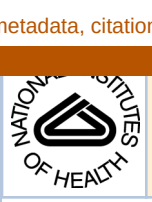

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Acceptance of HIV Testing for Children Ages 18 Months to 13 Years Identified Through Voluntary, Home-Based HIV Counseling and Testing in Western Kenya

Rachel C. Vreeman, MD, MS[1,2,3], **Winstone M. Nyandiko, MBChB, MMED**[3,4], **Paula Braitstein, PhD**[3,5,6], **Martin C. Were, MD, MS**[2,3,5], **Samwel O. Ayaya, MBChB, MMED**[3,4], **Samson K. Ndege, MBChB, MPH**[3,7], and **Sarah E. Wiehe, MD, MPH**[1,2,3]

[1]Children's Health Services Research, Department of Pediatrics, Indiana University School of Medicine, Indianapolis, IN, United States

[2]The Regenstrief Institute, Inc, Indianapolis, IN, United States

[3]USAID – Academic Model Providing Access to Healthcare (AMPATH) Partnership, Eldoret, Kenya

[4]Department of Child Health and Paediatrics, Moi University School of Medicine, Eldoret, Kenya

[5]Department of Medicine, Indiana University School of Medicine, Indianapolis, IN, United States

[6]Department of Medicine, Moi University School of Medicine, Eldoret, Kenya

[7]Moi University School of Public Health, Eldoret, Kenya

Abstract

Background—Home-based, voluntary counseling and testing (HCT) presents a novel approach to early diagnosis. We sought to describe uptake of pediatric HIV testing, associated factors, and HIV prevalence among children offered HCT in Kenya.

Methods—The USAID-AMPATH Partnership conducted HCT in western Kenya in 2008. Children 18 months to 13 years were offered HCT if their mother was known to be dead, her living status was unknown, mother was HIV-infected or of unknown HIV status. This retrospective analysis describes the cohort of children encountered and tested.

Results—HCT was offered to 2,289 children and accepted for 1,294 (57%). Children were more likely to be tested if more information was available about a suspected or confirmed maternal HIV-infection (for HIV-infected, living mothers OR=3.20, 95% CI: 1.64–6.23), if parents were not in household (OR=1.50, 95% CI: 1.40–1.63), if they were grandchildren of head of household (OR=4.02, 95% CI: 3.06–5.28), or if their father was not in household (OR=1.41, 95% CI: 1.24–1.56). Of the eligible children tested, 60 (4.6%) were HIV-infected.

Conclusions—HCT provides an opportunity to identify HIV among high-risk children; however, acceptance of HCT for children was limited. Further investigation is needed to identify and overcome barriers to testing uptake.

Corresponding Author: Rachel C. Vreeman, 410 West 10th Street, Suite 1020, Indianapolis, Indiana 46202, Office: (317) 278-0552, Fax: (317) 278-0456, rvreeman@iupui.edu.

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Keywords

HIV; pediatrics; home-based testing; barriers to testing

INTRODUCTION

In order to initiate timely HIV treatment and ensure widespread prevention of further infections, a person must first know his or her HIV status.[1] Early diagnosis and treatment is particularly important within pediatrics since HIV-infected children face very high mortality rates in the first few years of life. Without treatment, approximately 50% of HIV-infected children die before the age of 2, with mortality rates as high as 75% by 5 years of age.[2, 3] In regions such as sub-Saharan Africa, where a high incidence of infection is coupled with limited resources, the early diagnosis of HIV-infected children is critical for optimal therapy and effective public health planning.[4]

Despite the critical importance of testing at-risk children for HIV, acceptance of pediatric testing among caregivers and children in sub-Saharan Africa has not yet been well studied. In a study of free inpatient HIV testing in Uganda, testing was offered to all adults and children who were admitted to participating units in the hospitals and who had not had previous HIV testing.[5] The overall uptake for testing was 98%, but this statistic was not broken down by age, and does not specify children's testing uptake. The prevalence of HIV was 28% in the 39,037 patients who had never been tested before and 9% in those who had previously tested negative.[5] Of the 10,439 family members offered testing, 9720 (93%) accepted and 20% were HIV-infected.[5] Outpatient testing programs may differ from inpatient testing programs in both the uptake of testing and prevalence of HIV. In evaluation of a program offering HIV counseling and testing for outpatients seen at a rural hospital in Tanzania, children constituted 6.6% of the 4,353 individuals tested.[6] 1069 (24.6%) of those tested were HIV-infected, and 83 of these (7.8%) were children.[6] In a study of an outpatient program in Malawi offering HIV testing with acute malnutrition care, 92% of the children presenting for nutrition services also were tested for HIV and HIV prevalence was 3%.[7] In the inpatient setting of the same program, 97% of caregivers accepted HIV testing for children admitted with malnutrition, and HIV prevalence was 21.6%.[8] The uptake of testing in settings where patients also receive other forms of care or service may differ significantly from the uptake of testing in the general community.

Community- or population-based HIV testing may allow identification of HIV-infected children before they exhibit signs or symptoms of illness, enabling earlier treatment and more effective prevention. One such approach is Home-Based Voluntary Counseling and Testing (HCT).[9] The Academic Model Providing Access to Healthcare (AMPATH), is a large clinical care system that has enrolled over 113,000 HIV-infected adult and pediatric patients in western Kenya.[10] In 2007, AMPATH initiated HCT in western Kenya.[11] AMPATH implemented a form of HCT that includes the administration of a rapid, in-home HIV test for adults and children above 18 months, immediate disposition of the test results, post-test counseling and appropriate referral -- all during one visit to a household.[12] In this paper, we report the acceptance rates, associated characteristics, and results of HIV testing for at-risk children 18 months to 12 years of age within a program of HCT implemented in the Turbo Division in western Kenya.

METHODS

Study Design

This retrospective study used data collected through the HCT initiative of the AMPATH clinical care system in western Kenya. The study was approved by the Institutional Research and Ethics Committee of the Moi University School of Medicine (Eldoret, Kenya) and the Institutional Review Board of the Indiana University School of Medicine (Indianapolis, Indiana).

Setting

AMPATH began in 2001 as a partnership between Moi University School of Medicine, Moi Teaching and Referral Hospital (Eldoret, Kenya), and the Indiana University School of Medicine (Indiana, United States).[13, 14] AMPATH currently provides comprehensive HIV care, including free antiretroviral therapy, for over 101,000 HIV-infected and HIV-exposed adult and pediatric patients in 23 clinics and 23 clinic satellites throughout western Kenya.[13] AMPATH actively provides care for over 14,800 children under the age of 14 years (as of 15 May 2010).

AMPATH piloted implementation of HCT in the Kosirai Division of the Nandi North District of the Rift Valley Province in 2007, and then rolled HCT out into the Turbo Division of the Uasin Gishu District of the Rift Valley Province in 2008. This division is considered representative of the ethnic groups and socioeconomic strata of many rural divisions in western Kenya, and is the site of an AMPATH clinic caring for 5,340 patients, including 989 children. Time constraints resulted in the implementation of two separate phases of HCT in the Turbo Division, the first occurring June-December, 2008, and the second in January-June, 2009. We examined data collected in the first phase of the Turbo rollout, the first broad implementation of HCT in Kenya.

HCT Door-to-Door Program of Testing

AMPATH sought to establish a strong partnership with the target division in order to effectively implement population-wide HCT in Turbo.[11] AMPATH conducted community focus group discussions, and worked with community leaders to prepare for visits. Mobilization teams, comprised of respected community members, disseminated information about HIV,AMPATH's services and the HCT program during visits to every household in their respective villages. They also requested permission for trained counselors to subsequently visit the home and offer counseling and testing for HIV.

All consenting, adult household members (those 13 years and older) were eligible for testing. Children less than 13 years of age were deemed eligible for testing if they met one or more of the following criteria: mother known to be dead; mother's living status not known; mother HIV-infected; or mother's HIV status unknown. The mother's HIV status was determined through HCT testing or prior documentation of a positive HIV test. Parents/guardians could also choose to have children who did not meet the eligibility criteria tested. For children older than 18 months, HIV testing used parallel tests, the Determine HIV-1/2 rapid assay (Abbott Laboratories®) and SD Bioline HIV-1/2 3.0 rapid assay (Standard Diagnostics Inc.®, Kyonggi-do, South Korea). If the results were discordant, a tie-breaking test was done using the UniGold HIV test (Trinity Biotech®, Dublin, Ireland) rapid assay. Post-test counseling was provided for everyone, and all children with positive test results were referred to AMPATH. Children under 18 months of age require DNA PCR testing for HIV because they may have circulating maternal antibodies in their blood, for which a rapid test was not available. Thus, the parents or guardians of eligible children younger than eighteen months of age received counseling and were referred to the AMPATH Turbo clinic

for the children to have DNA PCR testing for HIV. Because testing for children under 18 months was not conducted within the immediate context of HCT, they were excluded from the analyses. The parents and guardians of both HIV-infected and HIV-uninfected children were counseled on risk-lowering behaviors, such as using condoms and repeated testing.

Data Collection and Measures

Personnel conducting HCT carried Palm T|X PDA devices (Palm Inc®, California, USA) that were used to enter information into data-collection forms programmed with Pendragon Forms Software (DDH Software, Inc®, Florida, USA). Data collected included individual demographic and household information, as well as HIV testing results. Data were transferred to a Microsoft Access database (Microsoft Corp®, Redman, Washington) by synchronizing the PDAs to a dedicated server.

Data Analysis

We described the demographic and household characteristics of the cohort of children approached in Phase One of Turbo HCT, focusing on acceptance of HIV testing and HIV prevalence. We performed multivariable logistic regression to assess the association between odds of accepting HIV testing for children and mother risk category, controlling for gender, age, whether both parents were in the household, child's relationship to head of home, father's HIV status, father's living status, whether the child had been completely immunized (by immunization card or by caregiver report), and whether the child had a previous HIV test. Mother risk was defined as an ordered, categorical variable (0= Mother HIV-uninfected and alive, 1 = Mother HIV-unknown and alive, 2= Mother HIV-uninfected or HIV-unknown and living status unknown, 3 = Mother HIV-uninfected or HIV-unknown and dead, 4 = Mother HIV-infected and alive, and 5 = Mother HIV-infected and dead or living status unknown). We assessed whether a higher mother risk category was statistically significantly associated with an increased odds of accepting HIV testing by including the ordered categorical variable mother risk category as a continuous variable (test of trend). Stratified analyses were done to determine whether sociodemographic characteristics were differentially associated with the odds of accepting testing by mother risk category. We tested the statistical significance of interactions using likelihood ratio tests. All models calculated 95 percent confidence intervals based on robust variance estimates. All statistical analyses were performed using Stata MP 10.1 for Windows (Stata Corp, College Station, TX).

RESULTS

The HCT effort in the Turbo Division identified a total of 57,466 household residents. Of these, 15,513 were children aged less than 13 years, and 12,862 were between the ages of 18 months and 13 years. 49.2% were female, and 88.6% had their parents in the household. Of these 12,862 children, HCT was indicated for 2,289 children. (Figure 1)

Of the 2,289 children for whom testing was indicated, HIV testing was accepted for 1294 children (57%). (Figure 1) Among all children for whom testing was indicated, higher percentages of children in the tested group did not have parents living with them; were grandchildren of the head of household (compared to being children of the head of household, other relatives of the head of household, or non-biological relations to the head of household); had a father who had died, had living status was unknown, or was HIV-infected; and had their immunization status was unknown. (Table 1) Higher percentages of children ages 5 to 12 years had HIV testing than did children who were less than 5 years of age. In multivariate logistic regression, eligible children were less likely to be tested for HIV if their mother was alive and had an unknown HIV status (OR = 0.34, 95%CI: 0.18–0.66), if

they lived with both parents (OR=0.50, 95% CI: 0.40–0.63), or if they had previously been tested for HIV (OR=0.30, 95%CI: 0.19–0.46). Children were more likely to be tested if more information was available about a suspected or confirmed maternal HIV-infection (for HIV-infected, living mothers, OR=3.20, 95% CI: 1.64–6.23) or if they were not the child of the head of household. For example, grandchildren of the head of household were more likely to receive HIV testing (OR=4.02, 95% CI: 3.06–5.28). Children were more likely to get tested if both of their parents were absent from the household (OR=1.50, 95% CI: 1.40–1.63) or if their father was not in the household (OR=1.41, 95% CI: 1.24–1.56). Gender; father's HIV status; being related to the head of the household as a sibling, househelp, or "other" relationship; child's age; child's immunization status; having a mother whose living status and HIV status are unknown; and having a dead mother with unknown or negative HIV status were not significantly associated with uptake of testing in the multivariable logistic regression.

Of the 1,294 children for whom testing was indicated and whose parents/guardians accepted testing, sixty (4.6%) of the children were HIV-infected. (Table 2) Positive HIV tests in children were more common among the children with mothers known to be HIV-infected; 9% of the children with HIV-infected, living mothers tested positive and 13% of those with HIV-infected, deceased or unknown living status mothers tested positive. (Table 2)

As previously described, the mother's risk factors defined whether or not testing was indicated for children. Parental/guardian acceptance of testing varied with the mother's specific risk factors within the general indication for testing (Table 3). The odds of accepting testing for a child was increased with higher values of the mother risk variable, with $p<0.001$ for the test of trend. This remained significant even when excluding those children whose mothers were alive and known to be HIV-uninfected and adjusting for the other variables ($p<0.01$). Children whose mothers were alive but had unknown HIV status (N=1,283) were more likely to be tested if they were older, if they did not have parents in the household, if they were not the children of the head of the household, or if their fathers were dead or living status was unknown. (Table 3) If their fathers were known to be HIV-uninfected, then these children were less likely to be tested. Children who had deceased mothers or for whom the mother's living status was unknown and the mother's HIV status was negative or unknown (N=299) were more likely to be tested if they were older; if they did not have parents in the household; if they were not the children of the head of household; if their father's HIV status was unknown; if their father had died or had an unknown living status, or if the child's immunization status was unknown.

Among children whose mothers were alive and HIV-infected (N=635), there were no prominent differences in demographics between those who were tested and those who were not, except that those not tested had more often had a previous HIV test and were less likely to have known immunization status. (Table 3) The groups were similar in regard to gender; age; the presence of parents in the household; relationship to the head of household; and father's HIV and living status. Among children whose mothers were dead or of unknown living status but known to be HIV-infected (N=72), older children, children whose parents were not in the household, those who were not the children of the head of the household, children whose fathers had died, and children with unknown immunization status were tested more often.

In 10,573 cases, HCT testing was not indicated for the children because the child's mother was both alive and HIV-uninfected. Children for whom testing was not indicated differed from the children for whom testing was indicated in other ways besides having a living, HIV-uninfected mother (Table 1). These children were also younger, more likely to have a mother or a father in the household, and more likely to be children of the head of the

household. They more often had living, HIV-uninfected fathers, and were described as fully immunized. Thirty-two children for whom testing was not indicated had had a prior HIV test (0.2%). Caregivers opted to have testing for 239 children for whom testing was not indicated; one was found to be HIV-infected.

DISCUSSION

HCT provides a unique opportunity to identify HIV infection early in the disease course, enabling the provision of early treatment and enhancing possibilities for prevention of transmission. Implementation of HCT in the Turbo Division of western Kenya used the mother's risk factors, specifically HIV status and living status, to identify children at high-risk for HIV infection. In contrast to the testing of adults in this program, where 95% of adults accepted testing,[12] caregivers refused HIV testing for almost half of these high-risk children, underscoring the need to improve home-based pediatric HIV testing. Children with HIV-infected mothers, children who did not have parents in the household and those who were not the children of the head of household were more likely to get HIV tests. Given the rates of HIV among those who were tested, there may be many HIV-infected children who remain undiagnosed if no community-based testing is available or if these testing options are refused.

The findings underscored that maternal HIV and living status are key indicators of a child's HIV risk, both in terms of caregivers' willingness to have the child tested and in terms of HIV prevalence. As the mother's risk factors increased, so did the likelihood of testing and of HIV infection. The children of mothers known to have HIV infection and/or known to be dead were most likely to be tested, and children with mothers known to be HIV-infected were more likely to be HIV-infected as well. Many children with HIV-infected mothers did remain untested, and these children had minimal differences in demographic characteristics from those with HIV-infected mothers who were tested. Thus, it is possible that HIV diagnoses were missed among the children for whom testing was refused. If all children who were considered high risk for HIV had been tested and if they had had an equal risk of HIV infection as the other children who were tested, 46 (2%) more pediatric HIV cases may have been identified.

This study found that almost half of caregivers did not consent to have high-risk children tested for HIV in HCT. The acceptance of testing varied with the child's position in the household, in particular with their relationship to the head of household and whether or not their fathers were alive or HIV-infected. Children who did not have both parents in the household and who were not the children of the head of the household were more likely to get tested. This suggests that orphaned children living with extended family may be more likely to be tested for HIV than children still living with their biological parents. This could reflect that the caregivers of these children are less concerned about the stigma associated with HIV testing or the child's HIV status. Biological caregivers also may not consent to testing because of feelings of guilt over potentially being the source of the child's infection. Children with an HIV-infected or deceased father may have been tested more often because they were seen as being at greater risk for HIV given their father's potential or known HIV status or the possibility that the father may have died from HIV. There was also a trend for older children to be more likely to get tested. Parents may be more apt to test older children for multiple reasons: older children manifesting more illnesses or signs of infection with age, concerns about increasing risk of transmitting infection as sexual debut draws closer, or feeling that an older child is better able to handle the diagnosis psychologically and emotionally. This would be in line with previous research, where caregivers refused testing for children because of fear that they were not psychologically ready or because the children were still healthy.[7] With increased antenatal HIV testing, it is also possible that younger

children and their mothers were more likely to have received antenatal counseling and testing previously. Having previous testing was a reason for not accepting another HIV test described for both adults and children in the study of inpatient HIV testing in Uganda.[15]

Fear of stigma and discrimination in the community also may have played a role in the refusal of testing. Because testing was only offered to high-risk children, and not to every child in every household, parents and caregivers may have been afraid that accepting testing for the children would signal to their neighbors that the household had some risk factor for HIV. In this setting, parents often avoid informing children about their HIV diagnosis or keep HIV medicines hidden because they are afraid the child will tell others.[16] Similarly, fear that the child would report that they were tested could have influenced parents' willingness to accept the testing. Alternatively, individual, family, or community factors not measured by this program may have influenced testing. For example, the acceptance of testing for children may be related to perception of access to care, or to varying experiences of clinical disease in the mother or child.

These outcomes underscore the need to further investigate caregivers' reasons for refusing pediatric testing so that we do not miss important opportunities to detect HIV within high-risk pediatric populations. More open-ended or qualitative techniques may be needed to illuminate the impact of social stigma; beliefs about pediatric HIV acquisition, treatment, or prognosis; issues about consenting for children's testing; concerns about the emotional impact of testing positive; or logistic challenges to pediatric testing and care access. Better understanding caregiver rationales for refusing or accepting testing will help identify interventions to increase pediatric testing uptake and ultimately improve treatment and prevention.

There are several potential limitations to our study. One limitation is that children were considered eligible or not eligible for testing based on the characteristics of their mother. A child's own risk factors or their health status were not taken into account, nor was the testing aimed universally for all child household members as it was for adult household members. Whether or not a child was sick or other characteristics about the child may have offered appropriate criteria for offering testing that also may have influenced caretakers' decisions. Nonetheless, the maternal characteristics clearly did play an important role in determining at risk children. Another limitation is that we were unable to offer testing for the youngest children, those under 18 months of age, who are also the most in need of early treatment if HIV-infected. These children could not be tested within their homes because of the need for a non-rapid, DNA PCR test to distinguish maternal antibodies from child antibodies. Prevalence of HIV among these children and follow-up of testing uptake with the need for a specialized referral would be interesting outcomes, but are not data captured in the scope of this investigation. Another limitation is that some households in the target community, and some individuals within the households, were missed during the "Turbo Phase One" testing and approached and possibly tested during "Phase Two". Nonetheless, there was no indication of any selection bias in who was recruited in each phase. Moreover, Phase One data still reflect a large community sample, with over 57,000 household residents counseled and offered testing. Another potential limitation is that our analyses were limited to quantitative data collected during brief household visits. While additional individual or household characteristics may have been of interest, we could only examine the data recorded. A final limitation of this study is that it occurred in a specific geographical and cultural area, which may not be generalizable to other regions. However, as other resource-limited settings move to scale-up HIV testing for larger populations and using community-based approaches, these results underscore the importance of considering how uptake of pediatric testing can be maximized for this vulnerable population.

In conclusion, home-based counseling and testing offers an important method for identifying the HIV-infected children early in their disease course. Maximizing the uptake of pediatric HIV testing for this vulnerable population will ensure optimal therapy and effective public health interventions to prevent transmission. While we were able to test almost 1,300 children and to identify 60 new pediatric HIV cases through HCT in a single community, HIV testing was not accepted for almost half of the high-risk children to whom testing was offered. In addition to the mother's HIV status and living status, whether or not the children had parents in the household and their relationship to the head of the household appeared to play an important role in whether their caregivers accepted HIV testing for the children. When parents or guardians refuse to test even high-risk children for HIV, urgent attention needs to be paid to identifying the caregivers' barriers to pediatric testing and overcoming these barriers.

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REFERENCES

1. Priority Interventions: HIV/AIDS prevention, treatment, and care in the health sector. 1.2 ed. Geneva, Switzerland: World Health Organization; 2009.
2. Taha TE, Graham SM, Kumwenda NI, Broadhead RL, Hoover DR, Markakis D, et al. Morbidity among human immunodeficiency virus-1–infected and -uninfected African children. Pediatrics. 2000; 106:e77. [PubMed: 11099620]
3. Newell ML, Coovadia H, Cortina-Borja M, Rollins N, Gaillard P, Dabis F. Mortality of infected and uninfected infants born to HIV-infected mothers in Africa: a pooled analysis. Lancet. 2004; 364:1236–1243. [PubMed: 15464184]
4. Join United Nationa Programme on HIV/AIDS (UNAIDS). 2008. Children and AIDS, Third Stocktaking Report 2008.
5. Wanyenze RK, Nawavvu C, Namale AS, Mayanja B, Bunnell R. Acceptability of routine HIV counselling and testing, and HIV seroprevalence in Ugandan hospitals. Bulletin of the World Health Organization. 2008; 86:302–309. [PubMed: 18438519]
6. Mossdorf E, Stoeckle M, Vincenz A, Mwaigomole EG, Chiweka E, Kibatala P, et al. Impact of a national HIV voluntary counselling and testing (VCT) campaign on VCT in a rural hospital in Tanzania. Tropical Medicine and International Health. 2010; 15:567–573. [PubMed: 20345555]
7. Bahwere P, Piwoz E, Joshua MC, Sadler K, Grobler-Tanner CH, Guerrero S, Collins S. Uptake of HIV testing and outcomes within a Community-based Therapeutic Care (CTC) programme to treat severe acute malnutrition in Malawi: a descriptive study. BMC Infect Dis. 2008; 8:106. [PubMed: 18671876]
8. Thurstans S, Kerac M, Maleta K, Banda T, Nesbitt A. HIV prevalence in severely malnourished children admitted to nutrition rehabilitation units in Malawi: geographical & seasonal variations a cross-sectional study. BMC Pediatrics. 2008; 8
9. Yoder, PS.; Katahoire, AR.; Kyaddondo, D.; Akol, Z.; Bunnell, R. DHS Qualitative Research Studies. Maryland: Calverton; 2006. Home-based HIV testing and counselling in a survey context in Uganda.
10. Wools-Kaloustian K, Kimaiyo S, Diero L, Siika A, Sidle J, Yiannoutsos CT, et al. Viability and effectiveness of large-scale HIV treatment initiatives in sub-Saharan Africa: experience from western Kenya. Aids. 2006; 20:41–48. [PubMed: 16327318]
11. Kimaiyo S, Were M, Shen C, Ndege S, Braitstein P, Sidle J, Mamlin J. Know your epidemic: Scaling-up home-based HIV counseling and testing in western Kenya. Journal of the International AIDS Society. 2009 IN PRESS.

12. Kimaiyo S, Were MC, Shen C, Ndege S, Braitstein P, Sidle J, Mamlin J. Know your epidemic: Scaling-up home-based HIV counseling and testing in western Kenya. Journal of the International AIDS Society. 2010 IN PRESS.

13. Einterz RM, Kimaiyo S, Mengech HN, Khwa-Otsyula BO, Esamai F, Quigley F, Mamlin JJ. Responding to the HIV pandemic: the power of an academic medical partnership. Acad Med. 2007; 82:812–818. [PubMed: 17762264]

14. Einterz RM, Kelley CR, Mamlin JJ, Van Reken DE. Partnerships in international health. The Indiana University-Moi University experience. Infect Dis Clin North Am. 1995; 9:453–455. [PubMed: 7673682]

15. Wanyenze R, Kamya M, Liechty CA, Ronald A, Guzman DJ, Wabwire-Mangen F, et al. HIV counseling and testing practices at an urban hospital in Kampala, Uganda. AIDS Behav. 2006; 10:361–367. [PubMed: 16395619]

16. Vreeman RC, Nyandiko W, Ayaya SO, Walumbe EG, Marrero DG, Inui TS. Caregivers' perceptions of the impact of disclosure of pediatric HIV status on antiretroviral therapy adherence in a resource-limited setting. AIDS Patient Care STDS. 2010 IN PRESS.

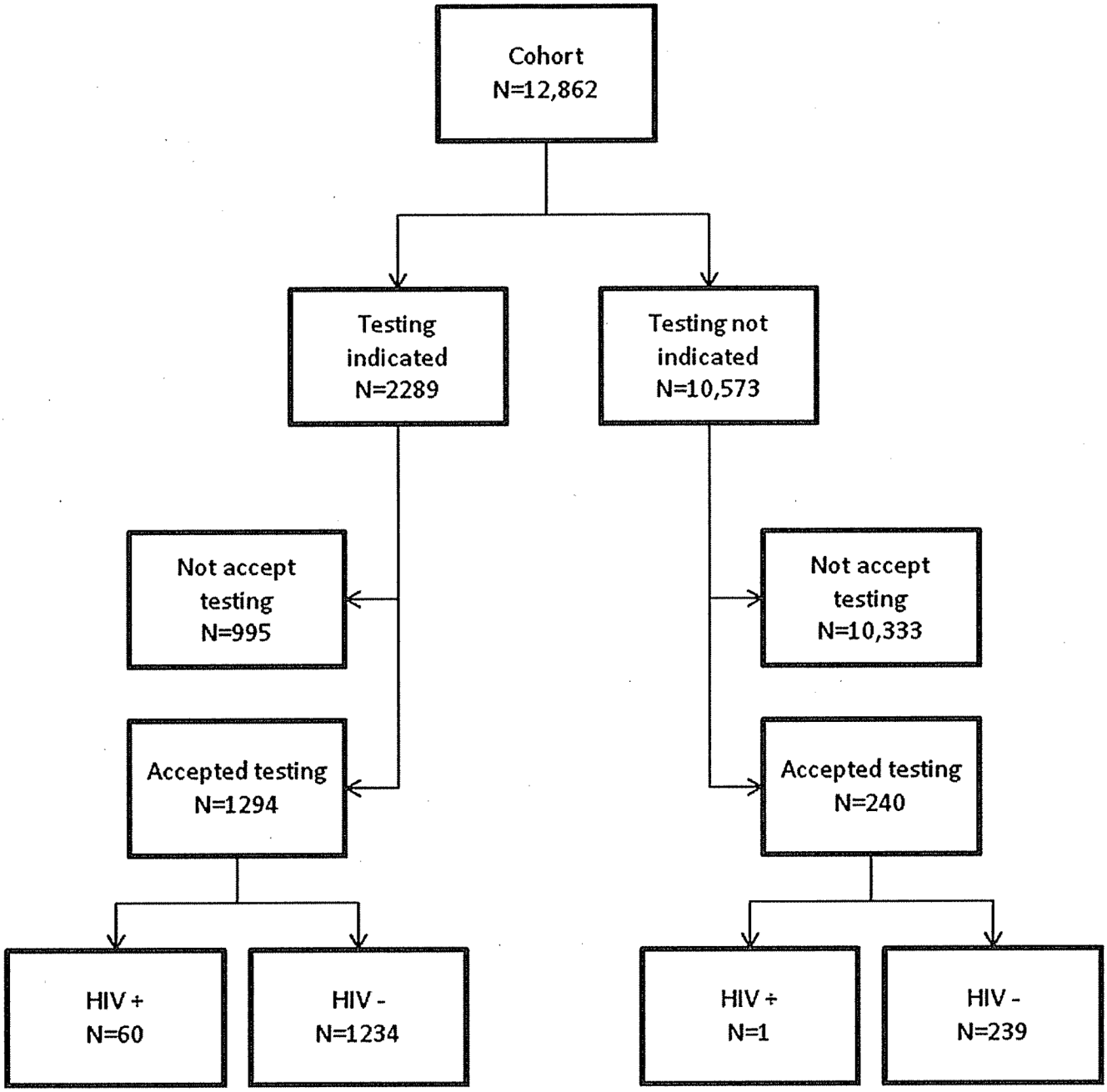

Figure 1.
Flow Diagram for Acceptance of Pediatric Testing Through HCT in Turbo, Kenya.

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Table 1

Characteristics of Children Identified Through HCT.

		Testing not Indicated		Testing Indicated			
		Mother Alive, HIV Negative		Testing Indicated, Not Tested		Testing Indicated, Tested	
		N=10,573		N=995		N=1294	
		N	%	N	%	N	%
Gender	Female	5,232	49.5%	462	46.4%	637	49.2%
	Male	5,341	50.5%	533	53.6%	657	40.8%
Age	1	1,073	10.1%	76	7.6%	68	5.2%
	2	1,707	16.1%	128	12.9%	113	8.7%
	3	1,428	13.5%	135	13.6%	141	10.9%
	4	1,245	11.8%	99	9.9%	125	9.7%
	5	988	9.3%	99	9.9%	127	9.8%
	6	809	7.7%	74	7.4%	107	8.3%
	7	679	6.4%	64	6.4%	102	7.9%
	8	726	6.9%	90	9.0%	119	9.2%
	9	518	4.9%	58	5.8%	94	7.3%
	10	543	5.1%	71	7.1%	117	9.0%
	11	395	3.7%	43	4.3%	89	6.9%
	12	462	4.4%	58	5.8%	92	7.1%
Parents in household	No	608	5.8%	273	27.4%	586	45.3%
	Yes	9,965	94.2%	719	72.3%	708	54.7%
	Missing	0	0.0%	3	0.3%		
Household status	1	9,687	91.6%	621	62.4%	608	47.0%
	2	605	5.7%	287	28.8%	529	40.9%
	3	134	1.3%	25	2.5%	17	1.3%
	4	22	0.2%	15	1.5%	46	3.6%
	5	40	0.4%	27	2.7%	60	4.6%
	6	3	0.0%	5	0.5%	7	0.5%

		Testing not Indicated		Testing Indicated			
		Mother Alive, HIV Negative		Testing Indicated, Not Tested		Testing Indicated, Tested	
		N=10,573		N=995		N=1294	
		N	%	N	%	N	%
	8	4	0.0%	0	0.0%	0	0.0%
	9	13	0.1%	6	0.6%	15	1.1%
	Missing	65	0.6%	9	0.9%	12	0.9%
Father HIV status	No	5,220	49.4%	214	21.5%	218	16.8%
	Yes	95	0.9%	73	7.3%	171	13.2%
	Unknown	5,258	49.7%	708	71.2%	905	69.9%
Father died	No	9,996	94.5%	796	80.0%	941	72.7%
	Yes	317	3.0%	86	8.6%	178	13.8%
	Unknown	260	2.5%	113	11.4%	175	13.5%
Child immunized	No	91	0.9%	6	0.6%	16	1.2%
	Yes	5,360	50.7%	419	42.1%	413	31.9%
	Unknown	5,122	48.4%	570	57.2%	865	66.8%

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Table 2

HIV Test Results Among Children Tested in HCT

Group based on Mother Risk	HIV Negative		HIV Positive	
	N	% of group	N	% of group
Mother: HIV unknown and alive	579	99.1%	5	0.9%
Mother: HIV-uninfected or unknown and living status unknown	52	100.0%	0	0.0%
Mother: HIV-uninfected or unknown and dead	132	95.7%	6	4.3%
Mother: HIV-infected and alive	424	91.0%	42	9.0%
Mother: HIV-infected and dead or unknown	47	87.0%	7	13.0%
Total among those tested	1234	95.8%	60	4.7%

Table 3

Acceptance of Pediatric HIV Testing Based on Mother's Risk Factors.

		Mother: HIV unknown and alive (1)				Mother: HIV-infected or unknown and living status unknown or dead (2+3)				Mother: HIV-infected and alive (4)				Mother: HIV-infected and living status unknown or dead (5)			
		Not tested N=699		Tested N=584		Not tested N=109		Tested N=190		Not tested N=169		Tested N=466		Not Tested N=18		Tested N=54	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Child's gender	Female	321	45.9%	295	50.5%	45	41.3%	91	47.9%	86	50.9%	226	48.5%	10	55.6%	25	46.3%
	Male	378	54.1%	289	49.5%	64	58.7%	99	52.1%	83	49.1%	240	51.5%	8	44.4%	29	53.7%
Child's age	18mo-<24mo	58	8.3%	23	3.9%	3	2.8%	7	3.7%	15	8.9%	36	7.7%	0	0.0%	2	3.7%
	2yr-2yr11mo	96	13.7%	48	8.2%	14	12.8%	16	8.4%	17	10.1%	48	10.3%	1	5.6%	1	1.9%
	3yr-3yr11mo	105	15.0%	53	9.1%	14	12.8%	18	9.5%	15	8.9%	70	15.0%	1	5.6%	0	0.0%
	4yr-4yr11mo	70	10.0%	50	8.6%	10	9.2%	18	9.5%	17	10.1%	52	11.2%	2	11.1%	5	9.3%
	5yr-5yr11mo	63	9.0%	54	9.2%	9	8.3%	16	8.4%	26	15.4%	54	11.6%	1	5.6%	3	5.6%
	6yr-6yr11mo	55	7.9%	56	9.6%	9	8.3%	16	8.4%	8	4.7%	33	7.1%	2	11.1%	2	3.7%
	7yr-7yr11mo	35	5.0%	51	8.7%	9	8.3%	10	5.3%	18	10.7%	36	7.7%	2	11.1%	5	9.3%
	8yr-8yr11mo	62	8.9%	54	9.2%	13	11.9%	17	8.9%	11	6.5%	38	8.2%	4	22.2%	10	18.5%
	9yr-9yr11mo	38	5.4%	45	7.7%	7	6.4%	14	7.4%	13	7.7%	33	7.1%	0	0.0%	2	3.7%
	10yr-10yr11mo	47	6.7%	57	9.8%	9	8.3%	22	11.6%	13	7.7%	29	6.2%	2	11.1%	9	16.7%
	11yr-11yr11mo	32	4.6%	49	8.4%	6	5.5%	15	7.9%	4	2.4%	17	3.6%	1	5.6%	8	14.8%
	12yr-12yr11mo	38	5.4%	44	7.5%	6	5.5%	21	11.1%	12	7.1%	20	4.3%	2	11.1%	7	13.0%
Both parents in Household	No	197	28.2%	321	55.0%	41	37.6%	145	76.3%	25	14.8%	75	16.1%	10	55.6%	45	83.3%
	Yes	502	71.8%	263	45.0%	65	59.6%	45	23.7%	144	85.2%	391	83.9%	8	44.4%	9	16.7%
	Missing	0	0.0%			3	2.8%			0	0.0%			0	0.0%		0.0%
Child's relationship to head of house	Child	397	56.8%	139	23.8%	62	56.9%	42	22.1%	154	91.1%	421	90.3%	8	44.4%	6	11.1%
	Grand child	235	33.6%	384	65.8%	29	26.6%	89	46.8%	14	8.3%	31	6.7%	9	50.0%	25	46.3%
	Sibling	18	2.6%	10	1.7%	6	5.5%	3	1.6%	1	0.6%	3	0.6%	0	0.0%	1	1.9%
	Foster or Stepchild	12	1.7%	11	1.9%	3	2.8%	28	14.7%	0	0.0%	1	0.2%	0	0.0%	6	11.1%
	Niece, Nephew, Cousin	21	3.0%	31	5.3%	5	4.6%	14	7.4%	0	0.0%	4	0.9%	1	5.6%	11	20.4%

		Mother: HIV unknown and alive (1)				Mother: HIV-infected or unknown and living status unknown or dead (2+3)				Mother: HIV-infected and alive (4)				Mother: HIV-infected and living status unknown or dead (5)			
		Not tested N=699		Tested N=584		Not tested N=109		Tested N=190		Not tested N=169		Tested N=466		Not Tested N=18		Tested N=54	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	Househelp	4	0.6%	4	0.7%	1	0.9%	1	0.5%	0	0.0%	1	0.2%	0	0.0%	1	1.9%
	Self	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	4	0.6%	0	0.0%	2	1.8%	12	6.3%	0	0.0%	2	0.4%	0	0.0%	1	1.9%
	Missing	8	1.1%	5	0.9%	1	0.9%	1	0.5%	0	0.0%	3	0.6%	0	0.0%	3	5.6%
Father HIV status	No	146	20.9%	93	15.9%	41	37.6%	35	18.4%	24	14.2%	88	18.9%	3	16.7%	2	3.7%
	Yes	8	1.1%	11	1.9%	4	3.7%	7	3.7%	52	30.8%	121	26.0%	9	50.0%	32	59.3%
	Unknown	545	78.0%	480	82.2%	64	58.7%	148	77.9%	93	55.0%	257	55.2%	6	33.3%	20	37.0%
Father died	No	577	82.5%	452	77.4%	79	72.5%	94	49.5%	130	76.9%	382	82.0%	10	55.6%	12	22.2%
	Yes	41	5.9%	48	8.2%	9	8.3%	35	18.4%	30	17.8%	62	13.3%	6	33.3%	33	61.1%
	Unknown	81	11.6%	83	14.2%	21	19.3%	61	32.1%	9	5.3%	22	4.7%	2	11.1%	9	16.7%
Child immunized	No	3	0.4%	4	0.7%	1	0.9%	6	3.2%	2	1.2%	6	1.3%	0	0.0%	0	0.0%
	Yes	314	44.9%	165	28.3%	39	35.8%	43	22.6%	62	36.7%	198	42.5%	4	22.2%	7	13.0%
	Unknown	382	54.6%	415	71.0%	69	63.3%	141	74.2%	105	62.1%	262	56.2%	14	77.8%	47	87.0%
Previous HIV test	No	695	99.4%	581	99.5%	105	96.3%	185	97.4%	131	77.5%	425	91.2%	9	50.0%	45	83.3%
	Yes	4	0.6%	3	0.5%	4	3.7%	5	2.6%	38	22.5%	41	8.8%	9	50.0%	9	16.7%
HIV results	Negative			579	99.1%			184	96.8%			424	91.0%			47	87.0%
	Positive			5	0.9%			6	3.2%			42	9.0%			7	13.0%

Optional Table

Adjusted odds of accepting pediatric HIV testing by demographics.

	Odds Ratio	95% Confidence Intervals
Mother HIV unknown and alive	**0.34**	**0.18–0.66**
Mother HIV negative or unknown and living status unknown	0.91	0.39–2.15
Mother HIV negative or unknown and dead	0.55	0.27–1.11
Mother HIV positive and alive	**3.20**	**1.64–6.23**
Male	0.88	0.73–1.06
Age		
2yr – 2yr11mo	0.96	0.61–1.53
3yr – 3yr11mo	1.10	0.70–1.73
4yr–4yr11mo	1.44	0.90–2.30
5yr – 5yr11mo	1.10	0.43–2.80
6yr – 6yr11mo	1.65	0.64–4.27
7yr – 7yr11mo	1.44	0.55–3.73
8yr – 8yr11mo	1.09	0.43–2.79
9yr – 9yr11mo	1.48	0.57–3.87
10yr – 10yr11mo	1.49	0.58–3.85
11yr – 11yr11mo	2.03	0.77–5.38
12yr – 12yr11mo	1.54	0.59–4.02
Both parents in household	**0.50**	**0.40–0.63**
Father not in household	**1.41**	**1.24–1.56**
Child's relationship to head of household		
Child	Reference	
Grandchild	**4.02**	**3.06–5.28**
Sibling	1.03	0.52–2.05
Foster child or step child	**4.35**	**2.26–8.40**
Niece, nephew, or cousin	**4.11**	**2.41–7.01**
Househelp, employee	2.01	0.57–7.07
Other	2.50	0.88–7.08
Missing	1.91	0.73–5.02
Father HIV positive	0.80	0.53–1.21
Father's HIV status unknown	**0.58**	**0.44–0.76**
Father dead	0.99	0.72–1.36
Father's living status unknown	0.90	0.66–1.22
Child immunized	0.65	0.22–1.85
Child's immunization record unknown	0.76	0.20–2.84
Previously tested	**0.30**	**0.19–0.46**

Notes: Bold indicates statistical significance. Variables of child's age 18mo – <24mo and Mother HIV positive & mother dead or living status unknown dropped because of collinearity.