The social determinants of HIV testing in Botswana: a keystone for addressing the epidemic

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Abstract

This paper considers the distribution of HIV testing in Botswana in 2002 and 2004. Botswana is a country with a high prevalence of HIV in the general population and HIV testing is considered to be a critical component of prevention and care efforts. The study found that people who had a higher level of education, had become parents since the establishment of the Prevention of Mother to Child Transmission of HIV (PMTCT) programme, and who had provided care for someone they suspected was HIV positive/ had known someone who was HIV positive were more likely to have taken an HIV test. In a population-based sample, women were more likely to have taken an HIV test. The findings indicate the effectiveness of a routine health intervention such as PMTCT in increasing knowledge of HIV status. They also provide empirical evidence of a socio-economic differential in HIV testing, underscoring the need to design and implement health care programmes in such a way as to reduce the socio-economic gap in health protective behaviour and health outcomes.

Key words: HIV testing, Botswana, VCT, PMTCT, SES, Poverty

Introduction

Globally, about 25 million people have died of HIV related illness, and currently close to 40 million people are living with the virus, approximately two thirds of whom are African [1]. HIV/AIDS is potentially the greatest threat to health and human development in sub-Saharan Africa. Not only are those who are poor more vulnerable to HIV infection, but those who are affected by HIV/AIDS are more likely to fall into chronic poverty as a result of lost income, health costs and increased household dependency ratios [2-5]. Life expectancy in many southern and eastern African countries has decreased dramatically as a result of HIV/AIDS, sinking to less than 40 years in a number of countries [6]. The scale and impact of the epidemic have precipitated an unprecedented mobilisation of international resources to increase access to prevention and treatment in resource poor countries [7]. However, many of the interventions have not had the desired effect in terms of reducing the spread of HIV, and as the epidemic continues to grow; more research is needed to understand what works, why and under what circumstances [8-10].

HIV testing has drawn increased interest in public health circles as an intervention for both prevention and treatment. [11-15]. Research has shown that HIV testing accompanied by risk reduction counselling can increase condom use, moderate unprotected sexual intercourse, and reduce STI prevalence and incidence [8, 13, 15-17]. An HIV diagnosis can aid the treatment of opportunistic infections and decrease the infectivity and sexual risk behaviour of Persons Living with HIV/AIDS (PLWHAs) [13]. HIV testing is also a first step to accessing Prevention of Mother to Child (PMTCT) programmes, which can reduce the likelihood of transmitting the virus to babies by up to 47% [18]. In an era of treatment scale up, an HIV diagnosis is important for a timely enrolment in ARV programmes [19]. Additionally, it has been suggested that increased knowledge of HIV status and the normalisation of HIV testing

in different settings can decrease stigma around HIV, thereby destroying some of the constructed myths and fears around the disease and bringing HIV infection back into the realm of public health. However, current research shows that there are persisting psycho-social, informational, and logistical barriers to testing in developing countries [20-25]. Further research is needed to understand barriers and motivators for HIV testing in order to strengthen prevention efforts [24].

Few studies have considered the population level predictors of HIV testing in countries with growing HIV/AIDS epidemics. More importantly, previous research has not measured changes in HIV testing over time that may be due to increasing awareness about HIV/AIDS, changes in social norms, and growing access to prevention and treatment interventions. This paper compares the factors associated with HIV testing in Botswana within a clinic-based sample of adults in mid-2002 and a population-based sample in mid-2004.

Botswana is one of a number of sub-Saharan African countries that is experiencing a high intensity generalised epidemic. A population-based survey in 2004 found 17.1% of the population between 10 and 64 years to be HIV infected, and antenatal sentinel surveillance data in 2005 measured an HIV prevalence of 33% [26, 27]. Botswana offers free health care services to its citizens and 80% of the population lives within 15 kilometres of a primary health clinic [28]. A national Prevention of Mother to Child Transmission of HIV (PMTCT) programme was established in 1999, a national antiretroviral programme was started in 2002, and in January 2004 a routine and diagnostic HIV testing policy was introduced into government health care facilities. There is relatively wide access to free HIV testing services in Botswana; by 2003, it was estimated that 80% of the population was living within 50 kilometres of an anonymous testing centre or mobile testing clinic by 2003 [29]. This study

helps to establish the distribution of testing and trends in testing in a high prevalence country and discusses the implications for prevention.

Methods

This paper analyses primary quantitative data gathered from adults at government health clinics in urban areas in Botswana in 2002, and secondary data from the second Botswana AIDS Impact Survey (BAIS II) which was conducted by the Central Statistics Office in 2004. For the 2002 survey, a questionnaire examining the health needs of individuals and families in Botswana was designed and administered by the research team. The study protocols received ethical approval from the necessary institutional review boards.

Men and women who were 18 years or above, had worked in the past six months, and had children or were helping to provide physical or financial care for a family member at least once a month were eligible to participate in the quantitative study. Between June and November 2002, eligible adults were recruited from outpatient clinics in the government hospitals in Gaborone, Molepolole and Lobatse, in proportions that are consistent with the population distribution by city, large urban village and major town in the 2000 government population projections [30]. The last eligible person waiting in line to see the health care provider was invited to participate in the study. The respondents were at the clinic for diverse reasons; out of 476 cases analysed, 37% of respondents were at the clinic for routine health check-ups (including ante-natal and post-natal care), 28% were there to seek treatment for illness, 22% were accompanying an adult, and 12% were accompanying a child. Respondents anonymously answered a closed-ended questionnaire that was administered in a face-to-face interview style by a member of the research team.

The final sample comprised 813 females (79%) and 220 males (21%). The high percentage of women reflects the fact that more women access health services than men, a phenomenon that has also been observed in other industrialised and African countries [31, 32]. The high response rate of 96% (1038 out of 1077 people recruited to participate in the study) suggests that non-response error would not be a serious concern. Five interviews (less than 0.5%) were discarded after completion because of missing data, data inconsistency or other concerns, and a further four cases where respondent were 65 years or older were dropped, yielding a final analysis file of 1029 cases. We used SPSS for Windows to conduct bi-variate analyses to examine associations between HIV testing and socio-demographic characteristics, and environmental and programme exposures, and binomial multiple logistic regression to establish correlates of HIV testing within the study population [33].

The data from the 2004 BAIS II were obtained from the Central Statistics Office in order to examine trends in HIV testing over time. BAIS II used a population-based sampling frame and included 15,878 people between the age of 10 and 64 years. The methods are described in the government statistical report [27]. For the purposes of this study, the raw BAIS II testing data from adults between the ages of 18-64 were analysed (n=10,794). Differences between urban and rural adults were also explored.

Variables included in the multivariate analysis were: i) gender; ii) marital status; iii) age; iv) education; v) giving birth since the establishment of the PMTCT programme; vi) caring for someone suspected or known to be HIV positive (2002); vii) knowing someone who was HIV positive (2004); and, viii) urban or rural residence (2004).

Results

In the 2002 sample, 401 out of 1029 respondents had taken an HIV test, although 38 (more than 9%) of those who had tested had not collected their results. Table 1 shows frequencies and the percentage of respondents within each category that had taken an HIV test. Younger, more educated, better paid respondents, who had a child since the start of the PMTCT programme were much more likely to know their HIV status ($p<0.001$). At the 95% confidence level ($p<0.05$), those who were aware of an HIV policy at their workplace, and who had provided care to someone they suspected to be HIV positive were also more likely to have taken an HIV test.

Table 1. Socio-demographic and environmental influences on HIV testing in 2002

	Tested for HIV n (%)	Never tested for HIV n (%)	p-value (Chi-squared test)
TOTAL	**401 (38.9%)**	**628 (61.0)**	
Gender			
Male	75 (34.4)	143 (65.6)	*.087*
Female	329 (40.6)	482 (59.4)	
Marital Status			
Single/Separated	247 (41.7)	346 (58.3)	
Cohabiting	46 (36.2)	81 (63.8)	.054
Married	92 (39.1)	146 (60.9)	
Other	19 (25.7)	55 (74.3)	
Age Group			
18-29	184 (44.7)	228 (55.3)	
30-39	162(44.5)	202 (55.5)	*<0.001*
40-49	51 (26.8)	139 (73.2)	
50-64	7 (11.1)	56 (88.9)	
Education Level			
None	28 (18.8)	121 (81.2)	
Primary	77 (30.8)	173 (69.2)	*<0.001*
Secondary	223 (45.2)	270 (54.8)	
Tertiary	75 (55.5)	61 (44.5)	
Income (BWP/month)			
0-999	170 (33.2)	342 (66.9)	
1000-1999	138 (42.6)	186 (57.4)	*<0.001*
2000 +	96 (49.7)	97 (50.3)	
Parent since PMTCT			
Yes	124 (53.7)	107 (46.3)	*<0.001*
No	280 (35.1)	518 (64.9)	
HIV workplace policy			
Yes	110 (42.1)	151 (57.9)	.271
No	292 (38.2)	472 (61.8)	
HIV care giver			
Yes	118 (45.4)	142 (54.6)	*.023*
No	286 (37.2)	483 (62.8)	

In the 2004 BAIS II sample, a total of 3834 (35.5%) out of 10,794 respondents between the ages of 18 and 64 years old had taken an HIV test. Table 2 shows frequencies and the percentage of respondents within each category that had taken an HIV test. All the variables shown were associated with HIV testing at the 95% confidence level.

Table 2. Socio-demographic and environmental influences on HIV testing in 2002

	N=10794	n=3834
	% of total	% of each category tested
Location		
Rural	54.3	32.7
Urban	45.7	38.9
Gender		
Male	44.3	28.8
Female	55.7	40.8
Age (years)		
18-29	46.1	36.4
30-39	25.1	41.5
40-49	16.4	35.5
50-64	12.4	20.3
Education Level		
None/ non-formal	14.9	34.0
Primary	25.8	29.8
Secondary	43.4	38.0
Tertiary	16.0	52.5
Marital Status		
Single/Separated	49.8	32.9
Cohabiting	25.1	39.1
Married	20.9	38.5
Other	4.2	30.2
	22.4	54.5
Parent since PMTCT		
	53.4	44.4
Exposure to PLWHA		

Multivariate analysis was conducted for comparable categories of the 2002 and 2004 data. The 2004 data were also split between urban and rural areas. The adjusted odds ratios for 2002 (which only included urban areas) and 2004 (total, urban and rural) are presented in Table 3.

Table 3. Adjusted odds ratios for HIV testing in 2002 and 2004

Independent Variable (Reference category)	2002 URBAN ONLY Adjusted Odds Ratios	2004 TOTAL Adjusted Odds Ratios	2004 RURAL Adjusted Odds Ratios	2004 URBAN Adjusted Odds Ratios
Female	1.09	1.22*	1.25*	1.17*
	(.78 – 1.52)	(1.09 – 1.34)	(1.09 – 1.45)	(1.01 – 1.34)
Age				
(18-29)				
30-39	1.15	1.25*	1.21*	1.25*
	(.84 – 1.58)	(1.11 – 1.39)	(1.04 – 1.42)	(1.06 – 1.47)
40-49	.60*	1.29*	1.40*	1.12
	(.38 – .95)	(1.11 – 1.45)	(1.14 – 1.72)	(.90 – 1.38)
50-64	.235*	.78*	.86	.68*
	(.10 – .59)	(.64 - .94)	(.66 – 1.11)	(.52 - .90)
Education Level				
(None)				
Primary	1.50	1.45*	1.69*	1.03
	(.89 – 2.50)	(1.24 – 1.69)	(1.39 – 2.07)	(.80- 1.33)
Secondary	2.49*	2.09*	2.51*	1.37*
	(1.52 – 4.05)	(1.78 – 2.45)	(2.03 – 3.09)	(1.06 – 1.72)
Tertiary	3.92*	3.60*	4.05*	2.44*
	(2.24 – 6.87)	(3.03 – 4.28)	(3.18 – 5.15)	(1.87 – 3.17)
Marital Status				
(Single/separated)				
Cohabiting	.81	1.22*	1.15	1.28*
	(.53 – 1.24)	(1.09 – 1.35)	(.99 – 1.34)	(1.10 – 1.50)
Married	1.23	1.21*	1.05	1.40*
	(.84 – 1.78)	(1.06 – 1.37)	(.88 – 1.25)	(1.17 – 1.88)
Other	.96	1.16	1.02	1.37
	(.51 – 1.80)	(.92- 1.48)	(.74 – 1.41)	(.96 – 1.96)
Parent since PMTCT	1.76*	2.59*	2.73*	2.48*
	(1.28 – 2.43)	(2.30 – 2.91)	(2.33 – 3.19)	(2.08 – 2.96)
Exposure to PLWHA/ HIV caregiver	1.57*	2.10*	2.16*	2.04*
	(1.16 – 2.15)	(1.92 – 2.29)	(1.91 – 2.43)	(1.79 – 2.32)
Nagelkerke R^2	.135	.159	.173	.140

*p<0.05

Gender did not have a significant effect on testing in the 2002 sample, controlling for other variables; however, in 2004 females in both rural and urban locations were more likely to have taken an HIV test.

Comparing the age specific distribution of testing in 2002 with data with the urban 2004 BAIS II sample, there are no consistent trends apparent amongst those who are in their 30s or in their 40s. Those in the oldest age group (50-64) were less likely to have tested in both samples, with the effect of being in the eldest age group much stronger in 2002 (O.R.=.235),

compared to 2004 (O.R.=0.684). In 2004, the age specific distribution of testing was similar in both rural and urban areas, with those in their 30s more likely to have tested than those who were under the age of 30, and those who were above 50 less likely to have tested. In rural areas, people who were in their 40s were more likely to have taken an HIV test than those under 30, but the effect was not significant in urban areas.

Similar trends in the education-specific distribution of testing were observed in 2002 and 2004, with higher levels of education predicting a greater likelihood of HIV testing. Education was a stronger predictor of testing in 2002 compared to 2004. In 2004, education had a greater effect on testing in rural areas compared to urban areas. In rural areas, those with a primary school education were 1.69 times more likely to have taken a test than those with no formal education, while a secondary education increased the likelihood of testing two and a half fold and tertiary education increased the likelihood of testing more than four-fold (O.R.=4.047). In urban areas, those with a primary education were not significantly more likely to have taken an HIV test compared to those with no formal education, while those with a secondary education and tertiary education were respectively 1.37 times and 2.44 times more likely to have taken an HIV test than those with no formal education.

Marital status did not have a significant effect of testing in the 2002 sample, or within the rural group of the 2004 BAIS II sample. This variable only had a significant effect on testing within the urban BAIS II sample, with those who were married or cohabiting more likely to have taken an HIV test than those who were single or separated.

As expected, the effect of having had a child since the start of the PMTCT programme (1999) was much stronger in 2004 in both rural and urban groups, compared to in 2002 (as more

people would have been offered counselling and testing at antenatal clinics in the two years between data collection). The effect of knowing someone with HIV/AIDS (2004 BAIS II) was similar to that of having cared for someone suspected to be HIV positive (2002) in terms of increasing the likelihood of testing between one and a half to two-fold.

In sum, a comparison of the 2002 and 2004 data confirms the continuing influence of education, exposure to PMTCT and exposure to HIV positive people on increasing the likelihood of HIV testing even after widespread testing was introduced. An important difference in the two data sets is that gender was a significant predictor of testing in 2004 but not in 2002. With regards to age, those in the oldest age group (50 – 64 years old) in both studies were significantly less likely to have tested than those in the youngest age group (18 – 29 years), but there was no consistent trend in how age predicted testing amongst those who were in their 30s and their 40s. The effect of marital status was not significant in 2002, although it was a predictor of testing in 2004. Finally, it should be noted that there were some differences in the distribution of testing within rural and urban areas of Botswana in the 2004 BAIS II, with education being a stronger predictor and marital status having an insignificant effect in rural areas.

Discussion

If HIV testing is to be used as a tool for preventing the spread of HIV/AIDS, it is important to understand the range of factors influencing HIV testing in different settings in order to more effectively promote testing. This study has considered correlates of testing and trends in testing in a country with a high intensity generalised epidemic. In Botswana, testing facilities are free and relatively widespread, indicating that access and cost issues with regards to the actual test may not be the primary barriers to testing. The distribution of testing is therefore

most likely to be influenced by demand. It is useful to consider data from as far back as 2002 because:

i) they provide a baseline from which to measure changes in HIV testing as a result of recent interventions in Botswana such as access to antiretroviral treatment, routine testing, and HIV education programmes

ii) the variable access to antiretroviral treatment and the lack of a routine testing policy in Botswana in 2002 are conditions that still hold for most other southern African countries that are experiencing high intensity generalised HIV/AIDS epidemics.

Although the comparative multivariate analysis did not include income as a variable (since income data were not collected in 2004), the bivariate analysis of the 2002 data revealed a strong positive association between monthly income and HIV testing. Income levels are likely to affect the odds of obtaining or affording to take leave from work to seek medical attention or testing. Moreover, although there is no charge for testing at government health services or testing centres, those with low income may not be able to access or afford transportation for taking a test and seeking treatment if necessary. Testing is also significantly influenced by the number of years of formal education. This supports previous research findings that formal education increases knowledge and practise with regards to HIV/AIDS [34], and is consistent with another recent study of HIV testing in Botswana, where education level was found to be a significant predictor of having taken a test [35]. The association may be partly explained by the fact that formal education is likely to increase exposure to and understanding of health-related information, as well as the confidence to negotiate health care services and interact with health care workers [36]. It should be noted here that the relationship between socio-economic status and HIV testing found in this study

may also be indicative of a host of more distal factors such as comfort negotiating health care services, freedom to make one's own health choices, and a sense of power to adopt a particular health protective behaviour.

There is a wide literature documenting how socio-economic status and social and economic inequalities translate into unequal health outcomes [37-40]. These are both proximally and distally related to actual health outcomes [41]. Those who are poor and socially isolated are more likely to "engage in a wide range of risk-related behaviours and less likely to engage in health promoting ones" [42]. Poverty and lack of education also often translate into a lower likelihood of seeking health care in industrialised and developing country settings [5, 43-46]. The theoretical and empirical research has documented how low socio-economic status is often associated with an unhealthy environment, difficulty meeting the monetary and non-monetary costs of seeking health care, discomfort with health care providers, limited access to and understanding of health information, and restricted power to negotiate personal health behaviour [40].

The study findings suggest that long-term investments in education and policies to raise median income levels could have a positive effect on health care seeking behaviour and health outcomes. At the same time, the income and education data underscore the short-term importance of targeting those with lower income and less formal education for HIV awareness and VCT education programmes. Indeed, there is growing support for the notion that health promotion efforts that are not targeted towards the poor are likely to increase the gap between the rich and poor with regards to health outcomes [47]. The majority of child-bearing lower income women attend government maternal and child health clinics; this is therefore a good location to provide health education for women. Indeed, the effectiveness of PMTCT

counselling of pregnant women is indicated in this study by the higher likelihood of recent parents being tested in both 2002 and 2004. It may be more difficult to find appropriate locations to provide similar education for men, who are less likely to come into contact with health services, both because they are less health-care seeking and because they are less likely to attend clinics either for routine care or to accompany children or sick adults. It is not surprising therefore that the 2004 data indicate that men are less likely to have tested than women, as this sample include both men who are health care seeking as well as those who may visit health care services less frequently.

Workplaces could be a useful point for providing HIV education and VCT for men and women working in the formal sector. In our sample, only a quarter of respondents were aware of a workplace policy on HIV; moreover, existing evaluations of HIV workplace policies in Botswana suggest that, apart from the mining industry, these initiatives tend to be under-resourced and poorly executed as a result of lack of capacity [48, 49]. A few large southern African companies have introduced comprehensive education and even treatment programmes employees [50, 51]. While this is a critical step for addressing the HIV/AIDS epidemic in high prevalence countries, these programmes are few and far between, and their successes and challenges are very much influenced by the environment within which they operate [52]. This may be an arena with much potential scope for expanding HIV education. Government action to encourage companies to introduce and implement HIV policies in the workplace, as well as to protect employees from HIV related discrimination would likely increase employees awareness of HIV/AIDS and willingness to know their status.

In addition to strengthening counselling for testing through health care facilities, the workplace, and government outreach programmes, it is also possible to widen support for

testing for men through civil society organisations and associations, including sports teams and churches [53]. One research study has assessed the acceptability of home-based HIV testing campaigns [22], and there is an ongoing multi-site trial in several African countries and Thailand to measure the effectiveness of community-based VCT programmes [8]. The effectiveness and cost-effectiveness data from this study will be invaluable for informing the feasibility of such interventions for promoting HIV testing in resource poor countries.

The increased likelihood of testing amongst HIV care givers in 2002 is probably attributable to greater awareness about HIV/AIDS as a result of care giving, advice from home-based care educators and clinic staff, increased perception of risk if caring for an HIV infected partner or child, and greater exposure to health care services and health information as a result of care giving. It is also possible that HIV care givers are more likely to be HIV positive if they are caring for a partner, and this might increase their chances of having tested because of having experienced HIV symptoms. Studies of HIV care giving in Botswana indicated fear of infection, and lack of knowledge about HIV/AIDS and prevention amongst many care givers [54, 55]. While the government has hoped to expand home based care support, the programmes remain under-funded; gender imbalances, poverty, lack of appropriate training and facilities, disproportionate burden of care amongst the elderly as constraining the success of the intervention [56]. This is fairly typical of other southern African countries, with high levels of morbidity and limited facilities for inpatient hospital care. While improving the support for HIV care givers, it would be highly beneficial to include counselling for HIV testing as a specific component of the education and training programmes for care givers, given their potential exposure both to HIV infection and stigma.

In 2004, respondents who knew someone who was HIV positive were more likely to have taken an HIV test, perhaps because of an increased perception of risk or as a result of encouragement to test from the HIV positive person. This suggests the importance from a population standpoint of HIV disclosure for strengthening personalised and community-based components of HIV prevention efforts; indeed, a multi-site study in Zambia, Malawi and Uganda linked HIV risk reduction with hearing about HIV/AIDS from friends or family, emphasising the utility of the 'social vaccine' for AIDS [57].

This study has revealed a socio-economic differential in HIV testing rates and indicates the need to target health promotion programmes towards those of low income and education levels. It also suggests that an offer of testing at health care facilities (including through PMTCT) is an acceptable form of raising knowledge of HIV status and providing risk reduction counselling in the health care seeking population. The Botswana government's policy of routine 'opt-out' testing at health care facilities, though still somewhat controversial in human rights circles, is another means of providing HIV risk reduction counselling and increasing the number of people who know their HIV status. Quantitative and qualitative research in Botswana have indicated that there is a high level of acceptability of routine testing, largely as a result of the availability of antiretroviral treatment [35, 58]. However, testing continues to be seen by the health-care seeking public primarily as an intervention for accessing treatment if sick or preventing vertical transmission of the virus [58]. It is critical to promote testing as a preventative measure to be taken by young people who will use an HIV negative result as a starting point for adopting and maintaining HIV risk reduction behaviour so as to remain free of the virus, as treatment programmes cannot remain sustainable unless they are matched with efforts to reduce the rate of new infections.

This study has some limitations. The 2002 data were clinic-based and drawn only from urban areas and are therefore not representative of the general adult population of the country. The fact that the 2002 sample is clinic-based (with respondents having greater exposure to health education and a higher likelihood of having been offered testing by a health care provider) and the 2004 sample is population-based may explain why an equal proportion of urban dwellers appears to have taken an HIV test in both samples, despite the fact that one would expect a higher number of people having taken a test in 2004. Finally, the data are a few years old and it is recognised that there are likely to be significant increases in the number of people accessing testing as a result of antiretroviral treatment availability and the introduction of provider-initiated testing at health services. Nevertheless, the findings provide important information for policy purposes. First, they underscore the need to target HIV education and prevention campaigns (including the promotion of testing) towards low income and education populations. It is also essential that men be targeted by HIV testing programmes, as they may be less likely to come into contact with health care facilities where they would receive HIV education and potentially be offered testing. While the literature indicates that access to antiretroviral treatment appears to have increased demand for testing and the routine testing policy is significantly increasing the uptake of HIV testing in Botswana, there is an urgent need in Botswana and all countries facing growing HIV/AIDS epidemics to ensure that HIV testing is also fully utilized as a preventative measure for providing risk reduction counselling and promoting behaviour change amongst the majority of the population who are still HIV negative. Finally, the study indicates the importance of taking into account and addressing social and economic barriers to health care seeking and health protective behaviour even where services are being provided free of cost.

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