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HIV Testing Rates, Prevalence, and Knowledge Among Outpatients in Durban, South Africa: Time Trends over Four Years

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LR, SR, SC, JG, DR, JNK, KAF, EL, RPW, and IVB analyzed and interpreted the data.

SR performed the statistical analysis.

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Abstract

The HIV public health messages in South Africa have increased. Our objective was to evaluate changes over time in HIV testing behavior, prevalence, and knowledge. We prospectively enrolled adults (≥ 18 years) prior to HIV testing at one urban and one peri-urban outpatient department in Durban, South Africa. A baseline questionnaire administered before testing included the number of prior HIV tests and four knowledge items. We used test results to estimate previously undiagnosed HIV prevalence among those tested. We assessed linear trends over enrollment. From November 2006–August 2010, 5,229 subjects enrolled and 4,877 (93%) were HIV tested and had results available. Subjects reporting prior testing over time increased, from 13% in study year 1 to 42% in year 4 (linear trend $p < 0.001$). The HIV prevalence among those tested declined steadily and significantly over time, from 64% of enrollees in study year 1 to 39% in the final year (linear trend $p < 0.001$). The percentage of subjects who recognized that medicine can help people with HIV live longer increased from 80% in study year 1 to 96% in study year 4. Rates of HIV testing have increased and prevalence among those tested has decreased in outpatients in Durban, South Africa.

Keywords

HIV testing; HIV prevalence; HIV knowledge; time trends; South Africa

Introduction

South Africa has the largest number of HIV-infected people worldwide.¹ Although the yearly mortality due to AIDS related deaths has improved from 257,000 in 2005 to 194,000 in 2010,² late diagnosis and poor access to treatment continue to be a challenge.³

Since the South African antiretroviral treatment (ART) program was rolled out in 2004, there has been increased focus on HIV policies and programs promoting testing.^{4–7} South African HIV policy has focused on increasing HIV testing, including in the National Strategic Plan for HIV and AIDS published in 2000 and 2007, and the 2003 Comprehensive HIV and AIDS Care, Management, and Treatment Plan.^{4, 6, 7} These programs are particularly important because HIV testing is a cornerstone of prevention and a gateway to diagnosis and treatment.^{8–10}

The impact of South African policy efforts on the HIV testing behavior, prevalence, and knowledge has been evaluated in national household surveys and to a limited degree in different healthcare settings.^{2, 11–14} Our objective was to evaluate changes in self-reported testing behavior and knowledge as well as newly-identified HIV prevalence in two outpatient departments with routine HIV screening at the center of the epidemic from 2006 to 2010.

Methods

We enrolled the South Africa Test Identify and Link (STIAL) cohort in Durban, South Africa.^{15, 16} Briefly, in this previously-described prospective, observational cohort study participants were enrolled prior to routine rapid HIV testing in two outpatient departments in Durban, South Africa. McCord Hospital, a 142-bed state-aided general hospital serves a largely urban patient population. St. Mary's Mariannhill Hospital, a 200-bed general district hospital serves a poorer, peri-urban population. Both sites charge a fee for services and have high-volume general medical outpatient departments. Both clinics changed from HIV testing by physician referral to an opt-out HIV testing policy one year into the study period. With opt-out testing, HIV counselors offered patients testing prior to physician evaluation. Patients were able to self-refer for testing during the entire 4 year study period. Both sites also had PEPFAR-funded HIV clinics during the study period.

We enrolled English or Zulu speaking adults (≥ 18 years) who presented for HIV testing between November 2006 and August 2010. Consenting subjects were included if they reported being HIV-negative or HIV status unknown and were willing to share their test results with research personnel. Participants were excluded if they were pregnant or critically ill. Prior to HIV testing, a research assistant administered a baseline questionnaire, which included self-reported information regarding prior HIV testing history, including the number of tests. HIV knowledge was assessed using four yes/no questions: 1) All pregnant women who are HIV positive will have babies born with HIV, 2) A person with HIV can look and feel healthy, 3) There is a vaccine/medicine that can stop people from getting HIV, 4) There are medicines available to help people with HIV live longer. The HIV knowledge questions were asked on a 4-point scale: strongly agree, agree, disagree, and strongly disagree. We extracted rapid HIV test results on the day of enrollment from counselor records and collected CD4 count results, when available, for those newly-diagnosed with HIV.

The study period, November 2006 to August 2010, was divided into four study years beginning in November of each year from 2006 to 2009. The final year was abbreviated, ending in August 2010. Participants were classified as repeat testers if they reported at least one HIV test prior to enrollment, and as multiple testers if they reported 2 or more prior tests at the time of enrollment. We assessed differences in rates of testing by sex and age (dichotomized at the median age, 35 years) using chi-squared tests. We assessed linear trends in the proportion of subjects self-reporting prior HIV testing and in HIV prevalence among those tested at enrollment using logistic regression, with study year as the ordinal independent variable. The 4 HIV knowledge questions were categorized as correct if the participant responded 'agree' or 'strongly agree' or incorrect if they responded 'disagree' or 'strongly disagree'; any missing or unknown responses were categorized as incorrect. The mean number of correct HIV knowledge questions (0–4) was tabulated by study year. The Cronbach alpha score for the original 4 point scale responses was 0.65 and for the dichotomous answers used in this analysis was 0.68. We assessed differences in knowledge scores by sex and age (dichotomized at 35 years) using t-tests and changes in HIV knowledge responses over time using linear regression with study year as the ordinal independent variable. We assessed whether sex or age influenced prior testing and

knowledge score by testing for the interaction between study year and sex or age. All analyses were performed using Stata statistical software (Version 10, StataCorp, College Station, TX).

The study was approved by the McCord Hospital Research Ethics Committee (Durban, South Africa) and the Partners Human Research Committee (protocol 2006-P-000250; Boston, Massachusetts, USA).

Results

From November 2006 through August 2010, 5,729 adults were screened, of whom 5,229 (91%) were eligible and enrolled. The median age of participants was 35 years (IQR 27–45) and 2,776 (53%) were female. During the study period, 4,877 (93%) of participants underwent HIV testing and had results available. Of these, 2,370 (49%) were HIV-infected. The HIV prevalence among those tested decreased from 64% in study year 1 to 39% in year 4 (linear trend, $p<0.001$, Table 1). Of the 1,530 (65%) newly-diagnosed HIV-infected participants who had a CD4 count done, the median value was 155/ μL (IQR 62–297/ μL) and did not change significantly during the study period (Table 1).

The proportion of participants who reported prior HIV testing increased from 13% in study year 1 to 42% in year 4 (linear trend, $p<0.001$, Table 1). Although females were more likely to report prior HIV testing than males overall (29% vs. 21%, $p<0.001$), there was no significant difference in the trend of the proportion of men and women reporting prior testing over time. Overall, younger participants (<35 years) were more likely to report prior HIV testing than older participants (≥ 35 years), (29% vs. 22%, $p<0.001$). From study year 1 to year 4, prior HIV testing increased more among younger compared to older participants (15% to 50% vs. 12% to 33%, $p=0.005$).

The proportion of participants who reported multiple HIV tests prior to enrollment increased from 4% in study year 1 to 17% in year 4 (linear trend, $p<0.001$, Table 1). Overall, females were more likely to report multiple prior HIV tests than males (12% vs. 8%, $p<0.001$).

The proportion of subjects that responded correctly to the four HIV knowledge items increased significantly over time (for all 4 questions linear trend, $p<0.001$, Figure 1). Between study year 1 and year 4, there was an increase in participants who correctly responded to the statements 'a person with HIV can look and feel healthy' (yes: 79% vs. 94%), 'there is a vaccine/medicine that can stop people from getting HIV' (no: 57% vs. 89%), and 'there are medicine available to help people with HIV live longer' (yes: 80% in year 1 vs. 96% in year 4). The question 'all pregnant women who are HIV positive will have babies born with HIV' had the lowest proportion of correct 'no' responses, but this also increased from 62% in year 1 to 75% in year 4. The proportion of participants who responded correctly to all four knowledge questions was lower for HIV-infected compared to uninfected participants (45% vs. 60%, $p<0.001$, data not shown). From study year 1 to year 4 there was a significant difference in the trend of HIV knowledge mean scores by sex (Table 1).

Discussion

We evaluated the rates of self-reported HIV testing and the HIV prevalence among adults undergoing rapid HIV testing at two outpatient departments in Durban, South Africa. From 2006 to 2010, prior HIV testing increased by 29% and there was a concomitant 25% decrease in HIV prevalence among participating outpatients. There was also an increase in HIV knowledge over time.

Our findings parallel a South African household national survey, which showed an increase in testing from 21% of adults reporting prior HIV testing in 2002 to 51% in 2008.¹¹ We find a continued increasing linear trend in HIV testing in the outpatient setting through 2010. The increase in HIV testing in South Africa has coincided with expanded testing efforts beginning with the antiretroviral roll out in 2004 and then the 2007 National Strategic Plan for HIV and AIDS that sought to increase HIV testing coverage and provide care to 80% of HIV-infected people.^{4, 7} Further, our study overlapped secularly with the 2010 national HIV testing campaign that set out to test 15 million people by June 2011.⁵ HIV testing rates will likely continue to increase given the goal of annual testing presented in the 2012 National Strategic Plan.¹⁷

A prior national household survey, including data through 2008, showed higher self-reported prior HIV testing among females than males and an increased linear trend in prior testing by sex.¹¹ In our study, women were more likely to report prior HIV testing than men, though there was no significant linear trend in prior HIV testing by sex from 2006–2010.

The higher rates of prior HIV testing among women are possibly related to successful Prevention of Mother to Child Transmission (PMTCT) national efforts that offer routine HIV testing.¹⁸ There was a significant linear trend in prior HIV testing in younger compared to older participants. The increase in self-reported prior HIV testing across the study period among younger more than older participants could be due to successful national media campaigns.¹⁹

Previous South African studies have reported conflicting trends in South African HIV testing prevalence. A 2008 national household survey reported an increase in HIV prevalence¹¹ and another study that included testing data from a community census, health care clinic, and hospital reported a decrease over time, from 2001 to 2006.¹² The HIV prevalence among outpatients participating in this routine testing program was high, though it decreased over the study period. The decrease in new HIV diagnoses among outpatients undergoing rapid testing could reflect a number of factors. The group of HIV-infected patients in the two outpatient departments could have been saturated with testing over time and the clinic fee could have biased the population that sought care at both sites. Also, as programs recommending HIV testing became more accepted, the proportion of people with fewer symptoms and lower likelihood of infection increased. The similar CD4 results across the study period suggest that HIV-infected adults were not undergoing earlier testing in the outpatient setting, that they continue to present late in their clinical course, and that further efforts are required.

We showed an increased linear trend in adult HIV knowledge in the outpatient department setting during the four-year study period. Using a different HIV knowledge assessment, a South African household survey showed higher knowledge among younger male participants.¹¹ In our cohort, women had greater increase in HIV knowledge than men across the study period but there was no difference by age. The increased linear trend in HIV knowledge among women could be due to the development of the PMTCT national program that includes routine HIV counseling and testing. Future public health campaigns should target men and should emphasize the importance of PMTCT programs, since 25% of participants did not know that HIV transmission from mother to child is preventable.

This study has several limitations. Our study sites are not representative of the large volume government clinics where care is free to patients. For some assessments, including HIV testing history, we relied on self-reported measures. Other important predisposing and enabling factors for prior HIV testing and for a positive HIV test were not accounted for in our analysis. The number of new HIV diagnoses may have decreased over time as most of the undiagnosed HIV-infected patients were tested at the two clinics. Although the HIV knowledge questions were not derived from a validated tool, they were piloted in one of the outpatient departments for several months prior to their use.¹³

Conclusion

This study highlights the increase in self-reported HIV testing, decrease in HIV prevalence among those tested, and improvement in HIV knowledge over time among outpatients in Durban, South Africa. These findings are consistent with successful public health efforts promoting HIV testing uptake and knowledge in South Africa.

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Figure 1. Proportion of outpatients who correctly answered four HIV knowledge questions from 2006–2010

The HIV knowledge of adult outpatients at two outpatient clinics in South Africa was assessed prior to HIV testing from 2006–2010. HIV knowledge was measured using the percentage of correct responses to four HIV knowledge questions per year over 4 study years.

Demographics, HIV testing, prevalence, and knowledge among adults at two outpatient clinic sites in Durban, South Africa, 2006–2010

Table 1

Characteristic	Total	Study Year 1	Study Year 2	Study Year 3	Study Year 4	Odds Ratio	p-value*
		11/2006-10/2007	11/2007-10/2008	11/2008-10/2009	11/2009-8/2010		
Total Participants	5,229	1,478	1,466	1,406	879		
Characteristic							
Female, N (%)	2,776 (53)	732 (50)	827 (56)	739 (53)	468 (53)		0.18
Age, Median (IQR)	35 (27–45)	35 (28–42)	36 (28–46)	35 (27–46)	34 (26–47)		0.54
HIV-infected, N(%)	2370 (49)	869 (64)	629 (46)	552 (41)	320 (39)		<0.001
CD4, cells/mm ³ , Media n (IQR)	155 (62–297)	137 (64–266)	174 (67–335)	161 (60–320)	133 (53–263)		0.71
Repeat tester, N (%)	1,329 (26)	193 (13)	314 (21)	458 (33)	364 (42)		<0.001
Female	812 (29)	109 (15)	201 (24)	275 (37)	227 (49)	1.10	0.14**
Male	517 (21)	84 (11)	113 (18)	183 (28)	137 (34)		
Age<35 years	733 (29)	107 (15)	155 (23)	251 (38)	220 (50)	1.20	0.005***
Age 35 years	578 (22)	85 (12)	153 (20)	199 (28)	141 (33)		
Multiple tester, N (%)	521 (10)	61 (4)	130 (9)	180 (13)	150 (17)		<0.001
Female	333 (12)	36 (5)	86 (10)	115 (16)	96 (21)	1.03	0.72**
Male	188 (8)	25 (3)	44 (7)	65 (10)	54 (13)		
Age<35 years	262 (10)	30 (4)	62 (9)	95 (15)	75 (17)	1.02	0.82***
Age 35 years	247 (9)	31 (4)	64 (8)	79 (11)	73 (17)		
HIV Knowledge, Mean (SD)	3.19 (1.08)	2.85 (1.26)	3.18 (1.08)	3.33 (0.97)	3.56 (0.73)		<0.001
Female	3.35 (0.99)	3.08 (1.16)	3.29 (0.99)	3.49 (0.86)	3.64 (0.71)	–0.07	<0.007**
Male	3.01 (1.16)	2.61 (1.31)	3.04 (1.18)	3.15 (1.05)	3.46 (0.74)		
Age<35 years	3.30 (0.99)	2.96 (1.17)	3.27 (1.00)	3.50 (0.80)	3.62 (0.70)	–0.004	<0.89***
Age 35 years	3.09 (1.16)	2.74 (1.33)	3.10 (1.15)	3.18 (1.09)	3.50 (0.76)		

Repeat tester: at least one self-reported prior HIV tests

Multiple tester: two or more self-reported prior HIV tests

Odd Ratio

IQR= interquartile range, SD= standard deviation

* P for linear time trend.

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P for interaction between time and sex,

P for interaction between time and age