Title

Community-based HIV testing services in an urban setting in western Kenya: a programme implementation study.

Journal

The Lancet HIV, 8(1)

Authors

Mocello, A
Ouma, David
Bushman, Dena
et al.

Publication Date

2021

DOI

10.1016/S2352-3018(20)30253-8

Peer reviewed

HHS Public Access

Author manuscript

Lancet HIV. Author manuscript; available in PMC 2024 February 21.

Published in final edited form as:

Lancet HIV. 2021 January ; 8(1): e16–e23. doi:10.1016/S2352-3018(20)30253-8.

Community-Based HIV Testing Services in an Urban Setting in Western Kenya: a program implementation

Hong-Ha M. Truong, PhD[1,*,Δ], **A. Rain Mocello, MPH**[2,*], **David Ouma, BSc**[3], **Dena Bushman, MSN**[1], **Kevin Kadede, MA**[3], **Eric Ating'a, BSc**[3], **Duncan Obunge, BSc**[3], **Elizabeth A. Bukusi, PhD**[3,Δ], **Francesca Odhiambo, MMed**[4], **Craig R. Cohen, MD**[2,Δ]

[1]Department of Medicine, University of California, San Francisco, CA, USA

[2]Department of Obstetrics, Gynecology & Reproductive Services, University of California, San Francisco, CA, USA

[3]Kenya Medical Research Institute, Kisumu, Kenya

[4]UC Global Programs, Kisumu, Kenya

Abstract

Background: Some countries are struggling to reach the UNAIDS testing target, especially among men and youth. To identify persons unaware of their HIV-positive status and achieve testing saturation, we implemented a hybrid HIV testing approach in an urban informal settlement in Western Kenya.

Corresponding Author: Professor Hong-Ha M. Truong, Department of Medicine, University of California, San Francisco, Hong-Ha.Truong@ucsf.edu.

*Co-First Authors

ΔFull Professor

Author Contributions:

- HMT led the program implementation, data analysis, and writing of the manuscript.
- ARM conducted the data analysis and assisted with writing the manuscript.
- DO assisted with program implementation and reviewed the manuscript.
- DB assisted with program implementation and reviewed the manuscript.
- KK assisted with program implementation and reviewed the manuscript.
- EA assisted with program implementation and reviewed the manuscript.
- DO assisted with program implementation and reviewed the manuscript.
- EAB reviewed the manuscript.
- FO reviewed the manuscript.
- CRC conceived of the program and assisted with writing the manuscript.

Conflict of Interest: HMT, ARM, DO and CRC received grant funding from the U.S. Centers for Disease Control and Prevention. EAB consults for Gilead and Merck.

Disclaimer: The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the funding agencies.

Presented in part at: Conference on Retroviruses and Opportunistic Infections, Boston, March 8–11, 2020

Methods: The Community Health Initiative (CHI) conducted community mapping, household census, multi-disease community health campaigns (CHCs), and home-based tracking in 2018 in the informal settlement of Obunga, located in Kisumu, Kenya. Health and counseling services were tailored for men and youth to encourage their participation. We calculated the previously unidentified fraction (PUF), which is the proportion of newly identified persons living with HIV (PLWH) out of all previously identified and newly identified PLWH.

Findings: CHI reached a total of 23,584 persons. Of 12,768 HTS-eligible individuals, 12,407 (97%) accepted testing, including 3,917 (32%) first-time testers. There were 101 newly identified PLWH out of 1,248 total HIV-positive persons, representing an 8·1% PUF. The PUF was higher among men (9·8%) and youth ages 15–24 (15·3%). Ninety-four newly identified persons (93%) initiated same-day treatment.

Interpretation: The community-based hybrid HIV testing approach was successfully implemented for the first time in an urban setting characterized by a high-risk, impoverished and highly mobile population. CHI identified persons previously unaware of their HIV-positive status, thereby enabling linkage to care and same-day treatment initiation, and reducing onward transmission risk. Innovative approaches that make HIV testing more accessible and acceptable, particularly to men and youth, are critical for achieving testing and treatment saturation.

Focusing on identifying persons unaware of their HIV-positive status in combination with monitoring the PUF has the potential to achieve the UNAIDS Fast Track commitments to end AIDS by 2030.

Funding: U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Centers for Disease Control and Prevention (CDC)

Keywords

HIV; Kenya; community health; testing; urban population; men; youth

INTRODUCTION

Some countries are still struggling to reach the UNAIDS 90% testing target, especially among men and youth.[1–8] In Kenya, there are approximately 1·5 million persons living with HIV (PLWH).[9] In 2018, HIV prevalence was estimated at 4·9% among adults 15–64 years of age. HIV prevalence was higher among women (6·6%) than men (3·1%) and in rural areas (5·0%) than urban settings (4·7%).[9] There were approximately 36,000 new infections among adults ≥15 years old.[9] In the most recent Kenya Demographic and Health Survey, testing coverage was lower among men (72%) than women (85%) and was lower among adolescents than older adults, a pattern observed in other countries in sub-Saharan Africa.[2–8,11]

Kisumu County in Western Kenya had an estimated HIV prevalence of 17·5% in 2018, which was 3·6 times higher than nationally and second highest of all counties.[9] Of 112,862 PLWH ≥15 years old in 2017, 16,771 (14·9%) were youth ages 15–24.[10] In 2017, the national incidence in Kenya was 0.18% and Kisumu was one of five counties with an HIV incidence of >0.26.[12] There were 4,012 new HIV infections in Kisumu County, the third

highest nationally accounting for 7·6% of all new infections in Kenya.[10] There were 3,396 new HIV infections among persons ≥15 years old, of which 1,630 were among youth.[10]

Community-based hybrid HIV testing to identify persons unaware of their HIV-positive status and achieve testing saturation has been conducted successfully in rural settings in East Africa.[11,13] The hybrid HIV testing services (HTS) approach entails a household census, multi-disease community health campaigns (CHCs) and tracking activities to offer home-based HTS.[13]

Prior to the testing initiative described in this paper, Family AIDS Care & Education Services (FACES) implemented a similar program in 2016 in the rural setting of Homa Bay County, Kenya.[13,14] The program tested 9,463 persons and 115 persons were newly identified as HIV-positive.[13]

In Kenya, persons living in urban settings, such as Nairobi and Kisumu counties, have a higher risk of HIV infection than those living in more rural areas.[10,12,15,16] Though there are health advantages of residing in urban areas, such as easier access to health care facilities, persons living in peri-urban areas and urban informal settlements, i.e., slums, often have higher rates of morbidity and mortality compared to persons living in more privileged urban neighborhoods and rural areas.[17] We describe the uptake of HIV testing and linkage to care and treatment through the implementation of the Community Health Initiative (CHI) in an urban informal settlement setting in Western Kenya.

METHODS

Program design and participants

The CHI program was implemented in the urban informal settlement of Obunga located in Kisumu, Kenya, from 7 December 2017 through 30 September 2018. The implementation location was chosen in consultation with CDC Kenya in response to the HTS needs of the community. The program components were modeled after our previous implementation in Homa Bay County.[13] Our team, comprised of over 100 staff members, conducted community mobilization and sensitization, community mapping, household census, multi-disease CHCs and tracking activities to offer home-based HTS. The program activities are presented in Figure 1. Residents of Obunga were eligible for all program components. Health services offered at the CHCs in addition to HTS included screening, testing and provision of referrals for tuberculosis, malaria, hypertension and diabetes, and were available to both residents and nonresidents in the coverage area.

Procedures

Community mapping identified community landmarks and health facilities and recorded GPS coordinates in order to inform the subsequent census, CHCs and tracking activities. Community landmarks for location purposes included the village chief’s office, churches, shops, railway flyovers, bypasses and junctions. The CHI team worked with local administrative and community leaders to conduct the community mapping.

We conducted a household census to enumerate and obtain demographic and fingerprint data from all persons residing in Obunga during the implementation of the census and CHCs. Enumeration also took place at CHCs for residents not located during the census. During enumeration, the head of household provided names of household members, defined as persons who usually lived in the home. For each household, we recorded GPS coordinates and noted locator information (e.g., landmarks) to facilitate the tracking process. We made up to three attempts to reach each household or individual household members.

CHI held a total of 52 multi-disease CHCs in mobile tents throughout the program coverage area, their locations determined using household distribution data gathered during the census. We held CHCs throughout the week including weekends, with the days varying from week to week. CHCs operated all day until dusk, with a few continuing until midnight to accommodate attendees who might not be able to attend during the daytime. To encourage participation of men and youth, CHCs provided tailored health and counseling services, musical entertainment and live screenings of the World Cup football competition.

Residents enumerated during the census who did not attend a CHC were tracked using GPS data in order to offer home-based HTS and TB screening. During tracking, we made up to three attempts to reach each individual. Verbal consent was obtained during the census by program staff who explained that demographic and fingerprint data collected would be used to confirm an individual's identity when that person attended a CHC. Verbal consent was also obtained for collection of demographic and fingerprint data from nonresidents who attended the CHCs and residents who were not previously enumerated during the census.

HIV testing was conducted by certified HTS counselors. HIV testing eligibility criteria for the CHCs and tracking activities were based on the 2015 national guidelines in Kenya.[18] Persons age ≥15 years who were not previously identified PLWH were eligible for HIV testing. Children <15 years who reported being sexually active or for whom testing was requested by a parent or guardian, and persons who tested within the past 3 months but reported a recent risk were also eligible for testing. Classification of previously identified PLWH was based on self-report and verified by presenting their clinic cards or answering verification questions posed by HIV test counselors.

Newly identified PLWH at the CHCs and through tracking activities were provided with referrals for linkage to care at the health facility of their choosing and same-day antiretroviral therapy (ART) initiation. Newly identified PLWH were also offered partner notification services (PNS) per national guidelines.

Statistical analysis

Statistical analysis was performed using SAS software version 9·4 (SAS Institute Inc., Cary, NC, USA). Frequencies and proportions were used to describe demographic characteristics, HIV yield and previously unidentified fraction (PUF). HIV yield is the proportion of newly identified PLWH out of the total number of persons tested. The PUF is the proportion of newly identified PLWH out of all previously identified and newly identified PLWH.[13] We also calculated the PUF+, which additionally includes newly identified and previously identified PLWH reached through PNS. Demographic factors of newly identified PLWH

were assessed with Fisher's Exact Test or the Chi-square test. Differences by HIV testing status (first-time vs. repeat testers) were analyzed with multivariate logistic regression. Covariates included sex, categorical age, highest education level, marital status and residency status. Persons with unknown education level and marital status were excluded from the multivariable analysis. Program data analysis was conducted with the approval of the institutional review boards at the University of California and the Kenya Medical Research Institute.

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

RESULTS

The CHI program reached a total of 23,584 persons, as presented in Figure 1. We engaged 22,685 residents and nonresidents through the CHCs and tracking activities, of whom 11,066 (48·8%) were males and 5,444 (24·0%) were youth ages 15–24. There were 899 enumerated residents who did not attend a CHC and could not be contacted through tracking. The census enumerated 16,734 residents who belonged to 4,509 households. At the CHCs, we enumerated an additional 540 residents who belonged to an existing household and 4,277 residents who reported belonging to a household not enumerated during the census. During tracking, we could not locate 165 enumerated residents and 276 enumerated residents who were located declined to complete the survey and HTS.

Of the 12,769 HTS-eligible individuals, 12,407 (97·2%) accepted testing (10,110 at CHCs and 2,297 during tracking). As detailed in Table 1, 5,909 (47·6%) testers were males and 3,483 (28·1%) were youth. Individuals ineligible for testing included 1,147 previously identified PLWH and 3,136 children <15 years old who did not have parental/guardian consent for testing, as detailed in Figure 2.

Of the 362 HTS-eligible individuals who were not tested: 169 (46·7%) were women and 193 (53·3%) were men; 34 (9·4%) were 15–19 years old, 62 (17·1%) were 20–24 years old, 125 (34·5%) were 25–34 years old, 94 (26·0%) were 35–49 years old, and 47 (13·0%) were ≥50 years old; and 295 (81·5%) were residents, of whom 227 attended a CHC. Compared to persons who accepted testing, HTS-eligible individuals who did not test were more likely to be male than female (p=0·036), persons ≥25 years old than youths ages 15–24 years old (p<0·0001), and nonresidents than residents (p=0·038).

Among the 12,407 persons tested, 101 were newly identified as HIV-positive, of whom 91 attended the CHCs and 10 were located through tracking. As shown in Table 1, 66 (65·4%) were female, 39 (38·6%) were 25–34 years of age and 92 (91·1%) were residents. HIV yield overall was 0·81%, and was higher among females than males (1·02% vs. 0·59%; p=0·0088) and similar between residents and nonresidents (0·84% vs. 0·61%; p=0·35). HIV yield increased with older age (p<0·0001) and was highest among the 25–34 and 35–49

age groups. The CHI team linked 94 (93·1%) newly identified PLWH to same-day ART initiation.

There were 1,147 previously identified PLWH, of whom 826 (72·0%) were females, 435 (37·9%) were 35–49 years old and 995 (86·8%) were residents. Among these individuals, 1,105 (96·3%) reported ever using ART, of whom 1,095 reported currently being on treatment, as shown in Figure 2. The CHI team linked to treatment 15 of the 52 previously identified PLWH who reported not currently being on ART.

Newly identified PLWH represented a PUF of 8·1% of the total 1,248 PLWH, which comprised of 1,147 previously identified PLWH plus 101 newly identified PLWH, as presented in Table 1. The PUF was comparable between males and females (9·8% vs. 7·4%; p=0·15) and between residents and nonresidents (8·5% vs. 5·6%; p=0·21). The PUF decreased with older age (p=0·0003) and was highest among the 20–24 age group at 17·2%. The PUF was 15.3% for youth ages 15–24.

Overall, of 12,407 individuals who accepted testing, 3,917 (31·6%) were first-time testers and 8,470 (68·3%) were repeat testers; 0·56% of first-time testers (22 people) were newly identified PLWH compared to of 0·93% of repeat testers (79 people). Among first-time testers, 1,425 (36·4%) were ≥15 years old and 2,492 (63·6%) were <15 years old. Table 2 presents the demographic characteristics of first-time testers ≥15 years old, of whom 725 (50·9%) were males and 769 (54·0%) were youth, including 362 male youths. In the multivariate analysis, sex, age, highest education level completed, marital status and residency were associated with first-time HIV testing. First-time testers were more likely to be males than females (aOR=1·19; 95% CI 1·08, 1·38), adolescents ages 15–19 years compared to persons 25–34 years old (aOR=2·63; 95% CI 2·14, 3·26), persons with no schooling than those with tertiary/vocational education (aOR=2·14; 95% CI 1·34, 3·40), widowed compared to married persons (aOR=1·64; 95% CI 1·18, 2·27), and residents than nonresidents (aOR=1·54; 95% CI 1·28, 1·85).

There were 61 newly identified PLWH who accepted PNS. The 39 male (63·9%) and 22 female (36·1%) index cases referred 144 contacts (mean=2·4, range=1–8), of whom 63 (43·8%) were sexual partners within the past three months and 81 (56·2%) were children. Of the sexual partners, 27 (42·9%) were women, 10 (16·7%) were 15–24 years old, and 25 (41·7%) were 25–34 years old. Thirteen named contacts (9·0%) were previously identified PLWH, including two children. PNS tracking activities reached 66 contacts (45·8%) who accepted testing. Five individuals (7·6%), all sexual partners, were newly identified PLWH and all initiated same-day ART. With the additional PLWH identified through PNS, the PUF+ increased to 8·4%.

Of the 15,468 individuals who attended the CHCs, 13,248 were residents and 2,220 were nonresidents. Overall, female residents and nonresidents ≥15 years were more likely to attend the CHCs, be eligible for HIV testing and accept testing. Residents compared to nonresidents were less likely to be ≥15 years old than <15 years old (59·4% vs. 76·1%; p<0·0001) and more likely to be females than males (56·5% vs. 52·3%; p=0·0003). With respect to HIV testing eligibility, 8,909 residents (67·2%) and 1,545 nonresidents

(69·6%) were eligible. Eligibility status could not be documented for 383 residents and 76 nonresidents attending the first few CHCs due to technical difficulties with the electronic HTS data collection tool. Among CHC attendees eligible for HIV testing, residents compared to nonresidents were less likely to be ≥15 years old than <15 years old (66·9% vs. 81·4%; p<0·0001) and more likely to be females than males (54·6% vs. 49·8%; p=0·0005).

Of individuals eligible for HIV testing at the CHCs, 8,632 residents (96·9%) and 1,478 nonresidents (95·7%) accepted services. Residents compared to nonresidents were less likely to be ≥15 years old than <15 years old (65·9% vs. 80·6%; p<0·0001) and more likely to be females than males (54·8% vs. 50·2%; p=0·0009). Among residents, there were 82 newly identified PLWH and 865 previously identified PLWH. Among nonresidents, there were 9 newly identified PLWH and 152 previously identified PLWH. HIV yield was similar between residents and nonresidents (0·84% vs 0·61%; p=0·57), as was the PUF (8·7% vs 5·6%; p=0·19)

Among Obunga residents tested at CHCs, there were 82 newly identified PLWH and 865 previously identified PLWH. There were 10 newly identified PLWH and 130 previously identified PLWH among residents who tested during tracking. HIV yield was higher among residents tested at the CHCs than during tracking (0·95% vs. 0·44%; p=0·016), whereas the PUF was similar (8·7% vs. 7·1%; p=0·55).

DISCUSSION

We successfully implemented a community-based hybrid HIV testing approach for the first time in an urban setting characterized by a high risk, impoverished and highly mobile population. CHI provided HIV testing in the informal settlement of Obunga and identified PLWH previously unaware of their status, thereby enabling linkage to care and same-day treatment and reducing onward transmission risk. We enumerated over 90% of Obunga residents and over 97% of persons eligible for HTS accepted testing, with nearly one-third being first-time testers.[19] Among persons newly identified with HIV, 93% initiated ART the same day as part of the campaign. CHI successfully reached the UNAIDS testing and treatment targets.[1]

CHCs held during weekends and evenings likely increased attendance among men and youth who might not otherwise have attended due to work and school responsibilities. Offering live music and World Cup screenings likely helped attract men and youth who otherwise might not have visited the CHCs. Tailored health and counseling services helped men and youth feel more comfortable getting their health care needs addressed and questions. We observed through our experiences implementing community-based hybrid HTS in both rural and urban settings that this strategy increased testing uptake among men and youth, thus lending support to prior recommendations to expand these approaches.[2,3,13,20]

We observed a parallel decline in the PUF and first-time testers starting with the 35–49 age group. Taken together, these observations likely reflect that persons engaging in behaviors that put them at higher risk for HIV infection were more likely to have a prior testing history and thus previously identified as HIV-positive. There was also a notable increase in HIV

yield starting with the 20–24 age group and continuing to rise with the 24–34 and 35–49 age groups.

HIV yield was higher among Obunga residents tested at CHCs than during tracking, a similar observation to what we found in Homa Bay County.[13] These findings could reflect that persons who perceived themselves at higher risk for HIV infection may have actively sought out testing at CHCs. These results may also indicate CHCs are more efficient at reaching persons who are unaware of their HIV infection status.

Studies have shown that persons whose mobility is related to their work are at higher risk for HIV.[21] Many nonresidents who attended CHCs work in Obunga but live in neighboring informal settlements. Their daily presence makes them a part of the Obunga social network and thus could potentially contribute to the HIV transmission chains in the community.

The observation of a PUF of 8·1% overall, 9·8% among males, and 15·3% among youth ages 15–24 are important findings since individuals unaware of their infection status pose a tremendous risk of sexual and vertical HIV transmission. The overall PUF was higher than the 7.2% observed in rural Homa Bay County.[13] Our approach of identifying persons unaware of their HIV-positive status in combination with ascertaining the PUF aligns with the UNAIDS concept of incidence/prevalence ratio.[22] The PUF can be used as a metric to compare the utility of different HIV testing platforms, e.g. facility-based vs. community-based testing and PNS, in order to maximize testing efficiency, reach populations lagging behind in testing saturation and increase the first ‘90’. Therefore, using the PUF metric has the potential to help target HIV testing approaches to reduce the number of persons unaware of their HIV-positive status and link newly diagnosed persons to care and treatment.

We recognize several limitations. We experienced technical difficulties with the electronic HTS data collection tool at early CHCs and could not document eligibility status for some attendees. We were unable to ascertain HIV status of persons eligible for testing but refused, could not be located during tracking or had unknown reasons for not being tested, which may have impacted the HIV yield and PUF. Some CHCs were held in April and May during the rainy season which likely deterred some people from attending on days with heavy rainfall and flooding. Programmatic data were collected using standardized HIV reporting forms issued by the Ministry of Health, therefore additional variables could not be added. Aspects of data collection were incomplete since the testing program was not designed to be a research study. We were unable to calculate a comprehensive cascade for all persons reached by the program because it was not possible to determine a denominator for nonresidents attending CHCs. We conducted data cleaning to remove duplicate records of enumerated individuals who attended more than one CHC but may have missed those who provided different names and demographic information. Residency status was self-reported, thus some individuals presenting at CHCs who reported belonging to a household not enumerated during the census may not have been residents, which would result in misclassification of residency status. There are no estimates available of the Obunga population in 2018, however, we believe our program enumerated >90% of the residents in Obunga based on 2019 census data.[19]

Increasing uptake of HIV testing among individuals who never tested or remain at higher risk for incident infection remains challenging. We applied lessons learned from our prior community-based hybrid HTS program in the rural setting of Homa Bay County in order to refine our implementation approach in the urban informal settlement setting of Kisumu County.[13] For instance, we scheduled more weekend and evening CHCs in Obunga based on feedback from our Homa Bay clients that these times were more convenient. We also introduced live streaming of the World Cup games and continued to host live bands at the CHCs in Obunga because we observed our Homa Bay clients enjoying the entertainment while waiting for services. Our experiences in these rural and peri-urban settings can help inform efficient implementation of community-based HTS approaches in urban and rural regions of sub-Saharan Africa. Our results showed that offering HTS at CHCs in combination with follow-up home visits is an effective strategy for reaching first-time testers, particularly men and youth.

Innovative HTS strategies that make HIV testing more accessible and acceptable to the community are critical for achieving testing saturation and exceeding the first '90' target. Government agencies, national ministries of health and public health programs can use the PUF and PUF+ as metrics to assess and compare the impact of different HTS strategies to identify PLWH who are unaware of their serostatus and determine the population-level knowledge of HIV serostatus. An evaluation of three universal test and treat (UTT) trials in sub-Saharan Africa found that a comprehensive strategy that started with universal HIV testing and rapid linkage to care and treatment led to more rapid increases in population-level viral suppression and decreases in HIV incidence than the status quo.[23] HTS strategies focused on identifying persons unaware of their HIV-positive status in combination with monitoring the PUF has the potential to achieve the UNAIDS Fast Track commitments to end AIDS by 2030.[24]

ACKNOWLEDGEMENTS

Funding:

This work was supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Centers for Disease Control and Prevention (CDC) under the terms of U2GGH001947.

REFERENCES

1. UNAIDS. 90-90-90 – An ambitious treatment target to help end the AIDS epidemic. Available at: http://www.unaids.org/sites/default/files/media_asset/90-90-90_en.pdf.
2. Kenya HIV County Profiles 2016. Available at: http://nacc.or.ke/wp-content/uploads/2016/12/Kenya-HIV-County-Profiles-2016.pdf.
3. Kenya Demographic and Health Survey 2014. Available at: https://dhsprogram.com/pubs/pdf/FR308/FR308.pdf.
4. Makusha T, Mabaso M, Richter L, Desmond C, Jooste S, Simbayi L. Trends in HIV testing and associated factors among men in South Africa: evidence from 2005, 2008 and 2012 national population-based household surveys. Public Health. 2017; 143:1–7. [PubMed: 28159020]
5. Takarinda KC, Madyira LK, Mhangara M, et al. Factors associated with ever being HIV-tested in Zimbabwe: an extended analysis of the Zimbabwe Demographic and Health Survey (2010–2011). PLoS One. 2016; 11:e0147828. [PubMed: 26808547]
6. Grobler A, Cawood C, Khanyile D, Puren A, Kharsany AMB. Progress of UNAIDS 90-90-90 targets in a district in KwaZulu-Natal, South Africa, with high HIV burden, in the HIPSS study: a

household-based complex multilevel community survey. Lancet HIV. 2017; 4:e505–513. [PubMed: 28779855]

7. Hayes R, Floyd S, Schaap A, et al. A universal testing and treatment intervention to improve HIV control: one-year results from intervention communities in Zambia in the HPTN 071 (PopART) cluster-randomised trial. PLoS Med. 2017; 14:e1002292. [PubMed: 28464041]
8. Iwuji CC, Orne-Gliemann J, Larmarange J, et al. Uptake of home-based HIV testing, linkage to care, and community attitudes about ART in rural KwaZulu-Natal, South Africa: descriptive results from the first phase of the ANRS 12249 TasP cluster-randomized trial. PLoS Med. 2016; 13:e1002107. [PubMed: 27504637]
9. KENPHI Preliminary 2018 Report. Available at: https://www.nascop.or.ke/kenphia-report.
10. Kenya HIV Estimates Report 2018. Available at: https://nacc.or.ke/wp-content/uploads/2018/11/HIV-estimates-report-Kenya-20182.pdf.
11. Chamie G, Clark TD, Kabamim J, et al. A hybrid mobile approach for population-wide HV testing in rural east Africa: an observational study. Lancet HIV. 2016: 3:e111–119. [PubMed: 26939734]
12. Kenya AIDS Response Progress Report 2018. Available at: https://www.lvcthealth.org/wp-content/uploads/2018/11/KARPR-Report_2018.pdf.
13. Truong HM, Akama E, Guzé MA, et al. Implementation of a community-based hybrid HIV testing services program as a strategy to saturate testing coverage in Western Kenya. J Acquir Immune Defic Synd. 2019:82(4):362–367.
14. Lewis Kulzer J, Penner JA, Marima R, et al. Family model of HIV care and treatment: a retrospective study in Kenya. J Int AIDS Soc. 2012; 15:8. [PubMed: 22353553]
15. Kerubo G, Khamadi S, Okoth V, et al. Hepatitis B, hepatitis C and HIV-1 co-infection in two informal urban settlements in Nairobi, Kenya. PLoS One. 2015; 10(6):e0129247. [PubMed: 26068212]
16. Kabiru CW, Beguy D, Crichton J, Zulu EM. HIV/AIDS among youth in urban informal (slum) settlements in Kenya: what are the correlates and motivations for HIV testing? BMC Pub Health. 2011; 11:685. [PubMed: 21888666]
17. Mberu B, Wamukoya M, Oti S, Kyobutungi C. Trends in causes of adult deaths among the urban poor: evidence from Nairobi Urban Health and Demographic Surveillance system. 2003–2012. J Urban Health. 2015; 92(3):422–445. [PubMed: 25758599]
18. The Kenya HIV Testing Services Guidelines. Available at: https://archive.org/details/hts_policy_kenya_2015.
19. 2019 Kenya Population and Housing Census Volume II: Distribution of Population by Administrative Units. Available at: https://www.knbs.or.ke/?wpdmpro=2019-kenya-population-and-housing-census-volume-ii-distribution-of-population-by-administrative-units.
20. Sharma M, Ying R, Tarr G, Barnabas R. Systematic review and meta-analysis of community and facility-based HIV testing to address linkage to care gaps in sub-Saharan Africa. Nature. 2015; 528:S77–85. [PubMed: 26633769]
21. Camlin C, Akullian A, Neilands TB, et al. Population mobility associated with higher risk sexual behavior in eastern African communities participating in a universal testing and treatment trial. J Int AIDS Soc. 2018; 21 Suppl 4:e25115. [PubMed: 30027668]
22. Making the end of AIDS real: consensus building around what we mean by “epidemic control”. Available at: http://www.unaids.org/sites/default/files/media_asset/glion_oct2017_meeting_report_en.pdf.
23. Havlir D, Lockman S, Ayles H, et al. What do the universal test and treat trials tell us about the path to HIV epidemic control? J Int AIDS Soc. 2020; 23(2):e25455. [PubMed: 32091179]
24. Fast Track Commitments to End AIDS by 2030. Available at: https://www.unaids.org/sites/default/files/media_asset/fast-track-commitments_en.pdf.

RESEARCH IN CONTEXT

Evidence before this study

We searched PubMed for English language articles for the terms “HIV”, “testing” and “yield”, accessed conference proceedings, and reviewed HIV surveillance reports and guidelines for Kenya (last searched February 20, 2020). HIV testing approaches in most countries do not accurately measure the number of people eligible for testing (i.e., the denominator), and rely instead on proxies for testing saturation, including periodic population-based sampling and yield. Recently, we proposed use of the previously unidentified fraction (PUF), a new metric defined as the proportion of newly identified persons living with HIV (PLWH) out of the total population of PLWH, to guide testing strategies to ensure saturation. A hybrid HIV testing approach combining multi-disease community health campaigns and home-based tracking HIV testing services (HTS) has been implemented in rural populations but not in urban centers in sub-Saharan Africa, some of which are experiencing significant HIV incidence.

Added value of this study

We delivered a community-based hybrid HTS program to saturate testing in an urban region in a high burden county in Western Kenya. Overall, 97% of persons eligible for HTS accepted testing, 32% of whom were first-time testers. The total PUF was 8·1%, and was higher among men (9·8%) and youth ages 15–24 (15·3%). Ninety-three percent of newly identified PLWH initiated same-day treatment.

Implications of all the available evidence

For the first time in an urban region in sub-Saharan Africa, we demonstrated that a hybrid HIV testing approach is an effective strategy for reaching first-time testers, particularly men and youth. The PUF is a useful measure to determine which populations and sub-populations require additional strategies to reach testing saturation to improve health outcomes, and prevent sexual and vertical HIV transmission to end the HIV epidemic.

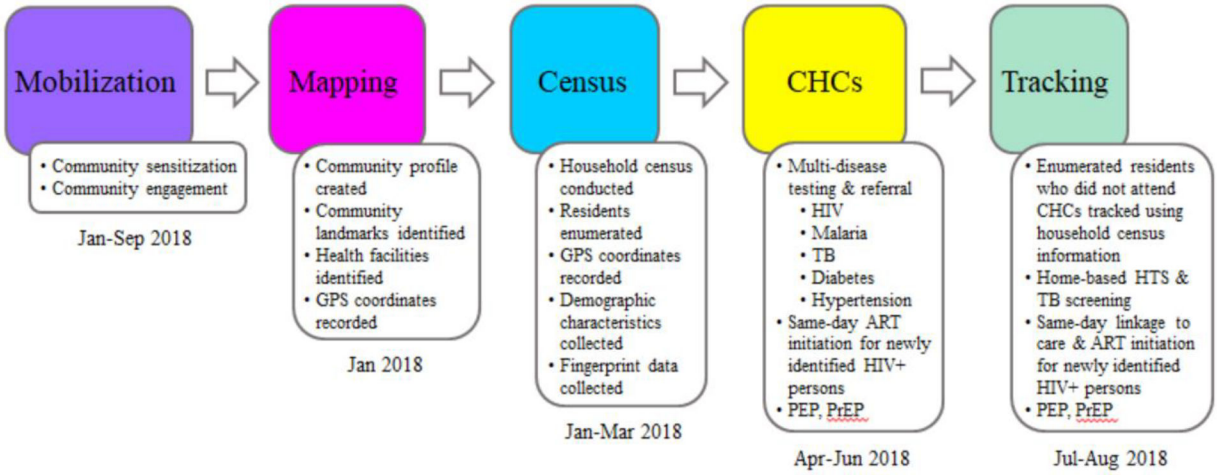

Figure 1: Community Health Initiative activities

ART=antiretroviral therapy. GPS=global positioning system. PEP= post-exposure prophylaxis. PrEP=pre-exposure prophylaxis.

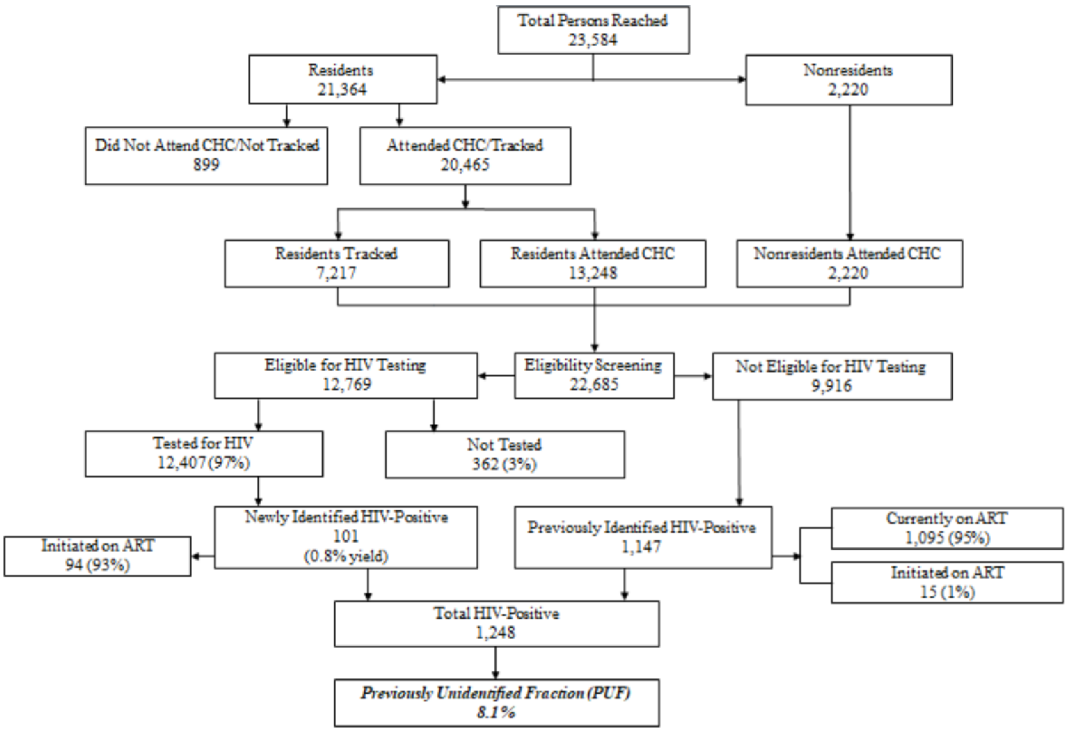

Figure 2. Flow Diagram of Community Health Initiative (CHI), Kisumu, Kenya, 2018

Table 1:

Demographic characteristics of persons who accepted HIV testing, newly identified and previously identified HIV-positive persons, HIV yield, and previously unidentified fraction (PUF), Community Health Initiative (CHI), Kisumu, Kenya, 2018

Demographic Characteristics	Testers N (%)	Newly Identified HIV-Positive N (%)	Previously Identified HIV-Positive N (%)	HIV Yield	PUF
Overall	12,407	101	1,147	0·81%	8·1%
Sex					
Male	5,909 (47·6)	35 (34·7)	321 (28·0)	0·59%	9·8%
Female	6,498 (52·4)	66 (65·3)	826 (72·0)	1·02%	7·4%
Age (years)					
0–9	2,875 (23·2)	6 (5·9)	36 (3·1)	0·21%	14·3%
10–14	1,352 (10·9)	3 (3·0)	22 (1·9)	0·22%	12·0%
15–19	1,652 (13·3)	3 (3·0)	32 (2·8)	0·18%	8·6%
20–24	1,831 (14·8)	21 (20·8)	101 (8·8)	1·15%	17·2%
25–34	2,623 (21·1)	39 (38·6)	389 (33·9)	1·49%	9·1%
35–49	1,441 (11·6)	21 (20·8)	435 (37·9)	1·46%	4·6%
≥ 50	633 (5·1)	8 (7·9)	132 (11·5)	1·26%	5·7%
Education (highest)					
No school	276 (2·2)	1 (1·0)	31 (2·7)	0·36%	3·1%
Some primary	3,798 (30·6)	29 (28·7)	330 (28·8)	0·76%	8·1%
Completed primary	1,938 (15·6)	29 (28·7)	368 (32·1)	1·50%	7·3%
Some secondary	2,044 (16·5)	15 (14·8)	171 (14·9)	0·73%	8·1%
Completed secondary	1,812 (14·6)	21 (20·8)	160 (13·9)	1·16%	11·6%
University/Post-graduate	291 (2·4)	0 (0·0)	14 (1·2)	0·0%	0·0%
T ertiary/V ocational	590 (4·8)	3 (3·0)	48 (4·2)	0·51%	5·9%
Refused/Unknown	40 (0·3)	0 (0·0)	3 (0·3)	0·0%	0·0%
Not applicable α	1,618 (13·0)	3 (3·0)	22 (1·9)	0·19%	12·0%
Marital Status					
Single	3,332 (26·9)	20 (19·8)	126 (11·0)	0·60%	13·7%
Married	4,622 (37·2)	61 (60·4)	645 (56·2)	1·32%	8·6%
Widowed	270 (2·2)	6 (5·9)	135 (11·8)	2·22%	4·3%
Divorced/Separated	179 (1·4)	5 (5·0)	66 (5·8)	2·79%	7·0%
Refused/unknown	32 (0·3)	0 (0·0)	123 (10·7)	0·00%	0·00%
Not applicable β	3,972 (32·0)	9 (8·9)	52 (4·5)	0·23%	14·8%
Residency (Obunga)					
Resident	10,929 (88·1)	92 (91·1)	995 (86·8)	0·84%	8·5%
Nonresident	1,478 (11·9)	9 (8·9)	152 (13·2)	0·61%	5·6%

α not collected for children ≤6 years old

β not collected for children <13 years old

Table 2:

Demographic characteristics of persons aged ≥ 15 years who accepted HIV testing, stratified by first-time and repeat testing status, Community Health Initiative (CHI), Kisumu, Kenya, 2018

Demographic Characteristics	First-Time Testers N=1,425 (%)	Repeat Testers N=6,748 (%)	Adjusted Odds Ratio (95% CI)	p-value
Sex				
Male	725 (50·9)	3,173 (47·0)	1·22 (1·08, 1·38)	0·0018
Female	700 (49·1)	3,575 (53·0)	ref	-
Age				
15–19	525 (36·8)	1,126 (16·7)	2·63 (2·14, 3·26)	< 0·0001
20–24	244 (17·1)	1,587 (23·5)	1·05 (0·87, 1·28)	0·5977
25–34	303 (21·3)	2,319 (34·4)	ref	-
35–49	199 (14·0)	1,239 (18·4)	1·27 (1·04, 1·55)	0·0176
≥ 50	154 (10·8)	477 (7·1)	2·06 (1·60, 2·66)	< 0·0001
Education (highest) *				
No school	44 (3·1)	101 (1·5)	2·14 (1·34, 3·40)	0·0014
Some primary	330 (23·2)	1,085 (16·2)	1·50 (1·13, 1·99)	0·0052
Completed primary	262 (18·4)	1,644 (24·5)	1·11 (0·84, 1·47)	0·4764
Some secondary	414(29·1)	1,567 (23·3)	1·11 (0·84, 1·47)	0·4593
Completed secondary	230 (16·2)	1,579 (23·5)	0·92 (0·70, 1·22)	0·5703
University/Post-graduate	65 (4·6)	226 (3·4)	1·91 (1·31, 2·77)	0·0007
T ertiary/V ocational	76 (5·4)	514 (7·6)	ref	-
Marital Status *				
Single	730 (51·7)	2,345 (34·8)	1·52 (1·27, 1·81)	< 0·0001
Married	577 (40·9)	4,041 (60·0)	ref	-
Widowed	72 (5·1)	197 (2·9)	1·64 (1·18, 2·27)	0·0033
Divorced/Separated	32 (2·3)	147 (2·2)	1·45 (0·97, 2·18)	0·0700
Residency (Obunga)				
Resident	1,267 (88·9)	5,716 (84·7)	1·54 (1·28, 1·85)	< 0·0001
Nonresident	158 (11·1)	1,032 (15·3)	ref	-

* persons with unknown education level and marital status excluded from multivariable analysis