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Integration of a social network strategy into index testing to increase HIV case finding among Haitian migrants and their descendants in the Dominican Republic

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Abstract

Introduction Increasing effectiveness, efficiency, and reach of HIV case-finding strategies among priority populations is essential for epidemic control. Index testing is effective but presents potential risks, including stigma, violence, abandonment, and challenges such as fear of disclosure and reluctance to list contacts. We integrated the enhanced peer outreach approach (EPOA) social network strategy into index testing to increase case finding among Haitian migrants and individuals of Haitian descent in Dominican Republic.

Methods The index-EPOA intervention implemented in two successive projects in the Dominican Republic offered index clients index-EPOA referral coupons to distribute to contacts. We analyzed retrospective client records from routine, aggregate program data. We compared overall case-finding rates pre-intervention (baseline October 2019–December 2020) and post-intervention (midline January 2021–March 2022; endline April 2022–June 2023), and case finding for index-EPOA versus standalone index. We calculated case-finding differences using the Student t-test.

Results HS3/EHSEC tested 7,305 contacts of index clients, with 23% case finding. At baseline, 1,234 contacts were tested through standalone index, identifying 211 HIV-positive contacts with case finding at 17%. During the roll-out of the intervention, the case-finding rate for standalone index testing remained similar to baseline (16%), while the rate for index-EPOA was 33%. Combined case finding for standalone index and index-EPOA increased to 22% at midline and 29% at endline, resulting in an overall case-finding rate of 25% during the intervention. The statistical analysis found overall case finding post-intervention (combined case-finding rate of 25% at midline + endline for standalone index and index-EPOA) significantly higher than at baseline (17% standalone index) ($p < 0.001$; 95% CI 8.5%–9.2%). Statistical significance of overall case-finding rates pre- and post-intervention was observed when disaggregated by sex: females 19% versus 26% ($p < 0.001$; 95% CI 7.2%–7.9) and males 15% versus 23% ($p < 0.001$; 95% CI 10.1%–10.9%).

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Conclusions Integrating the EPOA into index testing strengthened overall case finding for index testing among Haitian migrants and individuals of Haitian descent in the Dominican Republic, suggesting hybrid strategies can maximize program resources and impact.

Keywords HIV testing, HIV case finding, Index testing, Social network strategy, Priority populations, Migrants, Dominican Republic

Introduction

HIV testing is the gateway to epidemic control because knowing the status of a client or oneself is the guidepost for subsequent action. However, the complexity of connecting those at risk of HIV with testing and other HIV services mirrors the challenges affected populations face in the legal, economic, societal, cultural, and safety realms, and as regards human rights including the right to health care. Key populations (KPs)—sex workers, men who have sex with men (MSM), transgender people, and people who use or inject drugs—are particularly affected, as are priority populations (PPs) at high risk of HIV, such as youth, orphans and vulnerable children, adolescent girls and young women, men who purchase sex, refugees, and migrants.

One recommended method for reaching individuals with HIV testing services (HTS) is through index testing. Index testing is an effective HIV case-finding strategy that targets the exposed contacts of "index clients"—that is, people identified through HIV testing as living with HIV—for HTS. It is a voluntary process whereby counselors and health care workers propose that index clients list their sexual and injecting drug partners and their biological children. If the index client agrees, each listed partner and child is contacted through the index client's preferred modality and offered voluntary HTS. The World Health Organization (WHO) has supported scale-up of index testing since 2016 [1] and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) recommends that in countries with 70%–80% antiretroviral therapy (ART) coverage, effective, safe, and ethical index testing should be offered to every person newly diagnosed with HIV [2].

However, index testing does come with some challenges, such as potential risk of stigma, discrimination, violence, or abandonment to index clients or their contacts due to HIV status or participation in index testing; the difficulty of locating and contacting the contacts of the index client, especially if they are undocumented, mobile, or live in remote areas; and issues around confidentiality and disclosure that might prevent the index client from naming their contacts.

Social and sexual network-based recruitment offers additional approaches for reaching individuals at risk for HIV infection who have challenges to accessing HTS. Targeted HIV testing through social networks has proven to be a very effective case-finding strategy that improves the efficiency of HIV testing efforts and accelerates the overall potential for linking and retaining individuals in HIV services [3] and increases HIV case-finding rates [4] and testing uptake [5]. The social network strategy (SNS) is grounded in the idea that members of a social network share the same or similar risks for HIV, tend to trust each other, and may be more willing to adopt behaviors endorsed by members of their network. The approach was designed to extend programming beyond geographical areas given that stigma, discrimination, violence, and criminalization have driven many individuals facing the highest risks into hiding.

SNS has been implemented extensively in FHI 360-led projects through the enhanced peer outreach approach (EPOA). EPOA uses performance-based incentives and works through social and sexual networks to improve HIV case-finding outcomes [8]. In this approach, trained peer outreach workers invite members of their network to become peer mobilizers who, in turn, reach out to their social and sexual networks to encourage peers to get tested for HIV and seek other related services. HIV case finding through EPOA has been demonstrated as higher than in standard testing strategies at a statistically significant level [9]. Thus, scaling up index testing and SNS, including EPOA, within HTS is critical to achieving the first 95 goal (95% of people living with HIV [PLHIV] aware of their status) [10], particularly among hard-to-reach KPs and PPs.

In the Dominican Republic, Haitian migrants and their descendants figure among the local groups at high risk of HIV in the country, where the national HIV prevalence is 0.9% among the country's 10.2 million inhabitants. An estimated 78,000 people are living with HIV, 85% of whom know their serological status and 55% of whom are currently on treatment [2, 11].Haitian migrants and individuals of Haitian descent make up approximately 6.7% (751,080) of the country's population and 33.8% (27,215) of the estimated PLHIV [12]. HIV prevalence among this group is estimated at 4.6% [13, 14], compared to 5.2% among Dominican MSM, 4.5% among Dominican female sex workers, and a general population prevalence of 1.8% in Haiti [11]. Of the Haitian migrants and individuals of Haitian descent living with HIV in the Dominican

Republic, 40.7% know their serological status and 27.5% are currently on treatment (Spectrum 2022 data) [12].

Factors that may increase the risk for HIV infection and transmission among Haitian migrants and individuals of Haitian descent may also present barriers to HIV testing. These include being undocumented migrants constantly under the threat of the immigration authorities; having low literacy and a language barrier [15]; stigma resulting in social exclusion, harassment, discrimination in health care settings, and internalized stigma due to HIV status [16]; lack of a clear national policy for cross-border referrals or follow-up of Haitian migrants living with HIV [15]; and poverty. These factors can deter them from accessing HIV services, including HIV treatment even when aware of positive HIV status, as well as disclosing their status to others including to their sexual and injecting partners.

The 2019 and 2020 PEPFAR country operational plans for the Dominican Republic reported index testing uptake as low [17, 18]. Indeed, in December 2020, the FHI 360-led HIV Services and System Strengthening (HS3) project reported case finding through index testing in the project-supported areas as 17% against the PEPFAR benchmark of 20%. Although all providers in the HS3-supported teams were trained and regularly mentored on index testing, reaching the contacts of the index clients was challenging. Index clients' fears related to stigma and breach of confidentiality made them unwilling to disclose their status to their contacts, disclose or provide accurate contact information for the contacts to providers, or share the contact information of their secondary partners.

Following PEPFAR's recommendation to increase the availability of index testing in the Dominican Republic, and leveraging FHI 360's success in the country using EPOA to identify previously unreached Haitian migrants and individuals of Haitian descent living with HIV [19], HS3 (2019–2022) designed an approach that integrated index testing and EPOA for rollout among this population. HS3 and the follow-on Enhanced HIV Services for Epidemic Control (EHSEC) project (2023–2028) then implemented the integrated testing approach. Here we describe the index-EPOA approach and case-finding results among Haitian migrants and individuals of Haitian descent in the Dominican Republic.

Methods

Setting

The HS3 and EHSEC projects have provided support for HIV services in five of the 31 provinces in the Dominican Republic: La Romana, National District, Monte Plata, San Pedro Macoris, and Santo Domingo. There are 72 ART clinics in the country, 15 of which were supported by HS3. Through the project, teams of trained clinical providers and peer outreach workers who spoke Spanish and Haitian Creole offered navigation and HIV clinical services in alignment with national policy and guidelines, including HIV testing, prevention services including pre-exposure prophylaxis (PrEP), and treatment services at community sites and government and civil society organization (CSO)-led health facilities. HS3 and EHSEC provided subgrants to CSOs to offer HIV testing in the community or at their own facilities, ART services, as well as to navigate clients to the public facilities for testing and ART, as needed, according to client preference. Community clinical sites were located at hot spots—defined as areas of high HIV vulnerability, including streets, bars, clubs, brothels, markets, and squares where individuals engage in HIV high-risk behaviors. Hot spots were identified through a standardized mapping activity conducted through the support of key informants and peer networks. The geographic coordinates and characteristics of hot spots (i.e., typology, estimated number of clients supported by the project, key days and hours when project clients gathered, nearby services of interest) were documented in encrypted files. Community HTS was typically offered in community spaces temporarily rented by the project and at client residences.

Aim and design

The aim of our analysis was to learn the case-finding rates achieved through standalone index testing and the integrated index-EPOA approach among Haitian migrants and individuals of Haitian descent in the Dominican Republic served through the HS3 and EHSEC projects.

We analyzed retrospective client records using routinely collected, aggregated program data for clients meeting the inclusion criteria in four of the five project-supported provinces: La Romana, Monte Plata, National District, and Santo Domingo. Although the projects' geographic coverage area was larger, we selected only the provinces where index testing and index-EPOA were consistently implemented across the entire period of analysis.

We accessed the program data on November 22, 2023, for three program reporting quarters: baseline (October 1, 2019–December 31, 2020), midline (January 1, 2021–March 31, 2022), and endline (April 1, 2022–June 30, 2023). We compared the number of Haitian migrants and individuals of Haitian descent living with HIV identified through the standalone index testing modality to those identified through the integrated index-EPOA modality from baseline to endline. We also compared case-finding rates from standalone index testing versus index-EPOA before implementation of the intervention integrating

EPOA into index testing (at baseline) and after implementation (at midline and endline).

Participants

The program participants whose data we analyzed were Haitian migrants and individuals of Haitian descent served through HS3 and EHSEC. Individuals were classified as Haitian based on self-identification as Haitian migrants (individuals born in Haiti to Haitian parents) and individuals of Haitian descent were those who self-identified as born in the Dominican Republic to at least one Haitian-born parent. Inclusion criteria were being ages 15 years and older and index clients or elicited contacts of Haitian migrants and individuals of Haitian descent.

Interventions

Beginning in January 2021, the HS3 project added index-EPOA testing to the existing standalone index testing and standalone EPOA approaches, described below, with Haitian migrants and individuals of Haitian descent at the health facility and community levels. The three approaches were implemented by HS3 and continue under the follow-on EHSEC project. Peer outreach workers and health care providers engaged through the CSO partners provided the testing services. All were speakers of Spanish and Haitian Creole and were trained and accredited by the Ministry of Health. They included various cadres such as nurses, HIV counselors, laboratory technicians, and peer outreach workers.

All HIV testing in the interventions was offered in compliance with WHO's essential 5Cs: consent, counseling, confidentiality, correct test results, and connection to appropriate HIV prevention and treatment services [20]. The testing algorithm followed the national protocol: The Determine rapid test was conducted first, followed by a confirmatory second test using Unigold for clients reactive in the first test, and then ELISA as a third test if the Unigold test was nonreactive. Both Determine and Unigold rapid tests were procured through the national supply chain system, offered at both the community and health facility levels, used finger prick, and provided results within 20 min; clients were advised to wait for the test results. Blood samples collected in the community for the ELISA test, which was only offered at the facility level, were transported by the project.

For all testing modalities, clients who tested positive were offered ART at the point of diagnosis and in alignment with the national test-and-treat strategy, while those testing HIV negative were offered PrEP and other tools for HIV prevention (e.g., condoms and lubricants).

Index testing

As part of HTS, the project offered index testing to all Haitian migrants and individuals of Haitian descent living with HIV. The index clients could choose from the following options for offering testing to their elicited contacts: client referral (index clients refer contacts to HTS), provider referral (provider reaches out to the elicited contacts directly to offer HTS without disclosing the index client), contract referral (index client agrees to refer their contacts to HTS within a certain period), and dual referral (provider and index client jointly offer HTS to the contacts).

The project ensured that all index testing was provided in alignment with PEPFAR's Guidance on Implementing Safe and Ethical Index Testing [21]. Index testing was voluntary. Pre- and post-test counseling was provided to index clients and their contacts to ensure their understanding of the benefits and risks of index testing and their rights to confidentiality and autonomy. Written informed consent was obtained prior to testing and elicitation of the contacts. Confidentiality was secured and monitored through provider use of a standardized questionnaire and procedures for inquiring about intimate partner violence [22]. Contacts were assessed for intimate partner violence, and the index client was offered first-line support if violence was disclosed. Lastly, an adverse event monitoring and reporting system was put in place through which index clients could report any negative impact they experienced during or following index testing to the service delivery provider or peer outreach workers.

Index-Enhanced peer outreach approach (EPOA)

The project offered EPOA as a standalone testing strategy [15] and index testing combined with EPOA (hereafter "index-EPOA"), the results of which we report as combined in the analyses presented here. In standalone EPOA, the peer recruiters were trained to identify and distribute coupons marked "EPOA" to peers at high risk within their networks. Peers at high risk were defined as reporting at least one of the following behaviors: condomless sex within the last six months, sex with a known HIV-positive partner, never been tested for HIV, sex worker, man who had had sex with another man, transgender person, or injection drug user.

The peer recruiters received a financial incentive for each Haitian migrant and individual of Haitian descent they had referred to HTS who presented the EPOA coupon; payment of the incentive was independent of the test result. The value of the monetary incentive was determined based on consultation with the Haitian migrants and individuals of Haitian descent.

In the integrated index-EPOA approach, coupons marked "index-EPOA" were issued to index clients who did not want to disclose their contacts during the index testing elicitation process, as well as to index clients with contacts they wanted to notify and refer on their own. Index clients were also offered the option to identify and distribute coupons labeled "EPOA" to other peers at high risk for HIV within their social network who were not necessarily a sexual and/or injecting partner of the index client. Providers were trained how to explain to index clients which coupons they should distribute to contacts (index-EPOA) versus peers (EPOA).

The unique identification code of the index client was printed on all coupons distributed by the index client. Through this system, the individuals accessing the project-supported sites who presented an EPOA coupon were recorded as EPOA clients and attributed to the appropriate index client, while those presenting an index-EPOA coupon were recorded as index-EPOA and credited to the appropriate index client. As with standalone EPOA, an incentive was provided to the referring individual who had distributed the coupon—in this case the index client—based on the coupons turned in by the contacts or peers, irrespective of their test results. The incentives were distributed weekly by the project coordinator in an amount that aligned with the standalone EPOA incentive.

Data collection and analysis

The aggregated data were routinely collected by providers using HTS and index testing recording and reporting tools, as well as the EPOA coupon tracker. As noted above, identification and recording of which HTS recruiting approach had brought in a particular client was determined by the coupon presented, marked as EPOA (standalone) or index-EPOA. Clients who accessed HTS without a coupon and reported having a known HIV-positive partner during the HTS counseling were recorded as having been referred through standalone index testing.

Data were summarized and reported weekly and monthly. Prior to analysis, we disaggregated the data by age, sex, and HIV test result. We calculated the case-finding rate (defined as the number of clients living with HIV among those tested) by testing modality (standalone index and index-EPOA) and the "testing index" indicator. Testing index was defined for standalone index testing as the number of contact clients tested divided by the number of index clients, and for index-EPOA as the number of "secondary clients" who completed testing following social network divided by the number of index clients making referrals/distributing coupons.

For the statistical analysis, the difference in case finding at baseline (prior to the index-EPOA intervention) and follow-up (after implementation of the index-EPOA intervention) was calculated using the Student t-test. Along with the t-test, we calculated the point estimate of the difference in proportions, which serves as the best single estimate of the effect size observed between the groups. To assess the precision of this point estimate, we derived a 95% confidence interval (CI), indicating the range within which the true difference in proportions is likely to fall with 95% confidence. Differences greater than 0.05 were deemed to be statistically significant.

Baseline data consisted of reporting from October 2019–December 2020 (pre-intervention), while the follow-up period post-intervention was midline + endline (January 2021–June 2023).

Data quality

Client information was entered into paper-based index and index-EPOA tools for monitoring and evaluation using a unique identification code based on a 13-digit alphanumeric code and client demographic characteristics. The data entry clerks reviewed the data on the paper-based forms for completeness and consistency before entering them into the electronic database. All data were regularly validated through the project's established processes for data quality assurance using data triangulation between the paper tools and the electronic database. Built-in validation rules within the database mitigated data entry and transcription errors. At the end of each day, a gap analyzer was run on the database to identify data errors, which were then checked against the source documents and cleaned.

To minimize the risk of misclassification, the clients were identified through geographic targeting for the project services—that is, offering the services at specific locations where the people were primarily Haitian migrants and individuals of Haitian descent. Peer outreach workers were trained on the definitions of client categories, and the project coordinator verified client category data with the clients during supervision visits to the service delivery sites. In addition, prior to monthly reporting, the project team made random phone calls to clients who had accessed HIV testing services as a mean to further validate the data.

Prior to the weekly and monthly reporting, any gaps and outliers identified were reconciled, and data were regularly de-duplicated using the unique identification code. Testing data were also de-duplicated by testing venue to avoid the same client being reported twice when testing at the community and facility levels within the same reporting period. This approach played a pivotal role in mitigating the risk of data fraud associated with index-EPOA, given that it is an incentivized testing strategy, as well as ensured data quality and integrity. As part

of data quality assessment, the project also placed random calls to the contacts to verify their identity and use of HTS.

Ethical considerations

The request to use HS3 and EHSEC programmatic data for this analysis ("Maximizing the use of routine data in the PEPFAR-Funded Enhanced HIV Services for Epidemic Control project in the Dominican Republic: going beyond bean counting," reference no. 2136207–1) was reviewed and approved by the Protection of Human Subjects Committee at FHI 360 and given a determination of not human subjects research; given this determination, it was not reviewed by a local ethics committee. All data included in our analysis were aggregated, deidentified data extracted from routine project performance reports. These reports were prepared and used for routine program monitoring and improvement and are publicly available. No additional data were collected from clients beyond those for the routine programming reporting. Per Dominican Republic government guidelines, all program clients signed consent forms which covered data collection and the use of programmatic data for analytical purposes; these forms remain in their client files. Also, per government regulations, is not necessary to obtain parental consent for individuals ages 15 and older. At no point did the authors have access to individual-level data or personally identifiable information.

All clients received pre- and post-test counseling before and after the HIV testing in alignment with national guidelines. All HIV testing was voluntary and provided only upon written client consent. Clients who tested HIV positive were offered index testing counseling. All tests were conducted by providers trained and certified in HTS and in accordance with privacy, confidentiality, safety, and security standards.

An electronic system to monitor potential adverse events was established for documentation of coercion, violence, and any other negative effects occurring during or following standalone index testing and index-EPOA. During pre- and post-test counseling, providers explained to clients the process for reporting events potentially associated with routine testing, index testing, and index-EPOA. The index clients, contacts, and referred peers were given the peer outreach worker's contact information and advised to reach out in the case of an adverse event; the peer outreach worker would report the adverse event to the HTS provider; and the HTS provider would inform the project site coordinator, technical director, and chief of party, who would launch an investigation. The project site coordinator was responsible for documenting the case in the electronic monitoring platform and linking the client to the relevant services.

Results

From October 2019 through June 2023, the HS3 and EHSEC projects tested 7,305 contacts of Haitian migrants and individuals of Haitian descent living with HIV and identified 1,700 people living with HIV, representing an overall case-finding rate of 23%. In the same period, the project also tested 121,300 Haitian migrants and individuals of Haitian descent through testing modalities other than standalone index testing and index-EPOA. The total tested through these other strategies represented 6% (7,305/128,605) of the total tested through all modalities, with no variations over time (data not shown).

Among all contacts tested, 52% were female, with no difference by age band except for those ages 15–19 years, of whom 51% were male (Table 1). Slightly more than half of those who tested positive were female (55%), for an overall higher case-finding rate of 25% compared to that for male contacts (22%) and remaining higher when disaggregated by age band.

Females represented more than half of those who tested when disaggregated by testing modality—52% and 51% of those who tested through standalone index testing and index-EPOA were female, respectively—and were 55% of those who tested HIV positive in both testing modalities. Case finding was higher among females in all age groups than males in all age groups for standalone index testing (18% versus 16%, respectively), and likewise for index-EPOA (35% versus 30%, respectively). When disaggregated by age band, case finding through both testing modalities remained higher among females than males (Table 2). Although the ratio of case finding among ages 15–19 had the greatest increase, it did not reach statistical significance compared to the other age groups (statistical analysis not shown).

At baseline (October 2019–December 2020), the project tested 1,234 contacts of Haitian migrants and individuals of Haitian descent through standalone index testing, identifying 211 Haitian migrants and individuals of Haitian descent living with HIV, for a case-finding rate of 17% (Fig. 1). At midline (January 2021–March 2022), following the rollout of index-EPOA, overall case finding for both standalone index and index-EPOA increased to 22%, resulting in an increase of 3.6 times the baseline number of Haitian migrants and individuals of Haitian descent testing HIV positive (from 211 to 756). At endline (April 2022–June 2023), overall case finding for standalone index and index-EPOA had increased further to 29%, with 3.5 times more Haitian migrants and individuals of Haitian descent living with HIV found by testing only twice the number of clients when compared to baseline standalone index testing.

Figures 2 and 3 present the number of clients tested (Fig. 2) and tested positive (Fig. 3) by testing modality

Table 1 Contacts of Haitian migrants and individuals of Haitian descent who were tested and tested positive by sex and age band, October 2019–June 2023

	Tested				Tested Positive				Case-finding Rate			
	15–19 Yrs	20–34 Yrs	35 + Yrs	Total (all ages)	15–19 Yrs	20–34 Yrs	35 + Yrs	Total (all ages)	15–19 Yrs	20–34 Yrs	35 + Yrs	Total (all ages)
Male	450	1,548	1,531	3,529	36	330	398	764	8%	21%	26%	22%
Female	438	1,664	1,674	3,776	48	422	466	936	11%	25%	28%	25%
Total	888	3,212	3,205	7,305	84	752	864	1,700	9%	23%	27%	23%

Table 2 Contacts of Haitian migrants and individuals of Haitian descent who were tested and tested positive by sex and testing modality, October 2019–June 2023

	Standalone Index								
Sex	Male				Female				Male + Female
Age	15–19 yrs	20–34 yrs	35+ yrs	Total 15+ yrs	15–19 yrs	20–34 yrs	35+ yrs	Total 15+ yrs	Total 15+ yrs
Tested	333	873	850	2,056	315	933	994	2,242	4,298
Positive	13	145	161	319	24	174	199	397	716
Case-finding rate	4%	17%	19%	16%	8%	19%	20%	18%	17%
	Index-EPOA								
Sex	Male				Female				Male + Female
Age	15–19	20–34	35+	Total15+	15–19	20–34	35+	Total 15+	Total 15+
Tested	117	675	681	1,473	123	731	680	1,534	3,007
Positive	23	185	237	445	24	248	267	539	984
Case-finding rate	20%	27%	35%	30%	20%	34%	39%	35%	33%

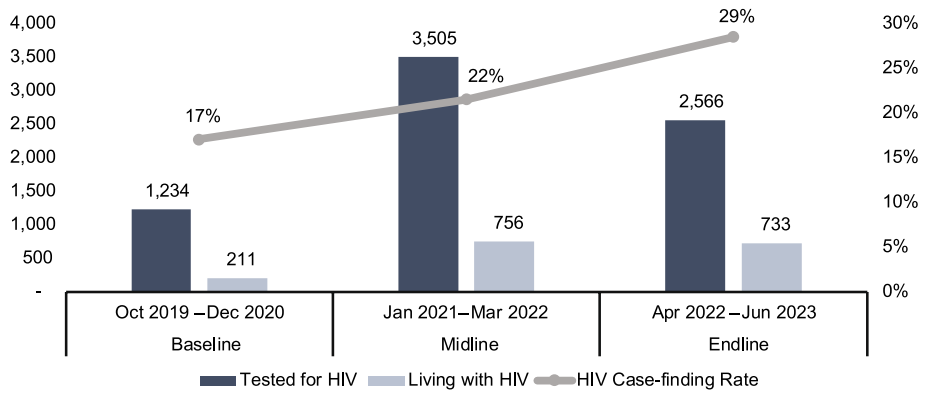

Fig. 1 Overall index testing case finding at baseline (October 2019–December 2020), midline (January 2021–March 2022), and endline (April 2022–June 2023)

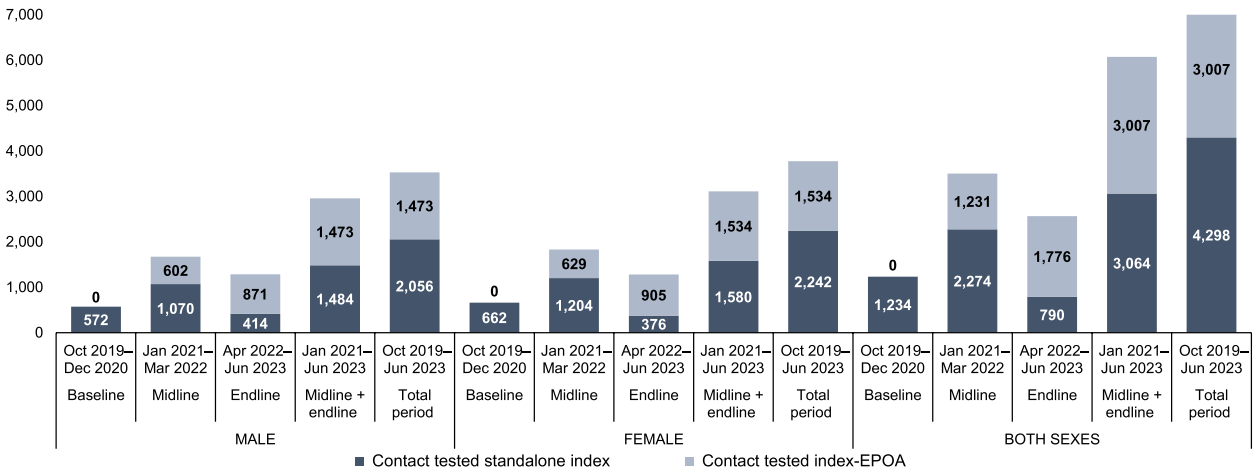

Fig. 2 Contact clients tested by testing modality, sex, and time period

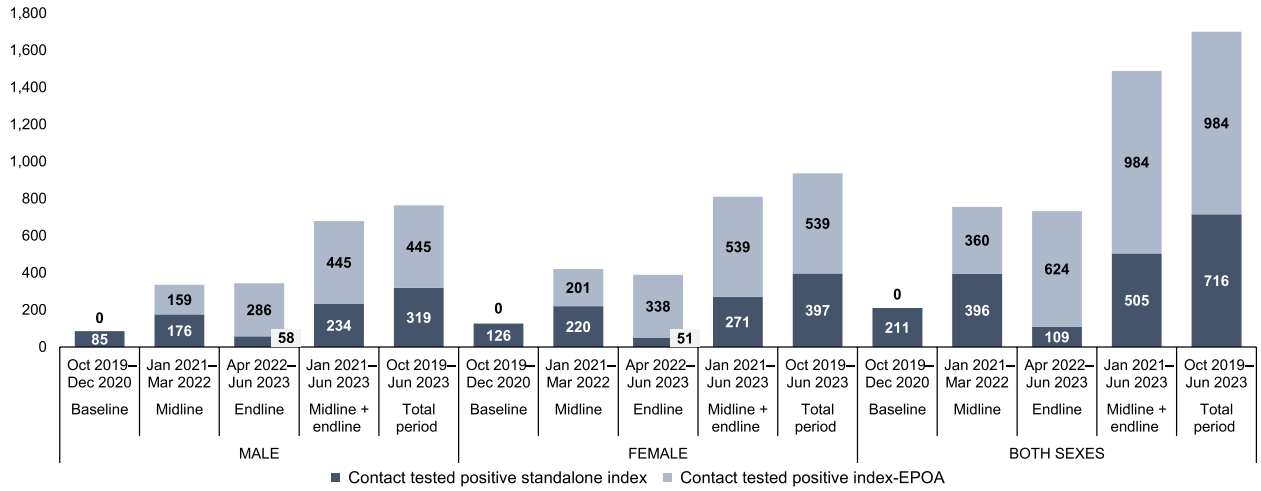

Fig. 3 Contact clients tested positive by testing modality, sex, and time period

(standalone index versus index-EPOA), sex, and time period.

At midline, when both testing strategies were being implemented concurrently, standalone index testing had the same case-finding rate as at baseline (17%), while index-EPOA resulted in case finding 1.7 times higher than through standalone index testing (29% versus 17%, respectively) (Fig. 1). Also at midline, the index-EPOA approach reached a similar number of Haitian migrants and individuals of Haitian descent living with HIV as standalone index testing, but by testing about half of the clients (1,231 versus 2,274, respectively). At endline, a decrease in the number of contacts reached through standalone index testing was observed (from 2,274 at midline to 790 at endline), while index-EPOA testing coverage continued increasing (from 1,231 at midline to 1,776 at endline) along with case finding reaching 35%—more than twice as high as through standalone index testing (14%) (Fig. 1).

When disaggregated by sex, at baseline and at midline the case-finding rate was higher through standalone index testing among females (19% and 18%, respectively) compared to males (15% and 16%, respectively) but was the same in both sexes at endline (14%). Index-EPOA case finding was higher among females than males at both midline (32% versus 26%, respectively) and endline (37% versus 33%, respectively) (Table 3). Furthermore, the testing index indicator for index-EPOA testing was higher than for standalone index testing (1.37 versus 1.09 at midline; 1.41 versus 1.18 at endline; 1.39 versus 1.11 at midline + endline) (Table 3).

In the statistical analysis, the overall case-finding rate after the intervention (25% combined case-finding rate for standalone index and index-EPOA at midline + endline) was significantly higher than at baseline (17% for standalone index) *with a point estimate of an 8% increase* ($p < 0.001$; 95% CI 8.5%–9.2%). Statistical significance of the overall case-finding rates before and after the intervention was also observed when disaggregated by sex, with females having 19% for standalone index testing versus 26% combined case finding for standalone index and index-EPOA testing *with a point estimate of 7% increase* ($p < 0.001$; 95% CI 7.2%–7.9%) and males having 15% for standalone index testing versus 23% combined case finding for standalone index and index-EPOA testing *with a point estimate of 8% increase* ($p < 0.001$; 95% CI 10.1%–10.9%).

Furthermore, case finding through index-EPOA (33%) was significantly higher than in standalone index testing (16%) after the intervention at midline + endline *with a point estimate of 17% increase* ($p < 0.001$; 95% CI 17.6%–19.2%) and significantly higher among females (35%) than males (30%) *with a point estimate of 5% for the difference* ($p < 0.03$; 95% CI 5.2%– 5.9%). The case-finding rate for standalone index testing after the intervention at midline + endline was not significantly higher among females (17%) than males (16%) *with a point estimate of 1% for the difference* ($p < 0.30$; 95% CI 1.0%–1.1%).

During the period of analysis, no adverse events (e.g., coercion, violence) were reported as linked to standalone index and or index-EPOA testing. Unnecessary repeated testing and testing of those known positive were not observed.

Discussion

Haitian migrants and individuals of Haitian descent in the Dominican Republic are disproportionately affected by the HIV epidemic. Knowledge about the

Table 3 Case-finding rate, testing index, and statistical analysis of contacts of Haitian migrants and individuals of Haitian descent by sex and testing modality, at baseline, midline, endline, midline + endline, and for the total period

		Case-finding Rate (CFR)			Testing Index		Difference in CFR Standalone Index Baseline vs. Midline + Endline for Male vs. Female			Difference in CFR Index-EPOA vs. Standalone Index Overall (Male + Female) and for Male vs. Female at Midline + Endline			Difference in CFR Combined Modalities Baseline vs. Midline + Endline Overall (Male + Female) and for Male and Female		
		Standalone Index	Index-EPOA	Both Testing Modalities	Standalone Index	Index-EPOA	Point Estimate	CI 95%	*P*-value	Point Estimate	CI 95%	*P*-value	Point Estimate	CI 95%	*P*- value
Male															
Baseline	Oct 2019–Dec 2020	15%	-	15%			-						-		
Midline	Jan 2021–Mar 2022	16%	26%	20%											
Endline	Apr 2022–Jun 2023	14%	33%	27%											
Midline + endline	Jan 2021–Jun 2023	16%	30%	23%									8%	[10.1%; 10.9%]	< 0.001
Total period	Oct 2019–Jun 2023	16%	30%	22%									-		
Female															
Baseline	Oct 2019–Dec 2020	19%	-	19%			-						-		
Midline	Jan 2021–Mar 2022	18%	32%	23%											
Endline	Apr 2022–Jun 2023	14%	37%	30%											
Midline + endline	Jan 2021–Jun 2023	17%	35%	26%			1%	[1.0%; 1.1%]	< 0.30	5%	[5.2%; 5.9%]	< 0.03	7%	[7.2%; 7.9%]	< 0.001
Total period	Oct 2019–Jun 2023	18%	35%	25%									-		

Table 3 (continued)

		Case-finding Rate (CFR)			Testing Index		Difference in CFR Standalone Index Baseline vs. Midline + Endline for Male vs. Female			Difference in CFR Index-EPOA vs. Standalone Index Overall (Male + Female) and for Male vs. Female at Midline + Endline			Difference in CFR Combined Modalities Baseline vs. Midline + Endline Overall (Male + Female) and for Male and Female		
		Standalone Index	Index-EPOA	Both Testing Modalities	Standalone Index	Index-EPOA	Point Estimate	CI 95%	*P*-value	Point Estimate	CI 95%	*P*-value	Point Estimate	CI 95%	*P*- value
Male + female															
Baseline	Oct 2019–Dec 2020	17%	-	17%	1.14	-	-						-		
Midline	Jan 2021–Mar 2022	17%	29%	22%	1.09	1.37									
Endline	Apr 2022–Jun 2023	14%	35%	29%	1.18	1.41									
Midline + endline	Jan 2021–Jun 2023	16%	33%	25%	1.11	1.39				17%	[17.6%; 9.2%]	< 0.001	8%	[8.5%; 9.2%]	< 0.001
Total period	Oct 2019–Jun 2023	17%	33%	23%	1.12	1.39							-		

most efficient approach for increasing HIV case finding among this population is lacking, but there is evidence that index testing presents challenges in this population due to high levels of stigma and discrimination. They experience high levels of poverty, constant fear of deportation, and frequent accusations of perpetrating crimes and spreading infectious disease [23]. Evidence from other migrant populations shows that the factors that increase their vulnerability to HIV infection and transmission may also serve as barriers to HIV testing, including limited access to health care and insurance, mistrust of health care systems, language barriers, experiences of racism, perceived stigma, poverty, and educational disparities [24].

Our intervention increased overall case finding through index testing from 17% at baseline to 25% at midline + endline. The younger age bands (20–34 years) comprised 44% of those who tested and tested positive for HIV overall in our analysis, which aligns with the 2017 Second National Immigrant Survey (ENI) finding, as reported by the United Nations Development Programme, of a predominantly young population of Haitian migrants and individuals of Haitian descent (39.5% were ages 20–34 years) [25, 26].

Sex distribution in our analysis differed slightly from the ENI report in which Haitian migrants were mostly male (58.3%), versus 48% in our analysis [25, 26]. This distribution did not change when disaggregated by age group or testing modality. The higher representation of females in our study may differ from the ENI report because the latter refers to the overall migrant population in Dominican Republic, whereas we refer to a subset who received HTS.

The higher case finding among females in our analysis suggests their greater vulnerability in facing gender-based barriers and discrimination. This is consistent with U.S. State Department reporting of human trafficking, sexual exploitation, and violence among female Haitian migrants, reflecting their vulnerability to abuse and coercion by traffickers and employers [27].

The statistically significant increase from baseline to endline in case finding overall and through the index-EPOA modality compared to standalone index testing suggests the greater impact of index-EPOA in identifying Haitian migrants and individuals of Haitian descent living with HIV for both sexes. Comparing case finding of index-EPOA by sex at endline, female contacts were found to be better able to access index testing services through the EPOA coupon than their male counterparts, but we do not know the reason for this difference, warranting further investigation. For standalone index testing, there was no statistically significant difference between females and males.

Furthermore, the higher testing index for index-EPOA testing compared to standalone index testing suggests that the hybrid testing index-EPOA resulted in slightly more contacts tested per index client. This finding has important implications, since one challenge of standalone index testing is for index clients to name the whole range of contacts, including not only the formal/stable partner but also other informal/occasional partners, with a further challenge in reaching the latter group, whose contact information is often unavailable or inaccurate [28, 29]. By not requiring clients to name any contacts, the index-EPOA strategy might have cleared this bottleneck, as well as possibly also leading to reaching informal/occasional partners who otherwise might have been missed by standalone index testing. However, we acknowledge that our study did not present information about the elicited contacts who were missed by standalone index testing, and we did not have information on the types of partners who received HTS in both modalities.

This study adds to the growing body of evidence demonstrating the effectiveness of integrating an SNS into index testing to increase case finding, particularly among marginalized and vulnerable populations. In their review of the literature on HIV case-finding strategies among MSM, Campbell and colleagues noted that SNS increased HIV positivity rates from 4 to 31% across the 15 studies included in the review [4]. Similarly, a systematic review and meta-analysis found that SNS significantly improved HIV testing uptake among sex workers, MSM, transgender people, and people who use or inject drugs [6]. Among MSM in Taiwan, a significantly higher HIV positivity rate was found for HIV testing through social networking platforms compared to the traditional voluntary counseling and testing model [5]. Additionally, acceptability and feasibility of HTS effected through SNS was found high in a study among Hispanics/Latinos ages 13–24 years recruited in the U.S. and Puerto Rico [7]. Our findings align with those of a study where reach of individuals at high risk was expanded through an approach integrating social networks and partner testing [30] and, similarly, to results from a trial in Malawi trial where HIV detection was increased by combining three distinct HIV testing and referral strategies—acute HIV infection screening, index testing, and socio-sexual contact networks [31].

This analysis also shows the project's adaptability in shifting its efforts toward a more efficient testing strategy such as index-EPOA, progressively increasing coverage to reach more contacts who might otherwise have been missed by standalone index testing.

Our findings indicate the acceptability and feasibility of integrated index-EPOA, as evidenced by the increased number of contacts of index clients who got tested for

HIV and the increased HIV case-finding rate among these contacts. The increasing coverage of index-EPOA and the concurrent reduction in standalone index testing suggest a preference for the former approach by this specific population, as the index-EPOA testing modality was offered through an opt-in approach. Index clients may have felt more comfortable reaching their high-risk contacts through index-EPOA compared to standalone index testing, as the latter had a potentially higher fear of breach of confidentiality even though disclosure was not required.

The standalone index testing and the index-EPOA testing modalities represented 6% of the total testing modalities implemented during the study period. This percentage distribution did not change over time, suggesting that the introduction of the index-EPOA strategy did not change other testing patterns other thanthe pattern of the standalone index testing.

Incentive-based testing strategies informed by behavioral economics, are now increasingly being tested, with promising results. They have been found to have potential utility when they correspond with participant needs [32], which appears to be the case for our interventions as well. For instance, in Uganda, incentives addressed men's structural, interpersonal and individual-level barriers to testing, because incentives offset costs of testing, in lost wages, which are exacerbated when livelihoods required mobility [33].

However, incentive-based testing strategies may create ethical dilemmas, such as whether they manipulate or exploit vulnerable populations, and can have unintended consequences, for example, coercion or undermining the intrinsic motivation to test for HIV. For these reasons, the project established a monitoring system through which we could track and respond to adverse events in real time. Nonetheless, no adverse events related to standalone index testing, index-EPOA testing, or incentives were reported.

Some studies on SNS have reported many repeat testers and a high number of individuals living with HIV who had already been identified previously, indicating that interest in the incentive may have been the prime motivating factor for recruiters and network associates [34, 35]. However, based on our use of a unique identification code and regular data quality assessments, our study did not detect any unnecessary repeat testing of the same individual or testing of individuals already known positive. Nonetheless, we acknowledge the possible role of the incentive payments under our index-EPOA model in producing favorable results. In addition, although we did not conduct a costing/resource analysis on using incentives for HIV testing and despite mixed results reported in the existing literature, studies suggest that economic incentives can be cost-effective in detecting HIV and reducing transmission [36, 37].

Lastly, a systematic review found that SNS was more cost-effective than other testing strategies such as index testing, estimating that the average cost per new HIV diagnosis through SNS was three times lower than for index testing [38]. On the other hand, despite the promising results, systematic reviews found the evidence to be of moderate to very low quality and more robust studies are needed to strengthen the evidence base [29]] and we acknowledge the need to assess the added cost of integrating index-EPOA compared to offering standalone index testing.

Limitations

This analysis has some limitations. Fidelity to the index-EPOA protocol was assessed as part of programmatic supervision of the HIV testing sites, but it was not measured. Although we minimized the risk of client misclassification as Haitian migrants or individuals of Haitian descent through geographic targeting of the project's services, training the team on client category definitions, and conducting data validation activities, we acknowledge that some clients might have been misclassified. In addition, because we did not collect data to learn the acceptability of the index-EPOA testing strategy among Haitian migrants and individuals of Haitian descent, we cannot complement the routinely collected programmatic data with qualitative data to better understand the results. Due to our use of retrospective programmatic data for this analysis, we could not account for confounding factors.

Conclusions

To our knowledge, this is the first study describing case finding through implementation of an SNS blended with index testing among Haitian migrants and individuals of Haitian descent in the Dominican Republic. The findings of this study add to the relatively thin body of evidence about the effectiveness of hybrid testing strategies and their potential to strengthen the effective use of index testing by index clients and maximize HIV testing program resources.

If implemented at scale, this testing approach could have a significant impact on achieving the ambitious UNAIDS 95–95-95 goals in the Dominican Republic, where the HIV epidemic is concentrated among Haitian migrants and individuals of Haitian descent.

Abbreviations

ART	Antiretroviral therapy
CSO	Civil society organization
EHSEC	Enhanced HIV Services for Epidemic Control [project]
ENI	National Immigrant Survey
EPOA	Enhanced peer outreach approach

HS3	HIV Services and Systems Strengthening [project]
HTS	HIV testing services
KP	Key population
MSM	Men who have sex with men
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PLHIV	People living with HIV
PP	Priority population
PrEP	Pre-exposure prophylaxis
SNS	Social network strategy
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1.

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Authors' contributions
CC: Conceived of the analysis, designed methodology, managed and formally analyzed the data, prepared data visualization, and wrote, reviewed, edited, and approved the final draft MG–K: Conceived of the analysis, managed and supervised the research, validated research outputs, and wrote, critically reviewed, edited, and approved the final draft JM: Analyzed and interpreted the data, managed and conducted data collection, designed software for analysis, and critically reviewed, edited, and approved the final draft RJ: Managed and conducted data collection, managed the research, validated research outputs, and critically reviewed, edited, and approved the final draft RD: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft GM: Managed and conducted data collection, designed software for analysis, and critically reviewed, edited, and approved the final draft SS-H: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft GM: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft CA: Critically reviewed, edited, and approved the final draft NP: Critically reviewed, edited, and approved the final draft NM: Critically reviewed, edited, and approved the final draft KH: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft MR: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft CM: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft LT: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft ME: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft MG: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft AL: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft JM: Managed and conducted data collection, and critically reviewed, edited, and approved the final draft EB: Reviewed and approved the manuscript, and critically reviewed, edited, and approved the final draft RF: Critically reviewed, edited, and approved the final draft AS: Critically reviewed, edited, and approved the final draft.

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Data availability
The dataset supporting the conclusions of this article is included within the article (and its additional file). [See Additional file 1.]

Declarations

Ethics approval and consent to participate
The request to use HS3 and EHSEC programmatic data for this analysis ("Maximizing the use of routine data in the PEPFAR-Funded Enhanced HIV Services for Epidemic Control project in the Dominican Republic: going beyond bean counting," reference no. 2136207–1) was reviewed and approved by the Protection of Human Subjects Committee at FHI 360 and given a determination of not human subjects research; given this determination, it was not reviewed by a local ethics committee. All data included in our analysis were aggregated, deidentified data extracted from routine project performance reports. These reports were prepared and used for routine program monitoring and improvement and are publicly available. No additional data were collected from clients beyond those for the routine programming reporting. Per Dominican Republic government guidelines, all program clients signed consent forms which covered data collection and the use of programmatic data for analytical purposes; these forms remain in their client files. Also, per government regulations, is not necessary to obtain parental consent for individuals ages 15 and older. At no point did the authors have access to individual-level data or personally identifiable information.

Consent for publication
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Competing interests
The authors declare no competing interests.

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