

Increasing uptake of HIV testing and counseling among the poorest in sub-Saharan countries: the role of home-based testing and counseling

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Abstract

Background: Uptake of HIV testing and counseling at health facilities is especially low among the poorest in sub-Saharan countries, and may generate significant inequalities in access to ARV treatment. Existing facility-based strategies to increase HTC uptake among sub-Saharan populations such as routine testing may not reach the poorest.

Objectives: To assess whether home-based provision of HTC increases uptake among members of the poorest households in a small sub-Saharan population.

Methods: 852 inhabitants of Likoma Island (Malawi) were offered home-based HTC services during a study of sexual networks and HIV transmission. Socioeconomic status, HIV testing history and HIV risk factors were assessed. Differences in HTC uptake between members of households in the lowest income quartile and the rest of the population are estimated in multivariate analyses using logistic regression models.

Results: The uptake of HTC at health facilities was very low in this population. Members of the poorest households were significantly less likely to have ever been tested (OR=0.60, 95% CI: 0.39,0.92) than the rest of the population. Poorer women were more than twice less likely to have ever been tested at a health facility than women in higher income quartiles. On the other hand, 73.9% of women and 65.6% of men were tested and learned their test results home-based HTC. Members of households in the lower income quartile, however, were significantly more likely to accept home-based HTC services than the rest of the population [OR=1.70, 95% CI: 1.09, 3.06]. Socioeconomic differences in uptake of home-based HTC were not due to underlying differences in sexual behaviors.

Conclusions: While existing strategies to expand HIV testing in sub-Saharan Africa (e.g., routine "opt-out" testing during health care) are unlikely to reach the poorest, the uptake of home-based HTC was highest amongst members of households in the lowest income quartiles on Likoma island. Increased HTC uptake may in turn increase access to HIV prevention and ARV treatment, and may help mitigate the impact of AIDS on the most vulnerable households. The feasibility and cost-effectiveness of home-based HTC should be assessed on a larger scale and in light of its impact on poverty.

Keywords: HIV testing and counseling, HIV prevention, ARV treatment, poverty, Malawi.

Rapid scale-up of HIV treatment and care is ongoing in sub-Saharan countries, but remains limited by the low uptake of HIV testing and counseling (HTC) among African populations. Furthermore, demographic and health surveys have identified a strong socioeconomic gradient in uptake of HTC among members of sub-Saharan populations (e.g., Malawi National Statistical Office 2004). The most vulnerable households may thus be durably excluded from the benefits of accessing anti-retroviral therapy such as prevention of HIV transmission to partners (e.g., Bunnell et al. 2006) and children (Mermin et al. 2008), increased survival (e.g., Jahn et al. 2008; Mermin et al. 2008), or increased labor productivity (Larson et al. 2008).

While several strategies to increase the uptake of HTC among sub-Saharan populations have been suggested (Matovu and Makumbi 2007), their impact on the poorest may be limited. Routine testing in hospitals and other health care facilities, for example, significantly increase uptake and case-finding (e.g., Bassett et al. 2007; Chandisarewa et al. 2007; Creek et al. 2007), but cost and convenience issues limit the use of health facilities among the lower socioeconomic strata in sub-Saharan countries (e.g., of Statistics (UBOS) and Inc. 2007). HTC uptake is also increased in workplace-based initiatives (Corbett et al. 2006), however such strategies similarly do not reach the poorest who are often unemployed. Bunnell and Cherutich (2008) recently outlined a strategy to attain “universal HIV testing and counseling” in Africa that draws on home-based provision of HTC services. Indeed, community-based approaches (like mobile HTC units (e.g., Mbopi-Kéou et al. 2007) or home-based HTC (Bateganya et al. 2007; Fykesnes and Siziya 2004; Were et al. 2006; Wolff et al. 2005)) have been shown to dramatically increase uptake (Bateganya et al. 2007). It is not clear however whether such interventions may reduce the socioeconomic gradient in HTC uptake observed in sub-Saharan countries. In a study in northern Malawi, we offered home-based HTC to residents of several small villages aged 18–35 and their older spouses and assessed whether inequalities in HTC uptake were reduced by the provision of home-based HTC services.

1 Methods

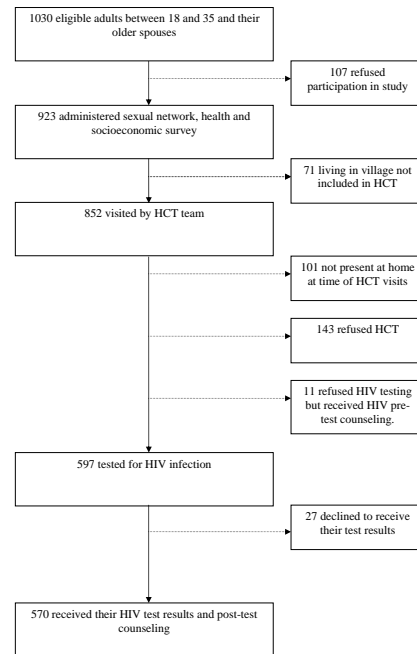
The study setting was an island located in the northern region of Lake Malawi near Mozambique (Likoma Island). The island is small, comprises roughly 12 villages and was inhabited by approximately 7,000 people in 2005. HTC is offered on the island at the local hospital, and a local NGO also runs a HTC center. Other HTC testing centers are located on the mainland of Malawi, in the northern cities of Nkhata Bay and Mzuzu. We refer to HTC conducted in these settings as “facility-based HTC”. HTC is not offered in the bordering villages of the mozambican shore, and migrants from mozambique occasionally attend HTC services on Likoma. The provision of home-based HTC described here was part of a larger study of sexual networks and HIV transmission described extensively in Hellinginger and Kohler (2007); Hellinginger et al. (2006).

1,030 eligible adults aged 18–35 and their older spouses were enumerated in 7 villages of the island, of which 923 (89%) agreed to be enrolled in the study and completed a socioeconomic and sexual networks survey during January 2006 (figure 1). In February 2006, 852 study participants in 6 (out of 7) study villages were offered the possibility to get tested for HIV and receive a free HIV counseling session in their homes. The seventh village was not included due to funding and timing constraints. The research team responsible for the provision of home-based HTC was composed of 10 health counselors trained in HTC by the Malawian ministry of Health. In order to guarantee the confidentiality of HIV test results, we selected team members who were not residents of Likoma. HIV testing was based on two rapid tests for the detection of HIV antibodies (Determine and Unigold) and followed a parallel testing algorithm. Results were available to the respondents after 20 minutes, but respondents were also given the option to retrieve their test results at a latter date if they desired so. Test results that were concordantly negative or positive were disclosed to the respondent. Discordant test results were declared inconclusive and clients were referred to the local testing centres for repeat testing. Each study participant was visited at most twice by the research team.

Participation in home-based HTC was voluntary and required informed consent. Inhabitants of the island visited by the study team were informed that they could refuse to participate or terminate the counseling/testing session at any point in time. In particular, participants were able to refuse HIV testing after having completed pre-test counseling, and were also able to refuse to learn their results after completing HIV testing. Testing and counseling were strictly individual and we did not attempt to jointly counsel co-residing couples. Study participants who accepted to be counseled by the study team (but did not necessarily accept to be tested) were provided with a small bar of soap as a token of appreciation. The bar of soap's value was 0.06USD. We discuss below how it may have affected the results obtained during this study. Because participants may have been concerned about the privacy of in-home HIV tests (Bateganya et al. 2007; Fykesnes and Siziya 2004), they were also given the option to be tested at another location (i.e., the team's hotel on the island). Sensitization meetings were conducted in each village prior to the start of home-based HTC. Consent from traditional chiefs and government officials was obtained. The study protocol received clearance from institutional review boards at the University of Pennsylvania (Philadelphia, USA) and at the University of Malawi College of Medicine (Blantyre, Malawi).

We collected standardized information on socioeconomic characteristics and health behaviors of study participants during a preliminary survey conducted in January 2006 (Helleringer et al. 2006). To assess prior use of HTC services, respondents were asked if they had ever been tested for HIV infection in health facilities and, if never tested, what was the main reason why they had not used facility-based HTC services. Socioeconomic status of households was measured by household income and was assessed as follows: respondents were asked what the main income generating activity of their household was and how much household members typically earned from this activity over a 1-month period. Respondents were then asked if there were other income-generating activities household members were engaged in, and how much they would earn from these sources over the course of a month. Total household income was calculated as the sum of these different activities. When several household members were interviewed, the measure of household income used in this paper is the average of individual reports. The correlation among reports of household income across household members was high (0.81). Sexual

Figure 1: Flow chart of participation in home-based HCT provision during the Likoma Network Study



risk behaviors ascertained during the survey included number of lifetime partners and number of concurrent partnerships at the time of the survey (Helleringer and Kohler 2007). Symptoms of STI were ascertained over the year prior to the survey and were coded “1” if the respondent experienced any of these symptoms during that time span, and zero otherwise. Symptoms of STI which were assessed included painful urination, ulceration of the genital area or discharge from the penis/vagina.

Data were double-entered into a MS access database during fieldwork, and all analyses were performed using STATA 10. We computed odds ratios for the odds of using facility-based and home-based HTC services based on the presence of various sociodemographic and behavioral characteristics. Adjusted odds ratios were computed using logistic regression models that included adjustments for clustering of observations within villages (Agresti 1990). Determinants of participation in home-based HTC were assessed in two stages: first, we considered determinants of the probability of finding a potential respondent at home at the time of the visit by the HTC team; second, we assessed determinants of HTC acceptance among respondents who were found at home. We focus on respondents who accepted to be tested and learned their test results. Differences in the effect of income on HTC uptake by gender were assessed on the basis of an interaction term introduced in the logistic regression models. Finally, predicted probabilities of participation in facility-based and home based HTC were derived from these models using STATA 10 “predxcat” function (Garrett 2006).

2 Results

The average household size was 6.2 (IQR: 4–8) and the average monthly income per household resident (all ages) was 1,430 Kwachas (\approx 10USD), equivalent to 0.33USD per person and per day. 90% of the population of the island was below the poverty line of 1USD per day and per person. The poorest quartile of the population was earning under 0.15\$ per person and per day.

101 potential HTC participants were absent at the time they were visited by the study team (figure 1). Among participants who were available, 143 refused home-based HTC services (19.0%), 11 received pre-test counseling but subsequently refused to be tested for HIV infection(1.5%), and 597 agreed to be counseled and tested for HIV (79.5%). Among those, 12 participants (1.4%) asked to be tested at an alternative location and received HCT at the research team’s hotel on Likoma. 95.5% of respondents who were tested for HIV asked to learn their results immediately. Among the 27 participants who did not retrieve their results, 7 asked to learn their results at a later date but never returned to retrieve them. HIV prevalence within the population was 8.0% (95% CI: 6.0-10.5).

Table 1 documents significantly lower uptake of facility-based HTC among members of the poorest income quartile: while 25.4% of respondents in the upper income quartiles had ever been tested, this was the case for only 16.9% of the poorest (adjusted OR: 0.67, 95%CI=0.43,1.06). Other important determinants of having ever used facility-based HTC services included age, schooling, having ever resided on the mainland, and the number of lifetime sexual partners. The main reasons invoked for never having used facility-based HTC services were distance to the testing center (24%), lack of confidentiality at the testing center (20%) and fear of diagnosis (15%). Reasons for never having been tested did not differ significantly by income quartile.

Table 1: Determinants of participation in Facility-based HIV counseling and testing. Likoma Island, February 2006.

		Ever tested at health facility		
		N (%†)	Unadjusted OR (95% CI)	Adjusted OR‡ (95% CI)
Sociodemographic characteristics				
<i>Sex</i>	Men(Ref)	370(23.5)	1	1
	Women	432(22.4)	0.94 (0.68,1.31)	1.05 (0.72,1.55)
<i>Age</i>	< 20 (Ref)	153(10.5)	1	1
	20-24	264(28.0)	3.33(1.83,6.06)**	3.59(1.91,6.71)**
	25-29	196(31.0)	3.51(1.89,6.52)**	4.38 (2.14,8.93)**
	30-34	106(19.8)	2.11(1.04,4.31)**	2.71(1.18,6.23)**
	35+	83(19.3)	2.04(0.96,4.37)*	2.70 (1.09,6.71)**
<i>Marital status</i>	Never married (Ref)	343(22.7)	1	1
	currently married	402(22.4)	0.98(0.69,1.38)	0.82(0.52,1.30)
	widowed or divorced	57(8.7)	1.33(0.70,2.49)	0.96(0.44,2.08)
<i>Schooling</i>	Incomplete primary (Ref)	353(15.6)	1	1
	Completed primary school	449(28.7)	2.18(1.53,3.12)**	1.81(1.22,2.69)**
<i>Religion</i>	Anglican (Ref)	671(21.9)	1	1
	Other religions	131(28.2)	1.40(0.92,2.14)	1.40(0.87,2.26)
<i>Residence</i>	Never on mainland (Ref)	503(18.1)	1	1
	Ever on mainland	295(31.2)	2.05(1.46,2.88)	1.65(1.14,2.39)**
<i>Income</i>	Top income quartiles (25 th percentile and above, Ref)	587(25.4)	1	1
	Bottom quartile (Below 25 th percentile)	189(16.9)	0.60(0.39,0.92)**	0.67(0.43,1.06)*
HIV behaviors and risk factors				
<i>Number of sexual partners during 3-year period prior to survey</i>				
	0-1 (Ref)	247(16.6)	1	1
	2	229(24.4)	1.63(1.03,2.56)**	1.29(0.80,2.10)
	3 or more	326(26.7)	1.83(1.21,2.79)**	1.54(0.96,2.48)*
<i>Concurrent partnerships at time of home-based HTC visit</i>				
	No (Ref)	685(22.5)	1	1
	Yes	117(25.6)	1.19(0.75,1.87)	1.12(0.67,1.87)
<i>Symptoms of STI over the last 12 months</i>				
	No symptoms (Ref)	659(23.2)	1	1
	Any symptoms	143(21.7)	0.91(0.59,1.42)	1.26(0.79,2.03)

Notes: * $p < 0.1$, ** $p < 0.05$

†Figures in parentheses are row percentages indicating the proportion of participants in a given category who have ever been tested.

‡Estimates presented in this column are derived from a logistic regression model that includes all variables listed in the table. The model is estimated among respondents with non-missing information on all variables.

Determinants of participation in home-based HTC are presented in table 2. Uptake of home-based HTC was significantly higher among members of households in the lowest income quartile (unadjusted OR: 1.60, 95% CI: 1.04,2.46) and the more common use of home-based HTC services among the poorest was not due to a higher probability of being found at home by the HTC team (unadjusted OR: 1.11, 95%CI: 0.67,1.84). In multivariate analyzes among respondents who were found at home, the odds of using home-based HTC services among the poorest respondents were 1.7 times those of respondents in the upper income quartiles ($p = 0.02$). These differences remained even after controlling for underlying differences in sexual risk behaviors and co-factors of HIV infection. In addition, participation in home-based HTC was significantly higher among younger respondents, respondents who had completed primary schooling, respondents with multiple lifetime sexual partners, and respondents who had experienced symptoms of sexually transmitted infections during the year prior to the survey. Participation in home-based HTC was however lower among respondents who were engaged in multiple concurrent sexual partnerships at the time of the survey.

While uptake of home-based HTC initially appeared higher among women, this pattern was largely explained by differences in sociodemographic characteristics and sexual behaviors, and disappeared in multivariate analyses. However, the effects of income on the use of different types of HTC services varied significantly by sex and by type of HTC delivery. For facility-based HTC, an interaction term between sex and income introduced in the logistic regression model was significant at the .05 level. While men in the poorest income quartile were not less likely to use HTC services at health facilities than men in the upper quartiles of the income distribution (Figure 2), the poorest women were twice less likely to have ever been tested at a health facility than women in upper income quartiles (adjusted proportions: 12.2% vs. 24.0%). Patterns of use of home-based HTC were almost opposite: uptake was highest among women, but differences in uptake by income quartile among women were not significant; among men, on the other hand, socioeconomic differences in uptake of home-based HTC were large and favored men in the lowest income quartile. Men in upper income quartiles were less likely to participate in home-based HTC than all other population groups, even after accounting for the probability of being found at home by the HTC team ($p < 0.01$).

3 Discussion

HIV testing and counseling is an essential step in accessing HIV prevention and treatment services, and reaping the benefits associated with use of these services (Makhlouf Obermeyer and Osborn 2007). The results presented here document large socioeconomic differences in uptake of HIV testing and counseling services provided at health facilities (e.g., hospitals, health centers) among members of a small island population of Lake Malawi. They also highlight, on the other hand, that the home-based provision of HTC services has the potential to help bridge the existing “income gap” in HTC uptake in sub-Saharan countries.

In our study, islanders in the lowest income quartile were significantly less likely to have ever used facility-based HTC services than the rest of the population. These disparities in access to facility-based HTC were even more acute among women: poorest women were twice less likely to have ever been tested for HIV infection at a health facility than women in the upper quartiles

Table 2: Determinants of participation in Home-based HIV testing and counseling, Likoma Island, February 2006.

	Found at home		Tested and learned results †	
	N (%\$)	Unadjusted OR (95% CI)	N (%\$)	Adjusted OR‡ (95% CI)
Sociodemographic characteristics				
Sex				
Men(Ref)	392(87.0)	1	341(71.9)	1
Women	460(89.1)	1.22(0.81,1.86)	410(79.3)	1.40(0.93,2.11)
Age				
< 20 (Ref)	165(93.3)	1	154(85.1)	1
20-24	276(88.8)	0.56(0.27,1.16)	245(81.6)	0.73(0.39,1.36)
25-29	208(88.0)	0.52(0.25,1.10)*	183(73.2)	0.49(0.24,1.01)*
30-34	115(84.3)	0.38(0.17,0.86)**	97(61.9)	0.29(0.13,0.63)**
35+	88(81.8)	0.32(0.14,0.74)**	72(62.5)	0.29(0.12,0.69)**
Marital status				
Never married (Ref)	364(90.7)	1	330(78.5)	1
currently married	426(86.1)	0.64(0.41,1.01)*	367(74.7)	1.23(0.73,2.07)
widowed or divorced	61(86.9)	0.68(0.30,1.56)	53(67.9)	0.96(0.42,2.17)
Schooling				
Incomplete primary (Ref)	377(88.1)	1	332(71.1)	1
Completed primary school	475(88.2)	1.01(0.66,1.54)	419(79.7)	1.39(0.93,2.09)
Religion				
Anglican (Ref)	709(88.0)	1	624(75.6)	1
Other religions	143(88.8)	1.08(0.61,1.91)	127(77.2)	1.17(0.66,2.06)
Residence				
Never on mainland (Ref)	538(88.8)	1	478(75.1)	1
Ever on mainland	308(87.0)	0.84(0.55,1.29)	268(77.6)	1.07(0.71,1.62)
Income				
Top income quartiles (25 th percentile and above, Ref)	627(87.7)	1	550(73.6)	1
Bottom quartile (Below 25 th percentile)	197(88.0)	1.11(0.67,1.84)	175(81.7)	1.70(1.06,2.73)**
HIV behaviors and risk factors				
<i>Number of sexual partners during 3-year period prior to survey</i>				
0-1 (Ref)	270(90.7)	1	245(70.2)	1
2	243(86.8)	0.68(0.39,1.17)	211(77.7)	1.54(0.94,2.50)*
3 or more	339(87.0)	0.68(0.41,1.15)	295(79.3)	1.60(0.97,2.64)*
<i>Concurrent partnerships at time of home-based HTC visit</i>				
No (Ref)	731(88.4)	1	646(76.5)	1
Yes	121(86.8)	0.86(0.49,1.53)	105(72.4)	0.53(0.30,0.93)**
<i>Symptoms of STI over the last 12 months</i>				
No symptoms (Ref)	664(87.4)	1	580(74.3)	1
Any symptoms	144(91.0)	1.45(0.79,2.70)	131(84.7)	1.95(1.12,3.40)**

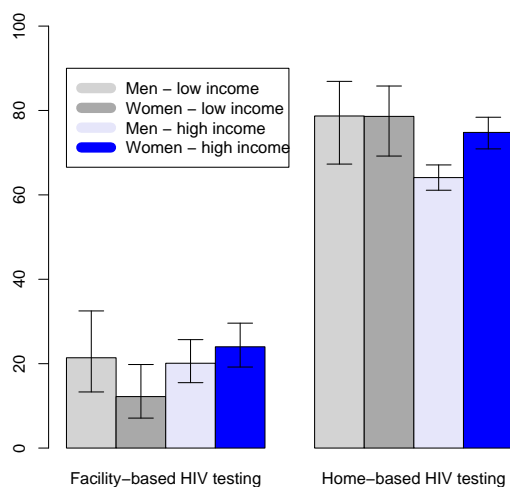
Notes: * $p < 0.1$, ** $p < 0.05$

†Conditional on being found at home by the HTC team.

‡Estimates presented in this column are derived from a logistic regression model that includes all variables listed in the table. The model is estimated among respondents with non-missing information on all variables.

§Figures in parentheses are row percentages indicating the proportion of participants in a given category who were found at home by the HTC team/got tested and learned their results.

Figure 2: Predicted proportions of respondents participating in home-based and facility-based HTC services by sex and income. Error bars represent 95% CI.



of the income distribution. This might be the case for several reasons: on the one hand, poorer women may be more dependent on husband’s approval to attend facility-based HTC testing services because they need to seek money for transport (Matovu and Makumbi 2007); on the other hand, women in rural Malawi are often tested for HIV in the context of antenatal clinic visits (ANC) and ANC attendance is lower among poorer households (Malawi National Statistical Office 2004). The inability of facility-based HTC services to reach the poorest may have far-reaching implications: by constraining access to HIV prevention and treatment services that effectively mitigate the impact of the disease, it may further broaden economic inequalities and jeopardize already fragile livelihoods.

Whereas uptake of facility-based HTC was low, the home-based provision of HTC was very well accepted in this population: more than 70% of the individuals visited by the study team accepted to be tested and immediately retrieved their HIV test results at home. Members of the poorest households, in particular, expressed a strong unmet need for HTC and women in the lower income quartile benefited most from the alternative model of HTC provision: more than 75% of them were tested during the home-based HTC campaign.

Participation in home-based HTC was also associated with several risk factors for HIV transmission/acquisition: inhabitants of Likoma with multiple lifetime sex partners and inhabitants who presented recent symptoms of sexually transmitted infections were more likely to participate in home-based HTC. These findings suggest that the “yield” (i.e., the number of newly identified HIV cases) of a home-based HTC intervention might be high. Respondents involved in multiple concurrent partnerships at the time of the survey were however less likely to participate in home-based HTC in multivariate models. Such partnerships play a key role in HIV transmission (Morris and Kretzschmar 1997), thus even though home-based HTC may significantly enhance

case finding for HIV it may not provide a solid ground on which to build possible contact tracing interventions.

There are several limitations to our study. First, our assessment of prior use of facility-based HTC services was crude: we did not know when was the last time a respondent got tested (recently or not), in which context testing was conducted (voluntary counseling and testing vs. diagnostic testing for example), nor did we know whether the respondent retrieved his/her results. Second, provision of home-based HTC services during our study was limited to narrow age range (18–35) and thus does not allow assessing the acceptability of home-based HTC among younger and older age groups (35 and above) who may be at significant risks of HIV infection. In particular, we did not assess the potential impact of home-based HTC on the identification of cases of paediatric HIV and unlike the study of Were et al. (2006). Third, we did not pursue additional case finding benefits of home-based HCT highlighted by Were et al. (2006), nor did we attempt to provide couple counseling to co-residing spouses. Bunnell and Cherutich (2008) suggest that one the main advantages of home-based HTC over traditional testing strategies may be its ability to identify serodiscordant couples and effectively intervene among this group at a high risk of HIV infection. Fourth, the provision of a small bar of soap as a token of appreciation for participation in the study may have provided stronger incentives for the poorest people to participate in home-based HCT and may thus have biased our results upwards. Finally, our assessment of home-based HCT as a strategy to reduce inequalities in access to HIV diagnostic and treatment services was conducted during a small research study and as such did not address issues of operational research associated with the implementation of such a model of HCT on a larger scale (Matovu and Makumbi 2007).

The home-based provision of HIV testing and counseling services has the potential to fill a strong unmet need for HTC in sub-Saharan Africa, particularly among the poorest segments of these populations. The cost-effectiveness of similar interventions should be assessed on a larger scale, in light of their ability to (1) prevent new infections, but also to (2) mitigate the impact of AIDS on the poorest. Though costly, they should possibly be incorporated more broadly into national HIV testing programs.

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