Opinions about and acceptability of HIV self-testing amongst students at the Institute of Health Sciences- Lobatse, Botswana

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Abstract

Botswana was amongst the first African countries to introduce universal access to HIV testing through voluntary counseling and testing (VCT) and routine HIV testing (RHT). However, despite years of the implementation of VCT and RHT, in 2013, only 70% of Batswana had ever been tested for HIV because of the limitations of the testing options. Alternative HIV testing options such as HIV self-testing (HIVST) have not been adopted, and its feasibility and acceptability have not been determined. We assessed the acceptability of and opinions of tertiary students at the Institute of Health Sciences in Lobatse about HIVST. Five focus group and five in-depth interviews were conducted with 45 students. Thematic data analysis using NVivo 10 were conducted. The findings revealed that the HIVST was acceptable to the students who believed that adopting it, as an HIV testing approach would address an unmet need for testing. They would utilize HIVST because it would assure confidentiality and privacy, it is convenient and offers the flexibility of when and where to conduct the self-test. However, there are were also concerns about the cost of self-testing kits, the lack of post-test counseling, and the lack of strategies to link the self-test results to HIV programming. They recommended that the concerns should be addressed to make HIVST effective and that potential users of HIVST should be provided with clear instructions on how to self-test. HIVST is an acceptable testing option that could complement available HIV testing and counseling services provided in public health facilities.

Key Words; HIV testing and counseling, HIV self-testing, Botswana, acceptability, argument against, recommendations

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Introduction

Botswana, like other countries in Southern Africa, is hardest hit with HIV despite the fact that it is counted among the first countries to provide universal HIV counseling and testing (Health, 2009). The HIV prevalence amongst the general population is estimated at 18.6% (Botswana, 2013), and an estimated 390,000 people are living with HIV and AIDS (UNAIDS, 2015). HIV testing is the gateway for people living with HIV (PLHIV) to access effective treatment, which is critical in the reduction of HIV infection rates (Kachroo, 2006). The implementation of a comprehensive HIV testing program in Botswana occurred in 1989 and offered provider-initiated testing and counseling (PITC) and voluntary counseling and testing (VCT), and 70% of the population of Botswana had ever tested by the year 2013 (Statistics Botswana, 2013). Despite years of implementation of VCT and PITC, the World Health Organization's goal of having at least 80% of the population tested is yet to be archived. Identified barriers to facility-based testing services such as the PITC and VCT include the fear of meeting someone known to the client and a lack of confidentiality at a testing facility (Mohlabane et al., 2016; Musheke et al., 2013), fear of a positive HIV test result (Weiser et al., 2006), and the stigma attached to accessing HIV services at designated centres (Kalibala et al., 2014). Facility-based HIV testing and counseling (HTC), while essential, has been seen as unlikely to meet national and global testing targets (Suthar et al., 2013).

Opportunities to increase HIV testing currently include self-testing. HIV self-testing (HIVST) is when testing is conducted by an individual in the privacy of their homes in the absence of supervision from health care worker (HCWs). Motivators to self-testing include; convenience, speed and having the time to conduct the test, privacy, confidentiality (Kebede et al., 2014; Pai, Behlim, et al., 2013), and a sense of empowerment arising from having control of one's health choices (Pai, Behlim, et al., 2013). International studies conducted in different parts of the world have shown a high acceptability of HIVST, particularly amongst certain population groups. In Malawi, where HIVST was offered at home with minimal supervision, the uptake was as high as 87% (Choko et al., 2011), while in Baltimore (USA), overall acceptability was as high as 91% among hospital emergency department clients (Gaydos et al., 2011). In Spain, more than 75% of clients of mobile testing units agreed to self test, and HIVST was especially attractive to gay people, young people, singles, and people who had never tested before for HIV (Belza et al., 2012; de la Fuente et al., 2012).

Research has demonstrated that HIVST is feasible to operationalise and acceptable among hospital HCWs and their sex partners (Kalibala et al., 2014; Ng et al., 2012). Given the strong preferences of HIVST, there are recommendations for further exploration of self-testing options as potential ways to make progress towards meeting universal access goals (Choko et al., 2011; Negin et al., 2009; Pai, Sharma, et al., 2013). Kenya was the first country in Africa to develop policy guidelines for self-testing, although no kit has yet been fully registered (Choko et al., 2011), while in South Africa, self-test kits are available through pharmacies, but its use remains unregulated (Madiba et al., 2015).

As already stated, Botswana has not met its testing target of 80% (National Aids Coordinating Agency, 2008), because of limitations of the current testing modalities (Fako, 2006). Alternative testing options such as HIVST is currently not part of the National Policy in Botswana, and there are no known studies conducted to assess its acceptability and feasibility. In this paper, we present results of a study conducted to assess the opinions and acceptability of HIVST amongst tertiary students. The findings will create awareness of HIVST as an alternative approach to testing and may serve as a basis for quantitative surveys to further investigate the use of HIVST among at-risk population groups.

Methods and Materials

Study design

A qualitative descriptive study was conducted amongst students at the Institute of Health Sciences, a tertiary education institution in Lobatse, Botswana. The study population included 176 general nursing students, 21 psychiatry students, and 44 environmental health students. Requests were made to the Heads of Department to make presentations on the types and use of HIVST kits to the students. During the presentations, the first author who was the lead person in the collection of data shared information about the objectives of the study and the purpose of the study with the students. Since HIVST is a new approach to HIV testing, a brief description and presentation were made to the students to ensure that they have the basic understanding of the testing approach. Information pamphlets with introductory information on HIV self-testing were also distributed to the students.

Convenient sampling was employed to select students to participate in the study. Since HIVST is a new testing approach and the aim of the study was to assess opinions and acceptability of HIVST, all students were eligible to participate. Students who turned up at the interview venue that was reserved for study recruitment activities were recruited to participate in the focus group discussion (FGDs) or in-depth interviews (IDIs).

Data collection

Five FGDs with six to ten participants per group and five IDIs were conducted. The first author conducted the IDIs and FGDs assisted by a research assistant who was trained in qualitative data collection and note taking. The researcher used a focus group guide to moderate the FGDs, the guide outlined questions about the students' awareness of HIVST, opinions, acceptability, and willingness to use the self-test kits. All interviews were recorded using a digital audio recorder with permission from the students and were in English the medium of communication at the college.

Ethical considerations

Permission to conduct the study was obtained from the Human Research Development Committee of the Ministry of Health in Botswana. Ethical approval was obtained from Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/70/2015: PG). Permission was also sought from the management of the Institute of Health Sciences and the academic program coordinators. Written informed consent was obtained from the students who participated in the study before the interviews.

Data analysis

Thematic analysis was used to analyze verbatim-transcribed data from audio recordings. To validate the data, the second author read and compared the transcribed to the original recording. All the authors independently performed multiple readings of the transcripts to familiarize with the data and to identify initial codes, which emerged from the data.

The authors, through scheduled meetings, began the process of developing a codebook, which consisted of common themes that emerged from the data. Once the authors reached consensus on the definition of codes, the transcripts were imported into NVivo version 10, a qualitative analysis software package that was used to apply codes to the remaining transcripts. The second step in the analysis of data was to identify themes from the coding and agree on the definition. These themes are used to present the findings.

Trustworthiness

We used various strategies to ensure trustworthiness; we used a good digital recorder to record the interviews to facilitate verbatim transcription and to ensure that the findings reflected the views and perceptions of the participants. We triangulated data by conducting FGDs, IDIs, writing extensive field and interview notes, and collecting demographic data from the participants. All the authors took part in data analysis using NVivo qualitative software.

Results

Demographic information of the participants

Table 1 presents the characteristics of the study participants, 45 nursing and environmental health students participated in the FGDs and IDIs. There were more female students (56%) as compared to males (44%), most were between 21-25 years (44%).

Table 1: Demographic information of the participants (n=45)

Variables	Number	Percentage
Gender		
Males	20	44
Females	25	56
Age group		
>20 years	12	27
21-25 years	20	44
26-30 year	5	11
<30 years	8	18
Programme		
Nursing and Psychiatry	25	56
Environmental Health	20	44

Themes

The analysis of the interviews revealed four themes and nine subthemes presented in Table 2.

Table 2: Themes

Theme	Sub-theme
Awareness of HIVST	
Acceptability of HIVST	HIVST assures privacy and confidentiality HIVST saves time and is convenient HIVST can facilitate partner testing
Non-acceptability of HIVST	HIVST results will not contribute to HIV programming Inability to cope with HIV test results The costs of doing HIVST
Recommendations for HIVST	Provide counseling services Provide clear instructions Link HIVST with broader HIV programming

Awareness about HIVST

Most of the students did not know about HIVST and heard about it for the first time during the interviews. This what one of them said, "*I only heard about HIV self-testing recently during the presentations of the study" (22-year-old female FGD 4).* However, a few students had prior knowledge and information on HIVST. One participants said "*I read on the internet about HIV self-testing and different option available for people to test" (24-year-old male IDI 3).* While the

other said, *"I heard about HIV self-testing from a friend and she told me that it is not just by pricking yourself but also by collecting saliva" (20-year-old female FGD 4).*

Acceptability of HIVST

The purpose of the study was to assess the acceptability of HIVST and the students were asked if they would accept HIVST as an HIV testing option. Three sub-themes related to acceptability of HIVST are outlined below.

HIVST assures privacy and confidentiality

The students reported that they would use HIVST because it can be done in a place where the individual feels comfortable and private. This is what some of them said about HIVST. *I feel that was a good initiative (self-testing) looking at the fact that I can just go to the store and buy the test kit to test myself without anyone knowing what I am doing and without being criticized by anyone. I am the only person who knows my status, and it is up to me whether I want to be counseled or not (21-year-old female FGD 1).*

HIV self-testing saves time and is convenient

In considering HIVST, some of the students expressed the opinion that HIVST was acceptable because no time would be wasted waiting at a facility, either to be tested or for the results. One of the participants said, "*I will do HIV self-testing because it also saves me time and it's convenient" (23-year-old female IDI 5).* They also felt that the test could be done quickly at home, and the results would be available immediately without the worries of having to come back for them, as is the case in the facility-based testing approaches. The other participant had this to say, "*I think I will just do it to save time. Instead of going to the hospital spending an hour there I will just do it in my own time" (22-year-old male FGD 3).*

HIVST can facilitate partner testing

The students believed that HIVST gives flexibility to individuals to test with their partners at any time in the event of an immediate need without having to go to a facility. They said, "*Nowadays with us youth, we go out at night, and we come back with a new partner. When we get home, maybe we can take a self-test together since we hardly know each other. So it is very convenient" (31-year-old male FGD 2).* Those who were in stable relationships also felt that it facilitate testing with a partner. One said, " *I would prefer HIV self-testing so that I can keep the test kit and we can do this with my partner especially if it is a new partner and if we want to involve in risky behavior, we can test together at home before we do that" (28-year-old female FGD 5).*

The HIVST results will not contribute to HIV programming

While HIVST was acceptable to most of the students, some of the students were the concerned that HIVST would reverse the gains made through universal access to HIV testing through facility-based testing services. They believed that making HIVST an alternative testing option would make

individuals test themselves, and their results would not be known in the broader national HIV programming context. One participant said, "*I do not support the issue of HIV self-testing because in our country we need statistics to show that there is a rise or a drop in HIV prevalence. If I do testing alone at home, I think it will not work for the country to see if there is any rise or decrease in HIV statistics" (23-year-old male FGD 1).*

Inability to cope with HIV self-test results

Some students would not do HIVST because of their concerns about their ability to cope with finding out the result of the HIV test. One of the participants said, "*I accept HIV self-testing, but it is going to be difficult for me to accept the results alone because I can take some funny decisions, for example, I can think of myself taking some pills to kill myself" (25-year-old female FGD 2).*
The biggest fear reported by the participants was obtaining an HIV-positive result while alone, "*I don't think it's a good idea because I can do many things to myself after interpreting the results, like suicide knowing that I am HIV positive" (22-year-old male FGD 3).*

The costs of doing HIVST

Students also thought that HIVST would come at a cost to the individual. Even if the test kits were subsidized, the fact that there would be a cost attached to the testing might be prohibitive to the potential users. Thy said, "*Self-testing is going to challenge people financially since the testing kit is bought" (22-year-old female FGD 2).* The participants anticipated that the price of the HIV self-test kits would be too high to afford, "*Well, it will be difficult for me to do HIV self-testing if I have to pay for the kit. If it is expensive, then it will be difficult for me" (21-year-old female FGD 4).*

Recommendations for HIVST

Regardless of their opinions on the acceptability of HIVST, the students made some suggestions related to the HIVST if it can be made an alternative testing option Three sub-themes related to recommendations are outlined below.

The provision of counseling services

The students recommended that a counselor should be on standby to provide support before and after testing if the individual finds it difficult to go ahead with the test or to cope with the result of the test, particularly positive result. "*HIV self- testing will be easier if a counselor is available before and after the test" (32-year-old female FGD 5).* The need for a counselor goes beyond the provision of pre and post-test counselling, but to help if the individual failed to understand how the test is conducted. "*Obviously, if I test positive that can traumatize me, so…, somebody should be able to help me with the situation, and if I am alone, I may find myself in a very difficult situation. While I do not want to share the results, but I need somebody to help me to cope with the situation" (23-year-old male IDI 3).*

The provision of clear instructions

The students also believed that the self-test kits should be provided with clear instructions to make it easy for the users to self-test. "*I will do HIV self-testing if the testing kit the instructions are written clearly, which will make it easier to conduct self-testing by myself" (22-year-old female FGD 4).* The participants were also of the opinion that the self-testing kit should provide guidance of what to do after the individual had conducted self-testing. "*I think if the self-testing kit should involve the next step after testing, just to inform the individual doing the self-testing, to give them the information on how to proceed if they test positive" (21-year-old male FGD 2).* In addition, the instructions in the test kits should be easy to read and should be written in the local languages to make it easy for people to understand. "*If I can read the instructions on my own, it easier for me to do the test, it will be easier if the instructions were also written in Setswana, the local language" (20-year-old female FGD 4).*

Link HIVST with broader HIV programming

The students were of the view that HIVST should contribute to the broader national level of HIV testing which suggest that the test results should be linked to health care facilities. As such, efforts should be made to ensure that those who self-test submit their results to the national program so for statistics. "*I think the pharmacies or any shop that will be selling the kits should also provide a form that a person could fill the results after testing so that they can take the results to the health facility" (22-year-old female FGD 1).* The participants suggested various strategies for ensuring that the self-test results reach the national program. "*The test kit should have an automatic digital reading of the results directly linked to the health care provider (26-year-old female IDI 2).* To maintain the identity of the individual who use self-testing one participants said, "*Maybe they can open the site where you can just submit your results privately, and only the health practitioner is going to see them not anyone else but just the person who open the mail/message through the internet. So we need to have a website for those who are going to use HIV self-testing (23-year-old male FGD 3).*

Discussion

The study assessed the acceptability of HIVST amongst tertiary students at an institute of health sciences. We found that although most of the student were not aware of HIVST before the interviews, most found HIVST to be acceptable as an alternative testing option. The study findings are not different from those reported among health care workers in studies conducted in sub-Saharan Africa, which reported high acceptability of HIVST (Kalibala et al., 2014; Kebede et al., 2014; Madiba et al., 2015; Mavedzenge et al., 2011).

We found that the reasons for the willingness to use HIVST were also similar to what is reported in other studies. The students indicated that they would utilize HIVST because it assures confidentiality and privacy, and would reduce the stigma concern that is associated with facility-based HCT. Studies on the acceptability of HIV self-testing have indicated the guarantees of

confidentiality and privacy as the main reasons for the preference of self-testing (Choko et al., 2011; Kebede et al., 2014; Madiba et al., 2015). Lack of privacy and confidentiality were the concerns that were raised around facility based HCT services and self-testing should be able to fill that gap. The findings from the current study and others on the high acceptability of HIVST suggest that it as a feasible option to increase the HIV-testing uptake of HCWs in particular. There is, however, evidence that HIVST is acceptable to other population groups such as college students (Mokgatle Madiba). The students also indicated that they would utilize HIVST because of the flexibility that it offers. HIVST that can be performed at any time and in any place without the individual user having to go to the public health facilities. Other studies also reported that HIVST is convenient, saves time, and offers the freedom over the timing and conditions of testing (Kebede et al., 2014; Madiba et al., 2015; Pai, Behlim, et al., 2013).

The package of HCT services offered in public health facilities includes pre-and post-test counseling to help individuals to cope with the HIV test results. This would be absent from self-testing, a fact which concerns potential users and policy makers. The students in the current study who were against HIVST, indicated that they would not utilize HIVST because of the lack of post-test counseling support. They indicated that they might harm themselves because of a positive HIVST results. The findings are consistent with other studies where the lack of post-test counseling was the main argument against HIVST (Kebede et al., 2014; Madiba et al., 2015).

One of the recommendations made by the students in the current study is that counseling services should be made available to those considering self-testing for support when the individuals fail to cope. Similar recommendations were reported in the study conducted by Madiba and Mokgatle among nursing students in South Africa. However, it is not clear how this could be structured and how the users of self-testing could access the support of counselors. In the study conducted by Madiba and Mokgatle, the students suggested that the self-testing kits should provide a link to an anonymous hotline to provide pre-test and post-test counseling as well as linkage to care and support (Madiba et al., 2015).

HIVST will also require the purchase of the test kits over the counter at a pharmacy or from other retailers depending on how the policy of distribution is developed. This will introduce a cost to HIV testing; the concern for the argument against HIVST is that not everyone will be in a position to afford the self-testing kit. The purchase of the self-testing kits was one of the reasons for non-acceptability of HIVST amongst the students in the current study and other studies. In South Africa, a cohort of nursing students indicated that they would consider self-testing if the kits were affordable (Madiba et al., 2015). This is an indication that the cost of the self-testing kits will most likely influence the uptake of the intervention. The students in the current study argued that HIVST would meet the need for HIV testing amongst those who can afford to buy the kit only and that the poor would not be able to utilize it. This runs counter to the principle of universal access unless the government decides to have the kits distributed free, even through private distributors.

It should, however, be noted that HIVST is an alternative HIV testing option and would not substitute the available and highly promoted HCT services already provided in the country.

We found that while the students accepted HIV self-testing as an alternative option, they were concerned about the lack of clear strategies to link the test results to the broader public health sector. This would make it difficult for HIV programming to have a record of both uptake and outcome of HIVST results. Similar concerns were raised in other studies. However, the recommendation that came from these studies were that National Departments of Health should develop systems to ensure that self-testing results are linked to health facilities (Madiba et al., 2015; Mavedzenge et al., 2011). It is recommended that awareness campaigns and educational programs should be used to educate people about HIVST before it could be adopted an alternative testing option (Madiba et al., 2015; Mavedzenge et al., 2011; Pai, Sharma, et al., 2013). In addition, the students in the current study suggested that the self-test kits should be accompanied by clear instructions on how to conduct the test and what to do before and after the test. Similar to other studies, the instructions, and any other educational information should be in different languages including the local languages for people with low literacy (Madiba et al., 2015; Mavedzenge et al., 2011).

Conclusions

HIV self-testing is an alternative testing option that can complement available HCT methods such as VCT and PITC provided in public health facilities. The students believed that HIVST could fill a gap, which the other testing options have not been able to do. HIVST is acceptable and will meet the needs of population groups who are particularly concerned about stigma as it guaranty confidentiality and privacy.

The concerns that were raised about HIVST will be addressed by developing interventions to educate potential users and the community at large about self-testing options. As already mentioned, most of the students were not aware of HIVST as an alternative option for testing before the interviews. Therefore, their concerns underscore the need to educate people and create awareness about the intended use and benefits of HIVST. Nevertheless, the concerns raised and recommendations will inform the development of the campaigns and educational programs.

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References

Belza, M. J., Rosales-Statkus, M. E., Hoyos, J., Segura, P., Ferreras, E., Sánchez, R., Molist, G., De la Fuente, L., & Group, M. R. H. T. (2012). Supervised blood-based self-sample collection and rapid test performance: a valuable alternative to the use of saliva by HIV testing programmes with no medical or nursing staff. *Sexually transmitted infections*, 88 (3), 218-21.

Botswana, S. (2013). Botswana AIDS Impact Survey IV (BAIS IV). Gaborone Botswana.

Choko, A. T., Desmond, N., Webb, E. L., Chavula, K., Napierala-Mavedzenge, S., Gaydos, C. A., Makombe, S. D., Chunda, T., Squire, S. B., & French, N. (2011). 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, 8*(10), e1001102.

de la Fuente, L., Rosales-Statkus, M. E., Hoyos, J., Pulido, J., Santos, S., Bravo, M. J., Barrio, G., Fernández-Balbuena, S., Belza, M. J., & Group, M. R. H. T. (2012). Are participants in a street-based HIV testing program able to perform their own rapid test and interpret the results? *PLoS One, 7*(10), e46555.

Fako, T. T. (2006). Social and psychological factors associated with willingness to test for HIV infection among young people in Botswana. *AIDS Care, 18*(3), 201-207.

Gaydos, C. A., Hsieh, Y.-H., Harvey, L., Burah, A., Won, H., Jett-Goheen, M., Barnes, M., Agreda, P., Arora, N., & Rothman, R. E. (2011). Will patients "opt in" to perform their own rapid HIV test in the emergency department? *Annals of Emergency Medicine, 58*(1), S74-S78.

Health, M. o. (2009). Botswana National Guidelines for HIV Testing and Counseling. Gaborone, Botswana.

Kachroo, S. (2006). Promoting self-testing for HIV in developing countries: potential benefits and pitfalls. *Bulletin of the World Health Organization, 84*(12), 999-1000.

Kalibala, S., Tun, W., Cherutich, P., Nganga, A., Oweya, E., & Oluoch, P. (2014). Factors associated with acceptability of HIV self-testing among health care workers in Kenya. *AIDS and Behavior, 18*(4), 405-414.

Kebede, B., Abate, T., & Mekonnen, D. (2014). HIV self-testing practices among health care workers: feasibility and options for accelerating HIV testing services in Ethiopia. *Pan African Medical Journal, 15*(1).

Madiba, S., Segobola, M., & Mokgatle, M. (2015). Assessing the Acceptability and Willingness to Use HIV Self-Testing among Student Nurses in a Private Nursing College, Gauteng Province, South Africa. *World Journal of AIDS, 5*(03), 208.

Mavedzenge, S., Baggaley, R., Lo, Y., & Corbett, E. (2011). HIV selftesting among health workers: a review of the literature and discussion of current practices, issues and options for increasing access to HIV testing in sub-Saharan Africa. Geneva, Switzerland: WHO.

Mohlabane, N., Tutshana, B., Peltzer, K., & Mwisongo, A. (2016). Barriers and facilitators associated with HIV testing uptake in South African health facilities offering HIV Counselling and Testing. *Health SA Gesondheid, 21*, 86-95.

Musheke, M., Ntalasha, H., Gari, S., Mckenzie, O., Bond, V., Martin-Hilber, A., & Merten, S. (2013). A systematic review of qualitative findings on factors enabling and deterring uptake of HIV testing in Sub-Saharan Africa. *BMC Public Health, 13*(1), 220.

National Aids Coordinating Agency. (2008). Botswana HIV/AIDS impact Survey III results

Negin, J., Wariero, J., Mutuo, P., Jan, S., & Pronyk, P. (2009). Feasibility, acceptability and cost of home-based HIV testing in rural Kenya. *Tropical medicine & international health, 14*(8), 849-855.

Ng, O. T., Chow, A. L., Lee, V. J., Chen, M. I., Win, M. K., Tan, H. H., Chua, A., & Leo, Y. S. (2012). Accuracy and user-acceptability of HIV self-testing using an oral fluid-based HIV rapid test. *PLoS One, 7*(9), e45168.

Pai, N. P., Behlim, T., Abrahams, L., Vadnais, C., Shivkumar, S., Pillay, S., Binder, A., Deli-Houssein, R., Engel, N., & Joseph, L. (2013). Will an unsupervised self-testing strategy for HIV work in health care workers of South Africa? A cross sectional pilot feasibility study. *PLoS One, 8*(11), e79772.

Pai, N. P., Sharma, J., Shivkumar, S., Pillay, S., Vadnais, C., Joseph, L., Dheda, K., & Peeling, R. W. (2013). Supervised and unsupervised self-testing for HIV in high-and low-risk populations: a systematic review. *PLoS Medicine, 10*(4), e1001414.

Statistics Botswana. (2013). Botswana AIDS Impact Survey IV. Gaborone, Botswana.

Suthar, A. B., Ford, N., Bachanas, P. J., Wong, V. J., Rajan, J. S., Saltzman, A. K., Ajose, O., Fakoya, A. O., Granich, R. M., & Negussie, E. K. (2013). Towards universal voluntary HIV testing and counselling: a systematic review and meta-analysis of community-based approaches. *PLoS Medicine, 10*(8), e1001496.

UNAIDS. (2015). Botswana Global AIDS Progress Report.

Weiser, S. D., Heisler, M., Leiter, K., Percy-de Korte, F., Tlou, S., DeMonner, S., Phaladze, N., Bangsberg, D. R., & Iacopino, V. (2006). Routine HIV testing in Botswana: a population-based study on attitudes, practices, and human rights concerns. *PLoS Med, 3*(7), e261.