Jurnal Berkala Epidemiologi
Volume 13 No 3. September 2025. 229 – 237
p-ISSN: 2301-7171; e-ISSN: 2541-092X

DOI: 10.20473/jbe.v13i32025.229–237
https://e-journal.unair.ac.id/JBE/
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

JBE Jurnal Berkala EPIDEMIOLOGI

Jurnal Berkala
EPIDEMIOLOGI
PERIODIC EPIDEMIOLOGY JOURNAL

ORIGINAL ARTICLE

EVALUATION OF DIARRHEA SURVEILLANCE SYSTEM IN MAGETAN REGENCY HEALTH OFFICE 2023 USING SURVEILLANCE ATTRIBUTES

Evaluasi Sistem Surveilans Diare di Dinas Kesehatan Kabupaten Magetan Tahun 2023 Berdasarkan Atribut Surveilans

Nur Afdaliah[1], Muhammad Atoillah Isfandiari[2], Agoes Yudi Purnomo[3]
[1]Epidemiology Study Program, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia, 60115, nur.afdaliah-2023@fkm.unair.ac.id
[2]Department of Epidemiology, Biostatistics, Population Studies and Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia, 60115, muhammad-a-i@fkm.unair.ac.id
[3]Magetan Regency Health Office, Magetan, Indonesia, 63314, ayudipurnomo@gmail.com
Corresponding Author: Muhammad Atoillah Isfandiari, muhammad-a-i@fkm.unair.ac.id, Department of Epidemiology, Biostatistics, Population Studies and Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, 60015, Indonesia

ARTICLE INFO

Article History:
Received April, 8th, 2025
Revised form May, 5th, 2025
Accepted June, 6th, 2025
Published online September, 30th, 2025

Keywords:
Children;
Diarrhea;
Representative;
Public Health Center;
Predictive Value of Test

Kata Kunci:
Anak-anak;
Diare;
Represenatif;
Puskesmas;
Nilai Prediktif Positif

ABSTRACT

Background: Diarrhea prevalence in 2023 in Magetan Regency was reported for all age groups at 59.40% and for children under five at 96.53%. The preliminary study found several problems in the recording and reporting system of Diarrhea in the Magetan Regency. **Purpose:** To describe the quality of the diarrhea surveillance system implemented in Magetan Regency Health Office based on surveillance system attributes assessment. **Methods:** Descriptive research with an evaluation study design. An evaluation was conducted on the diarrhea surveillance system in 2023 in the Magetan Regency Health Office. The respondents of this study were 23 people. Data was collected using questionnaires through Google Forms, interviews, and document studies. Data analysis was carried out and presented descriptively using tables and narratives. **Results:** Evaluation of the diarrhea surveillance system based on the assessment of surveillance attributes shows that the diarrhea surveillance system in Magetan Regency is simple, flexible, of high data quality, sensitive, highly acceptable, timely, and highly stable. However, the system is not representative, and the positive predictive value cannot be calculated. **Conclusion:** The implementation of the diarrhea surveillance system in Magetan Regency has been running well, mostly supported by the completeness of surveillance attributes. The evaluation results show that the system is simple, flexible, has high data quality and acceptability, is sensitive, timely, and highly stable. However, the system is not representative, and the PVT cannot be calculated.

How to Cite: Afdaliah, N., Isfandiari, M. A., & Purnomo, A. Y. (2025). Evaluation of diarrhea surveillance system in Magetan regency health office 2023 using surveillance attributes. *Jurnal Berkala Epidemiologi, 13(3),* 229-237. https://dx.doi.org/10.20473/jbe.v13i32025.229-237

ABSTRAK

Latar Belakang: *Prevalensi Diare pada tahun 2023 di Kabupaten Magetan dilaporkan untuk semua kelompok umur sebesar 59,40% dan pada balita sebesar 96,53%. Studi pendahuluan menemukan terdapat beberapa masalah dalam sistem pencatatan dan pelaporan diare di Kabupaten Magetan.* ***Tujuan:*** *Mendeskripsikan kualitas sistem surveilans diare yang diterapkan di Dinas Kesehatan Kabupaten Magetan berdasarkan penilaian atribut sistem surveilans.* ***Metode:*** *Penelitian deskriptif dengan desain studi evaluasi. Evaluasi dilakukan terhadap sistem surveilans Diare pada tahun 2023 di Dinas Kesehatan Kabupaten Magetan. Responden penelitian ini sebanyak 23 orang. Pengumpulan data dilakukan dengan menggunakan kuesioner melalui Google Form, wawancara, dan studi dokumen. Analisis data dilakukan secara deskriptif yang disajikan dalam bentuk tabel dan narasi.* ***Hasil:*** *Evaluasi sistem surveilans Diare berdasarkan penilaian atribut surveilans menunjukkan bahwa sistem surveilans Diare di Kabupaten Magetan sederhana, fleksibel, kualitas data tinggi, sensitif, akseptabilitas tinggi, tepat waktu, dan stabilitas tinggi. Namun sistem tidak representatif dan nilai prediktif positif tidak dapat dihitung.* ***Simpulan:*** *Pelaksanaan sistem surveilans Diare di Kabupaten Magetan sebagian besar sudah berjalan dengan baik yang didukung oleh kelengkapan atribut surveilans. Hasil evaluasi menunjukkan bahwa sistem sudah sederhana, fleksibel, kualitas data dan akseptabilitas tinggi, sensitif, tepat waktu, dan stabilitas tinggi. Namun sistem tidak representatif dan NPP tidak dapat dapat dihitung.*

INTRODUCTION

Diarrhea is characterised by three or more bowel motions per day or more frequently than usual. It is usually a sign of a digestive tract illness brought on by various bacterial, viral, and parasitic species. Diarrhea is still a chronic public health issue. About 1.9 million children under five die from diarrheal disease each year, primarily in developing countries, and there are approximately 2 billion instances of the disease worldwide, according to WHO and UNICEF. Every year, 1.7 billion episodes of childhood diarrhea are discovered worldwide (1). In Indonesia in 2023, the prevalence of diarrhea in all age groups is 2%, in children under five, it is 4.90%, and in infants, it is 3.90% (2).

The prevalence of diarrhea in the province of East Java in 2023 for all age groups was 1.8%, and for children under five years old, it was 4.8% (3). According to the routine diarrhea report of the Magetan Health Office in 2023, the incidence of Diarrhea reported in all age groups served was 10,319 cases (59.40%), and for children under five who were served was 5,782 cases (96.53%). While in the Early Warning and Response System (SKDR) report for 2023, from week 1 to week 52, the total number of reported cases was 5,702 (4).

In addition to the Diarrhea reporting system, there are several types of reports, namely routine infectious disease prevention and control (P2P) programme reports through the SIHEPI application and Diarrhea Surveillance reports through weekly reports (W2) reported through the Early Warning and Response System (SKDR), monthly reports through the Puskesmas Integrated Recording and Reporting System (SP2TP), outbreak reports, and case reports (5). Epidemiological surveillance of diarrhea is the methodical and ongoing examination of diarrheal illness and the factors contributing to its occurrence and spread to implement effective and efficient preventative measures. Epidemiological data provided to health program providers accomplish this (5).

Based on the preliminary study, several problems were found in the recording and reporting system for Diarrhea in Magetan Regency. One of the main problems is the lack of collaboration between surveillance officers and P2P Diarrhea programme managers, which causes diarrheal disease surveillance reporting to be suboptimal. In addition, there were data differences between SP2TP reports, weekly reports (W2) through SKDR, and routine programme reports through SIHEPI related to diarrhea case findings, thus

hampering the accuracy and effectiveness of the reporting system.

Evaluation of surveillance systems is critical to assessing the quality of the current system because evaluation plays an essential role in the policy-making process that can improve the performance and productivity of health programmes (6). Objectively efficient surveillance systems across communities and regions can aid long-term decision-making. This study aimed to describe the quality of the diarrhea surveillance system implemented by the Magetan Regency Health Office based on an assessment of surveillance system attributes.

METHODS

The research being conducted is descriptive and employs an evaluation study design. Evaluation studies are designed to evaluate the effectiveness of a program currently in operation or that has historically been implemented. The evaluation was conducted at the health office of the Magetan Regency from October to November 2024. The subject of the study was the diarrhea surveillance system in the Magetan Regency in 2023. The inquiry included 23 respondents, including surveillance officers at the health office and 22 public health centres in the Magetan Regency. The Public Health Centers (PHC) are PHC Poncol, PHC Parang, PHC Lembeyan, PHC Takeran, PHC Gorang Gareng Taji, PHC Tladan, PHC Kawedanan, PHC Candirejo, PHC Ngariboyo, PHC Plaosan, PHC Sumberagung, PHC Sidokerto, PHC Panekan, PHC Sukomoro, PHC Bendo, PHC Maospati, PHC Ngujung, PHC Karangrejo, PHC Taji, PHC Tebon, PHC Rejomulyo, and PHC Kartoharjo.

The data collected was both primary and secondary. Primary data was obtained using questionnaires distributed through Google Forms and interviews. The questionnaire was compiled based on nine surveillance system assessment attributes. However, the Positive Predictive Value (PPV) attribute could not be calculated quantitatively because no follow-up (laboratory) tests were conducted during diagnosis. Secondary data was obtained through document studies of health profiles, SKDR reports, and SP2TP reports of the Magetan Regency health office. Data analysis was conducted descriptively to describe surveillance system attributes: simplicity, flexibility, acceptance, sensitivity, positive predictive value, representativeness, timeliness, system stability, and data quality. The results were compared with the Guidelines for Evaluation of Public Health Surveillance Systems from the CDC in 2001 (7). Tables and narratives present the acquired information.

The Health Research Ethics Commission of the Faculty of Public Health, Universitas Airlangga, has granted ethical approval for this study, as evidenced by the ethical certificate number 222/EA/KEPK/2024.

RESULTS

Description of the Characteristics of Respondents

The characteristics of respondents provide an overview of the identity of surveillance officers who are respondents in this study. Table 1 shows that the characteristics of respondents for the highest gender are female, with 18 people (78.26%). The highest level of education is in Education Diploma III (DIII), the profession of midwife and nurse, with 16 people (69.57%). For the highest length of work in the range of 1-10 years, as many as 11 people (47.83%), and most officers have a workload of > 1 programme, namely 20 people (86.96%).

Table 1
Characteristics of Respondents

Characteristics of Respondents	n	%
Sex		
Male	5	21.74
Female	18	78.26
Total	23	100
Education		
DIII (Midwife, Nurse)	16	69.57
DIV/S1 (Midwife, Nurse, Public Health)	2	8.69
S1 Profesi (Nurse)	5	21.74
Total	23	100
Length of Employment		
< 1 Year	3	13.04
1-10 Years	11	47.83
11-20 Years	7	30.44
> 20 Years	2	8.69
Total	23	100
Workload		
1 Programme	3	13.04
> 1 Programme	20	86.96
Total	23	100

Description of Diarrhea Surveillance System Based on Surveillance Attributes

The evaluation results of the diarrhea surveillance system in Magetan Regency Health Office (2023), according to surveillance attributes, are shown in Table 2.

Table 2
Results of Evaluation of Diarrhea Surveillance System Based on Surveillance Attributes in Magetan Regency Health Office, Year 2023

Surveillance Attribute	Evaluation Result
Simplicity	Simple
Flexibility	Flexible
Data Quality	High Data Quality
Acceptability	High Acceptability
Sensitivity	Sensitive
Positive Predictive Value	Not Calculable
Representativeness	Not Representative
Timelines	Timely
Stability System	High Stability

Simplicity

The effectiveness of diarrhea surveillance at the Magetan Health Office was evaluated through the operational convenience experienced by the officers using the system. The assessment was conducted by considering the definition of cases in diagnosis, availability of resources, supporting facilities and infrastructure, reporting flow, involvement of agencies or data source units, and the process of data collection, processing, analysis, and interpretation. The results showed that the diarrhea surveillance system was considered simple. Based on the evaluation results, 86.96% of respondents stated that the system was simple, while 13.04% stated it was not. This simplicity is due to operational definitions based on the SKDR 2022 algorithm guidelines that do not require laboratory tests to confirm the diagnosis. In addition, this system has an easy reporting flow and a fast and efficient data collection mechanism, both actively and passively, with reasonably complete form-filling. However, there are still obstacles, namely, limited resources in 2 public health centres and difficulties in data analysis and interpretation in 1 public health centre.

Flexibility

The flexibility of the diarrhea surveillance system was evaluated based on its capacity to adapt to changes in information requirements without necessitating significant increases in costs, human resources, and time. The study results indicated that the diarrhea surveillance system in Magetan District was deemed flexible. However, there were modifications to the system, which did not significantly change costs, time, or human resources. According to the evaluation outcomes, 81.62% of respondents stated the system was flexible, while 17.39% stated it was not. The findings revealed that four health centres reported alterations in the surveillance system, particularly in weekly reporting through SKDR (W2 report). Previously, Diarrhea received minimal attention, but with this system, increases in cases can be detected through automatic alerts. Surveillance officers must follow up and confirm cases within <24 hours to ensure a prompt and appropriate response to potential surges in cases.

Data Quality

Data quality in implementing the Diarrhea surveillance system is assessed based on data completeness and validity. This assessment includes checking the accuracy and completeness of Diarrhea reporting data, the forms reported, and the frequency of incomplete or blank forms. Evaluation is conducted monthly in weekly reporting through SKDR and monthly through SP2TP, which is sent via email. The results showed that three public health centres did not check the data, and one public health centre often sent incomplete reports to the Health Office. Based on the study's results, the Diarrhea surveillance system in the Magetan Health Office has high data quality with a percentage of 82.61%.

Acceptability

The acceptance of the diarrhea monitoring system was evaluated based on the willingness of individuals and institutions to participate and take responsibility for its implementation. The results showed that the diarrhea monitoring system of the Magetan Health Office was very satisfactory, with 60.87% of respondents stating that the system had a high level of acceptance. In comparison, 39.13% said that the level of acceptance was low. The findings showed that the Magetan Health Office's diarrhea monitoring system was very satisfactory, owing to substantial network involvement and networking. These networks include independent practices, private clinics, private hospitals, and networks from auxiliary health centres and village health posts. However, there are still challenges in information dissemination, as nine public health centres have not actively disseminated data or information obtained from the diarrhea

surveillance. Nevertheless, the participation of various parties shows that the system has been well-received and continues to be improved, especially in coordination and information dissemination.

Sensitivity

Sensitivity in implementing the diarrhea surveillance system is assessed based on the ability of the system to detect and monitor the proportion of cases. Based on the study results, cases of Diarrhea are reported every week in the PHC working area. One outbreak of diarrhea has been recorded at a school. All respondents stated that the diarrhea monitoring system implemented at the Magetan Health Office can detect cases of Diarrhea and outbreaks, as well as effectively monitor changes in case trends, so it can be said that the diarrhea monitoring system at the Magetan Health Office is considered sensitive.

Representativeness

Representativeness in implementing the Diarrhea surveillance system is assessed based on the accuracy of reports on the incidence of Diarrhea in a specific period and its distribution based on the factors of person, place, and time. In addition, surveillance system reports are compared with data from other methods, related organisations, or other survey results in the same period. The results showed that 14 PHCs did not conduct place, time, and person-based analysis or compare surveillance reports with routine Diarrhea programme reports. This could lead to discrepancies in the reported trends of diarrhea incidence, resulting in less than optimal data accuracy in monitoring trends of incidence. Therefore, the diarrhea monitoring system in Magetan District is considered unrepresentative, with a representativeness rate of 9 (39.13%).

Timelines

Timeliness in implementing the diarrhea surveillance system is assessed based on the speed or delay in each implementation stage. This assessment includes the timely submission of Diarrhea reports by the agreed date, the deadline for data processing, analysis, interpretation of data, the accuracy of reports in 2023, and the routine dissemination of information. Weekly reports (W2) through SKDR are scheduled to be reported every Tuesday, while Monthly reports (SP2TP) must be reported by the PHC by the 5th to the Regency Health Office, which then sends it to the Provincial Health Office on the 5th of each month. The accuracy of the health office report reached 100%, while the accuracy of the PHC reached 95.45%. However, 5 PHCs did not disseminate information routinely. The findings indicated that the diarrhea surveillance system at the Magetan Health Office was considered prompt.

Stability System

System stability in implementing the Diarrhea surveillance system is assessed based on the ability of the system to store data properly without errors and ensure that data can be accessed easily when needed. This assessment includes the software/hardware equipment used, whether the device has experienced errors in the past year, the time required for repair, whether there has been damage or loss of data, and how many times or how long it has happened. The results found that 5 PHCs experienced device errors, and 1 PHC experienced data corruption. The data saved on the computer is the 2023 report data, when the Magetan Regency Health Office started using an electronic system that requires reports to be sent via email. The issues were effectively addressed within 24 hours, indicating that the Diarrhea surveillance system at the Magetan Health Office has high system stability.

DISCUSSION

Simplicity

The current diarrhea surveillance system is quite simple, as it identifies cases of diarrhea based on clinical symptoms without requiring laboratory tests to confirm the diagnosis. The success of a health programme is inseparable from the competence of human resources in epidemiology, adequate funding, and supporting facilities and infrastructure, including appropriate technology (8). However, limited human resources are a significant obstacle to monitoring implementation.

The lack of trained human resources and the absence of specialised surveillance officers have led to duplicate positions, so some surveillance activities cannot run optimally (9). Insufficient human resources significantly affect the ability to detect and respond to an outbreak early (10). The availability of facilities, infrastructure, and human resources significantly contributes to monitoring efficacy. The calibre and extent of facilities and infrastructure will dramatically influence the effectiveness of a program (11). The facilities and infrastructure needed in epidemiological surveillance include computers, software, internet services, office stationery (ATK) such as pens,

paper, ink, manuals or technical instructions, surveillance data collection forms, and other communication tools (12).

Flexibility

The current diarrhea surveillance system is considered flexible. A surveillance system can be flexible if it can adapt and accommodate new changes, such as telephone reporting methods and changes in case definitions. Flexibility is important to the success of a surveillance system. An inflexible system will be less effective and impact the acceptance and operational stability of the system (13). Flexibility is highly dependent on the availability of resources to accommodate changes that occur (14). The main indicator of system flexibility is its ability to accept changes without disrupting its main function. In addition, this flexibility is also reflected in its ability to adjust to various modifications and integration of new technologies without requiring significant additional time, effort, or funds (15).

Data Quality

The current diarrhea surveillance system is considered to have high data quality. Data quality is important in assessing a system's effectiveness in monitoring public health threats. Regular data quality checks can improve the accuracy of integrated disease surveillance (16). Meanwhile, poor data quality directly affects public health response and policy-making. In Ghana, an assessment of the COVID-19 surveillance system revealed insufficient data quality, resulting in inefficient decision-making and a weak response to the health emergency (17). For this reason, human factors, such as staff training and awareness, play an important role in ensuring data completeness and quality, ultimately impacting the surveillance system's effectiveness (18).

Acceptability

The diarrhea surveillance system that has been running is considered highly acceptable. Acceptability is an important aspect of the surveillance system, and it assesses the extent to which the system can be accepted and supported by the parties involved, such as health workers and local governments. In this case, if a system is poorly received, its implementation will not be optimal even though it is technically well-designed (19). This very high level of acceptance is influenced by the experience of surveillance officers in conducting surveillance activities in previous work units, as well as good supervision and monitoring activities by surveillance networks at higher levels, so that officers feel bound by the provisions related to the implementation of surveillance (20). To ensure the surveillance system's ongoing effectiveness and acceptance at the PHC level, the Health Office must regularly track officers' involvement in different surveillance stages, such as data collection, data processing, and the distribution of analytical information.

Sensitivity

The current diarrhea surveillance system is considered sensitive. Sensitivity allows trends in the number of cases to be used to identify changes that occur to guide immediate action, identify changes in various causal factors to assess the potential for future health problems, and follow and identify long-term trends to inform decision-making. The sensitivity of disease surveillance systems plays an important role in optimising case detection and supporting the design of effective interventions in public health (21). The sensitivity of surveillance can be evaluated at two levels: data collection and detection of disease case proportions. Sensitivity refers to the extent to which the system can accurately detect cases of Diarrhea. A sensitive system will be able to detect unusual events (outbreaks) quickly (22).

Positive Predictive Value

A good surveillance system will detect various cases with conditions to be monitored (23). Positive Predictive Value (PPV) is a metric utilized to evaluate the reliability of a diagnostic test or monitoring system. The ratio of true positive results to all positive reports determines PPV. In health surveillance, PPV reflects how effectively the system can recognize actual cases among the overall number of cases reported as positive (14). The diarrhea surveillance system operating at the Health Office and PHC in Magetan Regency cannot determine the positive predictive value of diarrhea cases since diagnosing them does not necessitate additional laboratory tests for confirmation.

Representativeness

The existing diarrhea surveillance system lacks representativeness. A surveillance system's effectiveness is assessed based on how representative the data it provides is. In several low and middle-income nations, diarrheal diseases significantly contribute to illness and death, particularly among children under 5 years old. This highlights the necessity for precise and thorough surveillance systems to track disease patterns and

create focused health interventions (24). Moreover, the representativeness of diarrhea surveillance systems can be affected by several factors, including the dependence on data that might not accurately showcase the state of Diarrhea within the community. Based on research conducted in hospitals, hospital admission rates often do not reflect the overall incidence of diarrhea, as many patients do not receive medical care or are only treated in outpatient facilities (25). This discrepancy highlights the importance of active community-based surveillance methods to obtain a more comprehensive picture of diarrhea incidence and its influencing factors (26).

Timelines

The current diarrhea surveillance system is considered timely. Timeliness is an important aspect of a disease surveillance system's effectiveness because it directly affects the ability to detect and respond to outbreaks quickly. Timely reporting can help prevent the spread of disease, enable rapid public health interventions, and evaluate the health status of the community (21) (27). Timely data collection in surveillance systems relies on officers' ability to report immediately in real-time. Therefore, it is important to improve the timeliness of surveillance system performance and ensure the information received is accurate in public health surveillance (28).

Stability System

The current diarrhea surveillance system is considered to have high stability. Stability is important in public health surveillance. An effective surveillance system can adjust to operational requirements and work alongside health professionals. Nevertheless, factors such as workforce motivation and resource availability affect stability (17); (29). As such, stability in the Newborn and Neonatal Mortality monitoring system in Jordan shows that system stability has a major effect on performance effectiveness. Therefore, periodic evaluation is necessary to improve the surveillance system's sustainability and effectiveness. For this reason, regular evaluation is an important factor in improving surveillance systems' sustainability and effectiveness (30).

CONCLUSION

Evaluation of the diarrhea surveillance system at the Magetan Regency Health Office based on surveillance system attributes shows that the system is simple, flexible, highly data quality, sensitive, highly acceptable, timely, and highly stable. However, the system is considered unrepresentative, and the Positive Predictive Value cannot be calculated. For this reason, we recommend that there is a need to improve coordination and cooperation between programme holders and surveillance officers at the Health Office and PHC levels, improve coordination with networks to report diarrhea cases both manually and electronically, and conduct regular meetings related to the results of reporting diarrhea cases between programme holders and surveillance officers.

CONFLICT OF INTEREST

There is no conflict of interest in this research.

AUTHOR CONTRIBUTIONS

All authors were involved in preparing this article and are responsible for its contents. NA: developed the research concept, analysed the data, and drafted the article. MAI: provided direction and revision. AYP: Mentored during the research.

ACKNOWLEDGMENTS

Acknowledgements are extended to the Magetan Regency Health Office, public health centres, all surveillance officers willing to participate in this study, academic supervisors and field supervisors, and all parties who contributed to its completion.

REFERENCES

1. World Health Organization. Vol. 30, Tropical Doctor. 2019. p. 170–2 Diarrhoeal disease.
2. Ministry of Health of the Republic of Indonesia. Indonesia's health profile 2023. Jakarta; 2024. 310 p.
3. Health Development Policy Agency. Indonesian health survey (SKI) in figures, accurate data, appropriate policies. 2023.
4. Magetan Regency Health Office. Health Service Profile. 2023.
5. Ministry of Health of the Republic of Indonesia. Diarrhea management guidelines. In: Jurnal Sains dan Seni ITS. 2017. p. 51–66.
6. Florentji Adel Benu F, Atoillah Isfandiari M, Pramono E. Tuberculosis surveillance system evaluation in Blitar district: study of

system approach and attributes. J Berk Epidemiol. 2024 Jan 26;12(1):88–97.
7. CDC. Updated guidelines for evaluating public health surveillance systems. MMWR. 2001;50(13):1–35.
8. Sono RH, Sari RDP, Lisiswanti R, Romulya AI. Factors influencing the effectiveness of HPV immunization program management in preventing cervical cancer. Action Research Literate. 2024.
9. Parmi & Daleng. Evaluation of the surveillance program at the West Ampana Community Health Center. J Ilm Kesehat Masyarakat-IJ. 2020;2(20):73–9.
10. Marsot M, Durand B, Hammouda W Ben, Ammar HH, Zrelli M, Khorchani R. Evaluation of human resources needed and comparison with human resources available to implement emergency vaccination in case of foot and mouth disease outbreaks in Tunisia. Epidemiology and Infection. 2020.
11. Susanti N, Simamora L, Andira AD, Erwina BP, Sagala NA. Evaluation and implementation of the epidemiological surveillance system for infectious diseases at the class I Port Health Office in Medan in 2022 in the working area of Kualanamu International Airport. Contag Sci Period J Public Heal Coast Heal. 2022;4(2):247.
12. Lubis EM, Ridho LH, Wasistha SSW, Ritonga SBS. Monitoring Health Protocols Covid-19 In Public Facilities. Int Arch Med Sci Public Heal. 2021;2(2):256–64.
13. Ario AR, Barigye EA, Nkonwa IH, Ogwal J, Opio DN, Bulage L, et al. Evaluation of public health surveillance systems in refugee settlements in Uganda, 2016–2019: lessons learned. Confl Health. 2022;16(1):1–9.
14. Lardi EA, Kuhlani SS Al, Amad MA Al, Serouri AA Al, Khader YS. The rotavirus surveillance system in yemen: Evaluation study. JMIR Public Heal Surveill. 2021;7(6):3–9.
15. Asante RA, Odikro MA, Frimpong J, Ocansey D, Osei-Tutu B, Kenu E. Evaluation of food services establishment inspections surveillance system in greater accra region of Ghana, 2020. Food Control. 2022;133(PB):108671.
16. Njuguna C, Vandi M, Mugagga M, Kanu J, Liyosi E, Chimbaru A, et al. Institutionalized data quality assessments: A critical pathway to improving the accuracy of integrated disease surveillance data in Sierra Leone. BMC Health Serv Res. 2020;20(1):1–9.
17. Awekeya H, Dubik SD, Amegah K, Ashinyo A, Wuobar F, Kaitoo E, et al. An evaluation of COVID-19 surveillance system in New Juaben South Municipality of Ghana: a cross-sectional study. Pan Afr Med J. 2021;40.
18. Gavhi F, De Voux A, Kuonza L, Motaze NV. Evaluation of the rubella surveillance system in South Africa, 2016–2018: A cross-sectional study. PLoS One. 2023;18(6 June):2016–8.
19. Agbemafle EE, Kubio C, Bandoh D, Odikro MA, Azagba CK, Issahaku RG, et al. Evaluation of the malaria surveillance system – Adaklu District, Volta Region, Ghana, 2019. Public Heal Pract. 2023;6(June 2022):100414.
20. Rimonda R, Saputra FF, Paradhiba M, Artika A. Gambaran Pelaksanaan Surveilans Dbd di Puskesmas Meurebo Berbasis Pendekatan Sistem Dan Atribut Surveilans. J Ilm Kesehat Rustida. 2024;11(2):162–74.
21. Adomako BY, Peprah NY, Malm K, Sackey S, Ameme D, Nyarko KM, et al. Tuberculosis surveillance system evaluation: Case of ga west municipality, Ghana, 2011 to 2016. Ghana Med J. 2020;54(2):3–10.
22. Rego R, Watson S, Ishengoma P, Langat P, Otieno HP, Lilford R. Effectiveness of SMS messaging for diarrhoea measurement: a factorial cross-over randomised controlled trial. BMC Medical Research Methodology. 2020.
23. Nennong HU, Hidajah AC, Hendrati LY. Evaluation of Tuberculosis Program Surveillance in the Departement of Health in Blitar District 2018. J Akad Kebidanan Kesehat Baru. 2021;5(q):26–33.
24. Cohen AL, Platts-Mills JA, Nakamura T, Operario DJ, Antoni S, Mwenda JM, et al. Aetiology and incidence of diarrhoea requiring hospitalisation in children under 5 years of age in 28 low-income and middle-income countries: findings from the Global Pediatric Diarrhea Surveillance network. BMJ Glob Heal. 2022;7(9):1–12.
25. Johnstone SL, Page NA, Thomas J, Madhi SA, Mutevedzi P, Myburgh N, et al. Diarrhoeal diseases in Soweto, South Africa, 2020: a cross-sectional community survey. BMC Public Health. 2021;21(1):1–10.
26. Rahaman MR, Dear K, Satter SM, Tong M, Milazzo A, Marshall H, et al. Short-term

effects of climate variability on childhood diarrhoea in Bangladesh: multi-site time-series regression analysis. Int J Environ Res Public Health. 2023;20(13).
27. Crawley AW, Divi N, Smolinski MS. Using timeliness metrics to track progress and identify gaps in disease surveillance. Heal Secur. 2021;19(3):309–17.
28. Mercy K, Pokhariyal GP, Fongwen NT, Kivuti-Bitok L. Evaluation of cholera surveillance systems in Africa: a systematic review. Frontiers in Epidemiology. 2024.
29. Umeozuru CM, Usman AB, Olorukooba AA, Abdullahi IN, John DJ, Lawal LA, et al. Performance of COVID-19 case-based surveillance system in FCT, Nigeria, March 2020 –January 2021. PLoS One. 2022;17(4 April):1–20.
30. Khader Y, Alyahya M, El-Khatib Z, Batieha A, Al-Sheyab N, Shattnawi K. The Jordan stillbirth and neonatal mortality surveillance (JSANDS) system: Evaluation study. J Med Internet Res. 2021;23(7):1–10.