Outcomes of community-based HIV testing modalities in a Mpumalanga district, South Africa

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Background. Testing for HIV in individuals informs them of their HIV status, which in turn enables them to receive prevention, treatment and care services. HIV services should ideally be accessed before an individual's immune system is severely damaged, which could also increase the prevention of new HIV infections. The national HIV testing services (HTS) programmes aim to identify HIV-infected individuals and link them to prevention, care and treatment services. Community-based (CB) HTS reaches community members who do not have access to such services at healthcare facilities. The Foundation for Professional Development (FPD) provided CB-HTS in a Mpumalanga district, South Africa, from 1 October 2016 to 30 September 2017 (Country Operating Plan (COP16)), where 65 691 clients were tested.
Objectives. To determine which of the FPD CB-HTS modalities used in the Mpumalanga district during COP16 delivered the highest positivity rate, disaggregated by population segmentation. The accompanying objectives were: to describe the demographic characteristics of HTS clients in the district and to compare the different positivity rates of FPD CB-HTS modalities in the district.
Methods. This cross-sectional quantitative study used all the individual, programmatic data collected for all CB-HTS clients in Ehlanzeni during COP16 as secondary data. Descriptive analysis was employed to describe participants' characteristics. The χ^2 test was used for comparing variables.
Results. The mean age of clients was 29.3 (95% confidence interval (CI) 29.7 - 29.9) years. Of the clients analysed, 56.4% were females. Of the clients who were tested for HIV, 14.1% were tested for the first time; 67.7% of those were between 15 and 49 years old. The positivity rate for each modality was calculated, and it was found that home-based HTS had the best positivity rate (9.1%) in the Mpumalanga district during COP16.
Conclusions. This study provides evidence that home-based HTS delivered the best positivity rate in the Mpumalanga district. The results should be used to replicate the programme in other districts. If similar findings are obtained in other studies, it could inform how future CB-HTS programmes should be rolled out, which could change future strategic planning and resource allocation for CB-HTS programmes.

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In 2011, ~34.2 million individuals worldwide were living with HIV.[1] The number had increased to 36.7 million in 2016.[2] In 2012, 23.5 million HIV-infected individuals were from Africa.[1] Only 12% of the total worldwide population was living in sub-Saharan Africa in 2013, but the region accounted for 71% of the global HIV burden.[3] Despite the burden of the disease, only a third of adults in sub-Saharan Africa were tested for HIV in 2012.[4] The total number of HIV-infected individuals in South Africa (SA) was estimated to be 6.4 million in 2012.[1] It was also estimated that 23.7% of South Africans were undiagnosed in 2012.[5] It is not possible for an individual to receive prevention, treatment and care services if they do not know their HIV status, i.e. whether it is positive or negative.[6] Furthermore, an early diagnosis enables individuals to access healthcare before their immune systems are severely damaged, and enables the prevention of new HIV infections.[7] Individuals also tend to reduce their high-risk behaviour once they know their HIV status.[8]

The aim of a national HIV testing services (HTS) programme is, according to the consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection, to 'identify as many people as possible with HIV early in their infection and link them successfully to prevention, care and treatment services'.[9] HTS provided at healthcare facilities is complemented by community-based (CB) HTS modalities and is implemented in high-incidence communities close to where people live and work. CB-HTS also aims to reach communities that do not have access to HTS at health facilities and to reach HIV-infected individuals earlier on in the course of the disease.[10]

The SA government has facilitated the testing for HIV, and thus increased the proportion of people who have been tested and know their HIV status – from 50% in 2008 to 66.5% in 2014.[11] The implementation of the World Health Organization (WHO) guidelines of universal test and treat (UTT) on 1 September 2016, was another milestone in the SA government's effort to scale up HTS. According to the UTT guidelines, an individual should be initiated on antiretroviral treatment (ART) as soon as possible and within 2 weeks of their CD4+ count being done. The Foundation for Professional Development (FPD) was awarded a grant by the US Agency for International Development (USAID) to implement a CB-HTS programme in 2014. The FPD CB-HTS programme used home-based HTS, index client trailing and mobile HTS. Home-based HTS provides an opportunity for adults, families and couples to be tested in their homes by lay counsellors.[12] Mobile HTS makes it possible to access hard-to-reach and high-risk populations.[13]

Mobile HTS units can perform HIV tests in both urban and rural populations. When these units perform HIV tests at a workplace, it is classified as 'workplace' HTS. Index client trailing focuses on HIV-infected individuals and offers to test their household and family for HIV, including their children.[14]

During the USAID Country Operating Plan of 1 October 2016 – 30 September 2017 (COP16), the FPD CB-HTS programme (FPD CB-HTS) tested 603 364 individuals. During COP16, the programme was active in 27 high-burden sub-districts or local municipalities in 13 districts, which are situated in 6 provinces. The programme made use of home-based HTS, index client trailing, mobile HTS and workplace modalities. The workplace modality did not include schools, but did include workplace implementation modalities. A total of 65 691 individuals were tested in a district in Mpumalanga during COP16. The number of individuals tested differed between districts and provinces, e.g. a district in Mpumalanga tested 65 691 individuals, while a district in KwaZulu-Natal tested 23 993 individuals. These differences between districts highlight the importance of identifying the most relevant testing modality for different communities to maximise HIV testing and counselling coverage and access.[15] Such knowledge will inform HTS providers regarding how to make optimal use of restricted HIV testing facilities in the face of stock-outs of test kits and a shortage of healthcare workers. The aim of this study, based on the shortage of resources, was to determine which of the FPD CB-HTS modalities used in the Mpumalanga district during COP16 delivered the highest positivity rate, disaggregated by population segmentation. Positivity rate is defined as the number of confirmed HIV cases per 100 suspected HIV cases examined, and provides an alternative method to estimate changes in incidence.[16] The district in Mpumalanga was selected for this study, as the captured data have been audited for correctness.

Methods

The study employed a cross-sectional quantitative design. Individual, programmatic data collected for FPD CB-HTS clients in the Mpumalanga district during the COP16 were used as secondary data. Data for each of the FPD CB-HTS clients were collected according to the FPD CB-HTS data collection plan. SA Government HTS registers and consent forms were used as main data collection sources. FPD CB-HTS programme managers were responsible for supervising data collection, in line with requirements of the data collection plan. All data collected and captured were evaluated for accuracy, validity, reliability, timeliness, precision and integrity to ensure data quality. All relevant staff received standardised training on data quality. The review of captured data included spot checks, count and verification exercises, reviewing data logics for errors and anomalies, reviewing data against understood programme performance expectations and conducting structured data quality audits.

The results of 65 691 FPD CB-HTS clients in the Mpumalanga district were captured on the database for COP16. During data cleaning, 434 results were deleted, as they were incomplete owing to the test result not being available (n=89), a conclusion that could not be made regarding the clients' HIV status (n=202), the date of birth that was incorrectly captured (n=121) and the modality used not being captured correctly (n=22). The remaining 65 257 FPD CB-HTS client results were used for analysis.

Descriptive statistics, including mean, standard deviation, median, interquartile range and frequency distribution, were used to describe participants' characteristics. The χ^2 statistical test was used for categorical variables. Proportions related to uptake, the corresponding 95% confidence interval (CI) and probability of 0.5 were calculated. The HIV positivity rate was calculated as the number of HIV-infected clients per total number of clients tested and reported as a percentage. All analyses were conducted with Stata 14.0 (Stata Corp., USA).

Ethical approval

FPD, the owner of the data, granted approval and provided the data for the study. The study was approved by the Faculty of Health Sciences Research Ethics Committee, University of Pretoria (ref. no. 401/2018).

Results

The results of 65 257 FPD CB-HTS clients during COP16 were analysed. Of these clients, 36 810 (56.4%) were females and 28 447 (43.6%) were males. Clients' birth dates were used to calculate their age on the date that they were tested and approximated a normal distribution. The mean age of clients was 29.8 (95% CI 29.7 - 29.9) years. The ages of clients on the date that they were tested were converted into categorial variables and grouped for every 5 years. The age and gender distribution of clients was compared with the testing modalities used by clients (Table 1). Index client trailing (57.4%), home-based HTS (56.6%) and mobile HTS (56.4%) were more popular with female clients. Workplace HTS was preferred by males (51.9%).

The total number of CB-HTS clients analysed (n=65 256) included 14.1% (n=9 217) who were tested for HIV for the first time (Table 2). One of the clients who was between 15 and 19 years old when tested was omitted from the calculation, because it was not specified if the client was a first-time tester. The total number of clients used for this analysis was therefore 65 256. Of the clients tested for the first time, 67.7% were between 15 and 49 years old.

The majority of clients (78.7%) who received an HIV test for the first time used the home-based HTS (Table 3), followed by mobile HTS, which was the second most used service (18.2%).

There was no statistically significant difference between the modalities and HIV test results (χ^2=3.2; p=0.361). The positivity rate for each modality was calculated by dividing the number of HIV-infected clients per modality by the total number of clients tested (Table 4). Home-based HTS had the best positivity rate (9.1%) for FPD CB-HTS clients in the Mpumalanga district during COP16. Descriptive analyses conducted on the raw FPD CB-HTS data for the district, initially indicated that index client trailing was the testing modality that delivered the best positivity rate.

Discussion

Very few articles comparing HTS modalities and the positivity rate of CB-HTS modalities have been published to date, especially articles on CB-HTS programmes in SA. The 4 HTS delivery models reviewed and discussed by Mabuto *et al.*[17] were clinic-based, stand-alone and urban mobile and rural mobile HTS. The study by Mabuto *et al.*[17] did not include home-based and index client trailing, but it did calculate the positivity rate of its 4 modalities. Naik *et al.*,[18] who conducted a home-based HTS in KwaZulu-Natal in 2011, found that ~9.7% of clients tested were HIV-infected.[18] The positivity rate from the study by Naik *et al.*[18] is in line with that for home-based HTS in this study. Another study in KwaZulu-Natal in 2016 found that home-based HTS could contribute to a lower HIV incidence, especially if it results in linkage to care.[19] Home-based HTS delivered the highest positivity rate in this study

Table 1. Age and gender distribution of FPD CB-HTS clients during COP16 compared with testing modalities utilised

Age, years	Home-based, *n*			Index, *n*			Mobile, *n*			Workplace, *n*			Total clients, *n*	Total female clients, *n*	Total male clients, *n*
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total			
0 - 4	495	516	1 011	8	10	18	46	38	84	1	3	4	1 117	550	567
5 - 9	635	635	1 270	21	18	39	26	29	55	1	2	3	1 367	683	684
10 - 14	795	677	1 472	64	39	103	101	86	187	2	1	3	1 765	962	803
15 - 19	2 881	2 320	5 201	350	197	547	991	640	1 631	20	11	31	7 410	4 242	3 168
20 - 24	4 128	3 029	7 157	519	364	883	2 046	1 202	3 248	77	58	135	11 423	6 770	4 653
25 - 29	4 920	3 561	8 481	620	488	1 108	2 313	1 734	4 047	149	119	268	13 904	8 002	5 902
30 - 34	3 426	2 487	5 913	393	319	712	1 576	1 278	2 854	151	170	321	9 800	5 546	4 254
35 - 39	2 621	2 136	4 757	282	240	522	1 166	1 150	2 316	132	151	283	7 878	4 201	3 677
40 - 44	1 387	1 048	2 435	155	120	275	604	556	1 160	55	81	136	4 006	2 201	1 805
45 - 49	975	866	1 841	111	86	197	400	372	772	46	60	106	2 916	1 532	1 384
50 - 54	538	344	882	57	36	93	195	183	378	30	44	74	1 427	820	607
55 - 59	351	234	585	32	24	56	112	99	211	9	20	29	881	504	377
≥60	575	377	952	21	14	35	195	162	357	6	13	19	1 363	797	566
Total, *n*	23 727	18 230	41 957	2 633	1 955	4 588	9 771	7 529	17 300	679	733	1 412	65 257	36 810	28 447

FPD = Foundation for Professional Development; CB-HTS = community-based HIV testing services; COP16 = Country Operating Plan of 1 October 2016 - 30 September 2017.

Table 2. Distribution of first-time testers

Age, years	Previously tested, *n*	First time tested, *n*	Total, *n*
0 - 4	452	665	1 117
5 - 9	474	893	1 367
10 - 14	797	968	1 765
15 - 19	5 558	1 851	7 409
20 - 24	10 148	1 275	11 423
25 - 29	12 618	1 286	13 904
30 - 34	9 082	718	9 800
35 - 39	7 268	610	7 878
40 - 44	3 730	276	4 006
45 - 49	2 693	223	2 916
50 - 54	1 289	138	1 427
55 - 59	795	86	881
≥60	1 135	228	1 363
Total, *n*	56 039	9 217	65 256

and could therefore contribute to a lower HIV incidence. A study in Swaziland found that the positivity rate among home-based HTS clients was 3.5%, whereas it was 4.7% among mobile HTS clients.[20] This study had a positivity rate of 9.1% among home-based HTS clients and 8.8% among mobile HTS clients, which are both higher than the results from the Swaziland study.

It is estimated that adult men, aged ≥15 years, comprise 37% of all HIV-infected adults in SA.[21] The current study found that 43.6% of CB-HTS clients were males, of whom 92.8% were ≥15 years. This may indicate that CB-HTS is a more effective method to test adult men than facility-based HTS. The majority (87.9%) of CB-HTS clients were 15 - 49 years old – the age group where most new HIV infections are diagnosed.[22] CB-HTS therefore reaches the age group most at risk. The majority (67.7%) of clients tested for the first time also fell in this age group.

The positivity rate between the different FPD CB-HTS modalities does not differ >1% between the highest modality, home-based HTS with a 9.1% positivity rate, and the lowest modality, index client trailing with an 8.3% positivity rate. The average FPD CB-HTS positivity rate of 8.9% was consistent with that in the study by Mabuto *et al.*,[17] which obtained a 9.3% positivity rate. The study found that home-based HTS was the most effective FPD CB-HTS modality in terms of positivity rate in the district being studied. The FPD CB-HTS home-based testing modality also proved to be the preferred testing modality among first-time testers.

Conclusions

This study has proven that the FPD CB-HTS modalities performed well in the district in Mpumalanga, with home-based HTS delivering the highest positivity rate. The vulnerable age group of 15 - 49 years was mainly reached by FPD CB-HTS, which could contribute to the lower HIV incidence. If this study is replicated in other districts, it could inform how future resource allocation should be rolled out and planned. It could also potentially change future strategic planning and resource allocation for CB-HTS programmes.

A similar study could also be used to compare provinces or districts per HIV burden.

Study limitations

The data used in this study were not collected by the researcher or for research purposes, but for programme implementation and

Table 3. Modalities preferred by first-time testers

Testing modality	Previously tested, *n*	First time tested, *n*	Total, *n*
Home-based	34 707	7 250	41 957
Mobile	15 624	1 675	17 300
Index client trailing	4 390	198	4 588
Workplace	1 318	94	1 412
Total	56 039	9 217	65 257

Table 4. Positivity rate of the FPD CB-HTS modalities

	Testing modality				
HIV status	Home based	Mobile	Index	Workplace	Total, *n**
HIV-positive	3 800	1 525	382	124	5 831
HIV-negative	38 157	15 775	4 206	1 288	59 426
Total	41 957	17 300	4 588	1 412	65 257
Positivity rate, %	9.06	8.82	8.33	8.78	8.94

FPD = Foundation for Professional Development; CB-HTS = community-based HIV testing services.
*Except where otherwise indicated.

reporting. The researchers therefore had to rely on programme managers for accuracy of the data, which could limit the accuracy of the study findings. The study was conducted in one district in SA and may not be representative of other districts in the country.

Declaration. None.

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Conflicts of interest. None.

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