Ministry of Health

RESEARCH AND EVALUATION REPORT

Evaluation of TB/HIV Collaborative Activities in Swaziland:

Intensified Case Finding Cascade, Provision of Antiretroviral Therapy for HIV-Positive TB Co-infected Patients, and TB Infection Control

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ACRONYMS

AIDS	Acquired immunodeficiency syndrome
APMR	ART patient monitoring record
ART	Antiretroviral therapy
CDC	United States Centers for Disease Control and Prevention
DGHT	Division of Global HIV and TB
HCW	Healthcare workers
HIV	Human immunodeficiency virus
ICF	Intensified case finding
INH	Isoniazid
IQR	Interquartile range
IPT	Isoniazid preventive therapy
KAP	Knowledge, attitudes and practices
MOH	Ministry of Health
MSF	Medecins Sans Frontieres
MTB	Mycobacterium tuberculosis
NTCP	National TB Control Program
OR	Odds ratio
PEPFAR	United States President's Emergency Plan for AIDS Relief
PITC	Provider-initiated counselling and testing
PLHIV	People living with HIV
PPE	Personal protective equipment
RIF	Rifampicin
SEC	Swaziland Scientific and Ethics Committee
SNAP	Swaziland National AIDS Programme
SOP	Standard operating procedures
TB	Tuberculosis
TBIC	Tuberculosis infection prevention and control
URC	University Research Co., LLC
WHO	World Health Organization

FOREWORD

The dual epidemic of HIV and AIDS and tuberculosis is one of the major health challenges faced by Swaziland. With a TB incidence rate of 733 TB cases per 100,000 per year and 73% of TB patients coinfected with HIV, Swaziland is listed among the 41 high TB/HIV burden countries. The country has made tremendous efforts to reduce the burden of TB among people living with HIV through the implementation of TB infection prevention and control measures, TB screening at all patient contact points, increasing access to TB diagnostic services including transportation of sputum samples through the national sample transportation network system, and early provision of anti-TB treatment among those diagnosed with TB.

The country is also making efforts to decrease the burden of HIV among patients diagnosed with TB through implementing provider initiated HIV testing and counselling services, HIV infection preventive services and providing cotrimoxazole prophylaxis and ART to those who are HIV positive. The National TB/HIV Coordinating Committee serves as a platform for joint planning between the Swaziland National AIDS Programme (SNAP), National Tuberculosis Control Programme (NTCP) and collaborating partners and guides the implementation of integrated TB/HIV collaborative activities.

This report provides more evidence on strengths and weaknesses as we implement TB/HIV collaborative activities and acknowledges the good work that health care workers, implementing partners and programmes are doing in fighting HIV and TB in the country. The report identifies key performance areas that the HIV and TB Programmes need to improve in their collective quest to contain the dual epidemic, which has put enormous pressure on the health delivery system in Swaziland.

Finally, the Ministry of Health would like to thank all stakeholders, healthcare workers and investigators who participated in the designing, implementing and conducting data analysis of this important activity

The information from this report will help inform better planning and programming of TB/HIV collaborative activities.

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EXECUTIVE SUMMARY

Swaziland has one of the highest HIV prevalence rates in the world with 26% of people 15-49 years being infected with HIV. This is coupled with an extremely high TB incidence in the country of 733 TB cases per 100,000 per year. It is estimated that 73% of TB patients are co-infected with HIV [1]. As recommended by the World Health Organization (WHO), Swaziland has over the years implemented TB/HIV collaborative activities aimed at decreasing the burden of TB among people living with HIV (PLHIV) through the 3I's strategy which involve intensified TB case finding (ICF), isoniazid preventive therapy (IPT) and TB infection control (TBIC) in healthcare and congregate settings. Effort is also being put to reduce the burden of HIV among TB patients through provider initiated HIV testing services and provision of HIV preventive services to TB patients as well as early ART initiation and cotrimoxazole prophylaxis among TB patients that are diagnosed HIV positive.

Starting in August 2015, the USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project in collaboration with the Ministry of Health (MOH), evaluated the implementation of these activities to identify key performance areas that the HIV and TB programs need to improve in their collective quest to contain the dual epidemic which has put enormous pressure on the health delivery system in Swaziland. This evaluation provides information on the effectiveness of the implementation of TB/HIV collaborative activities by collecting and analyzing data on: TB screening, TB diagnosis and anti-TB treatment among PLHIV as well as HIV testing and ART initiation among TB patients. The quality of TB and HIV data collected at facilities and reported to the HIV and TB programs were examined by checking and reporting missing data as part of the evaluation. Linkages between the HIV and TB programs as determined by successes at programmatic or service interface points [such as successes in initiating HIV positive clients diagnosed TB at antiretroviral therapy (ART) clinics and TB infection control measures (TBIC) practices in health facilities in Swaziland] were also evaluated.

The objectives of the evaluation were to:

- Evaluate the ICF cascade in HIV care and treatment settings
- Evaluate provision of ART for HIV-positive TB patients
- Evaluate the implementation of infection control measures in health facilities
- Validate PEPFAR TB/HIV indicators and explore reasons for discrepancies

Methods

A mixed methods approach using both quantitative and qualitative methods was used. A retrospective review of records was conducted to abstract data from TB and HIV patients enrolled at 11 selected TB and HIV health facilities. Data was abstracted from pre-ART, ART, or TB registers, chronic care files, and electronic systems. The study population for intensified case finding assessment was comprised of HIV-positive patients ≥15 years old seen at selected facilities for clinical care or treatment from July to November 2014. The ART provision assessment included TB patients ≥ 15 years seen at selected facilities for clinical care or treatment from July to November 2014. In addition, a baseline assessment was carried out to evaluate TBIC knowledge, attitudes, and practices of health care workers at each of the selected facilities using a semi-structured questionnaire.

Results

A total of 2,058 records were reviewed for the ICF cascade, and 466 for ART provision. Forty-three (43) healthcare workers participated in the KAP TBIC assessment. TB screening was excellent. Patient

record reviews showed that 97% of chronic care patients had documented TB screening at their last visit. However, of those screening positive for TB, 46% did not have documented TB diagnostic test. Of those that were evaluated only 64% were diagnosed with TB. IPT uptake was also found to be very low at 7% among those eligible. CD4 count at TB treatment initiation was not documented in almost a quarter (24%) of patients, which may be a reflection of the national guideline recommendations, which emphasise that HCWs should not to wait for receipt of CD4 count results when initiating ART. However, programs need to strengthen either appropriate recording of these results when they come or ensure CD4 count testing is done to evaluate the immune status of the TB/HIV co-infected patients. Almost 90% of TB patients were initiated on ART within two months of starting TB treatment. Overall, 85% of co-infected patients in this cohort were documented to have achieved TB treatment success (33% completed and 52% cured).

Conclusion

Based on this evaluation, we provide the following recommendations, there is a need to: increase efforts to ensure that all PLHIV with a positive TB screen receive a diagnostic evaluation; scale up IPT use and acceptance; strengthen and monitor the overall health system in terms of laboratory capacity, specimen transport and supply chain management to support recommended TB/HIV activities; conduct targeted healthcare worker focus groups to better understand obstacles to implementation, recording and reporting of routinely collected TB/HIV data necessary for targeted improvement of programs; improve the documentation of TB/HIV activities and related results; improve site specific and national TBIC practices in TB facilities; strengthen initiation of ART to TB patients within the recommended period; and improve crafting of messages for HCWs intended for programmatic guidance towards the care of clients especially regarding CD4 count testing for TB/HIV co-infected patients.

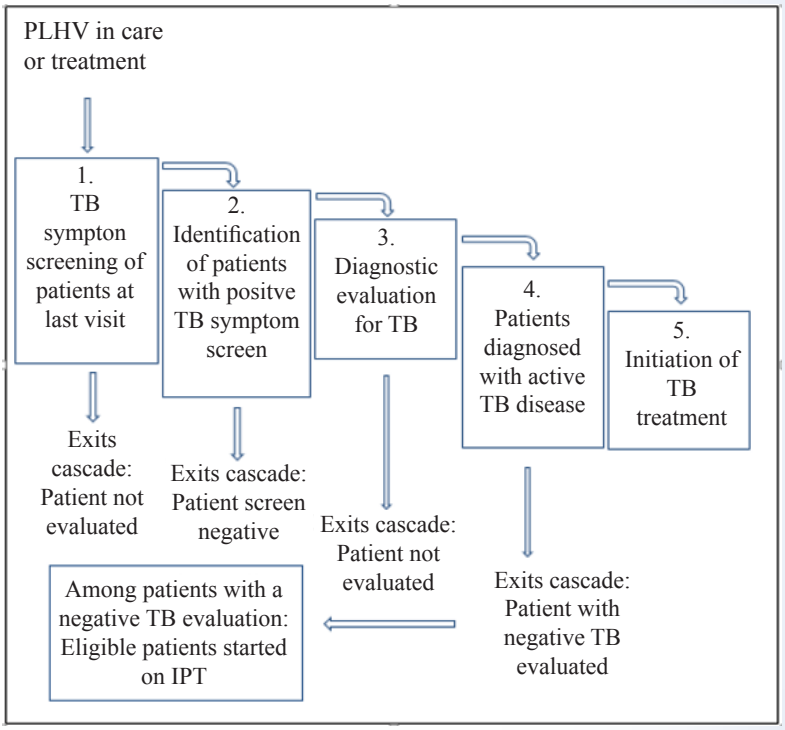
I. INTRODUCTION

A. Background

Tuberculosis (TB) alongside the Human Immunodeficiency Virus (HIV) is a leading cause of death worldwide [1]. TB remains the leading cause of death from curable infectious disease and remains the leading cause of morbidity and mortality among Persons Living with HIV (PLHIV) [1, 2]. In 2014, the World Health Organization (WHO) estimated 9.6 million new cases of active TB disease, of which 12% were among PLHIV [1]. Swaziland, a lower-middle income country with an estimated population of one million people, has been hit particularly hard by both diseases. Swaziland has the highest HIV prevalence in the world (26% for adults aged 15-49) [3, 4], and in 2014 had the third highest rate of TB incidence (733 cases per 100,000 population) [5], and the highest rate of TB/HIV co-infection of 73% [1].

WHO recommends intensified TB case finding (ICF) as the main strategic intervention to reduce TB-associated morbidity and mortality among PLHIV. This strategy involves a cascade of processes that includes symptom screening for all PLHIV at every clinical encounter, and subsequent diagnostic evaluation of those with presumptive TB. PLHIV who screen negative for active TB should be provided isoniazid preventive therapy (IPT) to reduce the risk of progression from latent to active disease, while patients diagnosed with active TB should be initiated on TB treatment [6, 7]. Patients enter this cascade when they enroll in HIV care or treatment services and exit at various points depending on results of their screening and/or diagnostic tests, the quality and completeness of data recording, or patient non-adherence (**Figure 1**). In addition, TB infection control (TBIC) measures should be put in place in congregate settings and health facilities providing TB and/or HIV care to reduce the risk of TB transmission.

Figure 1: Illustration of patient flow through ICF cascade



Conversely, TB patients should be screened for undiagnosed HIV infection using provider initiated HIV counseling and testing (PITC), and early antiretroviral therapy (ART) should be provided for all HIV-infected TB patients within eight weeks of TB treatment initiation, or within two weeks for those with a CD4 cell count less than 50/mL [7]. In Swaziland, however, the Ministry of Health (MOH) 2010 HIV Management Guidelines recommended that all TB/HIV co-infected patients start ART as soon as possible, preferably within the first two weeks after TB treatment initiation regardless of CD4 cell counts.

In Swaziland, there has been remarkable progress in the implementation of TB/HIV collaborative activities over the past years. As of 2014, 97% of notified TB patients had a known HIV status (of which 73% were HIV positive), and 79% of notified HIV-positive TB co-infected patients were initiated on ART (adjusted to 53% of the estimated actual number of HIV-positive incident TB cases in the country) [1]. In addition, the TB treatment success rate for TB-infected PLHIV was reported at 71%. Despite these improvements, only 5% of newly enrolled PLHIV were estimated to have started IPT, and 1,700 co-infected patients died in 2014, indicating a TB-related mortality rate of 135 per 100,000 PLHIV (compared with 51/100,000 for the HIV-uninfected

population) [1]. Temporal delays in record keeping result in the potential underreporting of ART coverage among TB patients. The timing of ART initiation relative to TB treatment start for these patients remains largely unknown, and programmatic data about adherence to ART, medication adverse events and drug interactions during TB/HIV co-treatment is also limited.

B. Objectives

The overall purpose of this study was to characterize and assess implementation of collaborative TB and HIV activities in Swaziland with reference to the National Guidelines. The results will be used to inform recommendations to the Swaziland National TB Control Program (NTCP) and Swaziland National AIDS Program (SNAP) for planning and improving integrated services in the country.

Objective 1: Evaluate the ICF cascade in HIV care and treatment settings

- Measure the performance of facilities in implementing and documenting the steps of the ICF cascade according to the National Guidelines
- Document routine ICF and IPT practices at the facility level

Objective 2: Evaluate provider initiated HIV testing and counselling (PIHTC) and provision of ART for HIV-positive TB patients

- Assess the proportion of HIV-positive TB patients initiating ART within six months
- Assess the timing of ART initiation relative to TB treatment initiation
- Assess TB treatment outcomes for co-infected patients
- Determine adherence to ART during TB/HIV co-treatment

Objective 3: Evaluate the implementation of TB infection control measures in health facilities

- Assess administrative, managerial and environmental IC measures and use of personal protective equipment (PPE)
- Assess healthcare workers' (HCW) knowledge, attitudes and practices regarding TBIC

C. Ethical Review

The study was submitted to CDC Institutional Review Board (IRB) and the Swaziland Scientific and Ethics Committee (SEC) for ethical clearance (MH/599/FWA 000 15267/ IRB 000 9688). Clinical and program staff and HCWs could participate in semi-structured interviews on a voluntary basis and gave informed consent; no identifying information on interviewees was collected. Appropriate data confidentiality procedures (outlined in the study protocol) were followed.

II. METHODS

A. Data Collection Methods

There were two main components to this evaluation:
Facility data: a retrospective quantitative review and data abstraction from TB and HIV facility data sources, and a TBIC evaluation involving completion of a facility assessment tool.

Provider data: HCW knowledge, attitudes, and practices (KAP) survey.
These are described in more detail below. Data collection was conducted from August to October 2015.

B. Study Site Selection

The evaluation was conducted in 11 TB and HIV care and treatment sites (**Table 1**). These sites were purposefully selected to ensure representation of all four regions of Swaziland (**Figure 2**) and all facility types (hospitals, health centers and clinics). Sites were required to have provided both TB and HIV services and been operational at least one year prior to study initiation, with enough patients to achieve sample size.

Figure 2: The four regions of Swaziland

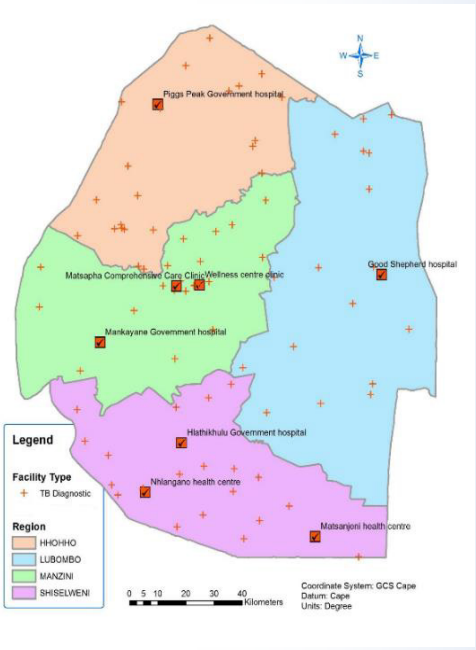


Table 1: Study site health facilities

	Health Facility	Abbreviation	Type	Region
1	Dvokolwako Health Center	DHC	Health center	Hhohho
2	Mbabane Government Hospital	MGH	Hospital	Hhohho
3	Piggs Peak Government Hospital	PPH	Hospital	Hhohho
4	Good Shepherd Mission Hospital	GSH	Hospital	Lubombo
5	Sithobela Health Center	SHC	Health center	Lubombo
6	MSF Matsapha Clinic	MSF	Clinic	Manzini
7	Phocweni USDF Clinic	PHO	Clinic	Manzini
8	Hlatikulu Government Hospital	HLH	Hospital	Shiselweni
9	JCI Clinic	JCI	Clinic	Shiselweni
10	Matsanjeni Health Center	MHC	Health center	Shiselweni
11	Nhlangano Health Center	NHC	Health center	Shiselweni

C. Study Participant Selection

A cohort sampling strategy was used to assess the ICF cascade and ART uptake. For the ICF cascade assessment, HIV care and treatment facility records were retrospectively examined to identify a cohort of eligible patients for data abstraction. Patients were considered eligible for inclusion if they were ≥15 Health Facility Abbreviation Type Region twelve months preceding the beginning of the study. For the ART assessment, TB facility records were retrospectively examined to identify a cohort of eligible patients aged ≥15 years, seen during and retained by the end 30th November 2014, and with an unknown or positive HIV status.

D. Retrospective Patient Chart Review

The quantitative component of this evaluation involved a retrospective review of existing TB and HIV clinical recording and reporting systems, using standardized data collection forms (Appendix 1-2). Data collectors were trained and supervised by study team representatives from the MOH, CDC, and ASSIST. Detailed individual-level data was abstracted from: 1) facility TB registers; 2) TB treatment cards for HIV-positive TB patients; 3) HIV chronic care files; and 4) facility-based pre-ART and ART registers for patients in HIV care and treatment facilities. Cross-reference was made using the electronic ART patient monitoring record (APMR) for all patients. Additional sources of data included laboratory and pharmacy records when needed. Information abstracted included demographics, TB and HIV treatment information, timing of ART, and clinical and treatment outcomes.

E. TB Infection Control Evaluation

The TBIC evaluation was conducted using the facility assessment tool provided in Appendix 3 to assess administrative, work practice, environmental and personal protective equipment (PPE) measures to reduce TB transmission in healthcare settings. A subset of 43 HCWs were selected by convenience sampling for interviews to assess TBIC knowledge, attitudes and practices through a semi-structured interview (Appendix 5).

F. Data Management and Analysis

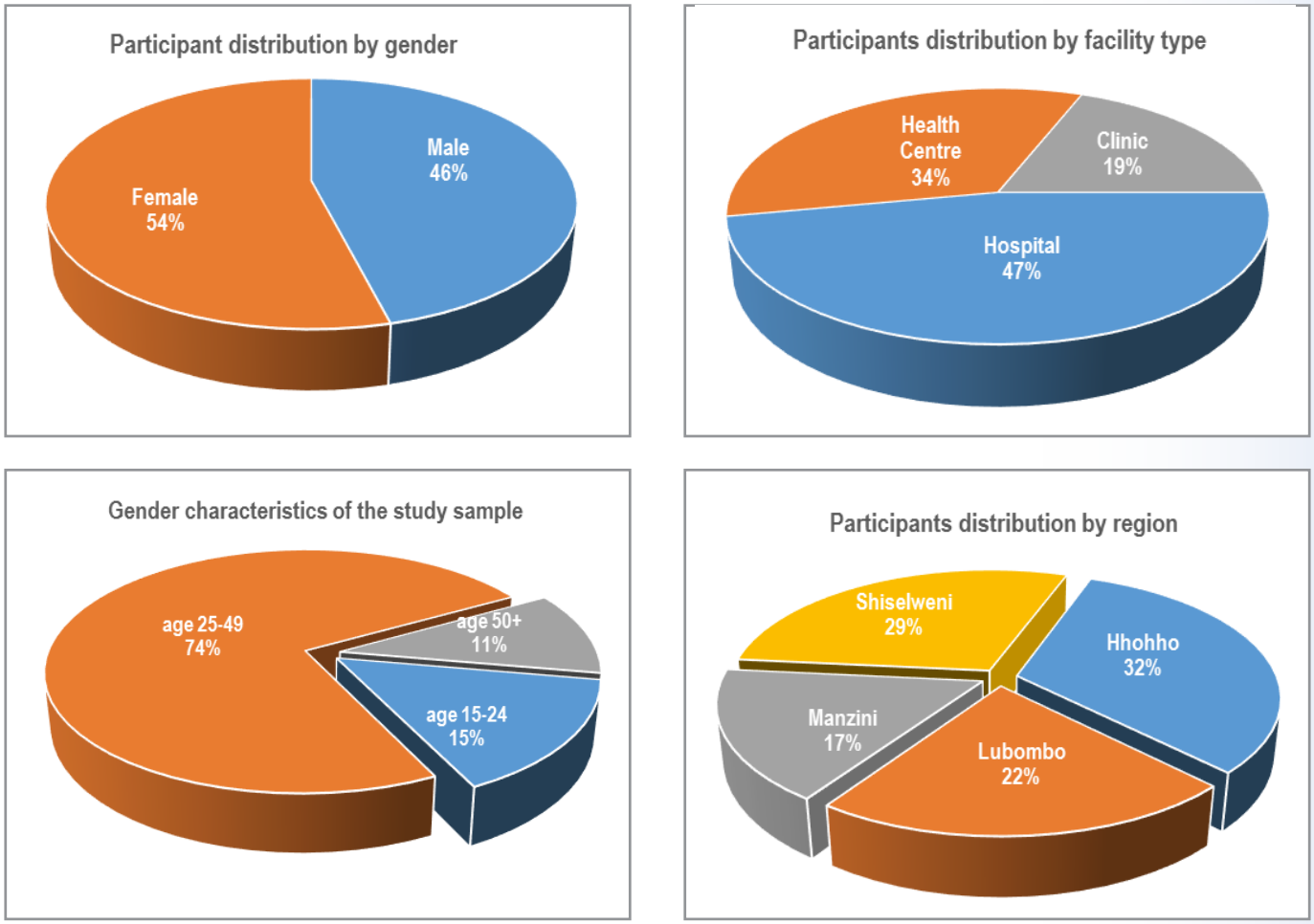
Data was collected and entered by trained data clerks, and cleaned and checked for missing or invalid values by the study coordinator. The electronic database used for analysis was restricted and contained no patient identifying information. Quantitative data was analyzed using Stata 13.0 to produce descriptive statistics including frequencies and percentages for categorical variables and means, medians and interquartile ranges (IQRs) for continuous variables. Input from regional clinical implementing partners and clinicians from the study sites was gathered during a three-day Data Analysis and Writing Workshop, conducted in January 2016 to guide analysis. Discussion points and recommendations developed during this workshop were included in this report. Qualitative data from KAP interviews were analyzed using thematic-content analysis to assess for overarching themes in the responses.

III. RESULTS

A. The ICF Cascade in HIV Care and Treatment Settings

A total of 2,058 PLHIV were included in this evaluation. Among these, 938 (46%) were male, 1116 (54%) were female, and median age was 33 (interquartile range [IQR]: 27-41). The median age for men [36 (IQR: 30-43)] was higher than for women [30 (IQR: 25-38)]. Nineteen percent (19%) of PLHIV received their care at a clinic, 34% (700) at a health centre, and 47% (957) at a hospital (**Figure 3**).

Figure 3: Characteristics of PLHIV included in the sample (by gender, facility type, age group and region), N=2058

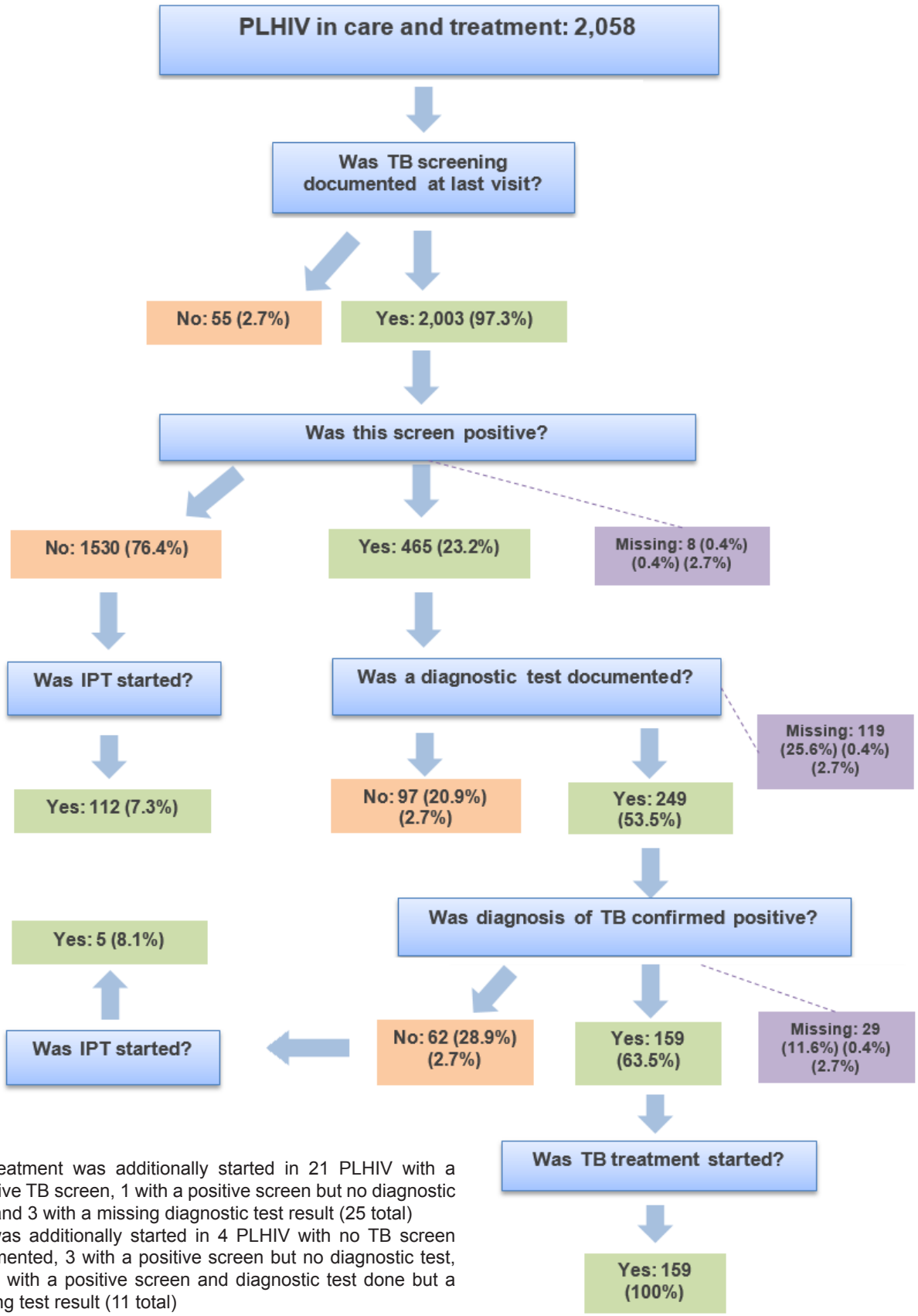


Among PLHIV sampled, 2,003 (97.3%) had TB screening documented in their records at their last HIV care or treatment visit within the study period. Of these, 465 (22.7%) screening results were documented to be positive. Half of those 250 (53.8%) with a documented positive TB screen, had a documented diagnostic evaluation (including sputum smear microscopy, culture, Gene X-pert, or chest X-ray) of which 159 (63.6%) were diagnosed with TB disease. All of those with a TB diagnosis received TB treatment (n=159), in addition to 25 other PLHIV who received TB treatment despite not having a positive TB screen or diagnostic evaluation recorded (e.g. empiric treatment). The ICF cascade for PLHIV in Swaziland HIV care and treatment settings is shown in **Table 2,** stratified by gender, age, and facility type, with absolute values. Finally, the overall flow of patient progression through the cascade is presented in **Figure 4**.

Table 2: ICF cascade in HIV care and treatment settings

	Total #PLHIV	# With TB screen recorded last visit	# With positive TB screen	# With diagnostic evaluation recorded	# With a positive TB diagnosis	# With a positive TB diagnosis put on anti-TB treatment	Total # put on anti-TB treatment started
Gender							
Male	938	916	252	133	75	75	87
Female	1116	1083	213	117	84	84	97
Missing	4	4	0	0	0	0	0
Age							
15-24	305	294	44	18	11	11	14
25-49	1518	1478	366	203	130	130	147
50+	216	212	52	27	17	17	22
Missing	19	19	3	2	1	1	1
Facility Type							
Clinic	401	383	154	82	59	59	65
Health Center	700	691	113	71	69	69	84
Hospital	957	929	198	97	31	31	35
Region							
Hhohho	666	652	93	61	31	31	40
Lubombo	460	455	130	61	23	23	27
Manzini	348	333	151	81	58	58	64
Shiselweni	563	563	91	47	47	47	53
Total (% of total study population)	**2,058 (100%)**	**2,003 (97.3%)**	**465 (22.6%)**	**250 (12.2%)**	**159 (7.7%)**	**159 (7.7%)**	**184 (8.9%)**
% achieving cascade step		97.3		53.8%		100%	

Figure 4: Flow of PLHIV through the ICF cascade



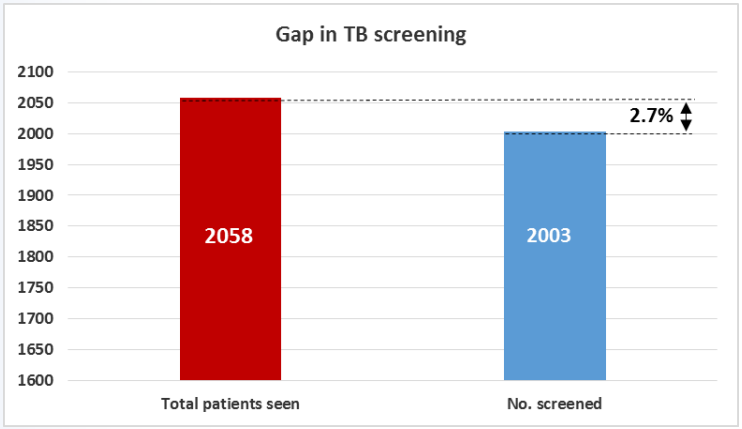
Note:

- TB treatment was additionally started in 21 PLHIV with a negative TB screen, 1 with a positive screen but no diagnostic test, and 3 with a missing diagnostic test result (25 total)
- IPT was additionally started in 4 PLHIV with no TB screen documented, 3 with a positive screen but no diagnostic test, and 4 with a positive screen and diagnostic test done but a missing test result (11 total)

The gaps in TB screening, TB diagnosis and provision of anti-TB treatment among those diagnosed with TB are illustrated in **Figure 5**.

Figure 5 (a)-(c): Gaps in TB screening, TB diagnosis and anti-TB treatment initiation

(a)



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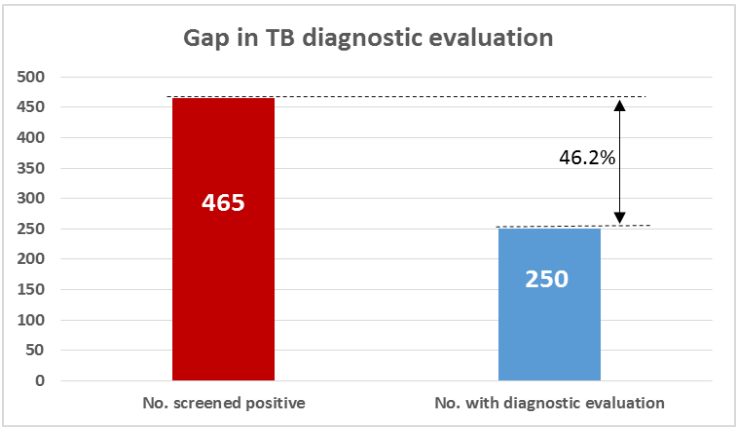

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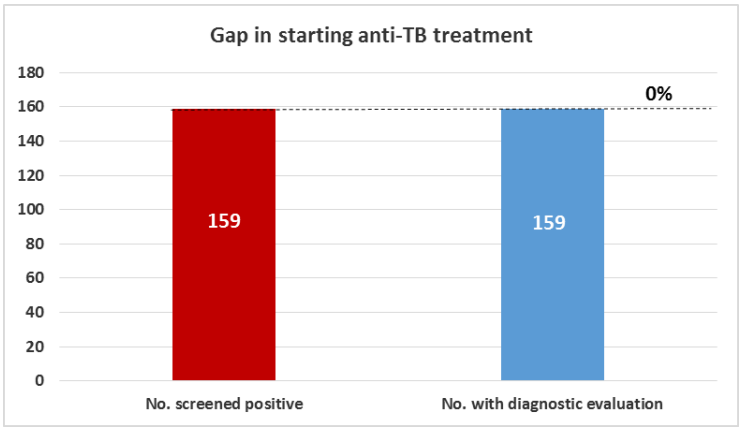


B. Isoniazid Preventative Therapy (IPT) Uptake among PLHIV

Of the 1,538 patients who had a negative TB screen documented, only 112 (7.3%) were documented to have been initiated on IPT (Figure 4). Of the 62 patients with a positive TB screen but negative diagnostic evaluation, only 5 (8.1%) were documented to have been initiated on IPT. IPT uptake classified by demographic characteristics, facility, and region is presented in **Table 3**.

Table 3: Percentage of eligible patients started IPT

Facility (N)	# IPT eligible (negative screen or diagnostic)	# IPT started (% of eligible per category/row)
Gender		
Male	697	48 (6.9%)
Female	891	69 (7.7%)
Missing	4	0 (0.0%)
Age		
15-24	256	11 (4.3%)
25-49	1157	90 (7.8%)
50+	164	16 (9.8%)
Missing	15	0 (0.0%)
Facility Type		
Clinic	251	8 (3.2%)
Health Centre	579	85 (14.7%)
Hospital	762	24 (3.2%)
Region		
Hhohho	574	64 (11.2)
Lubombo	344	25 (7.3)
Manzini	204	7 (3.4)
Shiselweni	470	21 (4.5)
Total	**1592**	**117 (7.3%)**

C. ART Uptake for HIV-Positive TB Patients

1. Description of TB/HIV co-infected patients

A total of 466 HIV-positive TB patients were included in the evaluation for ART uptake and of these 51.5% (n=240) were male, and 48.3% (n=225) were female. The median age was 35 (IQR: 29-42). Median age for men was 36 (IQR: 31-43) and for women 32 (IQR: 27-40). About one third (34.8%) received their care at a clinic, 24% at a health center, and 41.2% at a hospital, as shown in **Table 4**. Of the documented TB cases, 83.9% were pulmonary and 16% were extra-pulmonary, and of these 84.3% were new and 8.4% were previously treated cases. Of people who screened positive, 87.5% submitted a sputum sample for diagnostic evaluation. Mycobacterium tuberculosis MTB was detected by Xpert MTB/RIF in 60.9% of these. The median CD4 count at the start of TB treatment was 137 (interquartile range [IQR]: 58-268) however, this value was missing for a quarter (24.3%) of these (**Table 4**).

Table 4: Characteristics of HIV + TB patients included in sample (N=466)

Variable	n	
Sex		
Male	240	51.5
Female	225	48.3
Missing	1	0.2
Age		
15-24	35	7.5
25-49	388	83.3
50+	40	8.6
Missing	3	0.6
Facility type		
Clinic	162	34.8
Health Centre	112	24.0
Hospital	192	41.2
Region		
Hhohho	146	31.3
Lubombo	65	14.0
Manzini	160	34.3
Shiselweni	95	20.4
Total	**466**	**100**

Variable	n	%
CLINICAL CHARACTERISTICS:		
Disease Site		
Pulmonary	391	83.9
Extra-pulmonary	75	16.1
Type of Patient		
New	393	84.3
Relapse	39	8.4
Return after default	7	1.5
Transfer in	6	1.3
Other	18	3.9
Missing	3	0.6
Gene Xpert Result		
MTB not detected	124	26.6
MTB detected	284	60.9
Missing	58	12.5
CD4 Count at start of TB Treatment		
<50	79	17.0
50-<200	149	32.0
>200	125	26.8
Missing	113	24.3
Total	**466**	**100.0**

2. ART uptake among TB/HIV co-infected patients

Of the 466 HIV-positive TB patients, 189 (40.6%) were on ART prior to TB treatment, 275 (58.8%) initiated on ART during TB treatment and 2 (0.4%) were never put on ART during TB treatment. Therefore, 459 (98.5%) of TB/HIV co-infected patients were on ART by the end of anti-TB treatment regardless of whether ART was started prior or after TB treatment. Among the 275 not on ART at the time of starting anti-TB treatment, 112 (40.7%) started ART within 2 weeks, 135 (49.1%) started ART between 2-8 weeks and 8.4% started ART between 8 weeks and 6 months. Only 5 (1.8%) of the TB/HIV co-infected patients started ART after completion of 6 months TB treatments. The median time to ART initiation among the 275 TB/HIV co-infected patients not on ART was 15 days (IQR: 14- 28). Table 5-6 presents the timing of ART initiation stratified by gender and CD4 count category respectively.

Table 5: Timing of ART initiation after start of anti-TB treatment started by gender among the study participants

Gender	≤ 2 weeks Number (%)	2- 8 weeks Number (%)	8wks-6 months Number (%)	> 6 months Number (%)	Total Number (%)
Male	67 (44.3%)	69 (45.7%)	12 (8.0%)	3 (2.0%)	151 (100%)
Female	45 (40.7%)	66 (53.2%)	11 (8.9%)	2 (1.6%)	124 (100%)
Total	112 (40.7%)	135 (49.1%)	23 (8.4%)	5 (1.8%)	275 (100%)

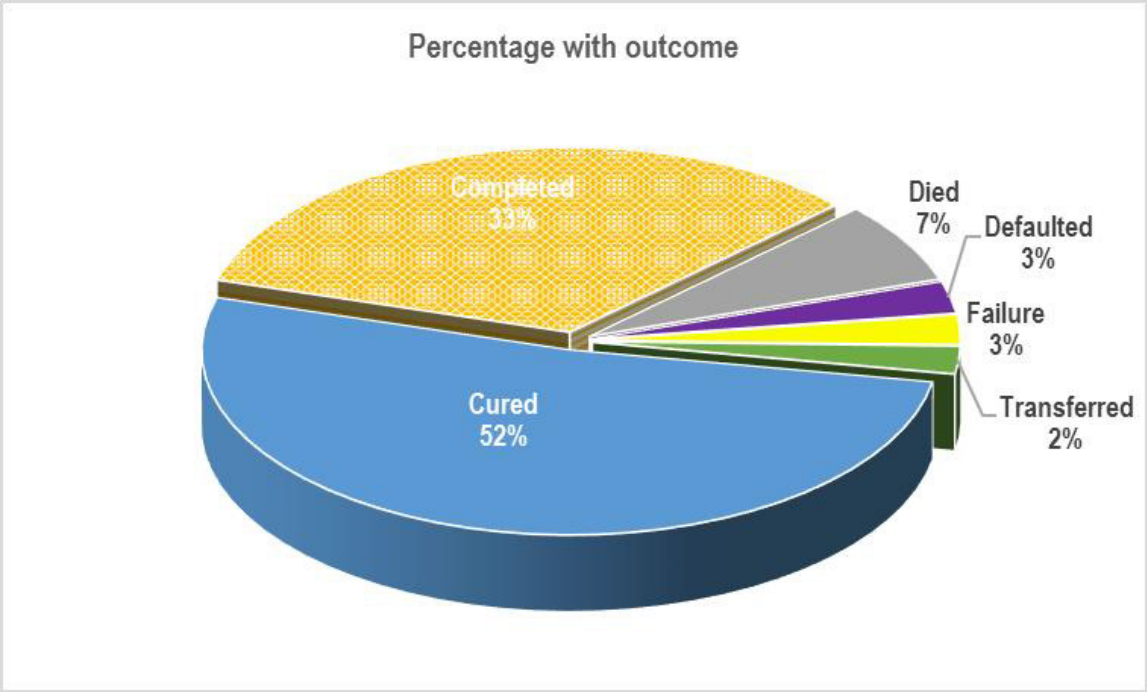
Table 6: Timing of ART initiation after start of anti-TB treatment by CD4 count category among the study participants

Baseline CD4 cell count	≤ 2 weeks Number (%)	2- 8 weeks Number (%)	8wks-6 months Number (%)	> 6 months Number (%)	Total Number (%)
CD4 <50	66 (37.7%)	89 (50.9%)	16 (9.1%)	4 (2.3%)	175 (100%)
CD4 ≥50	25 (45.5%)	25 (45.5%)	5 (9.1%)	0 (0.0)	55 (100%)
CD4 missing	21 (47.7%)	20 (45.5%)	2 (4.6%)	1 (2.3%)	44 (100%)
Total	112 (40.7%)	135 (49.1%)	23 (8.4%)	5 (1.8%)	275 (100%)

D. TB Treatment Outcomes

Overall, the TB treatment outcomes of the HIV positive TB patients show that 51.8% were cured and 33.3% completed treatment. Thus, the treatment success rate was 85.1% in this study population. In addition, 2.6% were reported to have failed treatment, 2.8% to have defaulted, 7.1% to have died, and 2.4% to have transferred out (**Figure 6**).

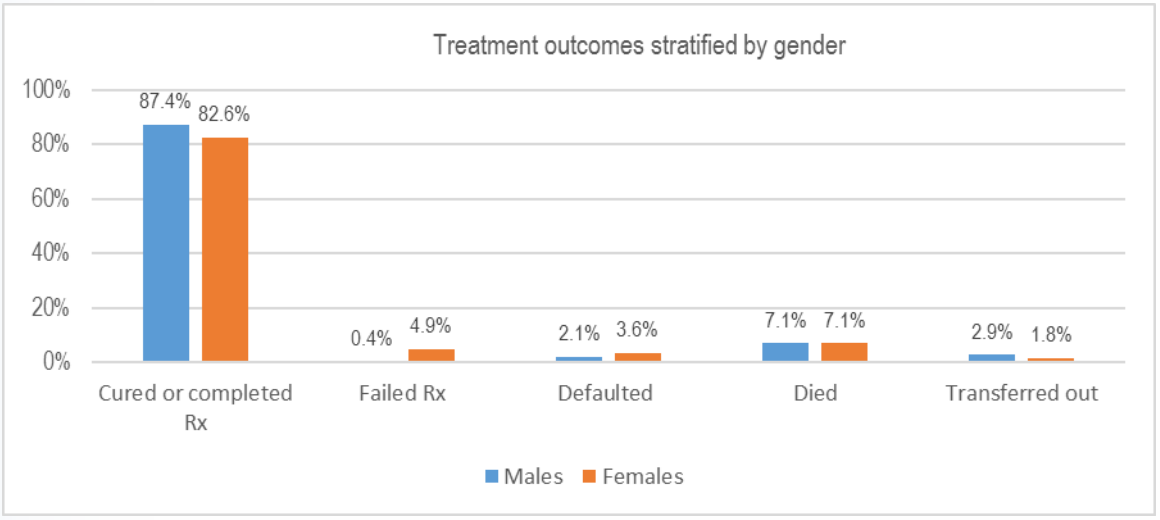
Figure 6: TB treatment outcomes in HIV+ TB patients



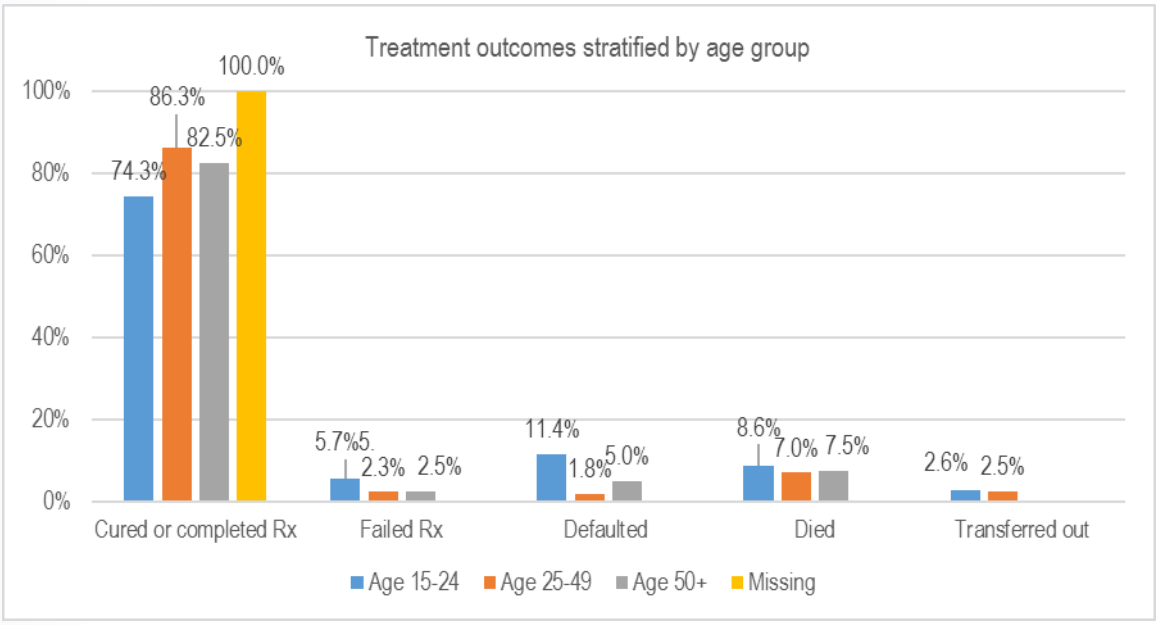
Of the 75 patients with extra-pulmonary TB, 81.3% successfully completed their treatment and 12% died compared to the 6.3% deaths experienced among those with pulmonary TB. The breakdown of TB treatment outcomes by demographic and clinical characteristics are outlined in **Figure 7 (a)-(j)**.

Figure 7: (a)- (j) show TB treatment outcomes stratified by different classifiers

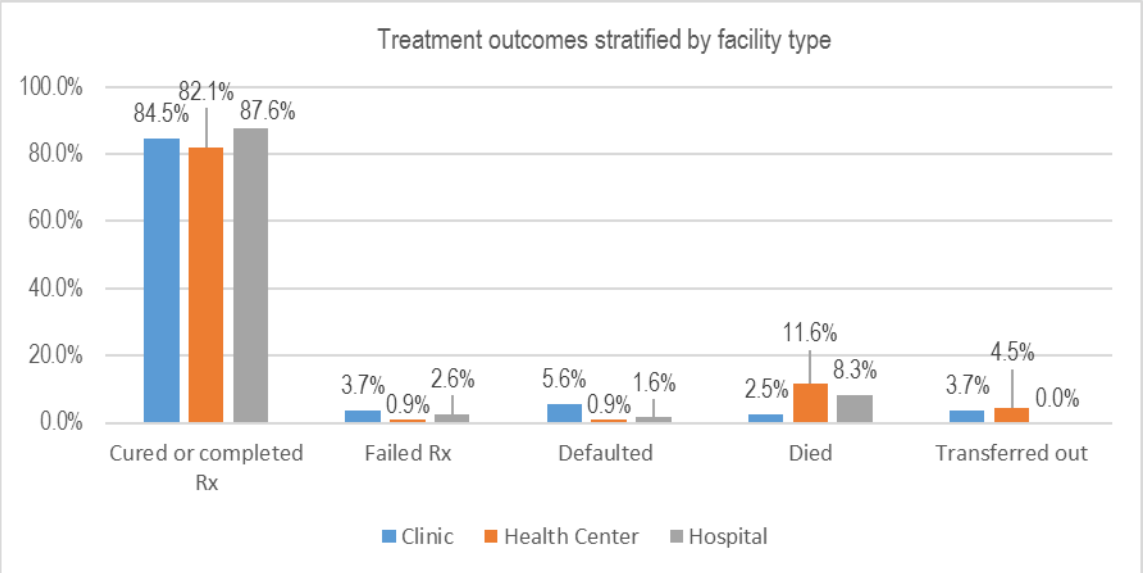
(a)



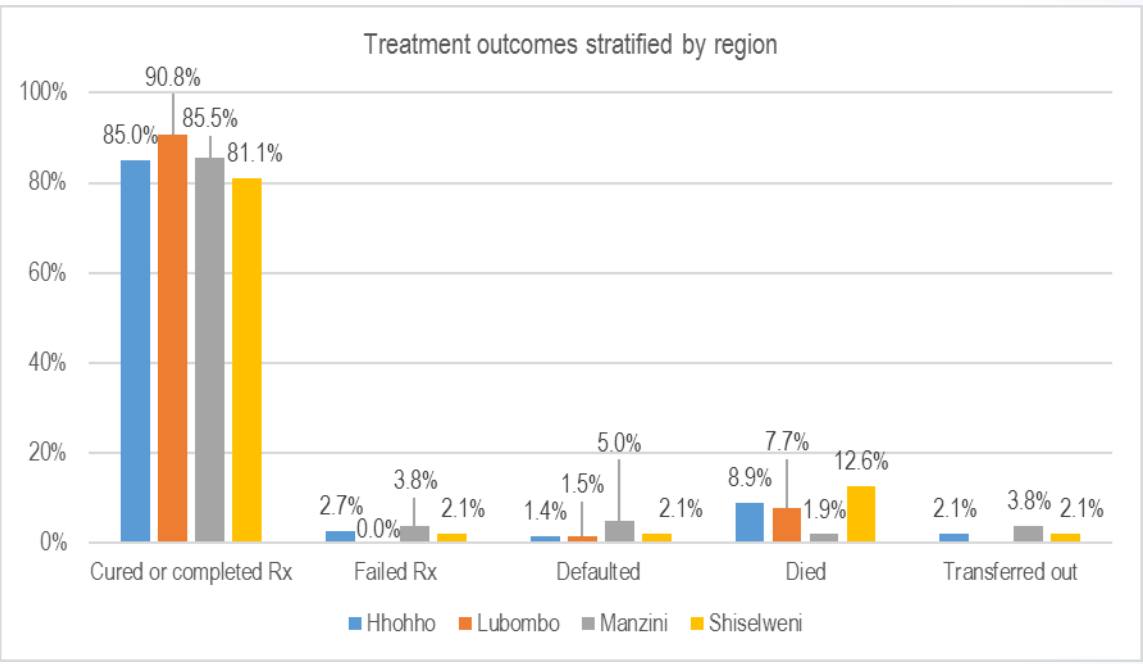
(b)



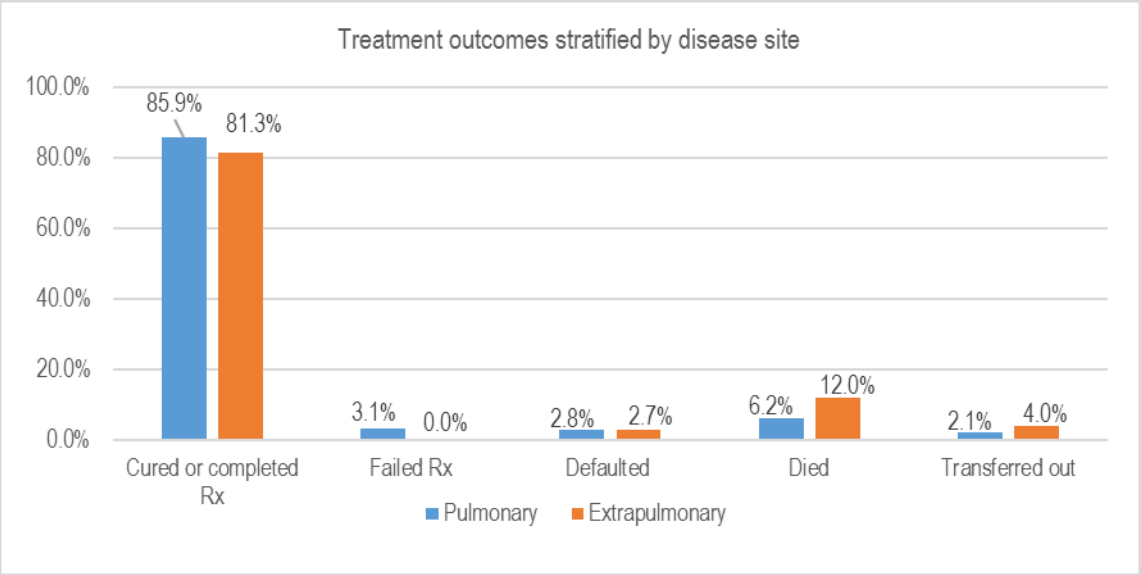
(c)


Treatment outcomes stratified by facility type
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
84.5%
82.1%
87.6%
3.7%
0.9%
2.6%
5.6%
0.9%
1.6%
2.5%
11.6%
8.3%
3.7%
4.5%
0.0%
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out
Clinic
Health Center
Hospital

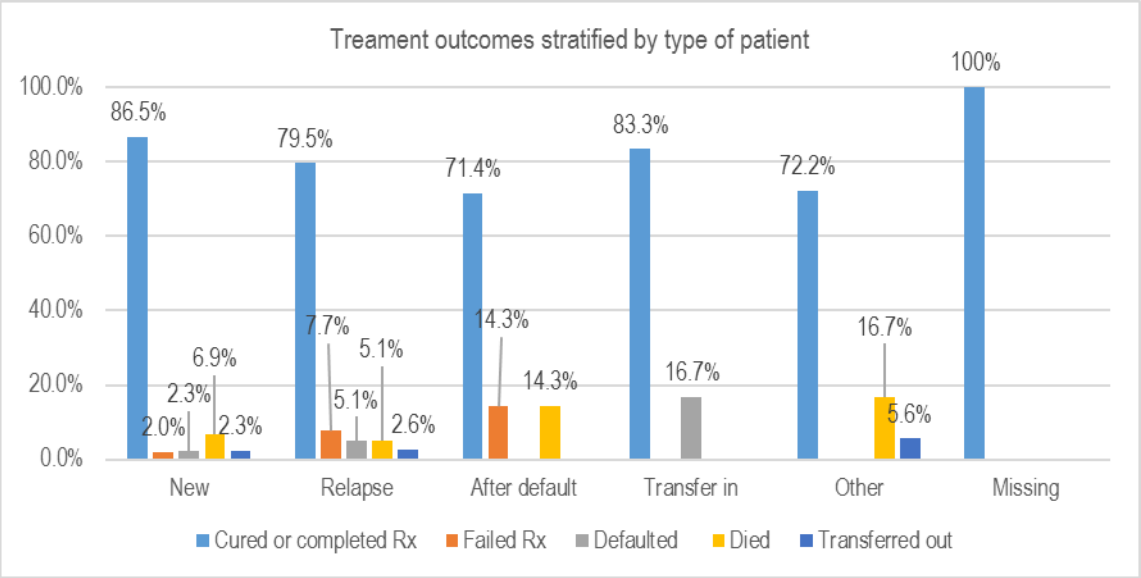
(d)


Treatment outcomes stratified by region
100%
80%
60%
40%
20%
0%
85.0%
90.8%
85.5%
81.1%
2.7%
0.0%
3.8%
2.1%
1.4%
1.5%
5.0%
2.1%
8.9%
7.7%
1.9%
12.6%
2.1%
3.8%
2.1%
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out
Hhohho
Lubombo
Manzini
Shiselweni

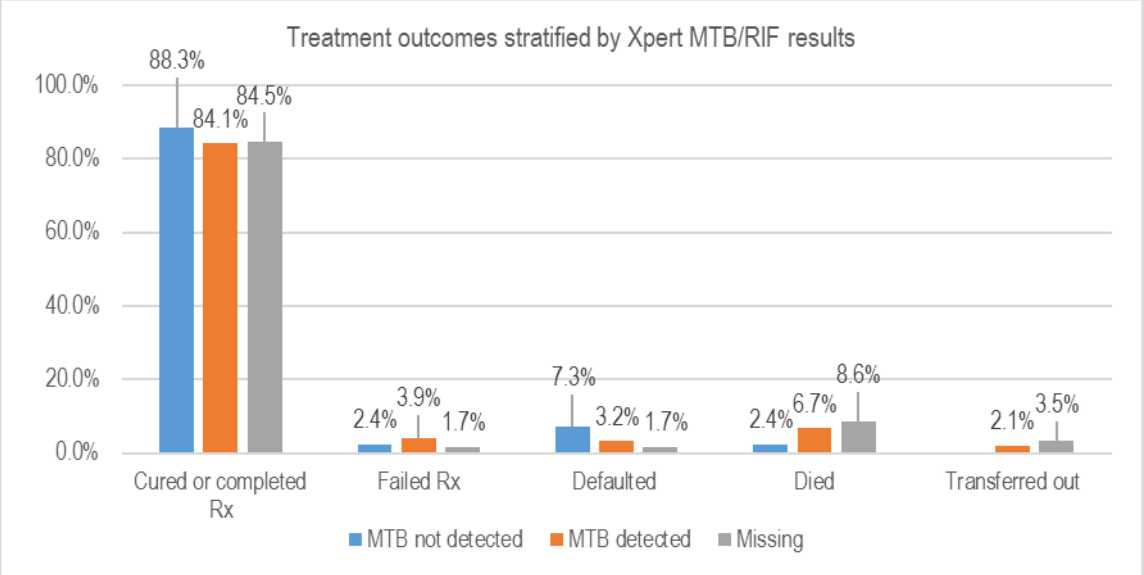
(e)


Treatment outcomes stratified by disease site
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
85.9%
81.3%
3.1%
0.0%
2.8%
2.7%
6.2%
12.0%
2.1%
4.0%
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out
Pulmonary
Extrapulmonary

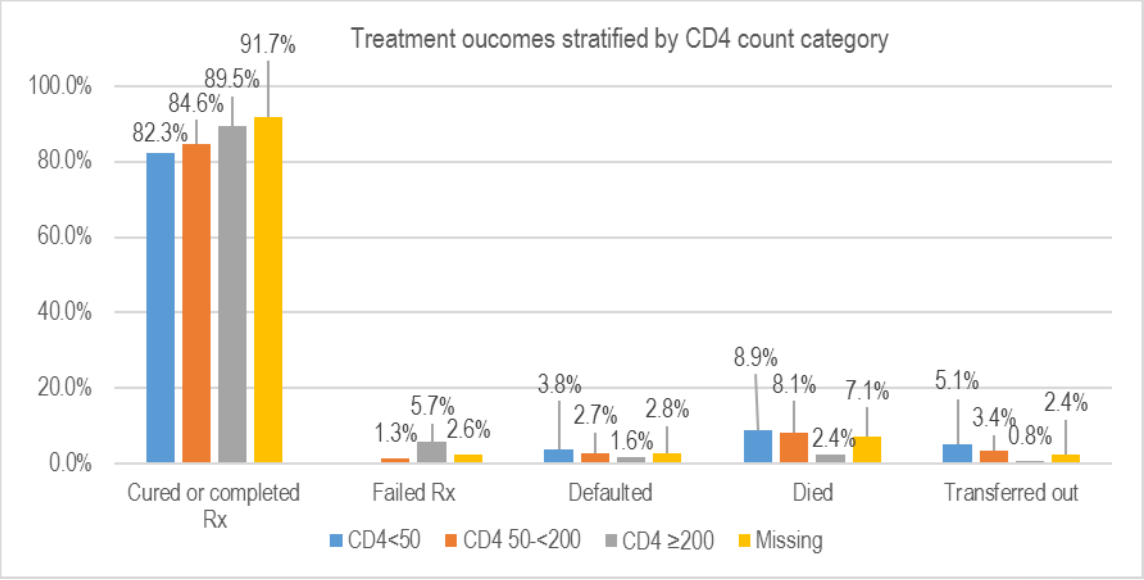
(f)


Treament outcomes stratified by type of patient
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
86.5%
2.0%
2.3%
6.9%
2.3%
79.5%
7.7%
5.1%
5.1%
2.6%
71.4%
14.3%
14.3%
83.3%
16.7%
72.2%
16.7%
5.6%
100%
New
Relapse
After default
Transfer in
Other
Missing
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out

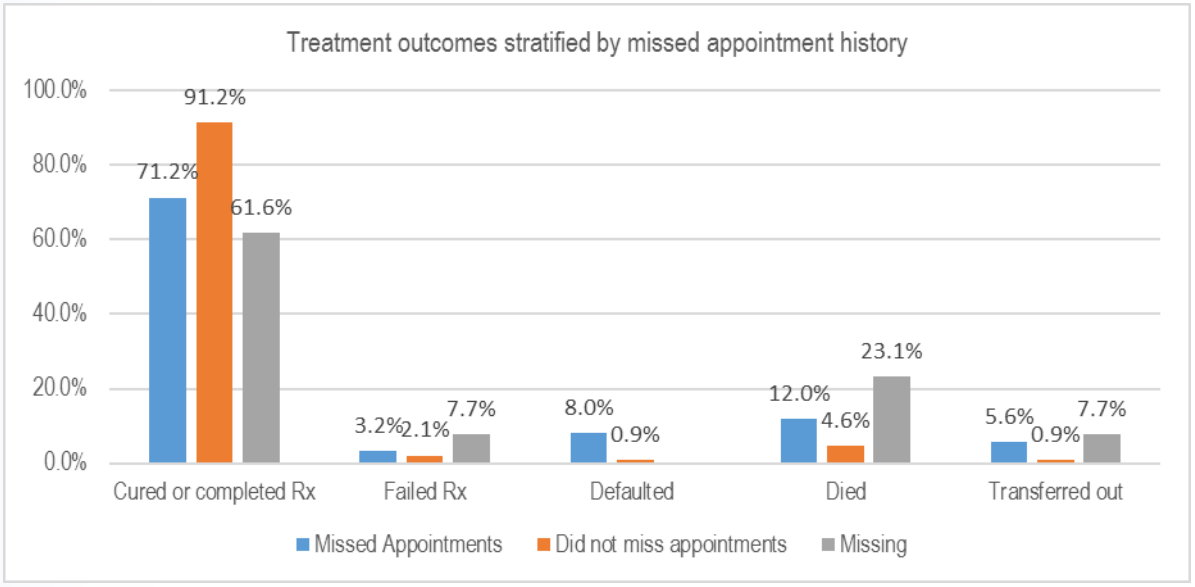
(g)


Treatment outcomes stratified by Xpert MTB/RIF results
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
88.3%
84.1%
84.5%
2.4%
3.9%
1.7%
7.3%
3.2%
1.7%
2.4%
6.7%
8.6%
2.1%
3.5%
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out
MTB not detected
MTB detected
Missing

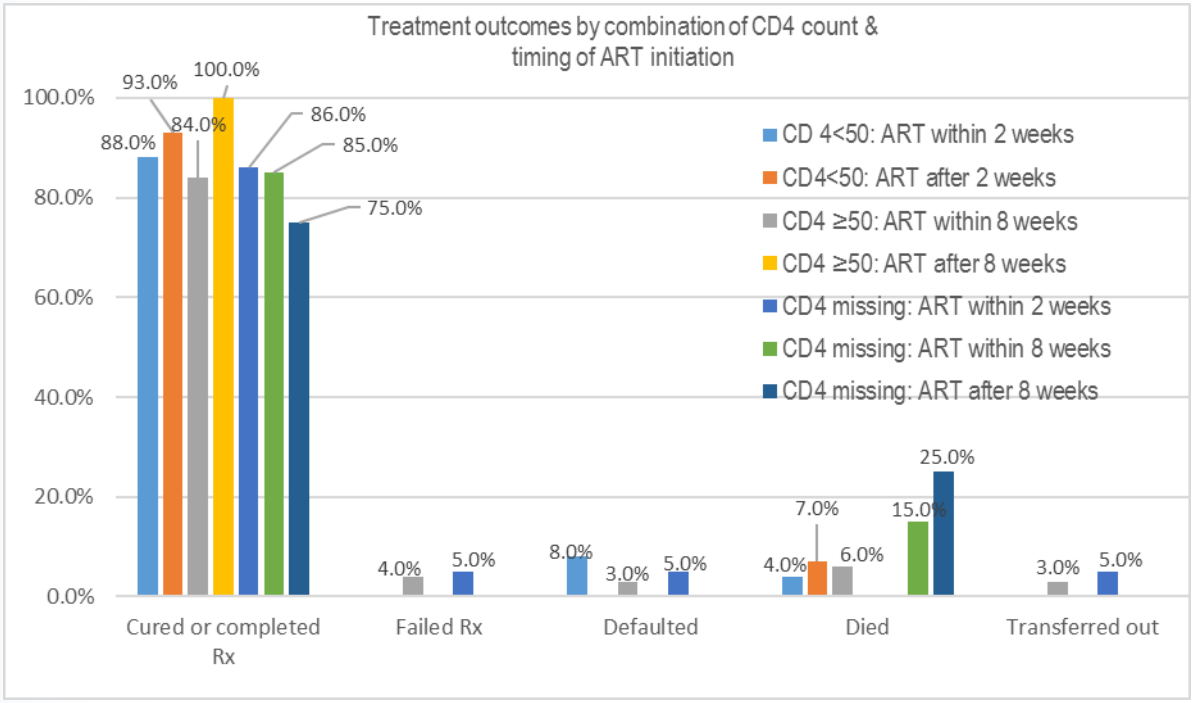
(h)


Treatment oucomes stratified by CD4 count category
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
82.3%
84.6%
89.5%
91.7%
1.3%
5.7%
2.6%
3.8%
2.7%
1.6%
2.8%
8.9%
8.1%
2.4%
7.1%
5.1%
3.4%
0.8%
2.4%
Cured or completed Rx
Failed Rx
Defaulted
Died
Transferred out
CD4<50
CD4 50-<200
CD4 ≥200
Missing

(i)



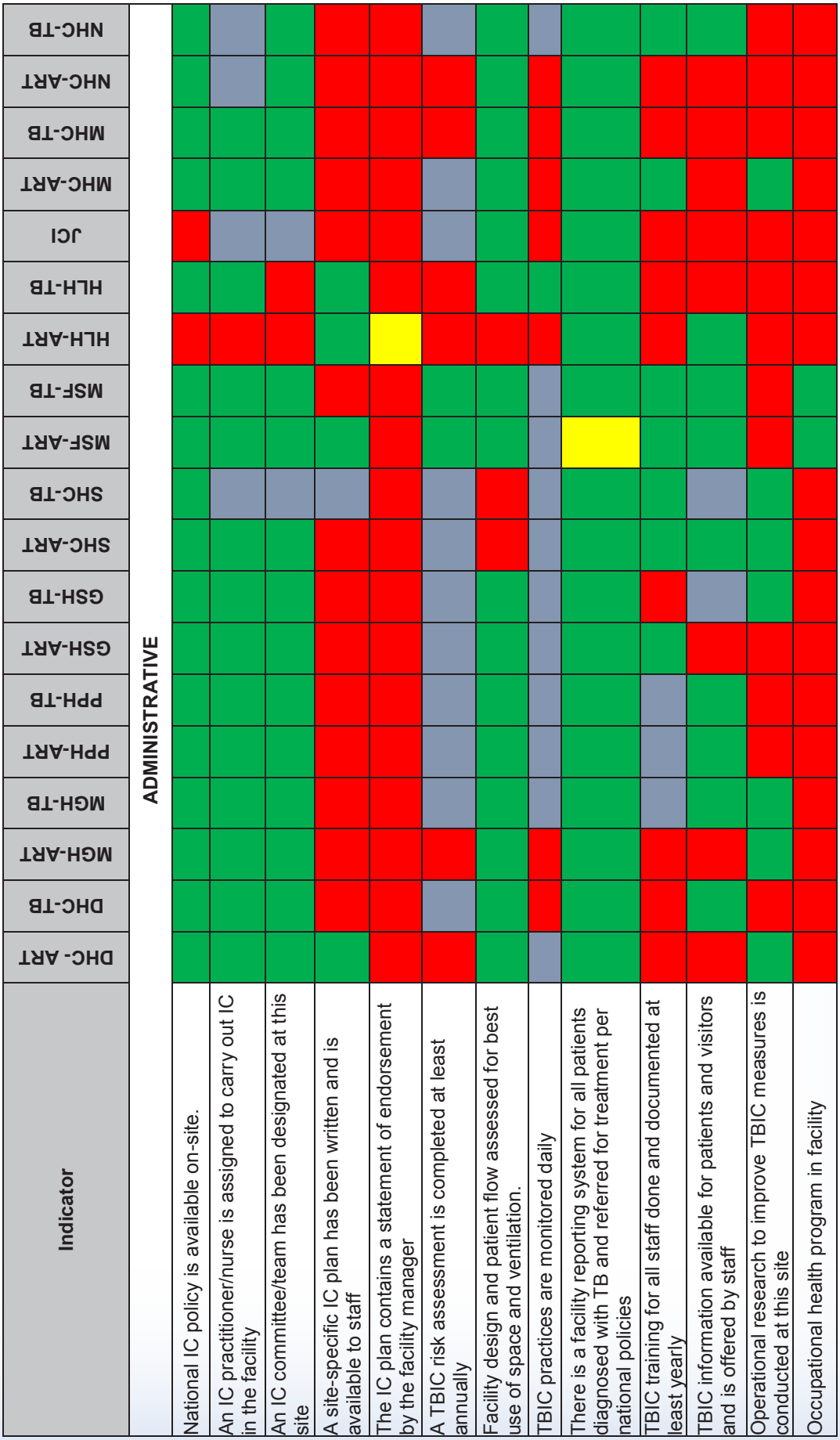
(j)



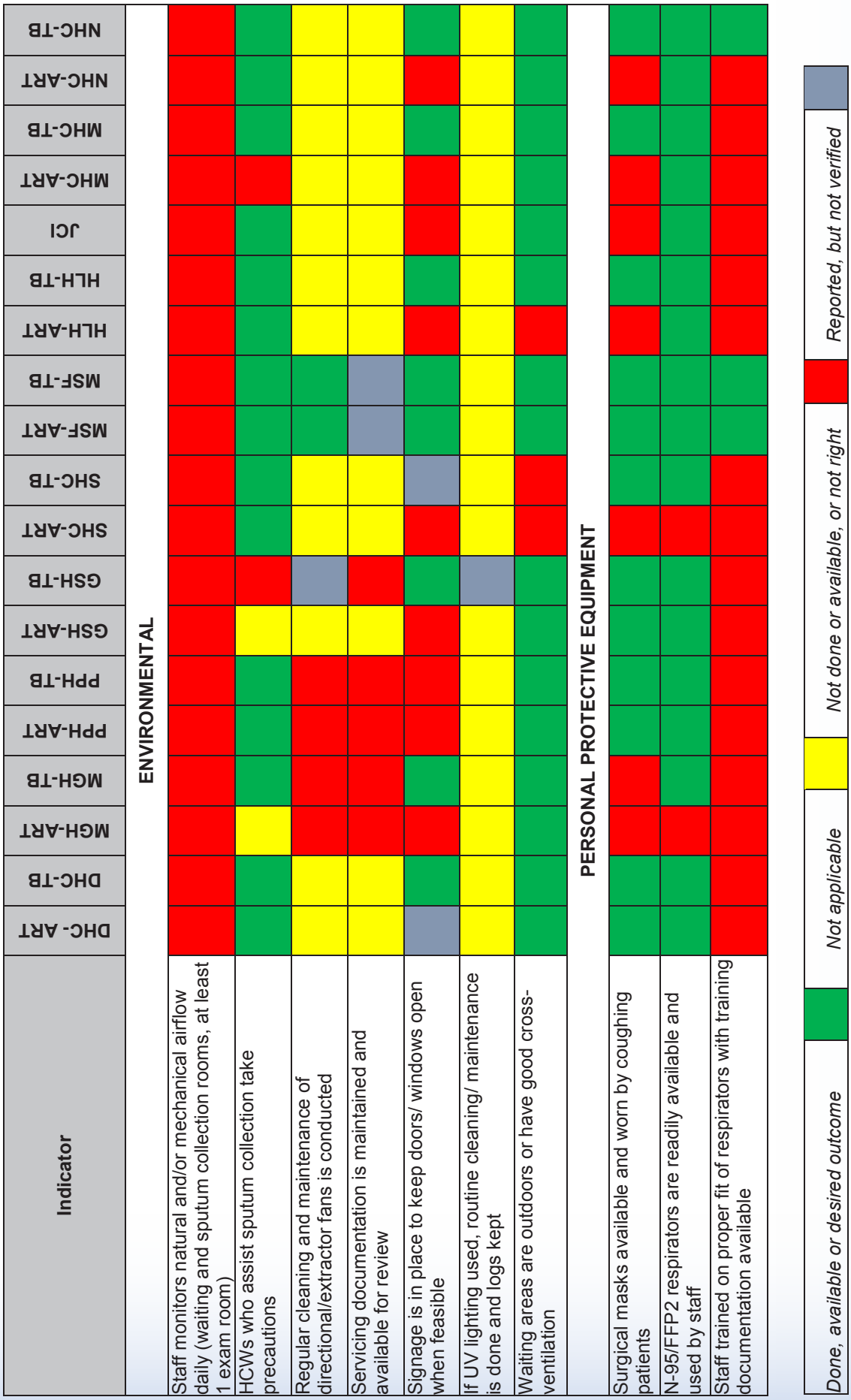
E. TBIC Implementation in Facilities

A TBIC evaluation was conducted in in 19 service points at 10 facilities. Assessments were conducted at TB and HIV clinics at each of these facilities. The aggregate results of the evaluation of facilities for the administrative, work practice, environmental controls and personal protective equipment availability and use are presented in **Table 7**.

Table 7: TBIC dashboard showing evaluation results by facility



Indicator	WORK PRACTICE	DHC- ART	DHC-TB	MGH-ART	MGH-TB	PPH-ART	PPH-TB	GSH-ART	GSH-TB	SHC-ART	SHC-TB	MSF-ART	MSF-TB	HLH-ART	HLH-TB	JCI	MHC-ART	MHC-TB	NHC-ART	NHC-TB
Patients are routinely asked about cough when entering the facility																				
Coughing patients are separated from others and "fast tracked" to a clinician																				
"Cough Monitor" or other person assists with cough etiquette, separation, triage																				
Signage for cough etiquette is present																				
Supplies are available to coughing patients																				
Sputum samples are collected in a designated area and away from others																				
Processing of sputum samples is expedited in the lab -- Tracking mechanism exists to monitor result turn-around time																				
Tracking mechanism exists to monitor patient turn-around time within facility																				
Staff get TB evaluation at least annually																				
A confidential log is kept of all staff diagnosed with TB																				
Staff are offered an HIV test yearly and ART if positive																				
HIV-infected staff reassigned if requested																				
INH preventive treatment is offered to HIV-infected staff																				


Indicator
DHC- ART
DHC-TB
MGH-ART
MGH-TB
PPH-ART
PPH-TB
GSH-ART
GSH-TB
SHC-ART
SHC-TB
MSF-ART
MSF-TB
HLH-ART
HLH-TB
JCI
MHC-ART
MHC-TB
NHC-ART
NHC-TB
ENVIRONMENTAL
Staff monitors natural and/or mechanical airflow daily (waiting and sputum collection rooms, at least 1 exam room)
HCWs who assist sputum collection take precautions
Regular cleaning and maintenance of directional/extractor fans is conducted
Servicing documentation is maintained and available for review
Signage is in place to keep doors/ windows open when feasible
If UV lighting used, routine cleaning/ maintenance is done and logs kept
Waiting areas are outdoors or have good cross-ventilation
PERSONAL PROTECTIVE EQUIPMENT
Surgical masks available and worn by coughing patients
N-95/FFP2 respirators are readily available and used by staff
Staff trained on proper fit of respirators with training documentation available
Done, available or desired outcome
Not applicable
Not done or available, or not right
Reported, but not verified

F. Knowledge Attitudes and Practices Survey Results

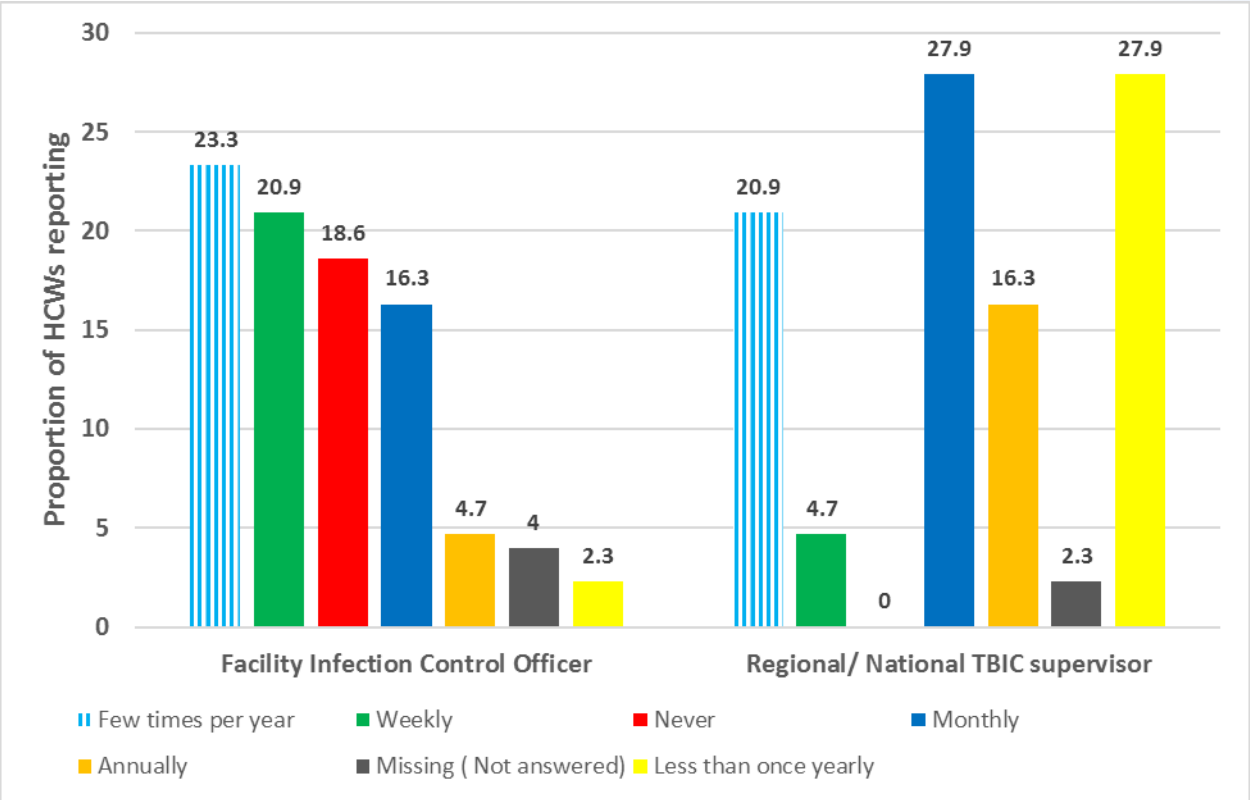
Knowledge attitudes and practices surveys were conducted among 43 HCWs at the study sites to determine their degree of comfort with TBIC principles and practice. Among these, 37.2% were male, 60.5% were female, and the median age was 36.5 (IQR: 31-47). Of the sampled HCWs, 46.5% were from a TB clinic and 48.8% from an HIV clinic. The majority (62.8%) were nurses with a median 9 years of experience (IQR: 5-17). Other descriptive characteristics of these interviewed HCWs are presented in **Table 8**.

Table 8: Description of HCWs who participated in the KAP survey and TBIC profiles related to their facilities (N=43)

Variable		n (%)
Gender	Male Female Missing	16 (37.2) 26 (60.5) 1 (2.3)
Age	Median [IQR]	36.5 [31- 47]
Facility type	Hospital Health Center Clinic	22 (51.1) 15 (34.9) 6 (14.0)
Region	Hhohho Lubombo Manzini Shiselweni	13 (30.2) 10 (23.3) 4 (9.3) 15 (34.9)
Clinic setting	TB VCT/ART Missing	20 (46.5) 21(48.8) 2 (4.7)
Occupation	Doctor Nurse Nursing Assistant Missing	5 (11.6) 27 (62.8) 9 (20.9) 1 (2.3)
Years of experience	Median (IQR)	2 (4.7)
Number who attended TB infection control training in the past 12 months		20 (46.5)
Number who attended general infection control training in the past 12 months		25 (58.1)
Number reporting presence of an infection control officer or nurse present at the facility		34 (79.1)

Monitoring and supervisory visits by facility TBIC officer and regional or national TBIC officers were assessed. All participants reported to having been visited by the regional or national TBIC infection control supervisor. However, eight (18.6%) reported that they have not been visited by the local or facility Evaluation of TB/HIV Collaborative Activities in Swaziland 21 based TBIC focal person. **Figure 8** compares the reported frequency of visits by the facility TBIC officer and the regional or national TBIC supervisor.

Figure 8: Frequency of visit to facilities by the facility based and regional or national TBIC focal person or supervisor



1. Assessment of knowledge of HCWs on TB and TBIC

Of the 43 HCWs who participated in the TBIC HAP survey, sixteen (37.2%) correctly identified lack of access to or use of respirators (N95 masks) as the main reason why HCWs develop TB disease. Forty HCWs (93%) correctly identified cough and night sweats as symptoms of TB while 38 correctly identified (88.4%) correctly identified unintended weight loss as a symptom of TB disease. No participant attributed skin redness to TB disease. Knowledge on how BCG vaccination provide protection was limited to six HCWs (14%) who correctly identified the provided correct answer which was to protect infants from TB meningitis. At the 80% mark (i.e. proportion of participants with correct knowledge), avoiding crowding of hallways with waiting patients and collecting sputum on the outside spaces were not well understood as methods of reducing the chance of HCWs acquiring TB disease. The proportions demonstrating correct knowledge (green) on TB issues and those with incorrect knowledge (red) on a cumulative scale are shown in **Figure 9**.

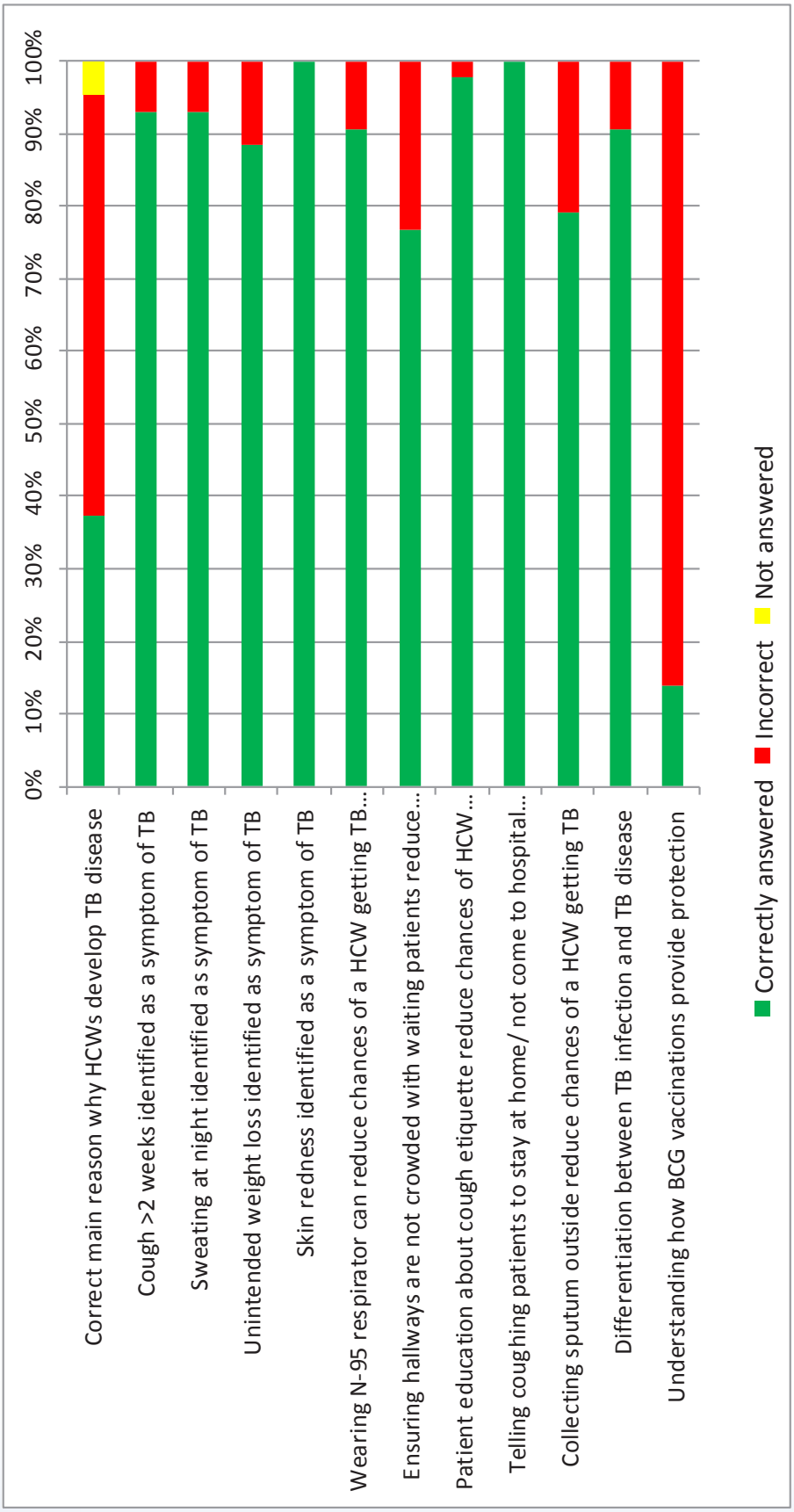


Figure 9: Dashboard representing cumulative proportion of participants giving correct, incorrect and no answers respectively

2. Attitudes and practices of HCWs on TBIC

Forty-two (97.7%) HCWs viewed that wearing of respirators is required when caring for TB patients and none felt that wearing masks is stigmatizing to the patients. Only two (4.7%) HCWs had a viewpoint that patients do not like to go outside for sputum collection on cold or rainy days. Only one (2.3%) HCW believed that most nurses and doctors are already infected with TB and thus preventive measures were not necessary. The majority, 42 (97.7%), believed that it was their job to talk to patients and their families about TB and HIV and their preventive methods. There were 27 (62.8%) who were of the position that their respective health facilities were concerned about their health and safety. Shortage of supplies with places of work needed for personal protection from TB were reported by 26 (60.5%) HCWs.

Figure 10 details the findings from HCWs regarding their attitudes and practices on TBIC.

3. TB and HIV preventive services for HCWs

Twenty-four (55.8%) HCWs reported having been offered voluntary HIV counselling and testing services at some point at their facilities. TB screening during the past year preceding the study offered by their facilities was reported by 25 (58.1%) HCWs. Five different screening methods have been used in screening HCWs and the number screened by each method are shown in **Table 9**.

Table 9: Tests used in screening HCWs for TB

Number screened (n) = 25	
Form of TB screening/test conducted (not mutually exclusive)	**n (%)**
TB Symptom screen	17 (68)
Tuberculin skin test	3 (12)
Chest X-ray	14 (56)
Quantiferon	1 (4)
Xpert MTB/Rif	15 (60)

There were seven (16.3%) HCWs who developed TB symptoms in the past and only two (28.6%) went to an occupational nurse or the wellness clinic at their facilities for care. Among the five who did not seek care 3 reported that there was no occupational nurse at their facilities, one cited lack of knowledge that it was necessary to report to the facility and the other one cited fear of being fired or creating conflict if they had reported.

Figure 10: Favorable and unfavorable attitudes and practices of HCWs regarding TBIC

G. Results from TBIC Qualitative Data

From the two open ended questions administered to the 43 HCWs (nurses, doctors, and nursing assistants) from 11 facilities, major themes were deduced in the context of TBIC implementation challenges and solutions were suggested to improve TBIC in facilities. Three major themes were deduced which identified the main difficulties faced by HCWs in implementing TBIC measures in health facilities. These were lack of knowledge and expertise on TBIC, inadequate infrastructure and standard equipment, and poor adherence to standard operating procedures and poor management of TBIC related activities. Three major themes for solutions included improving infrastructure and ventilation, building capacity through trainings of HCWs on TBIC, and lastly strengthening wellness services to conduct routine screening of HCWs and providing necessary care and support for infected HCWs. The results from the qualitative data analysis are shown in **Table 10**.

Table 10: Difficulties in implementing TBIC and suggested improvements: TBIC KAP survey – qualitative

MAJOR THEMES	HIGHLIGHT OF RESPONSES
Difficulties faced in implementing good TBIC in facilities	
Lack of Knowledge and Expertise	• Some health workers lack TB infection control knowledge. • There are no TB IPC focal persons in some facilities. Guidelines about TBIC practices are not available to everyone who works in the facility, especially newly employed staff. • There is a lack of in-service training and sensitization on IPC
Inadequate Infrastructure and equipment standards	• Inconsistent supply of N95 respirators at health facilities. • UV lights and extractors have not been installed in some of the health facilities. • Buildings in some facilities are poorly ventilated. • Some facilities have no open waiting space. • There is often late diagnosis of patients hence they spend a lot of time being seen in the OPD and not in the TB clinic. TB presumptive and non-presumptive patients are being kept waiting in the same closed waiting area.
Poor adherence to standard operating procedures and poor management	• One of the facilities is an army barrack, and the military guidelines contradict with the health standard operating procedures. • The fit testing of N95, which is a protective gear, is not done at some facilities.
Suggestions made for improving TBIC at facilities	
Infrastructure and Equipment Improvement	• Improvement of infrastructure ventilations • Expansion of building to create more open space. • Installation of standard equipment towards the reduction of TB infections. • Provision of N95 and ensuring that stock does not run out.
Build capacity	• Information on TB prevention not available for new staff to easily access it. • Trainings on IPC for health workers especially those joining service are needed.
Staff wellness	• To improve health workers' health, it would be good to make sure they undergo routine screening. • Infected health workers should be referred to wellness clinic.

IV. DISCUSSION

A. The ICF Cascade in HIV Care and Treatment Settings

This study has allowed detailed characterization of the ICF cascade among PLHIV accessing HIV care and treatment in a sample of facilities in Swaziland. Overall, screening for TB was excellent, with 97% of TB symptom screening documented in patients' records at their last HIV care or treatment visit. This aligns well with efforts in Swaziland over recent years to build healthcare worker capacity regarding TB screening, in compliance with national TB control guidelines. Of those screened, about a quarter had a positive screen. This is higher than reported in the 2014 Annual TB Program Report, which estimated that 3.4% cases screened for TB in Swaziland had presumptive TB [8]. However, cases reported by the Annual TB Program Report account for both HIV+ and HIV- clients screened at health facilities rather than HIV+ clients only.

Of those with a positive TB screen, only about half were reported to have received a diagnostic evaluation which, though higher than estimates from the 2014 Annual TB Program Report (8.6%) [8], still represents the single greatest transition at which people were lost from the cascade. Of those who were evaluated, 64% received a TB diagnosis. A factor that was reported to have played a role in this is the fact that in clinics, sputum sample collection was dependent on the national sample transport system (NSTS) availability. Patients are requested to return with a sputum sample that is collected on the day that the NSTS visits the clinic, while in hospitals and health centers, spot sputum collection was not being practiced consistently and therefore patients asked to return with a sputum sample most likely would not return. Additional loss to follow-up along the cascade would arise from the need for PLHIV in HIV care and treatment clinics to transfer to a TB clinic to initiate TB treatment. Some patients (especially those with a negative diagnostic evaluation) may be lost to follow-up between the two clinics. We are unable to distinguish from our data how much of this drop in the cascade is due to diagnostic tests not being ordered versus specimen results not being given back by patients, received by the lab or ordering physician, or recorded in registers. Likely, there was a combination of all factors at play. The writing workshop panel acknowledged that often patients receive a sample cup for sputum but do not return it, and that documentation in registers in addition to patient booklets is a significant challenge due to time constraints.

The importance of giving patients a TB diagnosis is underscored by the fact that 100% of patients who did so were started on TB treatment, which is remarkable (versus 85.3% of those diagnosed per the 2014 Annual TB Program Report) [1]. Empiric treatment also occurred in 25 people but this number is relatively low, implying that low levels of TB diagnostic evaluation are not simply due to empiric treatment in the laboratory setting or other diagnostic constraints. We unfortunately did not collect TB treatment outcomes for the PLHIV in the ICF cascade cohort, which should be the last measured step in the TB ICF, care, and treatment cascade.

Slight variations were noted in the ICF cascade based on baseline patient characteristics and their HIV care and treatment facility. Females and males were equally screened, but a slightly higher percentage of males had a positive screen, which might reflect the known later health-seeking behavior in this group. Young people and people over the age of 50 were also less likely to have a positive screen, but if they did, people ages 15-24 were less likely and those over age 50 were more likely to have a diagnostic evaluation documented. Clinics reported the highest percentage of positive TB screens, but health centers were most likely to follow up their positive screens with a documented diagnostic evaluation. Of note, health centers and hospitals might be more likely to get a TB diagnostic result back the same day as it is ordered, whereas for clinics this depends on the availability of the sample transportation. When looking at facility-specific data, a few things stand out: for example one site had only an 88% screening rate, there was a wide variety in percentage with a positive TB screen, and some facilities had particularly large drops (>50%) between the number screening positive for TB and the number receiving a diagnostic test result. This type of data is vital for helping individual facilities to identify ways to improve their TB ICF and treatment programs.

IPT uptake among the study cohort was universally low, at 7.3% of those eligible but comparable to 5% reported by WHO in 2014 [5]. A higher percentage of those on IPT were women (59%) and 41% were men. Seventy-three percent of those on IPT came from health Centres, despite Health Centres representing only 34% of the study population. Two sites had relatively high levels of IPT uptake (26% average), which, although below national targets, indicate that programmatic conditions for IPT use exist within Swaziland. Other facilities documented no IPT use at all. Some reasons provided by healthcare workers in the writing workshop included a combination of drug shortages, fear of severe side effects, demotivation, limited knowledge of IPT among facility staff and high staff turnover.

There were several limitations to this study that may have affected our assessment of the ICF cascade in Swaziland. We were unable to distinguish between steps of the cascade not being done versus not being documented. Poor documentation due to time constraints and an overburdened health system are likely. In addition, our study design and time constraints precluded collection of details from individual patient care booklets and charts that might have identified thought processes and tests not documented in registers. In addition, only the cascade among PLHIV accessing HIV care and treatment sites was assessed, which does not allow us to generalize results to the general population (including those communities not seeking care). We did not assess the percentage of people put on TB treatment who completed this treatment or achieved cure, which is the ultimate point of entering patients into the ICF cascade. Sites with co-located HIV and TB facilities were selected, and so results are not generalizable to the few facilities in Swaziland where these services are geographically separated. Finally, stratification by baseline variables of interest to national programs may have resulted in small denominators, requiring caution in interpreting and extrapolating sample results to the national population.

B. ART Uptake in HIV Care and TB Treatment Settings

PLHIV who initiated TB treatment between July and November 2014 at the TB treatment clinics were evaluated and men and women within clinics, health centers and hospitals evenly represented. Most patients had no prior history of TB treatment, or of having received TB treatment for less than one month previously (though about 8% were on treatment after a relapse), and most had pulmonary TB. CD4 count at TB treatment initiation was not documented in almost a quarter of patients, which is consistent with the CD4 test not being a requirement for initiation of ART treatment in HIV positive patients with TB. However, reports of frequent reagent stock outs or other laboratory shortages could have accentuated the low CD4 count documentation. Of those with a known CD4 count, it was lower than 200/mL in about 65% of people. Xpert MTB/RIF was used for diagnosis in all but 13% of PLHIV. MTB was detected by Xpert MTB/RIF in 61%. This is consistent with the fact that Swaziland was one of the early implementers of XpertTB/RIF and one of the first countries to implement the use of Gene Xpert as the first diagnostic test for TB among PLHIV.

Some of the patients were known to be HIV-positive and were on ART before they started TB treatment. In pursuance of the WHO guidelines on early ART initiation for TB patients diagnosed with TB, for everyone else, the study put special emphasis on the number of PLHIV who started their ART within the timeframe recommended by WHO with respect to their TB treatment. Of these, almost 90% were initiated on ART within two months (median time to initiation was 15 days) and almost all HIV-positive TB patients started ART within six months of TB treatment initiation, demonstrating high compliance with the WHO and national TB/HIV guidelines. Given that in the past, prescription of ART was the prerogative of medical doctors despite many TB clinics not having full time medical doctors to prescribe ART, this perhaps validates recent task-shifting of ART initiation from doctors to nurses with the introduction of Nurse-led ART Initiation in Swaziland (NARTIS) and integration of HIV services at TB clinics in the country. However, less than 40% of those with a CD4 count less than 50/mL started ART within the two weeks, probably because these patients were very sick and may had challenges with tolerating anti-TB medicines and hence were not prioritized for early ART initiation within 2 weeks. Conversely, more than 90% of those with a CD4 count over 50/mL started within the recommended eight-week period. Interestingly, PLHIV with a missing CD4 count were actually more likely than those with a CD4 less than 50/mL to start ART within 2 weeks (almost

50% of them did so). This could be because, for very sick patients, providers choose to start TB treatment as soon as possible based on clinical staging, regardless of (and without even ordering) a CD4 count. For patients with a CD4 less than 50/mL who did not fall into this category, it is plausible that the delay in ART initiation observed could be due to the need to await this laboratory result.

Overall, 85% of co-infected patients in this cohort were documented to have achieved TB cure (diagnostic confirmation of bacteriologic clearance) or to have completed TB treatment (compared with a 71% WHO-estimated TB cure rate for PLHIV in 2014, and a 79% treatment success rate reported in the 2014 Annual TB Programme Report) [2, 8]. Less than 3% of patients experienced documented treatment failure or defaulted from treatment, although 7% died during follow-up. These trends did not differ by gender, but younger people ages 15-29 were more likely to fail or default from treatment, and older people over age 60 were more likely to die. HIV-positive TB patients in health centers also had a higher proportion of deaths, as did the group of people with extrapulmonary TB. Some differences between individual facilities are noted: many of the hospitals documented more “cures” relative to “treatment completion” likely due to onsite availability and feasibility of repeat sputum testing to document cure. Patients in TB treatment after a prior treatment interruption (formerly referred to as default) had a higher proportion who failed treatment or died, and more of those who transferred into their study TB facility from another eventually defaulted. Patients with a CD4 count less than 50 had a slightly lower proportion of cures and treatment completions that the patients with higher CD4 count. The adverse outcomes are probably because of advanced HIV disease in the patients with a CD4 count <50 cells/µl. More people who were documented as missing appointments on TB treatment defaulted or died than those who did not miss them, although this variable was missing for many patients. Those who had an unknown CD4 disproportionately died during follow up and less of them achieved cure or treatment completion. Finally, timely ART relative to TB treatment did not appear to result in notably different TB treatment outcomes in those for whom CD4 count was known, but HIV outcomes based on this timing were not assessed.

Limitations of this study that affected our assessment of ART uptake among HIV-positive TB patients (in addition to many of those mentioned in the previous section) include the fact that overall sample size for this part of the study was low, so trends and proportions may not be significantly generalizable to the general population of PLHIV. In addition, many variables had large proportions of missing values. This study examined TB patients with known HIV-positive status and their likelihood of receiving timely ART, but did not examine uptake of PIHTC and HIV testing results among TB patients, which are both important components of collaborative TB/HIV programmes. In addition, we were unable to measure HIV treatment outcomes and, for people started on TB treatment after already being on ART, we did not collect ART start date to determine the timing of TB development relative to ART initiation.

C. TBIC Implementation in HIV Care and Treatment Settings

Details on TBIC practices are available by site and should be used by each facility to improve and monitor progress. Some overall generalizations were made for the study sites based on the TBIC dashboard and results of the KAP survey. On an administrative level, most sites have a national infection control policy on site and reported an infection control practitioner assigned to carry out and oversee activities, but very few have a site-specific infection control plan or existing occupational health program available to staff. Only about half of HCWs interviewed for the KAP survey felt as though they had a good understanding of their facility’s IC policy, though more than 60% felt that their facility was concerned about their safety. Although most interviewed HCWs said that an IC officer regularly visits their facility, 18% reported that this never happens. Most sites have assessed their facility design and patient flow for best use of patient space and ventilation, and have a reporting mechanism for all patients diagnosed and treated for TB.

However, several sites do not monitor their TBIC practices daily, conduct yearly training for staff, or have TBIC information available and offered to patients. More than 60% of KAP interviewees did not feel that they were adequately trained in TBIC measures, which puts them at greater risk of nosocomial TB infection. From a work practice point of view, patients in most facilities are routinely asked about cough using the

national symptom screening tool when attending the health facility at "entrance", and coughing patients are separated and fast-tracked to a clinician, assisted by a "cough monitor". However, multiple sites could improve on simple interventions, such as signage on cough etiquette or supplies available to coughing patients. Sputum samples are generally collected in a designated area away from others and many sites do in fact have a way to expedite processing of these samples through laboratories and track result turnaround time. In most sites, staff are offered a yearly HIV test (and ART and IPT if found to be positive), but in many facilities HIV-infected staff cannot request reassignment out of a TB ward. During the KAP survey, a little over half of respondents said they had ever been offered voluntary counseling and testing for HIV, and a similar proportion have even been screened for TB at their facility. Unfortunately, in most sites, staff do not routinely get an annual TB evaluation, and no site reported a confidential log of staff diagnosed with TB. 7% of interviewed HCWs said if they developed symptoms of TB they would not tell anyone at work. 16% said they have developed these symptoms at some time since they began working in their facility, but only a third of these went to an occupational health nurse whose services are limited in most facilities, however wellness corners do exist that can provide TB screening, HIV testing and support services.

In terms of environmental and PPE aspects of TBIC, few sites have equipment such as extractor fans or ultraviolet lights. No site reported daily monitoring of natural or mechanical airflow, only about half have signage in place to keep doors and windows open when feasible, and in the few sites using directional or extractor fans, regular cleaning and maintenance is not conducted or reported. However, waiting areas are generally outdoors or have good cross-ventilation. Surgical masks are also available and worn by most patients. According to the TBIC evaluation, HCWs who assist with sputum collection take precautions, and N95/FFP2 respirators are readily available in most clinics and used by staff, though they are seldom trained on or properly fitted for these masks. However, according to our KAP survey, 37% of interviewees think that the main reason HCWs develop TB disease is a lack of access to or use of appropriate respirators (the next most common reason cited was delay in diagnosis), and 60% said their ward often did not have the supplies needed to protect themselves from TB. Almost 15% of interviewees said they never or rarely wear a respirator with a coughing patient, and only about 40% said they always do. These results point to clear deficits that must be addressed to adequately protect HCWs and their patients from nosocomial TB transmission.

V. RECOMMENDATIONS

Based on our assessment, we propose the following recommendations for future action:

1. Focus efforts on ensuring that all PLHIV with a positive TB symptom screen receive a diagnosis, and try to understand better why this gap in the ICF cascade is occurring.

- Health facilities identified as doing particularly poorly in this regard should be notified and their practices investigated.
- Consider adding an additional column to HIV registers to capture when TB diagnostic specimen cups are given vs. when specimens are received and sent for diagnosis.
- Re-sensitize, motivate, and build capacity among healthcare staff on the management of TB disease.

2. Scale up IPT use and acceptance.

- Increase widespread availability of isoniazid (INH) for IPT.
- Consider decentralization of IPT prescription to ART clinics.
- Conduct a "deep-dive" into IPT-prescribing practices at Dvokolwako Health Center and Sithobela Health Center to understand what factors have enabled their higher use of IPT. Conversely, consider a similar approach to understand the complete rejection of IPT by Mbabane Government Hospital and Phocweni USDF.
- Re-sensitize, motivate and build capacity among healthcare staff.
- Demonstration of political will for IPT from the highest level is needed since there is still confusion and disagreement among health care workers regarding the benefits of IPT.

3. **Continue efforts to strengthen and monitor the overall health system in terms of laboratory capacity, specimen transport, supply chain management, drug procurement, etc., to support recommended TB/HIV activities. In particular, stock outs of INH and CD4 test reagents were identified in this study as bottlenecks to recommended and timely care.**
4. **Conduct targeted healthcare worker focus groups to better understand obstacles to implementation, recording and reporting of routinely collected TB/HIV data necessary for assessment and targeted improvement of programs.**
5. **Improve documentation of TB/HIV activities.**
   - Improve ease and usability of documentation systems.
   - Improve healthcare workers understanding and buy-in in terms of the need for documentation of their activities in registers to get "credit" for their work and to improve the overall quality, relevance and responsiveness of TB/HIV services and programs.
6. **Improve site-specific and national TBIC in TB facilities using the attached dashboards, and continue to monitor biyearly progress.**
   - Create site-specific infection control plans, oversight, and accountability for use.
   - Increase TBIC knowledge among patients and provide support for cough etiquette.
   - Conduct yearly TBIC training for staff including information on TB prevention.
   - Train and appropriately fit-test HCWs for use of N95 respirators, and ensure adequate stocks.
   - Create occupational health positions within facilities, evaluate HCWs for TB at least annually, provide guidance, diagnosis and treatment when they develop symptoms of TB, and reduce stigma associated with seeking care.
   - Allow and encourage HIV-positive HCWs to be reassigned from treating TB patients.
   - Regularly monitor airflow and conduct maintenance of equipment in TB facilities.
7. **Improve how messages that are intended for programmatic guidance towards the care of clients are crafted. About a quarter of TB patients co-infected with HIV did not have documented CD4 count results or CD4 testing done. Even though guidelines do not necessarily state that CD4 count should not be done but rather availability of CD4 results should not delay initiation of ART, some patients may still not have CD4 count testing conducted.**
8. **Validate study findings against results from the upcoming population based HIV Impact Assessment and TB Prevalence Survey, and use data as a baseline from which to measure future progress.**
9. **Disseminate results to all stakeholders, including the study facilities to foster continued improvements in service delivery of the TB/HIV collaborative activities.**

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APPENDICES

Appendix 1: Participants at the Report Writing Workshop- Mbabane, 18-20 January 2016

Participant Name	Sex	Designation	Organization /Facility
Amiri Achilla	M	Data Clerk	URC
Arnold Mafukidze	M	Associate Director- Clinical Services	URC
Bandzile Mthethwa	M	Monitoring and Evaluation Assistant	URC
Batsabile Simelane	F	Study Coordinator	URC
Caroline Ryan	F	Country Director	CDC
Dikoko Luzolo	M	Medical Doctor	Matsanjeni HC
Gugu Mchunu	F	TB/HIV Programme Officer	NTCP
Irene Zondo	F	Nurse	Good Shepherd Hosp
Ishani Pathmanathan	F	Epidemiologist	CDC Atlanta
Kikanda Kindandi	M	Medical Doctor	Mbabane Govt Hosp
Lucia Gonzalez	F	TB/HIV Clinical Advisor	ICAP
Lydia Mpango	F	Senior Clinical Services Advisor	AIDSFree- JSI
Maria Mahlalela	F	Nurse	Dvokolwako
Maria Nnambalirwa	F	TB/HIV Technical Advisor	AIDSFree
Maria Verdecchia	F	Epidemiologist	MSF
Marianne Calnan	F	Deputy Country Director	URC
Munyaradzi Pasipamire	M	Senior Technical Advisor- Care and Treatment	SNAP
Nancy Pereira	M	Nurse	Piggs Peak
Nondumiso Nxumalo	F	Nurse	Hlathikhulu
Nonhlanhla Mahlalela	F	Study Coordinator	URC
Pamela Bagaya	F	Data Clerk	URC
Peter Preko	M	Care and Treatment Lead	CDC
Qhubekani Mpala	M	Research Assistant	MSF
Samson Haumba	M	Country Director	URC
Sherri Pals	F	Statistician	CDC Atlanta
Sikhathele Mazibuko	M	Senior Program Officer- Research and Evaluation	SNAP
Sithembiso Simelane	M	Nurse	Nhlangano HC
Tony Ao	M	Epidemiologist	CDC
Zandile Dlamini	F	Nurse	Mbabane
Zethu Simelane	F	Data Clerk	URC

Appendix 2: ICF Cascade Data Collection Form

ICF Data Collection Form

Site Name:_____ Data collector: _____ Data collection date_____(DD)/_____(MM)/_____(YY)

Region: _____ Study period: 1st July-30th September 2014

	ART or pre ART #	Enrolment Date	Sex	Age	ART start date (date/ NA if preART)	TB screen done? (Y/No/ M)	TB screen result (P/Neg/ M)	Evaluated for TB? (Y/No/NA/ M)	Date of TB evaluation (date/ NA/M)	TB evaluation result (P/Neg/NA /M)	INH started ? (Y/No/ NA/M)	INH start date (date/ NA/M)	TB treatment started? (Y/No/NA /M)	TB treatment start date (date/ NA/M)	Patient name
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															

Appendix 3: ART Uptake Data Collection Form

Data Collection Form for ART Provision for HIV+TB Patients

Record Identifiers for connecting different data sources (To be destroyed after completion of data collection)
Patient Name: _____ TB register number: _____ ARV registration number: _____

Data collector: _____ Facility region:_____
Facility name: _____

A. TB TREATMENT DETAILS FROM TB REGISTERS/TB TREATMENT CARDS	
Sex: ☐ Male ☐ Female ☐ Missing	Age: __ __ Years ☐ Missing
DOT: ☐ Yes ☐ No ☐ Missing	
Date of start of TB treatment: __ __ / __ __ / __ __ __ __ (dd/mm/yyyy)	
Diagnostic results GeneXpert (see white card and or register): ☐ MTB detected ☐ MTB Not detected ☐ Missing	
Disease site: ☐ Pulmonary ☐ Extra pulmonary ☐ Missing	
Type of patient: ☐ New ☐ Relapse ☐ Return after default ☐ Transfer in ☐ Failure ☐ Other ☐ Missing	
TB treatment outcome: ☐ Cured ☐ Complete ☐ Failure ☐ Default ☐ Died ☐ Transfer out ☐ Missing	
Date of TB treatment outcome: __ __ / __ __ / __ __ __ __ (dd/mm/yyyy)	
B. GENERAL HIV DATA	
Date Confirmed HIV+: __ __ / __ __ / __ __ __ __ (dd/mm/yyyy) ☐ Missing	
Was the patient already on ART before starting TB treatment? ☐ Yes ☐ No ☐ Missing *If yes, skip the remaining questions in section B and go to section C and D.*	
Was ART initiation adherence counseling provided: ☐ Yes ☐ No ☐ Missing	
Date Enrolled in HIV Care: _ __ / __ __ / __ __ __ __ (dd/mm/yyyy) ☐ Missing	
Was patient initiated on ART? ☐ Yes ☐ No ☐ Missing	
If yes, ART Initiation Date (date patient initiated ART): __ __ / __ __ / __ __ __ __ (dd/mm/yyyy) ☐ Missing	
Was the patient started on ART during TB treatment period? ☐ Yes ☐ No	
C. SPECIFIC HIV DATA: from ART initiation visit or, if initiated ART prior to commencing TB treatment, the ART follow up visit closest to the start of TB treatment start date	
Date of the visit: __ __/ __ __/ __ __ __ __ (dd/mm/yyyy) ☐ Missing	Weight: _____ Kg ☐ Missing

WHO Clinical Stage: I ☐ II ☐ III ☐ IV ☐ ☐ Missing	CD4: _____ cells/dl ☐ Missing
Hemoglobin: ____ (g/dl) ☐ Missing	ALT: ____ ☐ Missing

D. ARV REGIMEN PRIOR TO START OF TB TREATMENT (*tick N/A if patients started on ART prior to TB Treatment)*
Mark only one box ☐ N/A

☐ TDF+3TC+EFV	☐ ABC+3TC+NVP
☐ AZT+3TC+EFV	☐ ABC+3TC+EFV
☐ TDF+3TC+NVP	☐ d4T+3TC+NVP
☐ AZT+3TC+NVP	☐ d4T+3TC+EFV

E. ARV Combination Regimen during TB treatment *Only for patients on ART during TB treatment (Mark All That Apply)*

☐ TDF+3TC+EFV	☐ ABC+3TC+NVP
☐ AZT+3TC+EFV	☐ ABC+3TC+EFV
☐ TDF+3TC+NVP	☐ d4T+3TC+NVP
☐ AZT+3TC+NVP	☐ d4T+3TC+EFV

F. Data on HIV care from visits that occurred during TB treatment (enter data from during TB treatment period only)

Total number of HIV care and ART visits during TB treatment: ___

Number of visits during TB treatment when weight was monitored: ___

Date of Cotrimoxazole (CPT) initiation: __ __/ __ __/ __ __ __ __ (dd/mm/yyyy) ☐ Missing

Number of visits during TB treatment when Cotrimoxazole was prescribed: ___

Number of visits when patient was on ART: __ (*if "0", then skip forward to section G)*

Was patient missing appointments while on ART? ☐ Yes ☐ No

Adverse events (during TB/HIV co-treatment):
☐ Headache ☐ Peripheral Neuropathy (tingling toes and/or fingers) ☐ Lymphadenopathy (swollen glands/ lymph nodes)
☐ Icterus/jaundice (yellow of skin or eyes) ☐ Skin rash ☐ Cough ☐ Vomiting ☐ None
Describe management:
_____

Was ART ever: ☐ Stopped (Yes) ☐ Substituted (Yes) ☐ Switched (Yes) ☐ No
If Yes, date: __ __ / __ __ / __ __ __ __ (dd/mm/yyyy)

If Yes, ART STOPPED/ SUBSTITED/ SWITCHED because of:
☐ Adverse events; enter code _____ ; specify _____ ☐ Treatment failure
☐ Poor adherence ☐ Patient decision ☐ Pregnancy ☐ Stock out ☐ Missing ☐ Other, specify:
_____

H. SPECIFIC HIV DATA FROM FIRST HIV CARE VISIT AFTER TB TREATMENT COMPLETED

Date of Visit: __ __ / __ __ / __ __ __ __ (dd/mm/yyyy) (If no visit with CD4 after referral, enter 11/11/1111)	Weight: ___Kg ☐ Missing
WHO Clinical Stage: I ☐ II ☐ III ☐ IV ☐ ☐ Missing	CD4: _____ cells/dl ☐ Missing
Hemoglobin: ____ (g/dl) ☐ Missing	ALT: ____ ☐ Missing

Appendix 4: Facility TBIC Assessment Tool

Name of the Health Facility	
Address	
Telephone Number	
Date Assessment Completed	
Name and Position of Person(s) Completing Assessment	
Level of Facility	District Provincial Health Centre Dispensary
Type of Facility: Public Private Faith-based	Services Provided: ART TB General OPD

Managerial

	Yes	No	Other	Comments
The National Infection Control Policy is available on-site.				
An infection control practitioner or nurse has been assigned to carry out infection control in the facility				
An Infection Control Committee/Team has been designated at this site.				
A written site-specific infection control (IC) plan has been written and is available to staff.				
The infection control plan contains a statement of endorsement by the facility manager.				
A TB IC risk assessment is completed at least annually.				
Facility design and patient flow has been assessed for the best use of space and ventilation.				
All patients with TB disease are managed on directly observed therapy (DOTS) per the national guidelines.				
TB IC practices are monitored daily.				
There is a facility reporting system for all patients diagnosed with TB and referred for treatment in accordance with national policies.				
TB IC training for all staff has been done and documented at least annually.				
Information on TB IC is available for all patients and visitors and is offered by staff.				
Operational research to improve TB IC measures is conducted at this site.				
An Occupational Health program is in this facility.				

Administrative

	Yes	No	Other	Comments
Patients are routinely asked about cough when entering the facility.				
Patients that are coughing are separated from others and "fast tracked" to a clinician.				
A "Cough Monitor" or other designated person gives cough etiquette guidance and assists with separation and triage.				
Signage for cough etiquette is present in the clinic.				
Supplies are available to coughing patients (tissues, cloths, masks, trash bins, etc).				
Sputum samples are collected in a designated area and away from others.				
Processing of sputum samples is expedited in the lab. There is a tracking mechanism to monitor turn-around time of lab results.				
There is a tracking mechanism to monitor turn-around time of patients within the healthcare facility.				
Staff receive an evaluation for TB at least annually				
A confidential log is kept of all staff that are diagnosed with TB disease.				
Staff are offered an HIV test annually and offered ART if they are positive.				
HIV-infected staff are reassigned if they request.				
INH preventive treatment is offered to HIV-infected staff.				

Environmental

	Yes	No	Other	Comments
Staff monitors natural and/or mechanical airflow daily (especially in waiting rooms, sputum collection rooms if available, and at least one exam room).				
Health care workers that assist during sputum collection take precautions.				
Regular cleaning and maintenance of directional and extractor fans is conducted.				
Servicing documentation is maintained and is available for review				
Signage is in place to keep doors and windows open when feasible				
If UV lighting is used, routine cleaning and maintenance is conducted and documentation logs kept.				
Patient waiting areas are out-of-doors or have good cross-ventilation.				

Personal Protective Equipment (PPE)

	Yes	No	Other	Comments
Surgical masks are available and worn by coughing patients.				
N-95 or FFP2 respirators are readily available and used by staff.				
Staff has been trained on proper fit of respirators and \ documentation of training is available.				

Appendix 5: Sample TBIC Knowledge, Attitude and Practices Survey

Health Facility: _____

Health Facility Code: _____ Date: _____

Healthcare worker Demographics/Background:

1. Age: _____
2. Sex: M F
3. Training (Circle one):
    a. Physician
    b. Medical Officer
    c. Clinical officer
    d. RN/Enrolled nurse
    e. Nursing assistant
    f. Social worker
4. Physical therapist Year of experience (since completion of professional training): _____
5. Attended TB Infection control training in the past 12 months: Yes or No
6. Attended general infection control training in the past 12 months: Yes or No
7. There is an infection control officer or nurse at this facility: Yes or No
8. How often does the Infection Control officer at your hospital visit your ward/area?
    a. About once/week
    b. About once/month
    c. A few times per year
    d. Annually
    e. Less than once/year
    f. Never
9. How often do you receive supervisory visits on TB infection control from the Ministry of Health (including national, district, or provincial authorities)?
    a. About once/month
    b. A few times per year
    c. Annually
    d. Less than once/year
    e. Never

Knowledge Questions (multiple choice and true/false):

1. What is the main reason a health care worker develops TB disease? (select one)
    a. Lack of access to or lack of use of respirators
    b. Poor personal hygiene
    c. Delay in TB diagnosis
    d. The air conditioner was not working that day
    e. Wards or rooms without UVGI lamps
2. Which of the following are symptoms of TB? (select all that apply)
    a. Cough lasting longer than 2 or more weeks
    b. Sweating at night
    c. Unintended weight loss
    d. Skin redness
3. What is the main reason a health care worker develops TB disease? (select one)
    a. Lack of access to or lack of use of respirators
    b. Poor personal hygiene
    c. Delay in TB diagnosis
    d. The air conditioner was not working that day
    e. Wards or rooms without UVGI lamps
4. Which of the following are symptoms of TB? (select all that apply)
    a. Cough lasting longer than 2 or more weeks
    b. Sweating at night
    c. Unintended weight loss
    d. Skin redness
5. How long should a patient with drug sensitive TB be considered infectious? (select one)
    a. After 2 weeks of appropriate drug therapy and symptoms have resolved
    b. After 2 weeks of drug therapy but the symptoms are still present
    c. After 4 weeks of drug therapy
    d. After 6 months and the doctors says they have been cured
6. How can a health care worker reduce the chances of getting TB in a hospital or out-patient clinic? (select all that apply)
    a. Wear an N-95 respirator when working with known or suspected TB, MDR and XDR patients
    b. Ensure that hallways are not crowded with waiting patients
    c. Provide education to patient about cough etiquette and encourage the use of tissues, cloths or masks to cover coughs
    d. By shunning coughing patients and telling them to stay at home and not come to the hospital
    e. By collecting sputum specimens outside whenever possible
7. What is the difference between TB infection and TB disease? (select one)
    a. TB infection means you have been exposed to TB and TB disease means that you are able to spread the disease to others
    b. TB disease and TB infection mean the same thing
8. BCG vaccinations provide protection (select one)
    a. Provide life-long protection against TB
    b. Provide protection during infancy against TB meningitis
    c. Provide protection against pneumonia and TB until age 15

Attitude and Practice Questions (agree or disagree)

9. Healthcare workers should be required to wear respirators when caring for patients with drug-resistant TB Agree Disagree
10. I do not wear a respirator because my patients do not like me to wear it
    Agree Disagree
11. It is OK to collect a sputum specimen in the ward/unit if it is cold and rainy outside or the patient does not want to go out
    Agree Disagree
12. Most nurses and doctors have already been infected with TB, so prevention measures are not necessary
    Agree Disagree
13. I close the windows at night because cold air will make the patients more sick
    Agree Disagree Not applicable
14. Healthcare workers should not wear masks because it makes the patient feel stigmatized.
    Agree Disagree
15. My hospital is concerned about my health and safety
    Agree Disagree
16. I believe I have a good understanding of my hospital's infection control policy
    Agree Disagree
17. If I develop symptoms of TB, I would not tell anyone at work
    Agree Disagree
18. It is part of my job to talk to patients and their families about TB, HIV and what measures they can do at home to protect themselves
    Agree Disagree
19. It is OK to place a patient with HIV in the same room as a patient with TB
    Agree Disagree
20. My ward/unit often does not have the supplies I need to protect myself from TB
    Agree Disagree
21. I have been adequately trained in infection control measures by my facility
    Agree Disagree
22. I think our patients will resist wearing a mask, so I don't offer it or ask them to wear one
    Agree Disagree
23. Patients complain if we open windows in my ward or unit
    Agree Disagree

Practice Questions (Choose closest answer)

24. If I need to collect a sputum sample from a patient, I do this indoors (e.g. at the bedside)
    a. Never
    b. Rarely
    c. Sometimes
    d. Most of the time
    e. Always
    f. Not applicable – I've never collected a sputum sample

25. When I am with a patient that is coughing, I wear a respirator
    a. Never
    b. Rarely
    c. Sometimes
    d. Most of the time
    e. Always
26. I sometimes have to perform or assist with bronchoscopy, endoscopy, intubation, or autopsies as part of my job: Yes or No
    (If yes, answer #25; if no skip to #26)
27. When I am participating in these procedures, I wear a respirator
    a. Never
    b. Rarely
    c. Sometimes
    d. Most of the time
    e. Always
28. I have developed symptoms of TB (chronic cough, fever, weight loss,) at some point in the past since I began working in the hospital: Yes or No
    (If yes, answer #27-28; if no, skip to #29)
29. When I developed symptoms that were concerning for TB, I went to the occupational health nurse or health and wellness clinic at my job: Yes or No
30. If no, why not?
    a. This is a daily part of my job and did not feel the need to report it
    b. Too busy during my shift to report
    c. Feared getting in trouble or fired from my job if I reported
    d. I did not know that I should report it
    e. I tried to report, but was told that I should not worry about it
    f. There is no occupational health clinic or infection control officer at my facility
    g. I prefer going to get my medical care somewhere else
    h. Other: _____
31. Have you ever been offered voluntary testing and counseling for HIV by this hospital/clinic?
    Yes or No
32. Have you been screened for TB by your hospital/clinic in the past year?
    Yes or No
33. If yes, please describe how you were screened (Circle all that apply)
    a. Symptom screen
    b. TB Skin Test (TST or PPD)
    c. Chest X-ray
    d. Quantiferon/
    e. GeneXpert
    f. Other: _____

<u>Open-Ended Questions:</u>

1. What do you think is the most difficult part if implementing good TB infection control practices in this facility?
2. What do you think is needed to improved TB infection control practices at this facility?

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