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Public Service Innovation in Malaria Control in Teluk Bintuni Regency

Otto Parorrongan[1]*, Haedar Akib[2], Andi Kasmawati[3]
Universitas Negeri Makassar, Makassar, South Sulawesi, Indonesia
Corresponding Author: Otto Parorrongan ottoparorrongan04@gmail.com

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A B S T R A C T
This study aims to analyze public service innovation in malaria control through the Early Diagnosis and Treatment (EDAT) approach based on Village Malaria Workers (Juru Malaria Kampung/JMK) in Teluk Bintuni Regency. This research employed a qualitative approach with a case study design using in-depth interviews, observation, and documentation. The findings reveal that the community-based EDAT model effectively improves accessibility, coverage, and responsiveness of health services through early diagnosis, treatment, and case reporting at the community level. The success of this innovation is supported by institutional support, community participation, and policy commitment, although constrained by limited funding, infrastructure, human resources, reporting systems, and health information support. Performance improvement strategies include strengthening human resource capacity, institutional support, financing, health information systems, and community empowerment. This innovation implies that the EDAT model represents a sustainable and adaptive community-based public health service innovation in malaria-endemic regions.

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INTRODUCTION

The era of globalization is characterized by increasing competition, growing complexity in governance, and the demand for innovation across various sectors, including public health services (Lavoie-Tremblay et al., 2017; Lee et al., 2018; A. Putra et al., 2017; R. M. D. Putra, 2018; Zulu et al., 2015). Healthcare services today are no longer solely focused on accessibility and patient satisfaction (Ali, 2016; Faezipour & Ferreira, 2013; Hsieh & Kagle, 1991; Prasojo, 2017; Raivio et al., 2014; Ruliansyah, 2017; M. Taufik et al., 2017), but are also required to be responsive, adaptive, innovative, and oriented toward improving community quality of life in a sustainable manner. In this context, innovation has become a strategic instrument to address evolving public needs while strengthening regional competitiveness in delivering optimal healthcare services.

Health occupies a fundamental position in national development, as it directly correlates with human resource quality, economic productivity, life expectancy, and educational attainment. Improvements in public health contribute significantly to economic growth and poverty reduction (Arsyad et al., 2020; B. S. Dwiyanto & Jemadi, 2013). Therefore, health development must be viewed as a long-term investment that requires creativity, planned innovation, and effective and equitable service governance (Indonesia, 2013; Machmud, 2008).

Normatively, health is a fundamental human right. The Constitution of the Republic of Indonesia, through Article 28H paragraph (1) of the 1945 Constitution, guarantees every citizen's right to obtain healthcare services, while Article 34 paragraph (3) emphasizes the state's responsibility to provide adequate healthcare facilities. This constitutional mandate is further reinforced by Law No. 36 of 2009 concerning Health, which affirms that every citizen has the right to healthcare services (Republik Indonesia, 2009; Syahra, 2018). Thus, healthcare provision is not merely an administrative obligation, but a constitutional mandate that must be fulfilled through effective, inclusive, and innovative policies, particularly for poor and vulnerable populations (Putri, 2014).

Despite various reforms, including healthcare decentralization and the strengthening of the national health insurance system, access to quality healthcare services remains a major challenge in many regions of Indonesia (Ruliansyah, 2017; Siti et al., 2019; Zulu et al., 2015). Some scholars highlight the limitations of social health insurance systems as a root cause, while others emphasize the lack of policy coherence between healthcare systems and broader socio-economic development agendas (Rahman, 2018; Rosyadi, 2015; Setiawan, 2017). Therefore, public service innovation in healthcare has become an urgent necessity to enhance service effectiveness, accountability, and sustainability.

Healthcare financing reform through the National Social Security System (SJSN), regulated under Law No. 40 of 2004, represents a form of institutional innovation in Indonesia's social security system (Santoso, 2014). The implementation of SJSN and BPJS Health since 2014 has brought significant changes but has also introduced challenges, including delayed claims, provider dissatisfaction, and suboptimal service quality (Anggriani, 2016; Endartiwi, 2020;

Ilahi, 2016; Sapitri & Sari, 2021). These conditions indicate that structural reforms must be accompanied by operational innovation at the institutional level, particularly within Primary Healthcare Centers (Puskesmas), which serve as the frontline of basic healthcare services.

In the geographical context of Eastern Indonesia, accessibility challenges are even more complex. Although more than 95% of the population can access healthcare facilities nationally, approximately 33.7% still face barriers related to distance and cost, particularly in remote areas (Novika, 2020). Teluk Bintuni Regency in Papua represents one such region, characterized by significant geographical challenges, low population density, and dispersed settlements, resulting in relatively limited access to healthcare services compared to other regions.

At the same time, Teluk Bintuni Regency faces a critical endemic malaria problem. Malaria not only affects individual health but also impacts community productivity and regional development. In response to this issue, the Teluk Bintuni Regency Government developed the Early Diagnosis and Treatment (EDAT) innovation as a primary malaria control strategy. This program is implemented through collaboration between the Health Office, Primary Healthcare Centers, private sector partners such as BP Tangguh LNG, and international partners including the Global Fund.

The EDAT innovation emphasizes early detection and prompt treatment through the empowerment of Village Malaria Workers (Juru Malaria Kampung/JMK), who are locally recruited and trained to conduct malaria diagnosis and administer treatment according to technical guidelines. The model is strengthened by door-to-door screening strategies, the distribution of insecticide-treated bed nets, and structured surveillance systems at the village level. The success of this innovation is reflected in the significant reduction in Annual Parasite Incidence (API) and the increasing number of malaria-free villages. Furthermore, the EDAT innovation received international recognition through the United Nations Public Service Award (UNPSA) in 2018 in the category of inclusive public services for vulnerable populations.

This success is supported by national regulatory frameworks, including Ministry of Health Regulation No. 22 of 2022 on Malaria Control and Ministry of Health Regulation No. 41 of 2018 on early detection and anti-malaria treatment by community health workers in special regions. These regulations provide legal legitimacy for empowering community health workers within the primary healthcare system, thereby enabling community-based healthcare innovation in remote areas.

LITERATURE REVIEW

Theoretically, public service innovation can be analyzed using Rogers' diffusion of innovation framework (2002), which includes dimensions such as relative advantage, compatibility, complexity, trialability, and observability. This framework is relevant for assessing the extent to which EDAT innovation can be accepted, adopted, and institutionalized within regional healthcare systems. Additionally, innovation performance can be evaluated using the Balanced

Scorecard approach (Kaplan & Norton, 2001; Riwu & Wibowo, 2021; Sharma, 2009; A. R. Taufik, 2018; Vitezić et al., 2019), which enables performance assessment across financial, customer, internal process, and organizational learning dimensions.

Public administration scholars emphasize that public sector innovation is essential to overcome bureaucratic stagnation and administrative dysfunction (Lavoie-Tremblay et al., 2017; Nolte & Organization, 2018; Suwarno, 2008; Zulu et al., 2015). However, empirical evidence indicates that local government innovation in Indonesia remains limited (A. Dwiyanto, 2021; Muttaqin, 2011). Therefore, the case study of public service innovation in malaria control in Teluk Bintuni Regency provides important empirical contributions to the public sector innovation literature, particularly in the context of endemic disease control.

Based on these empirical and theoretical gaps, this study aims to: (1) describe the performance model of EDAT innovation based on Village Malaria Workers in Teluk Bintuni Regency; (2) identify the determinants that support and hinder innovation performance; and (3) formulate realistic and institutionalized strategies to enhance innovation performance so that the innovation becomes embedded within routine governance rather than remaining limited to project-based implementation..

METHODOLOGY

This study employed a qualitative approach with a case study design to examine public service innovation in malaria control in Teluk Bintuni Regency, West Papua Province (Yin, 2018). The qualitative approach was chosen to explore the meanings, processes, institutional dynamics, and interactions among actors involved in the implementation of the Early Diagnosis and Treatment (EDAT) innovation, which cannot be adequately explained through quantitative methods. The case study design was considered appropriate because Teluk Bintuni represents a unique and representative context for community-based healthcare innovation through Village Malaria Workers (Juru Malaria Kampung/JMK). The study was conducted in healthcare institutions, including Primary Healthcare Centers (Puskesmas), the Regional General Hospital, the District Health Office, and communities involved in malaria control programs. The unit of analysis consisted of healthcare organizations and relevant actors, including healthcare personnel, program managers, malaria cadres, and community members.

Informants were selected using purposive sampling based on their direct involvement in the EDAT program. A total of 23 key informants participated, including healthcare workers, Health Office officials, Village Malaria Workers, and community leaders. Data were collected through in-depth interviews, field observations, and document analysis. Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2014), which consists of data condensation, data display, conclusion drawing, and verification. The analysis involved coding and categorizing data into thematic patterns, followed by interpretation to identify relationships among findings. Data validity was ensured through source and method triangulation, as well as member checking. This approach enabled a comprehensive understanding of the innovation model,

supporting and inhibiting factors, and strategies to improve public service innovation in malaria control.

RESEARCH RESULT AND DISCUSSION

Early Diagnosis and Treatment (EDAT) Innovation Performance Model based on Village Malaria Officers

The findings show that the performance model of public service innovation in malaria control in Teluk Bintuni Regency is operationalized through the implementation of the Early Diagnosis and Treatment (EDAT) approach based on Juru Malaria Kampung (JMK). This model is implemented by primary health centers (Puskesmas) through the recruitment of local community members as health cadres responsible for early malaria detection, initial treatment, and monitoring of patient conditions at the village level. JMK members are recruited from the local community and receive technical training from Puskesmas health personnel and the Malaria Center to conduct malaria testing using Rapid Diagnostic Tests (RDT), provide treatment according to established protocols, and report cases to health facilities. The duties of JMK are carried out directly within the community, including door-to-door visits and monitoring high-risk population groups.

These findings indicate a fundamental shift in the health service delivery mechanism, where services are no longer fully dependent on formal health facilities but are expanded through community empowerment as part of the health system. This is consistent with Rogers (2002), who states that innovation is a new practice adopted within a social system to improve effectiveness and efficiency in achieving specific goals. The JMK-based EDAT model demonstrates a relative advantage by providing improvements compared to the previous health service system, particularly in increasing access and expanding health service coverage in remote areas.

Interview data show that the presence of JMK enables health services to reach communities in remote areas that are difficult to access by formal health personnel due to geographical barriers, transportation limitations, and weather conditions. JMK plays a direct role in conducting malaria examinations and providing treatment at the community level, thereby improving access and the speed of service delivery. These findings indicate that the EDAT model has a high level of compatibility with the social and geographical conditions of the community, as it aligns with local needs and enhances service effectiveness. This is in line with Rogers (2002), who emphasizes the importance of innovation compatibility with social context, and Suwarno (2008), who argues that public service innovation aims to improve service accessibility and effectiveness.

In addition to diagnosis and treatment, JMK is also responsible for monitoring the progress of malaria patients and providing health education to the community regarding malaria prevention. These activities are carried out continuously through routine community visits and reporting to Puskesmas. Observational data indicate that JMK uses diagnostic tools provided by Puskesmas and follows standardized health service procedures. Furthermore, JMK contributes to malaria surveillance through systematic recording and

reporting of malaria cases to Puskesmas as part of the public health monitoring system.

These findings indicate that the EDAT model functions not only as a health service delivery mechanism but also as part of a community-based health surveillance system. This is consistent with Muluk (2015), who states that public sector innovation is an effort to improve organizational capacity in delivering public services through the development of more adaptive and responsive service systems. The presence of JMK enhances the responsiveness of the health system in detecting and managing malaria cases at the community level.

The findings also show that the implementation of the EDAT model involves coordination among Puskesmas, the Malaria Center, the District Health Office, and supporting partners. Puskesmas provides supervision, training, and operational support to JMK, while the Malaria Center plays a role in technical coordination and quality control of malaria diagnosis. Support from external partners strengthens logistical, training, and financial aspects of the program. This is consistent with Prasojo (2017) and Hafizh (2016), who state that public service innovation in the health sector requires integration among various actors, including government, health institutions, and the community, to improve service effectiveness.

Based on interviews and program documentation, the EDAT model has been systematically implemented through the establishment of JMK in various villages within the Puskesmas service areas. JMK actively conducts early malaria detection through direct community visits, performs malaria testing using available diagnostic tools, and provides treatment to diagnosed patients. In addition, JMK reports activity results to Puskesmas as part of the health reporting system. Documentation data show that these activities are carried out continuously as part of community health service programs in Teluk Bintuni Regency.

The findings also indicate that the implementation of the EDAT model has contributed to expanding health service coverage in remote areas. Informants stated that communities that previously had to travel long distances to obtain health services can now receive malaria diagnosis and treatment at the village level through JMK. In addition, communities receive direct health education from JMK regarding malaria prevention and the importance of early treatment. These activities bring health services closer to the community and expand service coverage in remote areas. This reflects improved accessibility, which is an important indicator of public service performance (Kaplan & Norton, 2001; Prasojo, 2017). The improvement in service access through the EDAT model demonstrates that public service innovation can enhance the capacity of the health system to reach communities with previously limited access to health services.

In addition to improving service coverage, the findings also show an increase in the speed of malaria detection and treatment. Documentation data indicate that the EDAT program enables faster case detection through direct examination at the community level. Patients diagnosed with malaria can immediately receive treatment without waiting for referral to formal health

facilities. This allows faster case management and reduces the risk of disease complications. These findings indicate that the EDAT model improves the responsiveness of the health system, which is a key indicator of public service performance (Lavoie-Tremblay et al., 2017; Zulu et al., 2015). Responsiveness refers to the ability of the health system to provide timely and appropriate services according to community needs.

The findings further show that the EDAT model is implemented through a coordinated system involving multiple actors within the health service system. Puskesmas, the Malaria Center, and the District Health Office play roles in program implementation, supervision, and monitoring. In addition, community involvement through JMK forms an integral part of the malaria control system. Thus, the implementation of the EDAT model reflects the interaction between formal health personnel, community health cadres, and health institutions in delivering public health services in Teluk Bintuni Regency.

Supporting and Inhibiting Factors for Early Diagnosis and Treatment (EDAT) Innovation Performance

a. Supporting Factors

1) Community involvement through Village Malaria Officers (JMK)

The findings indicate that community involvement through the establishment and empowerment of Juru Malaria Kampung (JMK) constitutes a key supporting factor in the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. JMK members are recruited from local communities within the Puskesmas service areas, particularly in regions with limited access to formal health facilities. The recruitment process considers social acceptance, geographical proximity, and the individual's capacity to participate in technical training. Following recruitment, JMK members receive training from Puskesmas and the Malaria Center on malaria diagnostic procedures using Rapid Diagnostic Tests (RDT), treatment administration according to established standards, patient monitoring, and case recording and reporting mechanisms. This role enables health services to extend beyond formal health personnel by incorporating community empowerment at the local level.

Interview data show that the presence of JMK significantly improves community access to health services, particularly for malaria diagnosis and treatment. The social proximity between JMK and community members enhances trust, facilitates communication, and encourages individuals to seek health services more promptly. Moreover, communities no longer need to travel long distances to Puskesmas, which often requires considerable time and transportation costs, thereby improving the efficiency and effectiveness of service delivery. This is particularly important in the geographical context of Teluk Bintuni, where access to health facilities is challenging, making JMK a strategic solution for expanding health service coverage.

Observational findings further indicate that JMK actively conducts early malaria detection through home visits (active case detection), provides treatment according to established protocols, monitors patient progress, and records and reports malaria cases to Puskesmas as part of the health surveillance system. In

addition, JMK plays an important role in providing health education to the community regarding malaria prevention, including the use of insecticide-treated bed nets, maintaining environmental hygiene, and the importance of early diagnosis. These activities contribute to improving community knowledge and awareness of malaria prevention and control, thereby strengthening the overall effectiveness of public health programs.

These findings demonstrate that community involvement through JMK represents an integral component of community-based public service innovation that enhances accessibility, responsiveness, and effectiveness of health service delivery. This is consistent with Rogers (2002), who argues that innovations aligned with community needs and social conditions are more readily adopted and effectively implemented. Furthermore, Muluk (2015) and Prasojo (2017) emphasize that public service innovations involving community participation can strengthen health system capacity, expand service coverage, and improve the quality and sustainability of health services, particularly in remote areas.

2) Institutional Support from the Community Health Center and Health Service

The findings indicate that institutional support from Puskesmas and the District Health Office is an important enabling factor in the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. Puskesmas plays a central role in organizing, implementing, and supervising community-based health services through Juru Malaria Kampung (JMK), including providing technical training, field supervision, and operational support. The training covers the use of Rapid Diagnostic Tests (RDT), malaria diagnostic procedures, administration of anti-malarial drugs, and case recording and reporting mechanisms. This support ensures that JMK personnel possess adequate competencies to deliver health services in accordance with established operational standards.

In addition to training, Puskesmas conducts regular supervision through field visits, monitoring activity reports, and maintaining ongoing communication with JMK personnel. This supervision aims to ensure service quality and strengthen the capacity of community health cadres through continuous guidance and mentoring. Puskesmas also provides essential health logistics, including diagnostic tools, anti-malarial medications, and other supporting equipment, and manages their distribution to service areas, including remote locations. This logistical support enables community-level health services to be delivered effectively and sustainably.

The Teluk Bintuni District Health Office also plays a critical role in supporting EDAT implementation through planning, coordination, supervision, and program evaluation functions. The Health Office coordinates with Puskesmas and the Malaria Center, receives program implementation reports, and supports institutional capacity strengthening through training and the development of reporting systems. The presence of the Malaria Center further strengthens technical coordination, health worker training, and malaria diagnostic quality control. This institutional support ensures that the EDAT program is implemented in a systematic, integrated, and sustainable manner.

These findings demonstrate that institutional support is a key determinant of successful public service innovation. This is consistent with Kaplan and Norton (2001), who emphasize the importance of organizational capacity in supporting innovation implementation, as well as Muluk (2015) and Prasojo (2017), who argue that public sector innovation requires strong institutional support, coordination, and organizational systems to ensure effective and sustainable implementation within the health service system.

3) Policy support and commitment of local government

The findings indicate that policy support and the commitment of the local government are critical enabling factors in the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. This support is reflected in the prioritization of malaria control as part of the regional health development agenda and the establishment of the Malaria Center as an institution responsible for coordinating and managing malaria control programs. Based on documentation and interview data, the local government, through the District Health Office, provides support in the form of technical policy formulation, program planning, and the integration of EDAT into the regional health service system. These policies provide an operational framework for Puskesmas and health personnel to conduct early diagnosis, treatment, and monitoring of malaria cases in a systematic and sustainable manner.

In addition to formal policy support, the local government's commitment is also demonstrated through efforts to strengthen institutional capacity and human resources involved in the EDAT program. Interview findings show that the local government supports training programs for health workers and Juru Malaria Kampung (JMK), as well as facilitates coordination among institutions involved in malaria control. This support enhances the capacity of health personnel and community health cadres to conduct diagnosis, treatment, and case reporting at the community level. Furthermore, the local government supports program monitoring and evaluation activities to ensure the effectiveness and sustainability of malaria control efforts in Teluk Bintuni Regency.

The policy support provided by the local government reflects its important role in creating an enabling institutional environment for public service innovation in the health sector. This finding is consistent with Muluk (2015), who emphasizes that public sector innovation requires strong policy support and institutional commitment to ensure effective and sustainable implementation. Policy support enables innovation to be institutionalized within the public service system rather than remaining dependent on individual or temporary initiatives. It also facilitates the allocation of resources and coordination mechanisms necessary for effective program implementation.

The local government's commitment to supporting EDAT implementation also reflects its responsibility as a public service provider to ensure the availability of health services for the community. This is consistent with Law Number 36 of 2009 on Health, which states that the government is responsible for ensuring access to health services for all citizens (Republic of Indonesia, 2009).

In this context, policy support and government commitment enable the sustainable implementation of EDAT as part of the regional health service system and strengthen the capacity of the health system to reach remote communities and improve the effectiveness of malaria control in Teluk Bintuni Regency.

b. Inhibiting Factors

1) Limited Program Funding

The research results indicate that limited program funding is a major inhibiting factor in the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. Operational budget constraints impact critical activities such as field supervision, distribution of health logistics, and monitoring of malaria cases, particularly in remote areas where transportation costs are high. Furthermore, limited funding also impacts the mobility of Village Malaria Officers (JMK), limiting the frequency of field visits, patient monitoring, and the implementation of training and technical supervision.

Limited funding also impacts the availability of health logistics, including diagnostic tools and antimalarial drugs, and their smooth distribution to remote areas. This situation demonstrates that financing is a crucial component in supporting the sustainability of community-based health services. This aligns with Kaplan and Norton (2001) and Muluk (2015), who stated that the availability of financial resources is a key factor in the success and sustainability of public sector innovations. Therefore, limited funding directly impacts the operational effectiveness, quality of services, and the sustainability of the EDAT innovation in malaria control in areas with limited geographic access.

2) Limited Health Service Facilities and Infrastructure

The findings indicate that limitations in health service facilities and infrastructure constitute a significant barrier to the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. These limitations are primarily related to the availability and sustainability of diagnostic tools, laboratory equipment, transportation facilities, and other supporting infrastructure required to support malaria diagnosis and treatment at the community level. Based on interview and field observation data, the availability of Rapid Diagnostic Tests (RDTs) and anti-malarial drugs experienced delays in distribution during certain periods, which affected the continuity and effectiveness of early detection activities in several service areas.

In addition to diagnostic tools, the condition of laboratory equipment in health facilities also represents a critical infrastructure limitation. Interviews with health personnel revealed that laboratory equipment, such as microscopes and supporting diagnostic instruments, was not always in optimal condition, particularly in remote health facilities. Equipment damage and limited maintenance capacity constrained the verification of malaria diagnoses, resulting in greater reliance on RDT-based diagnosis at the community level without adequate laboratory confirmation in certain cases. This condition affected the overall reliability and comprehensiveness of malaria diagnostic processes.

Infrastructure limitations were also closely related to transportation facilities used to reach remote service areas. Interview findings indicated that access to several villages required the use of boats or specialized transportation, which depended heavily on weather conditions and fuel availability. These transportation constraints affected the distribution of medical supplies and the ability of Puskesmas personnel to conduct regular field supervision and program monitoring. As a result, infrastructure limitations not only affected diagnostic and treatment services but also influenced supervision, coordination, and program management at the community level.

These findings demonstrate that adequate facilities and infrastructure are essential components for the successful implementation of public service innovation in the health sector. Kaplan and Norton (2001) emphasize that organizational infrastructure, including physical facilities and support systems, is a key determinant of an organization's capacity to implement innovation effectively. Similarly, Muluk (2015) highlights that public sector innovation requires sufficient resource and infrastructure support to ensure sustainability and effectiveness. In the context of EDAT implementation, infrastructure limitations remain a significant barrier that affects the effectiveness, accessibility, and sustainability of malaria control services, particularly in geographically remote areas.

4) Geographical Conditions of the Region and Limited Accessibility of Health Services

The findings indicate that the geographical conditions of Teluk Bintuni Regency constitute a significant barrier to the implementation of the Early Diagnosis and Treatment (EDAT) innovation, particularly in terms of healthcare accessibility, health worker mobility, and logistics distribution. The region is dominated by coastal areas, swamps, forests, and remote inland settlements with limited land transportation infrastructure, requiring access to several areas by water transport with long travel times and strong dependence on weather conditions. As a result, healthcare services provided by Puskesmas personnel cannot always be conducted routinely, particularly in remote areas with limited accessibility.

These accessibility constraints directly affect supervision activities, the distribution of medical logistics, and malaria case monitoring at the community level. Health personnel reported that adverse weather conditions, such as high waves and heavy rainfall, frequently hinder field visits, resulting in irregular supervision of Village Malaria Workers (Juru Malaria Kampung/JMK). Furthermore, the distribution of diagnostic tools and anti-malarial drugs to remote areas requires longer delivery times, which affects the continuity and effectiveness of healthcare services. Geographical barriers also limit community access to Puskesmas and hospitals, forcing residents to travel long distances to obtain formal healthcare services, thereby reinforcing the critical role of JMK in providing community-based health services.

These findings demonstrate that geographical conditions represent an external factor influencing the effectiveness of healthcare innovation. This is consistent with Muluk (2015) and Rogers (2002), who emphasize that physical

and environmental conditions significantly affect the implementation and success of public sector innovation. In this context, geographical constraints in Teluk Bintuni Regency influence health worker mobility, logistics distribution, and community access to formal healthcare services, thereby shaping the overall effectiveness of EDAT implementation.

5) Limited Human Resources for Health Services

The findings indicate that limitations in healthcare human resources constitute a significant barrier to the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. This limitation is primarily related to the insufficient number of healthcare personnel available at Puskesmas and other health service institutions to adequately cover the extensive service areas with challenging geographic conditions and limited accessibility. Interviews with healthcare personnel revealed that staffing levels at several Puskesmas remain inadequate, requiring health workers to manage multiple health programs simultaneously, including primary healthcare services, communicable disease prevention programs, and malaria control initiatives. This situation results in a high workload, which affects their capacity to conduct supervision, mentoring, and monitoring activities related to the EDAT program effectively.

The shortage of healthcare personnel also affects the supervision and technical support provided to Village Malaria Workers (Juru Malaria Kampung/JMK). Health workers reported that routine field visits for technical supervision cannot always be conducted, particularly in areas with limited transportation access. Supervision is a critical component of the EDAT program, as it ensures that malaria diagnosis, treatment, and reporting are carried out according to established operational standards. The limited availability of health personnel reduces the frequency and effectiveness of supervision, thereby affecting the quality and consistency of healthcare services at the community level.

In addition to staffing shortages, limitations in the technical capacity of healthcare personnel also pose challenges to EDAT implementation. Effective malaria control requires specialized competencies in diagnosis, treatment, and program management. However, limited opportunities for advanced training and the shortage of personnel with specialized malaria expertise constrain program effectiveness. Furthermore, the high rate of staff rotation and reassignment in some areas disrupts program continuity, as experienced personnel are transferred and replaced by less experienced staff.

These findings highlight that the availability and capacity of human resources are critical factors influencing the success of public service innovation in healthcare. This is consistent with Kaplan and Norton (2001), who emphasize that human resource capacity significantly affects organizational performance and innovation outcomes, and Muluk (2015), who argues that public sector innovation requires adequate human resources to ensure effective and sustainable implementation. In this context, human resource limitations affect supervision, capacity building, and program monitoring, thereby influencing the

effectiveness and sustainability of EDAT implementation in geographically challenging regions such as Teluk Bintuni Regency.

6) Limitations of the Reporting System, Coordination and Support of the Health Information System

The findings indicate that limitations in reporting systems, coordination, and health information system support constitute a significant barrier to the implementation of the Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency. These limitations are primarily related to malaria case reporting mechanisms from the community level to Puskesmas and the District Health Office, which are not yet fully supported by an integrated information system. Interviews with healthcare personnel and program managers revealed that malaria case reporting by Village Malaria Workers (Juru Malaria Kampung/JMK) is still largely conducted manually through written records, which are then submitted directly or through health personnel to Puskesmas. This manual reporting process requires more time, particularly in areas with limited transportation and communication access, thereby affecting the timeliness of information delivery and the speed of response in malaria control efforts.

In addition, limited communication infrastructure in several service areas poses challenges to effective program coordination. Observations and interviews indicated that some remote areas experience poor communication network coverage, resulting in delays in communication between JMK, Puskesmas, and the District Health Office. This situation affects coordination activities, including case reporting, logistics distribution, and supervision. The lack of reliable communication systems also limits the ability of health personnel to monitor malaria cases in real time at the community level.

These limitations also affect monitoring and evaluation activities within the EDAT program. Health personnel reported that the process of collecting and processing malaria case data remains time-consuming due to manual reporting practices in certain areas. This situation affects the ability of health institutions to conduct timely and accurate data analysis to support evidence-based decision-making. Furthermore, reporting limitations hinder effective data integration between community-level services, Puskesmas, and the District Health Office, which is essential for public health surveillance.

These findings demonstrate that information systems and coordination mechanisms are critical components in supporting public service innovation in healthcare. This is consistent with Kaplan and Norton (2001), who emphasize that organizational information systems play a vital role in supporting performance and innovation implementation, and Muluk (2015), who argues that effective management and information systems are essential for the successful implementation of public sector innovation. In this context, limitations in reporting systems and coordination directly affect malaria surveillance, inter-institutional coordination, and data-driven decision-making, thereby influencing the overall effectiveness of EDAT implementation.

Strategy for Improving the Performance of Early Diagnosis and Treatment (EDAT) Innovation

The research results indicate that the strategy to improve the performance of Early Diagnosis and Treatment (EDAT) innovation in Teluk Bintuni Regency is implemented through a series of efforts aimed at strengthening the capacity of human resources, institutions, support systems, and community empowerment as an integral part of the health care system. These strategies are formulated based on program implementation experience, field evaluation results, and the need to ensure the sustainability and effectiveness of community-based health care innovation. The strategies to improve the performance of EDAT innovation in Teluk Bintuni Regency include the following:

a. Strengthening the Capacity and Competence of Village Malaria Officers (JMK)

Strengthening the capacity and competence of Village Malaria Officers (JMK) is a key strategy for improving the performance of EDAT innovations. This capacity building is carried out through ongoing technical training, regular supervision by Community Health Center (Puskesmas) health workers, and technical coaching facilitated by the Malaria Center. Based on interviews, health workers stated that improving the technical capabilities of JMK is crucial to ensure accurate diagnosis, appropriate treatment, and accurate reporting of malaria cases. Ongoing training and supervision enable JMK to improve their technical skills and better understand health service procedures. This strategy aligns with the view of Kaplan and Norton (2001), who stated that improving human resource capacity is a key element in improving organizational performance and supporting the sustainability of public service innovation.

b. Strengthening Institutions and Coordination Systems Between Institutions

The second strategy is to strengthen the institutional and coordination systems between Community Health Centers (Puskesmas), the Health Office, and the Malaria Center in implementing the EDAT program. Research results indicate that inter-institutional coordination is carried out through technical supervision mechanisms, program monitoring, and regular reporting of malaria cases. This institutional strengthening aims to ensure that the EDAT program is integrated into the regional health care system. Furthermore, institutional strengthening is also carried out by increasing institutional capacity in program management, including aspects of program planning, implementation, and evaluation. This strategy aligns with Muluk's (2015) view that public sector innovation requires strong institutional support and an effective coordination system for sustainable implementation.

c. Strengthening Financial Support and Health Logistics Systems

The third strategy is strengthening financial support and the health logistics system to ensure the smooth implementation of the EDAT program across all service areas. Based on research findings, financial support is needed to support operational activities such as training, field supervision, distribution of health logistics, and the mobility of health workers and JMK. Furthermore, strengthening the health logistics system is also necessary to ensure the

continuous availability of diagnostic tools, medicines, and other health equipment across all service areas, including remote areas. Adequate financial and logistical support enables more effective and sustainable health service delivery (Kaplan & Norton, 2001; Muluk, 2015).

d. Strengthening the Health Reporting System and Information System

The fourth strategy is strengthening the reporting system and health information system to increase the effectiveness of monitoring and evaluation of the EDAT program. Research results show that an effective reporting system allows for faster and more accurate monitoring of malaria cases. This reporting system is strengthened by increasing the capacity of health workers and community health workers (JMK) to record and report malaria cases, as well as by strengthening the coordination mechanism between JMK, Community Health Centers (Puskesmas), and the Health Office. An effective reporting system allows for faster, data-driven decision-making, thereby increasing the effectiveness of program implementation. This aligns with Rogers' (2002) view that the success of innovation implementation is influenced by the system's ability to generate information that can be used to support decision-making.

e. Strengthening Community Empowerment and Participation in Health Services

The fifth strategy is strengthening community empowerment and participation in the implementation of community-based health services. Research results indicate that community involvement through JMK is a key component in the success of the EDAT innovation. Therefore, the performance improvement strategy focuses on strengthening the community's role through increased health education, increasing public awareness of the importance of early malaria detection, and strengthening the social legitimacy of JMK as part of the health care system. Strengthening community participation allows for more effective program implementation because the community acts not only as service recipients but also as part of the health care system. This strategy aligns with Prasojo's (2017) view that effective public service innovation requires active community involvement in the delivery of public services.

Thus, the strategy to improve the performance of EDAT innovation in Teluk Bintuni Regency is implemented through strengthening human resource capacity, institutional strengthening, financing and logistics, strengthening health information systems, and strengthening community empowerment. These strategies demonstrate that successful public service innovation in the health sector requires an integrated and sustainable approach to ensure the effectiveness and sustainability of community-based health services.

CONCLUSION AND RECOMMENDATION

1. The performance model of public service innovation through the Early Diagnosis and Treatment (EDAT) approach based on the Village Malaria Officer is an effective community-based health service innovation in increasing the accessibility, reach, and responsiveness of health services. This model allows for early diagnosis, treatment, patient monitoring, and

reporting of malaria cases to be carried out directly at the community level through community empowerment as health cadres. The implementation of this model is supported by the institutional role of Community Health Centers (Puskesmas), the Health Office, and the Malaria Center which provide training, supervision, and coordination in program implementation, thereby strengthening the health service system in reaching remote areas.

2. The successful implementation of the EDAT innovation is influenced by supporting and inhibiting factors originating from institutional aspects, human resources, financing, facilities and infrastructure, geographical conditions, and program reporting systems. The main supporting factors include community involvement through Village Malaria Task Forces, institutional support from Community Health Centers and the Health Office, and policy support and commitment from local governments. Meanwhile, inhibiting factors include limited program funding, limited health service facilities and infrastructure, geographical conditions of difficult-to-reach areas, limited human resources for health services, and limitations in the reporting system and health information system support.
3. The strategy to improve EDAT's innovation performance is implemented through strengthening human resource capacity, strengthening institutions and coordination systems, strengthening health financing and logistics support, strengthening health reporting and information systems, and strengthening community empowerment and participation. These strategies aim to increase the effectiveness of program implementation, strengthen the capacity of the health service system, and ensure the sustainability of public service innovations in malaria control, particularly in areas with limited geographic access such as Teluk Bintuni Regency.

ADVANCED RESEARCH

This study confirms that the Early Diagnosis and Treatment (EDAT) model based on Village Malaria Officers represents an effective community-based public service innovation that enhances accessibility, early detection, and malaria case management in remote areas such as Teluk Bintuni Regency. Its performance is strengthened by institutional support from Puskesmas, the Health Office, and community task forces, yet constrained by limitations in funding, infrastructure, human resources, geographic access, and reporting systems. Therefore, sustainable impact requires integrated strategies focused on capacity building, institutional coordination, financing reinforcement, and the strengthening of health information systems to ensure long-term effectiveness and resilience in malaria control.

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