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Abstract

High uptake of HIV voluntary counselling and testing (VCT) services is important for the success of HIV workplace programs in sub-Saharan Africa. From 2001 onwards Heineken, a multinational brewing company, implemented a comprehensive HIV prevention and treatment program for employees and their dependents of its African subsidiaries. Confidential in-house VCT is part of this program. VCT uptake dynamics over time, and factors associated with early uptake were studied. Between September 2001 and December 2007, 9,723 adult beneficiaries were tested for HIV in 14 company sites in 5 African countries. Three-hundred-and-seventy (3.8%) of tested persons were infected with HIV-1. During the first 12 months 1,412 tests were done, compared to 8,311 tests in the subsequent years. The annual average uptake of testing among eligible persons varied between 15% and 32%. The coverage was higher among female compared to male employees, and higher among female compared to male spouses. Distinct peaks in uptake were linked to specific local events. People aged 45 years or above, women, and HIV-1 infected persons were significantly more likely to be tested in the early period. The proportion of HIV-1 infected persons among testees was 8.8% in the first twelve months compared to 3.0% in the subsequent period ($p < 0.001$). HIV-1 infected persons diagnosed in the early period were in a more advanced clinical stage, and had a significantly lower CD4 count than those tested later (median CD4 count 227 vs. 314 cells/ μ l; $p = 0.002$). In this workplace program HIV-1 infected individuals came earlier for an HIV test than uninfected people, and people with advanced infection came earlier than those with less advanced disease. Employees' spouses are harder to reach than employees and extra efforts should be undertaken to reach them as well. Uptake of HIV testing can be actively influenced by educational or promotional activities.

Background

Despite vigorous promotion, the uptake of voluntary counselling and testing (VCT) has been low overall in Sub-Saharan Africa (SSA). The large majority of HIV-1 infected people in SSA are not aware of their HIV status (World Health Organization, UNAIDS, & UNICEF, 2007). New options to increase the proportion of people knowing their HIV status are being promoted and examined (De Cock, Mbori-Ngacha & Marum, 2002; Matovu, Kigozi, Nalugoda, Wabwire-Mangen, & Gray, 2002), for example nation-wide opening of VCT sites (Marum, Taegtmeyer, & Chebet, 2006; Creek, 2006), same-day results (Creek et al., 2006), routine HIV testing at health care facilities (De Cock, Marum, & Mbori-Ngacha, 2003; Weiser, 2006), home-based testing (Were et al., 2006), home-delivery of HIV test results (Were et al., 2006; Wolff, et al., 2005). WHO now recommends provider-initiated testing, whereby all persons attending certain health services, are routinely tested for HIV; persons who do not wish to be tested can opt out (World Health Organization & UNAIDS, 2007).

Recently highly active anti-retroviral treatment (HAART) has become more widely available and accessible in SSA, notably through large bilateral or multilateral programs (World Health Organization, et al., 2007). Knowing one's HIV status is a pre-requisite for the start of HAART and the availability of HAART has given a new urgency to promoting HIV testing. The fact that persons, if diagnosed with HIV infection, can be offered effective treatment is a key factor helping health care workers to offer HIV testing. In order to increase uptake of HIV testing it is important to analyse the successes and failures of VCT programs in getting people tested for HIV, both in the public sector (Creek et al., 2006) and in the private sector (Charalambous et al., 2007).

Here we report the uptake dynamics of VCT during the first six years of an HIV workplace program at 14 sites in 5 sub-Saharan African countries.

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Methods

Heineken HIV Workplace Program

In 2001 Heineken, an international brewing company with local operating companies in several African countries, started a comprehensive HIV workplace program, including antiretroviral treatment. All employees, their spouses and children and (at some sites) retired employees are beneficiaries of this program. Information and education campaigns among employees (adapted to local conditions, resources and expertise) are regularly conducted, and VCT is freely available at the company sites. Peer-groups of employees were created to enhance HIV awareness among the employees. Special events were regularly organized by the responsible medical officer in charge of health services at specific sites, for example on World AIDS day or on company family days. PharmAccess Foundation, a Netherlands-based non-governmental organisation that is supporting increased access to sustainable quality health care in resource-limited settings, provides technical assistance to the workplace program. The program was rolled out in the various operating companies of Heineken from September 2001 onwards. Before that date employees had been tested for HIV occasionally. HIV test results are only available to medical staff of Heineken and not to the Human Resources department or work supervisors.

Voluntary HIV pre-test and post-test counselling was done by physicians and nurses of the company's health services. They were trained at the start of the program in a 3-day training course; this was followed by refresher courses. Counselling was done on an individual basis or with couples; occasionally group counselling was conducted.

Of each person tested for HIV, the following information was collected: gender, age, marital status, beneficiary status (employee, spouse of employee, child of employee, or retired employee), site (city), date of the test, and HIV test result. In those with a positive HIV test result a clinical assessment and CD4 count were done. Clinical staging was done using the staging system of the Centers for Disease Control and Prevention (CDC, 1992). Briefly, stage A indicates the absence of symptoms or generalised lymphadenopathy only, stage B indicates the presence of HIV-related (but not AIDS defining) conditions, and stage C indicates the presence of one or more AIDS defining conditions.

In this analysis VCT data are included from 14 sites from 5 African countries: the Democratic Republic of Congo, Rwanda, Burundi, Republic of Congo (grouped together as the Central African sub-region; 9 sites) and Nigeria (forming the West African sub-region; 5 sites). Data were analysed from the start in September 2001 through December 2007. Test data from a site were included from the first quarter that VCT became operational at that site. Start dates varied by site from 3rd quarter 2001 to 2nd quarter 2003; so this analysis reports on the experience of the VCT program during its first 4¾ to 6½ years of operation. Sporadic HIV tests that were done prior to the start of the VCT at a particular site were omitted. For every site the observation period was divided in the first 12 months (the early period) and the time after that (the later period); this meant that the early period covered a different calendar period at each site. As the program was primarily aiming to reach employees and spouses and not specifically children of employees or retired employees, these latter two categories were excluded from this analysis. The size of the target population of employees and spouses fluctuated over the years due to local expansions and reductions of the

workforce. The proportion of the target population of a specific year that was tested was calculated (overall, and by sex and employee/spouse status).

Laboratory methods

HIV-1 status was assessed by a combination of two different rapid tests on blood samples. If the screening test was positive a second test using a different diagnostic principle was performed on a new sample for confirmation. Rapid tests used varied per site, depending on the local availability and on national policies or guidelines. A CD4 count was done as soon as possible after HIV-1 infection was confirmed in order to determine eligibility for HAART. CD4 counts were measured by flow cytometry on different equipment, varying by site, usually in national reference laboratories.

Data management and statistical analysis

A purpose-made database application was created in Lotus Notes (Lotus Notes, IBM, Armonk, New York, USA) to assist in the management of patients and for program evaluation. Second or later samples of repeat testees were excluded from the main analysis.

Statistical analysis was done in Stata version 8 (Stata Corporation, College Station, Texas, USA). Data were described with means and standard deviation, or median and inter-quartile range (IQR), as appropriate. Univariate analyses were done using chi-square tests for categorical variables and rank sum test for continuous variables. Crude odds ratios with 95% Confidence Intervals (CI) were calculated to assess the association between demographic factors and period of testing (early versus late) and between demographic factors and HIV status. Logistic regression with backward

selection was used to identify factors that were independently associated with period of testing or with HIV infection.

CD4 counts done more than 180 days after the first positive HIV test were ignored for this analysis. The distribution of CD4 counts was skewed, so CD4 counts were log-transformed to achieve a near-normal distribution. Multiple linear regression was done to examine whether lower CD4 counts were independently associated with early period of testing. This was done using backward selection and variables were retained in the model if they had an independent effect on CD4 count or if their exclusion led to a change in the co-efficient of >10%. The level of significance was set at 5%.

Ethical matters

This analysis was a program evaluation, making use of data that were collected in the course of a routine program; no samples or data were collected specifically for this analysis. All patients provided informed consent that their data could be used for program evaluations.

Results

General

Between 1 September 2001 and 31 December 2007 a total of 10,464 HIV tests were done in adult employees or their spouses. Of those, 233 were sporadic tests done in people before the start of the program at that site and 508 of the tests were second or later tests; all of these were excluded from the main analysis, leaving 9,723 tests. The total number of beneficiaries by December 2007 was 9,119 (5,363 employees and 3,756 spouses). The proportion of eligible beneficiaries that was tested per year varied between 15% and 32% (Fig 1). The mean annual coverage was 20%; 23% among employees and 17% among spouses. The mean annual coverage among female employees was higher than among male employees (28% vs. 22%; $p=0.008$). Also the mean annual coverage among female spouses was consistently higher than among male spouses (18% vs. 6%; $p<0.001$).

The main characteristics of the tested persons are listed in Table 1. The median age was 35.4 years (IQR 30.0-42.1) and 59% was male. The total number of testees varied per site between 113 (Gitega, Burundi) and 1,562 (Kinshasa, Democratic Republic of Congo). The proportion females among testees varied between a low 18% in Ama and a high 62% in Ibadan (both in Nigeria). The proportion spouses among testees also varied widely, between 12% and 59%.

Period of testing and factors associated with early testing

In univariate analysis there were significant differences between employees tested early and those tested later in terms of age, marital status, sub-region, and HIV-1 status (Table 2). The proportion of testees with HIV was significantly higher in the early

compared to the later period (7.3% vs. 2.7%; $p < 0.001$). In a multivariate analysis, women, persons from the West African sub-region (compared to those from the Central African sub-region), and HIV-1 infected persons were significantly more likely to be tested in the early period (Table 2).

Among spouses of employees, early testees were more often from the Central African region and HIV infected in univariate analysis (Table 2). Also among spouses the proportion of testees with HIV was significantly higher in the early compared to the later period (14.5% vs. 3.4%; $p < 0.001$). In multivariate analyses, age above 45 years, Central African subregion and a positive HIV test were significantly associated with testing in the early period (Table 2).

Peaks of VCT uptake in several sites

Figure 2.a shows that the uptake of testing in the program as a whole increased gradually until a peak was reached in the 5th quarter, after which an irregular pattern of uptake was observed. The uptake per site was not evenly distributed, but was characterised by clear peaks, most of which could be related to particular events. For example, in Kaduna, Nigeria (Fig 2.b), after a gradual increase there was a small peak at quarter 3, due to an intensive health education campaign within the company. A second, higher peak occurred in quarter 5, due to a hepatitis B vaccination campaign for spouses of employees, and a comprehensive medical check-up that was initiated in employees aged 40 years and above; both target groups were simultaneously offered VCT. In quarters 12 and 13 there was an increase in uptake, again due to a round of routine medical check-ups in employees aged 40 years or above. The last peak, in quarter 18 was caused by the introduction of opt-out testing at the Kaduna site and the annual medical exam during that same quarter.

In Pointe Noire, Congo-Brazzaville, three distinct peaks can be discerned (Fig 2.c.). The early small peak in quarters 2 and 3 followed the official launch of the HAART program. The peak in quarter 6 was induced by the first local peer educators' campaign. The largest peak, in quarters 9-10, followed the General Manager's personal promotion of VCT, and a second peer educators' campaign during "La Fête des Brasseurs", a special company event.

As already described in detail before (Feeley, Collier, Richards, Van der Borgh, & Rinke de Wit, 2007), the uptake of VCT increased sharply in the two Rwandan sites (quarter 5), after the testimony given by an HIV-infected police woman, who was living evidence to many employees and spouses that one could be infected by HIV but still lead a normal life (Fig 2.d).

HIV status and factors associated with HIV-1 status

Overall, 3.8% (370) of all testees had HIV-1 infection, varying from 1.0% at Ibadan, Nigeria, to 11.6% in Kigali, Rwanda. Within the group of employees, the proportion of testees with HIV-1 infection was higher among people aged 35 years or older, among single people, among people who were divorced or widowed (all compared to married people), in persons from Central African sites (compared to those from West African sites), and among those tested in the first twelve months (Table 3). Female employees were less likely to have HIV infection, compared to male employees ($p=0.07$). In a multivariate analysis adjusting for all other variables) the odds ratio for HIV-1 infection was 3.2 (95%CI 2.4-4.3) in the early period compared to the later period (Table 3).

Among spouses of employees, age, gender and subregion were not associated with HIV, but early period of testing was strongly associated with HIV (OR 4.8, 95%CI 3.4-6.9; Table 3).

CD4 count of newly diagnosed HIV-1 patients

In 311 of the 370 testees who had HIV-1 infection, a CD4 count was available within six months of the date of the first positive HIV-1 test. The median CD4 count was 280 cells/ μ l (inter-quartile range 141-435); 109 (35.1%) had a CD4 count below 200 cells/ μ l. In univariate analysis the median CD4 count was significantly lower in the early period compared to the later period (227 vs. 314 cells/ μ l; $p=0.002$). The median CD4 count of newly diagnosed persons rose significantly over the years, from 227 cells/ μ l in the first year to 316 cells/ μ l in the fifth year (test for trend; $p=0.01$). In multivariate linear regression analysis early period of testing, adjusted for subregion and marital status, was significantly associated with a lower CD4 count ($p=0.024$). The CD4 count was 51 cells/ μ l (geometric mean) lower in those tested in the early period compared to those tested in the later period.

CDC stage of newly diagnosed HIV-1 patients

In 309 of the 370 testees who had HIV-1 infection, the CDC stage was assessed within six months of the date of the first positive HIV-1 test. Nine people were in CDC stage C, 43 in stage B, and 257 in stage A. The proportion of persons with advanced disease (stages B or C) was 29.8% in the early, and 10.2% in the later program period (χ^2 test; $p<0.001$). In univariate analysis advanced disease was not significantly associated with sex, marital status, age, target group, or sub-region. Early period of testing was

significantly associated with advanced disease stage (OR = 3.72, 95%CI 1.97-7.04); multivariate analysis gave the same results.

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Discussion

In this HIV workplace program each year an estimated 20% of the target population was tested for HIV-1 through VCT. In the first 12 months of the program the proportion of HIV-1 infected testees was markedly higher than in the subsequent period. HIV-1 infected persons diagnosed in the early period had markedly lower CD4 counts, and were more often symptomatic than persons diagnosed with HIV-1 in the subsequent period. This shows that the program reached HIV-1 infected persons among the target population earlier, and that among the HIV-1 infected persons, those with more advanced infection came earlier for testing. This is probably due to self-selection. Those who were ill or felt they had been at increased risk for HIV reported earlier for testing.

The program was successful in reaching both male and female employees; strikingly, the annual coverage of testing was substantially higher among female employees than among male employees (28% vs. 22%). It proved harder to reach spouses of employees. Nevertheless, the annual uptake of testing among spouses was 17%. Again, the program was more successful in reaching female spouses than male spouses (18% vs. 6%). Considering that employees are socially and physically more closely connected to the company, it is not surprising that their uptake of testing is higher than that of spouses. The uptake of testing among spouses varied strongly between sites, and the Central African sites were more successful in attracting spouses from the start. The main reason for these differences may be that in the Nigerian sites spouses tended to attend outside clinics rather than on-site company clinics.

Distinct peaks in the uptake of VCT per site occurred and these peaks appeared to have specific, local reasons. This indicates that VCT uptake can be influenced actively by organising health education and information campaigns, or by making testing available at health days or during vaccination campaigns. In the absence of special interventions uptake can decrease to very low levels (see figures 2.b. and 2.c). Interventions to stimulate VCT appeared to have only temporary effects; therefore sustained innovative approaches are required to motivate people to report for VCT.

The uptake of HIV testing rose steadily during the first 15 months of the program. Many employees and spouses might have been skeptical about the confidentiality of the test results vis à vis management, and trust in the VCT program had to be built over time. Health care staff became more convinced themselves of the benefit of HIV VCT once they witnessed the dramatic improvements that HAART had on HIV-1 infected patients. The impressive improvements in the condition of employees who were tested and started HAART probably also induced co-workers to come forward for testing; a phenomenon also shown in Botswana (Warwick, 2006). Testing uptake declined after year 2 (see figure 1.a.), to an annual coverage of around 15%. Presumably the group of persons who were keen to get tested had been tested by then, and the remaining group consisted partly of people not willing to be tested.

The observed prevalence of HIV-1 does not reflect the prevalence among the employees and their spouses, but among those who came forward for VCT. The high proportion beneficiaries with HIV-1 among those tested early is an overestimate of the prevalence among the target group, and is caused by selective early uptake by HIV-1 infected persons. This is a welcome effect, but this phenomenon should be explained to

(financial) managers contemplating similar programs. Also the fact that sicker people report early in such workplace programs has to be taken into consideration when planning such programs. One of its consequences is that at the start of the program very sick people start ART, which may be too late in some instances. This phenomenon was also observed in this program (Van der Borghet et al., 2009).

The uptake of testing was high in this program (about 20% of the target population per year, so that after several years the large majority of the target population has been tested) and a positive effect was that most persons diagnosed with HIV started antiretroviral treatment: Of the 370 HIV-1 infected persons tested in this program, 239 (64.6%) had started HAART by 1st January 2008 (Van der Borghet et al., 2009). We have not examined the impact on those that tested HIV negative. A meta-analysis (Weinhardt, Carey, Johnson, & Bickham, 1999) and, more recently, studies from a rural research program in Uganda (Matovu et al., 2005; Matovu et al., 2007) and from a workplace program in Zimbabwe (Corbett et al., 2007) have cast doubt on the positive effects of VCT on sexual risk behaviour among people who are HIV-1 uninfected. Further studies are needed into the impact of VCT on HIV-1 incidence in HIV-negative tested persons (Matovu et al., 2007; Glick, 2005).

Initially the message in the workplace program was to get tested; only in recent years a policy was adopted that persons should be encouraged to be tested every two years. This policy is now starting to be implemented in conjunction with an opt-out policy. The challenge in the coming years will be to maintain a high testing rate, and to enshrine repeat testing every two years, through provider initiated testing, into the routine approach.

Conclusions

In an HIV workplace program HIV infected persons from the target population tend to report for VCT early in the program, and among the HIV infected those with more advanced disease tend to report earlier than asymptomatic persons. An early high HIV prevalence should not be extrapolated to indicate a high prevalence among the whole target population. Employees' spouses are harder to reach than employees and extra efforts should be undertaken to reach them as well. Uptake of HIV testing can be actively influenced by educational or promotional activities, which require ongoing and repeated efforts.

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Captions for Figures

Figure 1. **Proportion of beneficiaries tested for HIV, per year, and** by beneficiary category in the Heineken workplace program at 14 sites in 5 sub-Saharan African countries, 2001-7. The graph is based on data of the first 4 years and 9 months, as not all sites had reached quarter 20 by 31 December 2007.

Figure 2.a Numbers of persons counselled and tested by quarter in the Heineken workplace program at 14 sites in 5 sub-Saharan African countries, 2001-7. Quarter 1 indicates the quarter during which the program started at a particular site; so quarter 1 relates to a different calendar month or year for each site. The graph is censored at quarter 19, as not all programs had reached quarter 20 by 31 December 2007.

Figure 2.b. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Kaduna, Nigeria, 2003-7.

Figure 2.c. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Pointe Noire, Congo-Brazzaville, 2002-7.

Figure 2.d. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Gisenyi and Kigali, Rwanda, 2001-6.

Table 1. Characteristics of 9,723 persons, by beneficiary status, who were counselled and tested in an HIV workplace program at 14 sites in 5 sub-Saharan African countries, 2001-7.

	Employees	Spouses	All ¹
	n (%)	n (%)	n (%)
	[unless indicated otherwise]	[unless indicated otherwise]	[unless indicated otherwise]
n	6,335 (65.2%)	3,341 (34.4%)	9,723
Median age (IQR) in years	37.6 (30.8 - 44.1)	33.0 (29.0 - 37.8)	35.4 (30.0 – 42.1)
Age group			
15-34	2,349 (37.1%)	1,979 (59.2%)	4,328 (44.5%)
35-44	2,342 (37.0%)	973 (29.1%)	3,315 (34.1%)
45+	1,330 (21.0%)	233 (7.0%)	1,563 (16.1%)
Not recorded	314 (5.0%)	156 (4.7%)	517 (5.3%)
Gender			
Male	5,659 (89.3%)	85 (2.5%)	5,744 (59.1%)
Female	628 (9.9%)	3,237 (96.9%)	3,865 (39.8%)
Not recorded	48 (0.8%)	19 (0.6%)	114 (1.2%)
Marital status			
Single	1,499 (23.7%)	0 (0%)	1,499 (15.4%)

Married	4,457 (70.4%)	3,218 (96.3%)	7,675 (78.9%)
Divorced/widowed/union libre	117 (1.9%)	47 (1.4%)	164 (1.7%)
Not recorded	262 (4.1%)	76 (2.2%)	385 (4.0%)
Sub-region			
West Africa	3,205 (50.6%)	1,278 (38.3%)	4,483 (46.1%)
Central Africa	3,130 (49.4%)	2,063 (61.8%)	5,240 (53.9%)
Period			
First 12 months of program	1,020 (16.1%)	345 (10.3%)	1,412 (14.5%)
After first 12 months of program	5,315 (83.9%)	2,996 (89.7%)	8,311 (85.5%)
HIV status			
HIV-1 infected	218 (3.4%)	152 (4.6%)	370 (3.8%)
HIV-1 negative	6,117 (96.6%)	3,189 (95.5%)	9,353 (96.2%)
Median CD4 count (IQR) cells/ μ l ²	252 (124 - 456)	318 (180 - 427)	280 (141-435)
CD4 count category ²			
CD4 count < 200 cells/ μ l	74 (33.9%)	35 (23.0%)	109 (29.5%)
CD4 count \geq 200 cells/ μ l	110 (50.5%)	92 (60.5%)	202 (54.6%)
No CD4 count available	34 (15.6%)	25 (16.5%)	59 (15.9%)
CDC stage ²			
Stage A	145 (66.5%)	112 (73.7%)	257 (69.5%)

Stage B	27 (12.4%)	16 (10.5%)	43 (11.6%)
Stage C	9 (4.1%)	0 (0%)	9 (2.4%)
Stage not recorded	37 (17.0%)	24 (15.8%)	61 (16.5%)

Notes: (1) Included in the total are 47 persons for whom the beneficiary category (employee or spouse of employee) was not recorded; (2) Based on HIV-1 infected persons only.

Abbreviations: CI Confidence interval; IQR Inter-quartile range; CDC Centers for Disease Control and Prevention.

Table 2. Comparison of persons who were tested for HIV-1 in the first twelve months of a workplace program at 14 sites in 5 sub-Saharan African countries, and those tested later, 2001-7.

	Tested in first 12 months	Tested after first 12 months	Crude Odds Ratio (95% CI)	P ³	Adjusted Odds Ratio ⁴ (95% CI)	P
<i>Employees</i>						
n	1,020 (16.1%)	5,315 (83.9%)				
Median age [IQR] in years ¹	36.1 (30.0 – 42.5)	38.0 (31.0 – 44.3)	--	<0.001		
Age categories ¹						
15 – 34 years	436 (42.9%)	1,913 (38.2%)	1.0			
35 – 44 years	412 (40.6%)	1,930 (38.6%)	0.94 (0.81-1.09)	0.39		
≥ 45 years	168 (16.5%)	1,162 (23.2%)	0.63 (0.52-0.77)	<0.001		
Gender ¹						
Male	901 (88.5%)	4,758 (90.3%)	1.0		1.0	
Female	117 (11.5%)	511 (9.7%)	1.21 (0.98-1.50)	0.08	1.30 (1.04-1.62)	0.02
Marital status ¹						
Single	296 (31.1%)	1,203 (23.5%)	1.49 (1.28-1.74)	<0.001	1.27 (1.08-1.50)	0.003
Married	631 (66.4%)	3,826 (74.7%)	1.0		1.0	
Divorced/widowed/union libre	24 (2.5%)	93 (1.8%)	1.56 (0.99-2.47)	0.05	1.40 (0.86-2.27)	0.2
Sub-region						

West African Region	665 (65.2%)	2,540 (47.8%)	1.0		1.0	
Central African site	355 (34.8%)	2,775 (52.2%)	0.49 (0.42-0.56)	<0.001	0.56 (0.48-0.65)	0.001
HIV-1 status						
Negative	946 (92.8%)	5,171 (97.3%)	1.0		1.0	
Positive	74 (7.3%)	144 (2.7%)	2.81 (2.10-3.75)	<0.001	3.43 (2.54-4.63)	<0.001
Median CD4 count (IQR) cells/ μ l (of those tested +ve) ¹	188 (108-412)	280 (146-480)		0.03		
CDC Stage (of those tested +ve) ¹						
Stage A	42 (70.0%)	103 (85.1%)	1.0			
Stage B or C	18 (30.0%)	18 (14.9%)	2.45 (1.15-5.24)	0.017		
<i>Spouses</i>						
n	345 (10.3%)	2,996 (89.7%)				
Median age [IQR] in years ²	32.3 (28.0-37.0)	33.0 (29.1-38.0)		0.02		
Age categories ²						
15 – 34 years	215 (63.6%)	1,764 (62.0%)	1.0		1.0	
35 – 44 years	107 (31.7%)	866 (30.4%)	1.01 (0.79-1.30)	0.9	0.93 (0.72-1.20)	0.6
≥ 45 years	16 (4.7%)	217 (7.6%)	0.60 (0.36-1.03)	0.06	0.51 (0.30-0.87)	0.01

Gender ²						
Male	6 (1.7%)	79 (2.7%)	1.0			
Female	339 (98.3%)	2,898 (79.4%)	1.54 (0.67-3.56)	0.3		
Sub-region						
West African Region	53 (15.4%)	1,225 (40.9%)	1.0	1.0		
Central African site	292 (84.6%)	1,771 (59.1%)	3.81 (3.80-5.17)	<0.001	4.06 (2.99-5.51)	<0.001
HIV-1 status						
Negative	295 (85.5%)	2,894 (96.6%)	1.0	1.0		
Positive	50 (14.5%)	102 (3.4%)	4.81 (3.34-6.92)	<0.001	4.72 (3.25-6.87)	<0.001
Median CD4 count (IQR) cells/μl (of those tested +ve) ²	271 (122-394)	346 (230-449)	0.02			
CDC Stage (of those tested +ve) ²						
Stage A	31 (70.5%)	81 (96.4%)	1.0			
Stage B or C	13 (29.6%)	3 (3.6%)	11.32 (2.71-47.33)	<0.001		

Notes:

(1) Age missing for 314 employees; gender missing for 48 employees; marital status missing for 262 employees. CD4 count data based on 184 employees (57 in early and 127 in late period); CD4 count within 6 months of HIV diagnosis not available for 34 employees. CDC stage data based on 181 employees (60 in first and 121 in late period); CDC stage not available within 6 months of HIV diagnosis for 37 employees.

(2) Age missing for 156 spouses; gender missing 19 spouses; CD4 data used on 127 spouses (41 in early and 86 in late period); CD4 count within 6 months of HIV diagnosis not available for 25 spouses. CDC stage data based on 128 spouses (44 in first and 84 in late period); CDC stage not available within 6 months of HIV diagnosis for 24 spouses.

(3) P value based on χ^2 test, except for comparisons of median age and median CD4 count, which were done by the rank sum test.

(4) Odds ratios obtained by multiple logistic regression and adjusted for other variables for which odds ratios are provided in this column.

Abbreviations: CI Confidence interval; IQR Inter-quartile range; VCT Voluntary counselling and testing; CDC Centers for Disease Control and Prevention.

Table 3. Comparison of persons who were infected with HIV-1 with those who were not, in an HIV Workplace Program at 14 sites in 5 sub-Saharan African countries, 2001-2007.

	HIV-1 infected	HIV-1 uninfected	Crude Odds Ratio (95% CI)	P ³	Adjusted Odds Ratio ⁴ (95% CI)	P
<i>Employees</i>						
n	218 (3.4%)	6,117 (96.6%)				
Median age [IQR] in years ¹	41.2 (36.0 – 45.4)	37.4 (30.7 – 44.0)		<0.001		
Age group ¹						
15-34	38 (17.5%)	2,311 (39.8%)	1.0		1.0	
35-44	117 (53.9%)	2,225 (38.3%)	3.20 (2.20-4.64)	<0.001	2.39 (1.55-3.68)	<0.001
45+	62 (28.6%)	1,268 (21.9%)	2.97 (1.97-4.49)	<0.001	1.91 (1.19-3.08)	0.008
Gender ¹						
Male	204 (95.6%)	5,455 (89.9%)	1.0		1.0	
Female	14 (6.4%)	614 (10.1%)	0.61 (0.35-1.05)	0.07	0.44 (0.24-0.79)	0.007
Marital status ¹						
single	21 (9.6%)	1,478 (25.2%)	0.35 (0.22-0.56)	<0.001	0.74 (0.43-1.28)	0.3
married	172 (78.9%)	4,285 (73.2%)	1.0		1.0	
divorced/widowed/union libre	25 (11.5%)	92 (1.6%)	6.77 (4.22-10.85)	<0.001	6.55 (3.93-10.90)	<0.001

Sub-region

West Africa	67 (30.7%)	3,138 (51.3%)	1.0		1.0	
Central Africa	151 (69.3%)	2,979 (48.7%)	2.37 (1.77-3.18)	<0.001	2.24 (1.64-3.06)	<0.001

Period

First 12 months of program	74 (33.9%)	946 (15.5%)	2.81 (2.10-3.75)		3.20 (2.37-4.33)	
After first 12 months of program	144 (66.1%)	5,171 (84.5%)	1.0	<0.001	1.0	<0.001

Spouses

n	152 (4.6%)	3,189 (95.5%)				
Median age [IQR] in years ²	34.0 (28.1-38.9)	33.0 (29.0-37.7)		0.6		

Age group ²

15-34	86 (57.0%)	1,893 (62.4%)	1.0		--	
35-44	54 (35.8%)	919 (30.3%)	1.29 (0.91-1.83)	0.15	--	
45+	11 (7.3%)	222 (7.3%)	1.09 (0.57-2.07)	0.8	--	

Gender ²

Male	6 (3.9%)	79 (2.5%)	1.0		--	
Female	146 (96.1%)	3,091 (97.5%)	0.62 (0.27-1.45)	0.3	--	

Sub-region

West Africa	50 (32.9%)	1,228 (38.5%)	1.0		--	
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Central Africa	102 (67.1%)	1,961 (61.5%)	1.28 (0.90-1.81)	0.16	--	
Period						
First 12 months of program	50 (32.9%)	295 (9.3%)	4.81 (3.34-6.92)		4.81 (3.36-6.89)	
After first 12 months of program	102 (67.1%)	2,894 (90.7%)	1.0	<0.001	1.0	<0.001

Notes:

- (1) Age missing for 314, gender missing for 48, marital status missing for 262.
- (2) Age missing for 156, gender missing for 19.
- (3) P value based on χ^2 test, except for the comparison of median age, which was done by the rank sum test.
- (4) Odds ratios obtained by multiple logistic regression, and adjusted for other variables for which odds ratios are provided in this column.

Abbreviations:

CI Confidence interval; IQR Inter-quartile range; VCT Voluntary counselling and testing.

Fig. 1. Proportion of beneficiaries tested for HIV, per year, and by beneficiary category in the Heineken workplace program at 14 sites in 5 sub-Saharan African countries, 2001-7. The graph is based on data of the first 4 years and 9 months, as not all sites had reached quarter 20 by 31 December 2007.

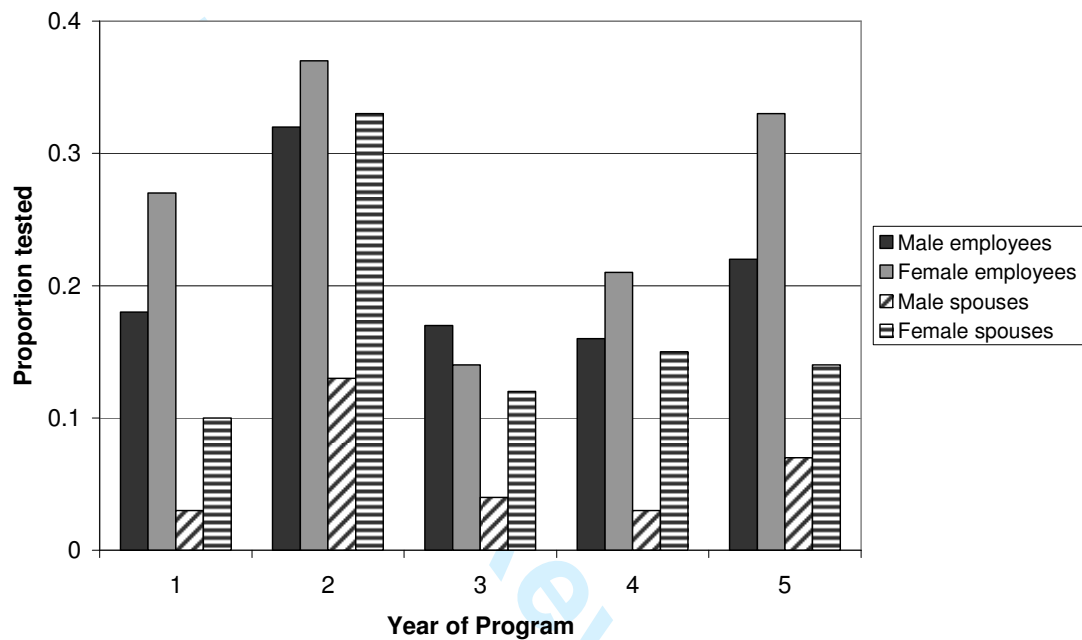


Fig. 2.a. Numbers of persons counselled and tested over the course of the first 5 years of an HIV workplace program at 14 sites in 5 sub-Saharan African countries, 2001-7.

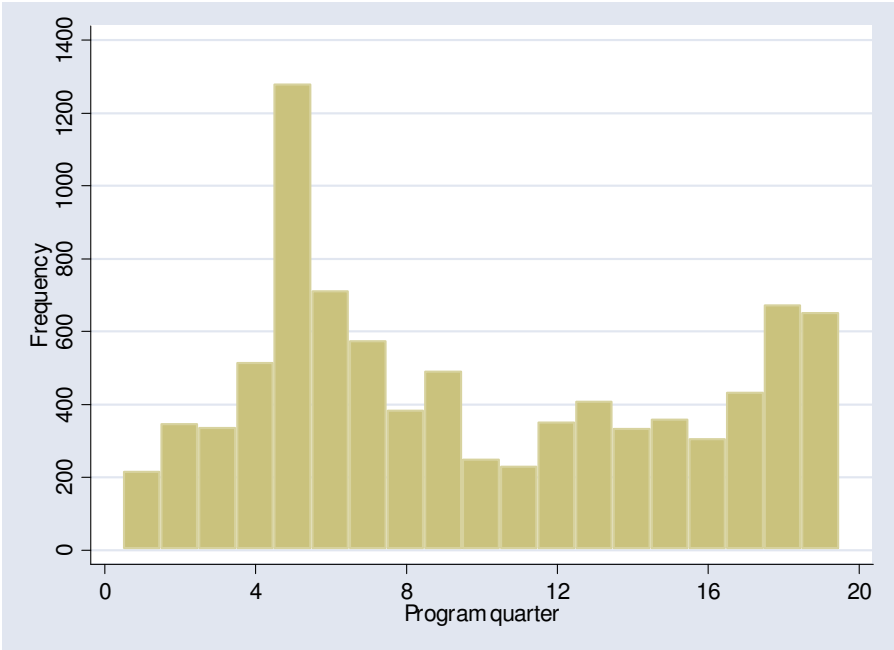


Figure 2.b. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Kaduna, Nigeria, 2003-7.

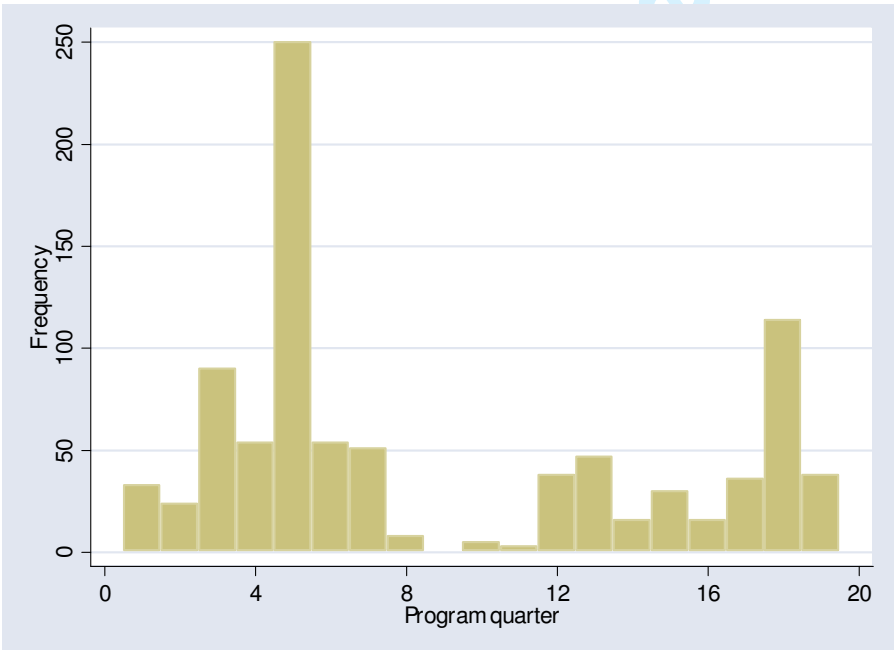


Figure 2.c. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Pointe Noire, Congo-Brazzaville, 2002-7.

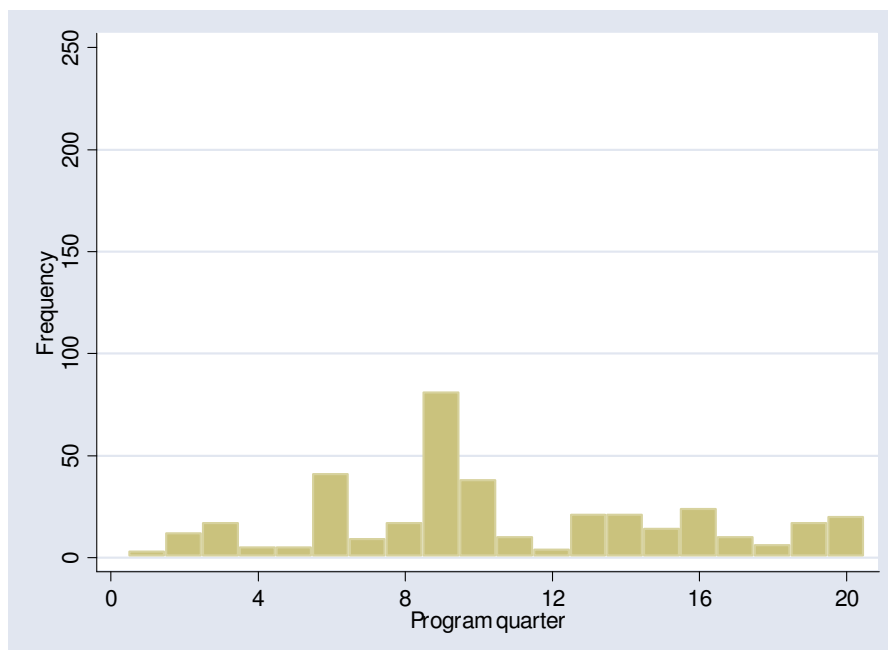


Figure 2.d. Numbers of persons counselled and tested by quarter in the Heineken workplace program in Gisenyi and Kigali, Rwanda, 2001-6.

