RESEARCH PAPER

Evaluation of Tuberculosis Control Innovation Programs at Community Health Centers (Puskesmas) in Cirebon City, Indonesia

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Abstract:

Background. Tuberculosis (TB) control is one of Indonesia's national development priorities because Indonesia ihasthe second highest TB burden globally. In 2021, Cirebon City had the second-highest number of TB patients in West Java province, while West Java had the highest number of TB patients in Indonesia. One of the national TB eradication strategies was TB control innovation.

Aims. This study aimed to evaluate regional innovation programs for TB control across all community health centers (Puskesmas) in Cirebon City.

Methods. This study employed a mixed-methods approach with concurrent model triangulation, combining qualitative and quantitative research methods. The study subjects were 22 Puskesmas in Cirebon City, TB patients, and the Cirebon City Health Agency. Data collection techniques included a literature review, in-depth interviews, focus group discussions (FGDs), questionnaires, field research, and observation. The qualitative method of this study was a post-intervention project group. The quantitative stage used a before-and-after data comparison to measure the impact of the innovation program. Data analysis was conducted by combining qualitative and quantitative sources, including FGD interviews, program data, and Puskesmas statistical data. Impact was measured by comparing input, process, and output indicators using data before and after the innovation was implemented.

Conclusion. This study concluded that after the implementation of TB control innovation programs in Puskesmas, TB case detection and the number of TB suspects treated increased. Program innovation for tuberculosis (TB) control must be continuously sustained and further developed to accelerate progress toward achieving the targeted reduction in TB burden.

Keywords: innovation impact; regional innovation; program evaluation; public service delivery; tuberculosis control

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INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by infection with Mycobacterium Tuberculosis. Tuberculosis is an airborne disease (Kementerian Kesehatan RI, 2024; World Health Organization, 2019). Transmission occurs through airborne particles called droplets. The main symptom of tuberculosis is a cough with phlegm for 2 weeks or more. Coughing can be accompanied by additional symptoms, including blood-tinged phlegm, coughing up blood, shortness of breath, weakness, decreased appetite, weight loss, malaise, night sweats without physical activity, and fever lasting more than a month. Groups at high risk of contracting TB include people living in slums and

densely populated areas, health professionals, especially those in direct contact with TB sufferers, the elderly, children, malnutrition, people with HIV (PLWHA), and people with Diabetes Mellitus (DM), inmates, correctional institutions/detention centres, and students at Islamic boarding schools (Kementerian Kesehatan RI, 2024).

Tuberculosis (TB) is a contagious disease that is a major cause of poor health and one of the leading causes of death worldwide (Gopalaswamy et al., 2020). The challenges faced are diverse, including global TB diagnosis and treatment coverage, TB drug resistance, the search for markers or biomarkers for treatment monitoring, effective vaccines, and diseases that impair the host's immune response, all of which have caused TB to re-emerge (Herrera et al., 2022).

According to the WHO in the Global Tuberculosis Report 2022, with the Covid-19 pandemic, the number of undiagnosed and untreated TB patients has increased, with community transmission rates and mortality rates increasing. Globally, in 2021, there were 1.4 million TB deaths from HIV-negative patients and 187,000 deaths from HIV-positive patients (World Health Organization, 2019). Indonesia has the second-highest TB burden in the world after India, followed by China, the Philippines, Pakistan, Nigeria, Bangladesh, and the Democratic Republic of the Congo, respectively. TB cases in Indonesia were estimated at 969,000 TB cases (one person every 33 seconds). This figure is up 17% from 2020, when there were 824,000 cases. The incidence of TB cases in Indonesia was 354 per 100,000 population, which meant that for every 100,000 people in Indonesia, 354 of them suffered from TB (Waluyo, 2023). West Java Province is the largest contributor to TB cases in Indonesia. In West Java, Cirebon City ranks second in West Java as the area with the largest number of TB patients (Rilis Humas Jabar, 2024).

According to the Regulation of the Minister of Health of the Republic of Indonesia Number 67 of 2016, TB control involves all stakeholders, including the central government, regional governments, the private sector, and the community. One of the main causes that affects the burden of TB is the involvement of cross-programs and cross-sectors in TB control, both in activities and funding. This is supported in Presidential Regulation Number 67 of 2021, which explains that there are six national strategies for TB elimination, namely 1) strengthening the commitment and leadership of the Central Government, Provincial Governments, and Regency/City Governments; 2) increasing access to quality and patient-centered TB control; 3) intensifying health efforts in the context of TB Control; 4) increasing research, development, and innovation in the field of TB Control; 5) increasing the role of communities, stakeholders, and other multi-sectors in TB Control; and strengthening program management. Thus, innovation in TB control is one of the national strategies for TB elimination.

Innovation can be understood as a series of research and development activities aimed at developing the practical application of new knowledge, values, and contexts or new ways of applying existing science and technology into products or production processes. Innovation is recognized as something that cannot occur sporadically and partially; it must be a collaboration among actors who interact within a system known as an innovation system (Resen, 2015). A regional innovation system refers to the entire process within a single system aimed at fostering innovation carried out among government institutions, regional governments, research and development institutions, educational institutions, innovation-supporting institutions, businesses, and communities in the region.

Regional innovation in Indonesia is governed by Government Regulation No. 38 of 2017 on Regional Innovation. Regional innovation is defined as all forms of renewal in the administration of regional government aimed at improving its performance. This goal aims to accelerate the realization of public welfare by improving public services, empowering people, enhancing community participation, and strengthening regional competitiveness. Based on the legal basis of Government Regulation No. 38 of 2017 on Regional Innovation, regional innovations are classified as follows: governance innovation, public service innovation, and other regional innovations related to governmental affairs that fall under the authority of the local region (Lembaga Administrasi Negara, 2018a).

At the regional level, following up on Presidential Decree Number 67 of 2021, to ensure the continuity and sustainability of Tuberculosis Control in Cirebon City, the Cirebon City Regional Government has stipulated Cirebon Mayor Regulation Number 70 of 2022 concerning the Regional Action Plan for the Acceleration of Tuberculosis Control in Cirebon City for 2023-2027. The regional policy document that has been prepared serves as a guideline for implementation and as a commitment by the Cirebon City Regional Government to control Tuberculosis.

Based on preliminary field studies in Cirebon City, it was found that the number of TB-RO case

detection rate and the TB-RO treatment success rate were still low, the tracing of cases that were lost to follow-up was not optimal, resulting in the treatment of all TB cases not being optimal, the TB control network was not functioning optimally, and not all Puskesmas had innovations. Following up on these initial findings, the Cirebon City Government has also made efforts to overcome obstacles to TB control and management in Cirebon City, such as encouraging Puskesmas to innovate. This was in line with the literature that argued that innovations must be supported by policies that result from decision-making, managerial expertise, developed through long-term evaluation, and innovation as the basis for the quality of government public services (Sudrajat & Andhika, 2021; Wahyudi, 2016). Through these innovations, it was expected that the quality and quantity of TB control for the community could be improved, from case detection to patient evaluation.

Recent studies have explored tuberculosis (TB) control innovations in Indonesian primary health centers (Puskesmas). In Cirebon, a program empowering school teachers for early TB detection in children was implemented, resulting in improved knowledge and screening capabilities (Nurhidayah et al., 2018). The "Ojek TB" program in Agam district aimed to increase TB case detection rates, though it faced challenges in policy documentation, human resources, and funding (Wati & Lendrawati, 2023). In Pasuruan, management factors in Puskesmas were analysed to improve TB case detection rates, focusing on planning, organizing, activating, and controlling (Wijayanti, 2016). Pekanbaru implemented the Public-Private Mix (PPM) strategy in six health centres, showing an increasing trend in case notification and success rates, despite not reaching national targets (Nazriati et al., 2021). These innovations demonstrate various approaches to enhancing TB detection and treatment in Indonesian Puskesmas, though challenges remain in implementation and resource allocation.

The research problem and gap in this study concerned the innovation in TB control in Puskesmas in Cirebon City, which had not been evaluated by the Cirebon City Government. Therefore, further study is needed to provide a comprehensive picture of the extent of TB control implementation by the Cirebon City Government. This is because Puskesmas have been on the front lines of community TB control to date.

This study aims to evaluate innovations in tuberculosis (TB) control implemented in Puskesmas across Cirebon City, assessing both their level of implementation and their benefits to the community. Currently, no research has examined the impact of regional innovations on TB control specifically within the scope of Cirebon City's Puskesmas. This research will provide the Cirebon City Government with insights into the effectiveness of its strategic approaches to regional innovation in the health sector. Additionally, the study will evaluate the impact of these innovations on TB control, with a particular focus on outcomes at the health center level.

State of the Art

Current research on tuberculosis (TB) control in Indonesia predominantly emphasizes programmatic performance, case detection strategies, and disease management outcomes at primary health care facilities (Puskesmas). Previous studies have explored specific innovation models, such as teacher-based early detection programs, community cadres, Public–Private Mix (PPM), and operational management improvements in selected regions. These studies generally demonstrate that innovation can improve TB case detection and treatment adherence, yet they are often fragmented, single-program focused, and limited to individual health centers or districts.

At the policy level, TB control innovation has been formally integrated into Indonesia’s national TB elimination strategy, particularly following Presidential Regulation No. 67 of 2021, which explicitly positions innovation as a core pillar of TB control. However, empirical studies evaluating how regional innovation policies are operationalized and translated into measurable impacts at the health-center level remain limited.

Methodologically, existing studies tend to rely on descriptive analyses, cross-sectional designs, or single-method approaches, with few adopting mixed-methods impact evaluation frameworks. Furthermore, most research evaluates program outputs (e.g., detection rates, coverage) without systematically examining context, input, process, and product dimensions in an integrated manner.

Thus, while the literature confirms the importance of innovation in TB control, there is still a lack of comprehensive, policy-oriented evaluations that link regional innovation systems, health service delivery, and measurable TB control outcomes across multiple Puskesmas within a single jurisdiction.

LITERATURE REVIEW

Tuberculosis

Epidemiologically, tuberculosis (TB) is an infectious disease caused by the *Mycobacterium tuberculosis* complex (Mtb). As explained by the WHO, TB is caused by the bacterium *Mycobacterium tuberculosis*, which spreads when a person with TB expels bacteria into the air (for example, through coughing) (World Health Organization, 2019). Tuberculosis (TB) is a contagious disease that is a major cause of poor health and one of the leading causes of death worldwide. Until the coronavirus (COVID-19) pandemic, TB was the leading cause of death from a single infectious agent, surpassing HIV/AIDS. Moreover, TB is one of the leading killers of humans, primarily by infecting the lungs (Gopalaswamy et al., 2020).

Pulmonary tuberculosis (TB) is a chronic, contagious, and controllable disease. More than 100 years after the discovery of *Mycobacterium tuberculosis* and despite the availability of effective treatment, this disease remains far from eradicated. The challenges faced are diverse, including global TB diagnosis and treatment coverage, TB drug resistance, the search for markers or biomarkers for treatment monitoring, effective vaccines, and diseases that impair the host's immune response, all of which have caused TB to re-emerge (Herrera et al., 2022). Etiologically, tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis* complex. As with other pathogens, the bacteria can infect the host body when the immune system is compromised. One of the reasons for the high incidence of TB in toddlers is an inadequate immune system due to poor nutritional status (Girsang & Yovsyah, 2023).

The management of tuberculosis at primary health care centres (Puskesmas) refers to the Ministry of Health's policy on pulmonary TB control through the Directly Observed Treatment Short-course (DOTS) strategy. In practice, not only is direct case management of concern, but also the input, process, and output achieved (Zarwita et al., 2019). Inputs include policies, human resources, funding, facilities and infrastructure, communication, and the bureaucratic structure. The process includes case detection and diagnosis, pulmonary TB treatment, recording, and reporting, while output represents the achievement of the implemented processes. The process in pulmonary tuberculosis services, also known as the Pulmonary TB Program, consists of case detection and diagnosis, pulmonary TB treatment, recording and reporting, and cross-checking (Chotimah et al., 2018).

The first activity, which involves case detection and patient diagnosis, includes screening for suspects, making diagnoses, determining disease classification, and identifying patient type. The next activity, TB treatment, is carried out based on the principle that anti-tuberculosis drugs (OAT) must be administered as a combination of several types of drugs, in sufficient amounts, at the correct dosage according to the treatment category. To ensure patient adherence to taking medication, direct supervision (DOT = Directly Observed Treatment) is performed by a Treatment Observer (PMO). TB treatment is given in two phases: the initial (intensive) phase and the continuation phase.

Next is the activity of recording and reporting, to obtain data to be processed, analysed, interpreted, presented, and disseminated for use. The data collected during surveillance activities must be valid (accurate, complete, and timely) to facilitate processing and analysis. Cross-checks are only conducted at referral Puskesmas. Cross-checks are performed by Puskesmas with a referral laboratory capable of conducting microscopic examinations of acid-fast bacilli (AFB), as in health service facility laboratories, in addition to the ability to conduct cross-checks of microscopy from laboratories of affiliated health service facilities (Chotimah et al., 2018).

Regional Innovation

Innovation can be understood as a series of research and development activities aimed at developing the practical application of new knowledge, values, and contexts or new ways of applying existing science and technology into products or production processes. Innovation is recognized as something that cannot occur sporadically and partially; it must be a collaboration among actors who interact within a system known as an innovation system (Resen, 2015). A regional innovation system refers to the entire process within a single system aimed at fostering innovation carried out among government institutions, regional governments, research and development institutions, educational institutions, innovation-supporting institutions, businesses, and communities in the region.

Regional innovation in Indonesia is governed by Government Regulation No. 38 of 2017 on Regional Innovation. Regional innovation is defined as all forms of renewal in the administration of regional government aimed at improving its performance. This goal aims to accelerate the realization of public welfare by improving public services, empowering people,

enhancing community participation, and strengthening regional competitiveness.

This regional innovation is closely related to the granting of regional autonomy, under which regions are given the broadest authority to accelerate the realization of collective welfare by improving services, empowering communities, and fostering community participation through renewal and the application of scientific and technological outcomes in regional government administration. These innovations are formulated in policies that refer to principles such as increasing efficiency, improving effectiveness, enhancing the quality of services, avoiding conflicts of interest, orienting towards public interest, being carried out transparently, adhering to propriety values, and ensuring that the results can be accounted for and are not for personal gain. Based on the legal basis of Government Regulation No. 38 of 2017 on Regional Innovation, regional innovations are classified as follows (Lembaga Administrasi Negara, 2018b):

1) Regional government governance innovation, which is the innovation in the management of the government and the region, covering internal procedures in the implementation of management functions and the management of management elements.
2) Public service innovation, which is innovation in providing services to the community, including the process of delivering public goods/services and innovations in the types and forms of public goods/services; and/or
3) Other regional innovations, which are related to governmental affairs that fall under the authority of the regional/municipal government. Additionally, the National Institute of Public Administration also classifies other regional innovations as those in community empowerment.

The criteria for regional innovations include: 1) the innovation must contain elements of renewal in all or part of its components; 2) it must provide benefits to the region and/or the community; 3) it must not result in any burden or restrictions on the community that are not following the provisions of the legislation; 4) it must fall under the governmental affairs that are within the region's authority; and 5) it must be replicable.

Public participation, which is also mandated in Law No. 23 of 2014 on Regional Government, is also mentioned in Government Regulation No. 38 of 2017 on Regional Innovation, which states that innovation initiatives can come from regional heads, members of the Regional House of Representatives (DPRD), civil servants, regional apparatus, and the public. Initiatives from the public are submitted to the chair of the DPRD and/or the regional head accompanied by a proposal for regional innovation, which is then forwarded to the regional head to be evaluated by the regional research and development apparatus. Proposals from civil servants and regional apparatus are submitted to the regional research and development apparatus along with a proposal for regional innovation for evaluation. Meanwhile, innovation proposals submitted by DPRD members must be decided in a plenary session and then submitted to the regional head for establishment as regional innovation through a Mayor/Regent Regulation.

Impact Evaluation

Policy or program evaluation is a systematic process aimed at assessing the effectiveness, efficiency, relevance, and impact of a policy or a program in achieving its predetermined objectives (Dunn, 2017). This evaluation is essential for providing policymakers with feedback to support future policy improvements. Policy evaluation encompasses the analysis of policy outcomes, impacts, and implementation across various contexts (Patton et al., 2015).

Impact itself refers to the long-term results produced by a program, project, or policy, including expected and unintended outcomes, both positive and negative, as well as direct and indirect impacts (Smith & Alinejad Antonio Balaguer Stan Bucifal Francy Bulic Paul Drake Samira Hassan Stacey Wilkinson Katherine Barnes Laura Jones, 1968). The identification of impact aims to observe the main differences made by a program or policy, based on its intended objectives. In this regard, the International Fund for Agricultural Development (IFAD) also defines impact as a way to assess the achievement of project or program objectives, or more specifically, the contribution towards achieving these goals, which can be assessed through an instrument called impact evaluation (The International Fund for Agricultural Development, 2022) (The International Fund for Agricultural Development, 2023).

Specifically, Impact evaluation is a systematic and empirical investigation of the outcomes produced by an intervention. This process determines whether an intervention aligns with the program or activity's desired objectives. In addition, impact evaluation aims to answer questions about what worked or did not work, how, for whom, and why it happened (Australian Aid, 2012). An approach or model is also needed to

capture the various stages of the innovation process and to map the progress of new approaches to social problems (Breckon, 2016).

Methods used in health research may include surveys with questionnaires, which are among the options in health impact evaluation design. Impact evaluation methods, according to the World Bank, include (Bamberger, 2006):

1) Pre- and post-intervention project and control group design with randomized or non-randomized assignment. This is the most robust evaluation design, combining pre- and post-intervention evaluations using baseline data and comparing groups.
2) Delayed pre-test/post-test comparison group design. This is useful when the evaluation process begins in the mid-term. It does not use baseline data but strengthens mid-term and post-intervention evaluation.
3) Pre- and post-intervention project group and post-intervention comparison group. This design allows for comparison over time and post-project transversal analysis. However, it does not use a pre-intervention comparison between groups, only post-intervention.
4) Post-intervention project and comparison groups with no baseline data. This design focuses on impact evaluation using post-intervention project data and group comparisons without using baseline data.
5) Pre- and post-implementation project group analysis with no comparison group. This design excludes an impact evaluation with a comparison group, but it still uses pre- and post-intervention data for the project group, including baseline data.
6) Post-intervention project group without baseline data or a comparison group. This is the weakest evaluation design, focusing on post-intervention evaluation without pre-intervention or baseline data.

Another impact evaluation model is the CIPP Model (Context, Input, Process, and Product). The CIPP model is a comprehensive framework to guide formative and summative evaluation of projects, programs, personnel, products, institutions, and systems (Daniel L. Stufflebeam, 2003). The CIPP model is also based on the view that the goal of evaluation is to improve, not just to prove. Thus, this model can help assess program success and make necessary improvements to enhance effectiveness. The CIPP model evaluates a program by examining its aspects of Context, Input, Process, and Product (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014).

The CIPP evaluation model helps evaluators address four decisions, namely: 1) Context evaluation to assist with planning decisions, 2) Input evaluation to assist with structuring or planning decisions, 3) Process evaluation to assist with implementation decisions, and 4) Product evaluation to assist with decisions regarding future actions after the results are known (Fitzpatrick et al., 2011).

Context evaluation examines the needs, problems, and opportunities within the environment. It helps determine the program's goals and priorities, as well as identify unmet needs and untapped opportunities. Therefore, context evaluation provides the justification for certain types of program interventions and ensures that the program is designed to meet existing needs.

Input evaluation aims to identify and assess relevant approaches to meeting the needs. This involves assessing human resources, facilities, funding, and the various procedures that must be followed. Consequently, input evaluation helps make decisions about plans and tactics to achieve goals and collect the necessary data to assess program effectiveness.

Product evaluation identifies both desired and undesired outcomes, including positive and negative results. This involves assessing the program's effectiveness against the set targets. Therefore, product evaluation provides information on the extent to which program objectives have been achieved and whether the program has produced the desired outcomes. The results of product evaluation are used by stakeholders to assess the program's sustainability.

According to Stufflebeam & Coryn (2014), Common types of policy or program evaluation include:

1) Formative Evaluation
   Formative evaluation, also called ongoing evaluation, aims to provide feedback during policy implementation to make necessary improvements. This type of evaluation focuses on the implementation process of a policy. For instance, process evaluation may involve the analysis of workflows, inter-agency coordination, and risks encountered during implementation (Daniel L. Stufflebeam & Coryn, 2014).
2) Summative Evaluation
   Summative evaluation, also known as impact evaluation or ex post evaluation, is conducted after the policy has been implemented to assess its impacts and overall success. The focus is on the

policy's final outcomes. For example, impact evaluation includes assessing the direct and indirect effects of the policy on society and the environment (Daniel L. Stufflebeam & Coryn, 2014).

The scope of policy evaluation encompasses several key aspects (Patton et al., 2015), including:

1) Policy Formulation Evaluation: Assessing whether the policy has been appropriately formulated in alignment with the problem it aims to address.
2) Policy Implementation Evaluation: Measuring the performance of policy implementation as well as the factors influencing its success.
3) Policy Performance Evaluation: Evaluating the extent to which the policy objectives have been achieved.
4) Policy Environment Evaluation: Analysing external factors that may affect the implementation and outcomes of the policy.

This study offers several original contributions to the TB control and public policy literature:

1. Systemic Evaluation of Regional TB Innovations. Unlike previous studies that focus on isolated innovations, this research maps and evaluates TB control innovations across 22 Puskesmas simultaneously, providing a citywide perspective on the implementation of regional health innovations.
2. Integration of Regional Innovation Policy and Health Outcomes. The study explicitly links regional innovation governance (Government Regulation No. 38/2017) to health-sector implementation, positioning TB control innovation as a form of public service innovation rather than merely a clinical or technical intervention.
3. Application of the CIPP Impact Evaluation Model in TB Innovation. The use of the Context–Input–Process–Product (CIPP) model within a mixed-methods concurrent triangulation design represents a methodological novelty in TB control studies at the Puskesmas level in Indonesia.
4. Evidence-Based Assessment of Innovation Benefits. The research demonstrates that TB control innovations increase case detection and treatment of TB suspects, even within a relatively short implementation period, thereby providing early impact evidence for innovation-based TB strategies.
5. Policy-Relevant Evaluation for Local Government Decision-Making. The findings align directly with local policy needs, offering actionable insights to sustain, scale, and institutionalize TB control innovations within regional health systems.

METHODS

This study employed a concurrent triangulation research design. This research model combines qualitative and quantitative methods in a balanced manner. Qualitative and quantitative research methods were conducted simultaneously and independently to answer the same research questions (Sugiyono, 2021). The mixed-methods approach using the concurrent triangulation design is considered the most efficient because both methods were applied at the same time (Creswell & Creswell, 2018; Ishtiaq, 2019).

By using the mixed-methods research approach, it was expected that more comprehensive, valid, reliable, and objective data would be obtained (Sugiyono, 2021). Comprehensive data refers to complete data that combines quantitative and qualitative elements. Valid data indicates a high level of accuracy between the actual data and the data reported by the researcher. Meanwhile, reliable data refers to data that remains consistent over time and across individuals.

The steps involved in the concurrent triangulation design were as follows: qualitative data were collected simultaneously with quantitative data using different instruments. Then, the quantitative and qualitative data were each analysed separately, followed by a combined analysis for interpretation and conclusions.

The focus of this research was to obtain information on the implementation of tuberculosis control at Puskesmas in Cirebon City, map and assess the implementation of local innovations in tuberculosis control at Puskesmas in Cirebon City, and provide impact analysis and recommendations for tuberculosis control at Puskesmas in Cirebon City. The subjects of this research were the Cirebon City Health Agency, TB patients, and 22 Puskesmas under the local government of Cirebon City, including Puskesmas Kejaksan, Puskesmas Pamitran, Puskesmas Jalan Kembang, Puskesmas Nelayan, Puskesmas Kesambi, Puskesmas Gunungsari, Puskesmas Sunyaragi, Puskesmas Majasem, Puskesmas Drajat, Puskesmas Jagasatru, Puskesmas Pulasaren, Puskesmas Astanagarib, Puskesmas Pekalangan, Puskesmas Kesunean, Puskesmas Pegambiran, Puskesmas Pesisir, Puskesmas Cangkol, Puskesmas Kalitanjung,

Puskesmas Larangan, Puskesmas Perumnas Utara, Puskesmas Sitopeng, and Puskesmas Kalijaga Permai.

The types of data used in this research included both qualitative and quantitative data. Qualitative data could only be measured indirectly and was typically in the form of verbal words, rather than numbers (Sugiyono, 2021). In this study, qualitative data related to general descriptions of the research object, which included: general descriptions of tuberculosis control innovations at Puskesmas in Cirebon City, and mapping and assessing local innovations in tuberculosis control at Puskesmas in Cirebon City. Quantitative data, on the other hand, was measured on a numerical scale and included interval and ratio data.

According to Lofland and Lofland, the data sources in this study consisted of words and actions, with additional supporting data such as documents and others (Moleong, 2013). A data source refers to the subject from which data can be obtained (Arikunto, 2011). In this study, the data sources referred to the information obtained by the researcher to answer the research questions. The data sources used in this study included primary and secondary data sources. Primary data were directly obtained and collected by the researcher from the primary source. In this research, the primary data source was the perceptions of the heads of the Puskesmas, tuberculosis control officers, tuberculosis patients, and relevant public servants at the Cirebon City Health Agency. Secondary data were those collected directly from the secondary sources by the researcher to support the primary data. The secondary data source in this study consisted of previous research on tuberculosis control conditions in Cirebon City.

The data collection techniques were divided into qualitative and quantitative (Sugiyono, 2021). Qualitatively, data were collected by reviewing theoretical and normative documents from government policies, legal foundations, books, journals, news, and other sources. In-depth interviews were conducted with public servants at the Cirebon City Health Agency, as well as tuberculosis control officers and tuberculosis patients at 22 Puskesmas in the Cirebon City regional government. Qualitative data collection was specifically aimed at answering questions about how tuberculosis control policies and programs were implemented, the status of tuberculosis cases, the services received by TB patients, and the mapping of innovations in tuberculosis control across the 22 Puskesmas in Cirebon City. Quantitative data was collected using a questionnaire instrument to gather data on inputs, processes, outputs, and the impact analysis of regional innovations in tuberculosis control at the Puskesmas in Cirebon City. Overall, data collection was conducted using literature reviews, field research, interviews, observations, and documentation (Arikunto, 2011).

Data analysis techniques were divided into qualitative and quantitative data analysis stages. Qualitative data analysis was conducted during data collection and after data collection was completed. According to Miles and Huberman, qualitative data analysis was conducted interactively and continuously until saturation. The activities involved data reduction, data display, and conclusion drawing/verification (Sugiyono, 2021). The quantitative data analysis stage used the Post-Intervention Project Group, and the qualitative data analysis used the Before-After Comparison model. The post-intervention design was used to measure impact by collecting data after the program was implemented, without requiring comparison with pre-program data (Bamberger, 2006).

The identification of impact aimed to observe the main differences made by a program or policy that has been implemented based on its intended objectives and goals (The International Fund for Agricultural Development, 2022, 2023). In addition, impact evaluation aimed to answer questions about what worked or did not work, how, for whom, and why it happened (Australian Aid, 2012). An approach or model was also needed to capture the various stages in the innovation process, and can be used to map the progress of new approaches to social problems (Breckon, 2016).

The impact evaluation model used in this study was the CIPP Model (Context, Input, Process, and Product). The CIPP model is a comprehensive framework to guide formative and summative evaluation of projects, programs, personnel, products, institutions, and systems (Daniel L. Stufflebeam & Coryn, 2014). The CIPP model is also based on the view that the goal of evaluation is to improve, not just to prove. Thus, this model can help assess program success and make necessary improvements to enhance effectiveness. The CIPP model evaluates a program by examining its aspects of Context, Input, Process, and Product (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014).

Impact measurement was conducted by combining various qualitative data sources, such as interviews with key informants, focus group discussions (FGDs), program data, and statistical data from the innovating institutions. The Before-After Comparison approach aimed to measure impact by

comparing conditions before (pre-program) and after (post-program) the innovation (actual post-program data). Additionally, this approach was used to compare community conditions after the innovation program was implemented. To assess the impact of the innovation, a comparison of input, process, and output indicators was made using data from before and after its implementation.

The duration of the TB control innovation program implemented across 22 Puskesmas varies; however, in general, the programs have been running for less than one year. Given this limited implementation period, it was not yet possible to determine the full impact of the programs at the time of writing. Nevertheless, it is important to establish an evaluation mechanism that demonstrates whether the programs are functioning as intended and has the potential to yield positive outcomes if continued.

Accordingly, an evaluation instrument was developed using the CIPP Model (Context, Input, Process, Product) (D. L. Stufflebeam & Shinkfield, 2007; Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014) to assess both the level of implementation and the program's perceived benefits to the community. The implementation assessment involved interviews with the Heads and TB control program officers at 22 Puskesmas. Meanwhile, to identify the benefits of the innovation, interviews were conducted with TB patients currently undergoing treatment, selected by the health centers based on patients' willingness to participate and the assessed risk of transmission.

Primary data from informants was collected over 30 days. Interviews with the heads of Puskesmas and TB control program officers were conducted at the respective health centers, while interviews with TB patients were conducted at the respondents' residences

DISCUSSION

Overview of TB Control in Cirebon City

The implementation of tuberculosis control is reflected in the achievements of the Minimum Service Standards (MSPs) and case detection. According to the Health Agency, all Puskesmas have exceeded their targets for passive and active case detection. Additionally, tuberculosis diagnoses are promptly confirmed, and patients are immediately treated if positive, with contact investigations conducted to prevent further transmission. A remaining issue is the presence of patients from outside the Cirebon City area, and the optimization of TB prevention and management networks remains inadequate.

Based on research data and SITB data as of August 15, 2023, 2,152 (77%) of the 2,783 TB cases were detected, meeting the target for TB case detection (Treatment Coverage). Thirteen cases (43%) were confirmed as Rifampicin-Resistant TB (RR)/Multi-Drug-Resistant TB (MDR), compared to the target of 30. Additionally, 441 cases (29%) were TB-Diabetes Mellitus (DM) cases, and 540 cases were detected out of the target of 97 for pediatric TB. There were 1,022 (58%) TB-HIV cases out of the target of 75%, and 67% success rate was achieved for Drug-Sensitive TB (SO) out of the 90% target. The TB mortality rate was 25 cases (2%) out of the 5% target. The healthcare facilities for TB control in Cirebon City consist of 2 Government Hospitals, 8 Private Hospitals, 22 Puskesmas, 1 Public Lung Health Center (BKPM), 1 Prison, 1 Detention Center, and 115 Independent Clinic/Doctor Units (DPM).

The TB control activities in Cirebon City are closely related to the extent of performance indicator achievements. The performance achievements in TB control in Cirebon City can be seen in Table 1.

Table 1. Performance Achievements of TB control in Cirebon City 2020-2022

Indicator	Unit	2020		2021		2022	
		Target	Achievement	Target	Achievement	Target	Achievement
TBC Minimum Standard Service	Percent	100	112	100	136	100	207
Case Detection Rate	Percent	110	102	110	162	110	179
Case Notification Rate	Per 100,000 population	380 /	380 /	380 /	536 /	380/	588/
Success Rate	Percent	90	91	90	91	90	74
Percentage of TB Patients	Percent	70	52	80	32	80	39

Indicator	Unit	2020		2021		2022	
		Target	Achievement	Target	Achievement	Target	Achievement
Aware of Their HIV Status							
Pediatric TB Detection	Absolute	110	168	110	401	110	930
Drug-Resistant TB Case Detection Rate	Percent	70%	51% (16 cases)	80%	45% (14 cases)	90%	93% (25 case)
Drug-Resistant TB Treatment Success Rate	Percent	90	43	90	66	90	15

Source: the Health Agency, Cirebon City, 2023

Based on Table 1 above, in 2022, performance against the minimum service standards for TB control in Cirebon City exceeded the target, reaching 207% (from a target of 100%), indicating that health services performed very well. High performance was also demonstrated in the Case Detection Rate at 179% (from a target of 110%), the Pediatric TB Detection Rate at 930% (from a target of 110%), and the Drug-Resistant TB Case Detection Rate at 93% (from a target of 90%). These improved performance achievements are inseparable from increased innovation across TB control services, including case detection and diagnosis, pulmonary TB treatment, record-keeping and reporting, cross-checking, and TB campaigns.

TB control and control services are a form of program and innovation activities within the Cirebon City Government, consisting of Promotive, Preventive, Curative, and Rehabilitative activities. The Promotive program refers to health promotion activities that aim to increase health knowledge by providing education on risk factors, symptoms, and disease prevention. The Preventive program refers to efforts to help individuals maintain or prevent the onset of health issues, which can be achieved through regular health check-ups. The Curative program refers to treatment efforts aimed at helping individuals resolve their current health problems, such as administering antibiotics for infectious diseases. The Rehabilitative program refers to recovery efforts following health examinations.

Mapping of TB control Innovations in Cirebon City

The mapping of innovations in Cirebon City was conducted by identifying each innovation in TB control, including the innovation name, service type, and program/activity type. The types of TB control services include case detection and diagnosis, pulmonary TB treatment, record-keeping and reporting, cross-checking, and TB campaigning. The programs and activities for innovation in the local government of Cirebon City are categorized as Promotive, Preventive, Curative, and Rehabilitative. Innovations in TB control are closely linked to the flow and mechanisms of activities, including inputs, processes, and outputs. Input information can include human resources, budgets, facilities (e.g., equipment), and materials. Process information may involve service time and service mechanisms in TB control. Output information can include the number of service patients, TB cases, and cured cases. The identification of innovation activities in TB control in Cirebon City in 2023 is shown in Table 2.

Table 2. TB Control Innovations in Cirebon City

Name of Puskesmas	Name of Innovation	Type of Service	Type of Program
Puskesmas Kejaksan	Sambat TB (*Solusi Bersama Pengobatan TB*)	• Case finding and patient diagnosis	• Preventive • Curative
Puskesmas Jalan Kembang	Martabak Keju (*Mari Berantas Tuberkulosis Bersama Kader Junantuk)*	• Case finding and patient diagnosis • Pulmonary TB Treatment	• Promotive • Preventive • Curative

Name of Puskesmas	Name of Innovation	Type of Service	Type of Program
Puskesmas Gunung Sari	Jumantuk *(Juru Pemantau Batuk) & Gerakan Eliminasi TB (Gregetntos TB)*	• Case finding and patient diagnosis	• Promotive • Preventive
Puskesmas Drajat	Sayonara TB *(Ayo Tuntas Berantas Tuberkulosis)*	• Case finding and patient diagnosis	• Preventive
Puskesmas Majasem	Sicantikjuli *(Skrining Tuberkolosis dengan Jumpa dan Peduli)*	• Case finding and patient diagnosis	• Preventive
Puskesmas Sunyaragi	Jumantuk *(Juru Pemantau Batuk)*	• Case finding and patient diagnosis • Pulmonary TB Treatment • Recording and reporting	• Promotive • Preventive • Curative
Puskesmas Kesambi	Jumantuk *(Juru Pemantau Batuk)*	• Case finding and patient diagnosis	• Promotive • Preventive
Puskesmas Jagasatru	Gemet *(Gerakan Masyarakat Eliminasi TB)*	• Case finding and patient diagnosis	• Promotive • Preventive
Puskesmas Astanagarib	Toss Ibak (*Temukan Obati Sampai Sembuh Inisiatif Bersama Anggota Keluarga dan Kader)*	• Case finding and patient diagnosis • Pulmonary TB Treatment • Recording and reporting • Cross check	• Promotive • Preventive • Curative
Puskesmas Pekalangan	Bu Tatat *(Buku Saku Tanggap Tanggulangi TBC)*	• Case finding and patient diagnosis • Pulmonary TB Treatment • Recording and reporting	• Promotive • Preventive • Curative
Puskesmas Pulasaren	Kader Jumantuk *(Kader Juru Pemantau Batuk)*	• Case finding and patient diagnosis	• Promotive • Preventive •
Puskesmas Kesunean	*Keluarga Warga Peduli TB*	• Case finding and patient diagnosis • Pulmonary TB Treatment • Recording and reporting	• Preventive • Curative
Puskesmas Pesisir	Ganbate *(Gerakan Basmi TB)*	• Case finding and patient diagnosis • Pulmonary TB Treatment	• Promotive • Preventive • Curative
Puskesmas Kalitanjung	Geprak Kutiru *(Gerakan Serempak Klub TB Paru)*	• Case finding and patient diagnosis • Pulmonary TB Treatment	• Promotive • Preventive • Curative • Rehabilitative

Name of Puskesmas	Name of Innovation	Type of Service	Type of Program
		• Recording and reporting • Cross check • TB Campaign	
Puskesmas Larangan	Sae TBC Larangan *(Sembuh, Aman, dan Edukasi)*	• Case finding and • patient diagnosis • Pulmonary TB Treatment • Recording and reporting • Cross check	• Promotive • Preventive • Curative • Rehabilitative
Puskesmas Perumnas Utara	Teko Panas *(Temukan Obati Pantau Sampai Sembuh)*	• Case finding and patient diagnosis • Pulmonary TB Treatment	• Promotive • Preventive • Curative • Rehabilitative
Puskesmas Kalijaga Permai	Grup Whatsapp "Kader TB TOP *(Temukan-Obati-Pantau)*	• Case finding and patient diagnosis • Pulmonary TB Treament • TB volunteers education	• Preventive • Curative
Puskesmas Sitopeng	*Gesit (Gerakan skrining tuberculosis)*	• Case finding and patient diagnosis	• Preventive • Curative

Source: research result, 2024

Based on Table 2 above, the majority of innovations in TB control consist of case detection services and patient diagnosis, with innovation activities in preventive and curative efforts for TB in Cirebon City.

Evaluation Implementation of TB Control in Cirebon City in 2023

The implementation of health services in TB control requires a well-functioning institutional structure and organization. The division of authority and responsibility in TB control in Cirebon City is outlined and established in the Mayor of Cirebon's Decree No. 443.24.05/Kep.114-DINKES/2019 regarding the Establishment of the Cirebon City Tuberculosis Control Team. The formation of this team reflects special attention to TB control, particularly through regional innovation by the Cirebon City Government. The local health authority, the Health Agency, has provided various forms of support. This support includes providing facilities for innovation at the Puskesmas, providing coaching for the Puskesmas, and offering rewards or recognition for achievements in TB control and management in Cirebon City.

Through the Health Agency, the Cirebon City Government supports all forms of TB control innovations at Puskesmas. The establishment of the Mayor's Regulation No. 70 of 2022 on the Regional Action Plan for the Acceleration of Tuberculosis Control in Cirebon City for 2023-2027 is a tangible form of support. Strategy 4 of this document mentions the Improvement of Research, Development, and Innovation in Tuberculosis Control conducted by the Cirebon City Development Planning Agency (Bappelitbangda). The implementation of TB control innovations in Cirebon City, carried out by the Puskesmas, is supported by the Health Agency, including the formation and implementation of evaluation forums at the city's TB innovation coordination level. The Health Agency also conducts socialization activities related to regional innovation in TB control in Cirebon City, such as sub-district-level coordination forum meetings, which are still area-specific. Through these forums, discussions are held on the progress of TB control innovation in Cirebon City,

including addressing challenges and improving health workers' competencies.

Based on research findings, the ability and competence of healthcare workers in TB control in Cirebon City indicate that field workers' competence is already quite good. This is evident in the cadres who act as patient referrals to the local Puskesmas. TB control officers are divided into three types: officers with Molecular Rapid Test (TCM) equipment, officers who can perform microscopic examinations, and officers who can only collect and send samples to referral examination centers. According to data from the Health Agency, the number of human resources (personnel) involved in TB control in Cirebon City consists of 56 trained cadres, 85 doctors, 37 TB officers/nurses, and 45 analysts. To improve the quality of human resources at Puskesmas for TB control, training is conducted, including capacity-building for laboratory and pharmacy staff related to the Tuberculosis Information System (SITB), training on sputum specimen packaging for cadres in 2022, and training on Latent Tuberculosis Infection (LTBI) in 2023.

TB control activities in Cirebon City have been carried out more intensively by the Puskesmas. To improve Puskesmas performance, facilities supporting TB control activities have been provided and are generally adequate, although a few Puskesmas still lack dedicated TB rooms. However, many Puskesmas now have TB Examination Rooms, Sputum Rooms, TB Patient Waiting Rooms, Sputum Pots, and Scales. Currently, other facilities provided include TCM (Molecular Rapid Test) equipment for TB diagnosis, available at five Puskesmas, and Microscopic Lab facilities at Referral Microscopic Puskesmas (PRM) and Independent Implementing Puskesmas (PPM) for TB follow-up examinations, available at 22 Puskesmas. In other words, all Puskesmas in Cirebon City now have a Microscopic Lab.

Regarding budgetary resources, budgeting in the implementation of TB control policies in Cirebon City is crucial and must be prioritized. According to data from the Cirebon City Health Agency, the budget for TB control in Cirebon City is funded by the National Budget (APBN), the Regional Budget (APBD), the Global Fund, and the STPI Penabulu Community Consortium. The budget for TB control in Cirebon City, sourced from the Cirebon City APBD and APBN, is managed by the Puskesmas. The comparison of the APBD and APBN budgets for TB control at the Cirebon City Health Agency is Rp. 526,997,350 (26.3%) from the APBD and Rp. 1,473,561,700 (73.7%) from the APBN.

The management of the TB control budget in Cirebon City needs to be systematically organized. The budgeting system in Cirebon City uses a system of allocation based on budget ceilings so the composition of the program budget is based on priorities. The use of the budget for TB control in Cirebon City includes the following:

1. strengthening the commitment and leadership of the regional government (regency/city);
2. improving access to quality TB control that prioritizes patients;
3. Intensifying health efforts for tuberculosis control.
4. enhancing research, development, and innovation in TB control;
5. increasing community participation, stakeholders, and other sectors in TB control;
6. strengthening program management.

The local commitment to TB control in Cirebon City is reflected in the regional policy-making process, which began in 2017 with the establishment of the Cirebon City Tuberculosis Control Team in 2019 (No. 443.24.05/Kep.114-Dinkes/2019). In 2019, the Cirebon City Mayor's Regulation No. 49 of 2017 on the Regional Action Plan for Tuberculosis Control (RAD-TB) for 2018-2022 was issued. In 2021, the Coalition of Professional Organizations for Tuberculosis (KOPI-TB) of Cirebon City was established under No. 443.24/Kep.475-Dinkes/2021.

In 2021, in relation to national TB control efforts, the central government issued Presidential Regulation No. 67 of 2021 on Tuberculosis Control. This regulation outlines six National Strategies for TB Elimination, including:

1. Strengthening the commitment and leadership of the central government, provincial governments, and district/city governments;
2. Improving access to quality TB control that prioritizes patients;
3. Intensifying health efforts for TB control;
4. Enhancing research, development, and innovation in TB control;
5. Increasing community participation, stakeholders, and other sectors in TB control; and
6. Strengthening program management.

In the theory of innovation impact analysis in tuberculosis control, it is necessary to examine the context, input, process, and product/output (CIPP) achieved from innovation activities (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014).This model is also based on the view that the

goal of evaluation is to improve, not just to prove. Thus, this model assesses program success and makes necessary improvements to enhance effectiveness. The context of tuberculosis control in the city of Cirebon can be explained and analysed from the mapping of TB control innovations and the evaluation of TB control program implementation in Cirebon City in 2023. Based on theory, policy or program evaluation is a systematic process aimed at assessing the effectiveness, efficiency, relevance, and impact of a policy or a program in achieving its predetermined objectives (Dunn, 2017). Policy implementation evaluation measures the performance of policy implementation as well as the factors influencing its success (Patton et al., 2015).

One aspect of the CIPP Model is evaluating a program by examining the context aspect (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014). In the evaluation context of innovation in TB control in Cirebon City, this is a response to this Presidential Regulation; the Cirebon City Government subsequently established the Cirebon City Mayor's Regulation No. 70 of 2022 on the Regional Action Plan (RAD) for the Acceleration of Tuberculosis Control in Cirebon City for 2023-2027. In line with the implementation of TB control activities in Cirebon City, based on research conducted in 2023, the identification of obstacles in the implementation of TB control in Cirebon City includes:

1. Regarding human resources, issues that need attention include staff who are not yet trained and those who have been reassigned to other health facilities. In addition, several training programs scheduled for 2023 had not yet been implemented by the time the research was conducted.
2. Regarding the budget, as of now, the TB Control Program in Cirebon City is funded by both the central government (APBN) and the local government (APBD). However, the budget allocation for the TB program is still suboptimal. This is because funding for activities carried out at Puskesmas is sourced from the APBN through Health Operational Assistance (BOK) and the National Health Insurance (JKN), and these have not yet been prioritized in budgeting, especially for TB control in Cirebon City. Furthermore, the TB control efforts in Cirebon City still rely on foreign funding.
3. Regarding the program and activities, several challenges were encountered, including:
    a. The TB control program has not been fully implemented across programs and sectors;
    b. Policy support is needed for TB control in Cirebon City.
    c. The case detection rate for drug-resistant TB (TBC-RO) and the success rate of treatment for TBC-MDR are still low;
    d. Patient adherence to TB treatment is still low;
    e. Tracking cases lost to follow-up has not been optimal, leading to suboptimal treatment for all TB cases;
    f. Many TB patients do not know their HIV status;
    g. Preventive TB treatment for people living with HIV (ODHA) and children with INH has not been optimal;
    h. TB service networks are not functioning optimally; and
    i. The local government has not yet established a TB training team at the city level.
4. In the process of socialization, several challenges were encountered, including:
    a. Suboptimal coordination between Puskesmas, villages, and cadres;
    b. Difficulty in accessing data from health center program holders;
    c. Not all Puskesmas have innovations;
    d. No specific TB budget at the village level; and
    e. Less than optimal coordination between Puskesmas, Sub-district office, and volunteers.
5. Other challenges include stigma, socioeconomic issues, suboptimal network functionality, and insufficient contributions from other regional local government agencies (SKPD).

Based on Stufflebeam & Coryn (2014) The evaluation of TB control innovation policies or programs in Cirebon City includes a formative evaluation, also called continuous evaluation, which is useful for providing feedback during policy implementation. In other words, it focuses on the process of implementing TB control innovation programs. Based on the research findings, several efforts as part of the acceleration of local commitment have been made by the Cirebon City Government to address the challenges faced in TB control, including:

1. Improving coordination between Puskesmas, villages, and cadres;
2. Providing feedback and support for TB control achievements;
3. Villages allocate funds for TB control annually in the Village Development Assembly (Musbangkel) and the Village Development Planning Assembly (Musrenbang);

4. Increasing the intensity of communication between the Health Agency, Puskesmas, and other stakeholders (internal) within the Cirebon City government for TB control by holding regular internal meetings every quarter;
5. Enhancing communication between the Health Agency and external stakeholders in TB control through cross-sectoral meetings, Puskesmas, and other stakeholders organized by the Cirebon City Health Agency; and
6. Mentoring and encouraging Puskesmas to create innovations. Various innovations initiated by Puskesmas in Cirebon City are expected to improve TB control, from case detection to patient evaluation, so that the achievement indicators can meet the set targets and comply with the standards as outlined in the technical guidelines

In the study of TB control innovations at Puskesmas in Cirebon City, the researcher observed the main changes in the input dimension across 18 Puskesmas. In this study, the input dimension includes human resources, finances, equipment, materials, internal strengths, and external opportunities.

In terms of finances, the largest change was in TB control resources at the Puskesmas. The innovation in these Puskesmas was the allocation of a dedicated budget for TB control, which had not previously been budgeted separately. This occurred in 8 Puskesmas, as shown in Figure 2.

In the process dimension of the innovation method implemented by the Puskesmas, activities included medication monitoring, cross-sector meetings, educational initiatives, contact tracing, and screening. One key aspect of program evaluation involves examining the process dimension (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014) , with process evaluation playing a critical role in informing implementation decisions (Fitzpatrick et al., 2011).

The evaluation of the process dimension focuses on assessing how well the tuberculosis (TB) program is being implemented. The main goal is to monitor, control, and provide feedback during the program. This step is crucial to ensure the innovation program runs effectively, efficiently, and in line with its objectives. Additionally, systematic process evaluation provides policymakers with accurate information, helping them make improvements and continuously enhance the program's quality.

In the process dimension of innovation, from a time perspective, a specific time was established for TB control at the Puskesmas, as reported by 15 Puskesmas. The specific time refers to the TB service innovation for the community, held every Wednesday, to minimize the spread of TB infection to other patients at the Puskesmas. The research results indicated that the primary activity was contact investigation of suspected TB patients, reported by 13 Puskesmas, as shown in Figure 7. Contact investigation is an essential process aimed at halting the spread of TB within the community. One aspect of program evaluation involves examining the product dimension (Daniel L. Stufflebeam, 2003; Daniel L. Stufflebeam & Coryn, 2014) , with product evaluation playing a key role in guiding decisions regarding future actions after the results are analyzed (Fitzpatrick et al., 2011). This innovation focuses on gathering information from individuals who have come into contact with an infected person, allowing them to undergo screening, counseling, and treatment if necessary.

Despite growing attention to TB control innovation, several critical gaps persist in the existing literature:

1. Lack of Regional-Level Innovation Impact Evaluation. There has been no prior comprehensive evaluation of TB control innovations conducted simultaneously across all Puskesmas within a single city, particularly within the framework of regional innovation policy.
2. Insufficient Use of Integrated Evaluation Frameworks. Previous studies rarely employ holistic evaluation models that capture contextual readiness, resource inputs, implementation processes, and outcome products within a unified analytical framework.
3. Limited Evidence on Policy–Implementation Linkages. Empirical evidence linking national TB elimination policies, regional innovation regulations, and frontline service delivery outcomes remains weak, especially at the municipal level.
4. Underexplored Short-Term Innovation Impacts. Many studies focus on long-term TB indicators, while the early-stage impacts of newly implemented innovations—particularly those occurring within less than one year—are underexplored.
5. Absence of Comparative Innovation Mapping Across Health Centers. There is minimal research comparing types, scopes, and functional orientations of innovations (promotive, preventive, curative, rehabilitative) across multiple Puskesmas in a coordinated health system.

CONCLUSION

The policies and programs for tuberculosis control in Cirebon City are outlined in Cirebon City Mayor Regulation Number 70 of 2022, which concerns the Regional Action Plan (RAD) for the Acceleration of Tuberculosis Control for the years 2023-2027. The current status of tuberculosis cases at the Puskesmas in Cirebon City shows that most Puskesmas have not yet met the targets for Minimum Service Standards (SPM), case detection, and treatment success rates. However, according to the regional innovation mapping, 18 of 22 Puskesmas in Cirebon City have implemented TB control innovation programs. These innovations, introduced in 2022-2023, have had a positive impact on TB case detection and the number of TB suspects treated in Puskemas that implemented TB control innovation programs. Program innovation for tuberculosis (TB) control must be continuously sustained and further developed to accelerate progress toward achieving the targeted reduction in TB burden.

This study addresses these gaps by providing a comprehensive, mixed-methods evaluation of regional TB control innovations across all Puskesmas in Cirebon City, integrating policy analysis, innovation mapping, and impact evaluation within the CIPP framework.

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