



Governance-Driven Stunting Reduction in an Archipelagic Regency: Community-Based Implementation in Bintan, Indonesia

Friska Agustina Sianturi¹, Darmanto Darmanto², Rudi Subiyakto³

¹Bintan Regency Government, Indonesia

²Graduate School, Universitas Terbuka, Indonesia

³Universitas Maritim Raja Ali Haji (UMRAH), Tanjungpinang, Indonesia

ARTICLE INFORMATION

Received: January 02, 2025

Revised: May 28, 2026

Accepted: June 17, 2026

Available online: July 29, 2026

KEYWORDS

Stunting; Local Governance;
Community Participation; Health
Governance; Bintan Regency.

CORRESPONDENCE

Name: Darmanto Darmanto

Email: darmanto@ecampus.ut.ac.id

A B S T R A C T

This study aims to analyze how local governance shapes the implementation of community-based stunting reduction programs in Bintan Regency, Indonesia, an archipelagic and semi-rural area facing administrative and logistical challenges. A qualitative descriptive design was employed through semi-structured interviews with 15 key informants, including village heads, midwives, community health cadres, health officials, and members of the Stunting Reduction Acceleration Team (TPPS). Data were analyzed thematically using five governance dimensions: political commitment, intersectoral coordination, program leadership, data and monitoring systems, and community participation. The findings show that political commitment and community participation were relatively strong, as reflected in village fund allocation, active local leadership, nutrition education, home visits, and community-based initiatives such as foster-home activities. However, inter-sectoral coordination, data utilization, and frontline leadership remained uneven across subdistricts and villages, often depending on informal coordination and individual initiative. The study concludes that stunting reduction in Bintan is not merely a technical health intervention, but a local governance challenge. Strengthening institutional coordination, digital data systems, frontline capacity, and sustained community engagement is essential for improving the effectiveness, equity, and sustainability of stunting reduction programs.

INTRODUCTION

For millions of children, stunting results in reduced linear growth and long-term developmental repercussions, making it a significant national and worldwide health concern. Stunting prevalence among children under five in Indonesia is 30.8%, higher than the regional average of 21.8% for Southeast Asia (Global Nutrition Report, n.d.). The fact that stunting lowers adult productivity, learning ability, and cognitive development highlights its long-term effects on the creation of human capital (Soliman et al., 2021; Haywood & Pienaar, 2021). Stunting has long-term consequences for health, cognitive development, human capital, and intergenerational welfare (Prendergast & Humphrey, 2014).

The Ministry of Health of the Republic of Indonesia (2023) reported that the prevalence of stunting in Indonesia decreased in 2022. Nonetheless, significant disparities in child undernutrition and stunting persist across Indonesian districts, particularly among socioeconomically disadvantaged communities with limited access to adequate nutrition, health care, and supportive living environments (Ayuningtyas et al., 2022; Laksono et al., 2024). Child stunting reflects interacting biological, socioeconomic, environmental, and service-delivery determinants rather than a single nutritional cause (Vaivada et al., 2020). Global evidence shows that childhood stunting is influenced by fetal growth restriction, poor sanitation, maternal nutrition, infection, and poverty-related factors (Danaei et al., 2016).

From an international perspective, stunting reduction has become a major concern in global nutrition governance because it requires coordinated action beyond the health sector. International evidence shows that effective stunting reduction

depends not only on nutrition-specific interventions, but also on multisectoral collaboration involving health services, education, social protection, sanitation, food security, and community participation. Nutrition-sensitive programs can accelerate progress when implemented through agriculture, social protection, early child development, education, and health-sector platforms (Ruel et al., 2013). WASH factors should be integrated with nutrition and health interventions in stunting reduction strategies (Torlesse et al., 2016). Nutrition-specific interventions are most effective when delivered through functioning health, community, and multisectoral platforms (Keats et al., 2021). Drawing on WHO nutrition policy guidance and UNICEF's systems approach to nutrition, this study adopts a governance-oriented analytical framework consisting of political commitment, intersectoral coordination, program leadership, data and monitoring systems, and community engagement (World Health Organization [WHO], 2018; United Nations Children's Fund [UNICEF], 2020).

Because of its semi-rural and archipelagic geography, which poses logistical and administrative issues, Bintan Regency in the Riau Islands Province is a prime example for studying stunted administration. The prevalence of stunting in Bintan decreased from 5.23% in 2021 to 3.41% in 2022 (Bintan Regency Health Office, 2023), placing it within the low-prevalence category for stunting based on the international threshold of less than 10% (de Onis et al., 2019). Notwithstanding these advancements, subdistrict variances show that technical interventions by themselves are unable to explain variations in results, highlighting the crucial importance of governance systems.

The main research problem addressed in this study is that, although stunting reduction policies and community-based interventions have been implemented in Bintan Regency, the

extent to which local governance capacity influences the quality, consistency, and sustainability of implementation remains insufficiently understood. It is still unclear how political commitment, inter-sectoral coordination, frontline leadership, data and monitoring systems, and community participation interact to support or constrain stunting reduction at the village and subdistrict levels.

Through the National Strategy for Accelerating the Prevention of Child Stunting 2018–2024, the Indonesian government emphasized convergent and multisectoral coordination across levels of government (Ministry of National Development Planning/National Development Planning Agency, 2018). This commitment was further reinforced through Presidential Regulation Number 72 of 2021, which regulates the national strategy, implementation, coordination, monitoring, evaluation, reporting, and financing of stunting reduction (Republic of Indonesia, 2021). For effective implementation, strong local governance is needed, including coordinated multisectoral action, supportive policy environments, institutional capacity, and sustained implementation mechanisms. Accelerating nutrition outcomes requires stronger data systems, financing, accountability, and implementation capacity (Heidkamp et al., 2021).

The World Health Organization emphasizes that nutrition improvement requires enabling policy environments, coordination mechanisms, available capacities, and concrete country-level actions (World Health Organization [WHO], 2018). In the context of stunting, further investment and accelerated action are also needed to achieve global nutrition targets and reduce the long-term developmental consequences of childhood stunting (WHO, 2014).

Examining the field's reflection of these governance elements is relevant, given Bintan's experience. Instead of being solely a question of service coverage, stunting reduction is a test of governance quality—how actors collaborate, how data is used, how leadership is exercised, and how communities are engaged. Global evidence shows that progress toward nutrition targets remains uneven, while nutrition policy reviews emphasize the importance of coordinated multisectoral action, supportive policy environments, and sustained implementation capacity for improving nutrition outcomes (Development Initiatives, 2021; World Health Organization [WHO], 2018). Empirical studies that critically assess these aspects in the context of district-level implementation are relatively scarce, nevertheless, particularly in areas with a blend of urban and rural characteristics like Bintan.

Previous studies on stunting in Indonesia have often examined individual and health-related risk factors, such as immunization status and history of infectious disease, using quantitative approaches (Khairani & Effendi, 2020). Low birth weight and poverty-related conditions are important predictors of stunting among Indonesian children (Aryastami et al., 2017). National Indonesian evidence shows that child stunting is socially patterned and related to household and maternal characteristics (Rachmi et al., 2016). In Indonesia, stunting is linked to maternal, child, household, sanitation, feeding, and health-service determinants (Beal et al., 2018). However, less attention has been given to how governance processes shape the implementation of community-based stunting reduction programs at the local level. Previous studies indicate that district- and village-level stunting reduction programs in Indonesia continue to face challenges related to administrative capacity, multisectoral coordination, data quality, funding, monitoring,

and frontline implementation capacity, as shown in national-level evidence and district-level studies from Aceh and West Sumatra (Indra & Khoirunurrofik, 2022; Sufri et al., 2024; Syafrawati et al., 2023). These issues are particularly relevant for Bintan Regency, where semi-rural and archipelagic conditions may further complicate coordination, service delivery, and data-based follow-up.

Although previous studies have highlighted the role of village funds, administrative capacity, and village government institutions in supporting stunting reduction, less attention has been given to how governance processes shape the quality and sustainability of community-based implementation at the local level (Anggreani & Werdani, 2024; Indra & Khoirunurrofik, 2022). Broader nutrition equity literature also emphasizes that unequal nutrition outcomes are shaped by underlying systems and processes, including governance, institutions, policies, and access to food and health systems (Development Initiatives, 2020). This gap is particularly relevant for Bintan Regency, where semi-rural, coastal, and archipelagic conditions may further complicate coordination, service delivery, and data-based follow-up. This disparity emphasizes the necessity of comprehending how local governance aspects function and influence frontline execution in widely separated areas such as Bintan.

The novelty of this study lies in its governance-oriented analysis of community-based stunting reduction in an archipelagic and semi-rural local context. Unlike previous studies in Indonesia that have mostly focused on nutritional risk factors, health outcomes, or program effectiveness, this study specifically examines how local governance capacity shapes the implementation of stunting reduction programs at the community level. By applying five governance dimensions—political commitment, inter-sectoral coordination, program leadership, data and monitoring systems, and community participation—this study explains how governance factors influence the quality and sustainability of program implementation across subdistricts and villages. Therefore, this study contributes to public policy and health governance literature by positioning stunting reduction not merely as a technical health intervention, but as a local governance challenge that requires institutional coordination, data-driven decision-making, and sustained community engagement.

This study aims to examine how local governance capacity shapes the implementation of community-based stunting reduction programs in Bintan Regency, Indonesia. The significance of this study lies in its contribution to public policy and health governance literature by demonstrating that stunting reduction is not merely a technical health intervention, but also a local governance challenge that requires institutional coordination, data-driven decision-making, effective frontline leadership, and sustained community participation.

The focus on Bintan Regency strengthens the uniqueness of this study because it represents an archipelagic local government setting where geographical dispersion, logistical constraints, and uneven institutional capacity influence the implementation of community-based public health programs. This title therefore emphasizes the article's distinctive contribution to public policy scholarship by linking stunting reduction, local governance capacity, and archipelagic implementation challenges. Multilevel evidence from Indonesia shows that stunting determinants operate across individual, household, and community contexts (Titaley et al., 2019).

Although previous studies have examined stunting determinants, nutritional risk factors, program coverage, and policy implementation in Indonesia, limited attention has been given to how local governance capacity shapes community-based stunting reduction in semi-rural and archipelagic areas. Few studies have applied a structured governance framework to analyze how political commitment, inter-sectoral coordination, program leadership, data and monitoring systems, and community participation interact in frontline implementation. The novelty of this study lies in its governance-oriented analysis of community-based stunting reduction in Bintan Regency, an archipelagic local government context where geographical dispersion, logistical constraints, and uneven institutional capacity may influence program implementation. By applying the five governance dimensions, this study provides a more comprehensive explanation of why implementation quality and sustainability may vary across subdistricts and villages.

Thus, the purpose of this study is to examine how the execution of community-based stunting reduction initiatives in Bintan Regency reflects five governance-oriented dimensions adapted from WHO and UNICEF nutrition guidance: political commitment, intersectoral coordination, leadership, data systems, and community engagement (WHO, 2018; UNICEF, 2020). This study, which employs a qualitative descriptive methodology, provides insights into governance strengths, implementation issues, and the potential to enhance the conversion of national policy into efficient and context-responsive local action.

METHOD

This study examined the governance of the stunting reduction acceleration program in Bintan Regency, Riau Islands Province, Indonesia, using a qualitative descriptive design. The study was carried out in several subdistricts between January and June 2024, which were specifically chosen due to their semi-rural and archipelagic features, which pose administrative and logistical difficulties for the provision of public health services.

This qualitative descriptive approach was chosen because the study seeks to understand governance processes, actor interactions, coordination practices, data use, and community participation in the implementation of stunting reduction programs. The study used both primary and secondary data. Primary data were obtained through semi-structured interviews and field observations, while secondary data were collected from policy documents, health reports, stunting-related records, and program documents. Informants were selected through purposive sampling because they were directly involved in planning, coordinating, and implementing stunting reduction programs at the district, subdistrict, village, and community levels. The collected data were analyzed through data reduction, data display, coding, and thematic analysis based on five governance-oriented dimensions synthesized from WHO and UNICEF nutrition guidance, leading to the interpretation of findings and conclusion drawing.

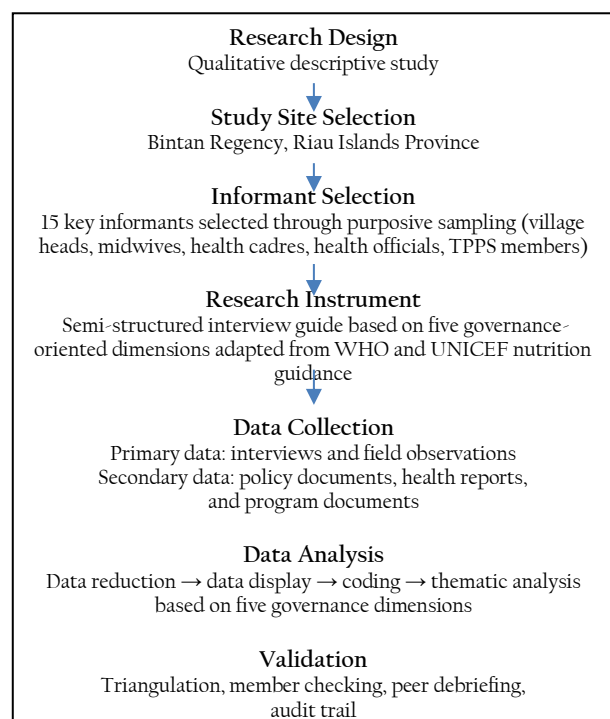
This qualitative descriptive approach was chosen because the study seeks to understand governance processes, actor interactions, coordination practices, and community participation in the implementation of stunting reduction programs. The main research instrument was a semi-structured interview guide developed based on five governance-oriented dimensions adapted from WHO and UNICEF nutrition guidance, namely political commitment, intersectoral

coordination, leadership, data and monitoring systems, and community participation (WHO, 2018; UNICEF, 2020). The research procedures included selecting the study site, identifying key informants through purposive sampling, collecting primary data through interviews and field observations, reviewing relevant secondary documents, coding the data based on governance dimensions, and drawing conclusions through thematic analysis.

The research population consisted of stakeholders who were directly involved in organizing, coordinating, and carrying out programs to reduce stunting. Purposive sampling was used to choose informants to get viewpoints from both the institutional and community levels. Village chiefs, midwives, nutrition officers, community health cadres, district and subdistrict health officials, and members of the Stunting Reduction Acceleration Team (TPPS) were among the 15 important informants that were included in the sample. We selected these individuals to ensure the inclusion of local decision-makers and frontline implementers who have direct experience in program execution.

The five governance-oriented dimensions—political commitment, intersectoral coordination, leadership, data and monitoring systems, and community participation—were used as the basis for the semistructured interview guide. These dimensions were synthesized from WHO and UNICEF nutrition guidance (WHO, 2018; UNICEF, 2020). Two public health specialists pretested and examined the interview guide to ensure its clarity and applicability. Each 45–60-minute interview was audio recorded with consent and then verbatim transcribed. All participants were given initials to ensure confidentiality. To provide a clearer overview of the research process, the methodological steps of this study are visually presented in Figure 1, covering the research design, study site selection, informant selection, research instrument, data collection, data analysis, and conclusion drawing.

Figure 1. Research Methodology Flowchart



Miles et al. (2020) explain qualitative data analysis as an interactive process involving data condensation, data display, and conclusion drawing/verification. After reading the transcripts several times, initial open codes were created and categorized according to the five governance dimensions. The research team manually coded to maintain contextual depth, and cross-checking and iterative discussion were used to guarantee inter-coder agreement. The governance-oriented analytical structure served as the basis for the deductive development of the themes.

Following Lincoln and Guba's (1985) trustworthiness criteria, this study applied credibility, transferability, dependability, and confirmability to ensure the rigor and reliability of the qualitative research process. Peer debriefing and member checking bolstered credibility, while detailed descriptions facilitated transferability. Triangulation of data sources, rigorous documentation, and an audit trail were used to maintain dependability and confirmability. Anonymization of participant identities, confidentiality protection, and informed consent were all ethical factors. The study adhered to the ethical standards established for research involving human subjects.

RESULTS AND DISCUSSION

The findings are presented through three integrated analytical subheadings to ensure that the results and discussion are analyzed together rather than treated as separate sections. First, Local Political Commitment and Community-Based Leadership examines how village fund allocation, TPPS support, local leadership, midwives, cadres, and community participation shaped the implementation of community-based stunting reduction programs. Second, Intersectoral Coordination and Data-Driven Implementation Challenges analyzes how cross-sector collaboration, KMS data collection, reporting practices, and data utilization influenced implementation consistency across villages and subdistricts. Third, Governance Implications for Sustainable Stunting Reduction discusses the broader implications of the findings for strengthening institutional coordination, digital data systems, role clarity, frontline capacity, and sustained community engagement.

This integrated structure follows the analytical sequence of finding, interpretation, theory, and implication. Each subheading presents the key empirical findings, explains their meaning, connects them with relevant governance perspectives and previous studies, and identifies their practical implications for improving community-based stunting reduction in a semi-rural and archipelagic local government context.

Local Political Commitment and Community-Based Leadership

The first major finding indicates that local political commitment and community-based leadership played an important role in supporting the implementation of stunting reduction programs in Bintan Regency. Political commitment was reflected in the allocation of village funds for nutrition-related activities, support from subdistrict heads for the formation and operation of the Stunting Reduction Acceleration Team (TPPS), and the inclusion of stunting prevention activities in village-level planning. Several respondents explained that village funds were used to support food packages, *rantang sehat*, Posyandu strengthening, and nutrition assistance for undernourished children. This finding shows that stunting reduction has begun to be understood not only as a health-sector responsibility, but also as a local development priority requiring

budgetary and institutional support. Political commitment for nutrition depends on evidence, leadership, stakeholder coordination, and sustained accountability (Baker et al., 2018).

The interpretation of this finding is that political commitment functions as an enabling factor for community-based implementation. In Bintan, village fund allocation and support from local leaders created the basic institutional conditions for frontline actors to carry out nutrition-related activities. However, the strength of this commitment varied across villages. Some villages had stronger planning mechanisms and more consistent support for TPPS activities, while others still relied on annual program decisions or the personal initiative of local leaders. This variation suggests that political commitment in Bintan has not been fully institutionalized across all local units.

This finding is consistent with previous studies showing that village funds and local administrative capacity significantly influence stunting reduction outcomes in Indonesia. Indra and Khoirunurrofik (2022) found that village fund programs and village administrative capacity play an important role in reducing stunting in Indonesia. Local political commitment and community-based leadership are essential for sustaining stunting reduction because malnutrition is not only a health problem, but also an equity and governance issue that requires effective institutions, responsive policy actions, and attention to vulnerable groups (Development Initiatives, 2020). Local political commitment and community-based leadership are central to effective stunting reduction because they help translate nutrition policies into coordinated local action, resource allocation, and sustained frontline implementation. This is consistent with WHO's emphasis on enabling nutrition policy environments, coordination mechanisms, institutional capacity, and accelerated action to achieve global stunting reduction targets (World Health Organization [WHO], 2014, 2018). The Bintan case strengthens the argument that effective stunting reduction requires local political and administrative commitment, not merely technical health interventions.

Community-based leadership also emerged as a key factor in program implementation. Midwives and health cadres acted as frontline leaders who connected policy directives with household-level practices. They conducted home visits, monitored children's growth, provided nutrition education, followed up on at-risk families, and encouraged mothers to participate in PMBA sessions, food demonstrations, and *rumah asuh* activities. Home visits and peer-group platforms can improve infant and child feeding practices when supported by trained community actors (Janmohamed et al., 2020). PKK groups and community volunteers also helped mobilize mothers and strengthen peer learning at the village level. These findings indicate that community-based leadership is essential for translating formal programs into practical and continuous action at the household level.

The interpretation is that midwives, cadres, PKK groups, and mothers functioned as operational bridges between government programs and community behavior change. Their roles were not limited to assisting health services; they also built trust, encouraged participation, and maintained regular contact with families. This is especially important in semi-rural and archipelagic areas, where geographical distance and uneven service access may limit the effectiveness of formal health interventions. However, the study also found that community-based leadership was often dependent on individual initiative, cadre capacity, and the motivation of local actors. This condition

may create vulnerability when cadres are inactive, overburdened, or replaced.

Community participation strengthens health programs when communities have meaningful roles and durable participation mechanisms (Haldane et al., 2019). These findings are supported by previous studies emphasizing the importance of frontline health workers and community actors in stunting prevention. Within the dimension of local political commitment and community-based leadership, village midwives serve as frontline actors who translate stunting reduction policies into direct household-level support, particularly through regular contact with mothers and children, growth monitoring, and nutrition-related guidance (Oktarina & Idawati, 2022). Strengthening health cadres is an important part of community-based leadership because cadres help connect local stunting policies with household-level prevention practices (Akhmadi et al., 2021; Etrawati et al., 2023). Within the subtopic of local political commitment and community-based leadership, community participation is important because local actors help translate health programs into context-sensitive, trusted, and sustainable community-level action. Evidence from a systematic review shows that community participation in health service development, implementation, and evaluation can generate positive organizational, community, individual, and health-related outcomes (Haldane et al., 2019). These studies support the finding that community leadership in Bintan is a crucial governance mechanism for sustaining household-level stunting prevention.

Effective community health-worker programs require community embeddedness, training, supervision, logistics, and health-system integration (Scott et al., 2018). The implication is that local governments need to strengthen political commitment and community-based leadership in a more systematic and institutionalized manner. Village fund allocation should be consistently linked to stunting indicators, TPPS activities should be integrated into village planning and monitoring systems, and the roles of midwives, cadres, PKK groups, and community volunteers should be clearly defined. Capacity building, supportive supervision, and incentives for frontline actors are also needed to reduce dependence on individual initiative. By strengthening both formal political commitment and community-based leadership, Bintan Regency can improve the sustainability, equity, and effectiveness of stunting reduction programs in semi-rural and archipelagic settings.

Intersectoral Coordination and Data-Driven Implementation Challenges

The second major finding shows that intersectoral coordination and data-driven implementation in Bintan Regency had developed but remained uneven across villages and subdistricts. Formal coordination mechanisms were already in place through TPPS meetings, joint case reviews, multi-stakeholder activities, and the annual *rembuk stunting*, a local multi-stakeholder consultation forum for discussing stunting cases, identifying priority families, coordinating referrals, and planning follow-up actions. These forums involved actors from village government, health services, education, social affairs, and community institutions. Respondents indicated that these meetings helped identify priority families, coordinate referrals, and discuss program follow-up. However, the implementation of coordination was still largely program-dependent and often

driven by the health sector, especially midwives and nutrition officers.

Multisectoral health action requires clear mandates, aligned incentives, coordination mechanisms, and accountability across sectors (Rasanathan et al., 2017). This finding indicates that intersectoral coordination in Bintan has reached the stage of formal establishment, but not yet full institutionalization. The existence of TPPS and regular coordination forums shows that multisectoral governance structures are available. However, coordination often depended on informal communication, personal relationships, and the initiative of frontline health workers. In some subdistricts, collaboration between Puskesmas, village government, and social affairs offices supported referrals and household follow-up. In other areas, coordination remained fragmented, with unclear division of roles among sectors. This variation suggests that the main challenge is not the absence of coordination mechanisms, but the uneven capacity to make those mechanisms work consistently.

These findings are consistent with previous studies on stunting convergence and multisectoral nutrition governance in Indonesia. Prasetyo et al. (2023) showed that stunting convergence depends on integrated regional service governance, including leadership commitment, cross-sectoral coordination, valid data analysis, digital data systems, and open access for relevant stakeholders; without these elements, local implementation may remain fragmented and uneven. Similarly, Lutt and Rahayu (2024) showed that effective stunting reduction depends on collaborative governance that integrates regional policies, cross-sector coordination, stakeholder commitment, and community participation, thereby strengthening the consistency of local implementation.

Findings from Aceh (Sufri et al., 2024) and West Sumatra (Syafrawati et al., 2023) indicate that district-level stunting reduction can be constrained by coordination problems, sectoral fragmentation, uneven data quality, and differences in local institutional capacity. Therefore, the Bintan case reflects a broader pattern in Indonesia, where convergence is formally required but its implementation varies across local contexts.

The second related finding concerns data and monitoring systems. In most villages, growth monitoring continued to rely on the Growth Monitoring Card (*Kartu Menuju Sehat/KMS*) and manual reporting. Respondents explained that KMS data were collected regularly, but reporting delays, inconsistent data entry, and discrepancies between village-level records and Puskesmas reports often occurred. These conditions made it difficult to detect high-risk children in a timely manner and weakened the use of data for decision-making. Although some villages used simple digital communication tools such as WhatsApp to accelerate reporting between cadres and midwives, these practices were not yet standardized across all villages.

The interpretation of this finding is that Bintan's monitoring system was functional, but not yet sufficiently data driven. Data were collected, but they were not always transformed into timely decisions, targeted interventions, or coordinated follow-up across sectors. The problem was not merely technical, but also institutional. Limited digital integration, uneven cadre capacity, workload pressures, and parallel reporting channels reduced the usefulness of data for program planning and monitoring. As a result, early warning and case follow-up often depended on the initiative of individual health workers rather than an integrated surveillance system.

This finding is supported by previous research emphasizing that reliable and actively used health data are essential for strengthening health programs and improving health system performance. Within the context of intersectoral coordination and data-driven implementation, Nutley and Reynolds (2013) argued that health data should not only be collected for reporting purposes, but also used to support planning, coordination, performance improvement, and evidence-based decision-making. In the context of stunting reduction in Aceh, Sufri et al. (2023, 2024) showed that implementation challenges are related to weak intersectoral coordination, limited data quality, insufficient integration between nutrition-specific and nutrition-sensitive interventions, and difficulties in translating convergence policies into operational action. Similar concerns are also found in studies and global nutrition reports showing that stunting reduction requires stronger frontline capacity, better coordination among relevant agencies, and more integrated nutrition-sensitive and nutrition-specific interventions (Food and Agriculture Organization of the United Nations et al., 2020; Sufri et al., 2023). These studies support the finding that data availability alone is insufficient; data must be timely, integrated, and actively used for decision-making.

The implication is that Bintan Regency needs to strengthen both intersectoral coordination and data governance. Coordination should move beyond meetings and become a shared accountability mechanism with clear roles for health, education, social affairs, village government, and community actors. TPPS should function not only as a coordination forum, but also as a mechanism for tracking cases, assigning responsibilities, and monitoring follow-up actions. At the same time, data systems need to be standardized and gradually digitalized to reduce reporting delays and improve data consistency between cadres, Puskesmas, village governments, and district agencies. Strengthening cadre capacity in data recording, improving feedback loops, and integrating data into village planning are essential to ensure that stunting reduction becomes more responsive, targeted, and sustainable in semi-rural and archipelagic settings. Community health-worker performance depends on supervision, data use, referral systems, service quality, trust, and retention (Agarwal et al., 2019).

To clarify the systemic relationship between intersectoral coordination, data governance, implementation bottlenecks, and program outcomes, Figure 2 presents a conceptual model of coordination and data-driven implementation challenges in community-based stunting reduction.

Figure 2. Systemic Model of Intersectoral Coordination and Data-Driven Implementation Challenges

Formal Coordination Mechanisms <i>TPPS meetings; joint case reviews; rembuk stunting; multisector activities</i>	Mutual Adjustment <i>Coordination requires continuous communication and role negotiation</i>	Data and Monitoring Sources <i>KMS records; Posyandu data; Puskesmas reports; village-level reporting</i>
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Governance Bottlenecks <i>Sectoral fragmentation; unclear roles; manual reporting; inconsistent data entry</i>	Governance Capacity and Feedback Loop <i>Role clarity; shared accountability; integrated data systems; frontline capacity; feedback mechanisms</i>	Data-Driven Decision-Making <i>Timely data use for case detection, planning, referral, and targeted follow-up</i>
Frontline Implementation <i>Midwives, cadres, and village actors translate coordination and data into household-level action</i>	Learning and Adaptation <i>Monitoring results inform coordination meetings and program adjustment</i>	Expected Implementation Outcome <i>More consistent, timely, and targeted stunting reduction across villages and subdistricts</i>

Source: Developed by the authors based on the study findings.

Note. The model emphasizes systemic interaction rather than a linear sequence. Coordination mechanisms and data sources interact through governance capacity and feedback loops, while bottlenecks affect the consistency of implementation outcomes

Governance Implications for Sustainable Stunting Reduction

The findings of this study suggest that sustainable stunting reduction in Bintan Regency depends not only on the availability of nutrition interventions, but also on the strength of local governance arrangements that enable those interventions to be implemented consistently across villages and subdistricts. Political commitment, community-based leadership, intersectoral coordination, data systems, and community participation were all present, but they did not operate with the same level of institutional strength. Some dimensions, such as village-level commitment and community participation, appeared relatively strong, while coordination, data utilization, and role clarity remained uneven. This pattern indicates that the sustainability of stunting reduction depends on whether local governance mechanisms can move from actor-dependent practices to more institutionalized and data-informed systems.

This finding implies that governance capacity should be understood as the connecting mechanism between national policy and community-level outcomes. National policies such as the stunting reduction acceleration agenda and TPPS formation provide the formal mandate, but their effectiveness depends on how local governments coordinate actors, allocate resources, use monitoring data, and maintain frontline implementation. In Bintan, the existence of village funds, TPPS forums, midwives, cadres, KMS data, and community activities created the basic foundation for implementation. However, when coordination relied heavily on informal relationships, when KMS data were not systematically used for decision-making, or when community participation depended on individual cadres, the program became vulnerable to inconsistency.

This interpretation is consistent with previous studies on stunting governance and multisectoral implementation in Indonesia. Indra and Khoirunurrofik (2022) showed that village fund allocation and administrative capacity are important for supporting stunting reduction, while Prasetyo et al. (2023) emphasized that system integration and regional service governance are necessary for effective stunting convergence.

Evidence from Aceh and West Sumatra shows that district-level stunting reduction is often constrained by coordination problems, uneven institutional capacity, and difficulties in

translating convergence policies into operational practice (Sufri et al., 2024; Syafrawati et al., 2023). These studies support the argument that technical interventions must be supported by strong governance systems if they are to produce sustainable results.

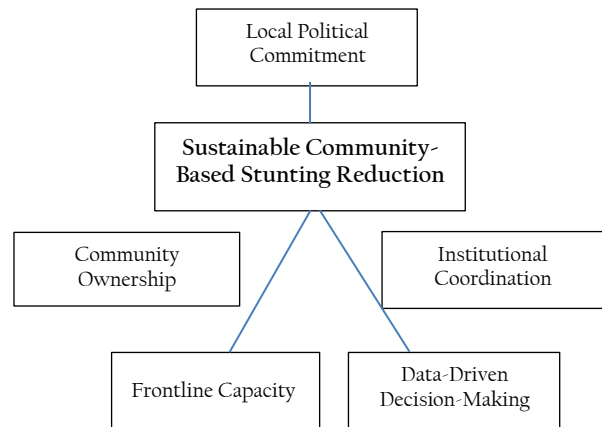
The findings also align with broader health governance literature which emphasizes that data use and community participation are essential for effective public health programs. Nutley and Reynolds argued that health data must be actively used for decision-making, not only collected for reporting purposes (Nutley & Reynolds, 2013). In Bintan, this point is particularly relevant because KMS and village-level data were available, but their use for early warning, planning, and targeted intervention remained limited. Similarly, studies on community-based health programs show that community participation can improve the relevance, acceptability, and sustainability of local health interventions when supported by capable frontline actors, such as trained health cadres and *Posyandu* cadres (Akhmadi et al., 2021; Haldane et al., 2019; Tyarini et al., 2024). This issue is particularly relevant in Indonesia's geographically diverse and island-based settings, where spatial differences may influence stunting patterns and service delivery challenges (Sipahutar et al., 2020). This supports the finding that midwives, cadres, PKK groups, and mothers play an important role in sustaining household-level stunting prevention.

Governance of multisectoral health action requires coordination structures, institutional authority, implementation capacity, and cross-sector accountability (Bennett et al., 2018). The broader implication is that sustainable stunting reduction requires an integrated local governance model. First, institutional coordination should be strengthened by clarifying the roles of health offices, village governments, education offices, social affairs agencies, TPPS, Puskesmas, and community organizations. Second, digital and integrated data systems should be improved so that monitoring results can be used for early detection, targeted intervention, and follow-up. Third, frontline capacity should be strengthened through training, supervision, and incentives for midwives, cadres, and community volunteers. Fourth, community engagement should be formalized within village planning and TPPS mechanisms so that participation does not depend only on temporary enthusiasm or individual initiative.

Based on these findings, stunting reduction in semi-rural and archipelagic areas should be treated as a governance sustainability issue. In geographically dispersed regions such as Bintan, effective implementation requires more than program delivery; it requires continuous coordination, reliable data flows, accountable local leadership, and active community ownership. Therefore, strengthening local governance capacity is essential for ensuring that stunting reduction programs are not only implemented, but also sustained, adapted, and institutionalized over time.

To illustrate the broader governance implications of the findings, Figure 3 presents an integrated governance model for sustaining community-based stunting reduction in semi-rural and archipelagic local government settings.

Figure 3. Integrated Governance Model for Sustainable Stunting Reduction



Source: Developed by the authors based on the study findings.

Figure 3 shows that sustainable stunting reduction depends on the interaction between local political commitment, institutional coordination, data-driven decision-making, frontline capacity, and community ownership. These governance capacities strengthen the ability of local governments to transform national stunting policies into consistent and sustainable community-level action.

Political Commitment

One of the most obvious aspects of governance in the execution of the Bintan Regency's stunting reduction initiatives was political commitment. Many respondents talked about concrete local nutrition program investments, such as the distribution of village cash for monthly food packages, *Posyandu* strengthening initiatives, and *rantang sehat*. PKK1 said that "our subdistrict head has actively supported the TPPS formation and encourages joint activities with the health office," while KG1 said that "we use the village fund to support the *rantang sehat* and monthly food packages for undernourished children." To prevent early stunting, DK1 stated that "the local government has issued regulations encouraging maternal and child health checks." According to these declarations, reducing stunting has been officially acknowledged as a local priority.

Field observations confirmed these assertions. Several communities regularly included subdistrict officials in the oversight of *Posyandu* operations and set aside a portion of their funds for nutrition-related initiatives. Stunting indicators are incorporated into village planning documents, and the creation of TPPS teams is evidence of institutional prioritizing. However, different regions had varying levels of formalization. Local laws (*perdes*) that supported integrated stunting prevention were in place in certain villages, but others relied solely on yearly program decisions, which resulted in inconsistent subdistrict implementation.

These results are consistent with national data demonstrating that district-level outcomes for reducing stunting are greatly influenced by village cash allocation and local administrative capability (Indra & Khoirunurrofik, 2022). Strong village-level regulation, in which village administrations act as both regulators and implementers, has also been shown to enhance the continuity of stunting interventions (Anggreani & Werdani, 2024). Through financial allocation and subdistrict leaders' backing, political commitment has started to be institutionalized in Bintan; yet, the level of this commitment

differs by village, reflecting variations in local government structures. Through village funding and TPPS institutions, Bintan has taken initial steps toward formalizing local political commitment to stunting reduction. This aligns with broader nutrition equity evidence emphasizing the need for supportive policies, institutional action, and attention to vulnerable groups (Development Initiatives, 2020), while village-level evidence from Sukoharjo indicates that local stunting prevention can remain constrained when formal regulatory support and institutional coordination are not fully established (Sugiyarti, 2025).

Nutrition leadership depends on individual agency, institutional authority, strategic capacity, and supportive political environments (Nisbett et al., 2015). Global evaluations show that to guarantee cogent action and accountability in nutrition programs, political commitment must be combined with coordinated cross-sectoral leadership (Development Initiatives, 2020). In relation to community-based leadership, Tyarini et al. (2024) showed that health education can improve Posyandu cadres' knowledge of stunting prevention, enabling them to provide more effective information, counseling, growth monitoring, and support for mothers and children at the community level. Recent research from Indonesia further emphasizes that stunting convergence policies require more than formal policy design. To be effective over the long run, they need to be supported by system integration, regional service governance, accurate problem identification, leadership commitment, and coordinated implementation across relevant actors (Prasetyo et al., 2023; Saleh et al., 2024).

The distribution of local resources, active leadership support, and the increasing institutional awareness of stunting as a development priority are the main indicators of political commitment in Bintan. Sustained malnutrition reduction requires political commitment, coherent policy, institutional capacity, and accountability throughout implementation (Gillespie et al., 2013). Despite its robustness, Bintan has not consistently institutionalized political commitment, as evidenced by the variations in regulatory formalization among communities. Maintaining momentum and promoting the sustainability of community-based stunting reduction projects will need fortifying legislative frameworks and making sure that priorities are consistently set at the village level.

Intersectoral Coordination

With many formal mechanisms in existence but differing degrees of operational integration across sectors, intersectoral cooperation in Bintan Regency displayed varied patterns. According to respondents, regular multi-stakeholder gatherings—like the TPPS talks, joint case reviews, and the annual *rembuk* stunting—offered forums for coordinating village, health, education, and social sector initiatives. While BD2 observed that "TPPS meetings bring together many actors, although most initiatives still come from the health sector," KD1 pointed out that "the health office, village government, and social affairs often meet to discuss priority families." As evidenced by research that demonstrates community health workers frequently serve as coordinators crossing several sectors, these perceptions highlight how coordination mechanisms rely significantly on the initiative of frontline health practitioners (Daniel et al., 2021).

Most coordination actions, including home visits, data verification, and referrals to social assistance programs, were started by midwives and nutrition officials, according to field observations. Although this improved Puskesmas-village vertical ties, there was still uneven horizontal coordination between the social protection and education sectors. Coordination in several subdistricts relied more on unwritten agreements than on clearly defined duties, which resulted in sporadic follow-up on nutrition class activities and referrals for early childhood education. In other parts of Indonesia, where coordination relies more on interpersonal ties than on formalized systems, comparable difficulties have been observed (Department of Foreign Affairs and Trade, 2023; Lutt & Rahayu, 2024).

These trends are consistent with previous studies showing that sectoral fragmentation, weak coordination, and unclear institutional roles can impede effective multisectoral nutrition governance. Research also highlights the importance of coordinating responsibilities across health services, education, village governance, and social affairs to reduce duplication, strengthen data use, and ensure more comprehensive family-based care (Nutley & Reynolds, 2013; Prasetyo et al., 2023). Bintan has made strides despite these obstacles by establishing TPPS institutions and holding frequent multi-stakeholder conferences. Stronger referrals and integrated follow-up activities seemed to result from better cooperation in areas where local leaders actively promoted stunting prevention. However, coordination became health-sector-oriented and susceptible to staff rotation and workload pressure in places where village councils had limited involvement. This supports the more general finding that institutional commitment and well-defined cross-sectoral channels are necessary for sustained multisectoral engagement.

In Bintan, intersectoral coordination is generally developing but has not yet reached complete institutionalization. Despite the existence of formal organizations, individual actors—especially midwives and nutrition officers—are crucial to operational convergence. Maintaining coordinated, multisectoral stunting reduction activities will require strengthening shared accountability, defining roles across sectors, and integrating convergence into village planning processes.

Program Leadership

Program leadership primarily drove the development of stunting reduction initiatives in Bintan Regency. The main players who engaged homes, started home visits, organized referral channels, and provided nutrition education were consistently found to be midwives and community health cadres in all communities. "The midwife reminds us about home visits and checks which families need closer monitoring," DK2 said, while KD3 clarified that "cadres help follow up on cases, especially when mothers cannot visit the *Posyandu*." These stories show how community-level stunting prevention is operationalized and care continuity is provided by frontline actors.

Although there was leadership at the front lines, it was frequently informal and not entirely incorporated into institutional frameworks, according to observations. Program leadership in several subdistricts mostly relied on the initiative of midwives or seasoned cadres, which left implementation open to changes in cadre capacity, workload demands, and staff turnover. Community health-worker performance improves when programs combine selection, training, supervision, incentives,

workload management, and health-system integration (Kok et al., 2015). Previous research has identified similar issues, demonstrating that personal dedication, rather than established managerial procedures, often shapes frontline leadership in community feeding programs (Lautt & Rahayu, 2024; Oktarina & Idawati, 2022). This dependence on individual players may hinder program sustainability, particularly in decentralized and resource-constrained environments. Frontline roles should be clearly defined according to workload, local needs, training, feasibility, and community acceptability (Glenton et al., 2021).

Bintan showed promising indications of growing institutional support despite these limitations. To legitimate the role of midwives and cadres in reducing stunting, subdistrict heads and TPPS coordinators took part in monitoring activities and gave guidance during coordination meetings. More consistent program delivery was made possible by village-level leadership, such as giving stunting priority in planning documents or encouraging cadre recruitment. Nonetheless, prior studies have indicated that the efficacy of local leadership is contingent upon the presence of well-defined responsibilities, sufficient support networks, and the capacity to foster multisectoral cooperation (Andromeda et al., 2023).

Strong and dispersed leadership across administrative levels—from village governments to frontline actors—is crucial for maintaining community-based interventions, as the Bintan experience echoes larger results from Indonesian community health programs (Akhmadi et al., 2021). Effective leadership enables stronger convergence between village government and the health sector, accountability, and follow-up on recognized cases. On the other hand, program momentum declined, and frontline workers encountered more difficulties in enlisting community participation in areas with low levels of local leadership engagement.

Overall, Bintan's leadership in reducing stunting was proactive and focused on the community, although it was still individualized and unequal. Supportive supervision improves frontline motivation and performance through feedback, guidance, resources, and problem-solving support (Westgate et al., 2021). To ensure long-term program viability and enhance cross-sector collaboration, it will be essential to fortify formal leadership structures, offer supportive supervision, and guarantee frontline staff continuity.

Data and Monitoring Systems

The accuracy, completeness, and timeliness of data and monitoring systems in Bintan Regency varied significantly throughout villages. The Growth Monitoring Card (*Kartu Menuju Sehat/KMS*) was still used for manual reporting in most villages, which hindered the incorporation of data into regular decision-making procedures. While KD2 acknowledged that reporting delays frequently made it difficult to detect high-risk youngsters promptly, DK4 pointed out that "we still use the KMS for growth monitoring, but not all villages submit their updates on time." According to these reports, the monitoring system was operational but lacked real-time updating capabilities and standards.

Frontline health professionals, namely midwives and cadres, were crucial in gathering, verifying, and disseminating growth data, according to observations. However, a lack of digital tools, workload pressures, and uneven cadre capacity all led to data flow bottlenecks. Disparities between Puskesmas reports and village-level KMS data in several subdistricts necessitated

repeated verification, adding to the burden and delaying case follow-up. Similar issues were noted in previous studies that showed how frontline capacity and the dependability of manual recording systems significantly impact the quality of growth tracking data (Food and Agriculture Organization of the United Nations et al., 2020; Sufri et al., 2023).

These results are indicative of larger problems with Indonesia's multisectoral governance framework for stunting, where inadequate interoperability and disjointed data systems make it difficult to coordinate efforts. Sectoral fragmentation frequently leads to weak feedback loops between Puskesmas and village governments, contradictory indicators, and parallel reporting channels (Nutley & Reynolds, 2013). Early warning of growth halting in Bintan was primarily dependent on the initiative of individual health professionals rather than a systematic surveillance mechanism due to the lack of an integrated digital platform.

Despite these challenges, we observed several encouraging advancements. To speed up communication between cadres and midwives, several communities started implementing basic digital tools, like reporting channels based on WhatsApp. Mobile technologies can improve community health-worker communication, reporting, decision support, and coordination (Braun et al., 2013). Additionally, during coordination meetings, subdistrict TPPS teams evaluated data on a regular basis, indicating a growing attempt to improve data-driven decision-making. However, these customs remained dependent on local initiative and had not yet spread to all villages.

Although manual procedures, irregular reporting, and disjointed information flows constrain Bintan's data and monitoring systems, they function generally. Digital health information systems improve data management when supported by infrastructure, standardization, training, leadership, and coordination (Dehnavieh et al., 2019). Enhancing surveillance quality and facilitating prompt decision-making in stunting reduction initiatives would require bolstering digital integration, boosting frontline capability for data administration, and standardizing reporting procedures across sectors.

Community Participation

Community participation, particularly active community organization involvement and household-level engagement, was identified as one of the most effective aspects of governance in Bintan Regency. According to the respondents, families regularly took part in Foster-Home (*Rumah Asuh*) activities for kids who needed extra nutritional care, food demonstrations, Mothers engaged in Feeding Infants and Children (*Pemberian Makanan Bayi dan Anak/PMBA*) sessions, and home visit follow-ups. According to KD4, "nearly every month, families attend nutrition classes and food demonstrations," while BD1 clarified that "the foster-home program functions because mothers alternately provide meals and support." According to these reports, many villages exhibit a high degree of social cohesiveness and group accountability.

Observations also demonstrated the critical role cadres had in keeping midwives informed about children at nutritional risk, organizing mothers, and guaranteeing participation at PMBA sessions. However, depending on local leadership involvement, cadre competence, and the perceived relevance of activities to household needs, participation levels differed greatly within subdistricts. These results are in line with studies that demonstrate that social networks and community actors' capacity to convert technical instructions into locally relevant

practices are essential for long-term community involvement in nutrition programs (Akhmadi et al., 2021; Al Djono & Daniel, 2022).

Several difficulties also surfaced. Activities like food protests frequently relied on the initiative of individual cadres rather than organized community institutions, and participation tended to drop in villages with high turnover or limited cadre availability. In several places, moms had conflicting obligations that made it harder for them to routinely attend nutrition lessons. These limitations are consistent with past research showing that community excitement and supportive mechanisms that lower barriers to participation are essential for successful community-based nutrition initiatives (Haldane et al., 2019; Andromeda et al., 2023).

Notwithstanding these drawbacks, Bintan's story shows how community involvement can help with the larger governance of stunting reduction. In addition to providing social support structures that supplemented official health services, community involvement improved early case detection and reinforced behavior modification at the family level. These findings are consistent with research from Indonesia that shows that multisectoral cooperation and program continuity are greatly enhanced by community mobilization when it is backed by frontline actors and village leadership (Tyarini et al., 2024; Sipahutar et al., 2020). Villages in Bintan with higher levels of leadership involvement showed greater follow-up of high-risk households and more consistent participation patterns.

Although it varies by subdistrict, community involvement in Bintan is generally rather high. To maintain community-driven efforts and improve the efficacy of stunting reduction measures, it will be crucial to strengthen cadre capacity, formalize community responsibilities within TPPS activities, and provide conducive environments for household engagement.

When combined, the study's results demonstrate that the level of local governance across the five WHO-UNICEF dimensions and the availability of technical interventions both influence how well stunting reduction initiatives in Bintan Regency work. While inter-sectoral coordination made it easier for village administrations, health services, and social sector programs to align—albeit not yet in a fully institutionalized form—political commitment served as the basis for resource allocation and institutional prioritization.

Although the program's emphasis on individual initiative posed weaknesses in settings with limited human resources, leadership by midwives and cadres allowed for program sustainability at the community level. Human reporting and disjointed information flows hindered the effectiveness of data and monitoring systems, making risk identification less timely. Although its level of intensity varied by subdistrict based on cadre ability and local leadership, community participation emerged as a significant asset that helped sustain family engagement and behavior change.

These trends demonstrate the continued importance of governance considerations in achieving reliable and equitable results in stunting prevention. Long-term program sustainability in semi-rural and archipelagic environments would require strengthening political and administrative structures, particularly by improving coordination mechanisms, enhancing data integration, and formalizing community participation. In order for local governments to more successfully convert national stunting policies into effective community-level action, these insights underscore the necessity of governance-driven strategies

that strengthen frontline leadership, improve cross-sector accountability, and facilitate data-informed decision-making.

There are various restrictions on this study. First, Indonesia's governance of stunting reduction is changing quickly, and policy changes that take place after data collection may affect how relevant particular contextual findings are. Second, the study was only carried out in a few villages and subdistricts within Bintan Regency, which would restrict how broadly the findings can be applied to areas with distinct administrative and topographical features. Third, the accuracy of observations pertaining to data consumption may have been impacted by the study's reliance on human KMS records and village-level reporting systems, which may have errors or delays. Last but not least, because this study is qualitative, the results represent stakeholder perspectives that could be impacted by individual experiences or institutional responsibilities, and the lack of quantitative outcome data makes it more difficult to gauge the direct consequences of the program. Though they do not lessen the study's value to understanding governance dynamics in community-based stunting reduction programs, these limitations should be accounted for when interpreting the results.

CONCLUSION

The findings demonstrate that the effectiveness of community-based stunting reduction in Bintan Regency is strongly shaped by local governance capacity. Political commitment and community participation emerged as the strongest dimensions, particularly through village fund allocation, TPPS support, active roles of midwives and cadres, and household involvement in nutrition-related activities. However, intersectoral coordination, data utilization, and frontline leadership remained uneven across villages and subdistricts. These findings indicate that stunting reduction is not only a technical health intervention, but also a governance issue that depends on institutional coordination, role clarity, reliable data systems, and sustained community engagement.

The main implication of this study is that local governments need to strengthen governance mechanisms that can transform national stunting policies into consistent community-level action. In semi-rural and archipelagic settings such as Bintan, program sustainability requires more than periodic activities or individual initiatives. It requires institutionalized TPPS coordination, integrated and timely monitoring data, stronger frontline capacity, and formalized community participation within village planning and implementation processes. Strengthening these elements can improve the consistency, equity, and sustainability of stunting reduction programs across geographically dispersed areas.

This study has several limitations. First, it was conducted in selected villages and subdistricts in Bintan Regency, so the findings may not fully represent other regions with different administrative, geographic, and institutional characteristics. Second, the study relied mainly on qualitative data from interviews, field observations, and program documents, which means that the findings reflect stakeholder perspectives and implementation experiences rather than measurable causal effects. Third, the use of manual KMS records and village-level reporting may limit the accuracy and comparability of data related to monitoring practices.

Future research should expand the study to other archipelagic and decentralized regions to compare how local governance capacity affects stunting reduction in different

contexts. Further studies may also combine qualitative analysis with quantitative outcome data to examine the relationship between governance capacity, program implementation quality, and stunting prevalence. In addition, future research should explore the role of digital data systems, TPPS institutional performance, and community-based monitoring in improving the sustainability of stunting reduction programs.

Acknowledgment

This research was financially supported by the Higher Education Endowment Fund (DAPT) through the Equity program at Universitas Terbuka Indonesia.

CRedit authorship contribution statement

Friska Agustina Sianturi: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Visualization.

Darmanto Darmanto: Conceptualization, Supervision, Validation, Formal Analysis, Writing – Review & Editing, Project Administration.

Rudi Subiyakto: Investigation, Data Validation, Resources, Writing – Review & Editing, Supervision.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study. The authors further declare that there are no financial, professional, or institutional conflicts of interest related to the conduct of this research, data analysis, interpretation of the findings, or preparation of the manuscript.

Ethical Statement

This study was conducted in accordance with established ethical principles for research involving human participants. Before data collection, all participants received a clear explanation of the study objectives, research procedures, voluntary nature of participation, and measures taken to protect confidentiality. Written or verbal informed consent was obtained from all participants prior to the interviews. Participants' identities were anonymized using codes or initials, and all information collected was treated confidentially and used solely for academic research purposes. The study adhered to recognized ethical standards for qualitative research involving human participants.

Data Availability

The datasets generated and analyzed during the current study are not publicly available because they contain information that could compromise the privacy and confidentiality of the research participants. The anonymized data supporting the findings of this study are available from the corresponding author upon reasonable request and subject to applicable research ethics and confidentiality requirements.

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