ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF ALLIED HEALTH SCIENCE

DEPARTMENT OF HEALTH ECONOMICS

Cost-Effectiveness of adding Tuberculosis Active Case Finding on Passive Case Screening Approach in Dire Dawa Town

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I, the undersigned MSc student, declare that I have submitted my original work on a title Cost-Effectiveness of adding Tuberculosis Active Case Finding on Passive Case Screening Approach in Dire Dawa Town for the examination.

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Abbreviations

ACF	Active Case Finding
AFB	Acid Fast Bacilli
BCG	Bacillus Calmette–Guerin Vaccination
CEA	Cost –Effectiveness Analysis
DOTS	Directly Observed Treatment Short Course
GDP	Gross Domestic Product
HCI	Household Contact Investigation
HMIS	Health Information Management System
HEWs	Health Extension Workers
HEP	Health Extension package
ICER	Incremental cost effectiveness ratio
LTBI	Latent Tuberculosis Infection
MOH	Ministry of Health Organization
MTB	Mycobacterium tuberculosis
NTP	National Tuberculosis Control Programme
PCF	Passive Case Finding
TB	Tuberculosis
WHO	World Health Organization

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Abstract

Introduction: The standard passive case finding (PCF) strategy is inadequate in detecting all TB cases. Active case finding (ACF) was suggested to be effective alternative, but empirical evidence of its cost-effectiveness is sparse. Prevention and control of tuberculosis (TB) is one of the components in the health extension package (HEP)and follow-up of contact tracing in tuberculosis (TB) burden areas, such as Dire Dawa is beneficial in improving smear-positive tuberculosis (TB)case detection the presence of those Health Extension workers in each community. This study evaluated the cost effectiveness of community active case finding compared to passive case finding in Dire Dawa town.

Objective: The objective of this study is to compare cost effectiveness of active and passive case finding for tuberculosis in Dire Dawa Town.

Methods: A Cross sectional study design was used and the economic cost was performed from provider perspective. The costing was based on bottom up costing method and intermediate outcome of number of TB case found by each interventions was used as an effectiveness. Decision tree model was structured and constructed to compare the cost effectiveness of Active case finding with a passive case finding and Incremental cost effectiveness ratio(ICER) of the least cost effective strategy was reported. One-way sensitivity analysis using tornado diagram was performed on costs and probabilities.

Results: The cost effectiveness study showed that incremental cost effectiveness ratio (ICER) of active case finding compared with passive one was found to be $536.6 per positive TB case. Based on the Gross Domestic Product (GDP) rule as per the recommendation of World Health Organization (WHO) which was used to recommend cost effectiveness intervention showed that the 2017 GDP per capita estimate of Ethiopia to be $873, and in this case active case finding is the cost-effective intervention.

Conclusion: Active case finding is optimal intervention to identify more number of positive TB case finding with less cost than the passive case finding. Therefore, I strongly suggest the use of ACF to improve the health of the community and to reduce economic burden incurred due to tuberculosis.

Key words: cost effectiveness analysis, active case finding, passive case finding

1. INTRODUCTION

1.1. **Background**

Tuberculosis (TB) is contagious and air borne, is one of the top ten causes of death worldwide, and responsible for more deaths than HIV and malaria. Globally in 2016 there was an estimated 6.3 million incident case of TB equivalent to 61% cases per 100,000 populations. The six countries that stood out as having the largest number of incident case in 2016 were (in descending order) India, Indonesia, China, Nigeria, Pakistan and South Africa.(1).

In 2016, the global incidence of tuberculosis was 133 cases per 100 000 populations. The World Health Organization (WHO) wishes to reduce the global incidence of tuberculosis below 10 cases per 100 000 populations by 2035 (1).

Different strategies have been working to control TB globally including vaccination, early diagnosis and treatment of active TB disease and of latently infected individuals. Early treatment of active cases be contingent upon efficient and timely diagnosis, which is not easy at least in poor income countries based on the current diagnostic tools and strategies (2).

Despite the presence of effective anti-TB therapy and overall good treatment outcome case detection rated for TB has been poor due to ineffective case finding techniques. It is well established fact that pulmonary tuberculosis (PTB) is most infectious when Mycobacterium tuberculosis (MTB) are present in the sputum. Many studies have reported this finding. (3).

Family and house hold contacts top them all in whom have proven that active case finding among house hold contacts (HHCs) yields substantially more TB case than passive case detection. Family and house hold contacts top them all in whom TB is found to be most frequent and close contact screening is therefore standard practice in developed countries and such screening programs intended to find active cases of TB in high risk populations (TB) is found to be most frequent and close contact screening is therefore standard practice in developed countries and such screening programs intended to find active cases of tuberculosis (TB) in high risk populations (4). Several studies have proven that active case finding among House hold contacts (HHCs) yields substantially more TB case than passive case detection (5).

The Ethiopia TB control program relies on passive case finding of TB cases. The predominantly urban-based population in Ethiopia has enough access to health facilities but many barriers to use health services. The active case finding program aimed to bring TB diagnosis services closer to communities has been implemented through partnership with health extension workers (HEWs). They undertook advocacy, communication and social mobilization activities, identified symptomatic individuals, at community level (6).

Current TB control policy stresses case finding through sputum smear microscopy for patients who self-report to primary health centers. However, this means that the cycle of infection is not being destroyed; it is evident that the risk of developing active TB among suggestive household contacts of index cases identified this way is very high (6).

Active case finding necessarily involves added costs to the system, therefore understanding the cost-effectiveness around this strategy is needed. In 2014, modeled estimates reported active case finding in India, China and South Africa was considered highly cost-effective in short term and longer term models, even if costs were over US $1,000 to detect and treat and active TB case. In Ethiopia, the effort of controlling tuberculosis began in the early 1960s with the establishment of TB centers and sanatorium in three major urban areas of the country. A standardized TB prevention and control Program, incorporating Directly observed treatments (DOTS) was started as a pilot in Arsis and Bale zones of Oromia region (7).

According to Federal Ministry of Health Ethiopia 2008, a country with the seventh highest TB burden in the Africa. The national TB Program relies on passive case finding at health facilities, but there is recognized need to strengthen community screening. Patients diagnosed with TB initiated treatment in the community, they were supported by health extension workers through the local health post and case notification increased from 64 to 127/100,000 population/year (8).

Ethiopia ranks third in Africa and seventh among the 22 highest tuberculosis (TB) burdened countries in the world. The prevalence of all forms of TB is estimated at 199 per 100,000 populations, leading to an annual mortality rate of 64 per 100,000 populations. The incidence rate of all form of TB is 108 per100, 000 populations. The TB case detection rate, treatment success rate and cure rate are 74 percent, 82.5 percent and 67 percent respectively (1)

There was regional disparity in TB case notification, very high greater than 200/100,000) TB case notification rates per 100,000 populations were reported in major urban areas (Dire Dawa, Addis Ababa, Harari); whereas, Somali Region reported less than 100 TB cases per 100,000 populations, far lower than the national level. In EFY 2007, the TB case detection rate was 67.3 percent, which was more than last year 53.7 percent but below the target set for the year 83.0 percent. Differences were observed across regions, ranging from 32.6 percent in Somali Region to over 100 percent in Afar, Gambella, Harari, Addis Ababa and Dire Dawa (8).

In conclusion active case finding detection based on contact investigation follow-up could help in detecting more TB cases the follow-up of contact tracing in TB burden areas, such as Dire Dawa is beneficial in improving TB case detection The presence of health extension workers (HEWs) in each community under the community-based initiative of Health Extension workers could ease the follow-up. Prevention and control of TB is one of the components in the Health Extension package. Thus, health extension workers could set up a smear positive TB registry at health center and health post and the HEWs could teach the community advantage of TB screening and give sputum for microscopy.

1.2. **Statement of the Problem**

Tuberculosis case detection remains a major challenge for TB control especially in Africa. Nearly 30% of infectious TB cases remain undetected leading to continuing transmission, individual suffering and death. In addition, TB disrupts the socio- economic welfare of society because it affects the most productive age-group of 15 to 54 years. The standard passive case finding (PCF) strategy for detecting TB cases has met with limited success in Africa. The major reasons include patients' delays, a lack of awareness of TB symptoms and lack of access to health care (9).

Ethiopia case detection rate remain steady 69 percent against the expected Global target. The WHO target for TB case detection is 90 percent and above. We attribute this low case detection to poor access to TB diagnostics, poor skills among health workers, and low public knowledge about TB (10).

Case detection by passive case finding (PCF) strategy alone is inadequate for detecting all tuberculosis (TB) Cases in high burden settings especially Sub-Saharan Africa Alternatives Case detection strategies such as community Active case finding (ACF) and House Hold contact investigation (HCI) are effective but empirical evidence of their cost-effectiveness is sparse (11).

Active case finding may prove to be cost-effective in the long run because of new cases prevented new evidence on the cost and cost-effectiveness of ACF in an attempt to address the long-standing policy claim that active case finding is very costly and labor-intensive(12).

Active case finding among House Hold contact believed to help patients to get early treatment and cure from disease while passive treatment leads to delay in treatment which may contribute high mortality due to TB and aggravate severity. Therefore, it is important to see the cost effectiveness of active case finding detection methods to get evidence so that the policy makers can decide based on the evidence. this the cost-effectiveness study provides key information on the optimal case detection strategy in an Ethiopian context (13).

1.3. Significance of the Study

This cost effectiveness study on ACF compared to PCF will help those concerned bodies in regional government and other development actors aiming at formulating and implementing related strategy to work on TB prevention and control to improve their efficiency and use resource efficiently to Improve TB case detection by less resource which will give higher value to resource.

The community will be better off by timely reducing economic and health impact of TB burden which will improve productivity and decrease the long term economic loss due to the higher prevalence of the disease in Dire Dawa town. Moreover, the study has gathered basic evidence, which shall also serve as in puts for researchers and policy makers who may further wish to consider the subject matter of this investigation in the future study.

2. LITERATURE REVIEW

This section provides review of the state of the existing literature on tuberculosis case finding especially in Sub-Saharan Africa. First, background of TB control using the standard DOTS strategy and its limitations are explained. Second, a brief historic perspective of work on active case finding is provided.

2.1. The Natural History of Tuberculosis

TB is an airborne disease caused by the bacterium *Mycobacterium tuberculosis* (*M. tuberculosis*) *M. tuberculosis* and seven very closely related mycobacterial species (*M. bovis, M. Africanum, M. microti, M,* and *M. mungi*) together comprise what is known as the *M. tuberculosis* difficult. Most, but not all, of these species have been found to cause disease in humans. It typically affects the lungs but can affect other sites as well (extra pulmonary TB). The disease is spread in the air when people who are sick with pulmonary TB expel bacteria, for example by coughing the organism.is spread by human to human contact through airborne droplets expelled when a person with active TB disease sneezes, and coughs, laughs or talks (14).

M. tuberculosis is carried in airborne particles, called droplet nuclei *M. tuberculosis* is carried in airborne particles, called droplet nuclei, of 1 to 5 microns in diameter. Infectious droplet nuclei are generated when persons who have pulmonary or laryngeal TB disease cough, sneeze, shout, or sing. Depending on the environment, these tiny particles can remain suspended in the air for several hours. *M. tuberculosis* is transmitted through the air, not by surface contact. Transmission occurs when a person inhales droplet nuclei containing *M. tuberculosis,* and the droplet nuclei traverse the mouth or nasal passages, Upper respiratory tract, and bronchi to reach the alveoli of the lungs (14).

The terms sputum smear positive and sputum smear negative are used within TB programs as a categorization of the quantity or load of acid fast bacilli (AFB) in sputum smear samples observed under microscopy. The bacillary load in sputum samples is considered a marker for infectiousness in active TB cases, such that TB cases with higher bacillary loads (AFB counts) are classified as sputum positive which may lead to more secondary infections and active TB cases amongst their contacts. Secondary cases of TB can be attributable to transmission from sputum smear negative cases, however sputum smear positivity are considered the main source of transmission in the community and remain the top priority for TB control programs in managing spread (15).

In addition to bacterial burden (smear positivity), the following factors are also considered important in estimating the probability of transmission from TB cases to other persons: cavitary and upper lung zone disease, laryngeal disease, amount and severity of cough in the source case, duration of exposure, proximity to the source case, crowding and poor room ventilation, delays in diagnosis and/or ineffective treatment (16).

Tuberculosis (TB) is one of the major public health problems in developing countries(17). If untreated, the case fatality rate is estimated to be 70 percent and 20 percent for smear-positive and smear-negative TB patients, respectively(18). Untreated smear-positive TB patients are the main cause of infection. Thus, TB cases should be known and treated in a suitable manner. But, a large number of TB cases have not been identified in many sub-Saharan African countries. Internationally, about 3 million people who developed TB in 2012 were missed by national notification Systems.(19).

In the past two decades, the Directly Observed Treatment Short-Course (DOTS) strategy and the subsequent Stop TB (DOTS expansion) strategy, recommended by the World Health Organization (WHO), saved more than five million lives.(20). However, total case numbers continue to rise and tuberculosis (TB) remains the leading infectious cause of death worldwide (21).

In the majority of TB endemic settings worldwide, the status quo for TB case finding is based on “passive case finding” (PCF). This relies upon a patient with active TB experiencing symptoms serious enough to seek health care and a health-care system capable of correctly diagnosing the patient’s condition (22). However, this strategy is grossly inadequate to detect the substantial burden of undiagnosed TB in the community. It is estimated that in 2014, more than 3.5 million people who developed TB (one-third of all cases) were “missed” by the health system (23). This massive case detection gap culminates in late disease presentation, with poor disease outcomes, and undiagnosed infectious cases continuing to spread infection within families and communities.

2.2. **Global TB Control Strategies**

a) Case Detection

Early case detection and prompt initiation of effective treatment is a principle means of controlling transmission and reducing tuberculosis (TB) incidence. Globally, the overall estimated case detection rate is 60 percent but is as high as 89 percent in developed countries and as low as 55 percent in developing countries. For any given year, the case detection rate is calculated as the total number of new and relapse cases diagnosed and reported divided by the estimated number of incident cases (24). Case detection has stagnated in recent years, while the rate of decline in estimated TB incidence has been slower than expected (25). This trend is indicative of a potential detection gap.

The World Health organization official global TB control policy advocates the Directly Observed Treatments strategy, which relies on passive self-presentation for case detection.(26).Despite the successes of DOTS in controlling TB in, some evidence suggests that active case-finding may be an essential component of TB control in high-prevalence areas, mainly in the setting of HIV. (27). Self-presentation to a health center by symptomatic persons alone may be insufficient to detecting enough cases of TB to make an impact on the epidemic.

The term ‘‘active case finding” (ACF) includes any methods for TB identification that does not rely on patients presenting to the healthcare system of their own accord.(28). The objectives of ACF are to diagnose and treat patients earlier, thereby reducing negative treatment outcomes, and socioeconomic consequences, as well as reducing the period of infectiousness and therefore transmission.

The poor knowledge disproportionate barriers in accessing TB diagnostic services and can incur the highest relative costs relating to illness and healthcare. These are important causes of delay in accessing TB services, and this group has been identified as susceptible. Active case finding (ACF) is a screening strategy used to analytically search for possible TB cases in groups thought to be at high risk, rather than waiting for patients to present themselves for medical attention. Screening aims to ensure that active TB is detected early and treatment is initiated promptly and so reduce poor disease outcomes and the adverse social and economic consequences of TB. ACF is increasingly used alongside efforts to improve advocacy, communication and social mobilization for TB and other diseases. There are a growing number of innovative approaches aimed at increasing case finding that include using informal private providers and community health workers.(29)

b) Passive Case Finding and newly adopted Active case finding TB Control Strategy

The standard passive case finding (PCF) approach relies on patients who present voluntarily to the health system. However, the reliance on self-presentation of patients has several limitations. First, patients often present late to the health system after transmitting TB for weeks and months before diagnosis and initiation of effective therapy (30).Passive case finding refers to the current strategy within the WHO DOTS program. The program receives and diagnose persons with symptomatic TB who self-present for care (31).

Enhanced case finding refers to various modifications of the passive system, relying primarily on extensions of passive case finding, such as education or advertising or including incentives for presenting to clinics for evaluation (32). Previously, passive case finding was considered sufficient for TB control programs in LMICs based on the assumption that symptomatic TB cases would eventually seek care and be captured by the health care system.

Active case finding, also called intensified case finding, refers to strategies of actively searching for TB disease in a defined population, which require more intensive efforts on the part of Health services, often involving screening endeavors outside of clinics (33). Active case finding in LMICs refers to case finding strategies in defined populations which can range from community-based activities such as door-to-door campaigns, annual community based surveys and mobile vans with screening services. More targeted case finding activities in based surveys and mobile vans with screening services. More targeted case finding activities in specific high- risk groups include screening HIV patients and evaluation of household contacts with a known recent exposure to smear positive TB cases (34). In contrast to passive case finding, active case finding implies a provider initiated effort to actively seek TB cases or those at-risk for having TB, outside of health facility settings. In particular, active case finding seeks TB suspects who may not self-present to health facilities in a timely manner.

ACF is a non-conventional, provider-initiated strategy to identify symptomatic individuals within the general community or high-risk groups who are suspected to have active TB disease but have not sought care. Alternative case detection strategies such as community Active Case Finding (ACF) and Household Contact Investigations (HCI) are effective but empirical evidence of their cost-effectiveness is scarce (35).

2.3. **Other TB Control Strategies**

Bacillus Calmette–Guérin **(**BCG) vaccination is a primary prevention strategy. The vaccine is given at birth to provide protection against the most severe forms of childhood TB (miliary and meningeal tuberculosis), but these forms of disease are not associated with transmission (36).
meta-analysis of published efficacy studies of BCG vaccine against TB reported a summary protective effect of 51%. However, BCG does not prevent reactivation of latent pulmonary infection to active disease, which is the principal source of bacillary spread in the community. The impact of BCG vaccination on transmission of *Mycobacterium tuberculosis* is therefore limited (37).

Treatment of latent TB infection is a secondary level control strategy and a person who is infected with *Mycobacterium tuberculosis* is treated using one or more anti-tuberculosis drugs to prevent the development of active TB. The WHO recommends tuberculosis preventive therapy for all HIV-infected populations because they are at greatest risk for developing active disease (38).

Infection control through work practice and administrative measures has the greatest impact on preventing TB transmission in healthcare settings (39). The prevent TB exposure to health workers and patients, reduce the spread of infection by ensuring rapid diagnostic investigation and treatment for those suspected or known to have TB. Environmental control measures including the use of N95 personal respirators, negative pressure ventilation, ultraviolet lights in TB wards and clinics, constitute a second line of defense in health settings. They all have been shown to have some benefit in preventing the spread of TB to health workers and among patients in hospital settings (40). But, these measures are impractical in most resource-limited settings due to prohibitive costs.

a) Alternative TB Case Detection Strategies

Effective alternative strategies to improve TB case detection should be geared towards reducing delays in diagnosis and the potential risk of transmission at the community level. Several alternative strategies mainly requiring extra efforts by the health care workers have been tried in the past. In recent years, there has been renewed interest in screening for active tuberculosis (TB), also called active case-finding (ACF), as a possible means to achieve control of the global TB epidemic. Active Case finding purposes to increase the finding of TB, in order to diagnose and treat patients with TB earlier than if they had been diagnosed and treated only at the time when they sought health care because of indications. This will reduce or avoid secondary transmission of TB to other people, with the long-term goal of reducing the incidence of TB.(41)**.**

Alternative strategies of case detection such as community active case finding (ACF) and household contact investigation (42). Ions (HCI) have been tested in studies and are known to work. However, very few studies have evaluated their cost-effectiveness compared to the standard strategy (43).Active case finding (ACF), on the other hand, systematically looks for cases of TB, rather than waiting for people to develop symptoms and seek treatment. Although ACF has been implemented for decades primarily in resource rich settings, there is growing interest in using this approach for early case detection in developing countries (44).

House hold contact investigation (HCI) is a special type of active case finding strategy which involves targeted evaluation of House hold members of a known infectious index TB case; the health providers rely on the index case to provide information about their contacts for follow up. The strategy evaluated is a combination of HCI and the existing PCF standard strategy from which index TB cases are generated. The rationale for this strategy is that people who are in close contact with individuals who have the infectious form of TB are at increased risk of acquiring infection and progressing to TB disease (45).

2.4. **Cost-effectiveness of TB case finding**

Cost-effectiveness analysis (CEA) is a tool increasingly used in health care and public health to support evidence-based decision-making.(46). The approach compares relative costs and effects (or outcomes) of two or more strategies. These strategies can range from clinical interventions, for example, comparing Drug A to Drug B, or comparing a new screening strategy with the standard of care. The referent or baseline comparator can be any comparator of interest and often this is the routine standard of care currently in use and the purpose is to understand whether the introduction of a new strategy is considered cost effective.(47).

Cost-effectiveness analysis is a central component of decision-making for package and policy makers to assess the provision of resources(44). In low TB burden settings, active case finding amongst close contacts of active cases is considered cost-effective, as is the evaluation of latent TB infection.(45). In contrast, in TB endemic settings the cost-effectiveness of screening for LTBI is considered limited due to higher LTBI prevalence, low predictive value of latent TB infection tests, lack of adherence to prophylactic regimens and the number of infected contacts that require to be treated to prevent a single case of TB.(48).

Active case finding is considered to be more resource intensive than passive case finding of TB, with the added operational costs, the number needed to screen to detect a single case, and the additional burden on laboratories (49).Active case finding necessarily involves added costs to the system, therefore understanding the cost-effectiveness around this strategy is needed. In 2014, modeled estimates reported active case finding in India, China and South Africa was considered highly cost-effective in short term and longer term models, even if costs were over US $1,000 to detect and treat and active TB case (50). An active case finding strategy to a routine passive case finding program in Cambodia (a TB endemic country with relatively low HIV prevalence). The authors reported that a reduction in mortality from 14% to 2% would result in a cost per DALY averted of $330, and found overall that an active case finding program is highly cost- effective (51)

The growing use of cost-effectiveness analysis (CEA) to evaluate the costs and health effects of specific interventions is dominated by studies of prospective new interventions compared to current practice This type of analysis does not explicitly take a sectorial perspective where the costs and effectiveness of all possible interventions are compared in order to select the mix that maximizes health for a given set of resource constraints. The estimated cost-effectiveness of a single proposed new intervention is compared either with the cost effectiveness of a set of existing interventions reported in the literature or with a fixed price cut-off point representing the assumed social willingness to pay for an additional unit of health.(28).

Sensitivity analysis (CEA) is a form of economic analysis that compares the relative costs and outcomes (effects) of different courses of action. Cost-effectiveness analysis is often used in the field of health services, where it may be inappropriate to monetize health effect. Typically, the CEA is expressed in terms of a ratio where the denominator is a gain in health from a measure (years of life, premature births averted, and sight-years gained) and the numerator is the cost associated with the health gain. The most commonly used outcome measure is quality-adjusted life years. CEA of a wide range of interventions can be undertaken to inform a specific decision-maker. This person faces a known set of resource constraints (hereafter called a budget), a set of options for use in the budget, and a series of other (ethical or political) constraints. CEA of a wide range of interventions can be undertaken to provide general information on the relative costs and health benefits of different technologies or strategies which contribute through multiple channels (52).

The decision making tree is one of the better known decision making methods, probably due to its characteristic ease in visually communicating a choice, or set of selections, along with their associated uncertainties and outcomes as in all logical structures, if the assumptions are false, conclusions will be misleading. The tree builder (decision maker) must ensure the distinction between causality and correlation, particularly for trees that will be used for predicting future outcomes.(53).

2.5. **Gaps in the Literature**

Study from developed countries highlights ACF is feasible strategy to easily identify high-risk target groups in TB control programs, although this applicability is needed to be accordingly the available resources and still further studies were highlighted for the determination of the most feasible and cost-effective ACF approaches in different settings (54).

While studies from Africa, the addition of HCI to the existing PCF is more cost effective than utilizing both ACF and PCF. Here the study relied on the perspective of cost alone, which is not considering the quality of life the patient will be benefitted from early TB detection based on ACF (11).

Now days some studies have focused on identifying undetected TB confected cases using the ACF approach in Ethiopia. Moreover, there is inadequate evidence from cost-effectiveness studies comparing ACF strategies with passive case finding in high TB burden situations. This study tries to fill this gap by finding evidences in the study area compared community ACF in the perspective of an existing passive case finding program.

3. OBJECTIVES

3.1. General objective:

To identify cost-effectiveness of active TB case finding compared with the passive case finding in the TB control program Dire Dawa.

3.2. Specific objectives:

1. To determine the cost and effectiveness of TB case detection using active and passive finding strategies; and
2. To estimate which method of case detection is cost effective.

4 METHODS

4.1. Description of the Study Area and Period

The study was conducted in Dire Dawa town, which is located in South- eastern part of Ethiopia, 505 kilometers away from Addis Ababa, 55 kilometers north of Harar, and 311 kilometers west of port Djibouti. It is located between 90 28.1N and 90 49.1N latitude and between 410 38.1 E and 420 19.1 E longitude. According to 2007 census, the town has a total population of 342,827; out of which, 50.2% are male. Regarding ethnic composition, even though the town is dominated by the Oromo and Somali, it seems to constitute all nations and nationalities of Ethiopia (55).

The Town has 5 Hospitals, 15 Health Centers and 30 Health Posts. The present study was conducted on six governmental health centers that had reported high pulmonary positive TB cases.

4.2. Study Design

The study design is a retrospective Health facility and community based cross-sectional survey to determine the cost-effectiveness of Active case finding compared to passive case finding.

4.3. Population

4.3.1. Target Population

All health facilities that provide Health service in Dire Dawa town.

4.3.2. Source Population

All health facilities that provide the TB screening and diagnosis service in Dire Dawa.

4.3.3. Study population

All health facilities that provide the TB screening and diagnosis service in Dire Dawa

4.4. Data collection tools and procedure

The data collection tools for this economic evaluation are adapted from different sources and were checked to be consistent with the aim of this study before considering for further improvements. The data was collection tool were showed to advisors and different experts working on health and health economics related professions to check its appropriateness and feasibility of use practically. After getting feedback, further improvements were made on the data collection tools. Three undergraduate economics professionals were hired for the data collectors were hired and a two-day training were given to them. Pretests were done in other than study health center and the data collection tool were edited based on the pretest. The data collections were conducted and it was collected from review of HMIS reports, payrolls, and interview with responsible bodies. Each day, the collected data was being tested for its totality and consistency by the principal investigator.

4.5.Operational Definitions

Case detection: Means that TB is diagnosed in a patient and is reported with in the national surveillance system.

Case of TB: A definite case of TB (defined above) or one in which a health worker (clinician or other medical practitioner) has diagnosed TB and decided to treat the patient with a full course of anti-TB treatment.

Case of pulmonary TB: A patient with TB disease involving the lung parenchyma

Cost effective: Defines a threshold cost-effectiveness ratio, we followed the convention that an intervention with an ICER less than per capita gross domestic product.

Incremental cost effectiveness ratio: Defined as the additional cost of intervention divided by its additional clinical benefit, as compared with the next-less-expensive intervention

Index case(IC): The first TB case identified in the house hold, TB patient registered for DOTS in selected health facility.

Household: A group of people living within one residence who share meals together and identified a head of family who made decisions for the house hold.

Household contact: An individual that shared the same house with the index case for a period of at least 3 months leading up to the time of diagnosis of the index case.

Screened household contacts: A household contacts who attended a public or private health facility for TB screening in the interval (days) between the day treatment was started of the index case and the interview date of the house hold.

Secondary case: A household contact who was diagnosed to have TB in the interval (days) between the day start of treatment of the index case and the day of interview of the household.

4.6. Costing method and outcome measures

4.6.1. Costing measures

Bottom up costing method was used to do the costing. The bottom up costing method exhaustively lists all the necessary inputs used, measure them and value the inputs based on economic principle. The inputs were classified into capital and recurrent inputs. Capital inputs includes; building, equipment, and furniture. The annual rental value of the health centers was used assuming rental values indicate the current societal valuation of the resources indicates economic costs. Equipment and furniture were also annualized based on their expected year of life using 5% discount rate. The recurrent inputs include; supplies and staffs. The 2009 Ethiopian calendar time Horizon was used as a base year cost using consumer price index of the country. Finally, all the costs were adjusted to 2017 US dollar.

4.6.2. Effectiveness Measure

The intermediate outcome of the number of Tb case identified was used to measure the effectiveness of the interventions.

4.7. Data analysis

4.7.1. Cost analysis

The completed cost data for both the ACF and PCF were entered into excel and descriptive statistics were used to estimate the cost per number of TB case, cost per screened, cost per clinical diagnosis, and cost per TB case by AFB for both ACF and PCF strategies. The unit cost of the input parameters of the costs and different probabilities are listed in the table below.

Table 1 Input Parameters for the cost Effectiveness Study

Description	**Most likely Value**	**Low Value**	**High Value**	**Source (high& low)**
Cost of clinical diagnosis at ACF	15	10	20	Primary data
Cost of clinical diagnosis at PCF	18	10	26	Primary data
Cost of screening at ACF	25	22	28	Primary data
Cost of screening PCF	30	25	35	Primary data
Cost of TB by ACF (AFB test)	300	200	300	Primary data
Cost of TB by PCF (AFB test)	200	190	210	Primary data
Probability of access to health center for PCF	0.4	0	0.4	Dire Dawa TB program
Probability of being accessible by ACF	0.7	0	0.7	(11)
Probability of cough for ACF	0.4	0.02	0.4	(11)
Probability of cough PCF	0.7	0.78	1	(11)
Probability of no accessible by ACF	0.3	0	0.3	(11)
Probability of sputum for ACF	0.4	0.65	0.9	(57)
Probability of sputum for PCF	0.7	0.75	0.95	(58)
Probability of TB by active case finding	0.054	0.028	0.3	Primary Data
Probability of TB	0.024	0.2	0.75	(43)
Sensitivity of AFB	0.49	0.34	0.64	(56)
Specificity of AFB	0.96	0.85	0.99	(56)

4.7.2. Cost effectiveness analysis

After completing the data on excel spreadsheet, the finalized data were entered into Tree Age pro 2018 to calculate the cost effectiveness analysis of the two strategies. Cost–effectiveness analysis (CEA) is used to address questions of efficiency. It is applied in conditions where a choice between at least two options with the same goal must be made. That is, given that a particular goal is to be achieved for a fixed budget, CEA will respond to the best way to obtain that goal; TB case detection for this study. A decision analysis is a systematic quantitative method to decision-making under uncertainty whereby least two decision options and their respective consequences are compared and evaluated by their expected costs and expected effectiveness.

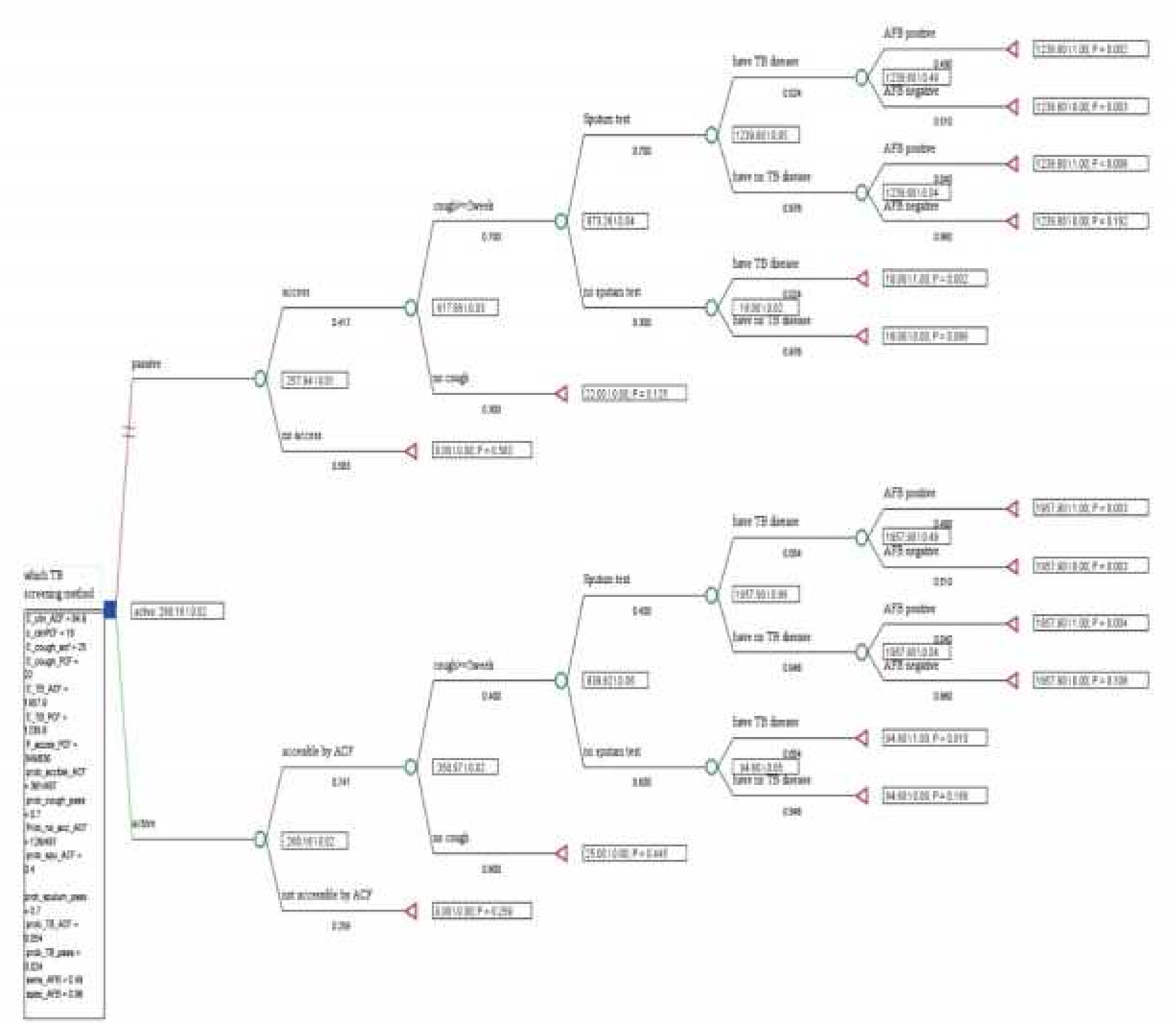


Figure 1: Model Structure

household contacts were cost-effective compared with a passive case finding strategy intervention Among the types of decision analysis, decision tree model was developed to determine if active TB case finding amongst. The baseline strategy in the decision tree was a routine passive case finding program, where symptomatic persons' self-report for TB diagnosis and are diagnosed using sputum smears and clinical evaluation. Comparison to this first alternative strategy is an active case finding strategy for Household contacts of TB case screening. Incremental Cost-effectiveness Analysis were performed for the study based on the constructed decision tree model and the ICER of the least cost effective strategy were chosen as optimal strategy based on the WHO GDP rule for a choice of the cost effective.

4.7.3. Sensitivity Analysis

One-way sensitivity analyses were performed to explore the impact of uncertainty in the sensitivity, specificity and cost estimates of the base analysis using tornado diagram. In one-way sensitivity analyses each selected variables was varied one at a time over a range of predefined clinically and economically plausible maximum and minimum values.

4.8. Dissemination plan

The findings of this research will be presented and submitted to the Addis Ababa University School of Public Health. This research finding will provide the cost effectiveness study pro key information on the optimal case detection strategy in Ethiopian context. This thesis emphasizes the importance of secondary prevention through screening for disease and evidence-based policy decision making for TB control in Ethiopia.

4.9. Ethical Considerations

Ethical approval for the study was obtained from AAU school of public health ethical review committee. An official letter of approval was written to Dire Dawa city administration regional health bureau.

5 RESULTS

5.1. Demographic characteristics

A total of 710, in which 49.15% (349 of 710) of them by ACF and 50.85% household contacts were screened in six health facilities during the study period. Almost similar (49.15% Vs 50.85%) proportion of households had been screened with both ACF and PCF. Household contacts screened by ACF was with a mean of 58.167 +/- 17.37 SD (95% CI= 17.443, 19.017) and house hold contacts screened by PCF was with a mean of 60.167+/-24.799 SD (95%CI= 25.235, 26.811).

Table 1: Household's screened using ACF and PCF in selected Health facility of Dire Dawa town

	House hold Screened by			
	ACF		PCF	
Facility	Frequency	Percentage	Frequency	Percentage
Dire Dwa HC	52	61.9%	32	38.1%
Leghare HC	49	35%	91	65%
Dechatu HC	80	57.1%	60	42.9%
Addis Ketama HC	80	59.2%	55	40.8%
Gende Gerada HC	40	31.5%	87	68.5%
Gende Kore HC	48	57.1%	36	42,9%
Total	**349**	**49.15%**	**361**	**50.85%**

From the total twenty-eight TB contacts detected, Contacts detected by ACF had been much higher a fold, 19(67.86%), than contacts detected PCF which accounts 9(32.14%) of all contacts detected. Among One hundred thirty-eight contacts (19.4%) household Contact with Smear examination done eleven (39.28%) household contacts were detected, while the majority (60.72%) household contacts were detected by Secondary TB case by Clinical examination.

Table 2: TB detected households

Variables	Detected	
	Frequency	Percentage
Secondary Tb Case Detected from +ve smear	11	39.28%
Secondary Tb case Detected from Clinical	17	60.72%
Total contact TB Detected	28	3.94%

5.2. Cost of ACF and PCF

From the total house hold contacts 349 were traced by active case finding which means by health extension workers, 361 were traced by passive case finding which means by health center, and in total 710 persons were contacted. In ACF and PCF out of total person contacted only 80 and 58 persons were sent to be laboratory tested respectively. Out of those tested 19 and 9 were positive in lab investigation and clinically diagnosed for TB. The average (SD) total cost for active and passive case finding were $4,388.07(955.323) and $5,198.07 (1,144.25) respectively. Average (SD) cost of per person TB screened house hold contact by active and passive case finding was $12.57 (2.73) and $14.39 (3.16) respectively. For those laboratory tested average (SD) per person cost for active and passive case finding was birr $244.04 (34.61) and $162.8 (18.68) respectively.

From the total house hold contact 349 were traced by active case finding which means health extension workers, 361 were traced by passive case finding which means by health center total

710 persons were contacted. In ACF and PCF out of total person contacted only 80 and 58 persons were sent to be laboratory test respectively. Out of those tested 19 and 9 were positive for TB.

Average (SD) cost of per person TB screened house hold contact by active and passive case finding was $ 12.57(2.7) and 14.39(3.16) respectively. For those laboratory tested average (SD) per person cost for active and passive case finding was $ 244.04 (34.61) and $ 162.80(18.6) respectively.

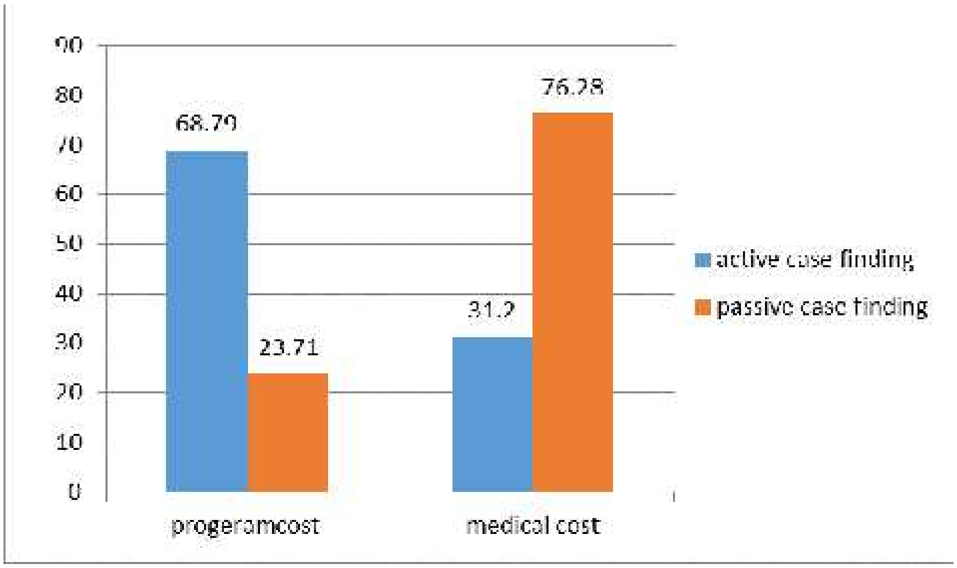
Table 4 average per person cost of active and passive case finding in Ethiopian birr

Strategies and cost	**average (SD)per person cost**	**Average (SD)cost per person laboratory tested**
Active case finding	339.5(73.90)	6589.10(934.58)
Passive case finding	338(85.58)	4395.78(504.5)
Total cost	728.25	10984.89

From the total direct per person cost of house hold contact by active and passive case finding salary of health extension worker account more than half (65.33%) and TB room building and salary of personnel at TB room account 51% and 34.9% respectively.

Out of the total cost for those who have been laboratory tested by active and passive case finding salary of health extension worker and TB room building account 51.4 % and 13.7% and laboratory building, salary of laboratory personnel, TB room building account 13.9%, 23.1% and 36% respectively.

Figure 3 share of program and medical cost from total direct cost



As we can see from the figure 1 in case of active case finding program cost account 68.79 % of the total cost. where as in case of passive case finding medical cost account 76.28% of the total cost.

5.3. Cost effectiveness of PCF verses ACF

The cost effectiveness graph indicates the cost on vertical and the effectiveness on the horizontal line of the graph. Both the costs and the effectiveness of the two intervention are the expected cost and expected effectiveness after accounting for all the possible uncertainities related to their respective cost and effectivness. Interventions not dominated will be connected by line to form the cost-effective frontier. Only the strategies on the cost-effective frontier is the optimal choice and lowest cost option is part of this frontier; if it dominates all comparators, the graph will have no lines. Based on this output method, this cost effectiveness frontier of the cost effectiveness study indicates active case finding is both costly and more effective than the passive case finding. The cost effectiveness frontier also shows that both the ACF and PCF are not dominated by each other.

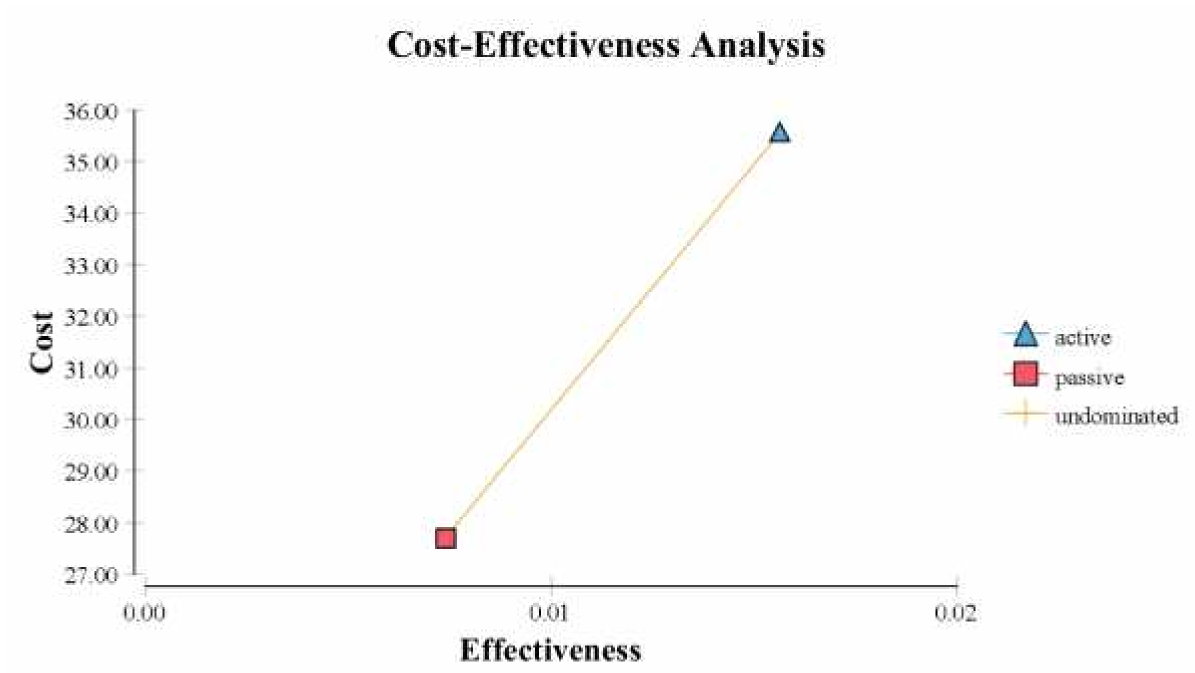


Figure 4: cost effectiveness analysis output

The incremental cost effectiveness ratio for the two intervention is listed in the table below. The ICER is sorted from the lower cost to the higher cost. And the interventionwith the lower cost will be used as reference. The additional cost and effectiveness will be subtracted from the reference intervention and the ratio of the cost per effect of the subtracted payoffs is used to determine the ICER of the intervention. The ICER of ACF relative to the reference intervention of PCF is $536.6. this indicates to get one additional positive TB case by ACF a

Strategy	Cost	Incremental Cost	Eff	Incremental Eff	Incremental C/E
passive	**44.312**		**0.0119**		
Active	**46.62**	**2.308**	**0.0162**	**0.0043**	**536.6**

additional cost added on PCF is $536.6. to determine which intervention is cost effective, I have used the GDP per capita income of ethiopia. The GDP per capita of ethiopia for the year 2017 is$873.

Table5: CEA output:incremental cost effectiveness ratio 2017 USD

Based on this rule ICER ranging within 1 GDP per capita is very cot effecive and ICER ranging within 3 GDP is relatively cost effective. Our base case result shows the ACF is very cost effective when compared to the PCF.

5.4 One-way sensitivity analysis

Due to uncertainities in the costs and sensitivity of the study, one way sensitivity analysis is done for cost of TB by PCF, cost of screening by ACF, cost of clinical diagnosis by ACF and PCF, sensitivity and specificity. Tornado diagram is used to do the one-way sensitivity analysis. As we can see from the graph the tornado diagram brings all the selected variables together in a single graph which includes the variables defined for this analysis.

The resulting bars on the Tornado graph represent individual one-way sensitivity analysis performed for the selected variables. From the bar, the variable with the greatest impact is low and high cost of TB by PCF which is at the top and the variable with the smallest impact is low and high sensitivity of AFB which is at the bottom; resulting in a tornado-like appearance. The expected value (ICER) is indicated by the vertical dotted line on the left which is ICER of $536.4 per TB case identified. The willingness to pay with 1 GDP per capita of $873, is also indicated at the right to show the threshold limit the intervention can afford. As the graph shows the ICER is sensitive to higher cost of TB by PCF and it crosses the willingness to pay threshold of 1 GDP per capita, but stay within 2 GDP per capita which is again affordable. The sensitivity, specificity, cost of screening, and cost of clinical diagnosis are less sensitive to ICER and the changing ICER again stays within 1 GDP per capita of $873.

Figure 4: ACF Vs PCF Comparison

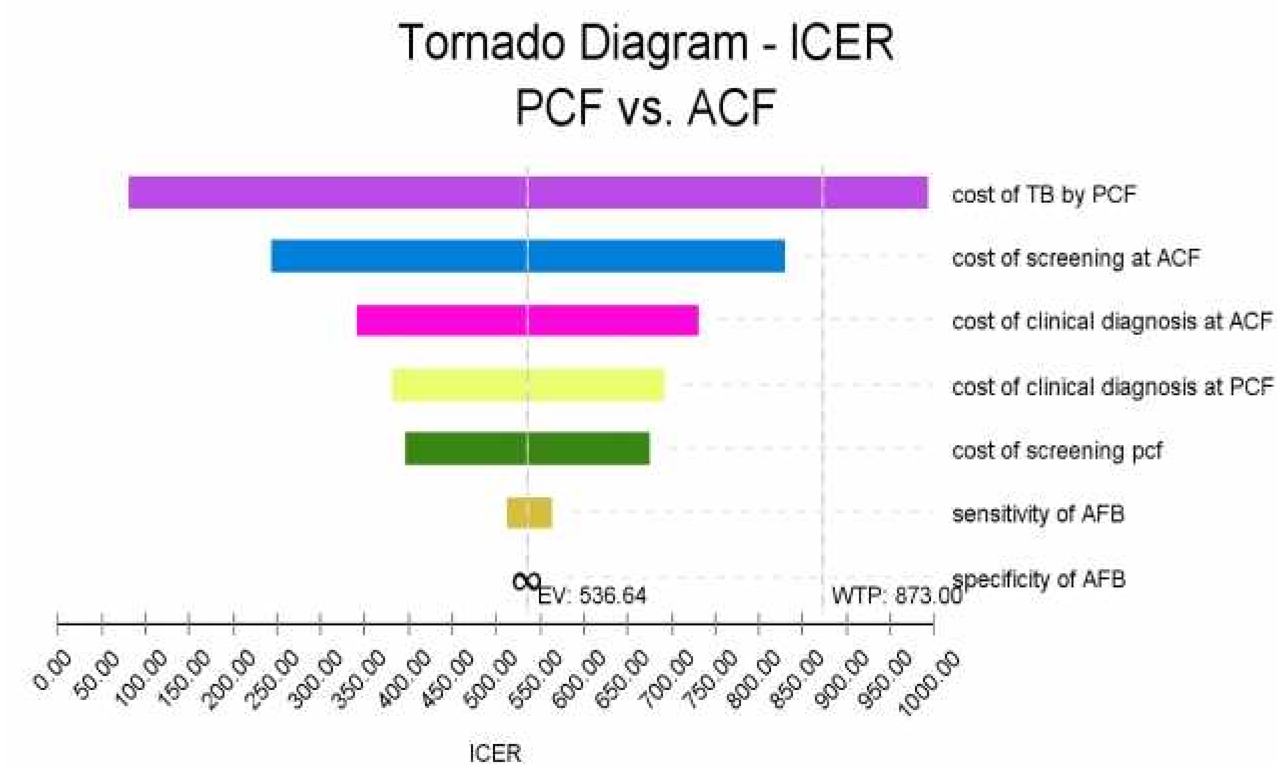


FIGURE 4: SENSITIVITY OF COST

Finally; the sensitivity analysis result shows, alhough the ICER is sensitive to higher cost of TB by PCF, the changing ICER still lies within 2 GDP range of wiilingness to pay. the ICER for the other variables are less sensitive their changing cost and lies within 1 GDP per capita of the Ethiopia.

6 DISCUSSION

In this section the findings this study was discussed comparing the Active case finding strategies to passive case finding of the house hold contacts within a routine TB program in Ethiopia.

Contact investigation may be more effective in detecting TB among contact than passive case finding. A study that was conducted in rural Malawi compared the yield of TB disease from passive and active case finding in household contacts. The results showed that the yield of TB cases was nine times more when using active case finding in contact investigation. (47). In principle the household contact investigation approach should be more efficient than untargeted door-to-door surveys. A study done in South Africa compared household contact investigation and house-to-house active case finding. The TB yield from contacts investigation was 19% compared to 1% from the ACF done in the general community (41).

On the other hand, contact investigation may turn out to be less effective in the absence of a well-developed public health infrastructure through which to index case are followed to their homes. Regardless of the systemic limitations, contact investigation is a key strategy for TB detection and its cost-effectiveness warrants evaluation to inform policy decision making. Active case finding necessarily involves added costs to the system, therefore understanding the cost-effectiveness around this strategy is needed. In 2014, modeled estimates reported active case finding in India, China and South Africa was considered highly cost-effective in short term and longer term models, even if costs were over US $1,000 to detect and treat and active TB case(50). An active case finding strategy to a routine passive case finding program in Cambodia (a TB endemic country with relatively low HIV prevalence). The authors reported that a reduction in mortality from 14% to 2% would result in a cost per DALY averted of $330, and found overall that an active case finding program is highly cost-effective(51).

In this study compared Active case finding strategies to passive case finding of house hold contacts within a routine TB program in Ethiopia. The alternative considered the addition of active case finding of house hold contacts to the passive case finding program. Overall, ACF alternatives were considered cost-effective compared with passive case finding alone.

An incremental cost-effectiveness analysis was performed for the study based on to the constructed decision tree the ICER of the least cost-effective strategy were chosen as optimal strategy based on the WHO GDP for a choice of the cost effective to Compare passive and active case finding with in health provider perspectives in Ethiopian context.

This study findings contrast with those from a recent study on cost-effectiveness of active case finding conducted India, China, and South Africa Active case finding is considered more resource intensive than passive case finding of TB, with the added operational costs, the number needed to screen to detect a single case and the additional burden on laboratories.(49).

The ICER of ACF relative to the reference intervention of PCF is $536.6. this indicates to get one additional positive TB case by ACF a additional cost added on PCF is $536.6. to determine which intervention is cost effective. I have used the GDP per capita income of ethiopia. The GDP per capita of ethiopia for the year 2017 is$873.

The study results showed that adding ACF on passive case finding is cost-effective for detecting TB cases compared to PCF alone perspectives. The cost per additional TB case detected was $536.6 for ACF+PCF. The model conclusions were Due to uncertainities in the costs and sensitivity of the study, one way sensitivity analysis is done for cost of TB by PCF, cost of screening by ACF, cost of clinical diagnosis by ACF and PCF, sensitivity and specificity.

6.1 Limitation of the study

Several limitations should be noted. First, it used a Decision Tree Model to estimate the cost and effectiveness of the strategies as measured by the number of contact person screened and case detected true TB, this a short-term benefit. In this model did not account for potential future Benefits from this a short-term benefit. From Implementing the strategies such as the new TB cases prevented by interrupting ongoing TB transmission and death prevented as a result of earlier detection. This could have led to underestimation of the overall effectiveness and cost-effectiveness of the ACF Strategies in the medium to long-term period.

Second, it did not use effectiveness measures such Quality-Adjusted Life Years (QALYs) or Disability—Adjusted Life Years (DALYs) therefore the study findings comparisons Could be limited to only to studies with similar measures.

Third limitation is that the study focused only provider perspective of cost effectiveness of active TB case finding due to limited data availability, resources and short time frames for conducting the evaluation.

6.2 Strength of the study

Strength of this study is that it was used cost estimates from actual data from different governmental source and the probability estimates from Ethiopia national TB program data and actual data in the Africa country Uganda TB Program.

7.CONCLUSION AND RECOMMENDATION

7.1 Conclusion

Active case finding is better to identify additional number of undetected TB case finding with less cost than the passive case finding in this study Contact tracing is considered as effective to identify newly infected individuals and has become crucial part of TB elimination strategies in African countries. Obviously not all contacts are identified or screened. The reasons include low educational level, a fear of stigma, lack of counseling, unwillingness of the index patient to identify all contacts, and lack of motivation of Health workers, Health extension workers to initiating contacts for screening.

Identified the lack of cost-effectiveness evidence, more studies are still needed to examine the lifetime health benefits and costs that enhance from active case finding strategies. Future cost-effectiveness studies should specifically account for the impact of active case finding on the reduction in TB transmission and new incident TB cases. Additionally, more research to understand where the most TB transmissions occurs, will extend the accepting of how best to prioritize active case finding, whether to target case finding within household or outside the household.

7.2 Recommendation

Based on the finding of this study the following recommendation could be taken by the responsible bodies:-

- Improving service delivery strategy about Active TB case finding .
- The Government shoud also strengthen the skill and enhancing work motivation of HEWs.
- Further Resarch shoud be conducted to determine the costeffectiveness of Acive TB case finding .

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Annexes

Annex I

Costing Questionnaire for Tuberculosis case detection

This interview guide is prepared to collect expertise evidence from the health care professionals (Medical doctors, health officers, nurses, health extension workers) working on the Tuberculosis infection prevention case Team. This guide will contain the following sub-sections:

A. General facility information
B. Health professional time- labor cost
C. Health professional time - across the TB case finding
D. Supplies typically used during case finding Health service provision
E. Equipment used for during Tuberculosis screening and detection Health service
F. Transportation equipment, operations, and maintenance attributed to the TB case finding Health service
G. Costs for building facility used
H. Total cost of preparation cost

A General Facility Information
Data collector: (1) A1-A6 to be filled in prior to interview except for A7-10. (2) For A10, all persons contacted to fill this questionnaire should be listed; indicate whether the respondent was interviewed in the last column. (3) In general, data collector should refer to data Collector Guide for terms and definitions that may not be clear.

A1	Name of Health Facility				
A2	Region				
A3	Year of establishment				
A4	Catchment population				
A5	Type of Facility				
A6	Facility Settlement		■ Urban ☐ Rural (agrarian, pastoralist)		
A7	Level of Facility		■ Primary ☐ Secondary ☐ Tertiary		
A8	Total number of staff working in the health center				
A9	**1. Respondent Name**	**2. Position**	**3. Ward/ Unit/ Department**	**4. Contact (Email, phone number)**	**5. Was respondent interviewed? (Y/N)**
A					
B					
C					
D					
E					

B. Health Professional time labor cost

	Please Provide the following information for the staff that work at your facility in providing TB service are on the facility payroll:								
	1. Staff Type/Title (please include also the level)	**2. # of Staff working at this title level**	**3. Staff monthly salary/ Pay grade, scale**	**4. Orgs that pays**	**5. Total Days worked per month on any service**	**6. Total days worked per month on TB Clinic/TB tracing out reach**	**7.Average min Taken screening and detection per client**	**7. Hrs …… Total days worked per month on TB Screening and case detection**	**Remark …**
a	Health Officer								
b	Nurse graduated in degree								
c	Nurse graduated in diploma								
d	Health Extension Worker								
e	Laboratory Technologist								
f	Other Professionals								

Health professional Time across TB case Finding

Staff Type/Title (please include also the level	Staff salary	# Of Staff worked Tb Clinic	Average Time used to screen per Pt	# of TB House Hold contacts with smear examination	#of House Hold Traced by ACF	#of House Hold Traced by PCF	#of patient Detected ACF	#of patient Detected by PCF	Total # House Hold Screened	Total # of House Hold Detected
Nurse graduated diploma										
Health Extension worker										
Laboratory Technologist										
Total										

B Equipment typically used during the TB clinic

Sr.N	Please list the supply items used in TB Case Team	**Unit of measurement**	**Unit price(ETB)**	**Year of purchase**	**How long (months) is this item used for TB service?**	**Notes/ Remarks**

C Items used Laboratory tests used in TB Diagnose

Sr.N	Type of Items List	Unit	Price	Year of purchase	No of items patient per served
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

D Equipment used for TB screening and case Diagnostic Service

Direction: Fixed Equipment used *for TB Diagnose and case detection service will be identified, measured and valued. Different costs will be collected such as: total cost (for the equipment) and estimated working days (in a year, in a month). Finally, the average rate of equipment utilization per client will be estimated. The working life years for the Equipment will be retrieved from the cost effectiveness and strategic planning (WHO-CHOICE) document from the WHO website*

Sr. N	Description *(Describe the equipment specification)*	Unit Price(ETB)with VAT	Year of Purchase operation	Days per month in operation	Number of average TB patient served per a day
1.					
2.					
3.					
4.					
5.					
6.					

E Transportation equipment, operations, and maintenance attributed to the TB case team

Direction: *Resources used for the transportation of equipment (including operation and maintenance cost) for TB case team will be identified, measured and valued. Different costs will be collected such as: vehicle purchased costs, regular vehicle maintenance cost and etc. The working life years for the vehicle will be retrieved from the cost effectiveness and strategic planning (WHO-CHOICE) document from the WHO website.*

Sr. N	Description *(Describe the type/ specification of the vehicle)*	Year of purchase/ operation	Total expense in purchase year (if known)	Months per year in operation	Total days worked per month on any service	Total days worked per month for TB case team	Total days worked per month on TB case team	Note
Health facility setting:								

F. Costs for building facility used

Sr. N	**Description** *(Describe the type/ specification of the building space)*	**Room space (in square meter) Estimation**	**What number of rooms used for TB Health unit**	**What is the annual total number contact screening and test at this room**	What is the annual total number contact person diagnosed coming at this room	**What is the annual total number of all TB patient coming at TB room**	**Estimated Annual Rent**

G1. Training Cost (Basic training) for Doctor, nurse, Health officer

Input	Number per day	Number of participant	Number of days	Unit cost, …ETB	Total	Notes and sources
Basic Training						
1.Labor						
1.1 Trainer fee						
1.2 Facilitator Per Diem						
Total Labor cost						
2. Other Inputs						
2.1 Writing Pad/ Note Book						
2.2 Pens						
2.3 Plastic Folders						
2.4 Art line Marker						
2.5 Flip Chart						
Total Other input cost						
4. Refreshment/ Hall Rent Cost (For participants)						
Total Hall Rent cost						
5. Accommodation cost						
5.1 Accommodation cost for trainers						
5.2 Accommodation cost for trainees						
Accommodation cost						
Total Training Cost						
Number of health facilities included in the training						
Total basic training cost per ….						
Grand Training Cost						
Total Training Cost Per ……..						

G2. Training cost (Basic TB Training) for Health Extension workers

Input	Number per day	Number of participant	Number of days	Unit cost, …ETB	Total	Notes and sources
Basic Training						
1.Labor						
1.1 Trainer fee						
1.2 Facilitator Per Diem						
Labor cost						
2. Other Inputs						
2.1 Writing Pad/ Note Book						
2.2 Pens						
2.3 Plastic Folders						
2.4 Art line Marker						
2.5 Flip Chart						
Other input cost						
3. Refreshment/ Hall Rent Cost (For participants)						
Total Refreshment cost						
4. Accommodation cost						
5.1 Accommodation cost for trainers						
5.2 Accommodation cost for trainees						
Total accommodation cost						
Total Training Cost						
Number of health facilities included in the training						
Total basic training cost per ……						
Grand Training Cost						
Total Training Cost Per ……..						

A Performance Indicator for TB infection prevention case team

Data collector: *Identify the number of clients/ patients that accessed services at the TB infection prevention health unit during the following time periods. Collect the TB case team report (from the Health information system) for the period from Ethiopian calendar Meskeram 1, 2009 to Pagume 5, 2009.*