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# Tuberculosis and HIV integration in sub-Saharan Africa

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ABSTRACT

Sub-Saharan Africa (SSA) has borne the greatest burden of the tuberculosis (TB) and HIV pandemics. In attempt to halt and reverse the situation, World Health Organization-inspired policies have been adopted by many countries. However, implementing these policies have seen limited success. And few studies have been conducted to ascertain the factors influencing interventions and their implementation. This review therefore sought to use comparative analysis to determine the activities implemented, service delivery models as well as the barriers and facilitators of TB/HIV integration in SSA. Many literatures were identified and selected based on a criteria. Narrative approach was then used to review the literature. Eight articles were identified based on different TB/HIV integration programmes across SSA. TB/HIV implemented interventions were HIV screening for TB patients, co-trimoxazole preventive therapy and antiretroviral therapy for eligible HIV positive patients. Three main service delivery models with varying levels of integration were identified: referral, partial integration and full integration model. Staff shortages, poor documentation, lack of resources, irregular supply of drugs, inadequate infrastructure were barriers whereas direct supervision, standardization and mutual adjustment were identified as facilitators of integration. TB/HIV integration in SSA is feasible but the uptake of interventions has been low due to barriers arising from the local policies and other contexts. Identified facilitators can therefore be used to promote TB/HIV integration.

## 1. Introduction

Sub-Saharan Africa (SSA) bears the greatest burden of both tuberculosis (TB) and HIV pandemics[1,2]. Of the 35 million people living with HIV worldwide, about 70% (24.7 million) live in SSA, and 73% (1.1 million) of the 1.5 million HIV deaths globally occur in SSA[1,2]. The prevalence of HIV in adults aged 15–49 years in SSA is 5% as compared to 0.8% worldwide; 2.3 million children below 15 years live with AIDS, and 230000 children die of AIDS each year in SSA[1,2]. Of the 22 countries with the highest TB burden globally, 9 are in SSA, and therefore many sub-Saharan African countries have embraced the challenge and developed TB/HIV policies based on World Health Organization recommendations[3,4]. However, implementation has been challenging and the uptake has been low. Resources are limited; health systems are weak; and human resource capacity for health is still a challenge in most countries. Sub-Saharan African countries therefore need to use existing strategies with innovation more aggressively and examine potential strategies to curb the TB/HIV. This review is therefore intended to use comparative analysis of TB/HIV practice in SSA to determine the TB/HIV activities implemented, the service delivery models as well as the barriers and facilitators of TB/HIV integration in SSA.

## 2. Study selection and search strategy

A literature search was performed in different relevant databases using different search terms to identify relevant articles from March to May 2011. Articles identified through the literature search were browsed and relevant ones were selected, and further selection was done by reading through the abstracts of papers retrieved. References of selected articles were browsed for more articles and other relevant grey literatures. A final selection of articles was made based on these inclusion criteria: articles based in SSA, involved only TB and HIV integration interventions, involved general population, and TB and HIV diagnosis and management. Articles were rejected based on these exclusion criteria: literature based on specific groups or ages, participants selection based on their extensively drug-resistant- or multidrug-resistant-TB status, single TB/HIV interventions, and literature that did not report on TB/HIV indicators. Similarly, articles reviewing different programmes with no detailed descriptions were not included (Figure 1).

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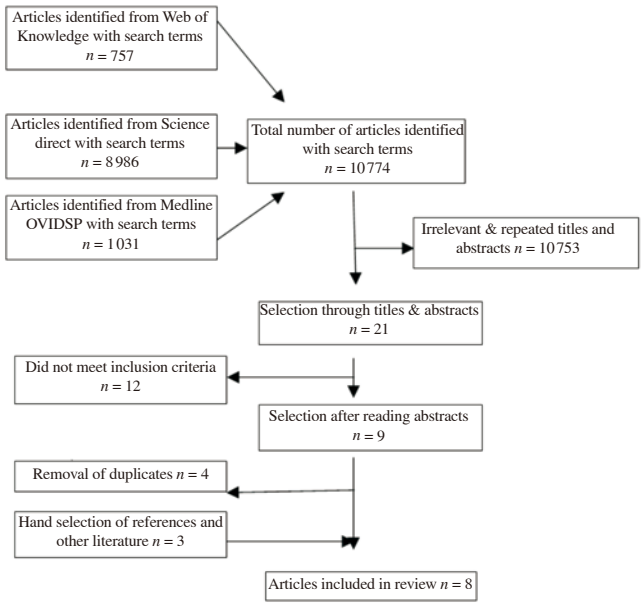


**Figure 1.** Flow diagram of article selection.

## 3. Search results

Eight articles were selected out of 10 774 identified based on different TB/HIV integration programmes across SSA. These included one each from Kenya, Mozambique, Rwanda and Uganda, and two each from South Africa and Zambia. The studies included 3 in which HIV services were added to existing TB service and another 3 in which both TB and HIV services were introduced into existing care. The remaining two studies involved the addition of TB service on existing HIV services.

The articles involved 1 controlled post-intervention study[5], 3 uncontrolled before-and-after studies[6-8], 1 prospective study[9], and 3 cross-sectional studies[10-12].

The controlled post-intervention study involved 72 patients at the intervention site and 96 at the control site[5]. The two sites had similar socio-economic backgrounds. The study demonstrated that integrating TB treatment and monitoring into a home-based HIV care programme may improve adherence but not death rates.

Miti *et al*.[5] adopted controlled post-intervention study design to evaluate directly observed treatment, short course strategy of an HIV/AIDS homecare programme by comparing where patients took TB treatment at home for first two months in HIV programme and providing medical, nursing, welfare, psychological, spiritual and pastoral services with home care programme (HCP). It was found that cure rate was higher at intervention site, but not treatment success. Better follow-up default was lower at intervention site. No difference in transfer rates was observed.

Micek performed TB/HIV case descriptive study and collected data over 14 months to describe a strategy of integrating TB and HIV care in Beira, Mozambique[10]. Adding TB screening and management to HIV programme, they observed reduction in morbidity and mortality among HIV patients. There was, however, low utilization, poor referrals by staff, high mortality and high loss to follow-up. Médicins Sans Frontières (MSF) conducted a case study and reported on the integration of TB and HIV services in site B Khayelitsha (South Africa) Ubuntu clinic[11]. The one-stop shop model demonstrated that integration of services was feasible, but context flexibility was important. The uptake of services also increased. Gasana *et al*.[8] undertook a before-and-after case study to ascertain the results of integrating TB and HIV activities at a rural health care site. When referral strategies were improved between TB and HIV centres, it was observed that provider-initiated counselling and testing (PICT) uptake and TB case detection increased. TB/HIV integration was noticed to focus on services for patient benefits. Harris *et al*.[7] conducted an uncontrolled before-and-after study (with phased implementation) at 7 public primary care centres in Lusaka and Zambia to report on the integration of TB and HIV services in primary care. TB/HIV integration strategies included TB/HIV coordinating committee, guidelines, and modified patient's records. Case detection and access to antiretroviral therapy (ART) increased. Similarly, referrals, communication and follow-ups improved. Although enrolment at HIV clinic and utilization improved, utilization was low. Gandhi *et al*.[9] adopted an operational research study design to demonstrate TB/HIV integration's feasibility, effectiveness and safety in rural South Africa. TB/HIV co-infected patients in rural Kwazulu-Natal were treated with once-daily anti-retroviral (ARV) therapy at the same time with home-based TB therapy. Patients were followed for 12 months after the ARV initiation. Consequently, CD4 increased; viral loads reduced; and TB treatment outcomes improved. They demonstrated that integration of TB and HIV treatment was safe and effective. Using mixed methods (focus group discussions, in-depth interviews, secondary data) and purposive sampling, Okot-Chono *et al*.[12] identified health provider, facility, patient and community barriers affecting implementation of TB/HIV activities in Uganda. The study involved TB, HIV and TB/HIV patients, providers and community members. It was found that service utilization was low and there was no TB/HIV data at HIV clinics. Uptake of integration was poor. Health system barriers to TB/HIV were staff shortages, increased workload, and irregular drug supply. Huerga *et al*.[6] conducted a retrospective evaluation before and after HIV care integrated into TB clinic programme in 2005 to evaluate short and medium term impact on patient care and TB outcomes. It was observed that uptake of service increased, extrapulmonary tuberculosis increased slightly and TB outcomes improved. There was no difference in default or failure and there was no difference in outcomes between HIV negative TB patients and HIV positive TB patients on ART. Success and death rates worsened among HIV positive cases.

The uncontrolled before-and-after studies were on the impact of integration of different aspects of patient care. The common indicator in all three studies was HIV screening among TB patients. Huerga *et al*.[6] examined the impact of integration from 6 months to 30 months after implementation among 1 323 TB patients. There was no difference in TB treatment success rates between HIV-negative TB patients (82%) and HIV-positive patients on ART (76%) at $P < 0.27$. Death rates were also not different between the two groups ($P < 0.60$). However, treatment success rates in HIV-positive TB patients was not on ART (66%) and those with unknown HIV status (52%) were much worse ($P < 0.01$). The findings suggested that integration improved case detection and management of HIV among TB patients, and thereby improved TB treatment outcomes.

Gasana *et al*.[8] also compared records before 12 months after integration. Uptake of PICT, and case detection of HIV among TB patients as well as TB among HIV patients increased. Harris *et al*.[7], on the other hand, reported only on HIV screening in TB patients, and how many enrolment in the ART department. There was a

phased implementation of integration in 7 primary care centres over 20 months. Data was collected 3 months before and after implementation. And 1 983 patients with unknown HIV status were counselled. Although integration increased the detection of HIV cases, the uptake of PICT was still relatively lower and the enrolment for HIV care also low.

There was one prospective study adding once-daily dose of ARV to a home-based TB treatment programme[9]. One hundred and nineteen patients were enrolled and monitored over 12 months. Median increased in CD4. Cell counts were 151 cells/mm$^3$ and 211 cells/mm$^3$ at 6th and 12th months, respectively. Patients' weight also increased by 6.5 kg at 6th month and 10.5 kg at 12th month. 93% of patients also attended follow up within 1 day of scheduled visits. Using existing TB directly observed treatments structures to deliver ART was found to be feasible, effective and safe.

There were three retrospective evaluations: one mixed methods study and two case reports[10-12]. Okot-Chono *et al*.[12] investigated barriers of implementation of integration. Because of lack of efavirenz-based ARVs which can be given with rifamycin-based anti-TB regimens, ART initiation was delayed. For patients already on ART, it had to be suspended for 2 months of intensive phase of TB treatment.

The first case report involved the integration of TB services into an HIV clinic but reported only on HIV screening among TB patients and partially on the impact of ART[11]. There were many missed opportunities for testing TB patients for HIV. Micek reported on data covering 14 months of integration[10]. ART was not universally accessible and capacity to give co-trimoxazole preventive therapy (CPT) was limited. There were no comments on HIV screening actually done, and no references to the TB treatment outcomes of other TB patients because the report appeared to be restricted to findings from the HIV clinic which introduced TB screening.

## 4. TB/HIV indicators

### *4.1. HIV screening among TB patients*

Five articles reported on this indicator: three of these reported rates between 77% and 91%[6-8]. Only Huerga *et al*. demonstrated a significant increase above pre-integration levels[6]. Gasana *et al*.[8], however, observed a significant increase in proportion of TB patients with known HIV status, and a 38% increase in TB/HIV patient enrolment in the HIV clinic. According to Micek, only 8% of the estimated 1 663 TB/HIV co-infected patients were seen at the HIV clinic[10]. Lower screening levels of 56% and 40.9% were also reported[11,12], signifying a lot of missed opportunities: 37% of eligible TB patients were offered no screening, and 36% of those screened were not on CPT or ART[12]. A challenge in comparing these results, however, was the fact that Gasana *et al*.[8], Harris *et al*.[7] and MSF[11] reported on HIV screening among TB patients with unknown HIV status as compared to Heurga *et al*.[6] and Okot-Chono *et al*.[12] who referred to HIV testing among all TB patients.

### *4.2. CPT for HIV-positive TB patients*

Huerga *et al*.[6] demonstrated a significant increase in the proportion of HIV-positive TB patients on CPT from 47% before to 93% after integration. Gasana *et al*.[8] reported 72% of patients on CPT, but Okot-Chono *et al*.[12] reported only 52%.

### *4.3. ART for HIV-positive TB patients*

HIV-positive TB patients receiving ART increased from 9% to over 40% in Huerga *et al*. study[6], which was comparable to the 42% observed by Gasana *et al*.[8]. The 12% observed by Okot-Chono *et al*.[12] was rather comparable to the pre-integration levels in the Huerga *et al*.[6] study. Gandhi *et al*.[9] observed that ART initiation was around 9 weeks after TB treatment initiation, and that being on ART was associated with significant increases in CD4 counts, viral load suppression, and weight gain. While Gasana *et al*.[8] reported that viral load was undetectable in 88% of patients at 12th month, MSF referred only to viral load suppression in 93% of patients.

### *4.4. TB treatment outcomes*

Huerga *et al*.[6] demonstrated an increase in TB treatment success rate to 71%, but this was lower than 84% observed by Gandhi *et al*.[9]. There was, however, no difference in success rates between the intervention and control sites in the Miti *et al*.'s study[5], although default rate was lower at the intervention site. Huerga *et al*.[6] also observed no difference in TB treatment outcomes of HIV-negative TB patients and HIV-positive TB patients on ART. Micek reported on TB treatment outcomes for 141 TB patients managed at the HIV clinic: 24% died and 41% were lost to follow up[10]. Resistant TB was responsible for all three failed TB treatments and 6 of the 13 deaths in the study by Gandhi *et al*.[9]. Four of the other 7 deaths were also suspected cases of resistant TB which were not confirmed prior to patient death.

### *4.5. TB screening among HIV patients*

Gasana *et al*.[8] established that only 48% of HIV patients were screened for TB and 3.7% of the 300 patients screened had active TB which was lower than the 8% observed by Micek[10].

## 5. Barriers to integration

Barriers are described here in relation to the health system components, namely leadership and governance, financing, information system, service delivery and barriers from other sources.

### *5.1. Leadership and governance*

Two out of the interventions cited lack of leadership in coordinating and supervising TB/HIV activities as barriers[11,12]. There was also reference of inadequate knowledge of the policy and the role of the provider. Providers did not display enough knowledge about the TB/HIV policy and seemed not to appreciate their roles and responsibilities in the success or otherwise of the integration. Patients were also not involved in planning[12].

### *5.2. Financing*

The initial cost of integration remained high because the capital required in training, infrastructure, supplies and drugs among other programme monitoring and evaluation systems. The cost of care to patients was also high and resource allocation for TB/HIV activities was not appropriately prioritised[8,12].

### 5.3. Health information systems

Difficulties associated with poor or too much documentation and the separate systems of the two programmes were the commonest complaints. Okot-Chono *et al*.[12] also identified the lack of tools for recording TB/HIV activities in HIV units as a barrier to implementation. Also, they observed that collected data was not adequately used in planning or given as feedback to communities to enhance coordination and compliance.

### 5.4. Service delivery

The commonest barriers were inadequate infrastructure and long waiting times due to increasing caseloads[7,11]. In Uganda, lack of infrastructure was the main hindrance to one-stop services[12]. There was also lack of privacy for HIV services, especially where existing TB services were used, as some TB services operated in open air spaces[7]. There were poor inter-clinic referrals, and patients complained of multiple visits[12]. Shortage of staff coupled with high staff attrition rates and increasing caseloads overburdened staff who became overburdened and de-motivated[7,10,12].

### 5.5. Medical products

In the Ugandan case there were frequent shortages of drugs and other supplies sometimes because procurement estimates were inaccurate or the process was delayed[12]. Gandhi *et al*.[9] also observed that drug-resistant TB posed a challenge due to increased adverse outcomes. These presented as barriers to implement integration irrespective of the degree.

### 5.6. Cultural beliefs

In the Ndola (Zambia) case there was a high rate of loss to follow up because patients suddenly moved away without informing community volunteers or nurses. Family members moved patients to villages where funerals were cheaper and access to alternative care was also greater. And then there was the belief that if an illness was caused by a spell cast by a neighbour, if the patient relocated the spell was broken[5]. According to Harris *et al*.[7], stigma may also posed a challenge for TB patients. Community members described 'old TB' which was believed to be curable, and 'new TB' referring to HIV-associated TB which was believed to be associated with immoral behaviour and incurable. Community members who were therefore perceived to have 'new TB' were more likely to be stigmatised.

## 6. Discussion

The articles included in this study are from Eastern and Southern Africa, with none from Central and West Africa. This may be due to the fact that Central and West Africa bear a lower TB and HIV burden as relative to the Eastern and Southern Africa[13]. HIV prevalence in West and Central Africa ranges from 1.7% to 5.3% as compared to 5% to 28% in Southern and Eastern Africa. A lot of TB/HIV research has therefore been based in Southern Africa especially. More research from SSA countries with low HIV prevalence are required to provide a more comprehensive view of the burden and control of the two epidemic.

The studies reported variable increases in key TB/HIV indicators. However, the diversity in the study designs and other methodological considerations posed a challenge to the drawing of conclusions on these indicators. One of the sources of diversity was the types of indicators used. More than 12 different indicators were used in reference to different aspects of TB/HIV care, and there was no one indicator used by all studies. The commonest indicators were HIV screening (5 studies), death rates (4 studies), proportion of HIV-positive TB patients on ART (4 studies), proportion of HIV-positive TB patients on CPT (3 studies), and TB treatment success rates (3 studies). Other indicators included TB treatment default rates and cure rates, proportion of TB patients with known HIV status, enrolment at ART units, patient weight gain and viral load.

A second source of heterogeneity was the different samples used in different studies. Five papers included all TB or HIV cases registered during the study period while one used only HIV-associated TB cases. Of the remaining two articles, one used all new TB cases while the other included only new smear-positive TB cases. There was also a wide variation in how long after integration the studies occurred and the study periods were. The initiation of the studies ranged from immediately after integration to 4 years. And the study duration ranged from 5 to 30 months of integration. These different time periods with different impacts of maturation and statistical regression made the results less comparable across study sites. Therefore, multi-site studies with common indicators are needed to facilitate comparison of TB/HIV services and add to the knowledge to improve policy and practice.

### 6.1. Temporal influence on TB/HIV

It was observed that the studies conducted earlier from 2003 to 2005 generally had poorer indicator values as compared to those conducted later[5,10,11]. With respect to TB treatment outcomes Miti *et al*.[5] reported an average of 55% treatment success rate, 20% deaths and 15% default rates. Death and default rates observed by Micek were 24% and 41% respectively[10]. In comparison, treatment success rates ranged between 76%–82%[6-9], death rates 3%–9%[6,9], and default rate 3%[9].

HIV screening among TB patients was 41% in the earlier years with no record of how many were on CPT or ART[11]. From the later studies, on the other hand, HIV screening ranged from 72% to 91%[6,8], and CPT and ART rates were 72%–93% and 41%–46% respectively[6,8]. Enrolment at HIV clinics was 8.5% as compared to 59%[7,10].

The studies span 8 years from 2003 to 2010 inclusively. This period coincided with a season of global promotion of TB and HIV programmes collaboration through increasing awareness of their interaction, as well as the provision resources and technical support. This resulted in a heightened level of commitment and good will which led to the introduction of many national TB/HIV policies and interventions. Consequently, as observed by the World Health Organization, indicators for TB/HIV activities have steadily improved over these 8 years and beyond[1,14]. Notified TB cases with known HIV status has risen from 3.6% in 2003 to 77% in 2013 in the Africa region[1]. The number of HIV-associated TB cases on CPT or ART has also risen steadily from 85% and 11% to 86% and 69%, respectively in the Africa region over the same period. Therefore, the differences in the impact of integration observed between the two groups of

studies have also been influenced by these activities outside the study settings as well as the effect of maturation.

### 6.2. TB/HIV activities

Recognised TB/HIV activities include establishing mechanisms for collaboration between TB and HIV programmes, HIV testing of TB patients with CPT and ART for those who are HIV positive and intensified TB case-finding among HIV patients followed by isoniazid preventive therapy (IPT) for those without active TB and infection control in health care and congregate settings[13,14]. These activities are intended to promote early detection, provide access to comprehensive care[15,16], reduce morbidity, improve survival and reduce transmission[17,18]. The TB/HIV programmes included in the review together involved HIV screening for TB patients, CPT for HIV positive TB cases, and ART for eligible TB patients.

Uptake of these activities which has been increasing globally was still below targets which were to test 85% of TB patients for HIV, put 95% of co-infected cases on CPT, and 300 000 HIV-positive TB cases on ART by 2010[1,13,14]. Findings in this review also supported this low uptake rates, with just one testing between 86% and 91% of TB cases for HIV after integration[6]. Major bottlenecks to HIV screening among TB patients have been available and usable[18]. PICT is intended to ensure that every TB patient is offered counselling and testing but the uptake has been below global targets due to many missed opportunities as a result of health workers not offering the service, patients not accepting to test, lack of trained staff as well as disconnected services and poor referral systems leading to high loss to follow-up[18,19]. These challenges also affect the uptake of CPT, including lack of human capacity to deliver and monitor CPT, and drug shortages[18].

The barriers to ART in SSA include lack of capacity for rapid decentralisation to improve access, determining eligibility for ART, drug-drug interaction and overlapping toxicities with anti-TB agents, and immune reconstitution inflammatory syndrome[20,21]. ART has been proven to reduce morbidity and mortality in HIV patients, and to reduce TB transmission[22-25]. The improvement of survival was corroborated by Huerga *et al*.'s study which demonstrated that there were no differences in treatment outcomes between HIV-negative TB patients and HIV-positive TB patients on ART[6]. Kwange and Budambula also demonstrated that there was no significant difference in sputum conversion rates at 2- and 5-months between HIV-negative TB patients and HIV-positive TB patients on ART[26]. Current research suggests that ART should be started early and preferably as soon as a person is tested positively for HIV[14,23-25], and opposed to current recommendations to use CD4 count of 350–500 cells/mm$^3$ or less, or clinical staging of disease to determine who was eligible for ART[20].

However, as more and more HIV-positive patients are put on ART, there will be additional burden on already overburdened staff and more patients will be at risk of immune reconstitution inflammatory syndrome. On the other hand, rifampicin therapy of 6 months or more with daily therapy in intensive phase has been identified to be associated with lower risk of failure and relapse in HIV-positive patients[27]. Current research priorities therefore are the need to identify best models to deliver ART in hospitals and community level[18], and how to provide adherence support and monitor adverse reactions[23].

Screening HIV patients for TB was another activity, but in 3 of the studies[7,8,12], it was not routinely done for all cases but only for those who reported symptoms. This is as opposed to the intensified case finding promoted because early diagnosis and treatment of TB is still an effective control strategy[21]. Challenges include the availability of sensitive screening tools and how often to screen[23]. Improving uptake in SSA requires that barriers to these TB/HIV activities are addressed and best practices are identified and replicated.

None of the review articles included IPT or reported on infection control as part of TB/HIV integration. IPT has been proven to be a safe, feasible and cheap way of reducing morbidity and mortality in HIV patients[17,23,28], but uptake has been low[23,29]. Combination of IPT and ART results in a significantly greater reduction in TB risk than does either treatment alone[17]. Many reasons have accounted for this low uptake of IPT including the difficulty in diagnosing latent TB in person living with HIV before IPT initiation[17,30], and lack of emphasis and adequate attention in national policies[15]. Other concerns have been the fear that this may enhance the development of resistance to isoniazid, and therefore reduce its effectiveness as a first line drug in treating new TB cases[23]. More advocacy and research are needed to improve IPT uptake.

Although infection control in congregate settings is an essential component of TB/HIV integration, it has not been accorded with the same attention of other activities. Even though SSA bears the greatest burden of both diseases[1,13,31], none of the articles made any reference to that. More advocacy and political will be needed to give this activity the required support for uptake. Delays in diagnosis facilitate nosocomial infections[23]. Other challenges to infection control include overburdened clinics, crowded out-patient departments, long waiting times and lack of technological interventions[23,32].

### 6.3. Service delivery models

The theories of integrated care propose that improvement in patient care results from three key strategies, namely patient-centred care, organizing the care continuum through multidisciplinary collaboration and processing improvement[33,34]. Care continuum is a reflection of the extent to which services are experienced as part of a coherent, coordinated and uninterrupted succession of events and consistent with the patient's medical needs and personal context[35,36]. Continuity of care is achieved by bridging the discrete elements in the care pathway and it is an indicator of quality care[35,37].

Models of service delivery in TB and HIV integration refer to how collaborative activities are organised around existing services. These models are generally related to the continuum of integration, namely linkage, coordination or collaboration and full integration[38,39]. In this regard, three main models of service delivery have been associated with TB and HIV integration based on the level of integration between the two units at the point of service delivery, namely referral, partially integrated or fully integrated[17,18,25,40]. On this basis the 8 programmes described in this review includes 2 referral models[5,8], 4 partially integrated models[7,9,10,12], and 2 fully integrated models[6, 11].

### 6.4. Referral model

In the referral models, no HIV activity occurs at the TB unit or

*vice versa*. Patients are simply referred to the other unit to have screening done for either TB or HIV where it is applicable. The two referral programmes in this study used variants of the basic model (Figure 2).

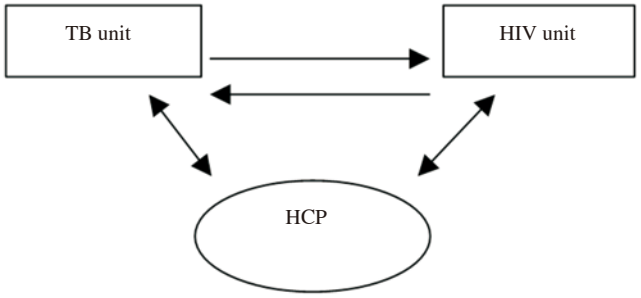


**Figure 2.** Referral model variant 1.

In the Zambian case at Ndola, there was a HCP in which administration and monitoring of TB treatment and ART was done in the community or patients[41]. The HCP also supervised sputum collection and sended for testing.

The other variant of the referral model was described in the Rwandan study by Gasana *et al*.[8]: a three-unit referral system where the voluntary counselling and testing (VCT) centre for HIV was separated from the HIV clinical care and management unit (Figure 3).

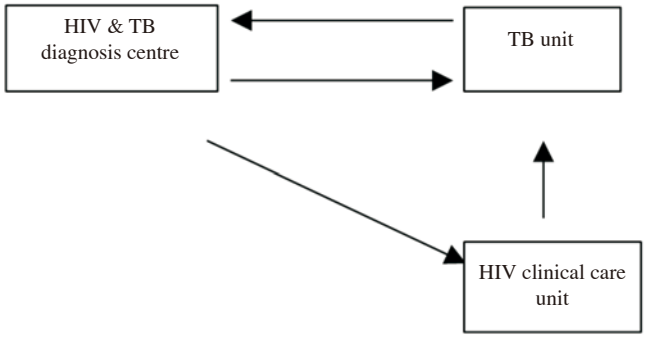


**Figure 3.** Referral model variant 2.

In this model, the TB and HIV clinical care units were located in the District Hospital while the VCT centre was located in the Health Centre adjacent to the District Hospital. VCT was done at the Health Centre and not at the HIV clinical care unit in the hospital. TB screening and diagnostic services were also available at the Health Centre through the VCT centre. Diagnosed cases were therefore referred to the TB and HIV care units for the appropriate care. HIV cases that end up in the HIV clinical care unit from other VCT centres were all referred to the TB unit in the hospital where they can be screened for TB. And also TB cases that have not been screened for HIV were sent to the Health Centre for HIV screening.

TB and HIV centres are separate units of the same institution run by different staff in the referral model and different locations referring cases one to the other. Patients have to attend two clinics, probably on different days, increasing both direct and indirect costs of care to patients[17,42]. Recommendations for overcoming the challenges of this model are to synchronise clinics so they are held on same day for easy access by patients, and to administer anti-TB drugs and ARVs from the same point . Other suggestions include decentralisation of ART from hospitals to the Health Centres[42].

Referral models offer low levels of all the three types of continuity because service experience is more likely to be incoherent and inconsistent due to the above challenges. The referral system in the Rwandan model successfully increased TB and HIV case detection, but may have greater challenges for achieving continuity[8]. This model has its advantages and disadvantages. Positively, it has a relatively low start-up cost and resource requirement; staff specialise in a particular care process and there is lower risk of infection from open TB case. However, it increases cost and inconvenience for patients, requires numerous patient visits; there is disconnection of services, higher loss to follow up as well as higher case fatality rate and delays to ART initiation.

### 6.5. Partially integrated model

The partially integrated models include all the programmes in which some HIV care activities occur at the TB unit or *vice versa* (Figure 4). HIV diagnosis and management therefore begins at the TB unit[9,12]. TB diagnosis is also initiated or done at the HIV centre or both[7,10]. Patients are then referred to the appropriate unit for further management. It therefore represents a wide range of models based on different levels of coordination and collaboration between TB and HIV services[17].

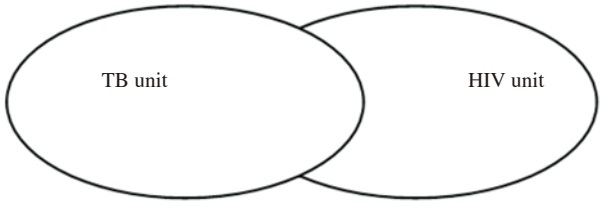


**Figure 4.** Partially integrated model.

The differences between the partially integrated models are based on how much HIV care takes place at the TB unit or *vice versa*. An increasing level of integration is reflected in how much treatment of one condition occurs at the other unit, or to what extent synchronization of both clinics occur to improve access to both services as described by Chifundo *et al*.[43]. This model is expected to be more coherent and offer more continuity than a referral model because establishing informational and managed continuity is expected to be relatively easier as compared to the referral model. However, the challenges of relational continuity still persist[44].

In the Ugandan model, only HIV pre-test counselling is integrated into the TB care. Patients are then referred to the HIV unit for testing and care if needed[12]. Gandhi *et al*.[9] also describe a model where HIV counselling and testing are incorporated into TB care at the TB unit as well as the integration of daily ART into the home-based directly observed TB treatment programme. In Mozambique, TB screening was introduced into an existing HIV care programme[10]. In Zambia, HIV counselling and testing is done at the TB centre, and blood samples for CD4 evaluation are sent if they are positive[7]. At the HIV centre, TB screening is also done and positive cases are referred for treatment. The more integrated these services, the more likely it is to achieve continuity, and the more patient-centred care is likely to be.

Comparatively, it is convenient for patients than the referral model. It enhances communication between different units. However, loss to follow up and discontinuities still exist. Different visits are also required for needed care.

### 6.6. Fully integrated model

This model is usually called a one-stop service[15,43]. In this model, all TB and HIV services are provided in the same location by a team of providers. In Kenya, a TB/HIV team was constituted and trained in co-infection management[6]. In the Khayelitsha model in South Africa, TB diagnosis and management was integrated into an HIV clinic and staff there were trained[11]. The most integrated TB and HIV services are more commonly found in primary care[6,7,11]. Variants of this fully integrated service have been described: patient may be seen by one provider for all needs, or same provider but different session, or different providers in the same building[17,45].

The term full integration of TB/HIV services has been used to describe various service delivery configurations. Leutz defines full integration as the pooling together of resources from the collaborating units to create new services with a single and common information system[39], and Shigayeva *et al.* also refer to it as a merger of the two programmes[46]. However, integration in TB and HIV is not about creating a new programme out of the two but to identify effective ways of delivering their services together. Full integration in TB/HIV therefore refers to the provision of TB and HIV services under one roof, usually referred as one-stop shop or service and therefore this model has the greatest potential to provide continuity of care for TB/HIV co-infected patients and be more patient-centred. For example, the TB/HIV integration in South Africa and rural Kenya demonstrated increased case detection and improved outcomes by offering a comprehensive package of care but indicators were still below targets[6,11]. This may be due to health system barriers which affect implementation as suggested by Ansa *et al*.[45].

Some authors suggest that the higher the level of integration is, the better the service delivers[42,43], and therefore the one-stop shop has been recommended or identified as the ultimate goal[15,42]. However, Ansa *et al*.[45,47] observed that health system barriers were a major setback in effective assessment of the impact of the level of TB/HIV services integration. Gyapong *et al*.[48] proposed that the success or otherwise of an intervention like integration was determined not only by the effectiveness of the intervention, but also by the multiple interactions between the context within which it was introduced, and their impact on how the intervention was implemented.

The fully integrated model gives better access to continuum of care, staff are multi-tasking, and fewer visits to access needed care. Primarily, it is the most convenient model to the patients. However, initial set-up is very costly, staff are overworked and there is high risk of cross infection from open TB cases at the out-patient department. Leguido-Quigely *et al*.[49], however, suggest that if integrated care leads to prompt diagnosis and early treatment of TB cases, then this risk is minimised.

### 6.7. Barriers of integration

The barriers are mainly staff shortages, high turnover, increasing workload, inadequate infrastructure, lack of or irregular supply of drugs and equipment, poor documentation and lack of resources. These are mainly health system barriers corroborating the findings of other studies[47,50]. They mainly affect availability and utilisation, but they have no direct relationship with integration itself. Barriers to integration arise from the differentiation or specialisation which account for the structural and cultural differences in the two programmes and the political aspects of integration which may result in loss of territory, influence and resources[47,50]. Patients also complain of the high cost of accessing services, long waiting times and lack of prescribed drugs[12]. Other barriers include the high adverse outcomes, atypical presentations complicating diagnosis, and stigma[5].

### 6.8. Facilitators of integration

Facilitators of integration identified include direct supervision, standardisation of work, output, and skills and knowledge. Others include standardisation of norms, and mutual adjustment. Highly differentiated systems require high degrees of integration in order to achieve organisational effectiveness in the face of differentiation[51]. Most successful organizations are those which can effectively balance differentiation and integration[46]. Mechanisms of coordination are direct supervision, standardisation and mutual adjustment[51]. Standardisation of norms involves socialising people to work towards common expectations. A common culture is promoted so that externalized controls are replaced by internalized attitudes. All the participants can therefore co-ordinate their efforts because they know what to do.

Direct supervision involved creating a hierarchy of authority appointing a manager or committees to supervise activities, such as in the home-care programme, clinical manager and electronic monitoring of follow-ups and the use of coordinating committees[5,7,11]. In standardisation of work, common tasks and procedures are specified through joint planning, protocols, guidelines and tools as exemplified in national guidelines, TB screening tools and modified patient cards[7,8]. Skills and knowledge were standardised by training different people in different relevant skills so that each one knew what was expected of them and others: service providers, patients, volunteers and family members[5-7,9]. Standardisation of norms to ensure that people work towards a common expectation was achieved through socialisation to establish common beliefs and values[5]. Lastly, mutual adjustment was used to help providers adaptively and collaboratively deal with challenges to service access: HIV status and CD4 levels were assessed the same day to reduce number of patient visits[7]; TB centre staff escorted patients to enrol at HIV centre, or HIV nurses came to enrol patients at TB centre to reduce loss to follow-up[8]. Other strategies included giving money to patients to reduce costs[8]; patients choosing their own supporter, and using medication calendar to facilitate and monitor patient adherence[9].

### 6.9. Limitations

The inclusion of only articles that described interventions which involved ART may have excluded other articles that described other innovative models, limiting the findings of this review. Another limitation is the fact that TB/HIV is usually implemented concurrently with other TB and HIV programme activities and accounting for the effect of these individually can be problematic. The different settings and study periods in the articles make comparison of results impractically: the articles ranged from 2003 to 2010 and major changes in practice occurred over that period. These articles referred to studies conducted in an era where there was global emphasis on TB and HIV interaction and collaboration leading a surge in

political will for TB and HIV collaboration. These events would therefore have influenced TB/HIV integration and implementation, and serve as confounders to the study findings as these had not been accounted for.

## 7. Conclusions

The integration of TB and HIV services in SSA as well is feasible with varying degrees of successes due to variations in policies and other local contexts. The commonest TB/HIV activities include HIV screening among TB patients, CPT and ART for those who are HIV-positive cases, and TB screening among HIV patients. However, uptake of these has been low due to missed opportunities, and lack of capacity to deliver and monitor interventions. IPT and infection control are less common activities.

Three service delivery models of TB/HIV activities with varying degrees of modification and effectiveness are identified. Differences in resources, capacities and other local factors contribute to the adoption of which service delivery models are used and how these can be adapted to suit the local settings. Although many health system barriers to integration exist, training, education and other types of support are used to enhance integration. This review demonstrates the paucity of research which compares different service delivery models as well as evidence to support that greater integration resulted in better indicators and outcomes. The articles demonstrated varying degrees of improvement in indicators post-integration to underscore the potential of integration to improve outcomes. However, there was not enough evidence to identify which model is the most effective.

## Conflict of interest statement

The authors declare no conflict of interest.

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