

Active Case Finding of Tuberculosis Among Household Contacts in the Special Region of Yogyakarta

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ABSTRACT

Background: Tuberculosis (TB) is an infectious disease and also one of the problems in the world due to the high mortality rate and thus becomes an economic burden. The Special Region of Yogyakarta (DIY), Indonesia, has an increasing incidence of tuberculosis, however the Case Detection Rate has not yet reached the target. One of the approaches used by the government of DIY to control TB is through the Active Case Finding Program of Tuberculosis. This research aimed to see the extent of TB case finding in DIY through the Active Case Finding Program.

Method: This is a quantitative-descriptive research. The type of data used in this research were the secondary data from the "Active Case Finding Program of Tuberculosis," obtained from the Health Department of DIY in 2017-2019. The sampling technique used the non-probability sampling based on registered TB patients at Primary health care. The screening was conducted through TB patients among household contacts and the closest neighbors.

Results: The Active Case Finding Program of Tuberculosis in DIY found that in 2017 to 2019 respectively that there were 19 TB patients positive out of 19.904 screened people, 13 TB patients positive out of 4.078 screened people and 27 TB patients positive out of 7.520 screened people. The incidence rates of TB patients per 10,000 population in 2017 to 2019 respectively 9.55; 31.88 and 35.9. **Conclusion:** The findings revealed that although ACF contributed to an increase in TB case detection—particularly in districts such as Sleman—the overall yield remained low compared to the number of individuals screened



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Introduction

Tuberculosis (TB) remains a major global public health challenge, particularly in low- and middle-income countries, where the disease continues to cause substantial morbidity, mortality, and economic burden (1). The World Health Organization (WHO) reported that TB remains one of the leading infectious causes of death worldwide, and the burden is still concentrated in high-incidence regions, especially South-East Asia. Indonesia continues to rank among the countries with the highest TB burden globally, underscoring the need for strengthened prevention, early detection, and treatment strategies (1, 2). Although progress has been made in TB treatment and

preventive therapy, global TB control remains suboptimal, and screening and diagnostic services still need to be strengthened substantially to meet End TB targets (2). One strategic plan taken by the Indonesian government in controlling TB risk factors is by screening TB patients in the community. Screening aims to identify and increase the detection of TB, both passively and actively, as well as to prevent TB transmission through an index of confirmed TB patients.

Household contacts of patients with pulmonary TB are among the groups at highest risk of infection and disease because they are exposed repeatedly and often for prolonged periods to infectious index cases. In addition, evidence suggests that transmission risk is not limited to people living in the same household, as close extra-household contacts may also contribute to ongoing community transmission (3). Household contacts of TB patients are among the most vulnerable groups, often experiencing repeated exposure to *Mycobacterium tuberculosis* without prompt identification or intervention. Emphasis on TB prevention not only spares individuals the burden of TB-associated morbidity and mortality but also reduces the economic impact of the disease on health systems (4). For this reason, contact investigation and Active Case Finding (ACF) have become important strategies for improving TB case detection. Studies have shown that enhanced or active household contact investigation can identify more TB cases than passive case finding (PCF), and in some settings it may also represent a cost-effective approach for improving early diagnosis (5, 6). The national TB case detection target in 2014 was 299 per 100,000 population, and it always increases every year. The Case Notification Rate (CNR) in Indonesia in 2014, 2015, and 2016, respectively were 125 per 100,000 population, 130 per 100,000 population, and 139 per 100,000 population. Accordingly, the CNR in Indonesia still has not yet reached the target (7). The coverage of detection of TB patients in DIY in 2014 was 58.6%, and 56.58% in 2015; this is still less than the target achievement of 70% (8).

The results of research in Myanmar showed an increase in case detection rate in an area that was implemented by a screening program (9). ACF has gained increasing attention as a programmatic strategy because it reduces dependence on self-presentation at health facilities and may contribute additional case detection at the community level. Nevertheless, the implementation of ACF in low- and middle-income countries is often constrained by several barriers, including limited diagnostic resources, insufficient training and workload among health workers, stigma, communication barriers, and low community awareness (10). Highlighted that subclinical TB cases are common and contribute silently to ongoing transmission. By incorporating systematic screening protocols—irrespective of clinical symptoms—ACF enables the identification of infectious individuals who would otherwise remain undetected under PCF models. Although ACF has been implemented in DIY, its effectiveness in detecting TB cases among household contacts has not been systematically evaluated. Therefore, this study aims to see the extent of TB case finding in DIY through the Active Case Finding Program of Tuberculosis.

Materials and Method

This is a quantitative-descriptive research. The data used in this research were the secondary data from the “Active Case Finding Program of Tuberculosis,” obtained from the Department of health of DIY in 2017-2019. The data obtained from this research were then analyzed descriptively with the frequency distribution.

The regions studied consisted of 5 regencies or cities in DIY. Each area consists all of Primary Health Care in 5 regency there are Yogyakarta City, Sleman Regency, Bantul Regency, Gunungkidul Regency and Kulonprogo Regency. Totally 121 Primary Health Care (11). The data were collected by primary health care officers based on the TB patient register data belonging to the primary health care. From each primary health center, up to three index TB patients were purposively selected, and their household contacts and nearest neighbors were screened. The screening was conducted by interviewing the household contacts of TB patients and their closest neighbors regarding the TB symptoms, including the presence or absence of weight loss, cough with phlegm, coughing up blood, sweating at night, fever for a long period, and shortness of breath and chest pain. If the household contacts and the closest neighbors had these symptoms, a diagnostic support examination would be carried out and classified into the suspected TB group. The suspects identified from the active case finding were further confirmed by the diagnosis of TB from the phlegm sample examination.

The variables in this study were structured to evaluate the effectiveness of Active Case Finding (ACF) for tuberculosis (TB) in the Special Region of Yogyakarta between 2017 and 2019. The primary independent variable was the implementation of the ACF program, which involved systematic contact tracing and TB screening among household members and neighbors of confirmed TB patients. The dependent variables included the Case Detection Rate (CDR),

defined as the proportion of diagnosed and reported TB cases relative to the estimated incidence; the number of suspect TB cases, identified based on clinical symptoms such as cough, fever, and weight loss; and the number of bacteriologically confirmed TB cases through AFB smear or MTC testing.

Operational Definition of Variables.

a. Contact Tracing

Contact tracing refers to the identification of individuals residing in the same household as, or in neighboring residences to, a confirmed TB patient. These individuals are presumed to have had close or prolonged exposure to the index case and are prioritized for TB screening.

b. Tuberculosis Patient

A tuberculosis (TB) patient is defined as an individual who has been bacteriologically confirmed as having TB through sputum examination, with the detection of acid-fast bacilli (AFB) indicating active infection.

c. Case Detection Rate (CDR)

The Case Detection Rate represents the proportion of TB cases that have been diagnosed and reported among the estimated total number of TB cases (incidence) in the population during a specific period. It serves as an indicator of the effectiveness of TB surveillance and case-finding activities.

d. Suspect TB Case

A suspect TB case is defined as an individual presenting with clinical symptoms consistent with TB, including persistent cough, fever, and unexplained weight loss. These individuals are subjected to further diagnostic evaluation to confirm or exclude active TB disease.

The primary instrument used in this study was secondary raw data obtained from the Yogyakarta Provincial Health Office (Dinas Kesehatan Daerah Istimewa Yogyakarta). The dataset comprised the results of contact tracing activities conducted as part of the Active Case Finding (ACF) program from 2017 to 2019. This data included records of identified contacts, symptom screening outcomes, referrals, laboratory confirmations (sputum smear and MTC testing), and reports of confirmed TB cases from each primary health care center (Puskesmas) across the five administrative regions. The dataset served as the basis for evaluating suspect identification, diagnostic confirmation, and calculation of the Case Detection Rate (CDR) in each region in DIY.

Descriptive statistics were employed to summarize the frequency and percentage distribution of demographic and diagnostic outcomes across districts and study years. The trend in CDR from 2017 to 2019 was analyzed to assess the program's effectiveness. Cross-sectional comparisons were conducted between pre-ACF and post-ACF implementation periods to identify any significant improvements in TB case detection.

Results

One of the important variables in controlling and controlling TB is the conduct of screening in a regional population. Tuberculosis screening is useful for finding TB cases as early as possible so that treatment can be done in the form of treatment or referrals to TB sufferers (16). The screening program run by the DIY government is the Active Case Finding Program of Tuberculosis. The program is carried out by finding contacts in the household of TB sufferers and close neighbors. Active Case Finding of Tuberculosis was carried out by involving all Primary Health Care in DIY. The flow of case finding can be seen in Figure 1.

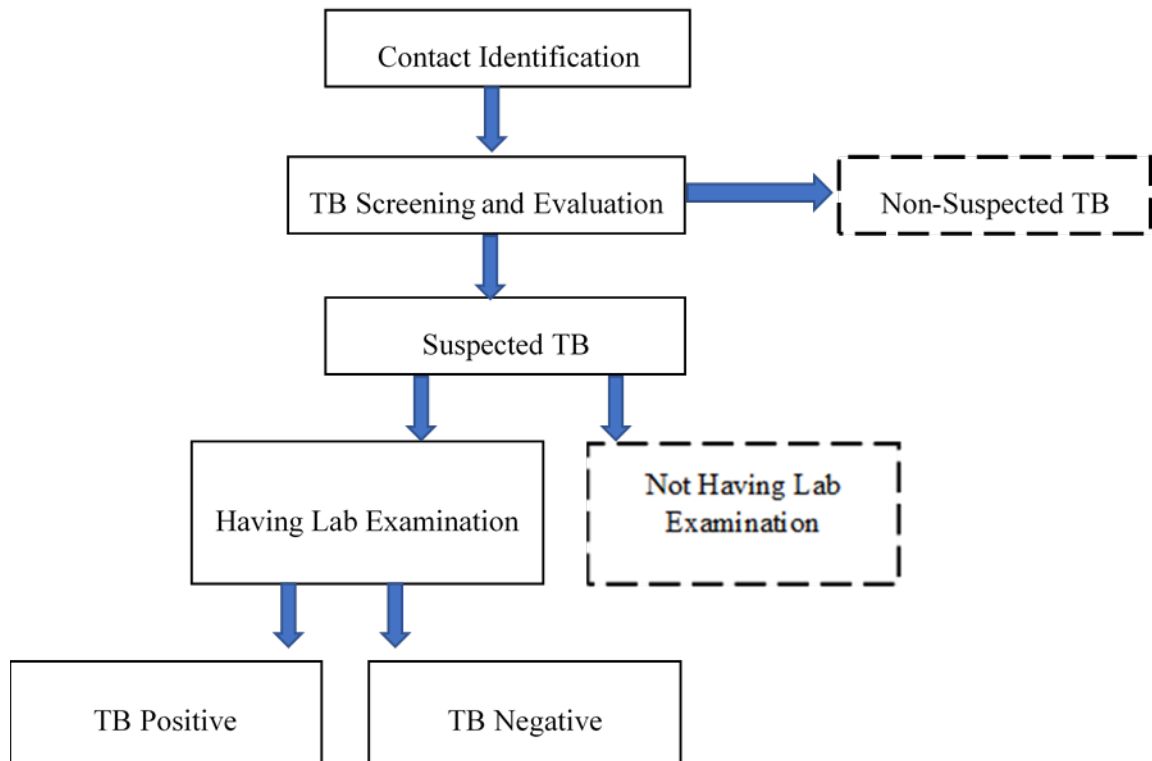


Figure 1. Flow chart Active Case Finding of Tuberculosis

Based on Figure 1, there are two core stages in the screening process for the Active Case Finding Tuberculosis. The first stage is to separate those with symptoms and those with no symptoms. For those with symptoms, they will be excluded, and categorized as non-suspected TB. Meanwhile, for those with no symptoms, diagnostic support examination will be carried out, with the examination results being confirmed as TB positive or negative.

Table 1. Characteristics of Active Case Finding of Tuberculosis in 2019

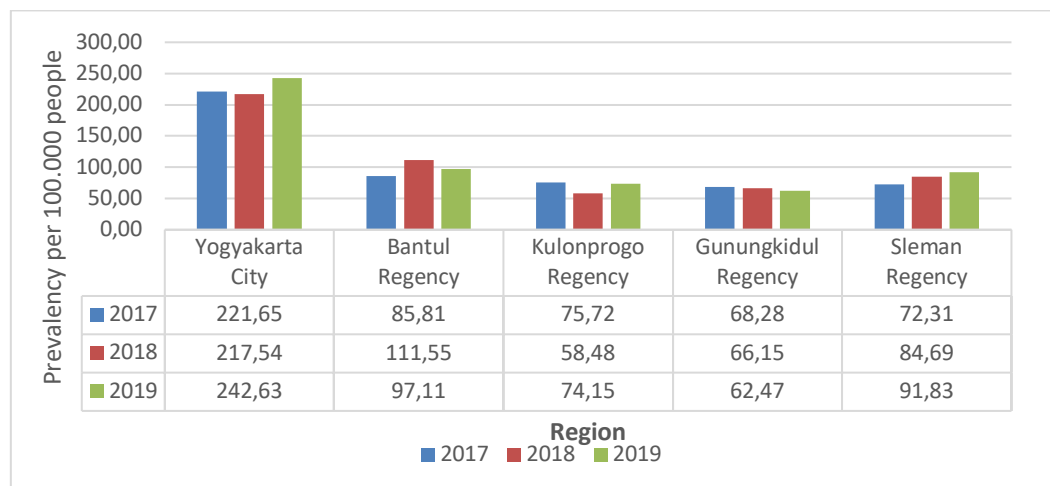
	Gunungkidul		Kota Yogyakarta		Bantul		Sleman		Kulonprogo	
Variable	Frequency N= 1.267	%	Frequency n= 1043	%	Frequency n=571	%	Frequency n=1.313	%	Frequency n= 971	%
Sex										
Male	636	50.2	484	46.4	291	51.0	642	48,9	473	48.7
Female	611	48.2	551	52.8	280	49.0	671	51,1	495	51.0
No information									3	0.3
Age										
0 - 10	145	11.4	93	8.9	81	14.2	162	12.3	115	11.8
11 - 20	167	13.2	139	13.3	79	13.8	183	13.9	129	13.3
21 - 30	145	11.4	148	14.2	78	13.7	237	18.1	117	12.0
31-40	183	14.4	149	14.3	85	14.9	176	13.4	133	13.7
41-50	185	14.6	152	14.6	90	15.8	200	15.2	137	14.1
51-60	195	15.4	165	15.8	75	13.1	188	14.3	164	16.9
>= 61	190	15.0	155	14.9	74	13.0	167	12.7	159	16.4
NA	57	4.5	42	4.0	9	1.6			17	1.8

Table 2. Description Suspected and Incidence rate Tuberculosis In 2017-2019.

Region (Regency/city)	2017				2018				2019			
	TSP	STB	TB (+)	IR	TSP	STB	TB (+)	IR	TSP	STB	TB (+)	IR
Yogyakarta	2.289	166	10	43.69	688	54	2	29.07	1.071	81	5	46.69
Bantul	4.465	164	2	4.48	1.014	127	1	9.86	1.970	128	1	5.08
Kulonprogo	4.668	66	2	4.28	598	51	0	0	1.067	73	0	0
Gunungkidul	3.063	182	3	9.79	1.067	141	3	28.18	1.847	144	3	16.24
Sleman	5.419	294	2	3.69	711	60	7	98.45	1.565	127	18	115.02
TOTAL	19.904	872	19	9.55	4.078	433	13	31.88	7.520	553	27	35.9

Note: TSP = total screened people; SP = screened people; IR = incidence rate; STB suspected tuberculosis; TB = tuberculosis

Prevalence tuberculosis in DIY at 2017- 2019 in population can see at Figure 2.

**Figure 2.** Prevalence Tuberculosis in Special Region Yogyakarta 2017 – 2019.

Discussion

TB case finding activities based on household contacts are in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No.67 of 2016 concerning Tuberculosis prevention, which states that the National Targets for preventing TB are TB Elimination in 2035 and Indonesia is TB-free in 2050. The TB Elimination is to achieve a TB case coverage of 1 per 1 million population. In 2020, it was targeted that the morbidity rate due to TB would decrease by 30% from 2014, and a decrease in the death rate due to TB by 40% compared to 2014 (12). The active TB case finding is a global health priority (13). WHO recommends that the active TB case finding be carried out in high-risk groups with a prevalence of more than 100 patients per 100,000 people. The groups prioritized are household contacts and close contacts with TB patients, people with HIV, homeless, and urban poor (14).

This study evaluated the implementation of Active Case Finding (ACF) for tuberculosis (TB) among household contacts and nearby neighbors in the Special Region of Yogyakarta (DIY) during 2017–2019 using routine program data. Overall, the findings indicate that ACF contributed additional TB case detection in the province, but the diagnostic yield remained low relative to the number of individuals screened. Although the number of confirmed TB cases increased from 19 cases in 2017 to 27 cases in 2019, the overall positivity remained modest, and substantial variation was observed across districts. These findings suggest that ACF under routine primary health care implementation can improve case detection, but its performance is highly dependent on screening strategy, diagnostic capacity, follow-up completion, and local epidemiological context. Research in Bandung showed that there were 22.9%, or more than 498 patient contacts,

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with one symptom; and 8.1% of patients were TB+ (15). The research results in India showed that the TB case finding by the Active Case Finding found 8.7% of TB patients. The Active Finding can identify 63% of new cases (16).

The case finding between one region and another by means of Active Case Finding varies widely. It also shows different results between the regencies and cities in DIY. Compared to the findings in Bandung and India, the Active Case Finding in DIY was very low in 2017, only 9.55 per 10,000 population, in 2018 it was 31.8 per 10,000 population, and in 2019 it was 35.9 per 10,000 population. The case prevalence conducted door-to-door in other research can reach 2 to 7.6% (17). The contribution of the Active Case Finding in DIY is still small compared to the Passive Case Finding. Most of the findings of TB patients still come from the Passive Case Finding from clinics or hospitals (18). In India, systematic household contact investigation contributed an additional 63% TB cases compared with passive case detection alone, demonstrating that contact-based screening can identify cases that would otherwise remain undetected (16). Similarly, a clinic-based study in South India reported a TB yield of 5.3% among screened household contacts and showed that the number needed to screen was particularly low among contacts with abnormal chest radiography (19). The relatively low yield in the present study therefore does not necessarily imply that ACF lacks value; rather, it suggests that the current implementation approach in Yogyakarta may not yet be optimized to detect the full burden of disease among exposed contacts.

In 2017, the highest IR was in the Yogyakarta City, amounting to 43.69, due to the high number of patients with TB+, in which The TB prevalence in Yogyakarta City reached 221.7 per 100,000 population. Meanwhile, in 2018 and 2019, the highest case finding rate was in the Sleman Regency; the highest IR over the past two years has been there (see Table 1). The TB prevalence case in Sleman Regency in 2018 and 2019 was 84.7 and 91.8 per 100,000 population, respectively. Based on the most TB patients' prevalence in Yogyakarta City, this is also supported by the high population density which reaches 13,000/km² (see Table 2). Population density is a risk factor for TB transmission (20). Many factors influence TB transmission in the community, including the length of contact with the patient, ventilation, nutrition status, social status, and the history of vaccinations (3).

The IR number of this research showed an increase in results, possibly due to the benefit of the Active Case Finding program that was implemented. However, the extent of the case findings during the program, whether it gave better results, still needed evaluation. The results of this research indicated the case finding low rate with the Active Case Finding can be due to the case finding of household contacts and neighbors, which phlegm examination was conducted, was only for those with symptoms; while those with no symptoms were not examined. This can result in the absence of symptom-free patients. Several other research showed TB cases with no symptoms; however, after being examined, they were diagnosed with TB (21). TB patients with no symptoms tend to be seek treatment reluctantly since they just feel well (22). This can have an impact on transmission to the surrounding environment. Meanwhile in other research, the TB patients with no symptoms reached 12% (15). Recent evidence from a high-burden setting showed that symptom burden was substantially lower among individuals identified through ACF than among those detected through passive case finding, and broader literature cited in that study indicates that a considerable proportion of bacteriologically confirmed TB may occur in persons who do not report cough or even any TB-related symptom [6]. In practical terms, this means that symptom-based screening alone may underestimate the true burden of TB among household contacts and nearby neighbors.

The low rate of the case finding in this research could also be due to the presence of suspected cases detected from ACF that did not continue the diagnostic examination. Those with suspected TB who did not follow diagnostic examination were 19.1% in 2018, and as many as 27.8% in 2019; there was no information in 2017. Public participation can be influenced by affordability of health facilities, socio-economic factors, and knowledge. The existence of stigma in society can be a factor influencing the participation in diagnosis (13).

The findings highlight both the opportunities and constraints of ACF implementation in a decentralized health system such as Yogyakarta's. While the increase in confirmed TB cases between 2017 and 2019 may signify better case finding, the persistent regional disparities and relatively low detection rates point to underlying systemic weaknesses, including programmatic coverage, diagnostic approaches, and follow-up mechanisms. Such shortcomings could hinder the broader goal of reducing TB burden, especially given that untreated or late-treated TB contributes significantly to transmission and mortality (14).

Early identification of suspected TB cases through the Active Case Finding program will be one of the national strategies in resolving the TB cases in Indonesia. There is a need for a strategy in finding cases in household contacts with TB patients in order to produce better findings. Case-finding activities with household contacts need to be carried out in an integrated manner along with national surveillance activities (16). The finding for contacts also needs to consider the existed risk factors such as smokers within family members, lack of ventilation, unclean home environment, and whether there are more than six family members. TB is potentially contagious during contact with TB patients (23). The use of several diagnostic methods together can be applied to increase the recovery rate (24). ACF activities need cooperation between the central chairmen, patients, administrators, and the regional service (13).

For regional health authorities, these findings suggest an urgent need for strengthening diagnostic strategies, investing in mobile and community-based screening, and integrating behavioral support interventions. The introduction of isoniazid preventive therapy (IPT), though underutilized, could offer substantial protective benefits for high-risk contacts if paired with ACF initiatives (4). Thus, aligning ACF with both preventive and curative frameworks is critical to achieving TB elimination targets in Yogyakarta and similar settings.

From a policy perspective, the present study supports continuation of ACF in DIY, but with substantial refinement. First, symptom-only pathways should be reconsidered because they are likely to miss a proportion of infectious or early-stage TB cases (6). Second, the use of more sensitive tools such as chest X-ray and rapid molecular assays should be expanded, especially for presumptive cases and high-risk contacts (19), (25). Third, district programs should strengthen follow-up systems to reduce losses between symptom screening and confirmatory examination. Fourth, health education and counseling should be integrated more systematically into ACF activities, given the evidence that knowledge and provider communication can improve adherence to household contact screening (26). These refinements would likely improve both the effectiveness and the efficiency of the program.

This study has several limitations. First, the use of secondary data may introduce reporting biases. Second, the lack of diagnostic data for asymptomatic contacts likely underestimates true TB prevalence. Third, the absence of follow-up data for suspected cases limits our understanding of program completion. Fourth, district-level differences in implementation quality could not be measured directly, limiting interpretation of regional variation. Nevertheless, the study remains important because it reflects real-world ACF performance under routine public health conditions rather than under tightly controlled research settings.

The increasing trend in confirmed TB cases within a reduced screening population may reflect an improvement in case identification efficiency. However, to enhance ACF performance, efforts must focus on integrating advanced diagnostics such as molecular testing, improving treatment adherence, and strengthening community-based outreach. Importantly, regional health authorities should consider embedding ACF within a broader continuum of care, including preventive therapy, to optimize its long-term public health impact. The study underscores the need for localized, data-driven strategies to ensure that ACF becomes a more effective pillar in Indonesia's TB control agenda.

Conclusion

This study demonstrates that Active Case Finding (ACF) among household contacts and nearby neighbors contributed to tuberculosis (TB) case detection in the Special Region of Yogyakarta during 2017–2019, but its overall diagnostic yield remained limited under routine program conditions. The increase in confirmed cases over time suggests that ACF has programmatic value as a complementary strategy to passive case finding, particularly in settings where delayed care-seeking may allow ongoing household and community transmission. However, the relatively low number of confirmed cases compared with the large number of individuals screened, together with the marked variation across districts, indicates that the current implementation model has not yet achieved optimal effectiveness.

The findings suggest that the main limitations of the current ACF approach lie in the probable under-detection of asymptomatic or subclinical TB, variation in implementation quality across districts, and losses in the diagnostic follow-up pathway after initial screening. Therefore, strengthening ACF in Yogyakarta will require a shift from predominantly symptom-based screening toward more sensitive and better-targeted strategies, including broader use of chest X-ray triage, rapid molecular diagnostics, stronger referral completion, and closer monitoring of the screening-to-treatment cascade.

From a public health perspective, ACF should be maintained and refined rather than discontinued. Its greatest value is likely to be achieved when it is integrated with risk-based targeting of high-priority contacts, standardized district-level implementation, and linkage to preventive and curative TB services. Future research should assess the full cascade of care, compare alternative screening algorithms, and evaluate the cost-effectiveness of enhanced ACF models under routine Indonesian program settings. Such improvements are essential if ACF is to function as a stronger component of TB elimination efforts in Yogyakarta and other high-burden settings.

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