**Can a conditional financial incentive (CFI) reduce socio-demographic inequalities in home-based HIV testing uptake? A secondary analysis of the HITS clinical trial intervention in rural South Africa.**

# Background

Changing individual health behaviours is notoriously difficult but conditional financial incentives (CFI) show considerable promise (1,2). CFI operate by offering an immediate reward when the future benefit of adopting a health behaviour is perceived as uncertain (1). They are particularly effective in promoting one-off behaviours such as adult vaccination and screening (3), although their use can be interpreted as coercion or even deemed as inappropriate and wasteful (4). With regard to HIV-related behaviours, CFI have been shown to be effective for several behaviours including testing, adherence to antiretroviral treatment (ART) and continuity in care (5). They lead to higher HIV-testing uptake among men and women (6–10) and linkage to ART for those HIV-positive (9,11) although their effect on longer term viral suppression remains unproven (11–13).

CFI focuses on psychological leverage of an immediate reward when the future benefit of adopting a health behaviour is perceived as uncertain (1). Individuals are not perfect rational choice makers and can be present-biased (i.e. favouring immediate rewards) and value more immediate or short-term consequences rather than those in the distant future with greater benefits (14). Although the effect of CFI on one-off health behaviours is clear, whether they operate differently in different socio-economic groups and thus their potential to reduce health inequalities is suggested but not demonstrated (15,16). On the other hand, while present biasedness remains the main mechanism leveraged by CFI, evidence show that the level of present biasedness can vary between age, gender, socio-economic situation or marital status (17). Thus, offering a CFI for the adoption of a health behaviour may lead to different level of adoption by sociodemographic subgroups. Understanding the differential effect of CFI on health behaviour adoption is important to ensure that it does not create or increase existing inequalities for that behaviour.

Most studies on CFI demonstrate the overall effect of CFI rather than its effect on sub-groups (16) and participant-level data, required to conduct a robust analysis of effect on sub-groups, are not commonly published (18). In the US and UK, the few studies that were conducted found no difference in CFI effect by gender, age, race, income or education (15,19). Another US study, conducted in a healthcare management company, showed a higher effect of a lottery-based CFI among people with a lower income (20). In low and middle-income countries, we found a single survey documenting the link between socio-demographic characteristics and CFI effect for a health intervention, which was attaining a HIV result centre after accepting a free door-to-door HIV test in rural Malawi (8). This study showed various effects of the CFI on gender depending on the study district considered; the author suggested that a woman may be less likely to obtain their test results as she might need to ask her husband permission first in some of the studied sites.

In relation to HIV-testing, there are clear inequalities in access and uptake (21). In South Africa, the country hardest hit by the HIV-epidemic (22), HIV testing access remain lower among men, young, single, unemployed or less educated people (23,24). Interventions such as home-based HIV testing are designed to increase HIV testing uptake among these sub-groups (25). While home-based HIV testing is shown to increase uptake among unemployed or younger individual, uptake remains overall low with lower level of uptake among men (25). To address the later, a recent clinical trial (the Home-Based Intervention to Test and Start (HITS) clinical trial­) have been conducted to investigate the use of CFI to increase home-based HIV testing uptake among men in rural South Africa (26). The preliminary results of that trial have shown that a CFI increased testing uptake by 55% among men (10). Yet, whether the CFI was able to reduce home-based HIV testing uptake gaps based on gender or other socio-demographic characteristics have not been explored. Such analysis is important to ensure that combining a CFI to home-based HIV testing contribute to higher testing uptake among those with less access to HIV testing. Using the HITS clinical trial dataset, we aim to investigate whether a CFI was able to reduce home-based testing uptake inequalities observed by socio-demographic groups by (i) measuring the effect CFI on existing socio-demographic differentials and (ii) assessing whether the effect of CFI was different depending on socio-demographic characteristics of individuals.

# Methods

## Setting

The study was conducted in the Africa Health Research Institute (AHRI) demographic surveillance system which provides an annual population-based HIV survey and census of people residing in the uMkhanyakude district in KwaZulu-Natal, South Africa (27). The area is primarily rural, though also has a number of smaller communities with denser housing, and one large town, which young people often migrate to. Overall, across the area there are high levels of unemployment with only 18% of those aged 18-35 years who are out of school in full-time employment, and two-thirds of households receive social grants. There are also high-levels of circular-migration to larger urban centres and vice versa.

## Data

We conducted a secondary analysis using data from the HITS clinical trial (Clinical Trial Number: NCT03757104) which was a 2x2 factorial design cluster-randomized clinical trial embedded in the AHRI’s ongoing population-based HIV surveillance. One of the aims of the trial was to measure the impact of two interventions (a CFI and a male-targeted HIV-specific decision support application, called EPIC-HIV —Empowering People through Informed Choices for HIV) on home-based HIV testing uptake and linkage to HIV care among the general population. 45 clusters were randomized into 4 arms: (i) CFI (8 clusters), (ii) EPIC-HIV (8 clusters), (iii) CFI and EPIC-HIV (8 clusters), (iv) control (21 clusters). A full description of the trial design has been published elsewhere (26).

## Eligibility criteria

All residents aged ≥15 years who have participated to the AHRI’s population-based HIV surveillance survey, conducted from 1st January 2018 to 31st December 2018, were eligible to participate in the HITS trial. The intervention activities and data collection related to the HITS clinical trial were integrated to the 2018 annual AHRI’s population-based HIV surveillance visit. People who self-reported both being HIV-positive and being already on ART were not eligible for the trial; those who self-reported being HIV-positive but not currently on ART (never been or who have interrupted their treatment) were eligible for the trial. Those individuals who tested HIV-positive by the rapid-test were eligible to receive a second intervention to increase linkage to ART which was not considered in this analysis but has been described elsewhere (26).

## Control arm

All eligible individuals were invited to participate in the survey. Participants were offered a free home-based rapid HIV-test with an immediate result performed by a field worker.

## Intervention arms

In the first arm, all eligible individuals accepting to undergo the free home-based HIV testing were given a food voucher of a value of 50 Rands (~3.5 US dollars). The value of the food voucher is equivalent to three time the individual daily 2019 Food poverty line (i.e., the amount of money that an individual will need to afford the minimum required daily energy intake) (28). A previous study conducted in rural Malawi, in a similar context to our study, showed that the effect of the total amount of an incentive does not change over a 1.5–3.0 US dollars value (8).

In the second arm, men were offered the EPIC-HIV application, which included tailored information to raise awareness of the benefits of knowing their HIV-status and linkage to care if diagnosed with HIV. The third arm combined the interventions of the first two arms. Individuals were informed about both interventions prior to their participation.

## Data collected

Socio-demographic (e.g., sex, age, education, employment status, household assets index) and geographical (e.g., distance from nearest clinic, urban/rural living area) data were collected for each individual. The selection of these variables were based on existing work showing HIV-testing inequalities linked to individuals’ socio-demographic and geographic characteristics (23–25). Where available, missing data on socio-demographic characteristics were completed from the previous data surveillance round that occurred less than one year before the trial.

The household assets index was obtained using a component analysis of data on house ownership, energy, water source, electricity, toilet type and 27 other household assets based on Filmer and Pritchett works (29). This variable categorized households as poorest 40%, middle 40% or the wealthiest 20%. We choose these three categories because they have been found to capture wealth effect well in several economical and health surveys within poor provinces in South Africa (30–32).

Home-based HIV testing uptake was defined as the acceptance of the testing offer and its performance by a field worker.

## Statistical analysis

Since the focus of this analysis was on the effect of the CFI intervention, and because EPIC-HIV had no effect on HIV testing uptake (10), the EPIC-HIV and CFI arm was grouped with the CFI arm only and the EPIC-HIV alone was grouped with the control arm (i.e. non-CFI arms). The analysis was conducted among all individuals contacted even if they did not participate in the HIV surveillance. Analyses were stratified by sex as HIV testing uptake and related barriers can greatly vary according to gender (33).

To measuring the effect of using a CFI on existing socio-demographic differentials in home-based HIV testing uptake, we computed the absolute differences in uptake of home-based HIV testing between CFI and non-CFI arms were measured for each socio-demographic characteristic.

To assessing whether the effect of CFI was different depending on socio-demographic characteristics of individuals, we computed the relative risk factors associated with home-based HIV testing uptake among individual depending on intervention arm. Relative risk factors were investigated by running a modified Poisson regression model with a logarithm link function adjusted for community-level clustering and binary outcomes through clustered sandwich estimators (34,35). The interaction terms between home-based HIV testing uptake and each socio-demographic variable were computed to measure any change in the effect of the CFI between two socio-demographic groups. Multivariate models included all variables but only interaction terms significant to the p≤0.2 threshold in the univariate analysis. Statistical tests were performed using likelihood-ratio tests.

All analyses were conducted in R 3.6.3. with the packages *sandwich* for the models' estimators and related confidence intervals and the package *survey* for the cluster-adjusted confidence intervals of descriptive results (36,37).

## Ethical approval and consent to participate

Participant were informed about the clinical trial prior their participation in the AHRI’s population-based HIV surveillance survey and reminded their right to declining the home-based HIV testing. Rapid tests were realised at the home of participant or any close area where confidentiality could be maintained. Participants were not asked to disclose the results of their test to anyone. The trial has been conducted with the AHRI’s ongoing population-based HIV surveillance platform which received approval by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (BE290/16). Additional ethical approval specific to the HITS intervention was received on 28 June 2017 (BFC398/16). The trial is being conducted with permission from the KwaZulu-Natal Department of Health, South Africa. Written informed consent is sought from individuals aged 18+ and parental/guardian consent with individuals 15–17 years old.

# Results

Overall, the 45 clusters included 37,028 individuals (Figure 1.A). Among them 3,252 (1591 men and 1661 women) were excluded because they died or out-migrated during the study period. Thus, 13,893 men and 19,883 women were eligible to participate in the AHRI HIV surveillance survey round. Among them, 8,188 individuals (24.2%) were not contacted because they were not at home during the survey round visit and were thus excluded from our analysis. Compared to those contacted, non-contacted individuals were more likely to be men, younger (among men), older (among women), to report no education or primary education and not currently working (Table S1, supplementary material).

Among the 25,588 contacted individuals, 61.3% have participated in the AHRI HIV surveillance and were offered participation in the survey (Figure 1.B). Participation in the AHRI data surveillance was higher in the CFI arms compared to non-CFI arms (67.8% vs 58.1%, p<0.001).

Among the 25,588 contacted individuals, 795 individuals were removed due to missing data (testing uptake or demographic characteristics). Therefore, 24,793 individuals have been included in our analysis on testing uptake (9,290 men and 15,503 women).

42.4% of our sample were over 40-years old. Women were older than men (average age: 42 vs 35 years old, p<0.001) and they were also less likely to be single than men (28.8% vs 42.3%, p<0.001) (table 1). Most of our sample lived in a rural area (59.3%) and a quarter (23.5%) lived more than 4 kilometres from the nearest clinic.

## Effect of CFI on existing socio-demographic differentials in home-based HIV testing uptake

CFI significantly increased home-based HIV testing uptake among both men (39.2% vs 25.2%, p<0.001) and women (45.9% vs 32.0%, p<0.001). Home-based HIV testing uptake was higher among women compared to men in the non-CFI arms (32.0% vs. 25.2%, p<0.001); however, the absolute percentage increase for uptake in the CFI arm was similar (13.9%, 95% Confidence Interval: [11.2–16.6] vs. 14.0% [11.6–16.4] among women and men, respectively) resulting in an absolute differential increase between women and men close to 0 (0.08% [-3.6–3.7]). That is, the CFI did not significantly increase the existing gender difference in home-based HIV testing uptake observed in the non-CFI arm.

The difference in home-based HIV testing uptake between young and older and the difference in home-based HIV testing uptake between more and less educated men and women increased in the CFI arm compared to the non-CFI arm among both men and women. In the non-CFI arm, home-based HIV testing uptake was higher among under 20s in both men and women compared to those 40 years old and over (Figure 2), whereas the CFI arm increased the difference by 7.4 points (95%CI [1.5–13.3]) among men and10.1 points [4.5–15.6] among women (table 2 and 3). Uptake in the non-CFI arm was higher among men and women with no education or just primary education compared to those with higher education (among men, 33.1% vs 12.3%, p<0.001, and among women, 41.9% vs 14.6%, p<0.001) and this difference increased by 11.8 points [6.4–17.3] among men and 7.2 points [3.0–11.4] among women.

Among men, marital and employment status difference in home-based HIV testing uptake increased in the CFI arm compared to the non-CFI one. Increase in the CFI arm was higher among single compared to those married or in a union (18.4%, 95%CI [14.7–22.1] vs 5.5% [-2.0–13.0] respectively, table S1). Testing uptake in the non-CFI arm was higher among men not currently working (29.8% vs 14.6%, p<0.001) and this difference increased by 15.7 points [12.8–18.6] in the CFI arm. Testing differentials between men currently working and those who did not was also higher in the CFI arm (6.9 points [3.3–10.5]).

Increase in CFI arm was similar for household assets index, area type and distance from the nearest clinic among both men and women.

## Effect of CFI on socio-demographic characteristics of home-based HIV testing acceptors

Figure 3 presents the relative risk factors with HIV testing uptake in each arm (CFI and non-CFI) by sex and the individual interaction p-value for each interaction term. Risk ratios indicate groups of individuals more likely to accept the home-based HIV testing, while the interaction term indicate is there is a significant relative change between the CFI group compared to the non-CFI. The latter is of interest for us as it shows whether the characteristics of individuals accepting the home-based HIV testing are similar or not without or without CFI.

Among men, no individual and global interaction terms were significant to the 0.05 threshold which indicates that the CFI arm does not modify the association between testing uptake and socio-demographic characteristics (for the individual p-value see Figure 3 and for the global p-value, see Table 4). Therefore, the socio-demographic profile of home-based HIV testing acceptor were similar between men in the CFI and those in the non-CFI one. The CFI had a higher effect on testing uptake among men living in peri-urban areas but not significantly (vs those living in rural areas Risk Ratio (RR) 1.24, 95%CI [0.98-1.56], p=0.070).

Among women, the CFI arm had a higher effect on testing uptake among those 30-39 years old (vs under 20, RR 1.15, 95%CI [0.94-1.41], p=0.166), those with a secondary education (vs no or primary education, RR 1.12 [1.03-1.23], p=0.012) and among women who were employed (RR 1.24 [1.05-1.47], p=0.012) [Figure 3, table 4]. In the multivariate model, interaction between CFI arm with age and employment status were still globally significantly associated but the level of education was not (Table 4).

When considering both men and women on the same model, the CFI arm had a lower effect on testing uptake among women close to the 0.05 threshold (vs men, RR 0.92 [0.84–1.01], p=0.095) (Table S3).

# Discussion

For this study, we considered both the absolute and relative effect of CFI on existing socio-demographic inequalities for home-based HIV testing uptake in a rural context in South Africa. Our results show that a CFI does increase home-based HIV testing overall uptake, but individuals accepting the testing offer share the same socio-demographic characteristics regardless of the CFI introduction. In other words, a CFI accentuates existing differences in that health behaviour adoption between socio-demographic groups rather than correcting them.

In our study, the sub-populations more likely to respond to the CFI were also those more likely to accept the home-based HIV testing without CFI. HIV testing uptake was higher among younger or less educated, in both men and women, and among single or unemployed men. In addition, these groups have a higher absolute home-based HIV testing uptake increase compared to other groups (i.e. older, more educated individuals, married or employed men). Although older, higher educated individuals, married or employed men were less likely to accept the testing offered in our study, previous research suggests that these groups have better access to HIV testing in South Africa (23,24). These groups may already have access to HIV testing by other means (e.g. voluntary HIV testing centre, testing offered at work) or may already have tested HIV positive and thus have no need to re-test, which could explain the home-based HIV testing refusal even when the testing is promoted with a CFI. Then, if the CFI did not reduce existing inequalities for home-based HIV testing uptake within our population study, the fact that the CFI enable the intervention to reach a higher proportion of the sub-populations known as having low access to other HIV testing services could, in fact, result in fewer inequalities in access to HIV testing.

The second important result of our study is to show the accentuating effect of CFI on existing socio-demographic differences for a health behaviour. This result could be explained by the fact that CFI prompts action by reducing psychological bias (i.e., present biasedness) but does not remove other existing barriers (e.g., perceived benefits) which can explain that some subgroups of a population are less likely to adopt a health behaviour event in the presence of a CFI. Thus, future health intervention should carefully assess the existing barriers and socio-demographic characteristics of the intervention recipients first before introducing a CFI to avoid the increase of existing health inequalities. An alternative approach to avoid an increase in health inequalities would be to offer CFI to targeted sub populations with poorer health outcomes (16,38).

Through this study we addressed a gap in the literature on the effect of CFI on health inequalities which remains poorly documented especially in the African context (16). Overall, the socio-demographic profile of people accepting the home-based HIV testing was similar between those offered CFI and those not offered CFI which is consistent with available studies in the US and UK that show few or no links between socio-demographic characteristics and effect of CFI on different health behaviours (15,19). However, differential effects were found among two sub-groups. First, older women were less likely to respond to the CFI for testing uptake; this could be explained by the fact that women and older people are shown to be less present-biased for health behaviour adoption (17). Second, we found a higher effect of the CFI among employed women; employed women may be more likely to accept the CFI as it could compensate income loss due to the time devoted to completing the survey. While the lack of differential CFI effects between subgroups suggests that the CFI mechanism operates in these groups through a behavioural effect (i.e. prompted by the immediate benefit of the reward), the higher CFI effect in young or employed women could be explained more by the income effect mechanism of CFI (i.e. the financial value that CFI represents). If the diminishing marginal utility of income (i.e., more income impact less) is well known in the economic literature on CFI (8,39), the differential CFI effect between specific groups is less documented and might reflect on the differential perception of the value of money induced by the high economic inequalities of some contexts (40,41). However, from our results, it is difficult to know if decreasing or increasing the size of the financial incentive would have had any impact on the differential CFI effect observed in specific groups in our sample.

Our results have shown no associations between household asset index and CFI, although our study took place in a relatively poor society overall (two third of the households benefiting from social grants) which may have overestimate the CFI effect on individuals living in household with a high asset index. Yet, study conducted in US suggest that small CFI has a significant effect regardless of individual wealth (15). Unlike price signals (e.g. taxes on alcohol, cigarettes or high-calories foods) which is shown to have a higher effect on lower socio-economic populations (42,43), CFI may be an interesting tool when the health inequalities are not based on economic status.

That said, there were a number of limitations in our study. Firstly, we excluded individuals who were not contacted through the AHRI based surveillance, who represent less than a quarter of the total sample. Using data from previous HIV surveillance rounds, people not contacted in this trial tend to be older (men), young (women), higher educated or those currently employed. Because of the study design of the HIV surveillance system, non-resident such as migrants or people with mobile livelihoods were also excluded from our analysis.

The initial design considered four arms among men with two including a male-targeted HIV-specific decision support application (EPIC-HIV). For statistical power considerations, we chose to group the arm with both the EPIC-HIV and the CFI with the financial incentive arm and the arm with EPIC-HIV only with the control arm, but considering the little effect of EPIC-HIV on home-based HIV testing (10), we believe this grouping had little effect on our results.

Despite these limitations, our large sample and the randomized control trial design of the study allow strong internal validity of our results. Randomization in our study achieved balance in respect of sociodemographic variables across the different arms of the trial (10).

People still express some objections toward CFI utilisation for health behaviour change. A common one is that the financial incentive could be seen as coercion if people who were reluctant to adopt a behaviour were persuaded by the CFI, which may represent something of high value (44). First, by showing the non-association between economic condition and effect of CFI, our study suggests that the poorest people may not be more likely to feel coerced to adopt the behaviour because of the financial reward compared to the richest. Second, as argued by Burns, lauding the transparency of financial incentive programmes, by insisting on the voluntary basis to adhere to such programmes and to remind that the individual is free to accept or refuse the incentive for any reason, supports a mode of respectful and equal exchange rather than a way to manipulate people to do what the CFI wishes them to do (16,45). The voluntary nature is commonly questioned when an economic reward is offered to the most deprived, but since the value of the CFI remains modest, and considering previous arguments, we believe that CFI is not likely to undermine an individual’s view on what choice is in their best interest.

Further research on CFI and testing uptake are required especially related to the economical sustainability and the long-term effect on uptake behaviours of such intervention. While CFI has been showed to be cost effective for other health behaviours (46,47), each health behaviour has their specific effects on health. The cost-effectiveness of CFI use to encourage testing uptake should be assessed with regards to local epidemiologic contexts. In addition, while studies tend to show that one-off CFI is not effective for long-term behaviours adoption (12,13), the impact of a one-off CFI on future non-incentivise testing offer acceptation remain undocumented. This last question is quite important as regular repeat HIV testing is recommended in high HIV incidence settings (48).

# Conclusion

Associating a CFI with an invitation for home-based HIV-testing intervention increases the overall HIV-testing uptake. However, this association leads to an increase in the existing socio-demographic differences in testing uptake. Future intervention involving CFI should consider its effect based on socio-demographic disparities of recipients to prevent any increase in existing inequalities in health behaviours.

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**Figure 1: Flow chart of eligible individuals included in the trial (A) and description of eligible people depending on whether they have been contacted, participated and consented to be HIV rapid tested depending on test result (B).**

EPIC-HIV: male-targeted HIV-specific decision support application

\* Including 9 individuals with missing data on testing consent

\*\* Including 42 individual who consent to be tested but with invalid/discordant result or missing data.

**Figure 2. Percentages of home-based rapid-HIV testing uptake among men and women who have been contacted for trial participation by socio-demographic characteristics and arms.**

Note: the grey area between the dots highlights the differentials between arms.

**Figure 3: Univariate analysis of risk factors associated with home-based HIV testing uptake among contacted individual depending on intervention arm.**

Note: p-value indicated are the likelihood-ratio test for the interaction.

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**Table 1. Sample description**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Contacted** | | | | |
|  |  | Men (n=9,049) | |  | Women (n=15,280) | |
|  |  | N | **%** |  | N | **%** |
| **Age (years)** | |  |  |  |  |  |
|  | Under 20 | 2141 | **23.0** |  | 1997 | **12.9** |
|  | 20-29 | 2401 | **25.8** |  | 3184 | **20.5** |
|  | 30-39 | 1735 | **18.7** |  | 2811 | **18.1** |
|  | 40 and over | 3013 | **32.4** |  | 7511 | **48.4** |
| **Education** | |  |  |  |  |  |
|  | Never went to school/Primary | 3826 | **41.2** |  | 6602 | **42.6** |
|  | Secondary | 4828 | **52.0** |  | 7630 | **49.2** |
|  | Tertiary | 636 | **6.8** |  | 1271 | **8.2** |
| **Marital situation** | |  |  |  |  |  |
|  | Single | 3933 | **42.3** |  | 4459 | **28.8** |
|  | Married/Informal union | 5146 | **55.4** |  | 8473 | **54.7** |
|  | Widowed/Separated/Divorced | 211 | **2.3** |  | 2571 | **16.6** |
| **Household assets index** | |  |  |  |  |  |
|  | 40% poorest | 3628 | **39.1** |  | 6125 | **39.5** |
|  | 40% wealth middle | 3771 | **40.6** |  | 6395 | **41.3** |
|  | 20% richest | 1891 | **20.4** |  | 2983 | **19.2** |
| **Professional situation** | |  |  |  |  |  |
|  | Currently employed | 2788 | **30.0** |  | 3180 | **20.5** |
|  | Not Employed | 6502 | **70.0** |  | 12323 | **79.5** |
| **Area of residency** | |  |  |  |  |  |
|  | Rural | 5417 | **58.3** |  | 9288 | **59.9** |
|  | Peri-urban | 3206 | **34.5** |  | 5063 | **32.7** |
|  | Urban | 667 | **7.2** |  | 1152 | **7.4** |
| **Distance from nearest clinic** | |  |  |  |  |  |
|  | 4km or below | 7122 | **76.7** |  | 11853 | **76.5** |
|  | >4km | 2168 | **23.3** |  | 3650 | **23.5** |

**Table 2. Testing uptake, difference within group and differential increase between CFI arms and non-CFI arms, among men (n=9,290)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Testing uptake (%) | | | |  | Uptake difference within group (%) | | Differential increase (%)  (C)-(D) | Differential increase 95%CI |
|  |  | CFI arm  (A) | | | Non-CFI arm  (B) |  | CFI arm  (C)= *ref*(A)-(A) | Non-CFI arm  (D)= *ref*(B)-(B) |
| **Age** | |  | | |  |  |  |  |  |  |
|  | under 20 | 55.6 | | | 36.7 |  | *ref* | *ref* | *ref* |  |
|  | 20-29 | 41.3 | | | 25.3 |  | 14.3 | 11.3 | 3.0 | [-2.6– 8.5] |
|  | 30–39 | 25.3 | | | 16.1 |  | 30.3 | 20.6 | 9.7 | **[4.1–15.3]** |
|  | 40 and over | 33.7 | | | 22.2 |  | 21.9 | 14.5 | 7.4 | **[1.5–13.3]** |
| **Education** | |  | | |  |  |  |  |  |  |
|  | No education/ Primary | | 49.5 | | 33.1 |  | *ref* | *ref* | *ref* |  |
|  | Secondary | 33.1 | | | 20.8 |  | 16.4 | 12.3 | 4.1 | **[0.1– 8.1]** |
|  | Tertiary | 16.9 | | | 12.3 |  | 32.7 | 20.8 | 11.8 | **[6.4–17.3]** |
| **Marital Status** | |  | | |  |  |  |  |  |  |
|  | Single | 49.9 | | | 31.5 |  | *ref* | *ref* | *ref* |  |
|  | Married/ Informal union | | | 31.1 | 20.0 |  | 18.8 | 11.5 | 7.4 | **[3.1–11.6]** |
|  | Widowed/ Separated/ Divorced | | 37.5 | | 32.0 |  | 12.4 | -0.5 | 12.9 | **[4.5–21.2]** |
| **Household assets index** | | | | |  |  |  |  |  |  |
|  | 40% poorest | 38.3 | | | 24.2 |  | *ref* | *ref* | *ref* |  |
|  | 40% wealth middle | 40.8 | | | 25.0 |  | -2.5 | -0.8 | -1.7 | [-5.8– 2.4] |
|  | 20% richest | 37.8 | | | 27.2 |  | 0.5 | -3.0 | 3.5 | [-0.6– 7.6] |
| **Currently employed** | |  | | |  |  |  |  |  |  |
|  | Not employed | 45.6 | | | 29.8 |  | *ref* | *ref* | *ref* |  |
|  | Currently employed | | 23.4 | | 14.6 |  | 22.1 | 15.2 | 6.9 | **[3.3–10.5]** |
| **Area type** | |  | | |  |  |  |  |  |  |
|  | Rural | 41.4 | | | 28.7 |  | *ref* | *ref* | *ref* |  |
|  | Peri-Urban | 36.9 | | | 20.7 |  | 4.5 | 8.0 | -3.5 | [-7.6– 0.6] |
|  | Urban | 29.3 | | | 17.8 |  | 12.1 | 10.9 | 1.3 | [-3.6– 6.2] |
| **Distance to the nearest Clinic** | | | | |  |  |  |  |  |  |
|  | 4 km or below | 38.1 | | | 23.3 |  | *ref* | *ref* | *ref* |  |
|  | >4km | 43.2 | | | 30.9 |  | -5.1 | -7.6 | 2.4 | [-2.9– 7.7] |

**Table 3. Testing uptake, difference within group and differential increase between CFI arms and non-CFI arms, among women (n=15,280)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Testing uptake (%) | | | |  | Uptake difference within group (%) | | Differential increase (%)  (C)-(D) | Differential increase 95%CI |
|  |  | CFI arm  (A) | | | Non-CFI arm  (B) |  | CFI arm  (C)= *ref*(A)-(A) | Non-CFI arm  (D)= *ref*(B)-(B) |
| **Age** | |  | | |  |  |  |  |  |  |
|  | under 20 | 66.6 | | | 45.4 |  | *ref* | *ref* | *ref* |  |
|  | 20-29 | 49.5 | | | 32.9 |  | 17.2 | 12.6 | 4.6 | [-0.9–10.0] |
|  | 30–39 | 29.8 | | | 17.6 |  | 36.8 | 27.8 | 9.0 | **[3.8–14.2]** |
|  | 40 and over | 44.6 | | | 33.5 |  | 22.0 | 11.9 | 10.1 | **[4.5–15.6]** |
| **Education** | |  | | |  |  |  |  |  |  |
|  | No education/ Primary | | 56.5 | | 41.9 |  | *ref* | *ref* | *ref* |  |
|  | Secondary | 40.1 | | | 26.5 |  | 16.4 | 15.4 | 1.0 | [-2.8– 4.8] |
|  | Tertiary | 22.0 | | | 14.6 |  | 34.4 | 27.3 | 7.2 | **[3.0–11.4]** |
| **Marital Status** | |  | | |  |  |  |  |  |  |
|  | Single | 50.0 | | | 35.7 |  | 0.0 | *ref* | *ref* |  |
|  | Married/ Informal union | | | 41.6 | 28.2 |  | 8.4 | 7.4 | 1.0 | [-3.2– 5.2] |
|  | Widowed/ Separated/ Divorced | | 53.3 | | 37.8 |  | -3.3 | -2.1 | -1.1 | [-6.2– 4.0] |
| **Household assets index** | | | | |  |  |  |  |  |  |
|  | 40% poorest | 43.6 | | | 31.2 |  | *ref* | *ref* | *ref* |  |
|  | 40% wealth middle | 46.4 | | | 30.7 |  | -2.8 | 0.5 | -3.3 | [-7.6– 1.0] |
|  | 20% richest | 49.5 | | | 36.1 |  | -5.9 | -4.9 | -1.0 | [-5.3– 3.2] |
| **Currently employed** | |  | | |  |  |  |  |  |  |
|  | Not employed | 49.5 | | | 35.5 |  | *ref* | *ref* | *ref* |  |
|  | Currently employed | 31.7 | | | 18.3 |  | 17.8 | 17.2 | 0.6 | [-3.3– 4.5] |
| **Area type** | |  | | |  |  |  |  |  |  |
|  | Rural | 49.9 | | | 35.8 |  | *ref* | *ref* | *ref* |  |
|  | Peri-Urban | 41.4 | | | 28.4 |  | 8.5 | 7.5 | 1.0 | [-3.0– 5.1] |
|  | Urban | 29.1 | | | 18.1 |  | 20.9 | 17.7 | 3.2 | [-0.6– 6.9] |
| **Distance to the nearest Clinic** | | | | |  |  |  |  |  |  |
|  | 4 km or below | 44.1 | | | 29.5 |  | *ref* | *ref* | *ref* |  |
|  | >4km | 52.6 | | | 39.5 |  | -8.6 | -9.9 | 1.4 | [-2.8– 5.5] |

**Table 4. Univariate and multivariate analysis of risk factors associated with home-based HIV testing uptake among men and women.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Men (n=9,290) | | | | | |  | Women (n=15,280) | | | | | |
|  |  | **Univariate** | | | **Multivariate** | | |  | **Univariate** | | | **Multivariate** | | |
|  |  | RR | **CI95%** | p-value | RRa | **CI95%** | p-value |  | RR | **CI95%** | **pvalue** | RRa | **CI95%** | **p-value** |
| **Arm** | |  |  | **<0.001** |  |  | **<0.001** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Control | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | Financial incentive | 1.56 | [1.45-1.68] |  | 1.47 | [1.20-1.81] |  |  | 1.43 | [1.36-1.51] |  | 1.46 | [1.25-1.69] |  |
| **Age** | |  |  | **<0.001** |  |  | **<0.001** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Under 20 | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | 20-29 | 0.71 | [0.65-0.77] |  | 0.89 | [0.82-0.97] |  |  | 0.72 | [0.68-0.78] |  | 0.80 | [0.73-0.87] |  |
|  | 30-39 | 0.44 | [0.39-0.50] |  | 0.71 | [0.61-0.83] |  |  | 0.41 | [0.37-0.45] |  | 0.49 | [0.42-0.56] |  |
|  | 40 and over | 0.60 | [0.54-0.68] |  | 0.81 | [0.72-0.91] |  |  | 0.70 | [0.65-0.77] |  | 0.75 | [0.68-0.83] |  |
| **Education** | |  |  | **<0.001** |  |  | **<0.001** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Never went to school/Primary | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | Secondary | 0.64 | [0.60-0.69] |  | 0.82 | [0.76-0.88] |  |  | 0.67 | [0.63-0.7] |  | 0.78 | [0.73-0.82] |  |
|  | Tertiary | 0.35 | [0.27-0.45] |  | 0.56 | [0.45-0.70] |  |  | 0.35 | [0.3-0.42] |  | 0.54 | [0.46-0.63] |  |
| **Marital situation** | |  |  | **<0.001** |  |  | **0.023** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Single | 1.59 | [1.46-1.72] |  | 1.11 | [1.01-1.22] |  |  | 1.24 | [1.17-1.31] |  | 0.91 | [0.87-0.96] |  |
|  | Married/Informal union | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | Widowed/Separated/Divorced | 1.42 | [1.18-1.71] |  | 1.21 | [0.99-1.47] |  |  | 1.31 | [1.23-1.39] |  | 1.08 | [1.01-1.16] |  |
| **Household assets index** | |  |  | 0.474 |  |  | 0.288 |  |  |  | **0.001** |  |  | **0.009** |
|  | 40% poorest | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | 40% wealth middle | 1.07 | [0.96-1.19] |  | 1.06 | [0.96-1.17] |  |  | 1.15 | [1.06-1.24] |  | 1.04 | [0.99-1.09] |  |
|  | 20% richest | 1.04 | [0.95-1.14] |  | 1.07 | [0.92-1.24] |  |  | 1.02 | [0.94-1.10] |  | 1.11 | [1.04-1.19] |  |
| **Professional situation** | |  |  | **<0.001** |  |  | **<0.001** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Currently employed | 0.50 | [0.44-0.55] |  | 0.66 | [0.59-0.74] |  |  | 0.56 | [0.51-0.62] |  | 0.69 | [0.60-0.79] |  |
|  | Not Employed | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
| **Area of residency** | |  |  | **0.006** |  |  | **0.001** |  |  |  | **<0.001** |  |  | **<0.001** |
|  | Rural | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | Peri-urban | 0.81 | [0.68-0.97] |  | 0.82 | [0.70-0.95] |  |  | 0.82 | [0.73-0.93] |  | 0.92 | [0.84-1.00] |  |
|  | Urban | 0.61 | [0.42-0.87] |  | 0.77 | [0.53-1.14] |  |  | 0.50 | [0.38-0.65] |  | 0.68 | [0.60-0.78] |  |
| **Distance from nearest clinic** | |  |  | **0.021** |  |  | 0.339 |  |  |  | **<0.001** |  |  | **0.018** |
|  | 4km or below | *ref.* | *ref.* |  | *ref.* | *ref.* |  |  | *ref.* | *ref.* |  | *ref.* | *ref.* |  |
|  | >4km | 1.23 | [1.03-1.46] |  | 1.07 | [0.93-1.24] |  |  | 1.26 | [1.13-1.41] |  | 1.11 | [1.02-1.21] |  |
| ***Interaction with arm*** | |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Age 20-29 | 1.08 | [0.93-1.25] | 0.738 |  |  |  |  | 1.03 | [0.89-1.18] | **0.010** | 0.98 | [0.85-1.12] | **0.005** |
|  | Age 30-39 | 1.04 | [0.80-1.35] |  |  |  |  |  | 1.15 | [0.94-1.41] |  | 1.08 | [0.87-1.32] |  |
|  | Age 40 and over | 1.00 | [0.80-1.26] |  |  |  |  |  | 0.91 | [0.77-1.07] |  | 0.87 | [0.76-1.00] |  |
|  | Education Secondary | 1.06 | [0.93-1.22] | 0.643 |  |  |  |  | 1.12 | [1.03-1.23] | **0.041** | 1.04 | [0.95-1.13] | 0.643 |
|  | Education Tertiary | 0.92 | [0.55-1.53] |  |  |  |  |  | 1.12 | [0.83-1.51] |  | 0.94 | [0.72-1.23] |  |
|  | Marital status Single | 1.02 | [0.87-1.20] | 0.326 |  |  |  |  | 0.95 | [0.85-1.07] | 0.590 |  |  |  |
|  | Marital status Widowed/ Separated/ Divorced | 0.76 | [0.52-1.11] |  |  |  |  |  | 0.96 | [0.85-1.07] |  |  |  |  |
|  | Household assets index 40% wealth middle | 1.03 | [0.87-1.22] | 0.127 | 1.00 | [0.85-1.16] | 0.249 |  | 1.08 | [0.94-1.24] | 0.399 |  |  |  |
|  | Household assets index 20% richest | 0.88 | [0.74-1.04] |  | 0.89 | [0.75-1.05] |  |  | 0.98 | [0.84-1.14] |  |  |  |  |
|  | Professional sit. Currently employed | 1.05 | [0.84-1.31] | 0.670 |  |  |  |  | 1.24 | [1.05-1.47] | **0.012** | 1.21 | [1.03-1.43] | **0.023** |
|  | Area of residency Peri-urban | 1.24 | [0.98-1.56] | 0.193 | 1.22 | [0.97-1.54] | 0.227 |  | 1.05 | [0.87-1.26] | 0.597 |  |  |  |
|  | Area of residency Urban | 1.14 | [0.74-1.75] |  | 1.11 | [0.74-1.67] |  |  | 1.15 | [0.87-1.52] |  |  |  |  |
|  | Distance from nearest clinic >4km | 0.86 | [0.65-1.13] | 0.276 |  |  |  |  | 0.89 | [0.75-1.07] | 0.219 |  |  |  |

Note: p-value mentioned in this table are global p-value. They were computed using Wald test.