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Barriers to Optimal Index Testing for Improved HIV Positivity Yield in Lusaka Urban District of Zambia

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Abstract

As the proportions of people living with HIV who do not know their HIV infection status decrease, reaching the first 90 will require effective and efficient HIV testing approaches. This project used an explanatory sequential mixed-methods study design to: 1) to understand the perceived facilitators and barriers to HIV partner testing from the perspective of the health-care provider; and 2) to propose interventions necessary for improved HIV case finding. At baseline, 452 index contacts (53.5%) tested HIV negative, 113 index contacts (13.4%) tested HIV positive. Following the intervention, 384 index clients were enrolled in the study. Total number of 668 contacts: 333 males and 335 females. The mean age of contacts was 34.5, ranging from 18 to 68 (SD = 8.638). HIV status: 320 tested positive, 240 tested negative, 29 not tested, 79 known positive. Positivity yield = 57% (320/560). Provider and client related challenges were addressed with the following key interventions: implemented were: Peer pairing approach using experienced counselors and hand holding mentorship; Training facility based volunteers and healthcare workers in Index Testing; Setting up network of counselors to reach contacts not in the same catchment as the index clients; Improving appointment system: After hours, week-ends and men's clinics; Ensuring correct, complete and consistent documentation in all registers. As in several other literatures, our study findings show that following appropriate interventions addressing barriers to index testing, the testing positivity rate improved from 20% to 57%.

Key words: *Contact Testing, HIV, Index Testing, Positivity Rate.*

Introduction

According to the 2018 UNAIDS Global AIDS Update [1], there are an estimated 36.9 million people living with HIV. Recently, marked progress on HIV test and treat strategy has been achieved by countries' commitment to achieve the 90-90-90 targets by 2020 [1]. As of December 2017, three out of every four people living with HIV knew their HIV status globally; 90% of HIV-infected individuals are expected to know their HIV status by the year 2020 [1].

According to ZAMPHIA 2016 fact sheet [2], only 67.3% of people living with HIV (ages 15 – 49) knew their HIV status. In 2017, Zambia had 1.1 million people living with HIV and 48,000 new HIV infections [3]. Without HIV testing services interventions targeted to key populations, including sexual partners of index clients infected with HIV, it will be hard to end HIV epidemic by 2030 [4].

Many studies have shown that index partner testing has the potential to increase HIV testing services (HTS) uptake; identify and diagnose HIV infected partners (yield ranging from 35% to 62% without reported intimate partner violence (IPV) [5].

However, they are barriers to effective HIV index testing. Some reviewed challenges pertaining to both male and female index

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clients noted are difficulties notifying past or casual partners [6]. Disease symptoms are a motivating factor for HIV testing for men as well as women. Studies have shown that gender determinants such as tolerant attitudes about intimate partner violence and unequal power dynamics within relationships, had noticeable effects for men and women, on deciding to get tested for HIV [7].

Gender-specific barriers for female index clients to successful referral include the following: women face gender roles and inequalities in relationships such as lack of education, lack of resources or ability to access services; fear of abandonment, violence or other abuse associated with partner notification [6, 8, 9]. They may need additional support to overcome challenges in the partner notification process. Antenatal care exposure makes women more likely to get tested for HIV.

For men, especially those in Sub-Saharan Africa, the following challenges to HIV testing and disclosure were noted: stigma, gender and social roles prescribing that men should be healthy, strong, and dominant [10, 11]. Studies have shown that men, compared to women, underestimate their level of risk of HIV infection [12]. However, once men have tested, they may be more likely to disclose their HIV status [12]. Some men believe that their role of breadwinner for the family protect them from rejection when disclosing their HIV positive status [13].

Rational: Effective approaches to HIV testing are needed to reach undiagnosed people and link them to HIV care and treatment as part of the UNAIDS 90-90-90 goals. Understanding barriers to index testing is crucial for planning appropriate interventions to improve HIV testing yield and to provide appropriate care for both index clients and their partners.

Generating such evidence requires a combination of quantitative and qualitative research methods.

In this context, we aimed at assessing the barriers to optimal index testing for improved HIV testing yield in Lusaka urban district of Zambia.

Significance: The cornerstone for achieving the UNAIDS 90-90-90 targets by the year 2020 begins with people living with HIV (PLHIV) knowing their status. As the proportions of those living with HIV who do not know their HIV infection status decrease, reaching the last mile of those who are asymptomatic and not in contact with the health care system becomes a critical challenge. Therefore, reaching the first 90 requires effective and efficient HIV testing approaches. The number of people living with HIV who know their HIV status and that of those who receive antiretroviral therapy could increase by the expansion of index testing services. This will result in the reduction of the number of people who can transmit the virus, and subsequently in reduced new HIV infections.

The goal of index testing is to break the chain of HIV transmission by offering HTS to persons who have been exposed to HIV.

The specific objectives were:

1. To understand the perceived facilitators and barriers to HIV partner testing from the perspective of the health-care provider.
2. To propose interventions necessary for improved HIV case finding.
3. To reach high risk but hard to reach populations in HIV programs such as middle aged men, and adolescent girls and young women (AGYW).

The permission to conduct this study was obtained from the Lusaka provincial health office before its commencement. Ethical clearance was sought and obtained from the ERES Converge research ethical committee. Authority to conduct research was also sought from the National Health Research Authority.

Review of Literature

Research Question

Can addressing barriers to optimal index testing results in improved HIV case finding among middle aged men and young women in Matero' Lusaka sub-district?

Construction of searchable question using PICO:

Problem: Barriers to optimal index testing in Lusaka sub-district

Intervention: Partner notification services

Comparative intervention: Routine HIV testing services

Outcomes: Improved HIV case finding among hard to reach populations in Lusaka sub-district:

1. Increased HIV case finding among middle aged men
2. Increased HIV case finding among young women
3. Increased HIV testing positivity yield

Search Strategy

To review the current knowledge of the above question, qualitative and quantitative studies were reviewed in the already published literature. The search was conducted in PubMed and other scientific data bases (including TRIP, Plos One, and science direct) to identify suitable and accessible peer reviewed articles published between January 2000 and September 2019. The reference list and citations of identified articles were also consulted to increase the reviewed results [14, 16-35].

The selected articles for further review contained at least one of the following search terms: Barriers AND HIV OR HIV AND Index testing; and HIV OR HIV AND contact tracing OR contact AND tracing OR contact tracing OR partner AND notification OR partner notification AND services. A total number of 34 articles were selected after screening for duplication and relevance. Most of the reviewed studies selected were from developing countries (Table 1).

Literature Research Flow Chart

The following literature review flow chart was constructed following the PRISMA 2020 flow diagram model [15] (Figure 1).

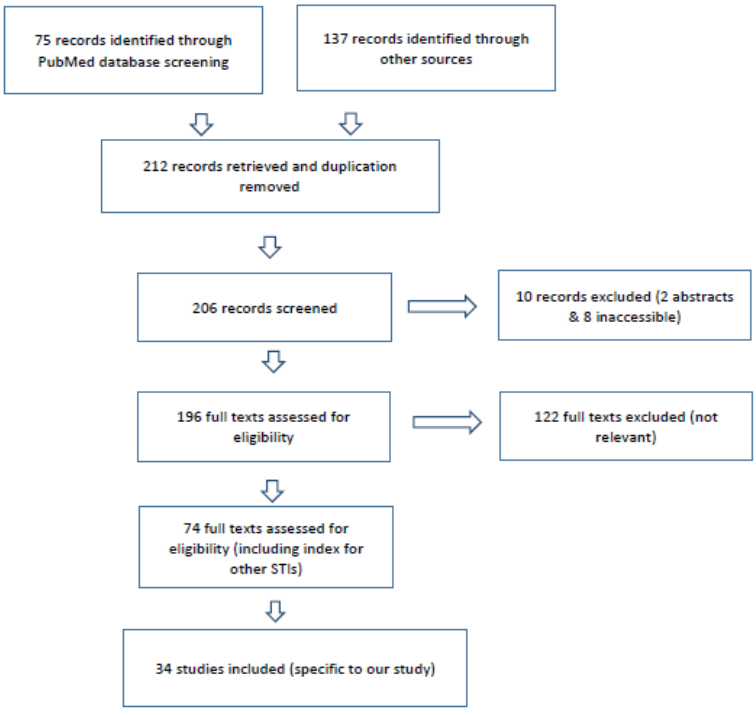

Figure 1. Prisma flow chart [15].

Summary of Reviewed Records by Type

Table 1. List of reviewed records

NO	Type of Record	Records Reviewed
1	Randomized controlled trials and RCT protocols	4
2	Systematic reviews and Meta-analysis	3
3	Non-controlled interventional studies	3
4	Program implementation studies	7
5	Observational and Cohort studies	2
6	Case-control studies	0
7	Mixed methods studies (qualitative & quantitative)	3
8	Cross-sectional & population based surveys	8
9	Secondary data analysis	3
10	Literature review	1
	TOTAL	34

Importance of Index Testing

HIV index testing has shown higher uptake and good yield than routine HIV testing methods. The World Health Organization has called for increased operational research to evaluate HIV care processes, and particularly linkage to care.

Barriers to Index Testing

Non-disclosure of HIV status (due to fear of marital discord), non-disclosure and under-disclosure of the number of sexual partners by the index clients, fear of negative consequences, difficulties notifying past or casual partners, geography/remote partners, and risk perception were major barriers for using the testing services. Key populations and people with casual partners were less able or willing to identify partners. Barriers to partner notification services included concerns around privacy/confidentiality and intimate partner violence. Lack of awareness of risk for HIV infection/misconceptions; structural, psychological, financial, were barriers to being tested. Other factors, such as demographic characteristics, marital dynamics, partner relationship, and relationship with the health care services such as fear of being labeled by health workers as promiscuous, also greatly affects the participants' decision making. The lapse between the enrollment of the index cases and HIV testing of partners often exceeded three months in some studies. Other common barriers included insufficient staff, inability of PNS providers to identify and contact partners, and limited resources.

Barriers to pediatric HIV testing included emotional, interpersonal, structural, financial and logistical challenges.

Being male index case, illiterate, above 25 years old, belonging to key populations, substance abuse and advanced HIV clinical stage, were factors more likely associated with partner non-testing. Male clients feared exposure of infidelity and were often not available for testing due to economic reasons.

Barriers specific to women were: fear of being abandoned; being undervalued for not having a child; sex work for livelihood; fear of violence or harm; perceived community level HIV stigma; individual level factors such as anticipated stigma, depression, and older age.

There is therefore a need for health workers to be given appropriate training that will empower them with the right counseling skills in order to be able to encourage index clients to voluntarily disclose information about their sexual contacts (UNAIDS/WHO, 2000).

Facilitetors to Index Testing

In the reviewed literature, the proportion of HIV positive partners were 1.5 times higher with assisted partner notification than with passive referral; successful partner referral was 2.5 times more likely among married compared to unmarried index; spouses and steady partners were more likely to be notified than other partners. Higher education was a common facilitator of HIV testing. Provider-based notification strategies are potentially cost-effective for identifying new cases of HIV. These strategies offer a simple, effective and easily implementable opportunity to control HIV transmission. Ensuring that health workers were trained on methods for sexual partner notification to improve counseling of index clients was a facilitator to disclosure.

Gaps in Existing Literature

High level evidence, Meta-analysis of three individually randomized trials showed that assisted partner notification services resulted in a 1.5-fold increase in HTS uptake among partners compared with passive referral. However, it was difficult to trace identified partners which may have resulted in the low ratio of partners notified per index patient.

Challenges experienced that have future implications for index partner testing included non-disclosure and under-disclosure of the number of sexual partners by the index clients. A study has also demonstrated sub-optimal HIV testing of unique partners of PLWH enrolled in the HIV program at this particular public hospital was suboptimal, both in frequency and timing; but, excluding multiple partners. In some studies, program data was used, which had some gaps in its completion and not specifically designed for research. This also limited ascertainment of client facilitators to linkage to care.

There is limited literature on HIV index testing in developing settings. There are variable concepts definition for index testing in various settings, sometimes not clear to participants, limiting the generalizability of study findings to others settings with different characteristics. HIV testing services need to adapt to the social context of Zambia where HIV-related stigma and discrimination is still persistent and overwhelming. The practices of HIV-testing have been always evolving.

Some studies have tackled the issues of barriers to successfully referring partners for testing, but were not specific to sex or age. Alternative strategies to target and provide acceptable and accessible HIV testing services to gender and age-specific populations are critically needed.

As Zambia makes significant progress towards achieving HIV epidemic control, more efforts are needed to reach specific high risk but hard to reach populations in HIV programs such as men and adolescent girls and young women (AGYW).

Materials and Methods

Study Design

An explanatory sequential mixed-methods study design was used. The quantitative phase, a retrospective study looking at index registers of clients who tested HIV positive and were elicited for index testing between October and December 2019. This was conducted in three high volume health facilities in Matero sub-district 3 of Lusaka district in Zambia. The overview results of the study, which looked at the effectiveness of HIV index testing, was described. The analysis examined index clients' identification, elicitations of index contacts, and testing of index contacts. The main quantitative outcome of interest for this analysis was the success of index testing to improve yield for HTS among female versus male and between ages among index clients; and secondly ART initiation for positive index contacts. This was followed by a qualitative phase, one to one interviews to explore index testing providers' views on barriers and other experiences arising during the process of HIV index testing. An interview guide was used for

consistency of information to be collected. The study was concluded by a five months optimized index testing through partner notification services, following on the job mentorship (addressing identified barriers) of index testing providers.

Study Setting

Lusaka is Zambia's highest HIV prevalence province with 16.1% of the people living with HIV (ZAMPHIA 2016). The study facilities included Matero first level hospital, Matero Main clinic, George health Centre (in Matero Sub-district 3 of Lusaka Urban district, Zambia).

Study Population

Quantitative:

The study population was comprised of all index clients (men and women at the study facilities who had been diagnosed with HIV and elicited for HIV index contact testing during the study period. This retrospective phase used a total sample enumeration technique.

Qualitative:

HIV index testing providers involved in patient care and management (Index testing champions, nurses, medical officers, counsellors and community liaison officers) were interviewed. Key informants included medical officers, health systems strengthening nurses, index community liaison officers, and index testing counselors). A saturation of findings was used to guide the sample size.

Eligibility Criteria

Participants in the final phase of the study were 384 index cases (men and women at the study facilities who are newly diagnosed with HIV or newly enrolled in care, through either VCT or PICT) and their sexual contacts (sexual partners of index clients who have been elicited and offered HIV index testing services). The study participants included:

1. Newly diagnosed HIV positive or newly enrolled in HIV care/ART (for less than 6 months);
2. Aged 18 years and above;
3. Had a sexual partner currently or in the past 12 months.
4. Eligibility criteria for enrollment as a sexual partner was that the partner was 18 years of age or older.

Exclusion criteria:

1. Known HIV clients on ART for 6 months or more.
2. ART LTFU (Lost to follow up) and those with high viral load of more than 1000 copies/ml.
3. Age below 18 years.
4. Sexual contact more than 12 months ago.

Sampling

The sample size for the study was calculated to answer the main study objective, which is the improved index testing yield among participants. The sample size calculation for the original research question was based on an assumption that index clients would list an average of one sexual contact, and that 51% of sexual partners would accept HIV index testing, as seen in a study conducted in the hospital setting in Malawi[14] and replicated in Tanzania[15]. The determination of the sample size was done through the approach based on precision rate and confidence level.

Using the Zambia Ministry of Health (MOH) HIV program target indicators, it is projected that optimized HIV testing services will yield a positivity rate of 26% in 2020.

Based on these assumptions, an effective sample size of 296 index contacts was needed to detect a similar rate of testing among sexual contacts with 80% power ($\alpha = 0{\cdot}05$, two-sided test).

The sample size formula was: $n = 1.96^2 \times p \times (1 - p) / e^2 = 1.96^2 \times 0.26 \times (1 - 0.26) / (0.05)^2 = 296$

Anticipating a non-response or drop out percentage of 20%, the final sample size was calculated as follows: 296 / 1 – 0.2 = 370.

Study Procedures

Review of data: retrospective review of index registers of clients who tested HIV positive and were elicited for index testing between October and December 2019.

Qualitative study: Participants in the qualitative component of the study were selected on a convenience basis from the index testing services providers. The index providers were selected in equal number from male and female index testing services providers who have been providing index testing for more than twelve months. Index providers were selected by the principal investigator who is trained in qualitative and quantitative studies for participation in a face to face interview on a convenience basis. A rough quota was given to each facility, balancing out male and female participants, and those providers who were invited to participate and agreed and consented were interviewed. This procedure intended to have a large enough sample size to uncover a variety of opinions, but to limit the sample size at the point of saturation (occurring when adding more participants to the study did not result in obtaining additional perspective or information).

Intervention study: Potentially eligible men and women (diagnosed with HIV through VCT or PICT at the study facilities) were offered HIV index testing services as per national guidelines. HIV trained index testing counselors (study staff) screened potential candidates for study eligibility using eligibility criteria for enrollment as index clients.

Written informed consent was obtained from interested and eligible clients before enrolling them as index cases.

Index cases elicited names and contact information (phone number and physical address) for sexual partners to study staff, who then entered the elicited contacts in index registers. Index clients also decided how the partner was to be contacted for HIV index testing services.

Index clients were encouraged to elicit as many partners as they can, indicating the type (married, unmarried, casual partner), duration, and status (past or current) of the relationship for each partner.

During partner elicitation, the index client was asked questions designed to identify sexual contacts to whom disclosure or the referral to HIV index testing might cause a risk of intimate partner violence (IPV). Any sexual partners the index client felt might react with violence were excluded from index testing services.

Index cases would choose to contact their partner themselves (passive referral), have the health provider contact the partner (provider referral), Sits with his/her partner (s) together with trained providers to provide support as they disclose their HIV status while the provider also offers voluntary HTS to the partner (dual referral), or attempt to contact the partner themselves, with the understanding that the health provider would contact the partner should the index client fail to do so (contract referral).

Index clients were given a choice as to whether or not they wanted a written referral letter (love letter) to take to their partner.

If the index client was agreeable, each listed partner was: (1) contacted, (2) informed that they have been exposed to HIV, and (3) offered voluntary HIV testing services (HTS).

All index testing needed to meet the 5Cs and be consensual, confidential, counselling, correct test results and connection to treatment or prevention services.

Data Sources, Variables and Collection

Quantitative:

Data on the index clients (cases) characteristics (age, sex, contacts, ART status), and the contacts' HIV test outcome (yield, initiation status) were extracted from

the HIV index testing registers into a structured pro forma.

Qualitative:

HIV index testing providers were interviewed by the HIV/TB district medical mentor (trained both qualitative and quantitative research). It was an onsite face to face interview, conducted in English, and audio-recorded using an 'audio-recorder' application after obtaining consent. An interview guide was used to explore the challenges and make suggestions for improving Index contact testing outcome for HIV.

Data Management and Analysis

Quantitative:

Data entry and analysis were performed using Statistics package for social science software (SPSS version 16.0). Descriptive statistics were performed to describe the background characteristics of index clients and successful testing of index contacts. Analysis entailed simple frequencies of the main study outcomes and cross-tabulations. The association of index contact testing with the Gender of the index cases was examined using the Chi Square test, and unadjusted relative risks (RR) with 95% confidence intervals (CI) was calculated.

Qualitative:

A descriptive content analysis by manual coding was performed to generate categories or themes. Audio-recorded interviews were transcribed verbatim on the same day by the HI/TB district medical mentor. The traditional method of qualitative analysis was used in the following steps: (a) manual coding; (b) identifying themes, patterns and relationships; (c) summarizing the data. After gathering the data, the source material was transcribed with a word processor, multiple photocopies of the text were made, painstakingly read through and assigned codes to the material, cut the pages up into coded passages and then, manually sorted the coded text in order to analyze the patterns found. The primary data was scanned to look for words and phrases commonly used by respondents (word and phrase repetitions). Using the framework for descriptive analysis, responses were ranged in categories. Recurrent themes were identified while looking for similarities and differences. The findings of the qualitative analysis were then linked to the research aim and objectives.

Ethical Considerations

Informed written consent was obtained from all key informants before conducting the interviews. Participants were free to skip questions that they deemed personal or otherwise.

Informed written consent was also obtained from interested and eligible clients before enrolling them as index cases. Since index testing service that was offered is part of the recommended national HIV testing services, universal testing principles were observed for all participants. Study participation was voluntary. The information collected during the course of this study was kept confidential. Client's privacy and confidentiality were observed by assigning a serial number to each participant that was known only to the health care providers. Only the client's initials and serial number appeared on the data collection forms. Research subjects were also given an option to opt out of the project at any time during the implementation period; and this did not affect their access to clinical care they are otherwise entitled to receive. Ethical clearance was sought and obtained from the ERES Converge Zambian Institutional Review Board (IRB), and authority to conduct research from the National Health Research Authority before the commencement of the study.

Results and Discussion

Quantitative Results

The total number of index clients included in the study was 604. Matero First Level Hospital leads the participation per facility

with 292 participants, followed by George Health Centre and Matero Main Clinic with 164 and 148 participants, respectively. The total number of female participants was 314. (representing 52%) and male participants was 290 (representing 48%) (Table 2).

Table 2. Number of participants (index cases) by sex, month, and facility

Month/Sex	Matero Main		Matero level 1		George		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
October 2019	20	26	57	56	26	28	103	110
November 2019	26	28	37	25	26	28	89	81
December 2019	23	25	49	68	26	30	98	123
Total	69	79	143	149	78	86	290	314
Grand Total	148		292		164		604	

The age of participating index clients ranged from 16 to 78 years, with mean age calculated at 34 years (SD = 9.1). Out of the total number of 604 participants, 514 clients (85.1%) were married, 85 clients (14.1%) were unmarried, 3 clients were widowed, and 2 clients were divorced.

Concerning the time spent from HIV test to the initiation of ART for index cases: 595 index clients started ART within 7 days (98.5%), 1 index client started ART within a month (0.2%), 1 index client started ART after 1 month (0.2%), and there was no evidence of starting ART for 7 clients (1.2%).

The number of contacts elicited per index client were as follows: 413 clients (68.4%) elicited 1 sexual contact each, 146 clients (24.2%) elicited 2 sexual contacts each, 40 clients (6.6%) elicited 3 sexual contacts each, and 5 clients (0.8%) elicited 4 sexual contacts each (Table 3).

Table 3. Number of elicited contacts by sex, month, and facility

Month/Sex	Matero Main		Matero level 1		George		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
October 2019	30	25	113	110	35	34	178	169
November 2019	35	39	45	65	35	27	115	131
December 2019	36	35	52	55	42	32	130	122
Total	101	99	210	230	112	93	423	422
Grand Total	200		440		205		845	

The mean age of elicited contacts was calculated at 33 years (range, 17–80 years SD = 9.4). From the total number of 845 elicited contacts, 604 contacts were main partners of index cases, 238 contacts were additional partners of index cases, and 3 contacts were casual.

The time spent from elicitation to HIV testing of index contacts varied across participants: 294 index contacts were tested within 7 days (34.8%), 76 index contacts were tested within 14 days (9%), 77 index contacts were tested within a month (9.1%), 133 index contacts were tested after 1 month (15.7%), and 265 index contacts were not yet tested (31.4%).

The HIV test outcomes for index contacts were as follows: 452 index contacts (53.5%) tested HIV negative, 113 index contacts (13.4%) tested HIV positive, 108 index contacts (12.8%) were known HIV positive, and 172 index contacts (20.4%) were not yet tested for HIV. Of the 113 contacts who tested HIV positive, 90 index contacts started ART within 7 days (79.6%).

There was no documented evidence of starting ART for 23 HIV positive contacts (20.4%).

The total number of 565 index contacts were tested for HIV and 172 index contacts had not yet been tested for HIV (Table 4).

Table 4. Contact Gender * Contact HIV status Cross tabulation

			Contact HIV status		Total
			Tested	Not tested	
Contact Gender	Male	Count	275	89	364
		Expected Count	279.1	84.9	364.0
	Female	Count	290	83	373
		Expected Count	285.9	87.1	373.0
Total		Count	565	172	737
		Expected Count	565.0	172.0	737.0

The Pearson Chi-Square test value was calculated at 0.498 and the p value was 0.481.

Qualitative Results

A total of 18 participants (index providers) were interviewed; 13 women and 5 men. Table 5 presents demographic characteristics of participants.

Major activities of an index testing provider in the past one year included ensuring that all newly tested HIV clients were listed, counseling was provided to them on partner notification service, elicitation of sexual contacts, contact tracing, testing of contacts and linkage of positive contacts to care.

Table 5. Demographics of the 18 index providers interviewed.

#	Facility	Age	Sex	Provider' Job Title	Interview Duration (minutes)
1	MFLH	42	Female	Community liaison officer	15
2	MFLH	38	Female	Counselor	15
3	MMAIN	51	Female	Health Systems Strengthening Nurse	16
4	MMAIN	39	Female	HTS Head of department	18
5	MFLH	28	Female	Counselor	18
6	MFLH	32	Female	Counselor	22
7	GEORGE	43	Female	Community liaison officer	20
8	GEORGE	26	Female	Community liaison officer	18
9	GEORGE	24	Male	Community liaison officer	15
10	MMAIN	35	Female	Counselor	21
11	MMAIN	36	Male	Community liaison officer	16
12	MFLH	42	Male	Counselor	14
13	MFLH	45	Male	HTS Head of department	24
14	MFLH	49	Female	Health Systems Strengthening Nurse	14
15	MMAIN	35	Female	Counselor	19
16	George	33	Female	Health Systems Strengthening Nurse	32
17	MFLH	39	Male	Medical Officer	18
18	George	28	Male	Medical Officer	17

"My major activities concerning index is if we find a positive, making sure that the client is indexed and elicitation is supposed to be done also. If the client says that I have got sexual contacts, I am supposed to book those sexual contacts and follow them either at home

or at the facility if the client agrees to bring them". (Participant 1)

Index testing workers worked together with other providers and implementing partners to provide index testing. Specifically, index testing providers from respective facilities worked hand in hand with program implementation partners to ensure activities were coordinated.

"For index testing to work, we need a multidisciplinary team. In working with other, being a nurse by profession, I need to work with counselors as I also provide testing. We need to identify people who are very skillful, who can spend more time with the client to get information on their contacts". (Participant 16)

There were many successes or experiences reported by respondents arising from index testing. Providers were open to share their experiences and lessons learned while providing services.

"My experience or successful story it was one time when we had a session with a certain index client. That client was able to open up and give us 6 contacts of whom 5 tested positive and 1 negative. That person was polygamous". (Participant 1)

"Through index testing, there was a certain man who had tested 7 years ago. When he came he was not feeling well. After we tested he said in the eyes of the public he only has one sexual partner (his wife). According to him he is a God fearing man. After eliciting we discovered that he had 3 extra girlfriends. Little by little after interacting with him those names were given to me. After that he said he may not be able to disclose to them because they will suspect that he may have infected them…." (Participant 12)

Barriers and facilitators to effective index testing were also identified by respondents.

"The index client may give you the correct contact information. But the contact might have lied to the index client. hard to reach clients that are out of town (Lusaka) or out of the country. the contact, when followed, two of them have really brought up their religious believes strongly: "you are not going to test me, I cannot do an HIV test, I don't believe in HIV". (Participant 7)

"Like earlier mentioned, index testing is a concept that is new. It is a concept that was not long ego embedded in our understanding as healthcare providers. One of the barriers in delivering this service has been its acceptance among healthcare workers or among facility based workers as well as community based workers. Because we have had to ask on sexual contacts from clients that come out positive. And looking at our culture, it is one thing that we don't easily talk about to bring out sexual relations to clients. Many staff tend to bring out they traditions, they cultural believes, they religious believes when it comes to them getting sexual partners. It has limited the number of sexual partners that we are getting from the client…" (Participant 16)

Specific challenges related to index clients' identification and elicitation of index contacts. Some clients did not open up easily (as this was the first time to meet a counselor) or immediately and others were not providing full contact information. This was usually resolved within two weeks of follow-up, as clients become more comfortable interacting with ART providers.

"One of the challenges of finding positives when doing index is most clients do not open up easily. Being the first time of meeting you as a counselor they can't open up just there and then. And then the other thing when it comes to elicitation, we elicit the client, you will find that when calling the sexual contacts, you are asked questions like where did you get my contact from? It is not everyone who will agree right there and then. It is not a one-day thing if I may say".

"… elicitation on the other hand is a skill. So one big challenge is they are very few staff who are skillful when it comes to elicitation. So you will find out that if you have a client in front of you, but if you don't have the skill and

if you do not perfect this skill, the client will be in front of you but you will not be able to get out this information from them". (Participant 16)

Specific challenges related to testing of index contacts. Various logistic challenges were noted with regards to tracing and testing of contacts.

"Number 1, transport must be readily available at all times. Number 2, … in short I can say logistics must be available at all times. If one says right now I have left my wife at home. If at all you are ready let's go together so that you can test her. You will find that we don't have transport at the facility at that particular time. The time you will be calling the client maybe he will say this time she is not around, maybe she is busy with something else. We know these clients; they've got a lot of things to do beside accessing services from the hospital". (Participant 1)

Perceived factors causing/contributing to sub-optimal index testing were reported as gender, age, stigma, social status, health system, facility structure, staff, and skill level.

"…when it comes to age, this is another challenge because elicitation is also age sensitive. By this I mean you cannot get a youth to elicit from a senior citizen for example who is maybe above 65. They will perceive the youth as a young boy or a young girl who has no concept of living, and they would close up on giving information…." (Participant 16) (Table 6).

Table 6. Field notes

#	**Theme**	**Description**
1	Major activities of an index testing provider in the past one year.	• Ensure all new positives clients are listed • counseling on partner notification service (PNS) • elicitation of sexual contacts • contact tracing • use of HIV screening tool to determine eligibility of index contact to take an HIV test • testing of contacts either at home/community or at the facility • assignment of tasks • linkage of positive contacts to treatment • prevention services to negative contacts • recording/documentation in various registers • reporting using available reporting tools • handholding mentorship with peers • conduct quality improvement projects
2	Working together with other providers and implementing partners to provide index testing.	• Work Hand in hand with all partners • Pairing of less experienced community health workers with those who are experienced • morning or afternoon meetings to verify data • when there was no coordination, different partners could follow the same contacts, there was dispute over numbers between community & facility implementing partners • good communication to settle differences • working together in conducting elicitation and at each stage of index testing • sharing work, distributing tasks • community initiation

		• technical advice/support provision • zoning of population, training of testers, support of weekend index testing • A multidisciplinary team of partners: counselors, nurses, community volunteers, etc. work together: follow up of index contacts for testing and linkage of contacts to care; provision of transportation, other resources/ finances, test kits, etc.
3	Successes or experience arising from index testing.	• Index client (polygamous) opening up and giving 6 sexual contacts (5 tested positive and 1 negative) • scale up program (community testing, hot spots) increased yield • openness on contact's behavior (narrating how he targets small ones/school going girls) • difficult contact was finally tested after several attempts by various providers • one partner elicited the girl friends for testing & wife (to protect the wife) • successfully contacted an arrogant contact who insisted to know where the provider got the phone number • reassured index contact on shared confidentiality (different provider from the one who elicited) and tested successfully • hesitant female client opened up over time and at the end a total number of 12 contacts were elicited • both partners did not disclose to each other (the male contact was followed, tested and disclosed that he is known positive, then disclosed to the female and started treatment) • a client elicited 8 contacts who were also tested in the same community • a self-believed God fearing client known positive for 7 years (pretending to have only 1 partner in the eyes of the public) disclosed 3 extra partners (he was initially fearing to disclose to them for fear of being victimized to have infected them), he was counseled and partners were finally tested • MCH client failing to disclose to partner (plan was made and provider assisted) the husband was later tested and provided 3 more contacts • index yield above 30% last year facilitated by weekend testing, finding men on weekends/mini bus drivers and testing they contacts as well
4	Barriers to effective index testing.	• Mobile clients such as track drivers with contacts out of town • transportation challenge • space for elicitation and confidentiality when disclosing (clients not disclosing more partners) • short time for elicitation because of patient queues, long waiting time • wrong contact details, wrong addresses and phone numbers, • patients refusing completely to give contacts • contacts out of town, denying to have more than one partners • clients not returning (defaulters) • contacts lying/giving wrong information to index • other contacts not believing in HIV testing • fear of GBV (giving up wrong details)

		• elicited adolescent girls below 18 were difficult to test without consent • lack of disclosure (fear to be labelled womanizers) • fear that the provider will disclose client status to the contact • it is difficult to elicit from people who test as a couple (separate them or elicit on subsequent visits) • transport challenges for contacts who live far from the facility • fear that they are known in the community • new counselors without needed skills lowered the yield • index testing is a new concept, its acceptance among health care providers is still a challenge • culture limits providers to discuss sexual matters with clients/traditional beliefs • facility set up do not promote privacy • knowledge gap • over-testing of children
5	Specific challenges related to index clients' identification and elicitation of index contacts.	• Clients not opening up easily (being the first time to meet you as a counselor) or immediately • difficult contacts asking difficult questions such as who gave you my number & details • very ill patients failing to give more partners, new clients not providing full information (resolving at 2 weeks) • wrong contact details • refusal to disclose sexual contacts, closing up of clients because of closed ended questions, buddies' collection of drugs, no elicitation room/lack of confidentiality/ cases not opening up, cases are gotten from both facility and community • elicitation of contacts is a process and is done over time, casual contacts are difficult to be identified • lack of probing skills for more contacts elicitation • new positives are often not ready to elicit partners (? still thinking, fear that the provider will disclose the result to the contact) • poor documentation, denying/declining identity by contacts • for others it takes time to believe and consent • more providers calling the same contact on the same day (contact may become emotional and close up) • poor counseling, consent from the clients to test contacts, age difference • dating married partners have it difficult to provide contacts' phone numbers • most staff not optimizing the use of the HIV screening tool • lack of skills for elicitation
6	Specific challenges related to testing of index contacts.	• Transport, logistics, preparedness to immediately follow the contacts who are ready • busy contacts with work • clients not opening up to give more contacts • stigma to test at home because of family members, also not coming to the facility when appointment is given (only after several attempts)

		• wrong address/locator information • contacts not keeping appointment sometimes, some who tested positive decline treatment/not ready • clients not opening up on first contact • clients lost their previous partners' contact details • contacts give excuses/ busy with work during the week/church on Sunday, fear of knowing their results/status • poor elicitation (1:1 main partner or biological children) • contacts may be other people's husband/wife (why did you call and what do you want to talk to my wife?) • age difference and communication barrier (e.g. adolescent clients with older counselors) • poor counseling • limited man power to meet the demand of follow up •
7	Perceived factors to be causing/ contributing to sub-optimal index testing (gender, age, stigma, social status, health system, facility structure, staff, skills, etc).	• Most CHWs not fully trained • lack of counseling skills • being a referrals hospital some clients come from far places, high social status barrier/ high profile • stigma, self-stigma (people may think that I have been sleeping around, lack of disclosure to partners, social status/pastors • lack of space for privacy and confidentiality • age difference (elderly not opening up to adolescent), ashamed to talk about sex, condoms, etc. married clients attended by younger ones (were not calling for assistance) • some staff being too judgmental to clients who give more than two partners • men are hard to find/always at work/ want to test on weekend • lack of skills on elicitation and contacts finding • community not sensitized on the benefits of index testing • across ages, male Vs female (provider/client), women have it difficult to disclose to their husbands compared to men • social status (celebrity, nurses, doctors, counselors, bishops, elders in churches) • fear of breaking relationships or losing marriage, skills to convince the client and contacts • female adolescents are more difficult to open up • high status people often hold back information on contacts • lack of proper planning at facility level •
8	Raisons for perceived challenges affecting optimal index testing.	• Some are temporal and can be sorted out • lack of confidentiality leads to no disclosure • similar challenges to most clients • space is a real challenge (we do ask for rooms when we have clients for elicitation), room for elicitation used for other activities (e.g. enrollment room), busy rooms/occupied by other providers, other people enter the

		room while elicitation is taking place/disturbing (making it difficult for clients to open up) • because it is what we are experiencing • poor documentation forms, elicitation forms not well documented/poor sketch map • long waiting time when contacts come • space is a real limitation • the results are not encouraging •
9	Specific actions or recommendations to address challenges.	• Have all logistics (transport, air time) in place when starting a program • have trained providers to initiate ART in the community, only link to the facility those clients that cannot be initiated in the community • call on other colleagues of same age to help with elicitation • need more attention and time when doing elicitation • educate clients (some are ignorant), IEC • engage the media/drama to address knowledge gap about index and its benefits in the community • resolve issue of shared space, create rooms/tents • invitation letter to partners • sensitization of the community • counseling of clients and contact • skilled individuals should lead index services • training, orientation, hand holding mentorship for skill transfer • frequent refresher courses for the counselors, psychosocial training for those who lack it • fast track contacts • stake holders' participation • effective supervision in all the department • sharing of challenges and experiences • involve elder counselors for old clients • continuous mentorship • improve on staffing •
10	Other interventions to improve index testing.	• Transport & lunch allowance to CHWs • work after hours • motivation (orientation/ same people always go for orientations and keep information to themselves/ alternate) • allocate specific individuals on weekly basis to attend to index testing • weekly report on targets and challenges • good rapport with the clients, reassuring the clients on the shared confidentiality • good elicitation skills, identify those who are good at elicitation • offer PNS testing modalities • engage churches/other stake holders for index sensitization • dispel myths and believes • proper documentation

		• continuous peer mentorship, proper documentation • elicitation skills improvement • sensitization of the public (advertise, drama, radio, TV) • foot soldiers to target hot spots in the community (e.g. churches, markets, bust stations, door to door) • Community initiation, same person doing elicitation should follow up and test contacts • translate most community tools/HIV screening tools in local languages because index testing is mostly applied by community workers •
11	Proposed change to improve HIV index testing yield.	• Delays in implementing programs • administrative procedures/late signing of checks • involve everyone/every index provider • improve on documentation on registers, address space challenge • same people always attend programs/learn new things/keep it to themselves (we need rotation), motivation • drama/role plays • refresher courses/orientations are needed, prioritize index testing • involve clinicians • preferably the one eliciting should contact the partners (other facility staff should not call the index to confirm the contacts/it makes them feel un-comfortable and distrust the provider) • age appropriate pairing of client/provider to improve communication and break the culture barrier • dressing code for providers • motivation of providers handsomely (notches, performance based reward) • avoid double counting of clients'/data duplication/ clients entered twice in the registers • improve yield by the use of the screening tool • follow the client instead of waiting for them to come • improve skills, IPV and disclosure • involvement of professional staff in index because they are most trusted by patients and not lay counselors or community volunteers • improve quality of care by improving the conditions of services for healthcare providers •
12	Other additions to improved HIV testing.	• Engage owners of bars, lodges to meet the key pop • Motivation of providers • introduce community testing/ hotspots • being passionate and real about the job, carrying it at heart • ensure that screening tool is used correctly, only test those who are eligible • improve on documentation • flat out index testing, sensitization in the field/community on index testing

		• motivation and support from management • refresher courses/orientations, reach-out to those who are hard to reach/ adolescents & men • engage work supervisors'/company supervisors/incorporate index with other services • introduce deliberate policies that support index testing • inform the community on index testing/sensitization

Results Following the Interventions

Total number of 384 index clients were enrolled in the study (140 from Matero Level 1 Hospital, 124 from Matero Main Clinic, and 120 from George Health Centre). Total number of 384 index clients were enrolled in the study (140 from Matero Level 1 Hospital, 120 from George Health Centre, and 120 from Matero Main Clinic) (Table 7).

Table 7. Number of participants (index cases) by sex, month, and facility

Month/Sex	Matero level 1		Matero Main		George		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
March 2020	16	15	11	19	4	5	31	39
April 2020	18	13	9	18	9	8	36	39
May 2020	11	12	14	15	14	7	39	34
June 2020	7	18	6	10	28	18	41	46
July 2020	15	15	11	11	15	12	41	38
Total	67	73	51	73	70	50	188	196
Grand Total	140		124		120		384	

Of all the cases, 70 were enrolled in March, 75 in April, 73 in May, 87 in June, and 79 in July 2020. The mean age for the 384 enrolled clients was 35.5 ranging from 18 to 64 (SD = 8.930).

Marital status: 327 were married and 57 not married. Participants by entry point were as follows: 293 from PICT (76.3%) and 91 from CICT/VCT (23.7%).

The number of contacts elicited were 668 (elicitation ratio = 1:2). 187 clients elicited 1 contact each, 123 clients elicited 2 contacts each, 64 clients elicited 3 contacts each, 9 clients elicited 4 contacts each, and only 1 client elicited 5 contacts.

From the total number of 668 contacts, 333 were males and 335 were females. The mean age of contacts was 34.5, ranging from 18 to 68 (SD = 8.638). Out of 668 elicited contacts, 384 were main partners to index contacts (57.5%), 277 were secondary partners (41.5%), and only 7 were casual relationships (1%). 518 contacts were married, 147 were not married, 2 widows, and 1 divorced.

The results for referral of index contacts are presented in the following table. (Table 8).

Table 8. Index testing notification type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		384	100.0	100.0	
	Passive referral	32	8.3	8.3	8.3
	Provider referral	352	91.7	91.7	100.0
	Total	384	100.0	100.0	

Referral type: 352 provider referrals (91.7%) and 32 passive referrals (8.3%). Of the 668 elicited contacts, 639 were reached with HIV index testing services and 29 were not reached. Out of the 639 contacts reached, 79 were known HIV positive and 560 were eligible for HIV test.

Table 9. Index Contact HIV testing status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive	320	47.9	47.9	47.9
	Negative	240	35.9	35.9	83.8
	Not tested	29	4.3	4.3	88.2
	Known Positive	79	11.8	11.8	100.0
	Total	668	100.0	100.0	

Following the HIV index testing, 320 tested positive and 240 tested negative, representing a positivity yield of 57% (320/560) (Table 9).

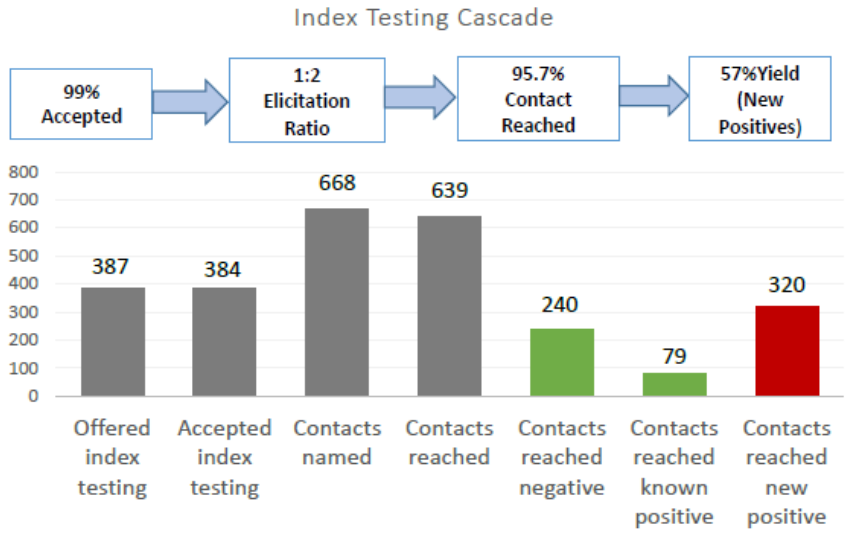

Figure 2. Index Testing Cascade

Figure 2 shows the index testing cascade from contacts offered HIV test to those who tested positive.

Of the 320 positive clients, 154 were males (48.1%) and 166 females (51.9%). The mean age for newly diagnosed HIV positive clients was 34 years (from 18 to 62 years, SD = 8.711). Out of the 154 new HIV positive men, 136 were between 25 and 49 years representing 88% (including 93 middle aged men aged 25 to 40 years). Only 4.5% (7/154) new positives were adolescent boys and young men (15 to 24 years old). The proportions of new HIV positive adolescent girls and young women between the age of 15 and 24 years were 24.7% (41/166).

The time elapsed from elicitation to testing of the 560 eligible index contacts was as follows: 473 within seven days (84.5%), 66 within two weeks (11.8%), 19 within four weeks (3.4%), 2 beyond a month (o.3%). Time from testing to ART initiation of the 320 new positives = 302 within seven days (94%), 15 within two weeks (4.7%), 1 within four weeks (0.3%), 2 not linked (0.6%).

Of the 320 positive clients, 154 were males (48.1%) and 166 females (51.9%). The mean age for newly diagnosed HIV positive clients was 34 years (from 18 to 62 years, SD =

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The above data was analyzed and the results indicate that there was no significant association between gender and HIV positive result (Chi square value = 1.050, p = 0.306). This study also shows that contact testing positive for HIV was independent of gender (alpha significance level > 0.05).

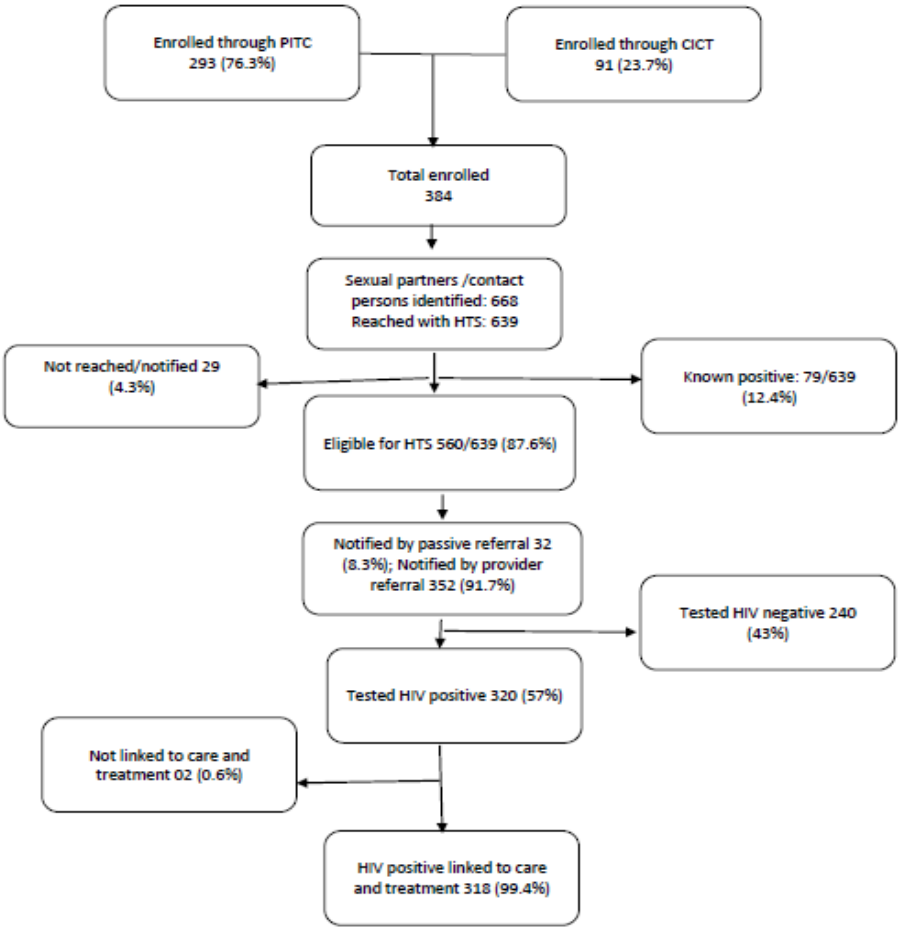

Figure 3. Index flow chart

Figure 3 discusses the steps of index testing from enrollment or entry point to enrollment to care and treatment for new HIV positive patients.

Discussion

At baseline, most index clients (98.5%) had documented evidence of starting ART within 7 days of HIV diagnosis. This demonstrates strongly that the test and start strategy is being implemented to scale in Matero urban sub-district of Lusaka. There was an elicitation of 845 contacts out of 604 cases, giving us a low elicitation ratio of 1:1.4. There was not much difference between gender for elicited contacts (423 males and 422 females).

A total number of 565 index contacts were eligible for HIV test. 113 of them tested HIV positive, representing a positivity yield of 20%. This index testing positivity yield was below the expected yield of above 25% as reported by several other studies [5-13]. The linkage rate for positive contacts was 79.6% at

the time. The calculated Chi-Square test value was 0.498 and the p value was 0.481. This result is not significant since p value (0.481) is greater than the designated alpha level (0.05), so we'd accept the null hypothesis that asserts the two variables are independent of each other. Therefore, there was no association between the gender of the contact and their HIV testing status.

In the qualitative phase of this research, barriers to accessing HTS were divided into provider- and client-related challenges.

Provider-related challenges: Inadequate elicitation skills among the newly trained community healthcare workers, treatment supporters and counsellors; trained providers such as healthcare workers were not fully involved; low number of volunteers trained in index testing; inadequate index testing knowledge among staff; limiting elicitation of index partners to only wife and husband (not eliciting all sexual partners); and limited transport for contact tracing (long distances to reach contacts).

Client-related challenges: Mobile communities due to seasonal activities such as cross boarder trades (e.g. truck drivers), sex work and farming; some index clients do not live in the same district/town as the index clients; key populations and adolescents index clients do not have contact details for some of their contacts; missing details on client locator forms or wrong details provided; and limited space dedicated to conduct elicitation of index clients (lack of privacy).

These findings are in keeping with evidence from other studies [2-5], that showed that non-disclosure of HIV status (due to fear of marital discord), non-disclosure and under-disclosure of the number of sexual partners by the index clients, fear of negative consequences, difficulties notifying past or casual partners, geography/remote partners, and risk perception were major barriers for using testing services. Key populations and people with casual partners were less able or willing to identify partners. Barriers to partner notification services also included concerns around privacy/confidentiality and intimate partner violence. Lack of awareness of risk for HIV infection/ misconceptions; structural, psychological, financial, were barriers to being tested.

Following the interviews with key informants, the following were implemented solutions to address identified challenges:

1. Peer pairing approach using experienced counselors and hand holding mentorship; Pairing treatment supporters to newly tested HIV positives clients for index testing and treatment support;
2. Training facility-based volunteers and healthcare workers (Nurses, Clinical officers, Medical officers etc.) in index testing.
3. Setting up network of counselors to reach contacts not in the same catchment as the index clients.
4. Providing transport to follow up clients (index contacts): additional vehicles needed or support transport refunds.
5. Identifying and allocating dedicated space for elicitation using experience counsellors.
6. Improving appointment system: after hours, weekends and men's clinics.
7. Ensuring correct, complete and consistent documentation in all registers.

The index testing elicitation ration improved from 1:1.4 at baseline to 1:2 at the end of the project.

As in several other literatures, our study findings show that following appropriate interventions addressing barriers to index testing, the testing positivity rate improved from 20% to 57%. Many studies have shown that index partner testing has the potential to increase HIV testing services (HTS) uptake; identify and diagnose HIV infected partners (yield ranging from 35% to 62% without reported intimate partner violence (IPV).

The data was analyzed and the results indicate that there was no significant association between gender and HIV positive result (Chi square value = 1.050, p = 0.306). This study also shows that contact testing positive for HIV was independent of gender (alpha significance level > 0.05).

Strengths and Limitations of the Research

Some studies have tackled the issues of barriers to successfully referring partners for testing [5, 9], but were not specific to gender or age. Alternative strategies to target and provide acceptable and accessible HIV testing services to gender and age-specific populations are addressed in this study. This study also addresses the gap of limited literature on HIV index testing in developing settings.

We used convenience sampling to explore barriers and facilitators of index testing. One other limitation was that the key informants in this research were only healthcare providers.

The perspective of HIV positive clients themselves was not explored in this study to balance the information bias.

Our findings may differ in settings with lower HIV prevalence. This may result in more stigma for HIV infected individuals and more reluctance to HIV status disclosure to sexual partners.

These findings have limitations. One limitation of the study was that we excluded index clients or partners for IPV reporting; if not, these participants might have been reluctant to notify their sexual partners, leading to accrued fewer HIV testing outcomes, and therefore biasing the results away from the null hypothesis. Not all partners were tested, and those who participated differed from those who did not by gender and age. Additionally, our data do not include all HIV tests received by partners as a result of notification in the HIV program, but rather only those who were offered and accepted to take part in the study. We may have therefore underestimated the number of partners tested for HIV.

Summary

Introduction: As the proportions of people living with HIV who do not know their HIV infection status decrease, reaching the last mile of those who are asymptomatic and not in contact with the health care system becomes a critical challenge. Therefore, reaching the first 90 will require effective and efficient HIV testing approaches. The number of people living with HIV who know their HIV status and that of those who receive antiretroviral therapy could increase by the expansion of index testing services.

Methods: This project used an explanatory sequential mixed-methods study design. The specific objectives were:

1. to understand the perceived facilitators and barriers to HIV partner testing from the perspective of the health-care provider;
2. to propose interventions necessary for improved HIV case finding;
3. to reach high risk but hard to reach populations in HIV programs such as middle aged men, and adolescent girls and young women (AGYW).

The permission to conduct this study was obtained from the Lusaka provincial health office before its commencement. Ethical clearance was sought and obtained from the ERES Converge research ethical committee. Authority to conduct research was sought from the National Health Research Authority.

Results: The HIV test outcomes for index contacts were as follows:

Baseline

452 index contacts (53.5%) tested HIV negative, 113 index contacts (13.4%) tested HIV positive, 108 index contacts (12.8%) were known HIV positive, and 172 index contacts (20.4%) were not yet tested for HIV. Of the 113 contacts who tested HIV positive,

90 index contacts started ART within 7 days (79.6%).

End line

Total number of 384 index clients were enrolled in the study (140 from Matero Level 1 Hospital, 124 from Matero Main Clinic, and 120 from George Health Centre). Number of contacts elicited: 668 (elicitation ratio = 1:2). 187 clients elicited 1 contact each, 123 clients elicited 2 contacts each, 64 clients elicited 3 contacts each, 9 clients elicited 4 contacts each, and only 1 client elicited 5 contacts. Total number of 668 contacts: 333 males and 335 females. The mean age of contacts was 34.5, ranging from 18 to 68 (SD = 8.638). HIV status: 320 tested positive, 240 tested negative, 29 not tested, 79 known positive. Positivity yield = 57% (320/560).

Of the 320 positive clients, 154 were males (48.1%) and 166 females (51.9%). The mean age for newly diagnosed HIV positive clients was 34 years (from 18 to 62 years, SD = 8.711). Out of the 154 new HIV positive men, 136 were between 25 and 49 years representing 88% (including 93 middle aged men aged 25 to 40 years). Only 4.5% (7/154) new positives were adolescent boys and young men (15 to 24 years old). The proportions of new HIV positive adolescent girls and young women between the age of 15 and 24 years were 24.7% (41/166).

The above data was analyzed and the results indicate that there was no significant association between gender and HIV positive result (Chi square value = 1.050, p = 0.306). This study also shows that contact testing positive for HIV was independent of gender (alpha significance level > 0.05).

Discussion

Barriers Identified include the following:

1. **Provider related challenges:** Inadequate elicitation skills among the newly trained Community healthcare workers, treatment supporters and Counsellors; trained providers such as healthcare workers not fully involved; Low number of volunteers trained in index testing; inadequate Index testing Knowledge of among staff; Limiting elicitation of Index partners to only wife and husband (not eliciting all sexual partners); and limited transport for contact tracing (long distances to reach contacts).
2. **Clients related challenges:** Mobile communities due to seasonal activities such as cross boarder trades (e.g. truck drivers), sex work and farming; some index clients do not live in the same district/town as the index clients; key populations and adolescents index clients do not have contact details for some of their contacts; missing details on client locator forms or wrong details provided; and limited space dedicated to conduct elicitation of index clients (lack of privacy).

Interventions implemented were:

1. Peer pairing approach using experienced counsellors and hand holding mentorship.
2. Pairing treatment supporters to newly tested HIV positives clients for index testing and treatment support.
3. Training facility based volunteers and healthcare workers (Nurses, Clinical officers, Medical officers etc.) in Index Testing.
4. Setting up network of counsellors to reach contacts not in the same catchment as the index clients.
5. Providing transport to follow up clients (index contacts): Additional vehicles needed or support transport refunds.
6. Identifying and allocating dedicated space for elicitation using experience counsellors.
7. Improving appointment system: After hours, week-ends and men's clinics.
8. Ensuring correct, complete and consistent documentation in all registers.

As in several other literatures, our study findings show that following appropriate

interventions addressing barriers to index testing, the testing positivity rate improved from 20% to 57%.

Conclusion

HIV index testing services are an effective way for improved HIV case identification. The challenges identified have future implications for index partner testing. These barriers were also gender and age specific. HIV testing services need to adapt to the social context of Zambia where HIV-related stigma and discrimination is still persistent and overwhelming. HIV programs need to explore and address barriers to HIV partner testing services to maximize HIV case identification. As Zambia makes significant progress towards achieving HIV epidemic control, more effort is needed to reach specific high risk, but hard to reach populations in HIV programs, such as men, adolescent girls and young women.

We believe that our findings, in combination with previously published and presented data, show that assisted partner services is an efficacious and acceptable public health intervention that needs to be brought to scale in low-income and middle-income countries.

Disclosure/Conflict of Interest

The author reports no conflicts of interest in this work.

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