High Acceptability and Increased HIV-Testing Frequency After Introduction of HIV Self-Testing and Network Distribution Among South African MSM

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Background: South African men who have sex with men (MSM) have a high burden of undiagnosed HIV infection and HIV-testing rates incommensurate with their risk. HIV self-testing (HIVST) may increase testing uptake, frequency, and earlier HIV detection and treatment.

Setting: Gert Sibande and Ehlanzeni districts, Mpumalanga Province, South Africa.

Methods: We conducted a longitudinal HIVST study among MSM between June 2015 and May 2017. Overall 127 HIV-negative MSM were provided with up to 9 test kits of their choice—oral fluid or blood fingerstick—to use themselves and distribute to their networks. Surveys conducted 3- and 6-month post–enrollment elicited information on HIVST experiences, preferences, acceptability, utilization, and distribution. We used generalized estimating equations to assess changes in testing frequency.

Results: Ninety-one percent of participants self-tested. All participants who self-tested reported being likely to self-test again, with over 80% preferring HIVST to clinic-based testing. Fingerstick was preferred to oral fluid tests by approximately 2:1. Returning participants distributed 728 tests to sexual partners (18.5% of kits), friends (51.6%), and family (29.8%). Six participants seroconverted during the study, and 40 new diagnoses were reported among test recipients. Frequent (semi-annual) testing increased from 37.8% before the study to 84.5% at follow-up ($P < 0.001$), and participants reported anticipated frequent testing of 100% if HIVST were available compared with 84% if only clinic-testing were available in the coming year ($P < 0.01$).

Conclusions: HIVST use and network distribution is acceptable and feasible for MSM in South Africa and can increase testing uptake and frequency, potentially improving early detection among MSM and their networks.

Key Words: HIV self-testing, home HIV testing, MSM, South Africa

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INTRODUCTION

In South Africa, which has the most persons living with HIV globally,[1] testing still falls far below the levels necessary to impact the epidemic, particularly among men, who test half as frequently as women.[2] Data from the most recent Demographic and Health Survey indicate that close to one-third of men ages 15–49 had never tested for HIV, with only 45% reporting testing in the last year.[3] The 2012 National Household Survey noted that only 37.8% of men who were HIV positive were aware of their status.[4] Furthermore, as in most high HIV burden countries of sub-Saharan Africa, stigma and discrimination against sexual minorities have hindered implementation and scale-up of effective HIV testing, prevention, and treatment programming for men who have sex with men (MSM)[5]—even despite South Africa having decriminalized homosexual behavior more than 2 decades ago. With few targeted testing and treatment programs aimed at engaging MSM, the epidemic among MSM has continued to expand in South Africa, with high prevalence, incidence, and rates of HIV testing that are not commensurate with the risk of infection.[6–10] In fact, in 2 peri-urban districts of Mpumalanga data indicate that more than

two-thirds of HIV-positive MSM were unaware of their status in 2012–2013.[7]

Ethnographic studies across South Africa have documented how fear of stigmatization in public health care settings serves as a barrier to testing for MSM, and how actual experiences of stigmatizing attitudes and behaviors by health care workers are a barrier to receiving effective risk-reduction counseling among those MSM who do access HIV testing at public clinics.[11–13] In such high-burden and high-stigma environments, identifying strategies to expand HIV-testing options for MSM is critical. HIV self-testing (HIVST) offers an alternative to clinic-based testing, with potential to increase testing uptake and frequency, thus facilitating early HIV detection and treatment, adoption of safer sexual behavior, and prevention of new infections.[14–17] Studies conducted among MSM outside of the African context have demonstrated that HIVST is a means of reaching high-risk MSM, that MSM will use HIVST both alone and in partnerships, and that introduction of HIVST has not resulted in increased risk behaviors or increases in sexually transmitted infections.[18–24] Furthermore, a recent randomized trial in Australia demonstrated that MSM who were offered HIVST tested at twice the rate of MSM offered clinic-based testing only.[25]

South Africa recently made strides toward making HIVST available: The South African National Strategic Plan (NSP) for HIV, STIs, and TB 2017–2022[26] includes guidance on HIVST, expanded in the National HIV Testing Services Policy for South Africa in 2016[27] and a policy and guideline supplement issued in 2017.[28] Policy restrictions are being lifted, making it likely that self-tests could increasingly expand testing for MSM who may feel uncomfortable accessing clinic services. However, it is currently unknown whether MSM in sub-Saharan Africa will use HIVST, how these tests might be shared and distributed among MSM, and whether introduction of HIVST would increase testing uptake and frequency to ultimately improve early detection and treatment. To address this gap, we implemented an HIVST study among South African MSM in 2 districts of Mpumalanga Province to explore acceptability, feasibility, utilization, and distribution patterns, and to better understand how HIVST might expand testing options and frequency in this high prevalence area.

METHODS

Sites

We conducted this research in 2 district municipalities in Mpumalanga province, Gert Sibande and Ehlanzeni, where our team had previously observed high HIV prevalence and incidence in the MSM population through the 2012–2015 Mpumalanga Men's Study (MpMS) and where our team had ongoing prevention activities and a community presence established.[6,7] Briefly, the MpMS employed respondent-driven sampling (RDS)[29] to recruit independent samples of MSM in Gert Sibande (307) and Ehlanzeni (298) in 2012–2013. In Gert Sibande, 2 successive waves of mixed RDS recruitment and targeted recruitment of previous wave participants produced samples of 326 in 2014 and 311 in 2015. The Gert Sibande site was centered in Ermelo, the administrative center of the municipality. Despite its distance from urban centers, Gert Sibande's local municipalities of Msukaligwa (Ermelo), Mkhondo (Piet Retief), Goven Mbeki (Secunda), Lekwa (Standerton), and Dr. Pixie Ka Seme (Volksrust) have a visible and thriving gay community. The Ehlanzeni site office was located in Mbombela (Nelspruit), the Mpumalanga provincial capital and a hub for tourists visiting Kruger National Park. Recruitment included the Mbombela central business district and surrounding peri-urban areas.

Materials

Two self-testing kits were used for this study. The OraQuick HIV 1/2 Rapid Antibody Test (OraSure Technologies, Inc., Bethlehem, PA) uses oral fluid, collected using a swab which is inserted into a tube of reagent for processing, to detect HIV antibodies. OraQuick was approved by the FDA for clinical use in 2004 and for over-the-counter sales in 2012. The test has 99.3% sensitivity and 99.80% specificity in a laboratory setting and 93.0% sensitivity and 99.98% specificity in self-testing studies.[30–32] The AtomoRapid HIV 1/2 Antibody Test (Atomo Diagnostics, Sydney, Australia) uses whole blood and has a built-in lancet device, with which the user can prick him/herself. Blood can then be delivered into a specimen collection window via an onboard collection tube; the test processes with the addition of 2 drops of reagent, also provided in the test package. Sensitivity and specificity of the AtomoRapid with professional use are 100.0% and 99.6%, respectively.[33] The AtomoRadpid uses a WHO prequalified test strip, the OraQuick self-test is fully prequalified, and both are being packaged for sales in sub-Saharan Africa.

Procedures

Participants in Gert Sibande were selected randomly from among the MpMS participants who had tested HIV-negative during the final RDS survey conducted in 2015. Participants in Ehlanzeni were recruited from among all HIV-negative MpMS participants who had participated in 2013 who were still reachable/in the area (n = 14), and from a new RDS recruitment designed to mimic MpMS recruitment, which occurred in September and October 2016 (n = 58). The new RDS was instituted as most MpMS participants in Ehlanzeni were no longer reachable. Participants recruited from MpMS in both sites were contacted by study staff to assess interest in the study, review eligibility criteria, and to gauge willingness to take an HIV test at the study office to confirm eligibility. Participants recruited through the new RDS in Ehlanzeni presented at the study office with a coupon and were screened for eligibility on site. Eligibility criteria included being at least aged 18 years or older, being sexually active with another man in the 6 months before recruitment, willing to undergo HIV testing to confirm negative HIV-status, and able to provide consent.

Recruitment for the HIVST study in Gert Sibande occurred between May and June 2015, with 55 MSM enrolled into the study. Recruitment in Ehlanzeni occurred between August and October 2016, with 72 MSM enrolled. Written informed consent was obtained from all participants, and all participants underwent HIV rapid test with the counselor to confirm HIV-negative status at enrollment. Participants were then administered a brief behavioral questionnaire, shown a demonstration on how to use both the oral fluid and fingerstick HIV self-tests, and asked to choose the type of test they would like to take home. Each participant received 5 tests (either oral fluid or blood). Participants were encouraged to use at least 1 test kit themselves and to test and share the kits with sexual partners and others with whom they felt safe distributing kits and discussing HIV. Participants were provided with logs to document the use of the tests, a list of local psychosocial and medical resources and referrals should the participant test HIV positive—including a 24-hour study phone number—and safer sex supplies (ie, condoms and lubricant). All test kits included instructions for use, the study contact number, and referral numbers; all test instructions and study resources had been pilot tested for clarity and updated during a formative phase in both sites in early 2015 (Fig. 1).

Return visits were conducted at 3 and 6 months after enrollment. The 3-month visit included an acceptability survey, delivery of used test logs, and receipt of additional tests (up to 4 of either type) if requested. Six-month visits included a behavioral and acceptability survey, delivery of used test logs, and an observed HIVST experience with the test kit of the participant's choice (blood or oral). The staff called each participant 6 weeks after the enrollment and 3-month visits (mid-way between visits) to monitor for adverse events, such as emotional distress or partner violence, answer any questions about the test kits, and make referrals if needed. Study retention efforts included visiting the more distant rural areas to conduct follow-up visits for those who were unable to present at the study office. Participants were provided a reimbursement of R100 (~USD$8) for their time at each visit plus up to R50 (~USD$4) additional transport reimbursement if traveling from a rural township. The protocol was approved by the UCSF Committee on Human Research, the University of the Witwatersrand's Human Research Ethics Committee the CDC's Center for Global Health, Human Research Protection, and the Mpumalanga Department of Health and Social Development Research Committee.

Analysis

Survey data were captured in QDS (Questionnaire Development System) and exported to STATA (Stata Statistical Software: Release 14; StataCorp LP, College Station, TX) and R (R Foundation for Statistical Computing, Vienna, Austria) for analysis. All measures are based on self-report during surveys and the received HIVST logs. Acceptability indicators include HIVST test utilization, preference, and intention to use HIVST in the future. We asked each participant to report on whom tests were shared with and the frequency of partner testing. To assess changes in HIV-testing behaviors, we compare reported HIV testing at (ie endline). to reported HIV-testing behaviors before participation in our research initiatives, including MpMS. As a result, we use MpMS survey data for those recruited from MpMS and baseline HIVST survey data for those recruited in the new

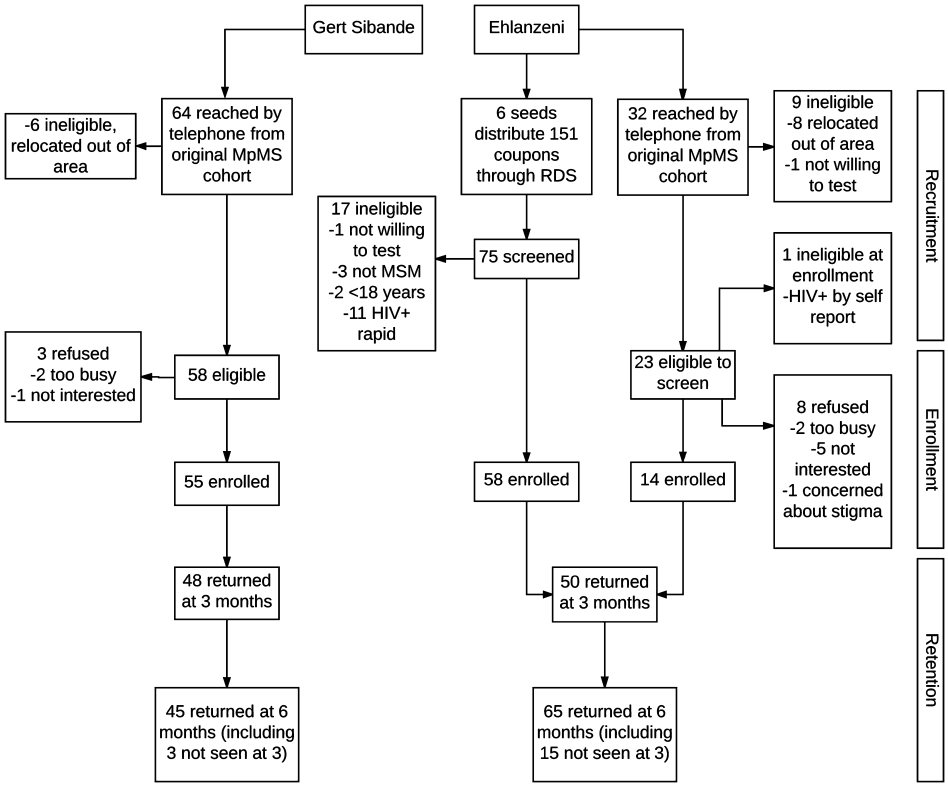

FIGURE 1. Recruitment and enrollment in HIVST among South African MSM.

RDS. This choice reflects testing behaviors before study initiatives that included HIV testing and thus would bias reporting. We also recorded HIV testing during the study and reported anticipated future testing to assess change in frequency of testing.

Frequency tables were generated to describe the population demographics, reported testing preferences, history of testing, and anticipated testing in the future. We compared frequencies of these variables by site, using Fisher exact tests. In addition, we summarized frequencies of characteristics of all distributed kits, including the relationship of the receiver to the study participant and the test result. Here, we compared dyad-level frequencies across site using Wald-based tests of generalized estimating equations with binomial distributions, log links, and exchangeable working correlation structures. Finally, we compared reported HIV-testing frequencies before and after study initiation using a Wald-based test of generalized estimating equations.

RESULTS

Among those contacted for participation in the pilot study in Gert Sibande, where men were recruited solely from the consecutive MpMS samples, 64 were reached by telephone. Six were ineligible due to relocation out of the area, and 3 declined to participate, resulting in a participation rate of 95% (55/58). In Ehlanzeni, where men were recruited either from the original MpMS sample or by the new respondent-driven sampling scheme, a total of 107 were approached about participation in the study. Twenty-seven were ineligible for a variety of reasons, including relocation out of the area (8), unwilling to have an HIV test (2), not MSM (3), under the age of 18 (2), and HIV positive either by rapid test during screening (11) or by self-report (1). A further 8 refused participation, resulting in a participation rate of 90% (72/80) among those eligible. There were no differences in age, education, employment, or HIVST-testing history between the participants recruited from RDS and the original MpMS cohorts. Between the 2 sites, 127 MSM were enrolled, of whom 98 participants returned for the 3-month visit and 110 returned at 6 months, including 18 who did not return at 3 months, resulting in 82% retention at the end of the study and 116 (91.3%) who returned at least 1 time to report on HIVST use and experiences.

Most participants were young, with 65% of the participants ages 18–24, only 10% reporting studies beyond high school to date, and only 30% reporting paid work in the past 6 months (Table 1). Although having regular male partners was consistently reported by more than 80% of men in both sites and most men in the study identified as bisexual, reported sexual identity and regular female sexual partners was different between sites, such that in Gert Sibande more men identified as bisexual and likewise reported more female partners. In Gert Sibande, all participants had tested recently during their participation in MpMS. HIV-testing history before the MpMS/HIVST research collaboration noted that 18.2% of participants in Gert Sibande and 12.5% of participants in Ehlanzeni had never tested and 10.9% and 25.0% had not tested in the last year in the 2 locations, respectively.

TABLE 1. Characteristics of HIVST Study Participants by Recruitment Area

	Overall (n = 127)		Gert Sibande (n = 55)		Ehlanzeni (n = 72)	
Respondent Characteristics	**n**	**%**	**n**	**%**	**n**	**%**
Age						
18–24	83	65.4	35	63.6	48	66.7
25–39	44	34.6	20	36.4	24	33.3
Highest level of education						
Primary or secondary	65	51.2	20	36.4	45	62.5
Matric (graduated high school)	49	38.6	28	50.9	21	29.2
Some college or technical school	13	10.2	7	12.7	6	8.3
Paid work in the past 6 mo?						
Yes	40	31.5	16	29.1	24	33.3
No	87	68.5	39	70.9	48	66.7
Sexual identity*						
Gay/homosexual	37	29.1	8	14.5	29	40.3
Straight	3	2.4	3	5.5	0	0.0
Transgender	1	0.8	1	1.8	0	0.0
Bisexual	86	67.7	43	78.2	43	59.7
HIV-testing history at HIVST baseline*†						
Never tested	5	3.9	0	0.0	5	6.9
Tested in past 6 mo	93	73.2	54	98.2	39	54.2
Tested 6–12 mo ago	10	7.9	1	1.8	9	12.5
Tested >12 mo ago	19	15.0	0	0.0	19	26.4
HIV-testing history before MpMS/ HIVST studies*						
Never tested	19	15.0	10	18.2	9	12.5
Tested in past 6 mo	48	37.8	11	20.0	37	51.4
Tested 6–12 mo ago	36	28.3	28	50.9	8	11.1
Tested >12 mo ago	24	18.9	6	10.9	18	25.0
Regular male sexual partner						
Yes	106	83.5	44	80.0	62	86.1
No	21	16.5	11	20.0	10	13.9
Regular female sexual partner*						
Yes	65	51.2	38	69.1	27	37.5
No	62	48.8	17	30.9	45	62.5
No. of sexual partners in the past 6 mo						
0	3	2.4	2	3.6	1	1.4
1	79	62.2	36	65.5	43	59.7
≥2	45	35.4	17	30.9	28	38.9

*Differences in site characteristics ($P \leq 0.05$).
†All participants in Ermelo had recently tested in the MpMS study.

Among all 127 participants, test use was reported among 116 (91.3%). Three participants were never reached to confirm the use of HIVST and are assumed to be nonusers. Self-testing was preferred over clinic-based testing: more than 80% of participants with a return visit who had used both clinic and self-testing stated that for their next HIV test, they would prefer HIVST to clinic-based testing (Table 2). Reasons for self-testing preference centered on benefits of privacy, convenience, and

TABLE 2. Uptake of HIVST Among Full Cohort and Utilization and Distribution of HIVST Among MSM Participants Returning for Follow-up, by Recruitment Site in Mpumalanga, South Africa

	Overall (n = 127)		Gert Sibande (n = 55)		Ehlanzeni (n = 72)	
Participant utilization†						
No. of reported HIVST used by participant*						
None reported (including LTF)	11	8.7	2	3.6	9	12.5
1 test	43	33.9	19	34.5	24	33.3
2 tests	59	46.4	32	58.2	27	37.5
3+ tests	14	11.0	2	3.6	12	16.7
Test(s) selected						
Blood	70	55.1	30	54.5	40	55.6
Oral fluid	25	19.7	9	16.4	16	22.2
Selected both (selected other test at 3-mo follow-up visit)	32	25.2	16	29.1	16	22.2
Testing conditions‡	N = 116	%	N = 51	%	N = 65	%
Distributed at least 1 test to‖						
Sexual partners	76	65.5	34	66.7	42	64.6
Friends	112	96.6	49	96.1	63	96.9
Family members	97	83.6	45	88.2	52	80.0
Tested with someone present						
Ever tested with others	37	31.9	14	27.5	23	35.4
Always tested alone	79	68.1	37	72.5	42	64.6
Tested concurrently (tested together at the same time)						
Yes	28	24.1	12	23.5	16	24.6
No	88	75.9	39	76.5	49	75.4
Present while test receiver conducted test‖						
Yes—partner	46	39.7	21	41.2	25	38.5
Yes—friend	48	41.4	25	49.0	23	35.4
Yes—family	38	32.8	20	39.2	18	27.7
Participant seroconversions during study	6	4.7	2	3.6	4	5.6
Testing preferences§	N = 112	%	N = 51	%	N = 61	%
Testing preference (among those who used HIVST)						
Prefer HIV self-test	93	83.0	43	84.3	50	82.0
Prefer to test with a health professional	12	10.7	7	13.7	5	8.2
No preference	7	6.2	1	2.0	6	9.8
Likelihood of using self-test if available?						
Very likely	109	97.3	48	94.1	61	100.0
Somewhat likely	3	2.7	3	5.9	0	0.0
Unlikely	0	0.0	0	0.0	0	0.0
HIVST kit preference (at 6-mo survey)¶						
Blood	51	64.6	23	63.9	28	65.1
Oral fluid	27	34.2	13	36.1	14	32.6
No preference	1	1.3	0	0.0	1	2.3
Total tests distributed by all participants‡	N = 728	%	N = 332	%	N = 396	%
Distributed tests provided to						
Sexual partners	135	18.5	57	17.2	78	19.7
Friends	376	51.6	167	50.3	209	52.8
Family members	217	29.8	108	32.5	109	27.5
Distributed test results*						
Negative	522	71.7	233	70.2	289	73.0
Positive	40	5.5	10	3.0	30	7.6
Invalid	27	3.7	8	2.4	19	4.8
Do not know	139	19.1	81	24.4	58	14.6

*Differences in site utilization, preference, or distribution ($P \leq 0.05$).
†Reported for all enrolled participants, including those who did not confirm use or who did not return to provide follow-up data.
‡Includes participants returning to at least 1 follow-up visit.
§Numbers reflect those who returned to a follow-up visit and reported use (eg, nonuse and LTFU excluded).
‖Percentages for individual boxes, not referent to column or row.
¶Preference question only asked of those reporting HIVST preference at 6-month survey.
LTFU, loss to follow-up.

empowerment. Those who preferred clinic-based testing stated a desire for counseling or support. Test choice favored fingerstick tests over oral fluid, with 57 (44.9%) ever choosing to take oral fluid tests home and 102 (80.3%) ever choosing blood. Test preferences were consistent over time, with 65% of those who stated a preference for HIVST at the final visit stating they would select a fingerstick test, the main reason being trust in the blood test compared with oral fluid. In addition, 97% of participants who returned said that they were very likely to use HIVST if available in the future (Table 2).

Participants returning for at least 1 follow-up visit reported on test distribution and testing conditions, that is, with whom they shared tests kits, whether they themselves tested with someone else present and whether someone else tested in their presence. Overall, 66% reported distributing tests to their sexual partners, 97% reported distributing tests to friends, and 84% reported distribution to family members. Overall, 32% of the cohort reported testing with someone else present and 24% reported concurrent testing (testing at the same time as another).

Returning participants reported distributing a total of 728 tests in the community, with 18.5% of kits going to sexual partners, 51.6% going to friends, and 29.8% going to family members. Participants reported on the results of distributed test kits, providing information regarding results for more than 80% of tests distributed; reported results included 71.7% reported as negative results, 5.5% (40 results) reported as positive, and 3.7% (27 results) reported as invalid tests. Finally, 6 participants, 5% of those returning for follow-up, had documented seroconversion over the course of the 6-month study.

We assessed HIV-testing uptake over time and anticipated HIV testing with and without HIVST availability. We found that less than 40% of the cohort tested frequently (every 6 months or less) before joining the MpMS or HIVST research cohort, and that more than 84% reported recent testing after 6 months in the HIVST study (at the end of the follow-up period), seeing a doubling in recent test uptake facilitated by the distribution of HIV test kits (Table 3). The increase in 6-month testing over the study period was statistically significant in Gert Sibande (difference = 62.6, $P < 0.01$) and in Ehlanzeni (difference = 34.5, $P < 0.01$). Furthermore, when asked about anticipated frequency of testing in the coming year, although 86% noted that they would test every 6 months or more frequently under the current scenario (of clinic-based testing), 100% said that they would test every 6 months or more frequently if HIVST were also available. (Table 3; Fig. 2). The difference in anticipated testing under the scenario of HIVST availability was statistically significant in Gert Sibande (difference = 11.1, $P = 0.02$) and in Ehlanzeni (difference = 15.6, $P = < 0.01$).

Linkage to care was recorded for those who tested HIV positive. Of the 6 participants who were known to have seroconverted, 4 reported having linked to care and starting treatment. One in Gert Sibande refused care referral, despite multiple attempts at follow-up by study staff; 1 in Ehlanzeni accepted the care referral and stated an intention to go to care but had not done so by the end of study follow-up.

TABLE 3. Reported HIV-Testing Frequency Over Time by Site in Mpumalanga, South Africa

Reported Testing Frequency	Overall (N = 127)		*P*	Gert Sibande, (N = 55)		*P*	Ehlanzeni (N = 72)		*P*
Before study participation (HIVST or MpMS)*	n	%		n	%		n	%	
<6 mo	48	37.8		11	20.0		37	51.4	
6–12 mo	36	28.3		28	50.9		8	11.1	
>12 mo	43	33.9		16	29.1		27	37.5	
			<0.01‡			<0.01‡			<0.01‡
After HIVST participation	N = 116	%		N = 51	%		N = 65	%	
<6 mo	98	84.5		42	82.4		56	86.2	
6–12 mo	15	12.9		9	17.6		6	9.2	
>12 mo	3	2.6		0	0		3	4.6	
Anticipated in following year—clinic-based testing only†	N = 109	%		N = 45	%		N = 64	%	
<6 mo	94	86.2		40	88.9		54	84.4	
6–12 mo	14	12.8		5	11.1		9	14.1	
>12 mo	1	0.9		0	0.0		1	1.6	
			<0.01§			0.02§			<0.01§
Anticipated in following year—clinic-based and HIVST testing available†									
<6 mo	109	100		45	100		64	100	
6–12 mo	0	0		0	0		0	0	
>12 mo	0	0		0	0		0	0	

*Includes data from 2015 for MpMS-recruited participants and 2016 for non–MpMS-recruited participants.
†Anticipated testing question only asked at 6-month survey; 1 participant in Ehlanzeni was inadvertently not asked questions about anticipated testing.
‡Difference between testing frequency at end of follow-up compared with previous testing frequency (overall; Gert Sibande; Ehlanzeni).
§Difference between anticipated testing with clinic-based testing available compared with HIVST and clinic-based testing available.

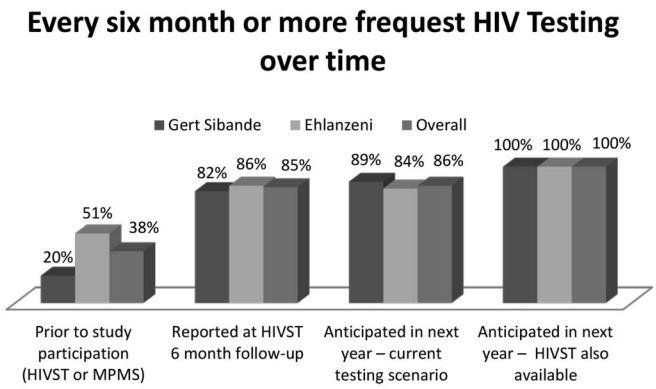

FIGURE 2. Change in frequent HIV testing over time.

DISCUSSION

We documented high uptake and acceptability of HIVST after distribution of HIVST kits to MSM in 2 high prevalence districts of Mpumalanga, South Africa. Uptake was more than 90% and preference for HIVST over clinic-based testing was more than 80%, a finding either commensurate or higher than other studies with MSM in resource poor settings when MSM had the opportunity to use HIVST.[24,34] We also found a significant preference for fingerstick tests over oral fluid tests among the participants. Very few studies have provided both oral fluid and fingerstick testing opportunities to date; our findings differ substantively from 1 study conducted in a US emergency department, where oral fluid testing was greatly preferred.[35] Based on survey responses during follow-up and reports from the study interviewers, this preference likely reflects both comfort with blood-based testing, which is the standard test used by public clinics, and some confusion about the difference between virus and antibody detection, as a number of MSM asked counselors how HIV would be detected in saliva if the virus cannot be transmitted through kissing. Nonetheless, given the diversity of preferences and the overwhelming support for HIVST, we recommend availability and distribution of both products (fingerstick and oral fluid) for MSM in South Africa.

We found that distribution of kits was extensive through the MSM network, with approximately 65% of MSM reporting providing a test to a sexual partner, over half of whom stated that they were present during their partner's test. Given low likelihood of uptake of partner testing for MSM in South African clinics, HIVST signals a new opportunity to both promote MSM partner testing and encourage discussions around serostatus.[19,21,36] Furthermore, in addition to providing kits to partners, almost all MSM who returned for follow-up distributed test kits to both friends and family. Although distribution to friends was expected, the fact that 83% of MSM shared a test kit with a family member was unanticipated. Although the nature of the family member relationship was not asked (eg, it could have been a parent, grandparent, sibling, or cousin, etc), the potential for supportive HIV testing in families is enormous in an environment where HIV is ubiquitous and treatment adherence may be improved when family is aware and supportive of ones' infection.[37,38] Furthermore, it should be noted that 40 (5.5%) of the distributed tests were reported as positive, which is a huge gain in new diagnosis. However, this may be an underestimate of new diagnoses because most distributed tests were conducted without the index participant present and, therefore, could have been misreported.

We found that frequency of testing increased over the duration of the study, with a doubling of those who reported frequent testing facilitated by the distribution of HIV test kits. A handful of other studies have documented a similar increase in testing frequency when MSM were provided with HIVST. In a recent randomized trial in Australia, Jamil et al[25] demonstrated that MSM who were offered HIVST tested at twice the rate of MSM offered clinic-based testing only. Similarly, Katz et al[22] noted that among MSM randomized to HIVST access vs. standard clinic-based testing in Seattle, the mean number of HIV tests and quarterly testing increased significantly among those in the HIVST arm, with no increases in risk behaviors. Furthermore, we noted that when asked about anticipated testing in the coming year, MSM anticipated more frequent testing with both clinic-based and HIVST available compared with the current, clinic-based only scenario, providing some additional evidence that adding HIVST to the testing options could improve testing uptake and frequency. Although this study did not aim and was not powered to document incidence, our observation of 6 seroconversions in a short time span (amounting to 6 new infections in 55 person years of observation) is consistent with previous estimates by Lane et al[6] and Kamali et al.[39] These facts and observations taken together confirm the urgent need to increase testing uptake in what is very likely a community experiencing peak incidence.

This study has some limitations. Although recruited through methods designed to generate a representative sample, and although participants reflect the original MpMS (RDS) cohort, the sample is unlikely representative of all MSM in the area. The sample was largely young, indicating that older MSM networks were not represented. Although our data add to a growing evidence base that HIVST would in fact increase testing, data are still sparse regarding whether HIVST would effectively decrease time to HIV diagnosis, reaching MSM who would not otherwise test and increasing frequency among high HIV risk nontesters or infrequent-testers, as opposed to becoming a substitute or replacement for clinic-based testing for those who would have tested regardless of the testing mechanism. This was a limitation of our study as well, and we recommend additional implementation science research to understand HIVST's impact on early diagnosis and thus early entry into care and reduced incident infections, which is the key to further promotion of this potentially impactful tool in the HIV epidemic.

CONCLUSIONS

In the absence of targeted HIV prevention and treatment programming for MSM, extensive sexual transmission has resulted in a concentrated MSM HIV epidemic within South Africa's generalized epidemic,[40] with testing rates that are not commensurate with risk among the MSM community. HIVST is acceptable and feasible, can be disseminated

through high-risk peer networks, and increases testing frequency and partner testing, potentially improving early detection and facilitating treatment. Both national stakeholders and international institutions are increasingly embracing HIVST; however, targeted distribution channels and accessible pricing are urgently needed to ensure MSM have access to this promising tool. At present in South Africa, over-the-counter sales of HIVST by pharmacists are no longer restricted; however, the cost (approximately 6–12 US dollars) limits access by low-income South Africans, including MSM. We strongly recommend the immediate implementation and scaling of HIVST as a programmatic innovation that can conceivably reduce time to diagnosis and subsequent treatment uptake in such rapid-transmission settings.

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