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Effectiveness of the Interventions of TB and HIV Control in Zambia: A Systematic Review

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Abstract

The purpose of the research paper was to investigate the effectiveness of the interventions of TB and HIV control in Zambia. The research had the objectives to 1) identify the current TB and HIV control mechanisms in Zambia, 2) to find out the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia and 3) to analyse the contents of the government policy provisions that address TB and HIV in Zambia. A mixed design was used for the research, in this regard two data sources were of significance to the research i.e. the primary and secondary data. The primary data was collected from the sample of 314 health personnel from the Copperbelt Regional offices and the National Aids Council who were randomly selected. Semi-structured questionnaires were used to collect primary data. In addition, primary data was collected for systematic review. The quantitative primary data was analysed using SPSS version 25 and thematic analysis was used for qualitative data. This systematic review followed the guidelines described in the Cochrane Handbook and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The findings indicate that the effectiveness of the interventions of TB and HIV control in Zambia is positively significantly correlated with TB and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465)

Keywords: *Control, Effectiveness, HIV, Interventions, TB.*

Introduction

The research paper investigated the effectiveness of the interventions of TB and HIV control in Zambia. Zambia's intervention programs aim at eradicating TB and HIV by the year 2030. The initiative concentrates on leveraging supplementary resources from countries, international private-sector partners, and other local organizations for the purposes of meeting the targets. The interventions have been carried out in the country across all the districts, aiming at communities that are highly burdened with TB, people living with HIV, children, and personages living in congregate settings for instance, prisons. From time and again, the Ministry of Health has partnered with various organizations international and local and this calls for the need to find out how effective these interventions have been so that improvements can be done where they need to [1].

The study objectives are to:

1. To identify the current TB and HIV control mechanisms in Zambia.
2. To find out the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia.
3. To analyse the contents of the government policy provisions that address TB and HIV in Zambia.

With regards to the study significance, the findings of the study will inform policy formulation, evaluation, and implementation in the area of intervention in health services in general and TB/HIV services specifically with respect to the transferable findings that can be

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applied in similar settings. In addition, the study will add to the body of knowledge.

Literature Review

Literature

Eligibility Criteria

The records were reviewed by the researchers to determine whether the search results met the following criteria: (1) published in peer-reviewed journals in English prior to November 2011; (2) focused on qualitative or quantitative studies of TB and HIV intervention programs with focus on Zambia; and (3) investigated the government policy provisions addressing TB and HIV.

Data Extraction

Data was extracted and coded using structured tables containing ten defined fields. The define field incorporated the participants' characteristics, location and setting, research design, and the effects of the programs. The participants' characteristics included the gender and age of the sample. The research design included such fields as sample size, study design, and type of TB and HIV intervention. The researcher and the research assistant worked independently to extract data from each article and then reconciled their responses for the purposes of checking for consistency.

Search Results

Initially, the search generated 18,000 studies related to HIV interventions and 15,900 studies related to TB interventions. Upon exclusion of duplicates, 11,000 remained for HIV and 12,000 remained for TB. In defining the search with regards to year of publication 486 studies were returned for HIV and 329 for TB. The researcher and the assistant carried out a three-step screening of the citations and the year of publication. As such at the title of publication review stage 405 studies were found not to be directly associated to HIV interventions in Zambia and 218 studies were found not to be directly associated to TB interventions in Zambia. This left 81 studies for HIV interventions and 111 studies for TB interventions. At the time of screening abstracts, 22 studies were found to be directly relevant to HIV interventions in Zambia and 22 for TB interventions. A manual search was carried out in the references of the remaining articles, resulting in the discovery of 3 articles on HIV interventions and 3 articles on TB interventions that met the inclusion criteria. In total, 28 articles on HIV interventions and 25 on TB interventions were deemed eligible for inclusion.

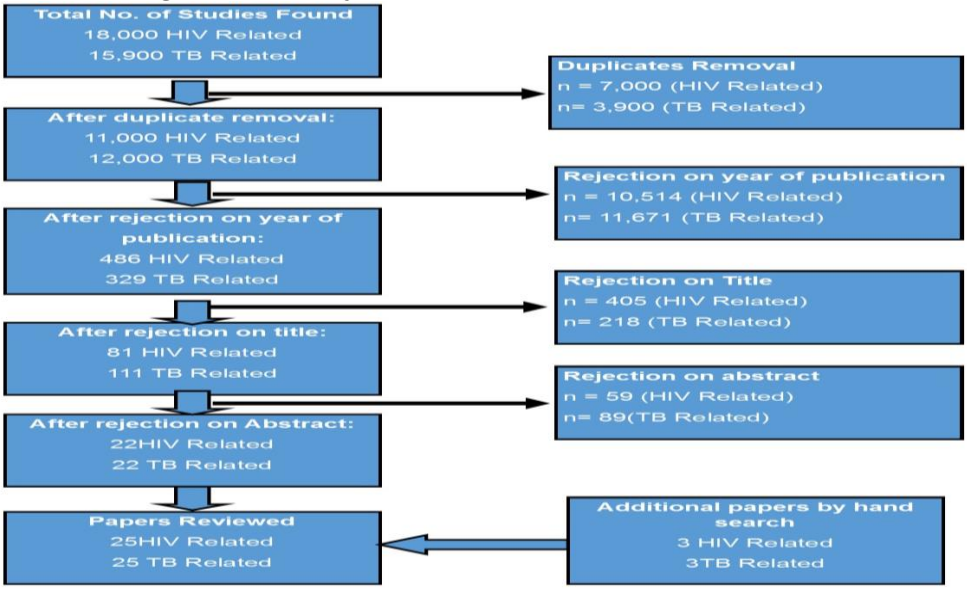

Figure 1. Review Protocol

Reviewed Studies

HIV/AIDS

Table 1 outlines some of the reviewed studies of the 25. The reviewed studies reviewed various HIV interventions, for instance, Behavioral risk reduction intervention, Couple voluntary HIV counseling and testing (CVCT) and condom use (among others). The studies targeted various populations and used a number of study designs

Table 1. Research Setting of the HIV Studies

#	Author and publication year	Geographic location	Year data collected	Target population	Sample size	Study design/method	HIV Intervention
1.	Vamos et al[2].	Lusaka	2015	Community health centers staff	82	Survey	Behavioral risk reduction intervention
2.	Kelley et al.[3]	Lusaka (Zambia) and Kigali (Rwanda)	2004	Men. 15-60 Women. 15-49	Rwanda: n = 600 Zambia: n = 603	Quantitative study: Questionnaire survey. Cross-sectional study.	Couple voluntary HIV counseling and testing (CVCT).
3.	Chitalu et al[4]	Lusaka	March 2009 to March 2012;	Couples in urban communities	240	Experimental (baseline assessment)	Behavioral interventions (condom use)
4.	Qiao et al.,[5]	Zambia	literature published prior to November 2016	1,819 articles	32 Articles	Systematic Review	HIV testing
5.	Shanaubea et al.[6]	Zambia	October 2016 to December 2017	12 communities in Zambia	2100 adolescents	cluster-randomized trial	PopART
6.	Bond et al.[7]	Zambia and South Africa	2012 to 2018	1547 participants	1127 observations.	Cluster-randomised trial (CRT	ART
7.	Leiby et al.,[8]	Lusaka	May to October 2014	uncircumcised males	2312 uncircumcised males aged 15–30	Randomized controlled trial	VMMC uptake
8.	Herce et al.[9]	Lusaka	study outcomes before (June 1, 2010—January 31, 2011) and after (August 1, 2011—March 31, 2012)	473 patients with HIV-associated TB	pre- (n = 248) and post-intervention (n = 225) cohorts.	quasi-experimental design	integrated HIV treatment and care

9.	Pry et al.[10]	Lusaka	1 January—30 June 2020	59 HIV care facilities	101 371 individuals	Experimental	HIV treatment and care
10.	Brooke et al[11]	Rural Macha	2010 and 2011	85,000 simulations	539 simulations	Mathematical modeling	Prep
11.	Limbada et al.[12]	Lusaka	May 5 and Dec 19, 2017	Two urban communities in Lusaka,	2489 participants were enrolled into the trial: 781 in the SoC group, 852 in the HBD group, and 856 in the AC group.	three-arm, cluster-randomised, non-inferiority trial	viral suppression (ART)
12.	Moyo et al.,[13]	Copperbelt Province	2010 to 2019	monthly data of HIV/AIDS cases from the Ministry of Health	120 observations	time series modeling	Mandatory HIV Testing (government policy provisions)
13.	Jones et al.[14]	Lusaka	2013	446 couples living with HIV attending community health clinics (CHCs).	223 heterosexual couples	Descriptive survey	ART adherence
14.	Chatora et al.[15]	Lusaka	2017	Lusaka based companies	128 randomly selected member companies of Zambia Federation of Employers	A mixed method assessment	Workplace policy
15.	Tiwari, et al.[16]	Zambia	July 2010 and December 2019.	29,980 studies	76 studies	systematic review and meta-analysis	Sexual behaviour change
16.	Pinchoff et al.[17]	Lusaka, Chilanga, Chongwe and Kafue	November 2015 to January 2016	g sexually active young adults ages 18–24	2,388 individuals	household cross-sectional survey	Condom use

17.	Gumede-Moyo et al.[18]	Zambia	2010 to 2015	all pregnant women who attended antenatal care in the 889 health facilities	104 155 pregnant women	Retrospective cohort study	PMTC

TB Interventions

Table 2 outlines some of the reviewed studies of the 25 that studied various TB interventions.

Table 2. Research Setting of the TB Studies

#	Author and publication year	Geographic location	Year data collected	Target population	Sample size	Study design/method	TB Intervention
1	Melgar et al.[19]	Copperbelt and Lusaka provinces	October 2018	Adults and children living with HIV	482 records of individuals diagnosed with HIV (including 128 children). Excluding two individuals diagnosed with tuberculosis before enrolling in HIV care	Cross-sectional survey	case-finding and prevention
2	Hatwiinda et al.[20]	Lusaka, Livingstone and Kabwe	2010-2011	Six large Zambian prisons:Lusaka Central Prison, Livingstone Central Prison andthe four prisons in the Kabwe Complex incorporating:Kabwe Maximum, Kabwe Medium, Kabwe Female and the Kabwe Open Air Prison	6282 inmates	Descriptive survey	TB diagnosis and treatment in Zambian Prisons
3	Cremers et al.[21]	Lusaka (Kanyama clinic)	2015	TB patients	300 TB patients	Mixed methods	DOTS
4	Podewils [22]	Copperbelt and North-Western provinces	2014-2018	Ex-mineworkers and healthcare workers (HCWs) in Zambia.	2,792 mineworkers and 94 HCW	mixed-methods	TB care and policies

5	Nanzaluka et al.[23]	Lusaka	1st January to 31st December, 2015	all TB cases on treatment	1,724 registered TB patients,	Descriptive	Tuberculosis treatment
6	Kerkhoff et al[24]	Lusaka	2021	consecutive adults with newly microbiologically-confirmed TB	401 patients	Experiment	Home Based Care
7	Toyama[25]	Lusaka	September 2014 and February 2015	community volunteers	74 community volunteer	cross-sectional study	community volunteer involvement
8	Herce et al [26]	Lusaka	June 1, 2010-January 31, 2011 And August 1, 2011-March 31, 2012	All new or relapse HIV-positive TB patients	473 patients with HIV-associated TB	quasi-experiment	Integrating HIV care and treatment into tuberculosis clinics
9	Kagujje et al.[27]	Lusaka	n July 2017 and December 2018	Walk in George health Facility clients	18,194 individuals	Descriptive survey	TB case finding
10	Chongwe et al.[28]	Lusaka, Central and Copperbelt provinces,	2012	all private health facilities in the country	157 health facilities	Cross-sectional survey	Private sector DOTS
11	Lungu et al [29]	Zambia	2018 to 2020	TB notifications in the patients ages 45 and above	All TB notifications	Retrospective study	Case detection
12	Mutanga et al.[30]	Southern province	2018	All TB patients	25,533 TB patients	Retrospective cohort study	TB treatment
13	Mweemba et al. [31]	Lusaka	2014	Pulmonary PTB patients	104 pulmonaryPTB patients	Descriptive study	TB treatment compliance
14	Lungu et al [32]	Zambia	2018	All individuals with active TB disease in Zambia	72 495 TB patients	Retrospective cohort study	Gap identification

Tb Control Mechanisms

Hachiboola [33] outlines that the Ministry of Health in Zambia aims to control TB by reducing morbidity, mortality and transmission of the disease, while preventing the development of drug resistance strains of M. tuberculosis. The essential strategies to control TB include: i) preventing the infection, ii) stopping the progression from latent to active TB, and iii) treating the active disease [34].

Prior to the development of anti-TB drugs, TB control focused mainly on prevention [35]. The discovery of anti-TB drugs in the 1940s revolutionalised TB control and from the 1950s, truly effective public health measures became possible with treatment to cure being the goal of TB control globally. Initially, treatment consisted of a standard 18 month regimen with a combination of anti-TB drugs. This was subsequently reduced to 6 months duration following the development of improved anti-TB drugs in the 1970s [35]. As a result of improved living conditions and availability of anti-TB drugs, TB control became effective in most industrialised countries. Subsequently, TB slipped from the international agenda and effective control became the responsibility of each country.

HIV Prevention and Control in Zambia

Various combinations of HIV prevention strategies have been implemented in Zambia, as outlined in the country's National AIDS Strategic Framework [36]. These strategies include:

1. Social and Behavior Change Communications (SBCC), aimed at altering behaviors of individuals and the community at large.
2. Comprehensive Condom Programming, aimed at promoting condom use among the general population.
3. Voluntary Medical Male Circumcision (VMMC), aimed at increasing male uptake of MC. The Ministry of Health (MoH) covers the costs by providing it free of charge in health centers.
4. HIV Testing Services (HTS) encouraged and provided free of charge by the Ministry of Health and its partners.
5. Pre-Exposure Prophylaxis (PrEP) which is administered to the HIV vulnerable population as a preventive mearsure, for instance the discordant couples.

Government Policy Provisions that Address TB and HIV (2016 -2021)

The Zambia government over the years has partnered with a number of organizations in coming up with a number of policies that have been documented in policy documents. For instance, some of the notable policies include immediate starting of ART for any individual who tests positive to HIV and ever firm to have a TB and HIV prevention program [36].

Hypotheses

The research hypothesizes that the independent variables (TB and HIV control mechanisms, government policy provisions and preventive and curative activities) are associated to the dependent variable (intervention effectiveness). These assumptions are presented as:

1. H1: There is a positive relation between TB and HIV control mechanisms and intervention effectiveness.
2. H2: There is a positive relationship between government policy provisions and intervention effectiveness.
3. H3: There is a positive relationship between preventive and curative activities and intervention effectiveness.

Methodology

Logic of Inquiry

Mixed methods were used as the research strategy incorporating concurrent triangulation; this meant collecting both quantitative and qualitative data simultaneously. The strategy was intended for model testing and in-depth understanding of phenomena [37]. The basis for this choice was three-fold. Firstly, because there was existing literature from which a conceptual model and hypotheses could be developed, a quantitative study was deemed appropriate for model testing. The quantitative research ensured that highly structured and objective methods were employed in order to test hypotheses, facilitate research replication and generalise findings.

The research study employed two research designs: descriptive and correlational. The descriptive design was chosen to accurately depict the current state of affairs. The correlational design enabled the researcher to evaluate the relationships between two or more variables [37]. A descriptive survey design, incorporating mixed methods, was utilized in the research. Both quantitative and qualitative data were collected through the use of a semi-structured questionnaire.

Research Setting and Participants

The study targeted health personnel from the Copperbelt regional offices (i.e. Ndola, Kitwe and Chingola) and National Aids Council. The targeted respondents were those involved in the TB and HIV intervention programmes which was estimated at 2500. Simple random sampling was used in selecting 377 respondents and the sample size was determined used Raosoft online calculator.

Methods And Procedure of Data Collection

At the beginning of data collection, identified respondents were served with consent form that explained the nature and purpose of the research. After signing the consent form, they were given either a printed copy of the questionnaire or were given a link to the softcopy questionnaire. The questionnaire was semi-structured that contained provisions for collecting data on the profile of the respondents, TB and HIV interventions and government policy provisions.

Methods and Procedure of Data Analysis

The data collected from the respondents was sorted and edited for analysis. The questionnaires were organized and classified according to the patterns given by the respondents. Inferential and descriptive and statistics were used in the analysis of the data. Quantitative data was recorded and analyzed by the use of Statistical Package for Social Sciences (SPSS) version 25. For qualitative data, thematic analysis was used.

Ethical Issues

The researcher observed the following.

1. Protection from harm: There are a number of ways in which participants can be harmed: physical harm, psychological harm, emotional harm, embarrassment (i.e., social harm). The research made sure that no harm occurred to the voluntary participants and that each and every participant had made the decision to assist her with full information as to what was required. Those who choose not to participate were also given the same information on which they made their decision not to be involved.
2. Voluntary Participation: Participation in the research was voluntary, and there was no coercion or deception.
3. Informed Consent: The researcher guaranteed that potential participants comprehensively understood the tasks they were asked to perform and were informed of any potential negative consequences of participation. The informed consent document provided detailed information about the research, and all participants were required to sign it before taking part in the study.
4. Confidentiality and Anonymity: no participant was known on a personal basis and in as much as electronic questionnaires were used, they were designed in such a way as not to leave a trace record of the respondent be it email or phone number. The responses were used for academic purposes only.
5. Plagiarism: Citations were included for every source of information used in the research. For the systematic review, it adhered to the protocols outlined in the Cochrane Handbook (Higgins & Green, 2008) and followed the Preferred Reporting Items for Systematic Reviews

and Meta-Analyses (PRISMA) guidelines [38].

Results and Discussion

This section presents the results obtained from the analysis of the primary data collected. Researchers predicted that the independent variables (TB and HIV control mechanisms, government policy provisions and preventive and curative activities) are positively associated to the dependent variable (intervention effectiveness). The results depict that relatively low correlations between the variables are shown. The study included hierarchical regression tests that were aimed at determining the applicability of the conceptual model.

This research was aimed at examining the effectiveness of the interventions of TB and HIV control in Zambia. The effectiveness has been determined by the primary and secondary data collected.

Correlation analyses

Pearson correlation analysis was conducted to assess the strength and direction of the relationships between variables. Table 3 displays the correlations, means, and standard deviations of the dependent variables (TB and HIV control mechanisms, prevention and curative activities and government policy provisions) and independent variable (interventions effectiveness).

Table 3. Correlations Amongst Variables

Variable		**N**	**Mean**	**Std. Dev**	**1**	**2**	**3**	**4**
1.Interventions Effectiveness	Pearson Correlation	314	3.678	1.055				
2.TB and HIV control mechanisms	Pearson Correlation	314	4.035	0.617	0.507**			
3.Prevention and Curative Activities	Pearson Correlation	314	3.061	0.758	0.279**	0.396**		
4.Government policy provisions	Pearson Correlation	314	3.407	0.670	0.465**	0.612**	0.280**	
**. Correlation is significant at the 0.01 level (2-tailed).								

The results in Table 3 depict correlations that are relatively low with regards to the variables i.e. each and every one of them is below 0.8. This gives an indication that multicollinearity is not a problem (Tabachnik et al., 2017). The table also depicts that interventions effectiveness is positively significantly correlated withT B and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465).

Hierarchical Regression Analyses

Table 3 is a presentation of the hierarchical regression results. It depicts the control variables and the independent variables that have been added to model containing the independent variable.

Table 4. Hierarchical Regression

Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**VIF**
	Beta, t	**Beta, t**	**Beta, t**	**Beta, t**	
Control Variables					
Education	0.017*, 0.278	0.100, 1.833	0.219*, 0.166	0.205*. 0.947	1.125

Years of Service	0.277*, 3.831	0.221, 3.496	0.305, 4.854	0.307, 0.037	1.524
Independent Variables					
TB and HIV control mechanisms		0.505***, 9.363	0.435*, 8.131	0.378*, 6.583	1.107
Prevention and Curative Activities			0.289**, 5.046	0.264*, 4.599	1.357
Government policy provisions				0.262***, 2.549	1.701
R	0.250	0.541	0.595	0.608	
R Square	0.062	0.293	0.354	0.370	
Adjusted R Square	0.049	0.280	0.340	0.353	

***sig < 0.001 (0.1 percent); **sig < 0.01 (1 percent); *sig < 0.05 (5 percent); VIF = Variance Inflation factor.

For the purposes of evaluating the ability of the multiple regression model (where TB and HIV control mechanisms, prevention and curative activities and government policy provisions) are the explanatory variables to predict (interventions effectiveness) after controlling for education level and years of service, hierarchical regression analysis was carried out. Table 4 gives a depiction of the results with interventions effectiveness as a dependent variable. The preliminary checks from Table 4 give an indication that multicollinearity is not a problem for the reason that the variance inflation factor (VIF) values were lower than 5 for the independent and control variables [39]. Further, each and every regression coefficients are in the anticipated positive direction.

Model 1 shows the base model with two control variables only i.e. education level and years of service. The control variables make a combined significant contribution of adjusted multiple coefficients of determination (R-Square) of 4.9 percent and multiple correlation coefficient of (R) 0.250, representing a combined small effect size.

In the 2nd model i.e. model 2, TB and HIV control mechanisms is added to the control variables and a significant combined effect happens (adjusted R2 = 28.0 percent from 4.90 percent), with R = 0.541 representing a combined medium effect size. For TB and HIV control mechanisms, this entails that the more control mechanisms are carried out in a manner that conforms to the health regulations, the more they will add to the effectiveness of the interventions. As such, hypothesis 1 which postulates that there is a positive relation between TB and HIV control mechanisms and intervention effectiveness has been supported.

In the 3rd model, i.e. model 2, prevention and curative activities firm is added to the control variables and TB and HIV control mechanisms, a significant combined effect happens (adjusted R2 of 34.0 percent from 28.0 percent), with R = 0.595 representing a combined medium effect size. As such hypothesis 2 which postulates that there is a positive relationship between government policy provisions and intervention effectiveness has been supported.

In the 4th model, i.e. model 4, in addition to control variables, TB and HIV control mechanisms and, prevention and curative activities, another variable i.e. government policy provisions is added and a significant combined effect occurs (adjusted R2 = 35.3 percent from 34.0 percent), with R = 0.608 representing a combined medium effect size. As such hypothesis 3 which postulates that there is a positive relationship between preventive and curative activities and intervention effectiveness has been supported.

The findings have revealed that the prominent control mechanisms for TB include case detection, routine screening and frequent checkups. Though there are few health personnel which posses a challenge in the

control of TB and HIV. The HIV control mechanisms include Social and Behaviour Change Communications, Comprehensive Condom Programming, Voluntary Medical Male Circumcision and HIV Testing Services. Also, Pre-Exposure Prophylaxis and Post-Exposure Prophylaxis.

The prominent TB curative activities are advocating for TB treatment adherence while being on a healthy diet. The same applies for HIV where ART adherence is ideal. The government has for some time partnered with various organizations in the drawing up of policy documents. For instance, the government has partnered with USAID, PEPFAR, UKAID, WHO (among others).

The effectiveness of the interventions of TB and HIV control in Zambia is positively significantly correlated with TB and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465). This implies that for the interventions to be more effective, TB and HIV control mechanisms, prevention and curative activities and government policy provisions should not be developed in isolation but the three should be developed together. As their improvements will lead to interventions to be more effective and the reverse is also true [40].

Table 5depicts the main results on the reviewed studies that studies various HIV and TB interventions ranging from VMMC uptake, Behavioral change, ART, Prep (among others) for HIV and, TB screening and treatment for TB.

Table 5. Main Results of the Studies

#	STUDY	INTERVENTION	FINDINGS
1	Leiby et al.**Error! Reference source not found.**	VMMC uptake	The self-reported VMMC uptake at six months was 11.6%, 12.6%, and 10.4% in the Conventional, Tailored, and control arms, respectively; verified uptake was 1.8%, 1.1%, and 1.5%. Using multivariate logistic regression, the adjusted odds ratio of self-reported VMMC uptake was 1.17 (95% CI: 0.80 to 1.72) in the Conventional campaign arm compared with the control arm and 1.24 (95% CI: 0.84 to 1.81) in the Tailored campaign arm. The adjusted odds ratios of verified VMMC uptake in the Conventional and Tailored campaign arms were 1.34 (95% CI: 0.45 to 4.02) and 0.67 (95% CI: 0.20 to 2.23), respectively.
2	Chitalu et al.**Error! Reference source not found.**	Behavioral change	Changes in acceptability had the most significant overall impact on condom use, with social support, relationship consensus, and willingness to use condoms following closely behind. However, changes in self-efficacy, IPV, negotiation, and information showed no effect. These findings underscore the value of multidimensional approaches in behavioral interventions and emphasize the need to identify crucial elements of interventions to maximize risk reduction outcomes. A significant positive relationship between changes in sexual behaviour acceptability and weekly condom use was found. A 1-point increase in the acceptability of male condoms was associated with a 5% increase in condom use (standardized β = 0.228). Social support positively impacted weekly condom use, such that a 1-unit increase in social support was associated with a 2% increase in condom use (β = 0.211).

			Willingness to use male condoms also impacted condom use, such that a 1 point increase in willingness was associated with an 7% increase in use ($\beta = 0.146$). No interactions were significant, and self-efficacy did not impact condom use in multivariable analysis.
3	Melgar et al.**Error! Reference source not found.**	TB Screening	About 482 records of individuals living with HIV were examined, including 128 children. Excluding two individuals diagnosed with tuberculosis before enrolling in HIV care, 93.4% underwent tuberculosis symptom screening. Of those screened, 4.7% were diagnosed with tuberculosis disease, and 95.3% were eligible for Tuberculosis Preventive Therapy (TPT), of whom 24.7% initiated TPT. TPT initiation was lower among eligible children (7.7%) compared to adults (25.2%, $p = 0.03$), and among Copperbelt residents (3.1%) compared to Lusaka residents (35.8%, $p < 0.01$). The TPT completion rate was 38.4% among people living with HIV who initiated the 6-month course. Among interviewed healthcare workers, 58.3% (unweighted) incorrectly stated the number of symptoms required for a positive tuberculosis symptom screen, 83.3% (unweighted) reported insufficient isoniazid stockpile for completion at the time of TPT initiation, and only 27.3% (unweighted) reported receiving TPT-specific training
4	Nanzaluka et al**Error! Reference source not found.**	TB treatment	A total of 1,724 registered TB patients were included in the study, with 694 (40%) from an urban clinic, 654 (38%) from a 1st Level Hospital, and 276 (22%) from a peri-urban clinic. Of all patients, 43% experienced unfavorable outcomes. These outcomes included treatment failure (0.3%), loss to follow-up (5%), death (9%), and not evaluated (29%). The odds of unfavorable outcomes were higher among patients over 59 years old (AOR=2.9, 95% CI: 1.44-5.79), relapse cases (AOR=1.65, 95% CI: 1.15-2.38), patients treated at the urban clinic (AOR=1.76, 95% CI: 1.27-2.42), and TB/HIV co-infected patients (AOR=1.56, 95% CI: 1.11-2.19).

Conclusion

To conclude, the current TB and HIV control mechanisms in Zambia include case-finding, case detection, diagnosis, community volunteer involvement, gap identification, stigma reduction and Health care provision (for TB). For HIV, the prominent control mechanisms include behavioural change, Couple voluntary HIV counseling and testing (CVCT), condom use, Differentiated service delivery (DSD), VMC, Stigma reduction and Self-testing.

For the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia they include DOTs, Integrating HIV care and treatment into tuberculosis clinics and TB treatment compliance (for TB). While ART and Prep are the prevention and curative activities for HIV.

With regards to the government policy provisions that address TB and HIV in Zambia, the government has made it mandatory for HIV testing in all the government health centers. In addition, it is a requirement by the government

that every individual who tests positive to HIV and TB to start ART and TB treatment respectively. In addition, it has become a mandate that every organization is to have a policy that is aimed at reducing the spread of HIV and TB.

Further, the research aimed at examining the effectiveness of the interventions of TB and HIV control in Zambia. As such it has been depicted that TB and HIV control mechanisms, government policy provisions and preventive and curative activities are positively associated to intervention effectiveness. Improvements in the interventions will lead to the interventions being more effective. As such the national statistics, the primary and secondary data findings depict that the interventions of TB and HIV control in Zambia have been effective.

Contribution to Knowledge

This research makes theoretical contributions along three directions the current TB and HIV control mechanisms, the curative activities on the incidence and fatality of TB and HIV, and the contents of the government policy provisions that address TB and HIV in Zambia. Also, how these three are associated to the effectiveness of the interventions. In the first instance, this study finds that the effectiveness of the interventions of TB and HIV should be examined in conjunction with factors at individual and institutional levels.

Suggestions for Future Research

The study has demonstrated the effectiveness of the interventions of TB and HIV can be associated to TB and HIV control mechanisms, the curative activities on the incidence and fatality of TB and HIV and the contents of the government policy provisions. For future research is required to:

1. Explore other elements of the health system (financing, information technology, pharmaceutical management and supply of medical technologies) involved in the interventions process not fully covered in this study.
2. Ascertain TB and HIV patients' perspectives on the challenges in accessing HIV services after testing for HIV.
3. Access the extent of partner notification after testing for HIV as a preventive method.
4. Determine how to adopt a system-wide approach in the interventions process and in service delivery by involving other key actors including those outside the health sector.
5. Uncover innovative ways to improve and sustain the existing trust between all the key actors involved in the interventions process and in service delivery.
6. Use actual health data on HIV and TB from the communities.

Conflict of Interest

The author declares that there are no conflicts of interest.

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