



A COMPARATIVE EVALUATION OF THE INDEX TESTING PROGRAM FOR MANICALAND AND MATABELELAND SOUTH PROVINCES, ZIMBABWE, 2022

Public Health

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ABSTRACT

Background: Zimbabwe has been implementing Index contact tracing and testing (ICT) since 2019 to expedite epidemic control and accelerate the identification of people living with HIV. We identified two comparable provinces (structure, catchment, and location) yet with contrasting HIV prevalence rates to evaluate the program and develop recommendations that can enhance program performance. **Methodology:** A process evaluation of the ICT program was conducted in 8 randomly selected districts shared between Manicaland and Matabeleland South provinces. A logical framework model was applied to evaluate program inputs and processes, correlated with outputs and contributions toward outcomes. Microsoft Excel 2021 was used to summarize data as frequencies and proportions. **Results:** We recruited 1,393 health workers over one year shared between Manicaland, 57.1% (n=795) and Matabeleland South 42.9% (n=598). An overall 80.6% (n=14,500) of the targeted Rapid test kits and 84.9% (n=24,200) of HIVST kits were supplied, resulting in intermittent shortages in both provinces. A copy of the ICT register was supplied per facility against an average of 3 entry points each. Manicaland conducted 33.5% of their targeted ICT trainings against 80% for Matabeleland. Program implementation was scored at 62.2% for Manicaland and 81.8% for Matabeleland South. Manicaland scored an HIVST reactivity rate of 7.7% (871/11,320) whilst Matabeleland South documented a reactivity rate of 6.2% (679/10,890) against a target of 10%. Both provinces scored above 60% of their target for the identification of HIV-positive individuals (Manicaland: 61.1%, Matabeleland South: 79.5%). An overall positivity yield of 62.8% (n=742/1,181) was obtained among index contacts. **Conclusion:** Index testing proved to be a resource-intensive HIV testing model yet highly effective in identifying individuals living with HIV among index contacts. The resource demand is justified by the high positivity yield which can be aided by implementation fidelity, critical to expediting epidemic control by mopping up clients living with HIV without the knowledge thereof.

KEYWORDS

HIV testing services, Index contact tracing and testing, Index testing cascade, Positivity yield, Comparative program evaluation, process evaluation

INTRODUCTION

Zimbabwe is one of the top 5 countries in Southern Africa that bears a generalized HIV epidemic, mainly driven by unprotected sex, and is home to 1.27 million people living with HIV (PLHIV) which includes 1.19 million adults and 69,972 children (1).

The Zimbabwe population-based impact assessment (ZIMPHIA) conducted in 2020 revealed an adult HIV prevalence of 12.9% accompanied by an annual incidence of 0.38% translating to approximately 31,000 new cases annually (2).

Though it is encouraging that the total number of new HIV infections declined nationally from 98,668 in 2003 to approximately 31,000 in 2020, a large testing gap remains and is contributory to the generalized epidemic status that the country is struggling to shake off. Nearly half of young people (15-24 years) living with HIV in Zimbabwe do not know their status (3).

In 2016, Zimbabwe commenced implementation of targeted testing following the 2015 World Health Organization (WHO) guidelines (4). Key to the targeted testing strategy is Index testing (Index contact tracing and testing) as a proven high-yield HIV testing innovation, recording as high as 40% positivity yield in evidence generation settings (5).

Index testing is when members of a household, biological children and partners of individuals newly diagnosed with HIV (the index clients) are offered HIV testing services (6). Index testing may also be extended to HIV-positive clients on antiretroviral therapy (ART) with unsuppressed viral loads (VL) (7).

Index testing also known as partner notification services are premised on the fact that people's knowledge of their HIV status, as well as their partner's status, is critical to global HIV prevention, risk reduction and treatment. The services are important for the management of not only HIV/AIDS, but also other sexually transmitted infections.

Given its potential, it is crucial to ensure that the index testing program is implemented according to the proven standard operating framework to obtain the expected results. The main objective of this study was to i) evaluate how the index testing program is being implemented in 2 selected provinces of the country, ii) to contrast the strategies being used against the results being obtained and iii) to derive lessons that can enhance the program.

MATERIALS AND METHODS

Study Design:

We conducted a comparative, process-outcome program evaluation, modelled around a logical framework.

The logic framework Approach

A Logical Framework Approach was used for problem analysis. This was used to assess the inputs which were available for the program, the processes carried out, the outputs realised and the outcomes of the index testing program in a comparative manner. The logic framework is a planning matrix that shows the links between goals, purposes, activities and outcomes of a proposed intervention or program (Fig1.).

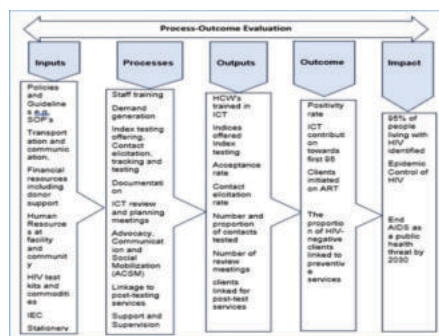


Fig 1. Index testing logical framework

Input indicators:

Input indicators include resources and materials invested in the program for Manicaland compared with Matabeleland South provinces, assessed for adequacy. These include policies and guidelines (eg standard operating procedure manuals (SOP)), transportation and communication, including digital media, financial resources including donor support, human resources ie health workers (facility and community, HIV test kits and commodities, IEC materials, stationery eg registers, monthly summary sheets.

Process Indicators:

Processes are the activities conducted utilising the inputs provided for the program. These included capacity building for facility and community health workers, demand generation initiatives, program implementation modalities including offering index contact tracing, contact elicitation, tracing and testing, documentation and reporting, review and planning meetings conducted, advocacy and community mobilisation and linkage to post-testing services.

Output Indicators:

These are short-term logical results of implementing program activities. These included the number of health facilities implementing the ICT program, proportion of health workers trained, acceptance rate, elicitation rate, the proportion of contacts tested and linked for post-test services

Outcome Indicators:

Outcome indicators will include medium-term logical consequences/ results of achieving some outputs and their contribution towards the achievement of program goals. The ICT programme outcome indicators included the number of health care workers trained at the facility and community level, HIV-positive clients identified, ICT contribution towards the achievement of the national goals, number and proportion of positive clients initiated on ART, the proportion of HIV-negative clients linked to preventive services

Setting:

General setting: Zimbabwe is a landlocked, low-income country in Southern Africa located between Botswana, South Africa, Mozambique and Zambia with an estimated population of 16 million and a human development index of 0.571, and it was ranked number 150 out of 189 countries globally in 2019 (8). The country is divided into two urban provinces, eight rural provinces and 62 districts

Zimbabwe Index Case Testing (ICT) Programme:

The ICT project is part of the HIV testing Services (HTS) package under the HIV Prevention department within the AIDS and TB Programme (ATP) under the Ministry of Health and Child Care (MOHCC). The ATP coordinates the development of HIV/AIDS health policies and set's up national standards and guidelines as part of the national response to HIV in Zimbabwe (9).

The ICT project was formatively commenced in 2017 as a targeted testing innovation before being enhanced in 2019, coined enhanced Index Testing and Counselling (eITC) (10). This resulted in the MOHCC, in collaboration with supporting partners developing a pilot ICT register and inclusion of the ICT-related indicators in the national database, DHIS2. The program is implemented both at the facility and in the community factoring client preferences for tracking their contacts.

This results in a cascade tracked through national tools that include registers, DHIS2 and eHR to measure offer rates, acceptance, tracking modalities and their results as well as linkage to post-test services. Various healthcare worker categories are involved in the implementation of the program including Nurses, Primary Counsellors and Community health workers including Community Adolescent Treatment Supporters (CATS), Community Facility referrals and other linkage cadres. HIV Self-testing plays a key role in contact tracing through secondary distribution of test kits, in the process, this facilitates disclosure of HIV diagnosis to contacts.

The project continues to expand in terms of coverage, mainly driven through Implementing Partner (IP) support and is now an integral part of HTS, the entry point to prevention and treatment services. HTS implementation is guided through strategic documents that include the HTS strategy, Comprehensive HIV programming and the Zimbabwe national AIDS strategic plan (11).

Study site: The study sites were two provinces out of 10 provinces in Zimbabwe.

Manicaland is a province in eastern Zimbabwe. It is the country's second-most populous province, with a population of about 2 million, as of the 2022 census (12). The province is divided into ten administrative subdivisions of seven rural districts and three towns/councils, including the provincial capital, Mutare (13). Manicaland is on the eastern border with Mozambique and covers an area of 36,459 square kilometres (14,077 sq mi), which is equivalent to 9.28% of the total area of Zimbabwe. Its economy is largely centred around industry and agriculture, particularly manufacturing, diamond and gold mining, timber, tea and coffee plantations, and tourism (14). In 2020, Manicaland recorded the lowest HIV prevalence of 9.6%, compared with the national average of 12.9% (2) *Matabeleland South province* covers the south-eastern plateau of Zimbabwe and it stretches to the Botswana border on the southwest and South Africa to the south (15). It is the least populous province in Zimbabwe with a population of 760,345 as of the 2022 census (12). The province is divided into six districts. Gwanda is the capital, and Beitbridge is the province's largest town. Its economy is largely centred around subsistence farming and livestock farming (14). In 2020, Matabeleland South province recorded the highest HIV prevalence in the country, at 15.4%, compared with the national average of 12.9% (2).

Client population:

All health care facilities in the four districts of Matabeleland South namely Gwanda, Insiza, Umzingwane, Mangwe and four districts of Manicaland province namely Buhera, Chipinge, Makoni and Mutare were involved in the ICT programme between 1 January 2021 and 31 December 2021 were included in this study.

Exclusion criteria:

We excluded health facilities that were not involved in the ICT program during the period of the study.

Sampling:

Purposive sampling criteria were used to identify the 2 provinces in this study based on having contrasting HIV prevalence rates, according to the ZIMPHIA results. Manicaland had the least prevalence at 9.6% whilst Matabeleland South had the highest prevalence at 15.4% (2), (Table 1).

Table 1. HIV Prevalence for Adults (15-49 years) by Province, Zimbabwe Population-based HIV Impact Assessment (ZIMPHIA), 2020

Province	Men		Women		Total	
	Number	%	Number	%	Number	%
Bulawayo	509	8.0	855	15.8	1,364	12.2
Manicaland	694	6.4	1,117	12.6	1,811	9.6
Mashonaland Central	737	9.7	948	15.6	1,685	12.5
Mashonaland East	565	7.8	811	14.3	1,376	11.1
Mashonaland West	780	8.5	1,053	15.7	1,833	12.1
Matabeleland North	502	10.7	779	16.2	1,281	13.5
Matabeleland South	470	8.9	646	22.1	1,116	15.4
Midlands	659	9.9	1,088	15.2	1,747	12.7
Masvingo	604	8.3	932	13.9	1,536	11.3
Harare	426	9.1	859	13.2	1,285	11.5

Manicaland districts are therefore considered to be low-gap whilst Matabeleland South districts are considered high-gap. We then randomly selected four districts from each province to make a total of 8 districts from which all facilities were included.

Data variables, sources of data and data collection:

Data were collected between April and June 2022 using a structured data collection form (S1 Annex). The template was used to collect data at the site level and verified with the data collected from the implementing partners that are driving the ICT program within public health institutions in Manicaland (Zimbabwe Health Interventions-ZHI) and Matabeleland South province (The Organisation for Public Health Interventions and Development- OPHID).

Analysis and statistics

Data were aggregated per province and single-entered and analysed using Microsoft Excel 2021 to generate frequencies and proportions. The inputs and processes were obtained from documented activities at

the facility, district, and provincial levels and this was compared with what the supporting partners provided from their databases. The outputs were taken out from primary source documents at the facility level and compared with the electronic database at the district level (DHIS2).

Ethical considerations

Approval to conduct this study was obtained from the Ministry of Health and Child Care head office, the Joint Research Ethics Committee for the University of Zimbabwe Faculty of Medicine and Health Sciences and Parirenyatwa Group of Hospitals (JREC 280/2021) and the Medical Research Council of Zimbabwe (MRCZ/A/2783). No client-identifying information was collected during the study.

RESULTS

Inputs injected into the Index testing program

Human resource inputs: A total of 1,393 human resource cadres were shared between the 2 provinces with Manicaland having 57.1% (n=795) against Matabeleland South at 42.9% (n=598). The most common ICT modality was facility-based for both provinces, constituting 62.3% (n=868) against the community level and most of the health workers were nurses who constituted 38.3% (n=533) of the total whilst Community Adolescent Treatment Supporters (CATS) were the least at 16.6% (n=231). Health workers from Manicaland had a median age in service of 9 years (Q1,6: Q3, 11) against Matabeleland South with 5 years (Q1,4: Q3,10) in service. Overall, the human resources provided were lower than the minimal number required to efficiently conduct ICT activities (Table 2).

Table 2: Human resource inputs for the Index testing Program, Manicaland and Matabeleland South Provinces, 2021 (N=1,393)

Variable	Category	Manicaland N= 795	%* 57.1	Matabeleland South N=598	%* 42.9	Total	%*
Entry level	Facility	487	61.3	381	63.7	868	62.3
	Community	308	38.7	217	36.3	525	37.7
Designation	Nurses (RGN & PCN)	232	29.2	301	50.3	533	38.3
	Primary Counsellors	259	32.6	217	36.3	476	34.2
	CRF/CLF	89	11.2	64	10.7	153	11.0
	CATS	215	27.0	16	2.7	231	16.6
Median years in service		9 Q1=6; Q3=11		5 Q1=4; Q3=10			

*Column percentage

RGN – Registered General Nurse

PCN – Primary Care Nurse

CRF – Community Referral Facilitator

CLF – Community Linkages Facilitator

CATS – Community Adolescent Treatment Supporter

Material resource inputs:

The four districts of Manicaland included in this study had a total of 98 health facilities. All facilities received a copy of the Operational Service Delivery Manual (OSDM), constituting 58.2% of the supplies provided. Of the 88 facilities in the 4 districts in Matabeleland South province, 89.8% (n=79) received the OSDM. For ICT standard operating procedures, the adult HTS Screening tool, IPV Screening tool and ICT registers, a target of 3 copies per facility were recommended. However, only 7.1% (n=21) of the IPV screening tools were supplied to Manicaland whilst Matabeleland South received 87.9% (n=232) of their target. An overall 80.6% (n=14,500) of the targeted Rapid test kits and 84.9% (n=24,200) HIVST kits were supplied, and this resulted in sporadic shortages of the commodities, resulting in interrupted service provision for periods not exceeding 2 weeks for both provinces as indicated by gaps within the registers and DHIS2 and verified by zero stock levels.

Manicaland received 61.2% (n=180) of their targeted ICT registers whilst Matabeleland South received 83.3% (220) of their target. This translated to all health facilities receiving at least 1 copy of the ICT register though this did not cover all entry points which is 3 per facility.

Information, education, and communication materials (IEC) were supplied at 28.9% (289) of the targeted ICT pamphlets for Manicaland, whilst Matabeleland South received 33.6% (n=336) of their target. Manicaland had 2 vehicles out of the targeted 5 (40%) whilst Matabeleland South had 3 out of 5 vehicles (60%) (Table 3).

Table 3: Material resource inputs for the Index testing Program, Manicaland and Matabeleland South Provinces, 2021

Variable	Category	Manicaland			Matabeleland South		
		Target	Provided	%*	Target	Provided	%*
Guidelines	OSDM	98	57	58.2	88	79	89.8
	ICT SOP	294	106	36.1	264	230	87.1
	Adult HTS Screening tool	294	172	58.5	264	210	79.5
	Job Aide	294	110	37.4	264	225	85.2
	IPV Screening tool	294	21	7.1	264	232	87.9
Test kits	HIV RDT kits	15,000	11,000	73.3	18,000	14,500	80.6
	HIVST kits	30,000	24,000	80.0	28,500	24,200	84.9
Documentation	HTS Registers	490	312	63.7	440	420	95.5
	ICT Registers	294	180	61.2	264	220	83.3
	Referral slips	600	400	66.7	500	425	85.0
IEC Materials	Pamphlets	1000	289	28.9	1000	336	33.6
	Flow Charts	600	277	46.2	500	375	75.0
Transport	Motor vehicles	5	2	40.0	5	3	60.0
	Motorcycles	8	6	75.0	10	8	80.0

*Row percentage

OSDM – Operational Service Delivery Manual

ICT SOP – Index Case Testing, Standard Operational Procedure

IPV – Intimate Partner Violence

RDT – Rapid Diagnostic Tests

HIVST – HIV Self-test

IEC – Information Education and Communication

Processes Implemented

Processes conducted for the ICT program included capacity building, demand creation, support and mentorship activities, review meetings and quality improvement initiatives, which included identifying key indicators of interest Per quarter to monitor the quality of services being provided. Manicaland managed to conduct 33.5% (n=4) of their targeted ICT trainings whilst Matabeleland South did 80% (n=12). Both provinces conducted all quarterly nurse's meetings and community meetings for demand creation as targeted. Manicaland conducted 58.3% (n=7) of the targeted monthly data review meetings, whilst Matabeleland South missed 3 meetings, scoring 75% (n=9). Only one out of 4 targeted visits were conducted by the province and district for Manicaland, whilst Matabeleland South received 2 out of 4 provincial visits and 1 out of 4 district visits. The visits are scheduled for key support and mentorship activities provided by a higher level to the implementing site and used as an opportunity to address pertinent issues faced by the sites (Table 4)

Table 4: Processes Implemented for the Index testing Program, Manicaland and Matabeleland South Provinces, 2021

Variable	Category	Manicaland			Matabeleland South		
		Target	Achieved	%*	Target	Achieved	%*
Capacity building	ICT Training/sensitisations	12	4	33.3	15	12	80.0

	ICT Refresher	8	4	50.0	8	6	75.0
Review meetings	Monthly data review	12	7	58.3	12	9	75.0
	Virtual contact with team members	12	4	33.3	12	6	50.0
	Quarterly nurses' meetings	4	4	100.0	4	4	100.0
Demand generation activities	Community meetings	4	1	25.0	4	1	25.0
	Campaigns	8	0	0.0	8	2	25.0
	Radio programs	10	3	30.0	8	2	25.0
Support and Mentors hip	District visits	4	1	25.0	4	2	50.0
	Provincial visits	4	1	25.0	4	1	25.0
	Supporting partner visits	4	2	50.0	4	3	75.0
Quality Improvement	Initiatives to enhance quality	12	8	66.7	12	8	66.7

*Row percentage

ICT – Index Case Testing

Outputs of the Index Testing Program

The outputs of the program included the total number of HIV-positive individuals identified through the ICT program, the number of facilities that were implementing the program through community and facility initiatives as well as the cascades generated for the program. We further included the role of HIV self-testing through secondary distribution to index contacts. Manicaland had 37 facilities which were not actively involved in ICT activities, translating to a 62.2% (n=61) level of implementation, compared with Matabeleland South which scored 81.8% (n=72/88) performance. Both provinces scored above 60% of their target for the identification of HIV-positive individuals (Manicaland: 61.1%, Matabeleland South: 79.5%). Both provinces most implemented facility-based ICT activities (Manicaland: 54%, Matabeleland South: 59.5%) than in the community (Manicaland: 43.6%, Matabeleland South: 52.3%) according to what they had targeted to perform. The index testing cascade for Manicaland reflects high performance on the linkage of positive contacts for ART (95.7%), acceptance rate (94.3%) and contacts who are tested after tracking (81.2%). A positivity yield of 52.1% (n=461/884) was documented among the contacts tested. For Matabeleland South province, the highest performances were on linkage to ART (98.1%), acceptance rate (95.3%) and offer rate (83.8%). A positivity yield of 62.8% (n=742/1,181) was documented among the index contacts tested. The targets were to offer index testing to all index cases, test all elicited contacts and link all positive contacts.

The HVST kits received met the target of 24,000 for Manicaland, whilst Matabeleland South received 98% (n=23,868) of their set target. Both provinces experienced stockouts of the test kits (3 weeks for Manicaland and 2 weeks for Matabeleland South). An average of 57.7% (22,210/47,868) results were shared. Manicaland scored a reactivity rate of 7.7% (871/11,320) whilst Matabeleland South documented a reactivity rate of 6.2% (679/10,890). The target was to have 80% of HVST results shared and achieve a 10% reactivity rate. Manicaland had 97.5% (849/871) of the reactive results confirmed positive through provider-delivered testing, whilst Matabeleland South had 95% (638/679) of its reactive results confirmed positive. The targets were to confirm all reactive self-test results (Table 5).

Table 5: Outputs of the Index testing Program, Manicaland and Matabeleland South Provinces, 2021

Variable	Category	Manicaland			Matabeleland South		
		Target	Achieved	%*	Target	Achieved	%*
Implementation	Facilities implementing Index testing	98	61	62.2	88	72	81.8
	HIV positive clients identified	3,250	1,986	61.1	4,500	3,576	79.5
ICT activities conducted	Community	365	159	43.6	365	191	52.3

	Facility	365	197	54.0	365	217	59.5
ICT Cascade	Offered	2,673	1,986	74.3	3,576	2,998	83.8
	Accepted	1,986	1,873	94.3	2,998	2,858	95.3
	Tracked	1,986	1,332	67.1	2,858	2,246	78.6
	Tested	1,332	1,082	81.2	2,246	1,355	60.3
	Positives identified	884	461	52.1	1,181	742	62.8
	Linkage to ART	461	441	95.7	742	727	98.1
HIVST Distribution	Kits Distributed	24,000	24,000	100	24,200	23,868	98.6
	Shared results	19,200	11,320	59.0	19,360	10,890	56.3
	Reactive tests	1,089	871	80.1	1,132	679	60.0
	Confirmed Positive	871	849	97.5	679	638	94.0

*Row percentage

ICT – Index Case Testing

HIVST – HIV Self-testing

DISCUSSION

This study exposed the resource-intensive nature of the ICT program where the amount of material and human resources deployed correlate with the results obtained (Identification of new HIV-positive clients). The outputs justify the means, given the goal to achieve epidemic control for HIV, through mopping up HIV-positive individuals who do not know their status in the community. Despite receiving lower human and material resource capacity, Matabeleland South province complemented this through processes that produced better HIV positivity yield.

Strengths

Availability of Index Case Testing (ICT) registers facilitated the generation of cascades that tracked offer, acceptance, tracking and testing of contacts. The obtained large sample size enabled us to study the trend and factors that influenced positivity yield against contact tracking and testing modalities. The study was done using routinely collected programmatic data which was representative of the reality on the ground.

Limitations

Our study utilized the ICT data only to calculate the HIV positivity yield, against the set targets for the program, which is not representative of the overall performance of the HTS program. The findings should therefore be interpreted in the context of the ICT program and its specific targets. We also did not do a qualitative evaluation of the program but restricted our analysis to logical framework-guided process evaluation.

Interpretation of key findings

This study provided important insights into the performance of the ICT program in Manicaland and Matabeleland South provinces.

First, the ICT program requires adequate resource supply to obtain desired results. The resource-intensive nature of the program is revealed through the correlation between resources supplied and results obtained. In this study, human and material resources deployed at the facility and community level influenced the results obtained. The index testing positivity yield of 52% for Manicaland and 63% for Matabeleland South observed in this study is not comparable with the 6% positivity yield observed in the general population, where resource supply is not comparable with what was provided in this study (16). Our findings are consistent with other studies on the subject. (7,17)

Second, the ICT program had the potential to obtain improved results than what was obtained in this study. First, not all facilities within the participating districts were implementing the program (Manicaland 37/61, Matabeleland South 72/88). Low implementation coverage stifles potential as indicated in standard operating procedures that emphasize vigilance to obtain ideal results (6,18). Secondly, providing a single ICT register per health care facility where the minimum entry point is 3 per facility limited the implementation of the program as health workers may be discouraged by having to request for the register from another entry point or having to refer clients for contact elicitation where the register is placed, for documentation index testing

should be ideally offered at the point of diagnosis and referring clients to a different entry point is associated with client attrition which may be contributed by confidentiality concerns (19).

Third, both provinces implemented the ICT program with a bias at the facility level (Manicaland: 54%, Matabeleland South: 59.5%) compared to the community level. Facility implementation entails contact testing at the facility achieved through client referrals whilst community implementation entails tracking and testing the clients within their communities.

Community-based contact tracing and testing are documented as a more effective strategy as reflected in previous studies (14,17,19). Client preferences for the facility or community-based ICT are respected in standard practice, in as much as community-based ICT is documented as more effective(20).

Finally, HIVST was demonstrated to be an effective contact tracing strategy that contributed to the identification of people living with HIV as reflected in a reactivity rate of 7.7% (n=871) for Manicaland and 6.2% (n=679) for Matabeleland South province. This was despite documented stockouts during the study period as well as a low average result sharing rate of 57.7%. However, 97.5% and 95% of the reactive results were confirmed using provider-delivered testing for Manicaland and Matabeleland South provinces respectively (21,22). Confirming all results is imperative to fully reap the results of HIV-positive clients who are identified through self-screen.

Implications for policy and practice

Documentation of the ICT program in a dedicated register (ICT Register) was found to be an essential practice that allows tracking of the program performance and identification of areas that need strengthening. However, implementation fidelity is required to ensure that all identified index cases are offered contact tracing services, utilizing differentiated approaches for facility and community tracking to suit the unique needs of everyone.

There is a need to provide adequate resources, at least according to set targets, to realize the full potential of the program, considering its resource-intensive nature. This is justifiable by the results obtained which have the potential to catapult the nation to epidemic control by mopping up individuals living with HIV with an unknown HIV status. The programme in Zimbabwe will benefit from considering the expansion of ICT services to all healthcare facilities, across all provinces and districts as a proven effective strategy to identify individuals living with HIV.

The model is effective in both high-gap and low-gap districts and is demonstrated in this study. All clients receiving an HIV diagnosis should be offered index testing. This will assist the nation to achieve its HIV testing goals and the client to mitigate the risk of transmitting the virus to their partners or reinfection in case their partner is HIV positive.

CONCLUSION

Index testing is a resource-intensive HIV testing model that is highly effective in identifying individuals living with HIV among contacts of index cases. The resource demand is justified by the high positivity yield and is critical to expediting epidemic control by mopping up clients living with HIV with an unknown HIV status. Our findings are consistent with previous results that correlated resource supply with positivity yield output.

What is already known about this topic?

- Index testing is a known high-yield HIV testing services innovation
- It is recommended by WHO to enhance targeted testing and accelerate the achievement of HIV testing targets.
- National policies and guidelines are required to guide Index testing is implemented.

What this study adds

- It is essential to provide adequate resources (human and material) to reap the best results out of ICT. The resources provided correlate with the outputs obtained
- Implementation fidelity is needed where program implementation adheres to laid down standard operating procedures to obtain good results.
- A differentiated contact elicitation, tracking and testing are

imperative for the success of the project. This includes the strategic use of HIVST to facilitate contact tracing

Declarations

Consent for publication

All authors consent to the publication of this work.

Availability of data and material

The dataset used in this study has been provided in the **S2 Annex**.

Competing interests

The authors declare that they have no competing interests.

Funding

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Authors' contributions

Conception and design: all authors; development of data capture tools: HDM, OM, JC, MT; data collection: HDM, OM; data entry: HDM, OM; data analysis and interpretation: all authors; preparing the first draft of the manuscript: all authors; critical review and approval of final draft: all authors.

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Conflicts of interest

None declared.

REFERENCES

1. PEPFAR. Country Operational Plan Strategic Direction Summary. 2015;(May):80. Available from: <http://www.pepfar.gov/documents/organization/250290.pdf>
2. Zimbabwe Ministry of Health and Child Care. Zimbabwe Population-based HIV impact assessment 2020 (ZIMPHIA) [Internet]. Zimbabwe Population-based HIV Impact Assessment (ZIMPHIA) 2020: Final Report. 2020. p. 71. Available from: Ministry of Health and Child Care (MOHCC) Zimbabwe
3. Zimbabwe Ministry of Health and Child Care, National AIDS Council Z. GLOBAL AIDS RESPONSE PROGRESS REPORT 2016 [Internet]. [cited 2019 Apr 4]. Available from: http://www.unaids.org/sites/default/files/country/documents/ZWE_narrative_report_2016.pdf
4. WHO. Consolidated guidelines on HIV testing services 2015. World Heal Organ [Internet]. 2015;(July):192 p. Available from: https://apps.who.int/iris/bitstream/10665/179870/1/9789241508926_eng.pdf?ua=1&ua=1
5. Innovative WHO HIV testing recommendations aim to expand treatment coverage [Internet]. [cited 2022 Jun 21]. Available from: <https://www.who.int/news/item/27-11-2019-innovative-who-hiv-testing-recommendations-aim-to-expand-treatment-coverage>
6. Global HIV Hepatitis and Sexually Transmitted Infections Programmes, Guidelines Review Committee. Consolidated guidelines on HIV prevention, testing, treatment, service delivery and monitoring: recommendations for a public health approach. Geneva: World Health Organization. 2021. 594 p.
7. Musee P, Yemaneberhan A. Intensified HIV Case Finding through Index Case Testing in Kenya: A Model of Success Background/Context. 2020;
8. Human Development Report 2020 The Next Frontier: Human Development and the Anthropocene Briefing note for countries on the 2020 Human Development Report. [cited 2022 Jun 22]. Available from: <http://hdr.undp.org/en/data>
9. AIDS & TB Programme M of H and CCZ. Zimbabwe Operational and Service Delivery Manual (OSDM) for the Prevention, Care and Treatment of HIV in Zimbabwe, 2017 [Internet]. 2017 [cited 2020 Dec 9]. Available from: <http://www.ophid.org/treat-all-toolkit/MOHCC-Guidelines/MOHCC-Zimbabwe-OSDM-2017.pdf>
10. Ministry of Health and Child Care (MOHCC) Z. Zimbabwe National HIV Testing Services Strategy, 2017-2020. 2017; Available from: <https://hts.hivci.org/hts-score.html?countryid=GTM>
11. Ministry of Health and Child Care. Zimbabwe Health Sector HIV and STI Strategy 2021-2025. 2021;(April 2020):1-104.
12. Zimbabwe Statistical Agency. Zimbabwe 2022 Population and Housing Census: Preliminary report. Family Court Review. 2022.
13. Manicaland [Internet]. [cited 2022 Jun 22]. Available from: <https://www.zim.gov.zw/index.php/en/my-government/provinces/manicaland>
14. Zimbabwe: Household Livelihood Intention Survey Report (Manicaland | Masvingo | Matabeleland south provinces), November – December 2021 - Zimbabwe | ReliefWeb [Internet]. [cited 2022 Jun 22]. Available from: <https://reliefweb.int/report/zimbabwe/zimbabwe-household-livelihood-intention-survey-report-manicaland-masvingo>
15. Matabeleland South [Internet]. [cited 2022 Jun 22]. Available from: <https://www.zim.gov.zw/index.php/en/my-government/provinces/matabeleland-south>
16. Programme UND. Zimbabwe HIV and Health Annual Report 2020-2021. FreseniusCom [Internet]. 2019;(December):2-2. Available from: <https://sec.gov.gh/wp-content/uploads/Annual-Reports/2019-Annual-Report.pdf>
17. Jubilee M, Park FJ, Chipango K, Pule K, Machinda A, Tarubekera N. HIV index testing to improve HIV positivity rate and linkage to care and treatment of sexual partners, adolescents and children of PLHIV in Lesotho. PLoS One [Internet]. 2019 Mar 1 [cited 2022 Jun 21];14(3):e0212762. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0212762>
18. Van Rooyen H, Essack Z, Rochat T, Wight D, Knight L, Bland R, et al. Taking HIV Testing to Families: Designing a Family-Based Intervention to Facilitate HIV Testing, Disclosure, and Intergenerational Communication. Front Public Heal. 2016 Aug 5;4.
19. Standard Operating Procedures for HIV Index Testing Services Standard Operating Procedures for HIV Index Testing Services, SOP000108/2020 Contents.
20. Differentiated Care > Models > Testing > Facility-based partner notification and index partner services [Internet]. [cited 2022 Jul 18]. Available from: <https://different>

- iatedservicedelivery.org/Models/HealthFacility/PartnerNotification Cameroon
21. INDEX TESTING RNR EPOA Primary purpose Case-finding of referrals Case-finding of referrals Case-finding, and engaging KP members who have not engaged in the program before.
 22. Kahabuka C, Plotkin M, Christensen A, Brown C, Njozi M, Kisendi R, et al. Addressing the First 90: A Highly Effective Partner Notification Approach Reaches Previously Undiagnosed Sexual Partners in Tanzania. *AIDS Behav.* 2017 Aug 1;21(8):2551–60.