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*Article*

# Developing a Model for Integrating of Tuberculosis, Human Immunodeficiency Virus and Primary Healthcare Services in Oliver Reginald (O.R) Tambo District, Eastern Cape, South Africa

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**Abstract:** Few studies have examined the pros and cons of integrated TB and HIV service delivery in public healthcare facilities, and even fewer have proposed conceptual models for improved integration. This study intends to fill that vacuum by outlining the development of a facility-based paradigm for integrating TB, HIV and patients services. The design of the proposed model were in stages that involved the evaluation of existing TB-HIV integration model and synthesis of both quantitative and qualitative data from the study sites which were selected public healthcare facilities at both rural and peri-urban settings in Oliver Reginald (O.R) Tambo District Municipality in Eastern Cape, South Africa. Secondary data on 2009-2013 TB-HIV clinical outcomes were obtained from multiple sources for quantitative analysis. Qualitative data involved focus group discussions among patient and health care staff, which was thematically analysed. The development of a possibly better model and validation of this model show that the district's health system was reinforced by the model's guiding principles, which placed a strong emphasis on inputs, processes, outcomes, and integration effects. The model is adaptable to different healthcare delivery systems but will require support from healthcare stakeholders and professionals to be successful.

**Keywords:** model development; TB-HIV integrated model; TB and HIV; model; quantitative and qualitative data

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## Introduction

Although great progress has been made in the fight against the two epidemics over the years, tuberculosis (TB) continues to be a prominent cause of mortality and bad health among persons living with Human Immunodeficiency Virus (HIV), especially in countries with low resources [1]. In fact, the spread of HIV in sub-Saharan Africa significantly boosted the incidence of TB [2]. There is strong evidence that HIV and TB are related, with co-infected patients having a greater fatality rate [3,4]. Programs at the global, national, and local levels started primarily with a vertical approach with little or no coordination [5–7], despite the substantial risk that HIV clients would develop TB. Due to this, the syndemic has been inadequately managed, which has had negative impacts on clients and operational challenges for service providers, particularly in environments with low resources [8]. The World Health Organization (WHO) suggested TB-HIV service integration, at least at the facility level, in response to the persistent TB-HIV co-morbidity [9]. However, there is disagreement over the degree (full or partial) of integration and the levels at which it should take place [8–10]. As a result, numerous models (linkage, cooperation, full integration) have been put into practice in various

situations with a number of difficulties [11–14]. According to the WHO collaborative model, a person who has received a TB diagnosis will also receive counselling and an HIV test, and if the test is positive, will be referred. All TB and HIV services are offered in one location by the same service providers under a fully integrated model of care. Evidence indicates that this fully integrated option provides the best advantages for patients, healthcare systems, and employees [14–16]. However, despite documented intent toward full integration [19–21], widespread integration of TB-HIV care remains unsatisfactory [17,18] in many resource-limited settings such as South Africa, where TB remains a public health challenge largely driven by a high background HIV prevalence, estimated at 12% in the general population. Even though this is not the first empirical discussion of TB-HIV integration in the country, it is, as far as we know, the first attempt to look at operational issues of TB-HIV integration from the point of view of care professionals at the facility level. This paper talks about the creation of a district-based model for providing comprehensive and integrated TB and HIV care that fits the needs of the area. At the time this text was written, health services in South Africa were still given separately and there were not many formal connections between them. Even though referral systems are getting better, it is still hard to keep track of patients who are sent outside of a clinic, and clients still miss out on chances to get full TB and HIV services. This is true even in healthcare facilities with limited resources like under staffed, not enough money, and high volume of TB, and or HIV infected patients.

### **Study Aim and Setting**

We aimed to promote the scaling up of TB and HIV services, highlight the challenges of delivering integrated TB-HIV services at scale, and contribute to the development of integrated services policy in South Africa through the design of an improved integration model based on empirical data evaluation. The study population were patients aged 18 years of age or older in the study setting, which also included five selected public healthcare facilities in both rural and peri-urban settings in the Oliver Reginald (O.R.) Tambo District Municipality in the Eastern Cape, South Africa. In addition to being one of the poorest districts within the Eastern Cape is one of the ten districts with the greatest combined burden of HIV and TB [32,33]. The country has estimated prevalence of 737/100,000 was higher than the Eastern Cape's incidence of TB in 2017 of 839/100,000 [32,33]. Additionally, the Eastern Cape had a high prevalence rate of HIV overall of 25.2% as of 2017 [19,32,33]. In order to improve both the TB and HIV care given at public healthcare settings, in terms of services provided to patients where they dwell, we set out to research cutting-edge approaches. In this article, we discuss the work that was done to help with the development of the integration model (study design), give a brief summary of the baseline data that was used to inform the model (key findings from baseline research findings), describe how the model was developed and its main components (discussion: designing the model), and describe how the model was implemented. The integration model's efforts for developing health care systems for the delivery of TB and HIV integrated care rely on straightforward, tried-and-true techniques as well as cutting-edge, novel concepts.

### **Methods**

#### **Part 1**

For quantitative assessment to inform the development of the model in part 1 phase, secondary data on TB-HIV clinical outcomes was obtained from a range of sources, including governmental, non-governmental, and research institutes. These outcomes included indicators for the efficacy of TB therapy were TB mortality rate, TB rate among the household contacts of the Index TB cases, TB treatment failure, HIV associated TB death rate, TB defaulter rate, and new TB smear positive cases. Analysis of variance (ANOVA) and Turkey's tests for post-hoc analysis with a type I error rate of 0.05 were used to compare the means of the pertinent variables. Regression models and canonical discriminant analysis (CDA) were used to examine the associations between trends in TB incidence and independent TB predictors. Wilk's Lambda values were closer to zero during CDA, and Fischer's

linear functions, Eigen values, and Mahalanobis distances were also calculated. Data analysis was performed using SPSS® statistical software, version 23.0 (Chicago, IL).

## Part 2

This study used a qualitative approach at this stage, employing the aggregate complexity theory and ethnographic ideas [22]. Complete mental representations of object function were provided by ethnographic principle hypotheses [22]. It has made it simpler for us to comprehend our perspectives, which is the first step in fostering reflexivity (the analysis of one's own beliefs), a crucial skill for conducting the exhaustive qualitative research required for our study [22]. To comprehend the local language and social customs, ethnography demanded total immersion in the culture. Conversation with participants in their native tongue enhances immersion. Before beginning this investigation, the researchers received training from an ethnographer. This was crucial for developing the question guide, testing it beforehand, and conducting participant interviews [22]. The interconnections between sociocultural, behavioural, interpersonal, and environmental aspects determined the framework during analysis. When it comes to TB-HIV service integration models and variables influencing how well they are perceived, culture has a significant impact on behaviour and outcomes [22]. The sample for this qualitative research phase involved 25 health service providers and 29 TB/HIV patients from the five selected health facilities in the O.R Tambo area. The participants were specifically chosen due to their lengthy work histories and direct involvement in the management of TB and/or HIV in the specified facilities. Despite the same frequency of TB and HIV in each of their catchment areas, the five health care facilities were chosen using simple randomization.

## Part 3

Themes 1 (one), 2 (two), 3 (three), and 4 (four) were the focus of information sent by 24 of the 29 participants (out of a total of 29 participants). Four more participants were recruited after data saturation to make sure nothing new had truly appeared. In looking for knowledge gaps, potential hurdles, and facilitators of TB-HIV integration services at the institutions from the patients' perspectives, the researchers found three themes, each with one to four subthemes.

### **Theme 1.** *Knowledge of Risk Factor for TB, HIV and TB-HIV Coinfection Etiology of Tuberculosis (TB)*

According to participant opinions, there is a lack of information regarding TB and/or HIV risk factor risk factors. Also, participants did not comprehend the causal link between TB and HIV, as shown by their comments that those with HIV need not worry about contracting TB. Participants believed that healthcare providers needed to continually advocate for health education to help patients better understand TB, HIV, and co-infected illnesses, particularly how they are related to one another. Due to a lack of knowledge about TB and its link to HIV disease, the provision of health services was misused and TB testing was delayed when HIV-positive individuals were at risk of getting TB and needed to begin taking cotrimoxazole for TB-preventive medication. For HIV-positive individuals with weakened immune systems, cotrimoxazole preventive therapy (CPT) is recommended to lower morbidity and mortality from illnesses like pneumocystis pneumonia and other infections. Health promotion and public awareness programs need to be strengthened in order to properly educate the public about TB and HIV.

### **Theme 2:** *TB-HIV Integration Management Services at the Healthcare Facility*

Participants' misunderstanding of the clinic's integration of TB-HIV services and belief that TB and HIV services are very seldom provided. The study showed that there is still a need for improvement in the management of TB-HIV integration, and there was a disconnect between the programs (partial integration), which raised the cost of treatment for patients and added hassles due to the number of visits required to receive the required care.

### 2.1. Diagnostic Process

The observed that nearly half of those with a confirmed TB diagnosis did not undergo HIV testing or counseling. This could be due to inconsistent in testing and counseling by health professionals. HIV weakened the immune system for opportunistic diseases like TB, hence it is highly advised that TB patients routinely test for HIV.

### 2.2. Dissemination of Information/Counseling

The majority of the participants in the study did not receive information or counseling regarding antiretroviral medications (ARVs), HIV, nutrition, tuberculosis, or other preventive measures, which the study identified as an evidence of TB-HIV integration. The healthcare professionals' health education initiatives on TB-HIV may not be consistent. Programs for TB-HIV control management put a strong emphasis on treatment adherence, particularly awareness of side effects, a well-balanced, behavior alteration in sex life (condom use, abstinence, be faithful, reduce the number of partners by patient), lifestyle changes (such as reduction smoking and alcohol intake), and adherence support strategies services that may include directly observed treatment.

### 2.3. Infection Control Practices against TB and HIV

We investigated whether or not the facility employed an infection prevention and control (IPC) nurse for the execution of policies, knowledge, and education for the facility based on the TB-HIV integration guidelines. The majority of respondents were unaware that their facility had an infection control nurse, which suggests that infection control measures are not as efficient as they may be and that there are difficulties in putting in place successful IPC programs.

## **Theme 3. Factors Affecting Compliance**

We looked into the potential contributing causes to treatment protocol non-compliance. The distances between respondents' houses and the healthcare facilities, which prohibited respondents from obtaining care as planned, surfaced as one of the issues. The survey found that the majority of respondents were worried about the distance to clinics, the condition of the roads, and the cost of transportation, all of which had an adverse impact on their ability to get TB and HIV care. Barriers to accessing TB and HIV services include distance and poor infrastructure, especially in underprivileged populations.

### 3.1. Patients' Recommendations for Improvement of TB-HIV Integrated Healthcare Services

The majority of respondents who were questioned whether the clinic's quality of TB and HIV care was good were dissatisfied with the solutions provided by the establishment. The majority of respondents believed that the TB and HIV services at their facility were of extremely poor quality. This can be the outcome of improper integration of TB and HIV management.

### 3.2. Patients' Recommendations for Improvement

The majority of respondents said that service could be improved when asked whether they thought the level of care offered by their facility could or should be improved. Hence, it would seem that most patients have a poor opinion of TB and HIV services, which may be changed. Those who thought the services were satisfactory could not have visited the clinic frequently because of how far it was from their residences. Their incapacity to compare the calibre of services offered and their inability to pay to go to alternative facilities may have had an impact on their responses.

## **Validity**

Validity is the extent to which an empirical measure accurately reflects the concept it is intended to measure. For development of this model validity, researchers traced the intermediate results and compare them with observed outcomes. By checking, the simulation model output using various

input combinations model was validated. In addition, by also comparing final simulation result with analytic results. PHC nurses and experts in research and model development were consulted during the questionnaire's preparation to ensure its face validity and content for O.R Tambo District Municipality clinics [34].

### **Reliability**

Describes the degree to which independent administration of the same instrument or a substantially comparable instrument consistently produces the same or similar results when subjected to the same conditions. To assess model homogeneity, the questionnaire was distributed to five PHC practitioners to fill them [34].

### **Definition of operational concepts**

**Pneumocystis pneumonia:** Pneumocystis pneumonia. Pneumocystis pneumonia (PCP) is a serious infection caused by the fungus *Pneumocystis jirovecii*. Most people who get PCP have a medical condition that weakens their immune system, like HIV/AIDS, or take medicines (such as corticosteroids) that lower the body's ability to fight germs and sickness [13]

**Simple randomization:** It is based on a single sequence of random assignments and it is the technique that maintains complete randomness of the assignment of a subject to a particular group. The most common and basic method of simple randomization is flipping a coin [34]

**Analysis of Variance (Anova):** is a statistical technique to analyze variation in a response variable (continuous random variable) measured under conditions defined by discrete factors (classification variables, often with nominal levels) and allows a comparison of more than two groups at the same time to determine whether a relationship exists between them [34].

**Turkey's test:** It is a single-step multiple comparison procedure and statistical test and can be used to find means that are significantly different from each other, named after John Tukey [32].

**Wilk's Lambda:** It is a measure of how well each function separates cases into groups. It is equal to the proportion of the total variance in the discriminant scores not explained by differences among the groups. Smaller values of Wilks' lambda indicate greater discriminatory ability of the function [32]

**Eigenvalues:** They are the special set of scalars associated with the system of linear equations. It is mostly used in matrix equations. 'Eigen' is a German word that means 'proper' or 'characteristic'. Therefore, the term eigenvalue can be termed as characteristic value, characteristic root, proper values or latent roots as well [32]

**Canonical discrimination Analysis (CDA):** It builds a predictive model for group membership. One primary purpose of CDA is to separate classes (populations) in a lower dimensional discriminant space [32].

**Mahalanobis distance:** It is the distance of the test point from the centre of mass divided by the width of the ellipsoid in the direction of the test point. It can be used to determine whether a sample is an outlier, whether a process is in control or whether a sample is a member of a group or not [32]

**Posthoc analysis:** Post hoc in Latin means 'after this'. Simply put, a post-hoc analysis refers to a statistical analysis specified after a study has been concluded and the data collected. A post-hoc test is done to identify exactly which groups differ from each other [32]

**Regression Analysis:** Regression analysis is a powerful statistical method that allows you to examine the relationship between two or more variables of interest [32]

**Model:** A model is a symbolic depiction of reality, which provides a schematic representation of some relationships among phenomena and uses symbols or diagrams to represent an idea [34]. For the purpose of this study, a model refers to a schematic presentation of the integration of TB and HIV service in O.R Tambo, Eastern Cape.

**Context:** The context represents the area where the action takes place. The TB and HIV services are provided in the Primary Health care facilities in the five clinics of O.R Tambo District Municipality, Eastern Province.

### **Results**

### *Some Key Findings from the Original Investigations (Part 1, 2 and 3)*

Quantitative data from part 1: There were 298 cases of tuberculosis (TB) for every 100,000 people over the course of a five-year period, according to an examination of 62 400 records of TB notice from 2009 to 2013. By the time the evaluation was finished, the incidence of TB had fallen by 79.70% from the baseline data from 2009. Multiple linear regression analysis revealed a strong and independent correlation between the decline in TB incidence and PHC expenditure per capita as well as the cost per patient day equivalent (PDE). In addition, compared to places with less socioeconomic disadvantage, the death rates from HIV-associated TB were significantly higher .

Qualitative data from Part 2 revealed that in a total of 54 participants in O.R Tambo District Municipality clinics, 39 (72.2%) reported that TB and HIV services were partially integrated while 15 (27.8%) participants reported that TB/HIV services were fully integrated. By partially integrated is when tuberculosis and HIV/AIDS service delivery points are in the same health facility, but some HIV/AIDS services are provided in TB clinic, and some TB services are provided in HIV/AIDS clinic. To get the full range of TB and HIV/AIDS services, the co-infected patients must still go to two different clinics run by different staff members. However, when TB and HIV/AIDS services are delivered at the same delivery location in the healthcare facility by the same team, TB and HIV/AIDS services are fully integrated. Qualitative data from part 3 observed that 29 patients analyzed using qualitative content analysis and presented from the themes were lack of health education about TB and HIV; an inadequate counselling for HIV and the antiretroviral drugs (ARVs); and poor quality of services provided by the healthcare facilities. Thus, these findings imply that the O.R Tambo district's TB-HIV integration needs to improve with immediate effect. Therefore, we identified these concepts (inputs-activities that needs to be done for TB-HIV full integration); (Processes-programmes executions of inputs), (outcomes-measurable results); (integration effect-impact of the implemented activities) for the development of an integration model from the preliminary findings of the groundwork from Parts 1, 2, and 3 of this work.

### *Model Synthesis*

Information extraction from quantitative and qualitative data allowed the key barriers to the full integration of the TB and HIV control and implementation models in the primary healthcare facilities of the O.R Tambo District Municipality to be identified. It has a detrimental impact on patient management since health care professionals are required to be trained in how to support and care for TB and HIV patients in the community. Competent health care staff members can and will inform patients' family in the neighbourhood about TB and HIV. This will improve patient compliance with therapy, help them comprehend the connection between TB and HIV, be aware of potential drug adverse effects, and be familiar with TB signs and symptoms.

### **Derivation**

TB predictors and their numerous deprivation indices, as well they affect the most susceptible populations in relation to TB and HIV, were identified using the results from quantitative data. Funding can be directed toward the most in need by keeping in mind that the most impoverished people are most affected by TB. TB predictors, multiple deprivation indices, and their effects on the most disadvantaged in connection to TB and HIV were identified using the findings from quantitative data. Knowing that TB mostly affects the most poor sector of the community can help with the distribution of budget to the most in need.

### **Deductive reasoning**

Deductive reasoning was necessary to operationalize the paradigm that was constructed. Deductive reasoning involves moving from broad to specific conclusions. Deductive reasoning can be used by the researcher to move from a broad theoretical understanding to a testable hypothesis [34]. The TB-HIV service integration model should be abstract in order to direct it toward deductive

reasoning and migrate from abstract notion to well-defined strategy before being implemented in PHC facilities.

### **Inductive Reasoning**

As defined by Brink et al. [34] as when special circumstances are combined to produce the general premise, inductive reasoning is a sort of analytical reasoning used when data need to be extended from a small sample to a larger sample. Starting with an observation, patterns in the observation are then found. In order to identify the integration as the study's core concept, the model generation approach employed in this study's data analysis from the focus group discussion [19] must use inductive reasoning.

### **Concept analysis**

Concept analysis is a procedure that enables investigation of the features or characteristics of the concept, according to Brink et al. [34]. Concepts that will be employed in the study were identified, described, and categorized throughout this phase of the research process. [34] defines concept analysis as a process that allows for the investigation of the features or attributes of the concept. Throughout this stage of the research process, concepts that will be used in the study were named, described, and organized. Concept analysis includes the procedure by which the traits necessary to the meaning of the concepts are identified, in addition to identifying and clarifying the concepts and variables upon which the model is based. In order to identify whether an idea is the major concept or a sub-concept, Brink et al. [34] suggest that it is crucial to ascertain the concept's nature and organizational structure. Throughout the idea analysis, concepts with related meanings and others with different meanings but ties to the primary concept will surface [34]. Analysis of the related concepts is required to ascertain how the linked concepts relate to and are related to the central ideas of the model. Defining the integration idea as well as its associated concepts, key components, antecedents, and consequences is part of the concept analysis pattern employed in this work.

### **The model validation phase**

Model validation seeks to confirm the model's applicability to the integration of TB, HIV, and patient care at the PHC facilities of the O.R Tambo District Municipality.

The model's efficacy was evaluated through validation, which also established if the model addresses the research issue and the study's goals. The model's validation took into account the concepts' clarity, its range of application, the extension of its use, and its logical progression.

#### *Model validation*

A model was validated in order to assess its effectiveness. This then determines whether the model satisfies the objectives of the study and offers a solution to the research problem. In this study, the model was validated to see whether the study's objectives were met. The questionnaires and the model's structure were delivered to PHC nurses and model development experts from Walter Sisulu University in order to validate the model. Throughout model validation, the primary objective of the model was to demonstrate its applicability to the integration of TB, HIV, and patient care at the PHC facilities of the O.R Tambo District Municipality. Via validation, it was determined whether the model satisfied the objectives of the study and the research issue as well as how well it performed.

### **Discussion: Creation of the Model**

Our goal was to develop an integration model that would be practical, affordable, and able to handle the demands and challenges of the participating institutions while also addressing the needs and challenges of the environment. Key informant viewpoints and a review of the literature on integration made it clear that our approach had to enable internal variation between sites in addition to being applicable to the setting of the larger health system. Our technique did, however, incorporate broad generic elements that permitted some site-specific customisation in recognition of the fact that

"one size doesn't fit all" [23,24]. In addition to the lack of standardized metrics to quantify integration [17–19], it is difficult to evaluate the advantages and disadvantages of integration efforts across various settings because the term "integration" has been conceptualized in a number of ways [16]. As opposed to two extremes of integrated/not integrated, it has been described as a "spectrum" [25] or a "continuum" [26]. Moreover, integration has been divided into "full" (providing a wide range of services on-site) and "partial" (relating to off-site services) forms [27,28]. At the facility level, the provider, the customer, or both may start or lead it. It is also important to establish the direction of integration, i.e., which programs or services are being integrated with which new or existing services? The completely integrated model for HIV-TB services was adopted in South Africa. However, in line with the results of our study, O.R Tambo District Municipality PHCs produced a partial integrated service model. They were used in this model as a reference to implement a full integration model. Processes and inputs must be improved in order to achieve a full integration, which will have an effect on how TB and HIV control are managed. Both programs will be responsive, and patients who are co-infected with TB and HIV will have equal access to services (outcome and integration effects). These services were included in our approach at the provider and facility levels. The latter had a single provider providing a range of services, whereas the former involved procedures to support internal referral, either during the same visit or a subsequent one. Measures to maintain solid ties across services were also put in place to improve coverage and continuity of care. Throughout the model's development, a few issues showed up like the inclusion of the community but intentionally the study was only focusing among health care workers and patients, however with a health care system that is already overburdened and has a high staff turnover rate. In addition, health care workers focused on how to ensure true community involvement, build capacity without unnecessarily depending on training, and improve service quality. Reviewing the research on potential obstacles to the efficacy of integrated programs revealed additional difficulties. Such obstacles could exist at the facility and health system levels and include a lack of specific instructions on which service is to be integrated in which department and how; insufficient supervisory on integrated training; and stock-outs of TB resources including drugs and ARVs supplier [29,30]. If clients believe that integrated services require lengthy wait times, poor privacy, and little opportunity for questioning during consultations, integration may be less beneficial from their perspective [31].

### Inputs

According to earlier research, policy and guidelines are necessary for integrating TB-HIV care and preparing healthcare professionals for implementation [13]. The budget/healthcare expenses (expenditure per capita, spending per day equivalent and local government expenditure) for integrating have been highlighted in other studies [12]. Studies by WHO [13], UNAIDS [14] and others have shown that TB-HIV education programs have a significant impact on full integration because the two diseases are epidemiologically linked. Patients and communities should be aware that people with HIV infection and untreated latent TB infection are much more likely than people without HIV infection to develop TB disease in their lifetimes. To empower patients and encourage their involvement in the fight against tuberculosis (TB), health education is crucial [15]. Health education initiatives are incorporated into primary health care (PHC) services in South Africa, although they are insufficient [19]. Similar numbers of PNs were employed per 100,000 OPD patients at each facility. In contrast, all clinics had a CHW shortage, which jeopardized appropriate family coverage. As a result, the number of staff members was solely considered a community-level integration constraint. A 2012 South African study that interviewed 29 health managers and NGOs also brought attention to staffing issues. The study found that human resource capacity was a significant barrier at the community level, reflecting the rise in HIV-associated TB cases, financial constraints that made it difficult to create new positions, and issues with hiring and retaining staff [16]. Three to four consultation rooms are needed for integrated HIV-TB care, according to other research conducted elsewhere [13]. Despite having few consultation rooms, 90% of the clinics felt that they lacked enough of them to offer integrated HIV-TB services. Infrastructure seemed to be a major barrier to integration; a related conclusion in the 2014 joint evaluation noted infrastructure issues impeding efficient TB infection control [12]. The historical mechanism of providing TB-HIV services

as vertical services located in various locations at facility level is an obstacle for the provision of integrated TB-HIV services, according to one explanation, which points to difficulties reorganizing the location of the services to enhance integration [16]. In Nairobi, Kenya, Chakaya and colleagues investigated getting private healthcare providers to treat TB patients in accordance with national criteria and to report cases to the government [20]. The authors discussed a number of results, including the proportion of patients with private sector diagnoses who were registered with the national program, the proportion of patients who underwent HIV testing (across both sectors), and the proportion of patients who started treatment for both TB and HIV.

### Processes

The movement of TB-HIV patients through a medical facility is known as patient flow. Improvement of patient flow between services and facilities in ways that can benefit all programs including TB and HIV programmes. Individuals who have HIV-associated tuberculosis (TB) frequently have their TB and HIV care provided through distinct vertical programs with little coordination. Such "siloes" (stand-alone) methods are linked to diagnostic and therapeutic hold-ups, which increase needless morbidity and mortality [15–17]. National efforts to manage the TB pandemic would be compromised by poor IPC. In addition, PLWHIV are more likely than the general population to get TB infection and die from it. In order to prevent nosocomial transmission of TB, fully integrated HIV-TB services must therefore implement excellent TB infection management, as was demonstrated in the Extensively drug-resistant TB (XDR-TB) outbreak at Tugela Ferry, KwaZulu-Natal, in 2006 [24]. The Interim Policy on Collaboration TB/HIV Activities was published by the World Health Organization (WHO) in 2015. In the policy, efforts for persons with HIV (PLWH) include infection control, increased case discovery, and isoniazid preventative therapy (IPT). Activities for TB patients included antiretroviral therapy (ART), care and support, cotrimoxazole preventative therapy (CPT), HIV counselling and testing, and prevention messages. Targets of the WHO Global Plan to End TB have not been met, despite significant advancements in implementation. Even though a straightforward TB symptom test may have been successfully incorporated, studies conducted elsewhere found that HIV patients were not routinely screened for TB [24–26]. Despite the fact that the median CD4 count was 336 cells/mm<sup>3</sup> (greater than the median CD4 level of 111 cells/mm<sup>3</sup> observed in large ART cohorts in sub-Saharan Africa), those newly diagnosed with HIV were not provided IPT, even though most may have been eligible. Thirdly, inadequate TB screening procedures were used for HIV patients [27–29]. To improve full integration as other research have noted the phenomenon, there should be interlinkage among TB-HIV services and all pertinent units [30,31].

### Outcome

In order to prevent and control TB among people living with HIV, the World Health Organization supports for the integration of HIV-tuberculosis (TB) services and suggests intensive case finding (ICF), isoniazid preventative therapy (IPT), and infection control (the "Three I's") [1–3]. Full integration has been linked to TB-HIV outcomes such as TB mortality, TB case finding index, TB treatment failure, HIV associated TB death, TB defaulter, and TB smear positive cases, according to previous studies [5,6]. Guidelines and policies supportive of the integration of TB-HIV services (TB, HIV, TB-HIV integrated, and PMTCT) have been developed by the South African Department of Health (S.A Department of Health) [4]. Facilities or PHCs providing integrated TB/HIV services may be able to lower mortality by earlier identification of TB and HIV patients and earlier commencement on both TB therapy and ART. The facility personnel adopted various TB/HIV integration improvements during TB reach and mentors that may have improved TB screening and initiation among HIV patients. For example, taking more proactive steps to identify HIV patients with TB symptoms and shifting TB medications to the HIV clinic. Improvements were also made in genexpert, treatment adherence, patient retention, and comprehensive quality infection control [16,17]. In investigations of groups of HIV-positive patients, heightened case finding with microbiological (sputum smear or culture) research in all patients regardless of symptoms led to the discovery of an

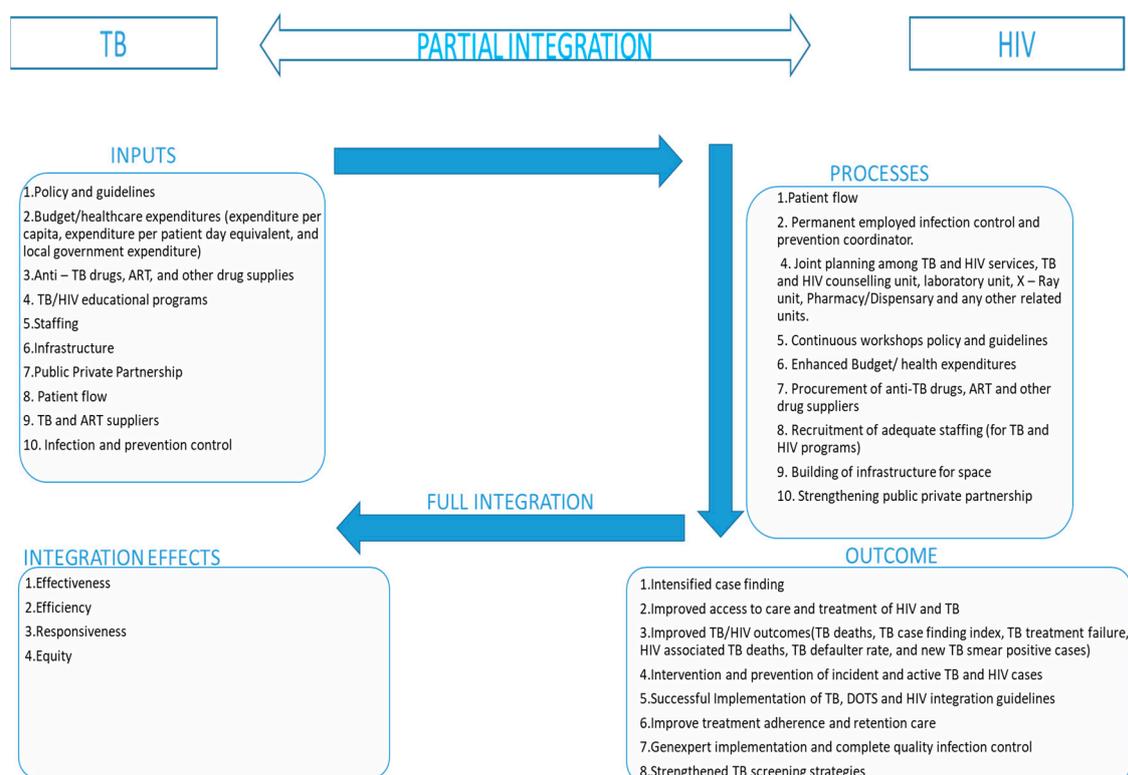
additional four cases per 100 people screened. This result is in line with the discovery that when actively screened, sizable portions of HIV-positive people have sub-clinical tuberculosis [18].

### Integration Effects

As previous research have shown [19,20], improved access, resource utilization, and efficiency would lead to improved TB treatment results. Other concurrent TB or HIV-specific therapies, however, may also result in better results. Consequently, good TB treatment results are then a representation of the influence of all the treatments when TB/HIV integration is offered as part of a national program-improvement approach, as studies in Ghana found [17]. Moreover, it is anticipated that improved access to more thorough care, efficacy, efficiency, responsiveness, and address equity will be connected with increasing integration of TB-HIV care [17]. The main goal of TB-HIV integration is to alter the way that multidisciplinary teams collaborate and deliver care [18]. This is expected to promote continuity, increase coordination, and put the patient first [19].

### Intelligibility of the TB and HIV services integration model's structure

According to the validation's results, many respondents thought the model's name was appropriate and that the integration model for TB, HIV, and patient services was well defined. The TB, HIV, and patient services integration model's goals are clearly stated, and has showed that the principles utilized in it are straightforward and that it will fulfil its purpose. The model's context is well stated, according to the respondents. The results also showed that the model's interactions are understood with structural clarity and consistency, and that they are well represented graphically for visual presentation. The interrelationships between the concepts used in the model are also very well interwoven.



**Figure 1.** Model of integration produced for the O.R Tambo District Municipality Integration conceptualized.

### **Building capacity through instruction and guidance**

A crucial part of the approach is increasing healthcare providers' ability to provide integrated services. Building capacity served as the foundation for initiatives aimed at bolstering health systems and interventions intended to raise the calibre of certain services. Topics related to TB and HIV were discussed in each case from the standpoint of integrated services. It is critical that training cover "systemic" topics including ways to improve referral systems, monitoring and evaluation (M&E), and record keeping. Sessions should be held on-site, at the providers' facilities, to boost attendance. Together with community members, they also included non-clinical personnel like clinic receptionists and security guards.

### **Conclusion and Recommendations**

While taking into account the local context, certain factors were identified as potential barriers to the integration of HIV-TB services. These include input and process factors that have an impact on partial integration, while outcome factors that strengthen integration effects help the system become efficient, effective, and responsive to the needs of the underprivileged population. Improvements in TB and Human Immunodeficiency Virus (HIV) and patients services Integration will be required by addressing the systemic issues affecting health service delivery, including strengthening supervision and mentorship, training, medicine supply, and strengthened designed model for quality care in TB-HIV Integration of Services.

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