

Overview of the Implementation of the Early Warning Alert Response System (EWARS) at the Suak Ribee Public Health Center, West Aceh District

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Abstract

The Early Warning Alert and Response System (EWARS) is an important system for early detection and response to extraordinary events (KLB) in health facilities. The Suak Ribee Public Health Center has implemented EWARS, but evaluation of its implementation and operational challenges is still needed. This study aimed to analyze the accuracy and completeness of EWARS reporting at the Suak Ribee Public Health Center and to identify challenges and strategies for improving the quality of the system. A descriptive study was conducted through observation and interviews with surveillance officers at the Suak Ribee Public Health Center. EWARS report data for the 2022–2024 period was analyzed quantitatively for accuracy and completeness, and qualitatively to identify obstacles and recommendations for improvement. The accuracy and completeness of reporting reached 100% every year, demonstrating the consistency and effectiveness of the reporting system. The main challenges encountered were limited internet connectivity and funding support, which could potentially affect the sustainability of the system. Improvement strategies include implementing a hybrid offline-online reporting system, increasing human resource capacity through training and clear SOPs, and collaborating with the Health Office, NGOs, and the private sector for operational and funding support. Although reporting is already optimal, improvements in infrastructure, funding, and human resource capacity are still needed to maintain the sustainability of EWARS. The implementation of these strategies can strengthen the surveillance system, support early detection, and improve the response to outbreaks in the working area of the Suak Ribee Public Health Center.

Keywords: Accuracy of reporting, Completeness of reporting; EWARS; Health surveillance, Suak Ribee Public Health Center

Introduction

Infectious diseases have been an ongoing threat to human health throughout history, with infectious disease cases still placing a significant burden on global health systems despite advances in vaccine development, medical therapies, and disease control strategies (Gaetano et al., 2025). Prevention and control efforts through surveillance, early response, and coordination of public health programs have had a positive impact on reducing the incidence of several infectious diseases. Developments in surveillance and early warning systems have improved the ability to detect and respond to outbreaks, but challenges such as the emergence of new pathogens, antimicrobial resistance, and disparities in health

system capabilities across regions complicate the management of infectious diseases (Li et al., 2024; Susanti, 2024). Thus, the complexity of managing infectious diseases remains a critical concern in global public health today.

Infectious diseases are pathological conditions caused by infectious agents such as bacteria, viruses, parasites, and fungi, which have the ability to spread from one individual to another through certain transmission mechanisms, either directly or indirectly. The transmission process can occur through physical contact between individuals, exposure to droplets or aerosols in the air, consumption of contaminated food and water, or through vectors such as insects or disease-carrying animals (Susanti, 2024). This transmission mechanism is influenced by complex interactions between infectious agents, hosts, and the environment, so that the dynamics of disease spread are highly dependent on biological and social factors, as well as environmental conditions that support the survival of pathogens (Baker et al., 2020). In addition, increased population mobility and global urbanization have accelerated the spread of infectious diseases across regions and countries, reinforcing the urgency of surveillance and early response systems in infectious disease control (Ikuta et al., 2022).

Efforts to control infectious diseases require comprehensive, integrated, and sustainable strategies, given that failure to control them can increase the risk of extraordinary events that have a widespread impact on public health. Therefore, the existence of a responsive and sensitive early detection system is a crucial component in increasing awareness and preparedness for potential outbreaks. Early warning based surveillance systems have proven to play an important role in quickly identifying increases in cases, enabling response actions to be taken before transmission escalates (Li et al., 2024). In addition, strengthening surveillance systems and integrated responses at the primary health care level up to the national level is a key strategy in minimizing the impact of epidemics and accelerating data-driven decision-making (WHO, 2022).

In the Indonesian context, the implementation of the EWARS is one of the strategic instruments in supporting early detection, rapid reporting, and coordinated response to infectious diseases that have the potential to cause outbreaks, thereby contributing to the strengthening of the overall public health system.

The EWARS was initiated and developed in 2007 by the Indonesian Ministry of Health as an adaptation of the early warning system recommended by the World Health Organization (WHO), with adjustments to suit the epidemiological characteristics and health system capacity in Indonesia (Fitriani et al., 2023). The development of this system aims to strengthen early detection capabilities and accelerate response to potential outbreaks. Operationally, EWARS works by monitoring trends in infectious diseases that have the potential to cause outbreaks on a regular basis, generally at weekly intervals, enabling faster and more measurable identification of increases in cases (Kemenkes RI, 2021).

Early warning-based surveillance approaches such as EWARS have been shown to improve the sensitivity of epidemic signal detection and accelerate decision-making in outbreak response, particularly in countries with a high burden of infectious diseases (Li et al., 2024). The implementation of EWARS in Indonesia has been gradually expanded to various provinces, districts/cities, and public health centers as part of a strategy to strengthen the national surveillance system. The expansion and replication of this system continues to ensure that all regions are able to optimally implement early detection and rapid response mechanisms (Archer et al., 2021), in line with global recommendations on strengthening EWARS to improve preparedness for outbreaks (WHO, 2022).

At the end of 2015, the Indonesian Ministry of Health launched the EWARS website platform to facilitate the processing and reporting of infectious disease data as part of early detection and rapid response efforts to potential outbreaks (Fitriani et al., 2023). Through this website, health center officials can upload weekly disease case reports, including disease alert updates, accuracy, and completeness of reported data, thereby facilitating disease trend monitoring and potential outbreak identification (Kemenkes RI, 2016).

The accuracy and completeness of weekly reports at the public health center level play an important role in the effectiveness of the early warning system, the more accurate the reports are, the faster early warning signals can be detected, while the more complete the data sent, the broader the coverage of monitoring for diseases with the potential for outbreaks (Depkes RI, 2016). The process of sending aggregate data is carried out every Monday morning from the health center to the district/city and central levels, thereby facilitating a rapid response to potential outbreaks (Kemenkes RI, 2015).

An evaluation of EWARS in Indonesia shows that structured digital reporting contributes to improved timeliness and completeness of surveillance reports, although challenges in infrastructure and resource distribution continue to affect the quality of reporting in some areas (Hardhantyo et al., 2022). Thus, strengthening digital reporting mechanisms at public health centers is one of the key factors in the success of early detection of outbreaks at the national level.

EWARS has been actively implemented in Aceh Province, including in West Aceh District. Interviews with officials at the Suak Ribee Public Health Center in West Aceh District showed that EWARS has been implemented consistently, with weekly and monthly reports on the health conditions of the local community. These reports play an important role in supporting the function of an integrated health surveillance system, from the public health center level to the district and national levels, thereby strengthening the capacity for early detection and response to potential outbreaks (Haryanto et al., 2021). Research shows that structured reporting-based early warning systems can improve the sensitivity and effectiveness of detecting abnormal health events, especially when supported by clear reporting standards and well-coordinated data access systems (Meckawy et al., 2022). Thus, the regularity and quality of reporting produced by primary health care units such as public health centers are important factors in ensuring preparedness and evidence-based decision-making in the EWARS system.

Although routine reporting through EWARS has been consistently implemented, the implementation of this system still faces various challenges, including limited human resources, technical capacity of officers, and availability of supporting facilities and infrastructure. These factors can affect the effectiveness of the early warning system and hamper the ability to detect and respond quickly to potential outbreaks (Meckawy et al., 2022). These limitations can hinder the effectiveness of early warning systems and reduce the ability to detect and respond to epidemic events optimally (Lesmana et al., 2024). Thus, strengthening the internal capacity of public health centers and integrating resources are important strategies in maintaining the sustainability of EWARS as an effective early detection tool.

Methods

This study falls under the category of observational research, in which researchers study and observe the implementation of a program without intervening or treating the research subjects. The approach used is an evaluation design, which allows for comparison between the current program and programs that have been completed within a certain period of time.

The study was conducted at the Suak Ribee Public Health Center in West Aceh District. The study was conducted from February to May 2025. The focus of the research was the EWARS surveillance system implemented at the Suak Ribee Public Health Center in West Aceh District from 2022 to 2024. Data was collected through informants who were EWARS program holders at the local public health center. There was one informant, namely the surveillance officer at the Suak Ribee Public Health Center in West Aceh District.

Data collection was carried out using instruments in the form of interview guides, including questionnaires and observation sheets. Data collection techniques were carried out through two sources, namely primary data and secondary data. Primary data was obtained in the form of information regarding the implementation of the EWARS program, while secondary data was obtained from EWARS implementation reports. Data processing and analysis were carried out by describing the actual conditions of EWARS implementation at the Suak Ribee Public Health Center, West Aceh Regency, and then comparing them with the 2012 EWARS Guidelines published by the Ministry of Health of the Republic of Indonesia. The results of the analysis are presented in the form of narratives, tables, and graphs.

Results

Overview of the Geographic and Demographic Conditions of the Public Health Center's Working Area

The Suak Ribee Public Health Center is a health care facility that has been operating for several decades and has experience in providing primary health care services. Initially, this health center was a satellite health center under the jurisdiction of Johan Pahlawan Public Health Center. As the coverage area of the assisted villages expanded, the jurisdiction was expanded, which then elevated the status of Suak Ribee Public Health Center to a main health center. With this change in status, Suak Ribee Public Health Center now plays a strategic role in providing public health services in Johan Pahlawan District.

The population in the working area of the Suak Ribee Public Health Center is recorded at 13.142 people spread across 10 villages. In this area, there are 4.381 households with an average of four family members per household. The population density in the Johan Pahlawan District reaches 1.372 people per square kilometer.

These demographic conditions have implications for the provision of health services at the public health center level. The relatively high population and density can increase the need for health services, including promotive, preventive, curative, and rehabilitative services. In addition, population density has the potential to affect the dynamics of disease transmission and the effectiveness of surveillance programs, requiring an optimal service and reporting system to ensure early detection and rapid response to disease outbreaks in the working area.



Figure 1. Map of the Working Area of the Suak Ribee Public Health Center, West Aceh Regency

The Suak Ribee Public Health Center is the second public health center located in the Johan Pahlawan District, West Aceh Regency. Administratively, this public health center's working area borders other areas within the Johan Pahlawan District and surrounding districts. The northern, southern, eastern, and western boundaries follow the administrative divisions of villages and subdistricts established by the local government. This coverage area forms the basis for planning, implementing, and evaluating health service programs, including promotional, preventive, curative, rehabilitative, and disease surveillance activities at the primary health care level.

The working area of the Suak Ribee Public Health Center is mostly lowland, covering residential areas, agricultural land, and plantation areas, particularly rubber plantations. Geographically, this area borders the Samatiga District. In addition, part of the area is a coastal area with potential fishery resources, which is one of the sources of livelihood for the community.

These geographical characteristics have implications for disease patterns and public health service needs. Lowland areas with agricultural and plantation activities have the potential to increase the risk of environment- and vector-based diseases, especially in conditions where sanitation and environmental management are less than optimal. Meanwhile, coastal areas are vulnerable to diseases related to water quality, sanitation, and occupational accident risks in the fisheries sector. Therefore, the geographical and socioeconomic conditions of the community are important considerations in planning promotive and preventive programs, as well as implementing disease surveillance in the working area of the public health center.

Overview of EWARS Implementation

The implementation of the EWARS system begins at health service units within the working area of the public health center, such as auxiliary health centers and village midwives. At the Suak Ribee Public Health Center, EWARS reporting is carried out routinely in two periods, namely weekly reports submitted no later than Tuesday and monthly reports submitted before the 5th of each month.

Health center staff collect and compile data from each service unit. The results of the compilation are then reported via text message (SMS) or through the national server in accordance with the established reporting format. In the event that there are cases in the community that have not been recorded or reported, village midwives are required to submit reports to health care facilities for subsequent entry into the reporting system.

At the district/city level, all weekly reports received via SMS are summarized and transcribed to ensure the completeness and accuracy of reporting. District/city surveillance officers monitor health centers that have not submitted complete and timely reports and follow up through direct communication. If the system generates an alert for a disease, district/city surveillance officers verify the data and immediately carry out response and control activities in accordance with the applicable Standard Operating Procedures (SOPs).

If there are indications of an outbreak, surveillance officers take samples to be sent to the reference laboratory in accordance with procedures. At the provincial level, surveillance officers monitor and evaluate the reporting performance of districts/cities and can take over the alert verification process if necessary. In an outbreak situation, the provincial level also provides technical support to districts/cities in accordance with applicable regulations. This entire series of activities forms part of a feedback mechanism aimed at improving the quality of surveillance system implementation.

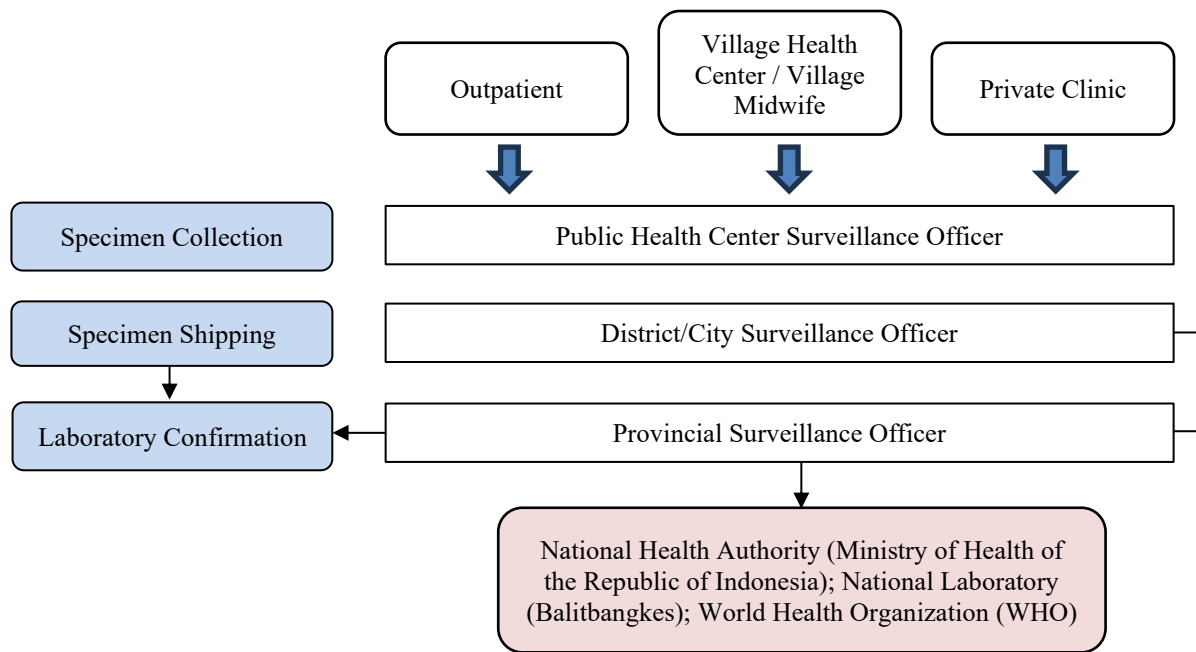


Figure 2. Specimen Collection and Delivery Process from Healthcare Facilities to National Laboratories

The chart shows the process flow starting from specimen collection by primary health care facilities, including public health centers, health posts, and private clinics, to the delivery of specimens to laboratories at the district and provincial levels, and finally to national laboratories such as the National Institute of Health Research and Development and the World Health Organization (WHO) for confirmation. This flowchart illustrates the coordination mechanism between laboratories at different levels and the laboratory verification procedures that ensure the accuracy and speed of disease detection in the surveillance system.

Characteristics of EWARS Officers

In order for the EWARS program to be implemented effectively, adequate personnel are needed in terms of type, number, and competence. These personnel include program managers who are fully responsible for the entire process of recording, processing, and reporting disease data in accordance with applicable operational standards.

The competencies of implementing personnel include understanding EWARS procedures, the ability to operate electronic reporting systems, and skills in data verification and analysis. In addition, implementing staff are expected to have good communication skills for coordination with health service units at the village level as well as at the district and provincial levels. These qualifications are important factors in ensuring the smooth running of the surveillance process, data accuracy, and rapid response to indications of outbreaks in the health center's working area.

Table 1. Characteristics of EWARS Officers at Suak Ribee Public Health Center, West Aceh District

Characteristics of EWARS Officers	Description
Number of Officers	1 person
Gender	Woman
Age	41 years old
Highest Level of Education	Bachelor's Degree – Public Health
Employment Period	1 year
Multiple Tasks	Yes
Attending EWARS Training	Yes

Characteristics of EWARS Officers	Description
Mastery of Technology	Medium
Availability of Manuals	Available
Availability of Disease Algorithm Books	Available
Availability of Reporting Forms (W2 and SMS)	Available
Computer Availability	Available
Availability of Mobile Phones	Private Property
Availability of Transportation Facilities	Private Property
Availability of Funding	None
Program Planning	Yes
Program Implementation	Active with Supervision
Reporting Format Sent	Complete
Availability of Epidemiology Bulletin	None
Cross-Program Meeting	Available
Cross-Sector Meeting	Available
Feedback from the Provincial Health Office	Available

(Primary Data, 2025)

Based on the table, it is evident that the EWARS program manager meets the specified qualifications, as she has a Bachelor's degree in Public Health. There is one program manager, who has undergone two consecutive days of EWARS training within a year. These educational and training qualifications support the program manager's ability to effectively record, report, and monitor surveillance data in accordance with applicable procedures.

In addition to participation in EWARS training, the quality of management personnel can also be evaluated based on the existence of dual roles outside the EWARS program. Program managers at the Suak Ribee Public Health Center have dual responsibilities: in addition to managing the EWARS program, they are also tasked with recording data in the Emergency Unit.

This dual role has implications for the effectiveness of EWARS program implementation. Limited time available can affect the speed of data collection, recapitulation, and reporting, requiring good time management and adequate prioritization skills. In addition, adequate competence in both areas of work is important to maintain the quality of surveillance data and ensure a rapid response to indications of disease or outbreaks in the health center's working area. This situation emphasizes the need for workload evaluation and human resource support so that the EWARS system can function optimally.

Accuracy of Data Reporting

Report accuracy refers to the timeliness of disease case data submission by officers via SMS to the center. In addition, monitoring of report accuracy needs to be carried out by evaluating the performance of health center officers at the Suak Ribee Health Center during three specific time periods. The following table shows the trend of report accuracy at the Suak Ribee Health Center for the period 2022 to 2024.

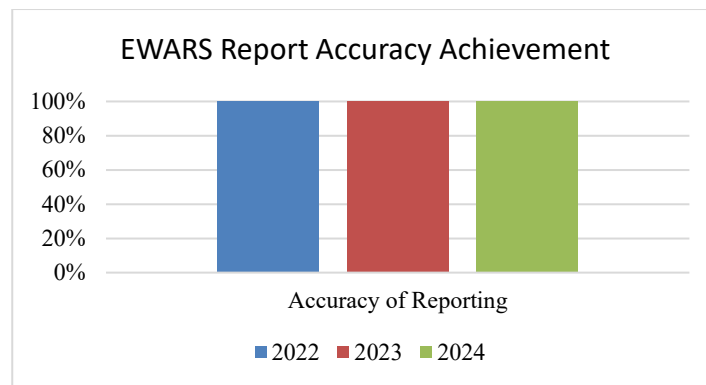


Figure 3. EWARS Report Accuracy Achievement
Suak Ribee Public Health Center, West Aceh Regency 2022 - 2024

The graph shows that the Suak Ribee Public Health Center has successfully maintained a 100% accuracy rate in EWARS reporting consistently for three consecutive years, from 2022 to 2024. This achievement reflects excellent performance in terms of timely report submission, which is one of the key indicators in the health reporting system. The accuracy of report submission plays an important role in supporting quick and accurate decision-making at the central level, especially in situations that require an immediate response to public health information.

Completeness of Data Reporting

Report completeness refers to the level of completeness of case data submitted by officers on a weekly basis to the center. In addition, monitoring needs to be carried out to assess the progress and level of completeness of reports submitted by Suak Ribee Public Health Center officers. The target set for report completeness is 100%. The following table shows the achievement of report completeness at the Suak Ribee Public Health Center during the period 2022 to 2024.

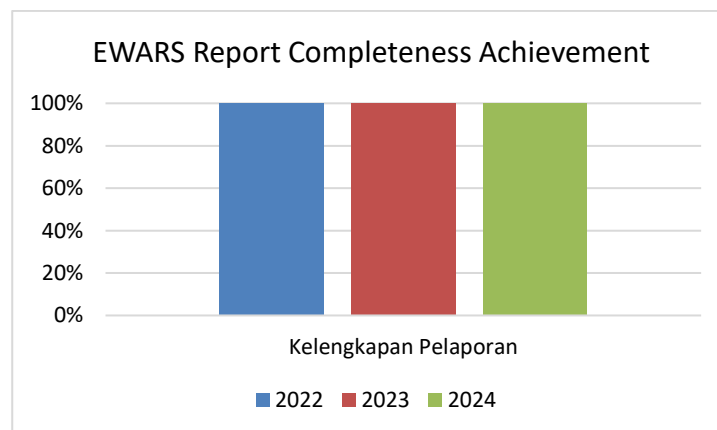


Figure 4. EWARS Report Completeness Achievement
Suak Ribee Public Health Center, West Aceh Regency 2022 - 2024

The graph shows that the completeness of reports at the Suak Ribee Public Health Center for the period 2022 to 2024 reached 100% each year. This indicates that case data reporting by public health center staff was carried out consistently and completely in accordance with the targets set. The level of report completeness is an important indicator in the health reporting system because it reflects the timeliness and accuracy of information sent to the center.

Achieving 100% compliance for three consecutive years demonstrates that the reporting system is well structured and supported by the high commitment of officers in carrying out their duties. This success not only reflects compliance with reporting standards, but also demonstrates the effectiveness of the monitoring and evaluation mechanisms that have been implemented. Therefore, this achievement needs to be maintained and can be used as a best practice for improving data quality in health care systems in other regions.

Discussion

Accuracy of Data Reporting

The accuracy of reports in disease surveillance systems is an important measure of timeliness, namely the ability of officers to submit case data according to the established reporting schedule, so that the information is available in a timely manner for analysis and use in public health decision making (Song et al., 2025). Timeliness of reporting is crucial because it contributes to the overall effectiveness of the surveillance system; late reports can hinder early detection of disease trends and slow down intervention responses (Jetoh et al., 2026).

Monitoring of the accuracy of reports submitted by officers at the Suak Ribee Public Health Center over three consecutive periods (2022–2024) shows a relatively stable performance trend. This trend reflects that EWARS reporting is consistent and timely, which is an indicator of the effectiveness of EWARS program management in the context of primary health care. This consistency is important because regular reporting supports the continuity of epidemiological monitoring and enables authorities to establish more responsive preventive measures (Nansikombi et al., 2023).

Furthermore, analysis of reporting accuracy trends can be used to identify factors that affect reporting performance, such as staff workload, communication technology infrastructure support, and human resource training. Surveillance studies in several countries show that challenges such as inadequate communication support, lack of training, and technological limitations can hinder the achievement of timeliness and completeness targets for reporting (Nansikombi et al., 2023).

In addition to providing an operational overview, high reporting accuracy also has strategic implications for health program planning and response to outbreaks. Timely reporting allows more accurate and relevant data to be available to districts, provinces, and the central government, enabling intervention plans to be established quickly and appropriately in the early stages of epidemiological trend changes. Thus, evaluating reporting accuracy trends is not only a measure of performance but also provides important information for workload distribution, advanced training planning, and strengthening the surveillance system at the public health center level (Song et al., 2025; Nansikombi et al., 2023).

Completeness of Data Reporting

Analysis of report completeness at the Suak Ribee Public Health Center during the period 2022 to 2024 shows that the target of 100% report completeness was consistently achieved each year. This report completeness reflects that all disease case data has been recorded and reported comprehensively without any data being missed, thereby minimizing the risk of losing important information that could affect the understanding of the epidemiological situation. In health surveillance, completeness is considered one of the most important dimensions of data quality, because the more complete the available data, the higher the likelihood that the system can accurately represent the health conditions of the community (Nansikombi et al., 2023).

Completeness of reports is a quality attribute that directly contributes to the reliability of data available in reporting systems. Studies of several surveillance systems show that high completeness is associated with the ability of surveillance to accurately identify disease trends and support accurate epidemiological analysis, which in turn strengthens evidence-based decision-making (Zavuga et al., 2023).

In addition, the achievement of uniform report completeness across different periods of the year shows that EWARS management in health centers has an effective mechanism for monitoring and data collection. Findings from Uganda show that although report completeness in some areas is still below the optimal target, improved reporting has significant implications for the system's capacity to evaluate disease trends (Nansikombi et al., 2023).

Consistent reporting also allows data from these health centers to enrich the information base at the district, provincial, and central levels, resulting in a more accurate epidemiological picture. A complete and valid epidemiological picture provides a strong basis for quick and accurate decision-making in disease control efforts, including early detection of outbreaks, evaluation of disease trends, and mapping of risk areas. This aspect is in line with the principle of surveillance that surveillance data quality includes completeness and accuracy, which are critical for public health decision making (Nsubuga et al., 2006).

Another factor that needs to be considered in interpreting the completeness of reports is the role of technology and digital reporting systems, which have been proven to help improve surveillance reporting in terms of both timeliness and completeness. Other studies show that electronically integrated reporting systems can improve data completeness, especially when supported by infrastructure and training for health workers (Aron et al., 2024).

Furthermore, high report completeness affects the accuracy of trend analysis and epidemiological predictions, enabling the design of responsive intervention strategies. In the context of establishing a fit-for-purpose surveillance system, the literature emphasizes that the system must be able to provide complete and timely data to respond to public health dynamics, including outbreaks or shifts in disease patterns (Song et al., 2025).

Thus, the 100% completeness of reports at the Suak Ribee Public Health Center not only shows that the reporting system is running optimally, but also proves that the EWARS system at this public health center is capable of supporting early detection, disease trend monitoring, and a more effective response to outbreaks. This success provides an example of good practice that can be used as a reference for efforts to improve data quality in surveillance systems in other regions.

Challenges and potential for improving the quality of EWARS at the Suak Ribee Public Health Center

Operational challenges in maintaining or improving reporting performance in health surveillance systems refer to various obstacles faced by officers even though reporting targets have been formally achieved. Although the Suak Ribee Public Health Center has achieved 100% accuracy and completeness in its reports, this does not mean that challenges at the operational level do not arise. Júnior et al. (2023) explain that such challenges are often referred to as technical, resource, or system barriers that can affect the effectiveness of digital reporting.

One of the main obstacles is the dependence on stable internet connectivity. The implementation of online reporting is highly dependent on adequate network infrastructure. Network instability can cause delays in data transmission and reduce the efficiency of officers, as they need to find a location or time with a strong signal to report data (Aisyah et al., 2025). This condition is in line with studies that suggest that difficulties with information technology infrastructure in primary health facilities, including the lack of reliable internet connections and adequate hardware, are significant

challenges in the use of health information systems in lower-middle-income countries (Akhlaq et al., 2016).

In addition to technical challenges, limited operational funds are also a significant obstacle to the implementation of digital reporting. Minimal funding allocation has an impact on several important operational aspects, such as hardware and software maintenance, provision of regular training on reporting systems, and incentives for officers. The lack of funds for system maintenance can result in devices that are frequently damaged or do not function optimally, thereby hampering the reporting and data analysis processes (Simamora et al., 2025).

Funding constraints also make it difficult to conduct training and capacity building for officers, which is an important factor in the smooth operation of technology-based reporting systems. Without adequate training, officers may not be proficient in using the system, which can lead to data entry errors or delays in reporting (WHO, 2025). In addition, a lack of operational funds can also impact staff motivation, particularly when they face high workloads without adequate incentive support. This is in line with research showing that the availability of resources and organizational support is related to user engagement and performance in health information systems (Nascimento et al., 2023).

These obstacles reflect that achieving formal targets such as 100% timely and complete reporting does not always reflect operational success without obstacles at the implementation level. Simamora et al., (2025) emphasize that technical, resource, and infrastructure challenges must be addressed in a sustainable manner to support the effective use of digital systems, especially in primary health care facilities that often operate with limited resources.

Thus, identifying and mapping these challenges is important in the strategy to strengthen the EWARS reporting system in public health centers. Strategic efforts such as investing in network infrastructure, providing funds for maintenance and training, and policies that support incentives for officers can improve the effectiveness of reporting and the strength of the surveillance system in a sustainable manner.

Although the accuracy and completeness of EWARS reporting at the Suak Ribee Public Health Center has reached 100%, this achievement does not fully reflect the overall quality of the system because there are still operational constraints that could affect reporting performance in the future. An internal evaluation identified limited internet access as one of the main obstacles, which can cause delays in data transmission and affect timeliness in situations of high workload or emergency conditions, especially when the connection is unstable (Akhlaq et al., 2016).

In addition, the lack of financial support is also a challenge in the implementation of EWARS, as limited funds affect important aspects such as hardware and software maintenance, as well as the provision of ongoing training for officers. This is consistent with the findings of a literature review which states that a lack of financial resources is a significant barrier to the implementation of health information systems in low- and middle-income countries, which can have an impact on the long-term sustainability of digital technology (Khubone et al., 2020).

These obstacles reflect that even though reporting statistics show good performance, infrastructure and funding challenges still need to be addressed in order to stabilize surveillance quality in the long term. Based on a literature review of the challenges and opportunities of EWARS in the Indonesian context, infrastructure limitations, including uneven internet access, and the need to increase human resource capacity are priority focuses in the strategy to strengthen the national surveillance system (Lesmana et al., 2024).

To maintain the sustainability and improve the quality of EWARS implementation, several improvement strategies need to be considered gradually. First, the implementation of a hybrid reporting system that allows offline data entry

and automatic synchronization when the network is available can overcome technological barriers. A similar approach has been proven to help health facilities with unstable connectivity to maintain data continuity and timeliness of reports in the context of digital medical records (Khubone et al., 2020).

Second, improving human resource capacity is a key aspect of EWARS success. Specialized training for health center staff on manual and digital reporting procedures should be a priority in order to strengthen technical skills and understanding of proper reporting standards. Evaluations of surveillance implementation in many countries show that ongoing training programs have a significant impact on human resource capacity to manage and report data accurately (Archer et al., 2021).

In addition, developing clear and simple SOPs for manual reporting when digital systems are disrupted can help maintain data continuity and reduce the risk of losing important information. This supports the national approach to disease surveillance, where strong operational guidelines can strengthen implementation in primary health care facilities (Fitriani et al., 2023)

Third, to overcome funding constraints, public health centers can collaborate with other stakeholders such as district/city health offices, non-governmental organizations (NGOs), non-governmental organizations (NGOs), and the private sector through Corporate Social Responsibility (CSR) programs. This type of cross-sector partnership approach has been identified as an important strategy in strengthening technical and financial support for health information systems that require sustainable resources (Lesmana et al., 2024).

With the planned implementation of these strategies, it is hoped that the sustainability and quality of EWARS reporting will be further strengthened, not only maintaining formal achievements but also reinforcing surveillance reporting practices that are adaptive to future technical and resource challenges.

Conclusion

The EWARS reporting process at the Suak Ribee Public Health Center begins with data collection at health facilities such as public health centers and health posts, which is then reported weekly to the district/city and provincial levels. This reporting focuses on the identification of and response to outbreaks, including the delivery of samples to reference laboratories if necessary, as well as performance monitoring by surveillance officers at various levels. The achievement of completeness and accuracy of reporting from 2022 to 2024 shows a rate of 100% each year, reflecting the consistency, timeliness, and effectiveness of a structured reporting system.

However, obstacles such as limited internet access and financial support remain challenges that could potentially affect the smooth operation of EWARS in the future. To improve the quality of the system, several strategies can be implemented, such as the application of a hybrid reporting system that allows offline data entry and automatic synchronization; increasing human resource capacity through training and the development of clear SOPs; and collaborating with relevant parties such as the Health Office, NGOs, and companies through CSR programs to support technical resources and operational funds. These strategies are expected to maintain high reporting achievements while strengthening the sustainability of the EWARS system.

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Author Contribution and Competing Interest

Mardi Fadillah (Author) contributed to the conceptualization of the research, design of the methodology, field data collection, and data analysis. Onetusfisi Putra (Corresponding/Co-author) contributed to data processing, interpretation of results, and writing of the initial draft of the manuscript. The authors declare that they have no financial, professional, or personal conflicts of interest related to the publication of this article. All information and analysis are presented objectively without external influence.

References

- Aisyah, D. N., Setiawan, A. H., Lokopessy, A. F., Aryanti, C., Mayadewi, Endryantoro, M. T. A., Wibowo, V., Disviana, S., Laksana, I., Aviandito, M., Kozlakidis, Z., & Manikam, L. (2025). Assessing Internet Quality Across Public Health Centers in Indonesia: Cross-Sectional Evaluation Study. *JMIR Medical Informatics*, 13, 1–19. <https://doi.org/10.2196/65940>
- Akhlaq, A., Mckinstry, B., Muhammad, K. Bin, & Sheikh, A. (2016). Barriers and facilitators to health information exchange in low- and middle-income country settings: a systematic review. *Health Policy and Planning*, 31(9), 1310–1325. <https://doi.org/10.1093/heapol/czw056>
- Archer, N., Lokker, C., Ghasemaghahi, M., Diliberto, D., & Archer, N. (2021). eHealth Implementation Issues in Low-Resource Countries: Model, Survey, and Analysis of User Experience Corresponding Author: *Journal of Medical Internet Research*, 23(6), 1–12. <https://doi.org/10.2196/23715>
- Aron, M. B., Nkhomah, W. E., Dullie, L., Matanje, B., Kachimanga, C., Ndarama, E., Chibvunde, S., Mulwafu, M., Banda, G. M., Mpinga, K., Kutsamba, M., Mikwamba, M., Mphande, I., & Matiya, K. (2024). Towards improving district health information system data consistency, report completeness and timeliness in Neno district, Malawi. *BMC Medical Informatics and Decision Making*, 24, 1–11. <https://doi.org/10.1186/s12911-024-02802-x>
- Baker, R. E., Yang, W., Vecchi, G. A., Metcalf, C. J. E., & Grenfell, B. T. (2020). Susceptible supply limits the role of climate in the early SARS-CoV-2 pandemic. In *Science* (Vol. 369).
- Depkes RI. (2016). *Sistem Kewaspadaan Dini dan Respon (SKDR): Manual Petugas Puskesmas*.
- Fitriani, H., Hargono, A., & Isfandiari, M. A. (2023). Development of Use of Digital Technology Surveillance System Early Awareness and Response (SKDR)/EWARS In Indonesia. *Majalah Saintekes*, 10(2), 103–116.
- Gaetano, S. De, Ponzo, E., Midiri, A., Mancuso, G., Infortuna, G., Zummo, S., Biondo, C., & Filippone, D. (2025). Global Trends and Action Items for the Prevention and Control of Emerging and Re-Emerging Infectious Diseases. *Hygiene*, 5(18), 1–23. <https://doi.org/10.3390/hygiene5020018>

- Hardhantyo, M., Djasri, H., Nursetyo, A. A., Yulianti, A., Adipradipta, B. R., Hawley, W., Mika, J., Praptiningsih, C. Y., Mangiri, A., Prasetyowati, E. B., & Brye, L. (2022). Quality of National Disease Surveillance Reporting before and during COVID-19 : A Mixed-Method Study in Indonesia. *International Journal of Environmental Research and Public Health*, 19. <https://doi.org/10.3390/ijerph19052728>
- Haryanto, B., Nugroho, A., & Setiawan, R. (2021). Implementation of early warning and response system in primary health care settings in Indonesia: A case study in Aceh Province. *Jurnal Kesehatan Masyarakat Nasional*, 16(2), 101–110.
- Ikuta, K. S., Swetschinski, L. R., & Aguilar, G. R. (2022). Global mortality associated with 33 bacterial pathogens in 2019 : a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*, 400, 2221–2248. [https://doi.org/10.1016/S0140-6736\(22\)02185-7](https://doi.org/10.1016/S0140-6736(22)02185-7)
- Jetoh, R. W., Yeabah, T. O., Shobayo, B. I., Kokro, J. S., Brown, L., Lamorde, M., Harries, A. D., & Dewitt, M. E. (2026). Adoption and use of the 7-1-7 timeliness metrics for detection , notification , and early response actions to public health events : an observational study in Liberia , January 2024 – June 2025. *Wellcome Open Research*, 10, 1–31. <https://doi.org/10.12688/wellcomeopenres.24992.2>
- Kemenkes RI. (2015). *Indikator nasional kelengkapan dan ketepatan laporan mingguan di Puskesmas*.
- Kementerian Kesehatan Republik Indonesia. (2016). *Pedoman Pelaporan dan Pemantauan EWARS*. Kemenkes RI.
- Kementerian Kesehatan Republik Indonesia. (2021). *Pedoman Sistem Kewaspadaan Dini dan Respon (SKDR)*. Kemenkes RI.
- Khubone, T., Tlou, B., & Mashamba-thompson, T. P. (2020). Electronic Health Information Systems to Improve Disease Diagnosis and Management at Point-of-Care in Low and Middle Income Countries : A Narrative Review. *Diagnostic*, 10, 1–10. <https://doi.org/10.3390/diagnostics10050327>
- Lesmana, A. E., Sihole, P. O., Anggreini, A. L., Kiswanto, J., Rochmah, D. L., & Wasir, R. (2024). Challenges and opprtunities for Implementing The EWARS System in Indonesia : Literature Riview. *Jurnal Kesehatan Tambusai*, 5(2), 4878–4887.
- Li, Z., Meng, F., Wu, B., Kong, D., Geng, M., Qiu, X., Cao, Z., & Li, T. (2024). Reviewing the progress of infectious disease early warning systems and planning for the future. *BMC Public Health*, 24, 3080–3093. <https://doi.org/10.1186/s12889-024-20537-2>
- Meckawy, R., Stuckler, D., Mehta, A., Ahdal, T. Al, & Doebbeling, B. N. (2022). Effectiveness of early warning systems in the detection of infectious diseases outbreaks : a systematic review. *BMC Public Health*, 22, 1–62. <https://doi.org/10.1186/s12889-022-14625-4>
- Nansikombi, H. T., Kwesiga, B., Aceng, F. L., Ario, A. R., Bulage, L., & Arinaitwe, E. S. (2023). Timeliness and completeness of weekly surveillance data reporting on epidemic prone diseases in Uganda, 2020 – 2021. *BMC Public Health*, 23, 1–12. <https://doi.org/10.1186/s12889-023-15534-w>
- Nascimento, I. J. B. do, Abdulazeem, H., Vasanthan, L. T., Martinez, E. Z., Zucoloto, M. L., Østengaard, L., Azzopardi-Muscat, N., Zapata, T., & Novillo-Ortiz, D. (2023). Barriers and facilitators to utilizing digital health technologies by healthcare professionals. *NPJ Digital Medicine*, 1–28. <https://doi.org/10.1038/s41746-023-00899-4>

- Nsubuga, P., White, M. E., Thacker, S. B., A., M. A., Blount, S. B., Broome, C. V., Chiller, T. M., Espitia, V., Imtiaz, R., Sosin, D., Stroup, D. F., Tauxe, R. V., Vijayaraghavan, M., & Trostle, M. (2006). Strengthening Health Systems. In *Public Health Surveillance: A Tool for Targeting and Monitoring Interventions* (pp. 997–1015).
- Simamora, A., Subuh, & Ernawati. (2025). Strategi Meningkatkan Surveilans Penyakit yang Dapat Dicegah dengan Imunisasi di Kabupaten Tanjung Jabung Timur. *Jurnal Ilmiah Kesehatan*, 24(2), 81–92. <https://doi.org/10.33221/jikes.v24i02.3661>
- Song, Y., Ma, R., Liu, J., Guo, Y., & An, S. (2025). How can timeliness and accuracy be balanced ? The surveillance information reporting mechanism for public health emergencies based on the online direct reporting system. *BMC Public Health*, 25, 3148–3169. <https://doi.org/10.1186/s12889-025-24637-5>
- Susanti, T. P. (2024). Tantangan dan Solusi Terkini dalam Penanganan Penyakit Menular. *Surabaya Biomedical Journal*, 4(1), 40–46.
- World Health Organization. (2022). *Early warning surveillance systems for epidemic-prone diseases: Implementation framework*. Geneva.
- World Health Organization. (2025). *Advancing the Responsible Use of Digital Technologies in Global Health A report of the World Health Organization Science Council*. https://cdn.who.int/media/docs/default-source/research-for-health/science-council_report_7january2025_for-public-comment.pdf
- Zavuga, R., Okello, P. E., Migisha, R., Gonahasa, D. N., Kadobera, D., Bulage, L., Aceng, F. L., Kayiwa, J., & Makumbi, I. (2023). Timeliness and completeness of monthly disease surveillance data reporting , Uganda , 2020-2021. *PanAfrican Medical Journal*, 46(3), 1–10.