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## Choice in HIV testing: the acceptability and anticipated use of a self-administered at-home oral HIV test among South Africans

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### Abstract

Combination HIV prevention is being widely promoted by funders. This strategy aims to offer HIV prevention choices that can be selected and combined to decrease HIV risk in ways that fit with each individual's situation. Treatment as prevention and pre-exposure prophylaxis are two new evidence-based strategies to decrease HIV incidence, both of which require high HIV testing rates to be effective, and the Joint United Nations Programme on HIV/AIDS (UNAIDS) has set a goal of 90% of HIV-positive individuals knowing their status by 2030. However, HIV testing rates in many countries remain suboptimal. Just as no single HIV prevention method is ideal for all people in all situations, no single HIV testing modality is likely to be acceptable to everyone. By offering HIV testing choices, we may be able to increase testing rates. However, many low-resourced countries have been slow to take up new HIV testing options such as the self-administered at-home oral HIV test that is currently available in the United States. In this paper, we present findings from 20 in-depth interviews, conducted in 2010, documenting opinions about self-administered at-home oral HIV testing, a testing modality still largely unavailable in Africa. Participants were clients of three primary healthcare clinics in South Africa. Self-testing was seen as enabling confidentiality/privacy, saving time, and facilitating testing together with partners. However, concerns were raised about psychological distress when testing at home without a counsellor. Some suggested this concern could be minimised by having experienced clinic-based

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HIV testing and counselling before getting self-testing kits for home use. Thus, self-administered HIV testing could be an option added to the current testing modalities to address some important barriers to testing.

### Keywords

condoms; gender; self-administered HIV testing; social ecological model; South Africa

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### Introduction

Combination prevention is being widely promoted for HIV by funders. This strategy aims to offer people several HIV prevention choices that can be selected and combined to decrease HIV risk in ways that fit with each individual's situation (Kurth, Celum, Baeten, Vermund, & Wasserheit, 2011). Treatment as prevention is one of the new evidence-based strategies to decrease HIV incidence (WHO, 2012), and the World Health Organization (WHO) has recommended that all people living with HIV, regardless of CD4 cell count, should initiate treatment. Pre-exposure prophylaxis (PrEP) is another new prevention option in the combination prevention tool kit being recommended. (WHO, 2015). However, for these methods to be effective, HIV testing rates must be high. In 2014 the Joint United Nations Programme on HIV/AIDS (UNAIDS) launched its ambitious 90-90-90 HIV testing and treatment goals that by 2020: (1) 90% of people living with HIV will know their HIV status; (2) 90% of people diagnosed with HIV will receive sustained antiretroviral therapy; and (3) 90% of people receiving antiretroviral therapy will have viral suppression (UNAIDS, 2014a).

Still, HIV testing rates in many countries remain suboptimal, and only 65.5% of South Africans, where this study was conducted and HIV prevalence is high, had ever tested for HIV in 2012 (Shisana et al., 2014). Furthermore, there are gender disparities in HIV testing in South Africa, as seen in the proportion ever tested in serial Human Sciences Research Council (HSRC) household surveys (2005: men = 27.6%, women = 32.9%; 2008: men = 43.0%, women = 56.7%; (Shisana et al., 2009); 2012: men = 59.0%, women = 71.5% (Shisana et al., 2014)). If there is to be any hope of achieving the first step in the 90-90-90 goals, new strategies for HIV testing are needed that address the factors preventing some people from testing under the current HIV testing system.

Numerous barriers to HIV testing and counselling (HTC) have been identified. These barriers likely differ between individuals and can be understood within their specific social and environmental contexts. The Social Ecological Model, a systems model that describes levels of influence between individuals and their social environments (Bronfenbrenner, 1994), has been modified for use to explain the complex associations among individual (intrapersonal), interpersonal, social environment, structural (institutional), and policy factors in influencing HIV sexual risk behaviour (Harper et al., 2014). This model may also be useful in considering barriers that prevent some people from accessing HIV testing, which may work alone or in combination at any of these social environmental levels. At the social level and related to social norms regarding HIV testing, there are concerns about the

stigma associated with being seen at HTC clinics and that clinic staff will breach confidentiality (Angotti et al., 2009; Jürgensen, Tuba, Fylkesnes, & Blystad, 2012). Concerns about lack of confidentiality may be, in part, related to fear that a main partner will suspect infidelity (DiCarlo et al., 2014; Mills, Beyrer, Birungi, & Dybul, 2012), and thus the interpersonal level is also important. In addition, at the structural level, inconvenience, time, and cost of travel to HTC clinics (Angotti et al., 2009; Gay, Croce-Galis, & Hardee, 2012; International Labour Organization, 2005), and the long waits (Gay et al., 2012; International Labour Organization, 2005) are barriers to health facility-based HTC for some (Stankard, LeTouzé, & Jones, 2014). However, whether these factors act as barriers may depend on individual-level context such as competing time commitments. Furthermore, some individuals may dislike or fear hospital and clinic settings, noted as an important barrier to testing among men, and prefer to test at home (DiCarlo et al., 2014; Mantell et al., 2014; Ochako, Vu, & Peterson, 2014).

In Zambia in the late 1990s, one population-based study found that those randomly assigned to a choice of HIV testing location (at home, in the local HTC clinic or some other preferred location) were 4.7 times more likely to accept HIV testing than those assigned to HTC only at a local health clinic (no choice). Most of those in the location choice arm choose to test at home (Fylkesnes & Siziya, 2004). Another study in South Africa in 2011 among a convenience sample of members of communities in nine different provinces asked participants to fill out a survey that included a question about what HIV testing method they would prefer (self-testing at home using kits made available for free, provider-initiated HTC when seeking health care, or client-initiated HTC in a clinic). Overall, 22.3% preferred self-testing at home, 11.6% preferred provider-initiated testing, and 66.1% preferred client-initiated testing in a clinic. Those preferring self-testing at home were more likely to be male, white, never tested for HIV, and live in cities or towns (van Dyk, 2013). This research suggests that no single HIV testing modality is acceptable to everyone and alternate options are needed. Perhaps multiple strategies to HIV testing, similar to the approach now used for HIV prevention, are needed to address the barriers specific to each individual's context. Offering new HIV testing choices in addition to the current options may increase HIV testing rates and testing frequency by addressing some of the barriers most important to those not testing regularly under the current testing system.

On 3 July 2012, the United States (US) Food and Drug Administration (FDA) approved a rapid self-administered oral HIV test for at-home use (OraQuick In-Home HIV Test). The test involves swabbing the mouth and results are available in 20–40 minutes. The test has a sensitivity (probability that someone infected with HIV tests positive for HIV) of 92% and a specificity (probability that someone HIV-negative tests negative for HIV) over 99% (McNeil, 2012). Numerous studies have found self-administered HIV testing to be acceptable in African populations (Choko et al., 2011; Kalibala et al., 2014; Kurth et al., 2014; Ochako et al., 2014; Pant Pai, Behlim, et al., 2013; UNAIDS, 2014b). In South Africa, however, the South African Pharmacy Council policy prohibited the sale of self-administered HIV test kits in pharmacies in the country (The South African Pharmacy Council, 2010) until 2015, when the ban was lifted (Gonzalez, Polao, & Warby, 2016). The South African Government is considering a policy that includes self-administered HIV testing (UNAIDS, 2014b). A recent announcement suggests that HIV self-testing kits are

expected to become available in South Africa in the near future (South Africa introduces, 2016).

Although the potential for harm due to psychological distress from unsupervised self-administered HIV testing without adequate counselling and possible forced or coerced testing has been noted (Campbell & Klein, 2006; Richter, Venter, & Gray, 2010; Wright & Katz, 2006), there is little evidence that such harm has or will occur (Brown, Djimeu, & Cameron, 2014; Richter et al., 2010; UNAIDS, 2014b). Similar concerns about self-tests for other conditions were proven unfounded when the products were made available to the public (Brown et al., 2014). Furthermore, in South Africa where one in six adults is HIV-infected and where treatment has become widely available (UNAIDS, 2012), HIV is no longer considered a death sentence and the fear associated with it may be on the decline (Njanji, 2013). Therefore, severe negative reactions to a positive test in the absence of a counsellor may be less likely. Error associated with self-administered HIV testing is a concern, and error rates among African populations have varied (Choko et al., 2011; Kurth et al., 2014; Pant Pai, Behlim, et al., 2013; Peck et al., 2014). In one study among South African healthcare workers, three of nine who tested HIV-positive incorrectly interpreted their tests as negative, resulting in a user sensitivity of only 66.7%, but 100% specificity. However, the authors argued that this can be improved with better instructions (Pant Pai, Behlim, et al., 2013). Supervised self-administered HIV testing, at least the first time the test kit is used, may be an option to increase correct use. Repeat testers (i.e., those who test HIV-negative on the first self-test) might then be better prepared to self-test correctly without supervision after having used the test once with supervision (Gollub, 2006; Pant Pai, Sharma, et al., 2013). With combination HIV prevention, even the use of less effective methods has been shown, through modelling, to potentially avert many HIV infections (Foss, Vickerman, Heise, & Watts, 2003; Smith, Bodine, Wilson, & Blower, 2005), and a similar situation may be the case with HIV testing. Even if certain HIV testing modalities have lower sensitivity than other modalities, if people who do not access HIV testing under the current system do test when offered a choice of testing methods, there still may be an increase in the number of people who know their HIV status. Furthermore, if regular repeat testing becomes the norm because of the addition of new, convenient testing options, then a somewhat lower sensitivity will become less of a concern as an HIV infection may be identified upon repeat testing; and test confirmation can be carried out when linking to care to address any false positives.

The USFDA-approved self-administered oral HIV test for in-clinic and/or home might increase HIV testing rates in South Africa. However, little data exist about perceptions of self-administered oral at-home HIV testing among South Africans. In 2010, before FDA approval of the test kit, we conducted qualitative interviews with 20 clients attending primary healthcare clinics in Durban, South Africa, and asked questions to elicit opinions about making a self-administered oral at-home HIV test available in South Africa. This study provides pre-approval baseline data about potential users of the self-test, which is particularly timely with the recent announcement that the kits are being introduced in South Africa (South Africa introduces, 2016). We hope that this study will help inform the development of the national policies about and roll-out of HIV self-testing.

## Methods

### Sites and recruitment

We randomly selected three large urban healthcare centres providing primary healthcare services from a list of District Department of Health facilities in the Ethekwini district of Durban. The study was presented to the managers and staff of these facilities and study support was obtained. A total of 10 men and 10 women were recruited from the 3 selected sites. Study staff members were present at each site to recruit participants on five different occasions between 22 and 26 November 2010. All clients attending the clinic during one of the recruitment days were given an Information Sheet describing the study and instructing those interested in participating to contact the study staff member present that day in the clinic. Those who expressed interest were assessed for eligibility by asking their age; the only eligibility criterion was age 18 years or more by self-report. All interviews occurred on the day the participant was recruited in a private room in the health centre. Written informed consent was obtained before the interview. Ethics approval was obtained from the New York State Psychiatric Institute-Columbia University Department of Psychiatry Institutional Review Board, the University of the Witwatersrand Human Research Ethics Committee, and the University of KwaZulu-Natal Biomedical Research Ethics Committee.

### Data collection and analysis

We administered a semi-structured interview that lasted about 90 minutes. The primary topic of the interview was male circumcision, but at the end we asked several questions about a self-administered, at-home oral HIV test. The interviewer introduced the change in topic by saying that in this last section of the interview s/he wanted to talk about HTC. The interviewer then said that HTC in South Africa was primarily available in healthcare facilities, but some countries are considering making a self-administered test kit available for home use. The interviewer then described how the rapid oral self-administered HIV test works and asked participants to consider, should such a test become available in South Africa: (1) what some of the advantages and disadvantages of such a test might be; (2) whether they think other people might use it; (3) whether they might use it themselves; (4) whether they might use the test together with their partners; and (5) what they might do depending on the test results when testing with partners in terms of condom use and continuing the relationship. All interviews were conducted in isiZulu, digitally recorded, then transcribed and translated into English for analysis. Participants received ZAR50 (about US\$8 at the time of data collection) in appreciation of their participation.

### Data analysis

Four researchers developed coding schemes independently after reviewing a few interview transcripts. Two of the researchers then compared, combined and edited the coding schemes in an iterative process until a coding consensus was reached. The consensus codebook was loaded into Dedoose version 6.2.21. (SocioCultural Research Consultants, Los Angeles, California) and the transcripts were analysed by organising the text within these codes. Dedoose software was also used to quantitatively code certain types of responses to generate counts within categories such as: (1) whether the participant was generally positive, neutral or negative about the test; (2) whether they thought that South Africans in general would use

the test; (3) whether the participant would use the test him/herself; (4) whether the participant would use the test together with a partner; and (5) whether the participant felt his/her partner would be willing to use the test. Transcripts were then quantitatively coded independently by two researchers. The two researchers agreed on the coding of participants 95–100% of the time, depending on the category. The coding scheme and the data analysis for this study were guided by the Social Ecological Model (Bronfenbrenner, 1994; Harper et al., 2014) in looking at the advantages and disadvantages associated with use of a self-administered oral at-home HIV test as they would apply to the general population in South Africa (social), the participant him/herself (individual), and together with their partners (interpersonal), the three levels that were covered by the interviews. We present the results in this order because this was the order in which these three levels were discussed during the interviews.

## Results

### Acceptability of self-test-use: levels of context

Participants identified multiple potential advantages and disadvantages associated with self-administered oral at-home HIV testing. This assessment was examined at the three different contextual levels (social, individual and interpersonal). The degree of acceptability and specific advantages and disadvantages identified varied by context. When there were apparent gender differences, those are noted.

#### Acceptability by the general population (the social context)

Participants were about evenly split on whether they viewed the self-administered at-home oral HIV test (self-test) positively (nine positive, eight negative, three neutral). However, they overwhelmingly agreed that South Africans in general would use a self-test ( $n = 16$ ), and would welcome its availability for a variety of reasons. Most prominent among those reasons was the ability to test for HIV with confidentiality and privacy.

[You can test] without your status to be known by the nurses or doctors. Knowing that it wouldn't be easy for me to go to this clinic by my house [because] I would go to the shops and there is this nurse seeing me again

(TC012 female).

They can use it because they have that fear. If they go to clinic, people are scared of what people are going to say when they see them go to the VCT room

(TC005 female).

Even participants who had generally negative feelings about the test ( $n = 8$ ) felt that South Africans would use the test ( $n = 6/8$ , compared to 10/12 of those who were generally positive or neutral about the test). Confidentiality related to self-testing was usually understood as beneficial, but this privacy was also viewed by some negatively as secrecy and “hidden-ness,” as indicated by the following statement: “*You see...those people who want to hide their things; they can use it to hide their disgrace*” (TC014 male).



The time-saving aspect of self-testing at home was also seen as a benefit making it easier for people to test.

The other thing, I think a person will think that, I will go to the clinic and get tested really, and I will stay for three hours. [...] Maybe if I buy it [self-test] and get tested at home, I am not wasting any time here

(TC004 male).

Maybe some people will like it because it saves them the hassle of having to go to the hospital or clinic

(TC019 female).

Some felt that people would test more often if a self-test was available as a way to ascertain their status after potential exposure.

Because they know they are sexually active so they will want to try it [self-test] all the time, every time, when they have sex they will want to test themselves

(TC001 female).

Some concerns about the test were expressed. There was a sense that some people would not be able to use the test correctly or would not trust the test results.

So now if you going to do it [test] alone without anyone helping you and giving you more information, I don't think that will help unless if it is really sold at the chemists but before a person could get it [He/She] must produce a certificate showing that this person is trained maybe at the Department of Health, showing that this person is trained and he knows about HIV. Maybe there should be a special training that could be designed for people to be ready to test themselves you see, but otherwise I don't think it is a good idea here in South Africa

(TC018 male).

Participant: The disadvantage that can be there, my sister, is that they have not gotten enough education about this before. Because, for the person, the more, he/she becomes educated, the more he/she gains knowledge.

Interviewer: To be educated about what?

Participant: About how to use this machine for HIV self-testing

(TC006 Male).

Hhaay some will use it but others won't even trust it

(TC011 male).

Concerns about mental distress when testing alone, including the risk of suicide upon a positive test result, was discussed by half of the participants. In these scenarios, the importance of the post-test counselling provided by clinics during the HIV testing process is seen as crucial.

So if let's say right now you will go and get that information that you are HIV-positive and there will be no-one to guide you there who is well trained that could give you counselling information about the disease

(TC018 male).

I will just take the rope and hang myself because I know there is no one who will shout at me. Even if I'm crying, no one will comfort me, but here are things [ARVs] to prevent [death] and even the government is bringing the pills and you can prevent [death] with them...because the disease doesn't kill you if you can go to the counsellors, the counsellor will tell you that okay, alright, you have the disease and the disease doesn't kill you

(TC014 male).

Suicidality and mental distress were also closely tied to previous knowledge about HIV/AIDS. Some participants felt that those who had less HIV-related knowledge were more susceptible to undue mental distress, and therefore less “qualified” to undergo self-testing alone. In addition, there was concern that those who self-test may be less likely to disclose a positive result in the absence of counselling guidance: *“Then you test yourself then you find out that you are HIV-positive, and then you don't disclose that you have the disease”* (TC014 male).

A few participants identified cost as a potential barrier if the self-test kit was not available for free. As one of them indicated: *“It is because it is not for free. People like things that are for free. Someone may not have money to buy it”* (TC003 female).

### Participants' views about using the test him/herself (individual level)

Most participants who hypothesised that those in the general population would use the self-test also agreed that they themselves would use it. Fourteen participants reported that they would use the self-test themselves, and male participants were slightly more likely than female participants to say they would use the test (eight males versus six females). Only four participants firmly stated that they would not use the test (two participants did not clearly answer the question). Of the eight participants who reacted negatively to the test in general, three still said that they would use the test themselves if it became available in South Africa. This seeming discrepancy was related to the context of self-testing, with participants describing their possible use of the test because of their specific situation. For example, having prior general knowledge about HIV/AIDS, confidence in a committed relationship with a partner, or the perception of being at low HIV risk all contributed to increased self-test acceptance.

Yes I would use it because I have had counselling you see

(TC016 male).

I won't have a problem with it because I know I am in a relationship with one partner

(TC017 female).



Those who had positive reactions to self-testing and/or firmly indicated that they might use the test themselves tended to assess their own (HIV/AIDS-related) knowledge or relationship commitment to be high. Additionally, privacy was highly valued among the participants who had positive views about the self-test.

Among those who would not use the test themselves, the benefits offered by clinic-based, professionalised care outweighed the privacy and convenience of testing at home. Being alone and unable to access immediate counselling support was a crucial deterrent to self-test use for some, but this risk was also evaluated according to the individual participant's situation.

No my brother. I won't be able to use it [self-test] because I would want a person that can comfort me, because if I am alone, as I am a person who suffers from an impediment of speech, a person who suffers from an impediment of speech can easily become upset and easily take a decision. If I find out that I have the disease, I will just take a rope and hang myself. Because I don't have the gun, I will take the knife and put it into my heart, I will fall on top of it, then I die

(TC007 male).

Some said they would not use the test because they did not trust that it would give the correct results. The fact that the test was saliva-based rather than blood-based was also a major concern for a few participants: *“No, aah, aah I don't understand this tongue one [oral HIV test]; is it not said that AIDS is transmitted nicely through blood and not saliva?”* (TC003 female). However, one participant saw the use of oral fluids instead of a blood draw as a positive aspect: *“To others it can be fun, they will say, hawu, my brother it is fun. There is no need to touch blood”* (TC005 female).

### The interpersonal context of self-administered at-home oral testing with partners

The final context of self-testing examined was use of the test together with partners. Half ( $n = 10$ ) of the participants reported that their sexual partners would be willing to use the self-test. Seven participants reported that they would not want to use the test with their partners (of whom four reported that their partner would be willing to self-test); seven thought self-testing together with their partner would be a good idea. Some participants had multiple partners and reported that while one partner might be willing to self-test with them, the other partner would not. The interpersonal context for self-test use with partners had three distinct dimensions: (1) deciding with whom to test; (2) how to introduce self-testing together to a partner; and (3) the post-testing scenario (i.e., hypothetically, what would happen after you test with your partner depending on the test results).

**Deciding with which partners to test**—The first dimension in self-testing with a partner is deciding with which partners they would test. Participants repeatedly stated that they would test with their main partner or the partner with whom they shared the longest and most committed relationship. Sometimes they reported that the comfort and trust they shared with a main partner would make it easier to talk about HIV testing and test together: *“Ja I will choose a main partner because he is the person who I tell many things, unlike with others [partners], it [the relationship] is just for the time being”* (TC005 female).

However, there seemed to be a dichotomy between testing and condom use based on partner type. HIV testing was seen as something you do with a committed partner whereas condoms were something to use with casual partners.

I think it should be the partner that you know you [are] going places with, someone who is your main partner; the casual partners you need to use condoms

(TC016 male).

Ja I can use it with my main partner, but with casual I won't use it because there are condoms

(TC009 male).

For many participants, the decision to use a self-test was closely linked to whether or not they used condoms with their partners. If condoms were used, then the need for self-testing together was viewed as less important for participants. However, if participants were not using condoms consistently in a relationship, then self-testing was seen as useful. The commitment in the relationship could be reaffirmed through a negative result. However, a positive result would demand further negotiation and action; it would put the fidelity and commitment of the partner into question. With casual partners, it was easier to use a condom than to invite a potentially complicated situation through HIV testing: *"It's easier to just continue with using protection and stop bothering you with this [HIV test] kit"* (TC003 female).

Conversely, a few participants reported that they would "definitely" test together with a casual partner. Trust and confidence in knowing the main partner's (presumably negative) HIV status is contrasted with lack of similar information about the casual partner: *"No, I will test [with] the casual partner because the main partner is not there, and you know your main partner's status"* (TC006 male).

The confidence in whether a sexual partner would agree to use the HIV test together with the participant had gendered dimensions. Male participants were more likely to report that their partners would likely agree to the test together if they asked them (7/10 male participants versus 3/10 female participants). Female participants, however, stressed being uncertain about whether a similar agreement could be reached.

Interviewer: Do you think that your partner would be willing to be tested before sex?

Participant: It maybe won't be easy; he may not want to, because obvious[ly] men are hard-headed, I don't think it will be easy

(TC013 female).

In such a situation, a main partner was considered by some as easier to approach about self-testing together. In the exchange below, the female participant interviewed expects to test with her main partner instead of her casual partner because he is more likely to agree to the test.

Interviewer: Ok, do you think your main partner would want to use this test, would he want to test?"

Participant: I think he would agree to use it.

Interviewer: This casual partner you said that is where you would really use it. Do you think he would want to?

Participant: That one might not agree. I think I could test the main partner because, maybe you can sit down and talk about this test, but for [a] casual partner. I don't think it is easy

(TC012 female).

Despite such a dynamic, fewer female than male participants reported having an overall negative attitude toward self-test use (3/10 vs. 5/10 respectively).

**Introduction of self-testing together to partners**—Several strategies for introducing self-testing with sexual partners were described. Some participants said they could introduce the test by starting a conversation about a new invention that they had heard about. Depending on the reaction, they would steer the conversation toward possibly using the test together. Participants also talked about discussing the convenience and benefits of the test, such as time and privacy, to create further incentives for their partners to test with them.

I can talk about it, as to see how their reaction [is], if I talk about it. If their reaction is a good one then, okay, I will go ahead with the test, but if it is a bad one I will see that he doesn't care about it

(TC005 female).

In one scenario, a female participant reported she would not involve her partner at all, but would test herself repeatedly to assess whether her partner was faithful.

I would use [it] to check myself, whether or not I have the virus. If I don't, then I will know that my partner does not have it. But if we have sex again... and I check myself again and find out that I have it, I will know that he got it from somewhere else

(TC017 female).

This idea of using the test to decide whether or not to trust a partner was indicated by both male and female participants. HIV test results, both the partner's and the participant's, were seen as a tool to monitor commitment and fidelity.

Ooh, I think it is a good way because, uhm, it can be easy to trust each other in that way

(TC005 female).

[I would test] all of them [partners], because you cannot trust anyone (laughing). Because you are not always around them all the time

(TC015 male).

In contrast, male participants sometimes simply stated that their partners would test because they asked them to do so: *“There is nothing else. If I say we should use it [the self-test], then we should”* (TC015 male).

Other times, the discussion of testing was presented in a way the male partner might find acceptable. One participant offers a possible acceptable way in which his female partner could introduce the test to him:

I think it would be right, but something like that, I won't allow her to make her own decision, you see...? If, let's say, she is thinking of doing something like that, to introduce something like that in our relationship, first we must talk about it and she must say that there is something that she heard of and, like this, she is thinking of buying it because she thought it useful, like this and this, and give me reasons. And then I will grant her the permission of that. Not just go ahead buy it and then we will test together, [she should] not make her own decision

(TC018 male).

Participants also introduced self-testing by agreeing to test themselves alongside their partner. Self-testing together was seen by some as a way to enhance the relationship and increase intimacy.

Mmh, I can tell my partner that, no as partners we have to know each other and be sure that maybe we are right or we are not right. I can try to encourage her to try this test so that we know our status. If we are maybe be already infected, we could start using substances like treatment and move on if we love each other, but we have to know each other's status

(TC009 male).

Many participants indicated that they would feel uncomfortable if they were asked to self-test together by partner before sex. Such a request had meanings for the relationship in terms of trust, sexual behaviour and moral character. Even before finding out the results, the request to undergo an HIV test introduced uncomfortable assumptions about the relationships.

No...I can feel bad maybe and that maybe I can take it as that maybe she is not trusting me maybe she saw me somewhere, maybe doing something bad, you see?

(TC007 male).

Other participants felt that this request from a partner might be an opportunity to reaffirm their commitment to each other. One participant said: *"Heyi, I can be happy because I can see that the person cares about me"* (TC006 male).

While for many, the request to self-test for HIV together with a partner was predicted to introduce an element of anxiety to the sexual encounter, it was thought that it could be managed by a reaffirmation of trust, commitment and open communication.

**The post-testing scenario**—Several participants (four women, four men) stated that they would use the self-test with a partner to decide whether or not to use condoms.

Ja I can use it with my main [partner] ... because I believe in one partner that you sleep with straight [without condoms]. [use it] if maybe you want to sleep straight

(TC009 male).

So you know your status before you [are] sleeping with your partner or you both can go for it [self-testing] before even sleeping together. [...] Maybe the girl might be positive or maybe negative or the guy might be positive or all might be negative so you know, you not make a blunder of yourself [by not using a condom]

(TC020 female).

But others said that condoms should always be used no matter what the test showed.

You cannot use this test and then decide [about condom use], you still need to use condoms at all times because you would not be sure if this is right

(TC015 male).

When asked how a positive HIV result would affect their relationship, only five participants stated that they would end the sexual relationship (stop having sex with the infected person). Most indicated that they would continue with a renewed commitment to using condoms consistently. The question posed by the interviewer was whether the HIV self-test could be used as a way to help decide if participants should have sex with a particular person. However, most participants did not think about using the test in this way. Instead, self-testing with a partner was a cue for deciding whether to use condoms with their long-term partners. Many participants stated that they would use the self-test with their main partners because generally condoms are not used in this type of relationship. Many participants stated that hypothetically if their partner tested HIV-positive, they would access clinic services with that partner to confirm the test result and encourage their partner to seek counselling and linkage to care.

First thing that we will need to do is to use a condom most of the time, then take her to counsellors maybe for advice about treatment without leaving her, I cannot run away because of that

(TC009 male).

Many participants acknowledged that testing together and discovering a positive result signalled a need for greater support and care-taking for a partner. Love and commitment both played a role in deciding what the next steps might be. Caregiving practices and related support were significant themes that emerged within the context of a hypothetical HIV-positive result. The level of commitment in the relationship often determined whether or not support would be provided and, if so, the nature of that support. Partners would have to play the role of the HIV counsellor when testing together, and comfort in playing such a role varied. But some suggested that certain partners (e.g., new or casual partners) simply did not merit the same degree of care and support.

Participant: I mean if he was a new partner and we weren't that serious and ja then maybe [end the relationship].

Interviewer: If you were serious?

Participant: Then I will stand by him

(TC019 female).

Often, the emotional labour anticipated for these conversations about trust, care and the future was avoided with casual partners by the participant stating that s/he would not self-test together with such partners. Expectations of caregiving following a positive HIV test differed by gender. Women expressed feeling uncertain about receiving care from male partners if they were found to be HIV-positive while men did not express such concerns.

If that happened to him, he would leave me. He won't continue with someone who is HIV-positive while they are so many fresh people out there, no never

(TC010 female).

That could be up to him and what he would do, which means there are a lot of chances that he might run away because most of the time men run away when a woman is sick. We women are able to be patient when a person is sick

(TC012 female).

Interestingly, only two participants expressed concern about possible conflict with a partner upon a positive test result and both were men.

There would be that conflict if one is HIV-positive and the other one is negative, one might ask the other one where they got it; that would be the problem. Maybe they got it from other people

(TC016 male).

Now this kit I think it can cause an argument because now it means that you will test each other. Then someone will be positive, then you argue, then you break up like that

(TC018 male).

Only one male participant expressed the possibility of a violent reaction after a positive test result. The violence described was more a reaction to what would happen if he tested HIV-positive and therefore a partner refused sex as opposed to becoming violent because a partner tested positive.

It will depend to the position which I would be in, that as she would be there and asking me to get tested and what about my desire. [...if I test HIV-positive...], I would force you to have sex with me because I already told myself that I'm going to have sex with you. I already told myself that I'm going to have sex with this woman

(TC014 male).

## Discussion

### The social (population) level

On the social level (i.e., anticipated social norms around self-testing in the population), most participants felt that the test would be used by South Africans and that such a test would remove some important structural barriers such as lack of privacy and confidentiality, and the long wait and travel times associated with clinic-based testing. However, there were some concerns about self-testing outside of the clinic. Participants suggested that for some, self-testing would be a good option, but for others it might be associated with risk of mental

distress and even suicide. Specifically, it was suggested that self-testing may be most appropriate for people who already have experienced HTC with a provider and therefore have received education around HIV transmission, care and treatment. Others, however, might be unprepared for self-testing and would be better served by testing in a clinic. Thus, participants felt that for the general population, individual-level factors will be important in determining which HIV testing modality is most appropriate.

### **The individual level**

When participants considered using the test themselves, they couched the appropriateness of the test in terms of their personal context. Those who reported that they would use the test themselves explained that in their context of having already experienced HTC, they have the knowledge needed for self-testing. Interestingly, being in a committed relationship and perception of being at low risk were also important factors in explaining their willingness to test themselves, which suggests that self-testing might not be taken up by those at highest HIV risk. However, another study about HIV testing preferences in South Africa found that never testers were more likely to prefer self-testing (van Dyk, 2013). This difference might be due to the different samples, as the Van Dyk study was conducted with a convenience sample from the community and our study was among clinic attendees. However, even if those at lower risk are the primary users of the self-test kits, this may free-up clinic facilities to make clinic-based testing more convenient and reduce wait times and thus encourage those at high risk to access clinic-based testing on a more frequent basis.

Participants expressed differences in their personal trust of the test in general and, more specifically, whether they trust an oral test or prefer a test that does not require a blood draw/prick. There were also some gender differences in willingness to use the self-administered test, with slightly more men reporting willingness than women. This gender difference was also found in the self-testing acceptability study by Van Dyk (2013) and may suggest that such a test could address some of the barriers men face that explain their lower testing rates but would need to be explored at a larger scale. Thus, as with the assessment of testing in the general population, individual beliefs, characteristics and context were key in the assessment of whether a self-administered oral HIV test or clinic-based testing was appropriate for the participant.

### **The interpersonal level**

When considering the interpersonal context of self-testing together with a partner, again context was important. More participants felt that they might test with a main partner, with only a few saying they would use it with casual partners. Testing together was seen as an extension of a committed relationship and a way to demonstrate (or prove in some cases) trust in and the fidelity of the partner. Thus, testing rather than condoms (when both partners were HIV-negative) made sense to many for committed relationships; condoms were considered more appropriate for casual relationships. The idea that condoms were appropriate for casual but not for committed relationships has been found in other studies (Harrison, Xaba, & Kunene, 2001) and condom use tends to decline over time in a relationship as commitment increases (Beksinska, Smit, & Mantell, 2012). However, it is possible that joint self-testing with a partner was seen as a one-time activity at a point in the



relationship where the level of commitment increases and where condom use might be decreasing. Whether joint self-testing is something couples might do on a regular, repeated basis was not explored in these interviews. This warrants further research as requests of repeat testing might, like condoms, be perceived as questioning the partner's faithfulness, and in fact some suggested testing could be used to assess faithfulness.

Hypothetical reactions to a partner testing HIV-positive were generally supportive and most participants said that they would encourage their partner to seek care, remain in the relationship but use condoms consistently. This suggests a decline in the fear associated with HIV infection in South Africa, as has been previously described (Njanji, 2013) and may make extreme negative emotional reactions to a positive HIV test less likely. Furthermore, since many participants were reportedly not using condoms consistently with main partners, making a decision about condom use based on self-testing together with a partner could facilitate more informed decision-making, compared to relying on partners to disclose their status after testing (or not testing) at a healthcare facility. This is likely the case even with the three-month window between HIV infection and positive test result when using an antibody-based test such as the one described to participants in this study. A modelling study among men who have sex with men (MSM) in the US looked at the use of a self-administered HIV test to screen partners and make condom-use decisions. That study found that this strategy could reduce risk of HIV infection, even among those who use condoms but do so inconsistently, in populations with high HIV prevalence and incidence (Ventuneac et al., 2009). This modelling exercise was looking specifically at MSM in the US. Therefore new models are needed to evaluate self-testing for condom-use decision making among heterosexual couples in other regions.

There were gender differences when discussing self-testing together with a partner. More men than women said that they would test with their partner, and women were less certain that their partners would be willing to self-test with them. Women were also less confident that their partner would continue the relationship if they tested HIV-positive. South Africa has some of the highest rates of sexual violence in the world (Jewkes, Sikweyiya, Morrell, & Dunkle, 2009), and several studies have linked intimate partner violence with increased risk of HIV infection (Ackermann & de Klerk, 2002; Jewkes, Dunkle, Nduna, & Shai, 2010; Pettifor, Measham, Rees, & Padian, 2004). Thus the reluctance of some female participants to invite their partners to test with them and the uncertainty expressed about the outcome of such a request may be because these women knew that joint self-testing within the context of their relationship might not be a safe option. Although none of the participants disclosed that they were in a violent relationship during the interviews, the statistics for South Africa suggest that a number of them likely were or had been in such relationships and that might limit their ability to introduce HIV risk reduction strategies such as joint self-testing to their partners.

This study had several limitations that should be considered in its interpretation. First, the study was conducted in 2010 and intervening events, such as PrEP and treatment as prevention, could affect how people feel about self-administered HIV testing. However, self-testing for HIV is not yet generally available in South Africa even with the removal of the ban on pharmacists selling such kits in 2015 (Gonzalez et al., 2016) and the announcement

that the kits are being introduced in the country (South Africa introduces, 2016), nor are they available in most other countries in the region. Second, the study asked hypothetical questions about predicted use of a product that was not available in South Africa at the time. Predicted use may differ from actual use when the product becomes available. Third, social desirability bias may have influenced responses to some questions. Several participants stressed the importance of always using condoms and the need for counselling when testing for HIV. Their responses may have been influenced by the HIV prevention messages they hear. In addition, the few people who mentioned intimate partner conflict and the prediction of high levels of support in the hypothetical scenario of a positive HIV test could have been influenced by the way participants wanted to be perceived by the interviewer as opposed to what they really thought might happen. The questions about self-testing for HIV were located at the end of an in-depth interview primarily about medical male circumcision. As HIV testing was not the focus of most of the interview and asking these questions after a lengthy interview on another topic, albeit one that is also related to HIV, may have influenced how people answered the questions. Finally, participants in this study were all recruited from primary healthcare clinics. Therefore we did not obtain views from South Africans who do not access the healthcare system, precisely the people who we would most want to reach with new HIV testing modalities. More research is needed among this difficult-to-access group.

## Conclusions

This study explored how self-administered at-home oral HIV testing might address some of the barriers to HIV testing in South Africa at the social, individual and interpersonal levels. Despite the limitations, our findings suggest that this testing modality might be more acceptable than the current clinic-based testing system for some. However, the findings also demonstrate that self-testing is not optimal for everyone and does not make clinic-based HCT services obsolete. Instead, by offering people several different HIV testing choices, more people may find an option that fits their individual situation and thus increase testing rates for the population as a whole as well as for difficult-to-access groups. Thus, as with combination prevention, HIV testing choices may allow more people to find ways to test for HIV that are acceptable and convenient given their context. In this way, we can move the HIV prevention agenda forward and increase the possibility of reaching the first step in the 90-90-90 goal, that 90% of all people living with HIV will know their HIV status (UNAIDS, 2014a).

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## References

- Ackermann L, de Klerk G. Social factors that make South African women vulnerable to HIV infection. *Health Care for Women International*. 2002; 23(2):163–172. <http://dx.doi.org/10.1080/073993302753429031>. [PubMed: 11868963]
- Angotti N, Bula A, Gaydosh L, Kimchi EZ, Thornton RL, Yeatman SE. Increasing the acceptability of HIV counseling and testing with three C's: convenience, confidentiality and credibility. *Social Science & Medicine*. 2009; 68(12):2263–2270. <http://dx.doi.org/10.1016/j.socscimed.2009.02.041>. [PubMed: 19375208]
- Beksinska ME, Smit JA, Mantell JE. Progress and challenges to male and female condom use in South Africa. *Sexual Health*. 2012; 9(1):51–58. <http://dx.doi.org/10.1071/SH11011>. [PubMed: 22348633]
- Bronfenbrenner, U. Ecological models of human development. In: Gauvain, M., Cole, M., editors. *International Encyclopedia of Education*. Vol. 3. Oxford: Elsevier; 1994. p. 1643-1647.
- Brown AN, Djimeu EW, Cameron DB. A review of the evidence of harm from self-tests. *AIDS and Behavior*. 2014; 18(S4, Suppl 4):445–449. <http://dx.doi.org/10.1007/s10461-014-0831-y>.
- Campbell S, Klein R. Home testing to detect human immunodeficiency virus: Boon or bane? *Journal of Clinical Microbiology*. 2006; 44(10):3473–3476. <http://dx.doi.org/10.1128/JCM.01511-06>. [PubMed: 17021069]
- Choko AT, Desmond N, Webb EL, Chavula K, Napierala-Mavedzenge S, Gaydos CA, Makombe SD, Chunda T, Squire SB, French N, Mwapasa V, Corbett EL. The uptake and accuracy of oral kits for HIV self-testing in high HIV prevalence setting: a cross-sectional feasibility study in Blantyre, Malawi. *PLoS Medicine*. 2011; 8(10):e1001102. <http://dx.doi.org/10.1371/journal.pmed.1001102>. [PubMed: 21990966]
- DiCarlo AL, Mantell JE, Remien RH, Zerbe A, Morris D, Pitt B, et al. El-Sadr WM. 'Men usually say that HIV testing is for women': Gender dynamics and perceptions of HIV testing in Lesotho. *Culture, Health & Sexuality*. 2014; 16(8):867–882. <http://dx.doi.org/10.1080/13691058.2014.913812>.
- Foss AM, Vickerman PT, Heise L, Watts CH. Shifts in condom use following microbicide introduction: should we be concerned? *AIDS (London, England)*. 2003; 17(8):1227–1237. <http://dx.doi.org/10.1097/01.aids.0000060388.18106.43>.
- Fylkesnes K, Siziya S. A randomized trial on acceptability of voluntary HIV counselling and testing. *Tropical Medicine & International Health*. 2004; 9(5):566–572. <http://dx.doi.org/10.1111/j.1365-3156.2004.01231.x>. [PubMed: 15117300]
- Gay, J., Croce-Galis, M., Hardee, K. What works for women and girls: evidence for HIV/AIDS interventions. 2nd2012. <http://www.whatworksforwomen.org/chapters/11-HIV-Testing-and-Counseling-for-Women/sections/27-HIV-Testing-and-Counseling-for-Women>
- Gollub EL. Choice is empowering: Getting strategic about preventing HIV infection in women. *International Family Planning Perspectives*. 2006; 32(4):209–212. <http://dx.doi.org/10.1363/3220906>. [PubMed: 17237018]
- Gonzalez, L., Polao, K., Warby, V. Home HIV testing gets the green light. 2016. <http://www.health-e.org.za/2016/02/08/home-hiv-testing-gets-the-green-light/>
- Harper GW, Riplinger AJ, Neubauer LC, Murphy AG, Velcoff J, Bangi AK. Ecological factors influencing HIV sexual risk and resilience among young people in rural Kenya: Implications for prevention. *Health Education Research*. 2014; 29(1):131–146. <http://dx.doi.org/10.1093/her/cyt081>. [PubMed: 23969629]
- Harrison A, Xaba N, Kunene P. Understanding safe sex: Gender narratives of HIV and pregnancy prevention by rural South African school-going youth. *Reproductive Health Matters*. 2001; 9(17): 63–71. [http://dx.doi.org/10.1016/S0968-8080\(01\)90009-6](http://dx.doi.org/10.1016/S0968-8080(01)90009-6). [PubMed: 11468848]
- International Labour Organization. [accessed 18 June 2014] HIV/AIDS in the transport sector of Southern African countries: A rapid assessment of cross-border regulations and formalities. 2005. Retrieved from [http://www.ilo.org/wcmsp5/groups/public/@ed\\_protect/@protrav/@ilo\\_aids/documents/publication/wcms\\_116343.pdf](http://www.ilo.org/wcmsp5/groups/public/@ed_protect/@protrav/@ilo_aids/documents/publication/wcms_116343.pdf)
- Jewkes, R., Sikweyiya, Y., Morrell, R., Dunkle, K. Understanding men's health and use of violence: interfece of rape and HIV in South Africa. 2009. [http://www.mrc.ac.za/gender/violence\\_hiv.pdf](http://www.mrc.ac.za/gender/violence_hiv.pdf)

- Jewkes RK, Dunkle K, Nduna M, Shai N. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: A cohort study. *Lancet*. 2010; 376(9734):41–48. [http://dx.doi.org/10.1016/S0140-6736\(10\)60548-X](http://dx.doi.org/10.1016/S0140-6736(10)60548-X). [PubMed: 20557928]
- Jürgensen M, Tuba M, Fylkesnes K, Blystad A. The burden of knowing: Balancing benefits and barriers in HIV testing decisions. a qualitative study from Zambia. *BMC Health Services Research*. 2012; 12(1):1–11. <http://dx.doi.org/10.1186/1472-6963-12-2>. [PubMed: 22214259]
- Kalibala S, Tun W, Cherutich P, Nganga A, Oweya E, Oluoch P. Factors associated with acceptability of HIV self-testing among health care workers in Kenya. *AIDS and Behavior*. 2014; 18(S4, Suppl 4):405–414. <http://dx.doi.org/10.1007/s10461-014-0830-z>.
- Kurth, A., Siika, A., Were, E., Naanyu, V., Emonyi, W., Sidle, J., Cleland, C., Macharia, S., Sang, E., Chhun, N. [accessed 16 August 2014] Accuracy of oral HIV self-tests in Kenya, 3ie grantee Final report. 2014. Retrieved from [http://www.3ieimpact.org/media/filer\\_public/2014/08/04/1\\_accuracy\\_of\\_oral\\_hiv\\_self-tests\\_in\\_kenya.pdf](http://www.3ieimpact.org/media/filer_public/2014/08/04/1_accuracy_of_oral_hiv_self-tests_in_kenya.pdf)
- Kurth AE, Celum C, Baeten JM, Vermund SH, Wasserheit JN. Combination HIV prevention: Significance, challenges, and opportunities. *Current HIV/AIDS Reports*. 2011; 8(1):62–72. <http://dx.doi.org/10.1007/s11904-010-0063-3>. [PubMed: 20941553]
- Mantell JE, DiCarlo AL, Remien RH, Zerbe A, Morris D, Pitt B, et al. El-Sadr W. ‘There’s no place like home’: Perceptions of home-based HIV testing in Lesotho. *Health Education Research*. 2014; 29(3):456–469. <http://dx.doi.org/10.1093/her/cyu004>. [PubMed: 24599266]
- McNeil, DJ. [accessed 3 July 2012] Rapid H.I.V. home test wins federal approval. *New York Times*. 2012 Jul 18. Retrieved from [http://www.nytimes.com/2012/07/04/health/oraquick-at-home-hiv-test-wins-fda-approval.html?\\_r=1](http://www.nytimes.com/2012/07/04/health/oraquick-at-home-hiv-test-wins-fda-approval.html?_r=1)
- Mills E, Beyrer C, Birungi J, Dybul M. Engaging men in prevention and care for HIV/AIDS in Africa. *PLoS Medicine*. 2012; 9(2):e1001167. <http://dx.doi.org/10.1371/journal.pmed.1001167>. [PubMed: 22346735]
- Njanji, S. [accessed 5 August 2014] Is SA losing it’s fear of HIV?. *News/South Africa*. 2013 Nov 29. Retrieved from <http://www.iol.co.za/news/south-africa/is-sa-losing-it-s-fear-of-hiv-1.1614671>
- Ochako, R., Vu, L., Peterson, K. [accessed 16 August 2014] Insights into potential users and messaging for HIV oral self-test kits in Kenya. 3ie Grantee Final Report. 2014. Retrieved from [http://www.3ieimpact.org/media/filer\\_public/2014/07/21/insights\\_into\\_potential\\_users-final.pdf](http://www.3ieimpact.org/media/filer_public/2014/07/21/insights_into_potential_users-final.pdf)
- Pant Pai N, Behlim T, Abrahams L, Vadnais C, Shivkumar S, Pillay S, et al. Dheda K. Will an unsupervised self-testing strategy for HIV work in health care workers of South Africa? A cross sectional pilot feasibility study. *PLoS One*. 2013; 8(11):e79772. <http://dx.doi.org/10.1371/journal.pone.0079772>. [PubMed: 24312185]
- Pant Pai N, Sharma J, Shivkumar S, Pillay S, Vadnais C, Joseph L, et al. Peeling RW. Supervised and unsupervised self-testing for HIV in high- and low-risk populations: A systematic review. *PLoS Medicine*. 2013; 10(4):e1001414. <http://dx.doi.org/10.1371/journal.pmed.1001414>. [PubMed: 23565066]
- Peck RB, Lim JM, van Rooyen H, Mukoma W, Chepuka L, Bansil P, et al. Taegtmeier M. What should the ideal HIV self-test look like? A usability study of test prototypes in unsupervised HIV self-testing in Kenya, Malawi, and South Africa. *AIDS and Behavior*. 2014; 18(S4, Suppl 4):422–432. <http://dx.doi.org/10.1007/s10461-014-0818-8>.
- Pettifor AE, Measham DM, Rees HV, Padian NS. Sexual power and HIV risk, South Africa. *Emerging Infectious Diseases*. 2004; 10(11):1996–2004. <http://dx.doi.org/10.3201/eid1011.040252>. [PubMed: 15550214]
- Richter M, Venter WD, Gray A. Home self-testing for HIV: AIDS exceptionalism gone wrong. *South African Medical Journal*. 2010; 100(10):636–642. <http://dx.doi.org/10.7196/SAMJ.4198>. [PubMed: 21081002]
- Shisana, O., Rehle, T., Simbayi, LC., Zuma, K., Jooste, S., Pillay-van-Wyk, V., et al. the SABSSM III Implementation Team. [accessed May 6 2016] South African national HIV prevalence, incidence, behaviour and communication survey, 2008 - a turning tide among teenagers?. 2009. <https://www.health-e.org.za/wp-content/uploads/2013/05/2966e129fc39e07486250fd47fcc266e.pdf>

- Shisana, O., Rehle, T., Simbayi, LC., Zuma, K., Jooste, S., Zungu, N., et al. Onoya, D. South African national HIV prevalence, incidence and behaviour survey, 2012. 2014. Retrieved from <http://www.hsrc.ac.za/en/research-outputs/view/6871>
- Smith RJ, Bodine EN, Wilson DP, Blower SM. Evaluating the potential impact of vaginal microbicides to reduce the risk of acquiring HIV in female sex workers. *AIDS (London, England)*. 2005; 19(4): 413–421. <http://dx.doi.org/10.1097/01.aids.0000161771.44276.92>. [accessed 22 April 2016]
- South Africa introduces self-test kits for HIV testing. *People Monthly Online*. 2016 Mar 10. Retrieved from <http://peoplemonthlyonline.ng/south-africa-introduces-self-test-kits-hiv-testing/>
- Stankard, P., LeTouzé, O., Jones, M. [accessed 16 August 2014] How should HIV self-test kits be packaged in Kenya? 3ie grantee final report. 2014. Retrieved from [http://www.3ieimpact.org/media/filer\\_public/2014/07/18/packaging\\_self-tests-testing\\_report\\_q2\\_final\\_report\\_060614.pdf](http://www.3ieimpact.org/media/filer_public/2014/07/18/packaging_self-tests-testing_report_q2_final_report_060614.pdf)
- The South African Pharmacy Council. Good pharmacy practice in South Africa. 2010. Retrieved from <http://www.mm3admin.co.za/documents/docmanager/0C43CA52-121E-4F58-B8F6-81F656F2FD17/00010773.pdf>
- UNAIDS. [accessed 2 August 2014] Global AIDS response progress report Republic of South Africa. 2012. Retrieved from [http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/ce\\_ZA\\_Narrative\\_Report.pdf](http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/ce_ZA_Narrative_Report.pdf)
- UNAIDS. [accessed 11 April 2016] 90-90-90 An ambitious treatment target to help end the AIDS epidemic. 2014a. Retrieved from [http://www.unaids.org/sites/default/files/media\\_asset/90-90-90\\_en\\_0.pdf](http://www.unaids.org/sites/default/files/media_asset/90-90-90_en_0.pdf)
- UNAIDS. [accessed 19 June 2014] A short technical update on self-testing for HIV. 2014b. Retrieved from [http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/JC2603\\_self-testing\\_en.pdf](http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/JC2603_self-testing_en.pdf)
- van Dyk AC. Self-testing as strategy to increase the uptake of HIV testing in South Africa. *African Journal of AIDS Research*. 2013; 12(1):41–48. <http://dx.doi.org/10.2989/16085906.2013.815413>. [PubMed: 25871310]
- Ventuneac A, Carballo-Diequez A, Leu CS, Levin B, Bauermeister J, Woodman-Maynard E, Giguere R. Use of a rapid HIV home test to screen sexual partners: An evaluation of its possible use and relative risk. *AIDS and Behavior*. 2009; 13(4):731–737. <http://dx.doi.org/10.1007/s10461-009-9565-7>. [PubMed: 19415483]
- World Health Organization. [accessed 22 April 2016] Programmatic uptake. Antiretroviral treatment as prevention (TasP) of HIV and TB. 2012. Retrieved from [http://apps.who.int/iris/bitstream/10665/70904/1/WHO\\_HIV\\_2012.12\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/70904/1/WHO_HIV_2012.12_eng.pdf)
- World Health Organization. [accessed 21 January 2016] Guidelines on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV. 2015. Retrieved from [http://apps.who.int/iris/bitstream/10665/186275/1/9789241509565\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/186275/1/9789241509565_eng.pdf?ua=1)
- Wright AA, Katz IT. Home testing for HIV. *The New England Journal of Medicine*. 2006; 354(5):437–440. <http://dx.doi.org/10.1056/NEJMp058302>. [PubMed: 16452553]