i> (Contextual Factors)	Perception of early marriage	Early marriage is still considered normal by some people	Early marriage is still considered normal by some people
	Supporting Factors	Support from Selo Health Center, active cadres, ongoing TPK program, support from village government	Become the main capital for the success of the program
	Inhibiting Factors	Mountainous geography, culture of early marriage, culture of babies not leaving the house for 40 days, limited cadres, low involvement of fathers, role of religious figures is not optimal	Become the main challenge of program implementation

Table 2 shows that the evaluation process for the stunting reduction program comprised five components: Reach, Fidelity, Dose Delivered, Dose Received, and Context Evaluation. In general, the program has effectively reduced stunting cases, but there remain inhibiting factors from the behavior and socio-cultural environment of the community. The inhibiting factors found in the field are location - the geography of Jrahah village which is the mountainous; early marriage is common in the community; babies are typically not leaving the house for 40 days; cadres are limited, fathers involved less, the role of religious figures is suboptimal. In addition, the factor of acceptance of stunting messages also shows that some people still consider stunting as a hereditary factor. There is still a just-to-be-full eating pattern and early marriage is still considered normal by some people and is considered to have no connection with stunting.

DISCUSSION

The results of the thematic analysis indicate that the stunting problem in Jarak Village, Boyolali, is complex and multidimensional. The study results indicate that stunting is a multidimensional problem influenced by basic, direct, and indirect factors. Basic factors are related to the community's socioeconomic status, such as education level, employment, and income; direct factors are related to nutritional intake, parent and child characteristics, and infectious diseases in children; and indirect factors are related to the physical and social environment and access to existing health services (Azriani et al., 2024). Some studies conducted in Indonesia also show that stunting is multifactorial, including socio-cultural factors related to pregnant women's nutritional intake, exclusive breastfeeding, provision of complementary foods, attitudes towards stunting, child-rearing patterns, environmental cleanliness, and economic factors (Ginting & Hadi, 2023).

The results of the community service conducted found that individual, family, environmental, health service, and support system factors interact to influence the incidence of stunting in Jarak Village, Boyolali. The program implemented by the relevant agencies and community health centers has been successful. However, many challenges remain, including community behavior, environmental and cultural factors, cadre factors and service processes, and system and stakeholder factors. Environmental and cultural factors also play a role. The survey results indicated that early marriage is commonplace in Jarak Village. Children are married officially or through unregistered marriages between the ages of 16 and 20. There is a belief within the community that if they are not married off immediately, they will be spinsters. Culture and tradition also influence the incidence of stunting within families, especially in rural communities (Sulaningsi & Fajar, 2023)(Setiana et al., 2023).

The concept of Systems Thinking is necessary for collaborative planning of stunting interventions, as it is the initial step in setting targets for these interventions, thereby effectively achieving the Sustainable Development Goals (SDGs). A conceptual model of collaborative planning can be applied. In its implementation, the model is expected to be influenced by the system's internal and external environments. A key element of the conceptual model of collaborative planning is the collaboration process, which requires commitment and trust among actors in planning the collaboration (Taufiq et al., 2025).

A study by (Oktavianty et al., 2023) suggested the Community Nutrition Improvement Program for toddlers with stunting. The innovation of the movement program to overcome stunting with breastmilk (GUSI) consists of: Toddler Mother Class, Breastfeeding Education Class, MP-ASI Counseling Class, Stunting Class, and Pregnant Women Class. This program has not run optimally because, according to the evaluation theory indicators, management assesses the division of tasks and SOPs of the program and this has not been formed in the movement program to overcome GUSI, as its implementation is carried out and together without a clear division of tasks. In addition, community behavioral factors are also an obstacle, where the low awareness of toddler mothers about the quality of nutritional food intake and understanding about providing exclusive breastfeeding.

Efforts to overcome stunting must be carried out in an integrated, holistic manner that involves all parties, including health services. DP2KBP3A, community health centers, sub-districts, villages, cadres, religious leaders, community leaders, and so on. Field studies indicate that the involvement of relevant stakeholders, particularly village and religious leaders, has not been optimal in stunting prevention efforts. Religious leaders make a significant contribution to health literacy, particularly through faith-based education. Health messages, particularly those related to stunting prevention and behavior change in the community, can be

delivered through lectures, sermons, and religious study groups (Harahap et al., 2025). The role of traditional and religious leaders is highly significant in strengthening the legitimacy and community acceptance of health messages, making interventions more participatory and sustainable (Fajri, 2024) (Wira, 2025).

In addition, innovative programs are required to improve public health behaviors, meet nutritional needs, and reduce stunting rates. Results of community service activities (Arifianto et al., 2026). The implementation of the Three Pillars Intervention Model in Tanggul Kulon Village has also created a holistic and measurable solution to reduce the prevalence of stunting by integrating education, technology, and food innovation. Culture-based interventions are also an innovative strategy for overcoming stunting (Yunanda et al., 2022). One of the innovations for preventing stunting is the development of processed snack products made from locally available foods or natural resources. This contemporary snack is good for children because it utilizes nutritious local foods, such as moringa leaves (Nuroddin et al., 2022).

The challenges in preventing and managing stunting are complex. This is evident from field analyses. Intervention programs must consider the constraints encountered within the community. Evaluation of implemented programs is also crucial to determine their effectiveness and the obstacles encountered during implementation. These obstacles should be minimized or prevented to make the program or intervention more effective. Furthermore, approaches and strategies are needed to address the root causes of problems within the community, such as attitudes and understandings about early marriage, eating just to satisfy one's appetite, and the perception that stunting is not a serious issue. Therefore, a comprehensive, integrated approach that involves multiple sectors is needed to improve the effectiveness of stunting prevention and management efforts in the community.

CONCLUSION

The problem of stunting in Jrah Village, Boyolali District, is a complex and multidimensional issue influenced by interacting factors within a system. Analysis using a Systems Thinking approach indicates that community behavior, environmental and cultural factors, quality of health services, cadre capacity, and system and stakeholder support contribute to stunting. Program evaluation results indicate that some interventions have been implemented by the community health center, village government, and relevant stakeholders through integrated health service posts (Posyandu), health education, supplementary feeding, home visits, prenatal classes, and other innovative programs. However, program reach has not been fully optimized, especially among adolescents, prospective brides, and fathers. Furthermore, there are still obstacles in the quality of program implementation, cadre capacity, and cross-sector coordination. Therefore, stunting mitigation in Jrah Village requires a comprehensive, integrated, and sustainable approach involving all elements of society and relevant stakeholders.

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