

Private Sector Engagement in Tuberculosis Notification: Participation and Challenges in Bangli District, Bali Indonesia

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Abstract. Background: Public-Private Mix (PPM) strategy has been shown to be an effective approach to increasing tuberculosis (TB) case notification on a global scale. Nevertheless, this strategy continues to encounter various barriers in its implementation, including in Bangli District. **Objective:** This study aims to explore the participation of private health services, and the barriers in TB notification. **Methods:** This study employs a descriptive cross-sectional design. The respondents were TB programme officers working at public health centres (PHCs) and private services in Bangli District. Structured interviews were conducted with 12 TB program officers, while 47 private services consented to complete an e-questionnaire. The quantitative data collected was analysed descriptively. **Results:** A total of 74.5% of private services had become part of the network, and 88.6% of them were still committed to participating. Of all the private services that responded, 41.82% were private midwives. Most private services chose to refer suspected TB cases, rather than other role. PHCs have identified several key challenges, namely the recording and reporting tasks, financing, facilities issues, the strengthening of networks, and the identification of cases and close contact tracing. In contrast, the barriers experienced by private services primarily concern technical aspects of diagnosis and reporting forms. **Conclusion:** In order to enhance the involvement of private health services, it is essential to reinforce the district-based public-private partnership through the following measures: enhanced coordination and network expansion, accelerated technical training, improved basic diagnostic and referral facilities, and simplified reporting systems for private health services.

Keywords: Public-Private Mix; Private Health Services; TB Notification



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1. Introduction

Tuberculosis (TB) remains a major global public health problem and is among the top ten leading causes of death worldwide, continuing to be a priority within the Sustainable Development Goals (SDGs) agenda. According to the Global Tuberculosis Report 2024 published by the World Health Organization (WHO), an estimated 10.8 million people worldwide developed TB in 2023, representing an increase from 10.7

million cases in the previous year. Indonesia ranks second globally after India, contributing approximately 10% of the total global TB burden, equivalent to 1,080,000 new TB cases in 2023 [1]. Based on data from the Indonesian Ministry of Health (2024), the number of TB cases detected in Indonesia has increased substantially compared to 2020, reflecting improved case detection coverage in the post-COVID-19 pandemic period. Programmatic data indicate that TB case detection coverage reached 78.6% in 2024, an increase from 77.5% in 2023. Nevertheless, this coverage remains below the 2024 strategic plan target of 90% set by the Ministry of Health [2],[3].

In Bali Province, TB case detection coverage reached 83.65% in 2023, representing a substantial increase from 50.20% in the previous year. Despite this improvement, the coverage remains relatively low compared to other provinces in Indonesia [4],[5]. Among the nine districts/municipalities in Bali Province, Bangli District continues to record the lowest TB case detection coverage. In 2023, a total of 131 TB cases (42.9%) were identified, followed by a further decline in 2024, with 94 TB cases detected (34.3%) [5],[6]

To achieve the TB elimination target by 2030, aggressive case-finding strategies and comprehensive reporting through the national surveillance system (TB surveillance) constitute key pillars of TB control efforts. Ensuring that every diagnosed case receives timely and appropriate treatment is critical to interrupting the chain of TB transmission [1]. According to Regulation of the Minister of Health No. 67 of 2016 on the national TB control program in Indonesia, TB case detection should be conducted through both active and passive approaches. The outcomes of case detection are managed within a TB surveillance system implemented in an integrated and coordinated manner. Furthermore, networking and partnerships in TB case detection involve all health stakeholders, including the private sector and other relevant institutions, through the implementation of the public-private mix (PPM) approach [7].

The PPM strategy has been shown to be highly effective in enhancing TB case detection and notification globally. Worldwide, the contribution of the private sector to total TB case notifications increased substantially from 19% in 2017 to 28% in 2019 [8]. Additional evidence indicates that active case-finding (ACF) interventions involving multiple healthcare services can achieve broad population coverage, although their effectiveness (yield) is highly dependent on screening algorithms and disease prevalence within the target population [9]. In the South-East Asia Region, which accounts for approximately 45% of global incident TB cases, transforming the TB response through multisectoral collaboration is particularly critical, as the private sector often serves as a primary source of care yet remains underreported within national surveillance systems [10]. Evidence from India demonstrates a marked increase in private sector engagement, rising from approximately 1% in 2013 to 26%

in 2019 [11], while in Pakistan, the private sector contributes up to 30% of national TB notifications [12].

Despite demonstrating high effectiveness, PPM implementation continues to face substantial challenges, including limitations in government governance and non-integrated health information systems [13]. The engagement of private healthcare services remains critical, as failure to adequately involve the private sector results in delayed diagnosis and ongoing transmission [11]. As part of the global effort to achieve TB elimination by 2030, strengthening political commitment to optimize PPM is essential to identify and manage previously undetected cases and is expected to accelerate the reduction of TB incidence worldwide [9],[10],[14].

The 2021 National Report indicated that private healthcare services' participation in the detection and reporting of presumptive TB cases remained very low, accounting for only 2%. Although performance remains below the targets outlined in Indonesia's National Tuberculosis Control Strategy 2020–2024, some improvements have been observed. The number of confirmed tuberculosis cases detected across all health facilities increased in 2021 compared to 2020, with a notable 17% rise in private practice physicians and private clinics. In addition, TB cases managed in private health facilities increased by 9% between 2016 and 2021. This trend suggests enhanced engagement of health facilities in TB case detection in 2021, despite the ongoing disruptions caused by the COVID-19 pandemic. However, earlier evidence highlights substantial gaps in TB reporting. The 2017 TB Inventory Study found that 41% of TB cases were under-reported within the national TB surveillance system, with the vast majority (96%) originating from the private sector [15]. Against this backdrop, the more recent increases in case detection and reporting suggest a gradual improvement in surveillance performance and stronger involvement of private healthcare providers in Indonesia. [15] Nevertheless, suboptimal TB notification rates and the persistently low contribution of the private sector to mandatory TB notification activities continue to be observed at the subnational level, including in Bali [16].

Bangli District is a predominantly rural area in Bali Province, characterized by hilly and mountainous topography, which limits access to public healthcare facilities in several rural locations. Although 12 PHCs are available as services of government health services, geographical barriers and travel distance often lead communities to rely more frequently on private healthcare services as their first point of contact, including midwife practices, nurses, independent physicians, and private clinics [17]. This pattern of healthcare utilization represents a strategic entry point for early detection of presumptive TB cases. However, the contribution of private healthcare services to TB case detection and reporting has not been systematically documented. This gap may result in under-detection and under-reporting of TB cases, thereby

undermining the effectiveness of the Public-Private Mix (PPM) strategy at the local level. Therefore, this study is essential to examine the private sector participation and to identify their barriers to get an opportunities to strengthen their involment into the TB surveillance system, in order to support improved case detection and more effective TB control efforts [1],[6],[8].

2. Materials and Methods

This study used a descriptive cross-sectional design conducted in Bangli District, Indonesia. Data collection was carried out from July to August 2021. The study aimed to assess private health service characteristics, their involvement in tuberculosis (TB) case detection, and perceived barriers to TB case detection.

The study population included TB program officers at public health centres and private health service providers registered with the Bangli District Health Office. A total sampling approach was applied to all eligible participants. All 12 TB program officers from public health centres were included in the study. In addition, all 55 registered private health services (including private clinics, general practitioners, midwives, and nurses in private practice) were invited to participate. Of these, 47 private health services consented and completed the questionnaire, resulting in a response rate of 85.5%. As all eligible participants were included, no formal sample size calculation was performed.

Data were collected using two methods. Structured interviews were conducted with TB program officers to obtain information on demographic characteristics, availability of private sector networks, and barriers to TB case detection. Data from private health services were collected using a self-administered electronic questionnaire (e-questionnaire), which included items on service characteristics, involvement in TB case detection, and perceived barriers.

The primary variable was private service involvement in TB case detection, defined as the participation of private health facilities or providers in the TB case detection network. This variable was measured using multiple indicators, including involvement status, commitment and willingness to participate, duration of involvement, referral destination and method for presumptive TB patients, type of role performed in case detection, treatment provision options, and use of recording and reporting systems. All variables were categorized based on predefined response options. Barriers to TB case detection among both TB program officers and private providers were assessed using a single open-ended question. Responses were coded and grouped into thematic categories based on similarity of content.

The e-questionnaire was developed based on established concepts of private sector engagement in TB programs and barriers to TB program implementation. Content validity was assessed through pilot testing involving the research team and

TB program officers at the District Health Office to ensure clarity, relevance, and appropriateness.

The collected quantitative data were analyzed descriptively and presented in frequency distribution tables. Qualitative responses from open-ended questions were analyzed using thematic categorization.

This study received ethical approval from the Faculty of Medicine, Udayana University (Reference No. 1823/UN14.2.2VII.14/LT/2021). Permission to conduct the study was also obtained from the Bali Provincial Investment and Integrated Services Agency (No. 070/3127/IZIN-C/DISPMPT) and the Bangli District Investment and Integrated Services Agency (No. 070/88/VI/DPMPTSP).

3. Results and Discussion

A total of 12 TB program officers were included in the study. The median age was 49 years (IQR 9.75), with a range of 36–56 years. Most participants were male (75%) and held a diploma degree (75%). The median length of service was 8.5 years (IQR 9.75). Half of the respondents were responsible for four or more program areas. In detail, these results are presented in [Table 1](#).

Table 1. Characteristics of TB Program Officers in Bangli District, Indonesia (2020)

No	Characteristics	Frequency	Percentage (%)
1	Sex		
	- Male	9	75.00
	- Female	3	25.00
2	Age		
	Median (inter-quartile range)	49 (9.75)	
	Range (minimum-maximum)	36–56 years	
3	Education level		
	- Diploma degree	9	75.00
	- Bachelor degree	3	25.00
4	Length of work experience		
	Median (inter-quartile range)	8.5 (9.75)	
	Range (minimum-maximum)	1.5–16 years	
5	Number of program assignments		
	- < 4 programs	6	50.00
	- ≥ 4 programs	6	50.00
6	Training in TB Program and Surveillance		
	- Before 2010	5	42.00
	- 2010–2018	7	58.00
	Total	12	100.00

Of the 12 PHCs included in the study, 10 (83.3%) reported having established networks with private health services, comprising a total of 55 facilities. Private practice midwives were the most common network partners (41.82%) from 75% PHCs, followed by private practitioner (29.09%) and private practices nurse (20.00%). Coordination with private healthcare networks was predominantly conducted

through direct communication (75%), while only one PHC reported using a WhatsApp group. When asked, seven (58.33%) PHCs indicated a perceived need for strengthening existing networks [Table 2](#).

Table 2. Mapping of private healthcare service networks by TB program officers at public health centres in Bangli District, Indonesia (2020)

No	Characteristics	Number of PHCs (n=12)	Percentage (%)	Number of Network Facilities (n,%)
1	Availability of private healthcare service networks			
	- Available	10	83.33	55 100)
	- Not available	2	16.67	
2	Availability of private healthcare service networks			
	- Midwife	9	75.00	23 (41.82)
	- General practitioner	7	58.33	16 (29.09)
	- Nurse	4	33.33	11 (20.00)
	- Clinic	4	33.33	5 (9.09)
3	Coordination strategy of TB program officers to the networks (n = 10)			
	- WhatsApp group	1	8.33	
	- Direct communication	9	75.00	
4	Perceived need of TB program officers for strengthening/expanding networks			
	- Yes	7	58.33	
	- No	5	41.67	

Table 3 describes the characteristics of respondents from private health services. A total of 47 respondents representing private health services were included in this study. The mean age of respondents was 41.74 years (SD $\pm$ 7.72), with the majority aged 35 years or older (74.47%). Most respondents were female (78.72%). Regarding educational background, 44.68% had a diploma-level education (D1-D3), while 36.17% held a professional, specialist, or master's degree. Only 29.79% of respondents reported having received training related to the TB program and surveillance. Among those who had attended training (n = 14), half participated before 2010 and half in 2010 or later. The majority of respondents worked in private practice midwives (64%), followed by private practitioners (28%). Most respondents were directly involved in service provision (92%), with only a small proportion holding program officer or management roles. In terms of work experience, 51.06% had worked for less than 10 years, while 48.94% had 10 years or more of experience.

Of the 47 respondents, 74.5% reported involvement in TB case detection activities. Among those involved (n = 35), most expressed commitment to

participating in the TB case detection network (88.6%). Among respondents not yet involved, 75.0% indicated willingness to participate.

Table 3. Characteristics of respondents representing private health services in TB case detection, Bangli District, 2020

No	Characteristics	Frequency (n=47)	Percentage (%)
1	Age (years)		
	Mean (SD)	41.74 (7.72)	
	< 35	12	25.53
	≥ 35	35	74.47
2	Sex		
	Male	10	21.28
	Female	37	78.72
3	Education level		
	Diploma degree	21	44.68
	Bachelor degree	9	19.15
	Professional/Specialist/Master degree	17	36.17
4	Training on TB program and surveillance		
	Yes	14	29.79
	No	33	70.21
5	Year of training (n=14)		
	< 2010	7	50.0
	≥ 2010	7	50.0
6	Workplace		
	Private practice midwife	30	64
	Private practitioner	13	28
	Private practice nurse	3	6
	Private Clinic	1	2
7	Job position		
	Service provider	43	92.0
	Program officer	2	4.0
	Management	2	4.0
8	Length of work experience		
	< 10 years	24	51.06
	≥ 10 years	23	48.94

PHCs were the main referral destination for presumptive TB patients (57.14%), followed by public hospitals (42.86%). Most respondents reported their role as referring presumptive TB cases (67.5%), while fewer provided diagnosis and treatment (30.0%), and only one respondent offered comprehensive TB services. Patient referral was the most common referral mechanism (74.36%). Slightly more than half of respondents used national standard TB recording and reporting forms (52.5%) (**Table 4**).

Summarizes the barriers to TB case finding reported by TB program officers at PHCs and private health services in Bangli District. Among PHCs (n = 12), the most frequently reported barrier was difficulty in TB case finding and close contact tracing (58.33%), followed by limited availability of facilities (50.00%). Funding constraints,

workload related to recording and reporting tasks, and weak coordination with private health services were each reported by one-third of respondents (33.33%).

Table 4. Involvement of private health services in TB surveillance system, Bangli District, 2020

No	Variable	Frequency (n)	Percentage (%)
1	Involvement in TB case detection (n=47)		
	Yes	35	74.5
	No	12	25.5
2	Commitment to involve in TB case detection network (n=35)		
	Yes	31	88.6
	No	1	2.9
	Do not know	3	8.6
3	Willingness to be involved as part of the network (among those not yet involved; n=12)		
	Yes	9	75.0
	No	3	25.0
4	Duration of involvement in the network (among those involved; n=35)		
	Before 2010	20	57.14
	2010–present	10	28.57
	Do not know	5	14.29
5	Referral destination for presumptive TB patients (among those involved; n=35)		
	Public health center	20	57.14
	Public hospital	15	42.86
6	Type of role performed in TB case detection (among those who are committed and willing to be involved; n=40)		
	Referring presumptive TB cases	27	67.50
	Referring for diagnosis and providing treatment	12	30.00
	Providing diagnosis, treatment, and follow-up	1	2.50
7	Method of referring presumptive TB cases (among those who choose to refer; n=39)		
	Referring patients	29	74.36
	Sending specimens	10	25.64
8	TB treatment provision options (among those who are committed and willing to be involved; n=40)		
	Referring to public health center or public hospital	27	67.50
	Treating patients directly in private services	13	32.50
9	Type of recording and reporting form used (among those who are committed and willing to be involved; n=40)		
	National standard TB case finding form	21	52.50
	Forms developed by private services	19	47.50

Among private health services (n = 35), the main barrier was low patient awareness and willingness to undergo TB examination (25.71%). Other reported challenges included patients' difficulty in producing sputum samples and disruptions in case finding during the COVID-19 pandemic (both 8.57%), while other barriers were reported less frequently (Table 5).

Table 5. Barriers to TB case finding based on TB program managers at public health centers and private health services in Bangli District, 2020

No.	Barriers/Difficulties	Frequency	Percentage (%)
Public Health Centers (n = 12)			
1	Division of recording and reporting tasks (multiple responsibilities and lack of training)	4	33.33
2	Funding constraints (transportation for specimen delivery, case finding, and close contact investigation)	4	33.33
3	Limited availability of facilities (specimen examination, transportation, computers, communication tools, standardized forms, and guidelines)	6	50.00
4	Difficulties in procurement of facilities (laboratory supplies not fully available)	1	8.33
5	Weak networking and coordination with private health services	4	33.33
6	Challenges in case finding and close contact tracing	7	58.33
Private Health Services (network partners) (n = 35)			
1	Difficulty identifying TB cases with cough symptoms lasting more than three weeks	1	2.86
2	Difficulty establishing extrapulmonary TB diagnosis	1	2.86
3	Patients' difficulty in producing sputum samples	3	8.57
4	Disruptions in case finding due to the COVID-19 pandemic	3	8.57
5	Shortage of tuberculin (Mantoux) reagents	1	2.86
6	Low patient awareness and willingness to undergo TB examination	9	25.71
7	Coordination issues with referral facilities regarding the use of standardized forms	2	5.71

Discussion

Mapping of private health services by TB program officers in Bangli District identified 55 private facilities distributed across the working areas of 10 PHCs, while two PHC areas currently lack private services. Among the 47 respondents representing private services, 74.5% are currently engaged in the program. Of this group, 88.6% expressed continued commitment to collaborating with PHCs within the TB case finding network. Furthermore, approximately 75% of providers not yet part of the network expressed willingness to participate. These findings highlight significant potential to enhance TB case detection in Bangli District through the active role and commitment of private health services.

Additionally, 58.33% of PHCs acknowledged the need to strengthen and expand the network. While direct communication and coordination via digital applications have been implemented, current evidence suggests these mechanisms require further reinforcement. The district-based Public-Private Mix (DPPM) strategy positions the PHC as a coordinator, serving as the primary link between national policies and private service providers within their working areas [18]. The role of the PHC is pivotal in expanding networks by strengthening technical capacity, facilitating diagnosis and referrals, and monitoring treatment compliance to ensure that all

private-sector TB cases are reported to the national surveillance system [8]. With robust coordination, PHCs can minimize missing cases and mitigate the risk of drug resistance through integrated treatment supervision [13].

Analysis of private health services in Bangli District indicates that approximately 64% are provided by midwives, highlighting their central role in healthcare delivery within rural communities. This predominance places midwives at the forefront of community outreach, particularly among vulnerable groups such as pregnant women, nursing mothers, and children, who often have regular contact with maternal and child health (MCH) services. Their strategic proximity to households is especially important for tuberculosis (TB) case finding in rural settings, where access to formal diagnostic facilities may be limited and pediatric TB frequently presents with non-specific symptoms. Through antenatal care, postnatal visits, child health monitoring, and routine health education, midwives are well positioned to identify presumptive TB cases early, provide counseling, and refer patients promptly to Directly Observed Treatment, Short-course (DOTS) facilities [19],[21]. Evidence also suggests that the active involvement of midwives in screening, referral, and treatment support contributes significantly to improved case detection and reduced transmission among high-risk populations. In addition, as Medication Supervisors (PMO), private practice midwives help maintain treatment adherence, mobilize family support, and monitor patient progress through their close emotional and geographical connection with the community. Therefore, strengthening the integration of rural midwives into the TB surveillance and referral system represents a strategic approach to reducing missed cases and accelerating progress toward district-level TB elimination targets [7],[18],[22],[23].

The study reveals that the majority of private service providers prefer referring TB suspects rather than other options. This preference aligns with treatment practices, where referrals to PHCs or public hospitals are predominant, although a notable proportion of providers continue to manage treatment within private facilities. This referral pattern is most prevalent among midwives, nurses, and individual practitioners, largely due to infrastructural constraints compared to private clinics or hospitals [18]. Furthermore, significant barriers to case detection, such as atypical clinical presentations and technical difficulties in sputum collection, underscore the critical need for accessible confirmatory diagnosis [7],[8]. While a minority of providers opt to transport samples, the prevailing practice remains direct patient referral. Consequently, enhancing the TB surveillance system requires strategic flexibility, supported by clear Standard Operating Procedures (SOPs) and intensive coordination between PHCs and the private sector [13],[24].

Among committed private providers, the preference for recording and reporting forms was nearly evenly distributed between national standard forms and

internal facility records, indicating persistent barriers in the reporting mechanism. Crucially, findings reveal that only 29.79% of private health services have received TB surveillance training. This limited coverage contributes to gaps in competence and adherence to national standards. Previous studies suggest that private practitioners often perceive notification obligations as an excessive administrative burden, leading to a reliance on internal documentation rather than standardized forms. Consequently, data generated by the private sector frequently remains incompatible with the national Tuberculosis Information System (SITB) [25],[26]. These results underscore that provider commitment alone is insufficient to guarantee data standardization without the concurrent transfer of knowledge via structured training. Therefore, it is imperative for the government to foster supportive partnerships by simplifying digital reporting tools and expanding training coverage to optimize the private sector's potential in detecting unreported cases [8],[27],[28]. This approach aligns with a multi-country analysis of TB strategies, which highlights the necessity of user-friendly electronic systems to facilitate effective private sector engagement [29].

This study identifies multifaceted barriers hindering TB case detection among PHCs and private health services in Bangli District. PHCs encounter complex operational constraints, ranging from administrative burdens in record-keeping to limited funding and diagnostic facilities. These challenges were further aggravated by the COVID-19 pandemic, which diverted critical resources and workforce, thereby disrupting essential activities such as contact tracing and network strengthening [18]. Furthermore, logistical deficits—including limited transportation for sample delivery and constraints in equipment procurement—have widened the gap of ‘missing cases’ at the regional level [14]. Consequently, it is imperative for the District Health Office and PHCs to integrate TB tracking systems with existing health infrastructure. Ensuring a dedicated budget allocation, resilient to external shocks like pandemics, is essential to maintain the continuity and effectiveness of the surveillance program.

Within the private health sector, primary barriers include low patient awareness regarding TB symptoms and technical challenges related to sputum collection. These obstacles were compounded by the COVID-19 pandemic, which induced patient reluctance to access healthcare facilities, thereby causing significant delays in diagnosis and treatment initiation. Furthermore, private providers face constraints in conducting independent screening due to insufficient coordination and inadequate on-site diagnostic infrastructure [8],[28]. Consequently, it is imperative for government and health authorities to strengthen efficient specimen referral systems and intensify public education campaigns aimed at destigmatizing the disease and promoting the importance of early screening [30],[31].

This study has several limitations, whereby the use of a cross-sectional design only provides a snapshot of the situation at a specific point in time, and therefore

cannot capture changes in private sector involvement on an ongoing basis or after the pandemic. There is also the potential for self-selection bias, whereby respondents who are willing to complete an online questionnaire are likely to be those who already have a higher level of interest or activity in TB programmes than practitioners who do not participate. Furthermore, through self-reporting by respondents, there is a risk of unverified information bias without direct observation of service practices in the field.

4. Conclusion

Private health services in Bangli District demonstrate strong commitment to the TB control network, with midwives serving as key frontline actors. However, the study identifies critical bottlenecks, including reliance on referrals due to diagnostic limitations and administrative burdens associated with non-standardized reporting. The gap in training and data compatibility further constrains the private sector's contribution to national surveillance. To bridge the gap between commitment and practice, it is imperative for the District Health Office to strengthen the District-based Public-Private Mix (DPPM) strategy. Future interventions must prioritize on enhancing coordination, expanding technical training coverage, upgrading basic diagnostic and referral infrastructure, and simplifying reporting systems to optimize private sector participation. Ensuring resilient funding and integrating private providers into the mainstream surveillance system are essential steps to minimize 'missing cases' and accelerate the achievement of TB elimination targets.

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