

Evaluation of the Tuberculosis (TB) Epidemiological Surveillance System at Matsum City Health Center

Raudhiyah Hasanah Rambe¹, Azra Muzaiana Nasution², Arini Dwi Rahmadani³, Dinda Purnama Sari⁴, Rizky Aditya Hutomo⁵

¹⁻⁵Public Health Study Program, Faculty of Public Health, State Islamic University of North Sumatra, Medan, Indonesia

Article Info

Article history:

Received Dec 15th, 2025

Revised Dec 22th, 2025

Accepted Dec 22th, 2025

Keywords:

Epidemiological Surveillance
System Evaluation
Tuberculosis

ABSTRACT

Tuberculosis (TB) is an infectious disease that remains a global public health challenge, including in Indonesia, requiring control through an effective epidemiological surveillance system at the primary health care level. This study aims to evaluate the TB surveillance system at Matsum City Health Center based on input, process, and output components, as well as surveillance attributes that include simplicity, flexibility, timeliness, data quality, and stability. The study used a descriptive qualitative approach with data collection through in-depth interviews and observations. The results showed that TB surveillance had been implemented in accordance with national guidelines and reporting was carried out in a timely manner, but there were still limitations in terms of the number of officers, funding, and operational facilities. Data quality and completeness are not yet optimal, and data analysis is still simple, so that output is limited to routine reports. The attributes of simplicity and timeliness are good, while flexibility, data quality, and system stability still need to be strengthened. Overall, the TB surveillance system at Matsum City Health Center is functioning, but requires strengthening of resources and analytical capacity to support more effective TB control.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Raudhiyah Hasanah Rambe

Public Health Study Program, Faculty of Public Health, State Islamic University of North Sumatra, Medan, Indonesia

Email: raudhiyahrambe@gmail.com

1. INTRODUCTION

Tuberculosis (TB) is one of the infectious diseases that remains a significant challenge to global public health, including in Indonesia (1). The Global TB Report 2023 shows that in 2022, tuberculosis was the second leading cause of death worldwide after COVID-19, with 1.3 million deaths. Globally, more than 10 million people are infected with tuberculosis each year, indicating the high rate of transmission and epidemiological burden of this disease (2). The situation in Indonesia is equally alarming, with the country ranking second in 2023 as the country with the highest number of TB cases in the world after India. The estimated number of TB cases reaches 824,000, with a death toll of around 93,000 per year, or the equivalent of 11 deaths every hour (3). Thus, tuberculosis remains a significant health challenge and threat both globally and

nationally, making its control a top priority on the global health agenda and one of the key targets of the Sustainable Development Goals (SDGs)(4)

Despite various control programs being implemented, TB remains high on the list of causes of death, especially in areas with high population density. This situation shows that control efforts need to be continuously optimized, one of which is through strengthening the epidemiological surveillance system. TB surveillance is the systematic and continuous monitoring of case data and transmission factors to provide accurate, complete, and timely information to support effective and efficient TB control (5). The implementation of this surveillance is regulated in Minister of Health Regulation No. 67 of 2016 as a guideline for health care facilities (6).

However, the effectiveness of the TB surveillance system is highly dependent on the quality of its implementation at the primary care level. Evaluation is important to assess program performance, review achievements, and identify obstacles in the implementation of surveillance. This assessment covers input, process, and output indicators, where inputs include the 5M components (man, money, material, machine, method, and market), while processes and outputs are tailored to management needs to ensure overall surveillance quality(5). In addition, the evaluation also considers surveillance attributes according to the Centers for Disease Control (CDC), which include simplicity, flexibility, data quality, acceptability, sensitivity, positive predictive value, representativeness, timeliness, and stability (7). This evaluation is generally conducted over a longer period of time, usually every 6 months to 1 year (8).

At the primary care level, Matsum City Health Center is one of the health facilities in the Medan Area Subdistrict that plays a strategic role in the implementation of tuberculosis (TB) epidemiological surveillance. The Puskesmas's service area is one of the contributors to TB cases in the city of Medan, so the quality of surveillance implementation is very important to ensure the accuracy of case detection, completeness of records, and timeliness of reporting. However, to date, research specifically evaluating the TB surveillance system at this health center has been limited. Therefore, this study aims to evaluate the implementation of the TB epidemiological surveillance system at Matsum City Health Center based on five surveillance attributes, namely simplicity, flexibility, timeliness, data quality and stability, and to assess performance through input, process, and output indicators.

2. METHOD

This study used a qualitative approach with a descriptive study design to gain an in-depth understanding of the implementation of the TB epidemiological surveillance system at Puskesmas Kota Matsum. Informants were selected through a purposive sampling technique and consisted of TB program officers who had knowledge and direct involvement in monitoring TB cases, including recording, analysis, and reporting activities (9). This selection was intended to ensure that the data obtained accurately and comprehensively reflected the actual conditions of TB surveillance implementation. Primary data were collected through in-depth interviews, observations, and documentation reviews. Interviews were conducted using a semi-structured guideline developed based on input, process, and output components, as well as five surveillance attributes: simplicity, flexibility, timeliness, data quality, and stability. Observations and documentation reviews were carried out to verify the implementation of case monitoring, recording, analysis, and reporting, as well as the availability of facilities and the completeness of program documents.

3. RESULTS AND DISCUSSION

The results of interviews with one informant regarding the implementation of the Tuberculosis (TB) surveillance system at Matsum City Health Center were summarized based on three indicators, namely input, process, output, and compared with the ideal conditions based on the applicable guidelines, namely the Decree of the Minister of Health/KMK No. 1116 of 2003 and Regulation of the Minister of Health/PMK No. 67 of 2016 in Table 1.

Table 1. Research Results Matrix

Indicators	Existing Conditions	Ideal
Condition Input		
a. Man	Number of TB officers: 1 person	There must be at least one fully responsible/trained officer, for example one trained TB Program Manager.
	Training for TB program officers was conducted properly	Initial training (comprehensive training) and periodic refresher training (at least every 5 years) to strengthen skills.
b. Money	Funding source: funds used for TB surveillance activities at the Community Health Center from BOK (Health Operational Assistance)	Funding sources: State Budget, Regency/City Budget, Provincial Budget, Foreign Aid, National and Regional Aid, and community self-help.
	Fund allocation: The distribution of funds from the BOK is often cut or allocated to other important activities, thereby limiting active monitoring activities.	Fund allocation: Sufficient and adequate to support active and passive surveillance activities, as well as TB case finding.
c. Material	Available resources: Computers, internet network, TCM tools, TB forms	Means used: Electromedia network, communication tools, library resources, TB surveillance implementation guidelines and their application program, surveillance equipment, surveillance forms.
	Vehicles: No official vehicles are available for active surveillance/home visits to patients. Officers use their personal vehicles.	Adequate transportation is available for conducting active surveillance and home visits.
d. Method	Implementation guidelines, technical instructions, and SOPs for TB surveillance activities are available and refer to the latest regulations (PMK No. 67 of 2016).	Guidelines/Technical Guidelines: Implementation guidelines, technical instructions, decrees, etc.
e. Market	The targets for information dissemination include cross-program parties (MCH, Nutrition), cross-sector parties (Village Heads/Sub-district Heads), cadres, and communities in the Puskesmas working area.	Information dissemination targets: Cross-program and cross-sector parties, policy makers, the public.
Process		
a. Data Collection	Methods used: Active surveillance (visits to patients) and passive surveillance (receiving reports from other health facilities/patient visits to community health centers).	Methods used: Active and passive surveillance.
	Completeness of reports (reporting units): 90% sent by health facilities/Puskesmas to the District Health Office.	Completeness of reports: 100%.
	Timeliness of reporting (reporting unit): on time	Reporting timeliness: 100%.
	Data recording, validation, coding, transformation, and grouping based on place, time, and person were carried out.	Data processing: Data recording, validation, coding, transformation, and grouping based on place, time, and person.
b. Data Analysis and Interpretation	Data analysis: Descriptive univariate analysis (by gender, age, and location) was performed using Microsoft Excel.	Data analysis: Descriptive and/or analytical epidemiological methods.
	Data interpretation results: presentation format, e.g., in the form of monthly tables/graphs]	Data interpretation results: Presented in infographics (tables, graphs, maps) according to gender, location, and time variables.

c. Dissemination of Information	Dissemination is carried out in the form of: internal meetings, feedback to relevant cadres/units, periodic reports. Feedback to data sources/related units: achieved 90%	Dissemination is carried out in the form of: Meetings and periodic reports, including feedback to data sources. Feedback to data source/related unit: 100%.
Output		
a. Information	Surveillance output: Output in the form of Monthly TB Reports and Patient Cohort Records used for internal evaluation.	Surveillance output: Epidemiological Surveillance Profile (for the district/city level) or specific, comprehensive, and clear periodic reports.

Based on Table 1 above, it can be seen that the implementation of the TB surveillance system at Matsum City Health Center still shows differences between the current conditions and the expected conditions. These differences are seen in the input, process, and output components that affect the implementation of TB surveillance.

3.1 Input Components

3.1.1 Man

The implementation of TB surveillance at Matsum City Health Center is supported by only one TB officer who performs several program tasks. This condition is not ideal because the high workload has the potential to reduce the quality of recording and reporting, as well as limiting the implementation of active surveillance such as home visits and contact tracing. The limited number of officers also impacts the suboptimal supervision and assistance provided to health facilities partnered with the health center, including clinics and hospitals. These findings are in line with the research by Pradipta et al. (2022), which states that limited health personnel and high workloads are major obstacles to the implementation of TB surveillance and services in primary health facilities (10). The WHO (2023) also emphasizes that a shortage of trained personnel can reduce the quality of surveillance data, especially in terms of completeness and timeliness of reporting (11).

3.1.2 Money

The results of the study show that funding for TB surveillance at Matsum City Health Center comes from Health Operational Assistance (BOK). However, the allocation of these funds is often limited because they must be shared with other program needs, so that active surveillance activities cannot be carried out optimally. This condition is not in line with the ideal condition which requires adequate funding support to support sustainable TB surveillance activities. These findings are in line with the Joint External Monitoring Mission Indonesia report, which states that limited budgetary support at the regional level remains a major challenge in strengthening the TB surveillance system (12). Other studies also show that active case finding requires relatively large costs and tends to be hampered when funding support is insufficient (13,14).

3.1.3 Material

In terms of facilities and infrastructure, the results of the study show that the Puskesmas already has basic facilities such as computers, internet networks, TB forms, and Rapid Molecular Tests (RMT). However, limited diagnostic facilities and the lack of operational transportation for active surveillance and home visits are major obstacles. This situation does not meet the ideal standards for TB surveillance. These findings are in line with previous studies which state that limited diagnostic and operational facilities can hinder accurate diagnosis and slow down TB case reporting, thereby impacting the effectiveness of TB control (15).

3.1.4 Method

From a methodological perspective, the results of the study indicate that guidelines for TB surveillance, technical instructions, and SOPs are available and refer to Minister of Health Regulation No. 67 of 2016 (6). The availability of these guidelines supports the uniformity of surveillance implementation and serves as a reference for case recording and reporting. This condition is in line with the WHO (2024) recommendation, which emphasizes that compliance with

standard guidelines is an important factor in maintaining the quality and comparability of TB surveillance data between regions (16). Previous studies have also shown that non-compliance with guidelines and SOPs in surveillance implementation has an impact on the low quality of TB data produced (17).

3.1.5 Market

The results of the study show that the dissemination of TB surveillance information has reached across programs, sectors, cadres, and communities. This coverage supports the use of surveillance data as a basis for program planning and decision-making. These findings are in line with WHO guidelines (2022), which emphasize that the widespread dissemination of surveillance results to stakeholders is an important component of TB control (16).

3.2 Process Components

3.2.1 Data Collection

Based on the results of the study, TB surveillance data collection was conducted through both active and passive surveillance. Reporting timeliness has generally been achieved; however, based on interview findings with TB officers, the completeness of reports was estimated at approximately 90%, which is still below the ideal target of 100%. This condition is influenced by staff turnover and limited technical capacity in data management. These findings indicate that although timeliness is relatively good, data quality still requires improvement. This is consistent with the study by Ferizqo et al. (2024), which highlights that staff assignment stability and training significantly affect the completeness and timeliness of TB surveillance reporting (18).

3.2.2 Data Analysis and Interpretation

The results of the study show that the analysis and interpretation of TB surveillance data are still largely descriptive, limited to the distribution of cases by person, place, and time, so that its use for identifying risk factors and planning interventions is still limited. This condition is in line with the WHO (2023) recommendation, which emphasizes the importance of strengthening data analysis capacity at the health service level so that surveillance data can be optimally utilized in evidence-based decision making (11).

3.2.3 Information Dissemination

The dissemination of TB surveillance information is carried out through routine reports, internal meetings, and feedback to reporting units, but the coverage of feedback has only reached 90%. In addition, the use of digital media and data visualization is still limited. This condition is in line with the findings of Pratiwi et al. (2025), which show that communicative and visual-based presentation of surveillance data plays an important role in increasing the use of information by health program stakeholders (19).

3.3 Output Components

3.3.1 Information

The results of the study show that the main output of TB surveillance is still in the form of monthly TB reports and patient cohort records, which are mainly used for internal evaluation. However, the lack of comprehensive, specific, and structured TB surveillance reports means that the information produced is not optimal in supporting program planning and evaluation. This situation is in line with the WHO (2022) recommendation, which emphasizes the importance of specific, systematic, and structured disease surveillance reports so that they can be used effectively in TB control (16).

3.3.2 Evaluation of the TB Epidemiological Surveillance System

Based on the discussion of input, process, and output components, it is known that the implementation of the TB epidemiological surveillance system at Matsum City Health Center has been running, but various obstacles that affect the overall performance of the system are still found. To obtain a more comprehensive picture of the quality and effectiveness of the surveillance system, further evaluation using surveillance attributes is needed. Therefore, the following section

evaluates the TB epidemiological surveillance system based on five surveillance attributes, namely simplicity, flexibility, timeliness, data quality, and stability.

a. Simplicity

The simplicity of the TB surveillance system at Matsum City Health Center has been conceptually supported by the availability of national guidelines and SOPs. However, the results of the study show that the limited number of officers has made surveillance in the field more complex, especially since officers have to perform multiple program tasks. This condition has increased their workload and made it difficult to implement surveillance procedures consistently. These findings are in line with the World Health Organization (WHO, 2022) guidelines, which emphasize that the simplicity of a surveillance system is not only determined by the clarity of the guidelines, but also by the adequacy of human resources so that procedures can be carried out effectively at the primary care level (20). In addition, research by Wafiroh et al. (2024) shows that the limited number of TB officers in health centers causes the surveillance system to be less simple in practice, even though the recording and reporting flow has been standardized (17). The study by Sihalo et al. (2025) also found that the complexity of TB recording and reporting in health centers increases when staff workload is high and operational support is limited (21). This reinforces the research findings that the simplicity of the TB surveillance system is greatly influenced by the balance between staff workload and available resource support.

b. Flexibility

The results of the study show that the TB surveillance system at Matsum City Health Center has implemented active and passive surveillance. However, the flexibility of its implementation is still limited due to funding constraints and the availability of operational facilities, especially for active case finding activities in the community. These limitations mean that the system's ability to adapt to field requirements and changes in the epidemiological situation is not yet optimal. These findings are in line with the research by Zahrah and Ekaputra (2025), which shows that the flexibility of the TB surveillance system at the primary health care level is greatly influenced by the adequacy of the budget and support for operational facilities (22). These resource constraints have a direct impact on the low intensity of active surveillance activities and the use of data for TB control in the community. In addition, Benu et al. (2024) also reported that the TB surveillance system at the district level tends to be less flexible when it comes to adjusting activities due to resource constraints and cross-program coordination (23). Therefore, the flexibility of the TB surveillance system at Matsum City Health Center still needs to be strengthened, especially in terms of input components.

c. Timeliness

The timeliness of TB surveillance reporting at Matsum City Health Center has been running well and in accordance with the established reporting schedule. This condition shows the commitment of officers in carrying out their reporting obligations on a regular basis despite facing resource constraints. The results of this study are in line with the findings of Benu et al. (2024), who stated that the timeliness of reporting is one of the attributes of TB surveillance that is relatively easy to achieve compared to other attributes, as long as the reporting flow is clear and officers understand the applicable recording mechanisms (23). Another study by Syahreni et al. (2023) also shows that timely TB reporting at the provincial level can be achieved well despite obstacles in data quality and utilization (24). This reinforces the finding that timeliness is one of the strengths of the TB surveillance system at Puskesmas Kota Matsum.

d. Data Quality

Although reporting has been carried out in a timely manner, the quality of TB surveillance data at Matsum City Health Center still faces challenges, particularly in terms of data completeness and utilization for program planning. Limited capacity of officers in data analysis and validation has resulted in suboptimal information. These findings are in line with the research by Zahrah and Ekaputra (2025), which shows that the quality of TB surveillance data in primary health care facilities is still influenced by limitations in training, supervision, and data validation processes that are not yet running optimally (22). In addition, Ke lele et al. (2024) also reported that the low quality of TB surveillance data has an impact on the suboptimal use of information in program

decision-making (25). Thus, improving data quality by strengthening staff capacity and routine supervision is an important requirement in the TB surveillance system at Puskesmas Kota Matsum.

e. Stability

The stability of the TB surveillance system at Matsum City Health Center is still vulnerable due to its dependence on a single officer and limited funding. This condition has the potential to disrupt the continuity of the surveillance system in the event of staff turnover, increased workload, or delays in budget support. This is in line with the research by Syahreni et al. (2023), which states that TB surveillance systems that are not supported by a clear organizational structure and sustainable funding tend to be unstable and difficult to maintain in the long term (24). In addition, Kalali et al. (2021) emphasized that the stability of the TB surveillance system is greatly influenced by the continuity of funding and institutional support, where weak support can hamper the long-term operational sustainability of the system (26). Therefore, the TB surveillance system at Matsum City Health Center still needs to be strengthened in terms of human resources, institutional aspects, as well as policy support and sustainable funding.

Analysis of the TB surveillance system at Matsum City Health Center based on five surveillance attributes shows that system performance is influenced by resource limitations, analytical capacity, and sustainability of activities. These findings are consistent with various studies in the last five years which confirm that the effectiveness of TB surveillance at the primary care level is highly dependent on the strength of input, process, and output components.

4. CONCLUSION

The implementation of the tuberculosis (TB) epidemiological surveillance system at Matsum City Health Center has been running smoothly and adheres to national guidelines, but its performance has not been fully optimized. Evaluations indicate that the input component still faces limitations, particularly in human resources, funding, and operational facilities, which impact the limited implementation of active surveillance. In the process component, reporting timeliness has been achieved, but report completeness, data analysis and interpretation capacity, and information dissemination still need improvement. Meanwhile, in the output component, the surveillance information produced is still limited to routine reports and has not been comprehensively organized to support optimal TB control program planning and evaluation.

Based on an evaluation of five surveillance attributes, the TB surveillance system at Matsum City Health Center demonstrates strengths in timeliness, but still has weaknesses in simplicity, flexibility, data quality, and stability, which are influenced by limited resources and technical capacity of staff. The policy implications of these findings emphasize the need for stronger support from local governments and relevant stakeholders, particularly in providing adequate surveillance personnel, allocating sustainable funding, and strengthening the capacity of officers through regular training and supervision. In addition, the development of a more integrated reporting system and optimal utilization of surveillance data is expected to increase the effectiveness of decision-making and program planning, so that TB control at the primary health care level can run more effectively and sustainably.

ACKNOWLEDGMENTS

The author would like to thank the Head of Matsum City Health Center and all health workers who provided permission, support, and cooperation during the implementation of this research. Appreciation is also expressed to the Tuberculosis program officers who were willing to act as informants and provide open information and support the data collection process. Furthermore, the author would like to thank the supervising lecturer and academic staff who provided guidance, input, and motivation so that this research could be successfully completed. All parties who have contributed, either directly or indirectly, to the preparation and completion of this article also deserve the highest appreciation.

REFERENCES

1. Kleden SS, Kellen CG, Kedeng SB, Rindu Y. Analisis Capaian Pelayanan Penanggulangan Tuberkulosis (TBC) di Nusa Tenggara Timur: Tantangan dan Peluang. Jurusan Keperawatan Poltekkes Kemenkes Kupang. 2024;4(1):315-22. [Kleden SS, Kellen CG, Kedeng SB, Rindu Y. Analysis of Tuberculosis (TB) Control Service Achievements in East Nusa Tenggara: Challenges and Opportunities. Nursing Department, Kupang Health Polytechnic. 2024;4(1):315-22.]
2. Seran Berek JF, Pangaribuan RM, Tamonob AM. Pemodelan Regresi Data Panel Untuk Jumlah Kasus Penyakit Tuberkulosis di Provinsi Nusa Tenggara Timur. Jurnal Ilmiah Matematika. 2025;13(2):524-34. [Seran Berek JF, Pangaribuan RM, Tamonob AM. Panel Data Regression Modeling for the Number of Tuberculosis Cases in East Nusa Tenggara Province. Scientific Journal of Mathematics. 2025;13(2):524-34.]
3. Fadhilah N, Kurniawan I, Manzahri M, Budianto A. Faktor Yang Berhubungan Dengan Pengetahuan Tentang Terapi Pencegahan Tuberkulosis (TPT) Pada Keluarga Penderita TB Paru. Scientific Journal of Nursing and Health. 2024 Apr 15;2(1):62-71. [Fadhilah N, Kurniawan I, Manzahri M, Budianto A. Factors Associated with Knowledge of Tuberculosis Prevention Therapy (TPT) in Families of Pulmonary TB Patients. Scientific Journal of Nursing and Health. 2024 Apr 15;2(1):62-71.]
4. Amalia I, Maharani C. Evaluasi Pelaksanaan Program Penanggulangan Tuberkulosis di Wilayah Kerja Puskesmas Wangon I Kabupaten Banyumas. Vol. 15, Artikel Penelitian Syifa' MEDIKA. 2025. [Amalia I, Maharani C. Evaluation of the Implementation of the Tuberculosis Control Program in the Working Area of the Wangon I Community Health Center, Banyumas Regency. Vol. 15, Syifa' MEDIKA Research Article. 2025.]
5. Hasnanisa N, Prasetyo S, Burhanudin A. Evaluasi Sistem Surveilans Tuberkulosis di Dinas Kesehatan Kabupaten Banyumas Berdasarkan Pendekatan Sistem. Jurnal Biostatistik, Kependudukan, dan Informatika Kesehatan. 2022 Jul 11;2(3):167-84. [Hasnanisa N, Prasetyo S, Burhanudin A. Evaluation of the Tuberculosis Surveillance System at the Banyumas District Health Office Based on a Systems Approach. Journal of Biostatistics, Population, and Health Informatics. 2022 Jul 11;2(3):167-84.]
6. Kementerian Kesehatan R. Peraturan Menteri Kesehatan Republik Indonesia. 2016. [Ministry of Health R. Regulation of the Minister of Health of the Republic of Indonesia. 2016.]
7. Uddin L, Umbul Wahyuni C, Setiawan AY, Kesehatan D, Jember K. Evaluasi Sistem Surveilans Tuberkulosis (TB) di Kabupaten Jember Berdasarkan Atribut Sistem Surveilans. Jurnal Kesehatan Global Vol. 4. 2021. [Uddin L, Umbul Wahyuni C, Setiawan AY, Kesehatan D, Jember K. Evaluation of The Surveillance Tuberculosis (TB) System in Jember District Based on Surveillance System Attributes. Journal of Global Health Vol. 4. 2021.]
8. Supriyanti S, Pohan TF, Siregar KN. Sistem Monitoring dan Evaluasi Serta Perkembangan Program Pencegahan dan Pengendalian Penyakit Tuberkulosis di Dinas Kesehatan Kota Depok. Jurnal Biostatistik, Kependudukan, dan Informatika Kesehatan. 2024 Mar 11;4(2):83-98. [Supriyanti S, Pohan TF, Siregar KN. Monitoring and Evaluation System and Development of Tuberculosis Prevention and Control Program at the Depok City Health Office. Journal of Biostatistics, Population, and Health Informatics. 2024 Mar 11;4(2):83-98.]
9. Putri LA, Dewi YLR, Rahardjo SS. PRECEDE- PROCEED Model on Determinants of Completeness Immunization Status among Infants in Bangkalan District, Madura. Journal of Health Promotion and Behavior. 2017;02(04):291-301
10. Pradipta IS, Idrus LR, Probandari A, Puspitasari IM, Santoso P, Alffenaar JWC, et al. Barriers to Optimal Tuberculosis Treatment Services at Community Health Centers: A Qualitative Study From a High Prevalent Tuberculosis Country. Front Pharmacol. 2022 Mar 25;13.
11. WHO. Global Tuberculosis Report 2023. World Health Organization; 2023.
12. Kementerian Kesehatan RI, WHO. The Republic of Indonesia Joint External Monitoring Mission for Tuberculosis. 2020.

13. Sohn H, Sweeney S, Mudzengi D, Creswell J, Menzies NA, Fox GJ, et al. Determining the value of TB active case-finding: current evidence and methodological considerations. *The International Journal of Tuberculosis and Lung Disease*. 2021 Mar 1;25(3):171-81.
 14. Nadjib M, Dewi RK, Setiawan E, Miko TY, Putri S, Hadisoemarto PF, et al. Cost And Affordability of Scaling Up Tuberculosis Diagnosis Using Xpert MTB/RIF Testing in West Java, Indonesia. *PLoS One*. 2022 Mar 10;17(3): e0264912.
 15. Saktiawati AMI, Triyana K, Wahyuningtias SD, Dwihardiani B, Julian T, Hidayat SN, et al. eNose-TB: A Trial Study Protocol of Electronic Nose for Tuberculosis Screening in Indonesia. *PLoS One*. 2021 Apr 21;16(4): e0249689.
 16. WHO. WHO consolidated guidelines on tuberculosis Tuberculosis preventive treatment Second edition. 2022.
 17. Wafiroh NYH, Bumi C, Kinanthi CA. Gambaran Sistem Surveilans TB di Puskesmas Wilayah Kabupaten Jember Berdasarkan Komponen Input. *Syifa' MEDIKA: Jurnal Kedokteran dan Kesehatan*. 2024 Mar 30;14(2):102. [Wafiroh NYH, Bumi C, Kinanthi CA. Overview of the TB Surveillance System in Community Health Centers in Jember Regency Based on Input Components. *Syifa' MEDIKA: Journal of Medicine and Health*. 2024 Mar 30;14(2):102.]
 18. Ferizqo FA, Wahyono TYM, Inggariwati. Evaluation of Tuberculosis Disease Surveillance System in DKI Jakarta Province in 2024: Structure, Function and Attribute Analysis. *Jurnal teknologi Kesehatan Borneo*. 2024 Dec 31;5(2):74-81.
 19. Pratiwi RD, Alisjahbana B, Subronto YW, Priyanta S, Suharna S. Implementation of an information system for tuberculosis in healthcare facilities in Indonesia: evaluation of its effectiveness and challenges. *Archives of Public Health*. 2025 Jan 24;83(1):22.
 20. WHO. WHO consolidated guidelines on tuberculosis Module 5: Management of tuberculosis in children and adolescents. 2022.
 21. Sihaloho S, Nina N, Darmayanti E. Evaluasi Pencatatan dan Pelaporan Tuberkulosis Di Uptd Puskesmas Jembe Kabupaten Tangerang Tahun 2024. *PREPOTIF: JURNAL KESEHATAN MASYARAKAT*. 2025 Apr 23;9(1):1909-25. [Sihaloho S, Nina N, Darmayanti E. Evaluation of Tuberculosis Recording and Reporting at the Jembe Community Health Center Uptd, Tangerang Regency in 2024. *PREPOTIF: PUBLIC HEALTH JOURNAL*. 2025 Apr 23;9(1):1909-25.]
 22. Zahrah TA, Ekaputra IWGA. Evaluasi Sistem Surveilans Tuberkulosis (TB) di Dinas Kesehatan Kota Denpasar. *Archive Of Community Health*. 2025 Jan 3;11(3):765. [Zahrah TA, Ekaputra IWGA. Evaluation of the Tuberculosis (TB) Surveillance System at the Denpasar City Health Office. *Archive Of Community Health*. 2025 Jan 3;11(3):765.]
 23. Florentji Adel Benu F, Atoillah Isfandiari M, Pramono E. Tuberculosis Surveillance System Evaluation in Blitar District: Study of System Approach and Attributes. *Jurnal Berkala Epidemiologi*. 2024 Jan 26;12(1):88-97.
 24. Syahreni N, Isfandiari MA, Sitepu FY. Evaluation of Tuberculosis Surveillance System in North Sumatra Provincial Health Office 2022. *Randwick International of Social Science Journal*. 2023 Jul 31;4(3):627-43.
 25. Ke lele Y, Wahyuni CU, Bebengu YB, Sondakh CS. Evaluasi Sistem Surveilans Tuberkulosis Berdasarkan Pendekatan Sistem di Kabupaten Kupang, Provinsi Nusa Tenggara Timur. *Jambura Journal of Health Sciences and Research*. 2024 Mar 29;6(2):121-35. [Ke lele Y, Wahyuni CU, Bebengu YB, Sondakh CS. Evaluation of Tuberculosis Surveillance System Based on Systems Approach in Kupang Regency, East Nusa Tenggara Province. *Jambura Journal of Health Sciences and Research*. 2024 Mar 29;6(2):121-35.]
 26. Al kalali FSA, Mahyoub E, Al-Hammadi A, Anam L, Khader Y. Evaluation of the National Tuberculosis Surveillance System in Sana'a, Yemen, 2018: Observational Study. *JMIR Public Health Surveill*. 2021 Nov 30;7(11): e27626. [Al kalali FSA, Mahyoub E, Al-Hammadi A, Anam L, Khader Y. Evaluation of the National Tuberculosis Surveillance System in Sana'a, Yemen, 2018: An Observational Study. *JMIR Public Health Surveill*. 2021 Nov 30;7(11):e27626.]
-