Journal of Epidemiology and Public Health (2023), 08(03): 335-348
Masters Program in Public Health, Universitas Sebelas Maret

Research
Open Access

Predictors of Positivity Yield among Index Contacts in Harare and Matabeleland South Provinces, Zimbabwe, 2022

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Received: 26 january 2023; Accepted: 21 March, 2023; Available online: 16 July, 2023

ABSTRACT

Background: Zimbabwe's Index Testing programme has failed to achieve targets since its inception in 2017. We determined the index testing implementation modalities to identify and recommend effective contact elicitation, tracking and testing modalities to enhance positivity yield.
Subjects dan Method: This study conducted a cross-sectional study on 50 multistage selected health facilities. Dependent variables were all clients, (≥15 years) diagnosed with HIV in 2021, whilst independent variables were contact tracking. The study instrument of variable measure was cascade analysis to identify tracing modalities against yield. Quantitative data were summarized as proportions, odds ratios, and adjusted odds ratios at a 5% significance level.
Results: Of 6,308 index cases identified, females constituted 53.9% (n=3,401 and 67.6% (n=4,265) were retests. Index testing was offered to 66.4% (n=4,190), accepted by 93.1% (n=3,899) and the elicitation rate was 1:1.3 (n=5,080). A positivity yield of 27.5% (n=1,736) was achieved from 78.6% (n=3,991) contacts. Mixed method tracking yielded 46.7% (n=349) positivity from a testing rate of 99.5% (n=748) in an urban setup, with 41.4% (n=1,243) preferring health worker referrals. As high as 202 contacts were not tested following elicitation through client referrals. In a rural setup, client referrals accounted for 53.1%, (n=1,103) yet 122 of these were not tested. The highest positivity yield was obtained from health worker referrals at 65.6% (n=196). Being male (aOR=3.09; 95%CI= 2.74 to 3.49), first tester (aOR=1.65; 95%CI= 1.43 to 1.91), anonymous tracking (aOR=8.46; 95%CI:3.37 to 22.75) and testing contacts within 7 days of elicitation (aOR=2.78; 95%CI=2.44 to 3.18) were identified as high predictors of positivity yield among index contacts.
Conclusion: The identified high positivity yield among men, first-time testers and contacts tested within 7 days of elicitation may inform index testing focussing to improve program performance. Implementation fidelity and differentiated contact referrals were recommended to mitigate attritions at each stage of the index cascade to yield the best results on index contact tracing and testing.

Keywords: targeted testing, HIV testing services, index contact tracing and testing, index testing cascade

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Cite this as:
Mugauri HD, Mugurungi O, Chikondowa I, Chirenda J, Takarinda K, Tshimanga M (2023). Predictors of positivity yield among index contacts in Harare and Matabeleland South provinces, Zimbabwe, 2022. J Epidemiol Public Health. 08(03): 335-348. https://doi.org/10.26911/jepublichealth.2023.08.03.05

BACKGROUND

Sub-Saharan Africa remains disproportionately affected by HIV, constituting 54% (20.6 million) of people living with HIV in the world despite contributing only 6.2% of the world's population (Parker et al., 2021). Zimbabwe is at the epicentre of the HIV pandemic with an adult prevalence of 12.9% in 2020, and an annual incidence of 0.38%, translating to approximately 31,000 new cases annually (Zimbabwe MoHCC, 2020). It is ranked 5th in sub-Saharan Africa, with 1.23 million adults being estimated to be living with HIV in 2020 Zimbabwe MoHCC, 2020). The country bears a generalized HIV epidemic largely driven by unprotected sex (PEPFAR, 2015).

Although the total number of new HIV infections has declined nationally from 98,668 in 2003, to 31,000 in 2020, a large testing gap remains, slowing down the achievement of national and global targets. In 2020, the country missed the first 90 of the UNAIDS 90-90-90 targets, scoring 86.8% instead (UNAIDS, 2020).

To address the testing gap, Zimbabwe commenced implementing targeted testing in 2016, following the World Health Organization (WHO) HIV testing guidelines of 2015 (WHO, 2015). 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 (WHO, 2019).

Index testing (Index contact tracing and 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 (WHO, 2019). It is complemented by effective partner notification services, which involve asking people diagnosed with HIV to list their sexual partners then a trained provider tracks and tests them for HIV. HIV Index testing further provides an opportunity for assisted disclosure in a family setting, a closer rapport between HTS providers and HTS clients, and a higher HIV positivity rate (Management Sciences for Health, 2018)

Index testing and partner notification services are premised on the fact that people's knowledge of their HIV status and their partner's status is critical to global HIV prevention, risk reduction and treatment (PEPFAR, 2020).

Given its potential, ensuring that the index testing program is implemented according to the proven standard operating framework is crucial to obtain the expected results. The main objective of this study was to identify the enablers and gaps in the index testing cascade and explore how the implementation of this innovation can be enhanced to improve positivity yield and expedite the achievement of national goals.

SUBJECTS AND METHOD

1. Study Design

This was a cross-sectional study with an analytical component.

Conceptual framework: This study designed a conceptual framework, extrapolated from the implementation framework for index testing, to guide the exploration of the various factors and their interplay in influencing the index testing process. Health system factors that affect the elicitation process including consistency, confidentiality and anonymity were factored into tracing and testing modalities that include community vs facility approaches as well as the application of guiding documents.

These factors influence the probability of HIV positivity yield when contrasted with other client factors that include the relationship with the index case, sexual practices influenced by perspectives on HIV that determines the use of protection during intercourse and duration of exposure to HIV

as reflected being a regular or irregular sexual partner to the index case (Figure 1).

General setting: Zimbabwe is a land-locked, 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, ranked number 150 globally out of 189 countries in 2019 (UNDP, 2019). The country is divided into two urban provinces, eight rural provinces and 62 districts. The capital city is Harare and other major cities include Bulawayo, Gweru, Kadoma, Kwekwe, Masvingo and Mutare.

Zimbabwe Index Case Testing (ICT) Programme: The ICT project is part of the HIV testing Services (HTS) package under the HIV Prevention department of the AIDS and TB Programme (ATP). 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 (MoHCC Zimbabwe, 2017).

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) (MoHCC Zimbabwe, 2017). This resulted in the nation, with collaboration from supporting partners developing a pilot ICT register and inclusion of the ICT-tracked indicators into the national database, DHIS2.

The project continues to expand in terms of coverage, mainly through partner 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 (MoHCC, Zimbabwe 2021).

Study site: The study sites were two provinces, randomly selected out of 10 provinces in Zimbabwe. Harare is situated in north-eastern Zimbabwe in the country's Mashonaland region, Harare is a metropolitan province and the capital city of Zimbabwe, which also incorporates the municipalities of Chitungwiza and Epworth (Britannica, 2022). The city sits on a plateau at an elevation of 1,483 metres (4,865 feet) above sea level and its climate falls into the subtropical highland category. Greater Harare or Harare Province which includes Harare Urban, Harare Rural, Chitungwiza and Epworth have a population of about 2.4 million people, making it the most populous province in Zimbabwe, according to the 2022 census (ZimStat, 2022). It is the country's industrial hub where most companies have their national directing offices (ZimStat, 2022). In 2020, Harare recorded an HIV prevalence of 11.5%, compared with the national average of 12.9% (Zimbabwe MoHCC, 2020)

Matabeleland South Province covers the south-eastern plateau of Zimbabwe and it stretches to the Botswana border on the east and borders South Africa on the South (IOM, 2020.). It is one of Zimbabwe's ten provinces and its administrative city is Lupane. With a population of 683,893 as of the 2012 census, it is the country's least populous province (ZimStat, 2022). After Matabeleland North, it is Zimbabwe's second-least densely populated province. 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 (IOM, 2020). In 2020, Matabeleland South province recorded the highest HIV prevalence in the country, at 15.4%, compared with the national average of 12.9% (Zimbabwe MoHCC, 2020).

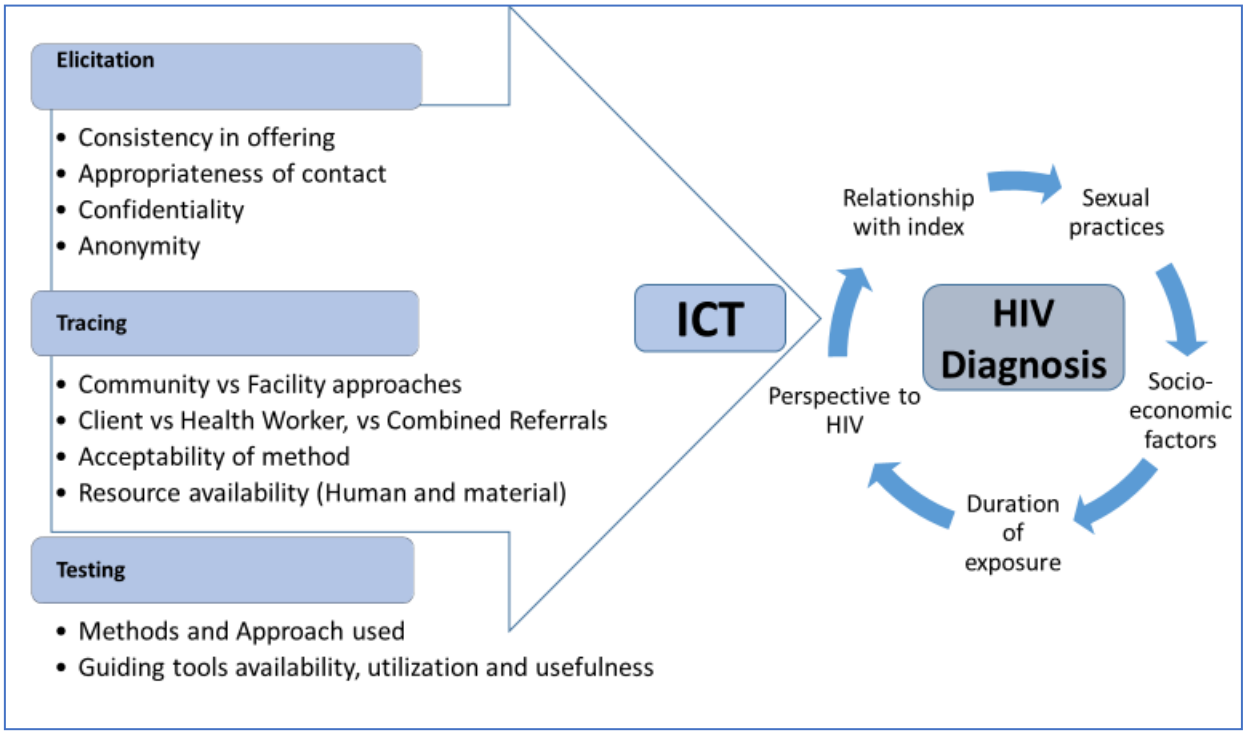

Figure 1. A conceptual framework for Index Case Testing (Designed from Implementation protocol and risk profiling)

2. Population and Sample

Population: All clients, 15 years old and above, including their documented contacts, in Harare and Matabeleland South provinces, diagnosed with HIV and were documented in the HTS register and Index testing register from 1 July 2021 to 31 December 2021 were included in this study

Inclusion criteria: HIV-positive diagnosed clients and their contacts who were documented in the HTS and Index testing registers in 2021 (1 July to 31 December 2021) in Harare and Matabeleland South provinces.

Exclusion criteria: HIV-positive clients diagnosed previously or during the study period but not documented in the HTS or Index testing register. We also excluded patients diagnosed as HIV-negative.

Sampling: Multistage sampling criteria were used to select 2 out of the 10 provinces of the country, from which 5 districts per province were randomly selected to obtain a total of 10 districts. We randomly selected 5 facilities per district to obtain 50 health facilities which were included in the study to achieve the calculated sample size. The electronic data accessed included all districts of the 2 provinces.

Sample Size Calculation: Using sample size calculation for 1 proportion, the following assumptions were used; 80% power, H0 of 93% (positivity of contacts by Mahachi et al, 2019), a delta of 2%, level of significance of 0.05, a sample of 618 was reached. Factoring in the design effect of 2, and an anticipated attrition rate of 10%, the final sample size reached was 1400 participants (TPB).

3. Study Variables

The following variables were collected: HTS number, name of the facility, name of the patient, age, sex, HIV test result, registration in the index testing register (yes/no), index testing offering, acceptance status, the number of contacts elicited, the number of contacts traced and tested, outcomes of test results (ineligible for testing, tested negative,

new positives identified) and linkage to post-test services.

4. Operational Definition of Variables

The following operational definition of variables was used in this study:

Index testing (Index Contact Tracing and Testing): A voluntary process whereby healthcare workers ask index clients to list all their sexual partners, injecting drug partners and biological children, to offer them voluntary HIV testing.

Index Case: An individual newly diagnosed as HIV positive

Index Contact: Individuals identified by the index client with whom they have had a sexual encounter or their biological children below 16 years of age.

5. Study Instruments

The sources of data included the HTS register, Index testing register, and district health information system (eHR). Data were collected between January and March 2022 using a structured data collection form (S1 Annex). A line list of all newly diagnosed HIV patients was prepared from the HTS register after the removal of duplicate entries. The same clients were tracked in the Index Contact Testing (ICT) registers, Pre-ART and ART registers using their names and unique identifiers.

6. Data Analysis

Data were single-entered and analyzed using EpiData (version 3.1 for entry and version 2.2.2.183 for analysis, EpiData Association, Odense, Denmark) for descriptive and unadjusted analysis (S2 Annex). The multivariable-adjusted analysis was done using STATA (version 12.1 STATA Corp., College Station, TX, USA).

Socio-demographic characteristics of participants were summarized using percentage for categorical data and mean (standard deviation) or median (interquartile range) for continuous data depending on whether they are normally distributed or not. The number and proportion with a 95% confidence interval were used to summarize the Index contacts elicited, tested, and linked for various post-test services and those who received these services as documented in the respective registers. To assess the association between contact and Index case, socio-demographic profile and HIV test results, an unadjusted and adjusted generalized linear model (log-binomial regression) was used. Those variables with a p-value <0.25 in the unadjusted analysis were included in adjusted models. The unadjusted and adjusted odds ratios at 5% significance levels (95%CI) were expressed as a measure of association.

7. Research Ethics

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). All participants provided written consent for participation, the audio recording of IDIs and the use of their quotations. All participant records and information were anonymized and de-identified before analysis.

RESULTS

1. Sample Characteristics

We identified 6,308 index clients, of which 53.9% were female (n=3,401. 45.1% (n= 1,103) and most (20%, n=1,261) were aged between 35-39 years. Provider initiation and client initiation were the most common reasons for testing at 30.7% (n=1,938) and 19.4% (n=1,225) respectively. This was closely followed by PMTCT at 19.2% (n= 1,208). Most of the index clients were categorized as retests, accounting for 67.6% (n=4,265) of the total tests whilst Matabeleland South province accounted for 56.7% (n=3,576) of the index cases identified (Table 1).

Table 1. Clinical and demographic profile of Index cases in Harare and Matabeleland South Provinces, Zimbabwe, 2021. (N=6,308)

Characteristics	Category	Frequency	Percentage (%)*
Age in years	15-24	1,161	18.5
	25-29	925	14.7
	30-34	953	15.1
	35-39	1,261	20.0
	40-44	727	11.5
	45-49	668	10.6
	≥ 50	703	11.1
Gender	Male	2,907	46.1
	Female	3,401	53.9
Reason for HIV Testing	Confirming Self-test	69	1.1
	PMTCT	1,208	19.2
	STI	879	13.9
	VMMC	159	2.5
	Client Initiated	1,225	19.4
	Provider Initiated	1,938	30.7
	TB Patient	162	2.6
	Sexual Abuse	131	2.1
	PrEP	345	5.5
	Family Planning	119	1.9
	Other	73	1.2
Type of HIV Test	First Test	1,906	30.2
	Retest	4,265	67.6
	Not Documented	137	2.2
Testing Province	Harare	2,732	43.3
	Matabeleland South	3,576	56.7

*Column percentage

STI: Sexually Transmitted Infections: VMMC: Voluntary Medical Male Circumcision; TB: Tuberculosis; PrEP: Pre-exposure Prophylaxis; PMTCT: Prevention of Mother to Child Transmission includes Antenatal, Labour and Delivery and Post-Delivery testing

Index Testing includes Partner testing

Provider Initiated Testing encompasses other registered variables; Occupational, Nutrition, Ongoing risk, and Diagnosis.

2. Bivariate Analysis

a. Index testing cascade

Out of a total 6,308 individuals diagnosed with HIV in Harare (3,902) and Matabeleland South provinces (2,406), 66.4% (n=4,190) were offered index testing, from which 93.1% accepted (n=3,899), resulting in an elicitation ratio of 1:1.3 (n=5,080). Among the elicited contacts, 78.6% (n= 3,991) were tracked and tested whilst 1,089 contacts were not eligible for testing. A positivity yield of 27.5% (n=1,736) was obtained from the tested contacts and 91.8% (n= 1.593) of these were initiated on lifelong ART (Figure 2).

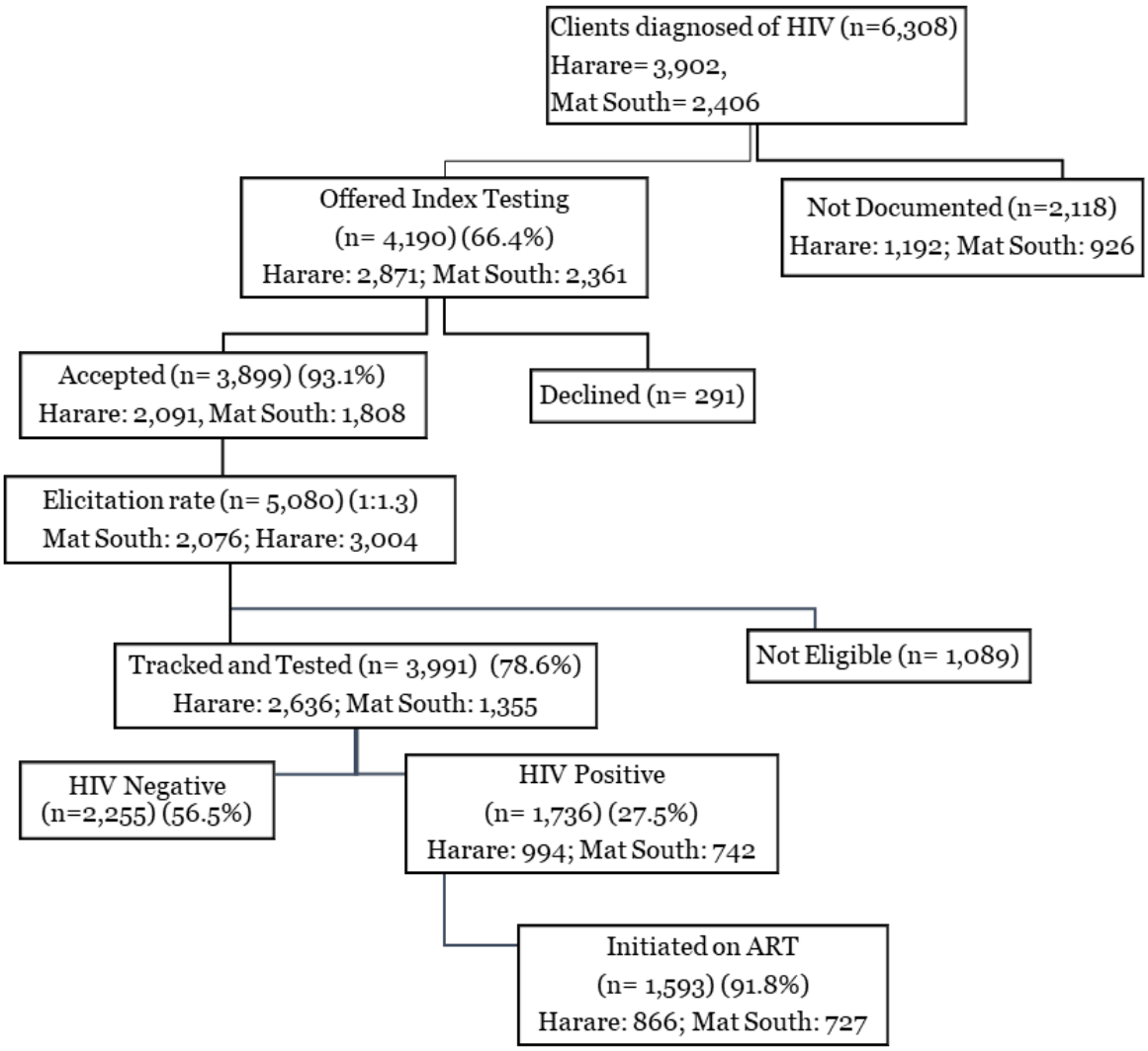

Figure 2. HIV Index Testing Cascade for Harare and Matabeleland South provinces, Zimbabwe, 2022 (N= 6,308)

b. Index contact tracking modalities

For Harare province, out of the 3,004 contacts elicited, 41.4% (n= 1,243) were tracked through health worker referrals, whilst the remainder were tracked through client referrals (32.9%, n= 989) and mixed method (25%, n= 752). Mixed method tracking yielded 46.7% (n= 349), closely followed by health worker referrals at 44.3% (n= 488) whilst client referrals yielded 19.9% (n= 157) positivity. The highest number of clients who couldn't be tested after follow-up was for client referrals (n= 202) and mixed methods were the least (n= 4) (Figure 3).

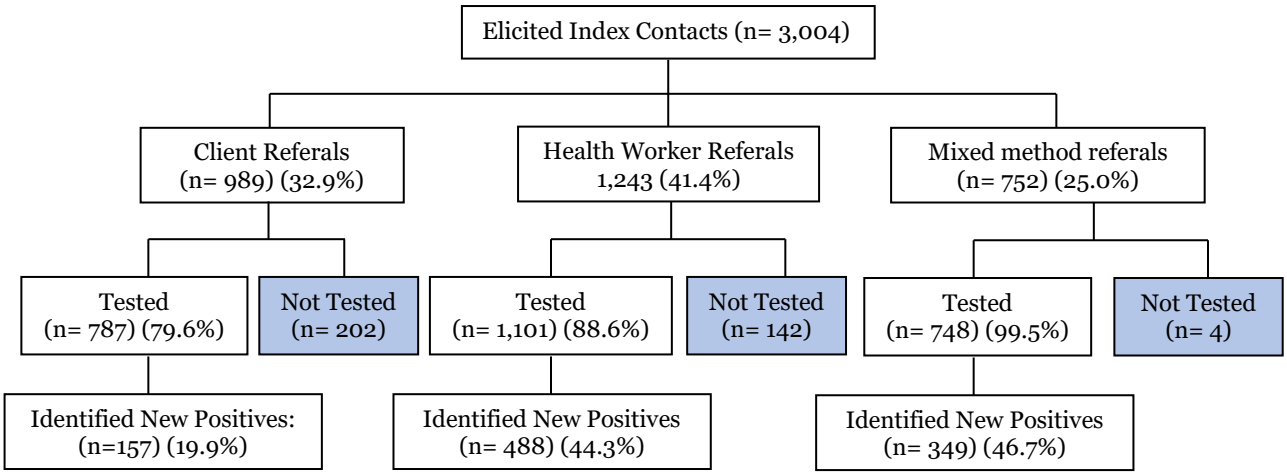

Figure 3a. HIV Index Testing referral modality flow-chart for Harare province, Zimbabwe

For Matabeleland South province, out of the 2,076 contacts elicited, 53.1% (n=1,103) were tracked through client referrals, whilst the remainder were tracked through mixed methods (31.3%, n= 649) and health worker referrals (15.6%, n= 324). The highest positivity yield (65.6%, n= 196) was obtained through health worker referrals followed by mixed methods and client referrals at 55.7% (n= 335) and 21.5% (n= 211) respectively. The highest number of clients who couldn't be tested after follow-up was for client referrals (n= 122) and health worker referrals least at 25 (Figure 3b).

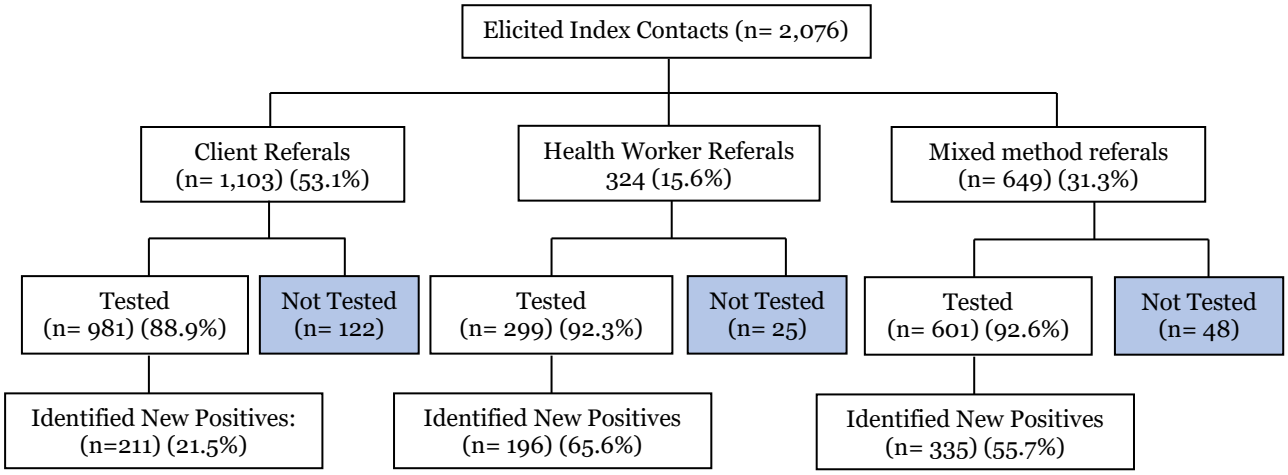

Figure 3b. HIV Index Testing referral modality flow-chart for Matabeleland South province, Zimbabwe

Table 2. Factors associated with positivity yield among Index contacts in Harare and Matabeleland South, Zimbabwe, 2021 (N=5,080)

Independent Variables	Category	OR	CI95%#		p	OR	CI95%#		p
			Lower Limit	Upper Limit			Lower Limit	Upper Limit	
Age in years	15-24	7.43	5.68	9.73	<0.001	7.42	5.65	9.86	<0.001
	25-29	Ref				Ref			
	30-34	1.69	1.22	2.33	<0.001	1.68	1.22	2.34	<0.001
	35-39	10.32	7.90	13.49	<0.001	10.31	7.92	13.54	<0.001
	40-44	12.26	9.21	16.31	<0.00	12.23	9.22	16.36	<0.001
	45-49	23.61	2.67	4.89	<0.001	3.61	2.67	4.90	<0.001
	≥50	5.07	3.62	7.11	<0.001	5.06	3.62	7.12	<0.001
Gender	Male	3.10	2.74	3.49	<0.001	3.09	2.74	3.49	<0.001
	Female	Ref				Ref			
Relationship with index case*	Spouse	0.63	0.51	0.78	0.012	0.63	0.50	0.78	<0.001
	Regular partner	3.90	3.05	4.97	<0.001	3.89	3.05	4.97	<0.001
	Casual partner	3.64	2.94	4.52	<0.001	3.64	2.93	4.53	<0.001
	Other***	Ref				Ref			
Type of HIV Test	First Test	1.66	1.44	1.91	<0.001	1.65	1.43	1.91	<0.001
	Retest	Ref				Ref			
	Unspecified	1.38	0.91	2.09	0.140				
Tracking Method	Contact slip through index	Ref				Ref			
	Community-based tracking	5.98	5.15	5.15	0.010	5.98	5.15	6.95	<0.001
	Anonymous tracking	8.48	3.36	21.39	<0.001	8.46	3.37	22.75	<0.001
	Mixed method	2.22	1.89	2.60	0.014	2.22	1.89	2.60	<0.001
Time interval from elicitation to testing	< 7 days	2.79	2.44	3.18	<0.001	2.78	2.44	3.18	<0.001
	8-18 days	Ref				Ref			
	≥15 days	0.68	0.57	0.82	<0.001	0.68	0.56	0.81	<0.001

*Confirming Self-test was excluded from the model as a reason for HIV testing

Row percentages; #Modified Poisson regression for aOR; * Fisher's Exact'

3. Multivariate Analysis

Among the 5,080 contacts elicited, an overall positivity yield of 27.5% (n= 1,736) was obtained. Most contacts were between 35 and 39 years (n= 1,061); the least were between 25 and aged between 35 and 39 years (n= 1,061), and the least were between 25 and 29 years. The 40–44 year category was more likely to test positive (OR= 12.26; 95%CI= 9.22 to 16.36). Males were more likely to test HIV positive in adjusted analysis (aOR= 3.09; 95%CI= 2.74 to 3.49), from as high as 47.9% (n=1,098) positivity yield. Being a regular partner and casual partner was comparable with regards to the odds of testing positive at (aOR= 3.89; 95%CI= 3.05 to 4.97) and (aOR= 3.64; 95%CI= 2.93 to 4.53) respectively, whilst spouses were 63% less likely to test positive (aOR= 0.63; 95%CI= 0.50 to 0.78) (95%CI: 0.50 to 0.78). First testers were 65% more likely to test HIV positive (aOR= 1.65; 95%CI= 1.43 to 1.91) whilst anonymously tracked clients were 8.46 times more likely to test HIV positive (aOR= 8.46; 95%CI= 3.37 to 22.75). A time interval of fewer than 7 days was associated with almost 50% positivity yield (aOR= 2.78; 95%CI= 2.44 to 3.18) whilst taking more than 15 days to test contacts reduced the likelihood of obtaining a positive diagnosis to 19,6% (aOR= 0.68; 95%CI= 0.56 to 0.81) (Table 2).

DISCUSSION

Overall, this study revealed an HIV positivity yield of 27.5% among index contacts for 2 provinces in Zimbabwe, over 6 months. This is an encouraging performance for a nation striving to meet the global milestones to achieve epidemic control, particularly given the previously missed first 90 targets in 2020 (MoHCC Zimbabwe, 2020). Index testing is therefore a promising strategy to meet the 95-95-95 targets by 2025 if implemented with fidelity (PEPFAR 2020; USAID, 2021).

Within seven days of elicitation, anonymous and community-based tracking of index clients were identified as high predictors of HIV positivity yield. Client factors that increase the probability of a positive HIV diagnosis for index contacts were also identified.

The availability of ICT registers facilitated the tracking of newly diagnosed patients (Index cases) from the HTS registers to measure contact variables and develop cascades. The study was done using routinely collected programmatic data which was representative of the reality on the ground.

Previously diagnosed HIV patients and those with a high viral load were not included in the operational definition of an Index case. This may have resulted in the underestimation of associations. However, the robustness of the data obtained resulted in the sample mean ($\bar{x}$) correctly estimating the population mean (μ) for the variables analysed.

This study provided important insights into the performance of the ICT programme in Harare and Matabeleland South provinces as follows:

First, as low as 66.4% of newly diagnosed HIV-positive patients were offered index testing. This translates to a third of new positives not accessing contact elicitation and tracking. Offering contact tracing and tracking to all positive patients is a critical step in the index testing cascade (University of Maryland School of Medicine, 2019). Although we observed a high acceptance rate of 93.1%, compared with 75% previously observed by Jubilee et al. (2019), the failure to offer contact tracing to all newly diagnosed patients indicates a sustained risk for community onward transmission of HIV.

Second, we observed an elicitation rate of 1:1.3 which indicate that most of the index cases provided 1 contact for tracking and testing. This is below the elicitation rate of 1 index case to: 1.5 - 2 contacts stipulated in

various guiding documents for the programme (PEPFAR, 2015; University of Maryland School of Medicine, 2019.)

Third, as high as a third of the elicited contacts were deemed ineligible for HIV testing. These were contacts who are known positives, with most of them being on treatment. Eliciting ineligible clients and only discovering them during tracking and testing reflects weak elicitation strategies that result in increased expenditure on index contact tracking, albeit unmerited. ICT is a resource-intensive process where positivity yield is what justifies the expenditure (Musee and Yemaneberhan, 2020; WHO, 2021)

Fourth, we observed variances in the results of similar index contact referrals in 2 different provinces, Harare, an urban province versus Matabeleland South, a predominantly rural province. In Harare, most contacts (41.4%) were tracked through heath worker referrals suggesting its higher effect in an urban setup. Through the mixed method, 99.5% of contacts were tested giving a positivity yield of 46.7%. The highest attrition before testing was among client referrals where 202 contacts were not tested, suggesting that this may not be a very effective approach in an urban setup. In Matabeleland South, client referrals accounted for 53.1%, suggesting a better response from the rural clientele, yet 122 were not tested, whilst the highest positivity yield was obtained through health worker referrals at 65.6%. Therefore, our findings point to the importance of a differentiated approach to index testing where a tracking method should be tailored to suit the unique needs of every client (CDC, 2020).

Lastly, our study enumerated being male (aOR= 3.09; 95%CI= 2.74 to 3.49), being a first tester (aOR= 1.65; 95%CI= 1.43 to 1.91), anonymous tracking (OR= 8.46; 95%CI= 3.37 to 22.75) and testing contacts within 7 days of elicitation (OR= 2.78; 95%CI= 2.44 to 3.18) as the factors that were associated with a high positivity yield among index contacts. High positivity yield among males corroborates findings on their low testing levels against high positive test results documented in the literature, supporting the need for efforts targeting men to extend to index contact elicitation (CDC, 2020; Hodgins et al., 2022; Mwango et al., 2020). Anonymous tracking is a documented strategy that targets HIV testing without connecting the index with their contacts, protecting them against the risk of intimate partner violence (IPV) (Musee and Yemaneberhan, 2020). The time interval from elicitation to testing observed in this study reveals the importance of timely tracking and testing of index contacts, to obtain the highest possible positivity yield.

This study recommended the development of a standard operating procedure (SOP) manual for ICT which includes IPV assessment, followed by implementation fidelity can assist the program in Zimbabwe to obtain maximum performance of the program.

The programme in Harare and Matabeleland South provinces should consider cohort-wise reporting from identified HIV-positive clients to contact testing and linkage to accurately determine points of weakness within the ICT cascade and tailor-make interventions for mitigation. This can be done onsite, at the district and provincial levels, and assist in improving the quality of data reported to the national office.

At policy level, ICT implementation fidelity can assist the program in Zimbabwe to obtain maximum performance of the program. There is a need to ensure that ICT is implemented in all districts and facilities of the country, to address inconsistent implementation across the country. The programme in Harare and Matabeleland South provinces should consider cohort-wise reporting

from identified HIV-positive clients to contact testing and linkage to accurately determine points of weakness within the ICT cascade and tailor-make interventions for mitigation.

A qualitative study to further explore the determinants of various preferences for contact tracking and testing was recommended to help broaden a differentiated approach to suit the unique needs of clients. This study had some limitations: previously diagnosed HIV patients and those with a high viral load were not included in the operational definition of an Index case. This may have resulted in the underestimation of associations. However, the robustness of the data obtained resulted in the sample mean $\bar{x}$ correctly estimating the population mean μ for the variables analysed.

In conclusion, our findings on ICT underscore the importance of implementation fidelity and differentiated service delivery to harvest the best results on index contact tracing and testing, which is a proven strategy for targeting HTS. The high positivity yield among men, first-time testers and clients tested within 7 days of elicitation are useful to improve the performance of the ICT program and expedite the achievement of espoused national and global targets.

AUTHOR CONTRIBUTION

Conception and design: all authors; development of data capture tools: HDM, KT, OM; data collection: HDM, KT, 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.

ACKNOWLEDGMENT

I acknowledge several individuals and institutions that made this study a success. Special gratitude goes to my academic supervisors, Professor M. Tshimanga, Dr J. Chirenda and Dr K. Takarinda, The Director of AIDS and TB Unit, Dr O. Mugurungi and the entire HTS team for their support and prodding during this study.

FUNDING AND SPONSORSHIP

None.

CONFLICT OF INTEREST

The authors declare that the study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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