

# Voluntary counselling and testing: uptake, impact on sexual behaviour, and HIV incidence in a rural Zimbabwean cohort

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**Objectives:** To examine the determinants of uptake of voluntary counselling and testing (VCT) services, to assess changes in sexual risk behaviour following VCT, and to compare HIV incidence amongst testers and non-testers.

**Methods:** Prospective population-based cohort study of adult men and women in the Manicaland province of eastern Zimbabwe. Demographic, socioeconomic, sexual behaviour and VCT utilization data were collected at baseline (1998–2000) and follow-up (3 years later). HIV status was determined by HIV-1 antibody detection. In addition to services provided by the government and non-governmental organizations, a mobile VCT clinic was available at study sites.

**Results:** Lifetime uptake of VCT increased from under 6% to 11% at follow-up. Age, increasing education and knowledge of HIV were associated with VCT uptake. Women who took a test were more likely to be HIV positive and to have greater HIV knowledge and fewer total lifetime partners. After controlling for demographic characteristics, sexual behaviour was not independently associated with VCT uptake. Women who tested positive reported increased consistent condom use in their regular partnerships. However, individuals who tested negative were more likely to adopt more risky behaviours in terms of numbers of partnerships in the last month, the last year and in concurrent partnerships. HIV incidence during follow-up did not differ between testers and non-testers.

**Conclusion:** Motivation for VCT uptake was driven by knowledge and education rather than sexual risk. Increased sexual risk following receipt of a negative result may be a serious unintended consequence of VCT. It should be minimized with appropriate pre- and post-test counselling.

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## Introduction

Voluntary counselling and testing (VCT) plays a pivotal role in the public health response to the HIV epidemic and is a vital point of entry to HIV/AIDS services including primary prevention, prevention of mother-to-child transmission, antiretroviral therapy, management

of HIV-related illnesses, tuberculosis control and psychosocial support [1–10]. In developed countries with epidemics in core groups, high-quality VCT been shown to substantially reduce the incidence of STD transmission and increase condom use [11]. In resource-poor settings, including many subSaharan countries with generalized epidemics, VCT is becoming increasingly

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available, but study results conflict with regards to the potential impact of VCT to promote reductions in risky behaviours [12–14].

Quality of VCT and local context are also critical. The costs/benefits to an individual of knowing their status have oscillated over time and place, depending on a multitude of factors such as stigma and discrimination [2,15], availability of social support [16], availability of interventions [17] including prevention of infant infection in pregnancy [18,19] and access to antiretroviral treatment [20,21]. However, beyond individual motivation, the mechanism by which VCT is provided may also be important. Providing VCT at home [22], in the workplace [23] or in other convenient locations has been shown to facilitate acceptability and uptake. In Zimbabwe, VCT first become available in the late 1990s. Although nearly 300 000 Zimbabweans received VCT in 2004 [24], geographical coverage of services remains patchy and uptake is low.

The cohort followed since 1998 as part of Manicaland HIV/STD Prevention Project provides an opportunity to investigate the uptake and impact of VCT in a general population sample. The current study was designed to examine (1) the recent trend in uptake of VCT and the factors associated with HIV testing; (2) the change during follow-up in behaviour of those who undergo VCT compared with those who do not, for both HIV-positive and HIV-negative individuals; and (3) the impact of VCT on HIV incidence.

## Methods

### Study population

The Manicaland HIV/STD Prevention Project is an ongoing population-based open cohort study, full details of which can be found elsewhere [25,26]. Briefly, the study population were resident in four subsistence farming areas, two roadside trading centres, four forestry, tea and coffee estates, and two small towns in the rural province of Manicaland in eastern Zimbabwe. All local residents were enumerated in an initial household census (conducted between July 1998 and February 2000; referred to here as the baseline survey), which was repeated 3 years later in each site (referred to here as the follow up survey). Males aged 17 to 54 years and females aged 15 to 44 years were recruited into a cohort study of HIV transmission. The different age ranges for males and females were chosen to reflect the different age patterns of HIV infection in Zimbabwe. A maximum of one member of each marital group was selected.

At each round after written informed consent was given, information on demographic and socioeconomic characteristics, HIV knowledge [27] and sexual behaviour

were collected through an interviewer-led questionnaire. Responses to sensitive questions about sexual behaviour were collected using an informal confidential system of voting [28]. Dried blood spots were collected for HIV serological testing, which was performed using a highly sensitive and specific antibody dipstick assay [29].

### Voluntary counselling and testing services

In parallel with the research, free HIV counselling and testing and free treatment for other sexually transmitted diseases were made available in the study areas through a mobile clinic service. The 12 sites were enumerated in succession with the mobile VCT clinic present within the study site at the time the survey was being conducted. Nurse counsellors working with the research programme were trained to provide counselling using a systemic approach [30] that emphasized the background of the client and tailored pre- and post-test counselling accordingly. VCT services provided primarily by non-governmental organizations were also available in the study areas and the provincial capital Mutare.

At baseline, respondents were asked the following regarding VCT use: whether and when they had ever received a test for HIV; how long ago they were last tested; the reasons for being tested; the factors that deterred them from testing; and whether they knew the HIV infection status of their partner. At follow-up, the same questions were asked along with additional questions on whether counselling was received before and/or after being given results and whether results were collected.

### Statistical analysis

All analyses considered the non-virgin population who had an unambiguous anonymous HIV dipstick test results.

Since the number of study participants at baseline who had attended for VCT was small, determinants of testing were investigated at follow-up. Separate logistic regression models were fitted for the male and female populations. First univariate models were fitted. All variables significant in the univariate models ( $P \leq 0.05$ , likelihood ratio test comparing with the null model with no explanatory variables) were included in an initial multivariable model. Variables were dropped from the multivariable models one at a time if inclusion did not significantly improve the fit of the model ( $P \leq 0.1$ , likelihood ratio test). In preliminary analyses, results were stratified by age (at 25); only education had a different impact at different ages, so the results for this variable are presented separately.

Reasons for uptake of VCT were recorded for all those who tested; anxiety, fear and worry were considered together as 'psychological prompters'. Deterrents from testing were also recorded for all participants and similarly coded.

The analyses also examined the impact of VCT on subsequent sexual behaviours. Individuals were categorized as becoming 'less risky', 'the same level of risk' or 'more risky' (coded -1, 0 and +1, respectively) based on five different sexual behaviours that were collected in a consistent manner at baseline and follow-up. Ordinal logistic regression models were fitted, comparing those who tested positive and those who tested negative, stratified on receipt of post-test counselling to a reference group of individuals who never tested. Individuals who tested but did not receive a result were excluded; those who seroconverted in the course of follow-up were classified as negative, which was their status at baseline. Separate models were fitted for males and females where the direction of the effect (more/less risky) differed.

HIV incidence stratified by gender was calculated by VCT status for all individuals who were HIV negative at baseline (based on the dipstick test for the cohort study). All individuals who reported at follow-up to have received an HIV test 2 to 3 years prior to interview were classified as having received VCT at/around baseline. It was assumed that seroconversions were distributed evenly within the follow-up period; therefore, the mean time to seroconversion of those who became infected was taken to be 1.5 years.

## Results

### Survey participation and follow up rates

The overall participation rate of individuals eligible for the cohort study was 79% at baseline (9454/11980) and 79% at follow-up (7019/8894). At follow-up, 6259 individuals reported sexually experience and, therefore, were included in the cross-sectional analysis (Table 1). The 5775 individuals who participated in the baseline and follow-up study (a follow-up rate of 61%) were analysed for sexual behaviour change and HIV incidence (Tables 2 and 3).

### HIV testing

HIV prevalence based on the undisclosed dipstick tests used in the survey was 20% and 18% for males (17 to 54 years) and 26% and 22% for females (15 to 44 years) at baseline and follow-up, respectively.

At baseline, relatively few study participants had ever received VCT (6.6%; 530/8036). Pre-test counselling at the mobile VCT centre was taken up by 5.9% (479/8036) but only 2.0% (163/8036) also returned to receive their results. HIV prevalence in research participants who took up the VCT service was 21.5%, compared with 22.5% amongst all participants.

At follow-up, 19% (1185/6248) reported having had an HIV test at some point in the past, with males being

significantly more likely to have been tested (26% males, 14% females;  $P < 0.001$ ) but less likely to have received the result after testing (46% males, 71% females;  $P < 0.001$ ). Consequently, 12% of men (308/2588) and 10% (355/3660) of women in the study population had ever collected an HIV test result. Follow-up members of the cohort tested and collected a result more frequently than new members (5% versus 12%;  $P < 0.001$ ). The great majority of respondents (88%; 5463/6248) said that they wanted to know if they were HIV infected, with males (90%, 2336/2588) being more likely to want to know their status than females (86%, 3127/3660) ( $P < 0.001$ ).

### Counselling

Of the 1185 who had tested for HIV, 51% reported having received pre-test counselling. Uptake of either pre- or post-test counselling was lower for males than for females: 42% versus 65% ( $P < 0.001$ ) and 32% versus 51% ( $P < 0.001$ ), respectively. For both males and females, those who received pre-test counselling were significantly more likely to return for their results than those who did not (males: 82% versus 21%; females: 80% versus 53%;  $P < 0.001$  for both).

### Deterrents and promoters of testing

Subjects were asked what factors would deter them from going for an HIV test. Psychological factors were the most common deterrent (32%) followed by stigma and discrimination (8%) and the belief that knowledge of infection would accelerate disease progression (7%). Males more frequently reported psychological deterrents than females (42% versus 25%; Fisher's exact test for whole table,  $P < 0.001$ ).

Respondents who received an HIV test could give up to three reasons. A total of 1486 reasons were given by the 1185 people who had been tested. The main reasons were anxiety/general concern and wanting reassurance of being uninfected and 75% of respondents gave at least one of those reasons. Need for reassurance was mentioned more often by men than by women (47% versus 27%;  $\chi^2$  test,  $P < 0.001$ ).

### Factors associated with HIV testing

Table 1 describes the results for possible predictors of HIV testing and receiving results for men and women who were sexually experienced and seen at follow-up (6259). Separate models are presented for males and females in order to highlight the differences in testing predictors. For both sexes, age was strongly associated with testing, so multivariable models controlling for age are reported.

Men who were tested were less likely to live in roadside trading centres and they reported fewer total lifetime partners but more non-regular partners. Women who were tested were more likely to live in roadside trading centres and in subsistence farming areas and reported

Table 1. Frequency distributions and associations between demographic and sexual behaviour variables and uptake of HIV testing in Manicaland, Zimbabwe, 2001–2003.

|  | Males     |                      |                                   | Females   |                     |                                 |
|--|-----------|----------------------|-----------------------------------|-----------|---------------------|---------------------------------|
|  | No. (%)   | OR (95% CI)          | AOR (95% CI)                      | No. (%)   | OR (95% CI)         | AOR (95% CI)                    |
| Total No.                                  | 2590      |                      |                                   | 3669      |                     |                                 |
| Age (years)                                |           |                      | 1.18 <sup>a</sup> (1.08–1.28)**** |           |                     | 1.08 <sup>a</sup> (1.01–1.18)** |
| 17–19                                      | 199 (3)   | 1                    |                                   | 266 (5)   | 1                   |                                 |
| 20–24                                      | 608 (10)  | 3.39 (1.44–7.98)***  |                                   | 612 (10)  | 1.99 (1.09–3.62)**  |                                 |
| 25–29                                      | 549 (11)  | 3.79 (1.61–8.95)**   |                                   | 605 (9)   | 1.76 (0.96–3.23)*   |                                 |
| 30–34                                      | 346 (12)  | 4.56 (1.90–10.9)**** |                                   | 570 (9)   | 1.69 (0.92–3.12)*   |                                 |
| 35–39                                      | 256 (14)  | 5.43 (2.24–13.1)**** |                                   | 483 (10)  | 2.03 (1.09–3.75)**  |                                 |
| 40–44                                      | 216 (15)  | 5.8 (2.37–14.2)****  |                                   | 501 (11)  | 2.17 (1.18–3.99)*   |                                 |
| 45 and older                               | 416 (18)  | 6.84 (2.92–16.0)**** |                                   | 632 (12)  | 2.38 (1.32–4.31)*   |                                 |
| HIV status                                 |           |                      |                                   |           |                     |                                 |
| Negative                                   | 2015 (12) | 1                    |                                   | 2661 (9)  | 1                   |                                 |
| Positive                                   | 575 (13)  | 1.14 (0.87–1.41)     |                                   | 1008 (12) | 1.33 (1.08–1.72)*** | 1.63 (1.25–2.12)****            |
| Socioeconomic site type                    |           |                      |                                   |           |                     |                                 |
| Town                                       | 479 (11)  | 1                    |                                   | 495 (6)   | 1                   |                                 |
| Estate                                     | 1105 (13) | 1.21 (0.86–1.69)     |                                   | 1010 (8)  | 1.38 (0.89–2.14)    |                                 |
| Subsistence farming                        | 630 (14)  | 1.27 (0.88–1.83)*    |                                   | 1353 (11) | 2.02 (1.34–3.04)*** | 1.56 (1.18–2.26)****            |
| Roadside trading centre                    | 303 (4)   | 0.36 (0.19–0.67)**   | 0.29 (0.15–0.56)***               | 735 (11)  | 2.07 (1.34–3.21)*** | 1.52 (1.14–2.26)****            |
| Marital status                             |           |                      |                                   |           |                     |                                 |
| Never married                              | 842 (8)   | 1                    |                                   | 232 (7)   | 1                   |                                 |
| Widowed                                    | 36 (8)    | 1.05 (0.31–3.51)     |                                   | 419 (14)  | 1.99 (1.12–3.51)**  |                                 |
| Divorced                                   | 73 (15)   | 2.05 (1.03–4.08)**   |                                   | 291 (8)   | 1.13 (0.48–1.59)    |                                 |
| Separated                                  | 35 (17)   | 2.39 (0.96–5.96)*    |                                   | 136 (8)   | 1.11 (0.48–2.05)    |                                 |
| Married                                    | 1604 (14) | 1.84 (1.38–2.46)**** |                                   | 2591 (9)  | 1.32 (0.77–2.08)    |                                 |
| Knowledge index (per 10 points/100)        |           |                      | 1.01 (0.96–1.13)                  |           |                     | 1.17 (1.05–1.24)****            |
| Recent health                              |           |                      |                                   |           |                     |                                 |
| Good health                                | 1803 (13) | 1                    |                                   | 2647 (10) | 1                   |                                 |
| Recurring sickness                         | 181 (15)  | 1.18 (0.78–1.81)     |                                   | 430 (10)  | 0.98 (0.69–1.31)    |                                 |
| Serious illness                            | 91 (13)   | 0.98 (0.52–1.83)     |                                   | 66 (20)   | 2.13 (1.14–3.96)**  |                                 |
| Visited bar or beer hall                   |           |                      |                                   |           |                     |                                 |
| No   | 1279 (11) | 1                    |                                   | 3521 (10) | 1                   |                                 |
| Yes  | 1311 (13) | 1.16 (0.91–1.51)     |                                   | 148 (7)   | 0.66 (0.34–1.26)    |                                 |
| Thinks spouse has other partners           |           |                      |                                   |           |                     |                                 |
| No   | 2275 (12) | 1                    |                                   | 2307 (10) | 1                   |                                 |
| Yes/don't know                             | 314 (13)  | 1.09 (0.79–1.56)     |                                   | 1355 (10) | 1.04 (0.83–1.30)    |                                 |
| Sexual behaviour                           |           |                      |                                   |           |                     |                                 |
| Age at first sex                           |           |                      |                                   |           |                     |                                 |
| Lifetime total partners                    |           |                      | 1.01 (1.00–1.02)                  |           |                     | 0.97 (0.95–1.00)*               |
| One  | 471 (9)   | 1                    |                                   | 2360 (10) | 1                   |                                 |
| Multiple                                   | 2120 (13) | 1.42 (1.01–1.99)**   |                                   | 1302 (9)  | 0.92 (0.73–1.16)    |                                 |
| Lifetime regular partners                  |           |                      |                                   |           |                     |                                 |
| None                                       | 442 (7)   | 1                    |                                   | 70 (14)   | 1                   |                                 |
| One  | 994 (13)  | 1.99 (1.32–3.02)**** |                                   | 2556 (10) | 0.66 (0.33–1.31)    |                                 |
| Multiple                                   | 1155 (13) | 2.08 (1.38–3.13)**** |                                   | 1036 (9)  | 0.58 (0.29–1.17)    |                                 |
| Lifetime non-regular partners              |           |                      |                                   |           |                     |                                 |
| None                                       | 600 (9)   | 1                    |                                   | 2920 (10) | 1                   |                                 |
| One  | 422 (11)  | 1.24 (0.82–1.87)     |                                   | 402 (11)  | 1.12 (0.86–1.67)    |                                 |
| Multiple                                   | 1569 (13) | 1.55 (1.13–2.12)**** |                                   | 340 (7)   | 0.74 (0.48–1.13)    |                                 |
| Different regular partners in last 3 years |           |                      |                                   |           |                     |                                 |

|  |           |                      |           |                     |
|--|-----------|----------------------|-----------|---------------------|
| None   | 713 (8)   | 1                    | 650 (13)  | 1                   |
| One  | 1286 (13) | 1.79 (1.30–2.45)**** | 2766 (9)  | 0.71 (0.54–0.92)*** |
| Multiple   | 592 (14)  | 1.89 (1.32–2.70)**** | 246 (7)   | 0.51 (0.29–0.89)**  |
| Different non-regular partners in last 3 years         |           |                      |           |                     |
| None   | 1343 (12) | 1                    | 3274 (10) | 1                   |
| One  | 471 (9)   | 0.71 (0.50–1.01)*    | 245 (10)  | 1.04 (0.68–1.60)    |
| Multiple   | 777 (13)  | 1.11 (0.85–1.44)     | 143 (6)   | 0.54 (0.26–1.12)*   |
| Different partners in last month                       |           |                      |           |                     |
| None   | 962 (9)   | 1                    | 1521 (11) | 1                   |
| One  | 1408 (13) | 1.49 (1.14–1.95)***  | 2107 (9)  | 0.85 (0.68–1.06)    |
| Multiple   | 221 (15)  | 1.72 (1.12–2.65)**   | 34 (12)   | 1.13 (0.39–3.26)    |
| Different partners in last year                        |           |                      |           |                     |
| None   | 484 (8)   | 1                    | 1202 (11) | 1                   |
| One  | 1428 (13) | 1.57 (1.09–2.24)**   | 2324 (9)  | 0.83 (0.66–1.04)    |
| Multiple   | 679 (13)  | 1.57 (1.06–2.32)**   | 136 (5)   | 0.44 (0.20–0.96)**  |
| Current sexual relationships                           |           |                      |           |                     |
| None   | 617 (8)   | 1                    | 953 (10)  | 1                   |
| One  | 1685 (13) | 1.60 (1.16–2.20)***  | 2666 (9)  | 0.91 (0.72–1.17)    |
| Multiple   | 289 (13)  | 1.71 (1.10–2.65)**   | 43 (9)    | 0.90 (0.31–2.56)    |
| Condom use in regular partnerships in last 2 weeks     |           |                      |           |                     |
| None/inconsistent                                      | 1299 (13) | 1                    | 2065 (10) | 1                   |
| Consistent   | 135 (56)  | 0.86 (0.50–1.48)     | 136 (10)  | 0.99 (0.58–1.82)    |
| Condom use in non-regular partnerships in last 2 weeks |           |                      |           |                     |
| None/inconsistent                                      | 223 (15)  | 1                    | 117 (7)   | 1                   |
| Consistent   | 86 (16)   | 1.05 (0.53–2.07)     | 39 (8)    | 1.12 (0.28–4.46)    |

OR, odds ratio; AOR adjusted odds ratio; CI, confidence interval.

<sup>a</sup>Modelled as a continuous variable.

\* $P < 0.1$ ,

\*\* $P < 0.05$ ,

\*\*\* $P < 0.01$ ,

\*\*\*\* $P < 0.001$ .

Table 2. Sexual behaviour change between baseline and follow-up interview by having received an HIV test at/around baseline interview<sup>a</sup>.

| Sexual behaviour indicator                         | Tested HIV positive <sup>b</sup> |                    |                |                  | Tested HIV negative <sup>b</sup> |                    |                |                     |
|--|----------------------------------|--------------------|----------------|------------------|----------------------------------|--------------------|----------------|---------------------|
|  | Counselled                       |                    | Not counselled |                  | Counselled                       |                    | Not counselled |                     |
|  | No.                              | AOR (95% CI)       | No.            | AOR (95% CI)     | No.                              | AOR (95% CI)       | No.            | AOR (95% CI)        |
| Visited bar/beerhall <sup>c</sup>                  | 54                               | 1.94 (0.90–4.16)*  | 109            | 1.06 (0.61–1.85) | 185                              | 1.45 (0.96–2.18)*  | 419            | 1.20 (0.89–1.61)    |
| New sexual partner in past year <sup>d</sup>       | 52                               | 1.33 (0.73–2.43)   | 104            | 1.01 (0.66–1.54) | 169                              | 1.34 (0.95–1.87)*  | 357            | 0.94 (0.73–1.19)    |
| Sexual partner in past month <sup>d</sup>          | 52                               | 0.84 (0.48–1.47)   | 104            | 0.76 (0.51–1.2)  | 169                              | 1.11 (0.81–1.52)   | 357            | 1.51 (1.20–1.90)*** |
| Multiple concurrent partners                       | 52                               | 0.85 (0.46–1.55)   | 104            | 0.81 (0.52–1.25) | 169                              | 1.50 (1.07–2.12)** | 357            | 1.11 (0.86–1.44)    |
| Total No. partners last year <sup>d</sup>          | 52                               | 0.53 (0.32–0.90)** | 104            | 0.97 (0.66–1.44) | 169                              | 1.22 (0.90–1.65)   | 357            | 1.31 (1.04–1.65)**  |
| Consistent condom use in last 2 weeks <sup>e</sup> |                                  |                    |                |                  |                                  |                    |                |                     |
| With regular partner (males)                       | 10                               | 0.39 (0.06–2.39)   | 36             | 1.32 (0.42–4.12) | 32                               | 0.77 (0.23–2.51)   | 81             | 0.84 (0.39–1.81)    |
| With regular partner (females) <sup>f</sup>        | 8                                | 0.11 (0.02–0.59)** | 13             | 0.21 (0.05–0.94) | 40                               | 1.89 (0.64–5.61)   | 27             | 0.98 (0.25–3.76)    |

AOR, odds ratio for change in behaviour adjusted for age and sex; CI, confidence interval.

<sup>a</sup>Respondents reported having received an HIV test 2–3 years prior to interview at follow up compared with those not having received a test.

<sup>b</sup>Results inferred from test conducted for research purposes.

<sup>c</sup>Includes all sexually experienced individuals.

<sup>d</sup>Includes all sexually experienced at time of baseline survey.

<sup>e</sup>Includes only those reporting a regular sexual partner; scored as –1, started consistent usage; 0, same usage as baseline; +1, stopped consistent usage.

<sup>f</sup>Of females who reported having at least one regular partner at baseline, 75% also reported at least one partner at follow-up; consequently, the observed risk reduction in regular partnerships is not an artefact of abstinence.

\* $P < 0.1$ ,

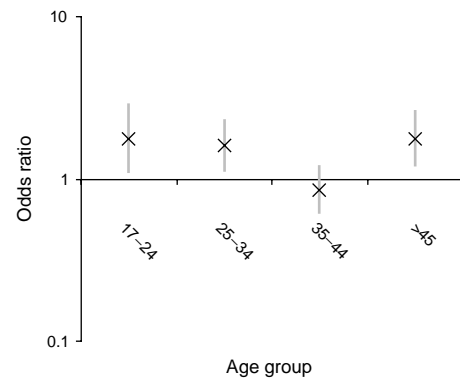
\*\* $P < 0.05$ ,

\*\*\* $P < 0.01$ .

**Table 3. HIV incidence in sexually experienced individuals by experience of voluntary counselling and testing at/around baseline interview.**

|            | Tested and received result                 |  |                  | Tested but not received result             |  |                  | Never tested                               |  |  |
|------------|--|--|------------------|--|--|------------------|--|--|--|
|            | Seroconversions person-years (individuals) | HIV incidence [per 1000 person-years (95% CI)] | IRR (95% CI)     | Seroconversions person-years (individuals) | HIV incidence [per 1000 person-years (95% CI)] | IRR (95% CI)     | Seroconversions person-years (individuals) | HIV incidence [per 1000 person-years (95% CI)] |  |
| Both sexes | 18/801 (276)                               | 22.5 (14.2–36.7)                               | 1.30 (0.79–2.14) | 22/954 (329)                               | 23.1 (15.2–35.0)                               | 1.20 (0.75–1.91) | 147/8401 (2874)                            | 17.5 (14.8–20.6)                               |  |
| Males      | 10/462 (159)                               | 21.6 (11.6–40.2)                               | 1.08 (0.62–1.82) | 17/764 (263)                               | 22.3 (13.8–35.8)                               | 1.06 (0.55–2.11) | 61/2950 (1014)                             | 20.7 (16.1–26.6)                               |  |
| Females    | 8/339 (117)                                | 23.6 (11.8–47.2)                               | 1.55 (0.63–3.84) | 5/191 (66)                                 | 1.7 (10.9–63.1)                                | 1.65 (0.80–3.43) | 86/5451 (1860)                             | 15.8 (12.8–19.5)                               |  |

IRR, incidence rate ratio adjusted for age and (for both sexes) for sex; CI, confidence interval.



**Fig. 1. Odd ratio of testing (and receiving test results) of those with any secondary/higher education compared to those with no/primary education.** Results for males and females are presented together as the pattern of the influence of education did not differ by gender. The age-stratified odds ratios are adjusted for gender. Adjustment for other predictors of testing (age at last birthday, site type, HIV knowledge index and HIV status) did not substantially change estimates of the effect of education.

fewer total life partners. Being HIV positive and having greater knowledge about HIV/AIDS were predictors of VCT in women but not in men.

Having any secondary/higher education was a predictor of testing in younger groups (< 35 years of age) and older adults ( $\geq 45$  years of age) but not in those aged 35–44. This pattern was observed in both males and females (Fig. 1).

### Voluntary counselling and testing and subsequent sexual behaviour

Men and women who received a positive result and post-test counselling had fewer sexual partners in the year prior to follow-up and women – whether they received counselling or not – reported higher levels of condom use in their regular partnerships (Table 2).

Individuals who received a negative result and counselling were more likely to become more risky in terms of beer hall attendance, new partners in the last year (borderline significance) and number of concurrent partnerships. Individuals who received a negative result but no counselling were more risky in terms of partners in the last month and last year.

### Voluntary counselling and testing and subsequent HIV incidence

HIV incidence in males (1436) and females (2037) who tested negative at/near to baseline did not differ significantly from those who had not (Table 3). This was true for crude, age-adjusted and sex-adjusted models.

## Discussion

One of the goals of VCT is to facilitate the adoption of safer behaviours [9,26], so it is of great concern that we found that testing HIV negative was associated with increased risk behaviour in terms of partner acquisition rates. A perhaps more encouraging observation was that the small group of women who tested positive may have increased condom use with regular partners. The local context of this finding may be important: where only a minority of people know their status (11% at follow-up), individual behaviour change may be especially difficult.

The causal mechanisms underlying behavioural responses to both positive and negative testing are unclear. Responses may relate to the way testing and counselling is conducted, may reflect factors related to those who go for testing, or may be associated with the psychological effects of receiving a negative test. Receiving a negative test, especially after a risk exposure, may be interpreted as permission for risk, reinforcement that risk does not have detrimental consequences or as enhancing a belief of being impervious to risk. Increased numbers of sexual partnerships is perhaps analogous to the literature from Western settings showing that those who attend for repeat HIV testing have elevated risk of HIV seroconversion and have increased risk behaviours [31,32]. This unintended effect of VCT needs to be considered when planning services – in particular, post-test education – as well as in the design of behaviour-change communication interventions. In terms of epidemic spread, increased risk behaviour amongst HIV-negative testers is particularly troubling. Since the majority of the population is not infected (80%), even small population-level increases in risk behaviour could have major implications. Despite increased sexual risk, higher HIV incidence among negative testers was not observed. However, this should not lead us to conclude that increased risk behaviours will have no detrimental effects. Changes in sexual behaviour may take time before resulting in increased incidence, especially to a level reaching statistical significance in an observational cohort [33].

Uptake of HIV testing was low and increased slowly over the period between the two rounds of the survey, from under 6% (testing) to 11% (testing and receiving result). Although 88% of people said they wanted to know their HIV status at follow-up, the majority had still not had a test, even when available, prompted, invited and – albeit, at limited times – provided on site. This discrepancy has also been noted in Zambia, where perceived risk (in the young) and poor health (in older groups) was associated with readiness to test [34]. We conclude, therefore, that the provision of VCT by mobile clinics based at the site where people have to give a sample specifically for personalized HIV testing was not a sufficient mechanism to effect wide uptake of services in a 3 year period. Our figures compare unfavourably with the high level of

uptake in home-based VCT programmes in Uganda [35] and mobile same-day VCT in other areas of Zimbabwe [36].

The data also highlight that VCT acceptors – particularly women – constitute a group self-selected on socio-demographics and low-risk sexual activity. Education, including knowledge about HIV, and place of residence appear to be the drivers of HIV testing rather than personal sexual risk behaviour. Women with HIV were more likely to test than HIV-negative women. However, in general, those who were at elevated risk through their sexual behaviour, sexual networks, relationship status or condom use were failing to access VCT. These data demonstrate that those most risk-averse are taking up VCT and it appears that, in this population, VCT has become part of risk-averse behaviour, which is consistent with findings for other populations [37,38].

There are a number of limitations that need to be taken into account in interpreting this study. Given that it is a self-selecting group accessing VCT, it is difficult to generalize the role of VCT were it extended widely. VCT, along with treatment of sexually transmitted infections, was offered as part of the research programme; this may have influenced who accessed testing, perhaps limiting the external validity of the findings.

The study was conducted at a time when antiretroviral therapy services were not available in Zimbabwe. This may be another cause of low motivation for testing and establishing HIV status. The advent and expansion of antiretroviral therapy may dramatically affect such motivation and cause a shift in normative attitudes since personal gain and treatment access are likely to have a dramatic effect on uptake of VCT [39].

The strengths of this study include its comprehensive coverage, the favourable response rate, the collection of follow-up data – which allowed for observation of changes in behaviour occurring over time – and the ability to record behaviour change in individuals for a period after they had received an HIV test result. By using prospective data collected in a baseline survey, we were able to avoid the bias that can be present in retrospective reports of behaviour resulting from knowledge of HIV test outcome. The prospective data also allowed us to obtain a valid measurement of the increase in uptake of VCT in the study population between 1998 and 2003 and to provide insights into the nature of the changes occurring prior to widespread availability of antiretroviral therapy.

This study showed the role that psychological factors play in the decision to test, both as deterrents to testing and in subsequent behavioural responses. This is often underestimated and poorly provisioned. The data point to the need for good provision for stimulating psychological



factors – such as motivation, control, intention, self-efficacy, comprehension, attitude and decision making – as VCT is expanded and uptake increases.

This study provides suggestive – not conclusive – evidence of a causal relationship between receiving a negative test result from VCT and increased HIV risk. As antiretroviral therapy becomes available and VCT increases, some caution will be needed because of the possible unanticipated effect of VCT whereby negative test results may increase risk behaviour. In certain conditions where uptake is low, provision of VCT may not always be positive or produce the expected results. The provision of VCT needs serious attention, and the quality of the provision may determine its ultimate efficacy in both identifying those with HIV and in effective HIV prevention generally and positive prevention specifically.

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