



## ORIGINAL ARTICLE

# Evaluation and Utility of a Family Information Table to Identify and Test Children at Risk for HIV in Kenya

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## ABSTRACT

**Background:** Effective strategies to identify and screen children at risk for HIV are needed. The objectives of this study were to evaluate the utilization of a family information table (FIT) to identify and test at-risk children in Kenya and identify factors associated with child testing.

**Methods:** A cross-sectional study was conducted among HIV-infected adults with children at five Kenyan clinics. HIV testing status for children aged  $\leq 18$  years was gathered from the patients' FITs and compared to reports from in-person clinic visits as the gold standard. Generalized estimating equations were used to assess predictors for HIV testing of children adjusted for confounders and within parent correlation.

**Results:** Our sample included 384 HIV-infected adults enrolled in care with 933 reported children. Overall, 323 FITs (84%) correctly listed all children in the family and 340 (89%) documented an HIV testing status (including untested) for all children. Seventy-five percent of parents verbally reported all children tested, compared to only 46% of FITs ( $OR=13.5$ , 95% CI 6.5-27.8). Verbal reports identified 739 (79%) children tested, with 55 (7.4%) HIV-positive and 17 (2.3%) HIV-exposed infants (HEI). Of 63 adults with HIV-positive children or HEI, 60 (95%) reported enrolling children into care. Likelihood that children had been tested was higher for younger children ( $\leq 4$  y vs.  $> 4$  y,  $aOR=2.0$ ; 95% CI 1.4-2.9) and lower if the partner's serostatus was unknown vs. seropositive ( $aOR=0.3$ ; 95% CI: 0.1-0.8).

**Conclusions:** Although the FIT may be a useful tool to identify children at risk for HIV, this study found underutilization by providers. To maximize impact of this tool, documentation of follow-up for untested and positive children is essential.

**Global Health Implications:** Through early documentation of at-risk children and follow up of untested and infected children, the FIT may serve as an effective resource for improving HIV testing and linkage to care.

**Key Words :** Family Information Table • Pediatrics • HIV/AIDS • Linkage • Kenya • HIV Testing

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## Introduction

In 2012, new pediatric HIV infections decreased by 38% in 21 priority countries; however, only one in three HIV-infected children received antiretroviral treatment (ART).<sup>[1]</sup> Currently, ART is initiated in children with advanced HIV infection, at an average age of five years old, but the most recent World Health Organization (WHO) recommendations suggest immediate ART initiation. This requires earlier identification and testing of infants and at-risk children along with rapid, effective linkage to care.<sup>[2]</sup> Early diagnosis and treatment is crucial because HIV-positive patients of all ages who enter care early have better clinical outcomes.<sup>[3]</sup>

Although there have been concerted efforts to expand HIV testing and access to HIV care in Kenya, overall rates of treatment still remain quite low for children. It is estimated that 120,000-150,000 children are infected in Kenya, with 20,000-30,000 children acquiring HIV annually.<sup>[4]</sup> In Kenya, 74% of HIV-positive adults needing treatment currently receive care; however, only 21% of HIV-positive children receive treatment.<sup>[5]</sup> Identification of HIV-positive children remains a major barrier to linking children to care, and discrepancies between actual risk and perception of risk for HIV amongst

caregivers exist.<sup>[4]</sup> One study in Kenya showed that although 95-98% of caregivers stated that they would take their own child for HIV testing if disease was suspected, only 7-14% had done so.<sup>[4]</sup> Thus, there is a need to implement effective interventions to overcome barriers to testing.

Several studies in sub-Saharan African countries have demonstrated that by offering HIV testing and care to families, pregnant women are more likely to undergo HIV testing, to obtain their results, to adhere to therapy, and to disclose their HIV status to their partners.<sup>[6-8]</sup> One study reported on the success of an integrated family model of care, one component of which was the use of a family information table (FIT) to record partners and children of HIV-infected patients and their respective HIV status. This study demonstrated for each index patient, 2.5 family members at risk were identified; 1.6 family members were tested; and 61% of those family members identified and tested were children.<sup>[9]</sup> However, this study was limited to one site and did not specifically evaluate the level of utilization of the family information table within routine HIV care. This study extends prior work by evaluating the use of a FIT within routine care at multiple clinic sites in Kenya. It also examines parent and child factors associated with child testing status.

**Figure 1** Family Information Table (FIT)

**Family Information Table**

Name:	Patient No:				
	Name	Date of Birth	HIV Status: POS/ NEG/ Unknown (indicate mo/yy of most recent test)	if POS: PCS NO/Site (or indicate if not in care)	TB sputum AAFB +ve -ve
<b>Spouse/s</b> or partner/s or co-wives	1 2 3				
<b>Children</b>	1 2 3 4 5 6 7				

## Objectives

The primary objective of this study was to evaluate utilization of the FIT to identify and screen at-risk children of parents receiving routine HIV care in Kenya. Our secondary objectives were to determine factors associated with child testing and assess proportion HIV-positive enrolled into care.

## Methods

**Study Design.** From June through August 2012, a cross-sectional study was conducted among a convenience sample of HIV-infected adults with children at Family AIDS Care & Education Services (FACES)-supported clinics in Nyanza Province, Kenya.

**Setting.** FACES is a collaboration between the University of California, San Francisco (UCSF), the Kenya Medical Research Institute (KEMRI), and the Kenya Ministry of Health (MOH) funded by the Presidential Emergency Plan for AIDS Relief. FACES supports comprehensive HIV prevention as well as care and treatment through the MOH for over 80,000 HIV-infected patients in Nairobi and Nyanza Provinces where HIV prevalence is the highest in Kenya.

FACES has implemented a FIT as part of routine care to identify patients at high risk of contracting HIV, increase enrollment of HIV-positive patients into care, and prevent HIV transmission (see Figure 1). When an “index patient” is identified as HIV-positive, providers use the FIT to identify “family members at risk” (including partner(s) of the index patient and/or the patient’s children under the age of 18 years). Patients are asked about the number and ages of their children and their children’s current HIV testing status. Those with known positive children are asked if those children were enrolled into care. Children’s HIV testing status is recorded as negative, positive, HIV-exposed infant (HEI), not tested, or unknown. Family members with unknown status or ongoing risk of HIV acquisition are invited for HIV counseling and testing. Clinicians are instructed to review FIT information with patients and update the FIT at all routine follow-up visits.

**Participants.** Information was gathered from 384 HIV-positive patients with children during routine

clinic visits and from patients’ charts. Participants were drawn from five FACES-supported clinics in two regions, one urban and one rural. Patients were selected from a convenience sample without randomization.

**Measurements.** Primary endpoints included FIT utilization as measured by documentation of all at-risk children in family and documentation of children’s HIV test status. Secondary endpoints included demographic factors associated with child testing and proportion enrolled into care if HIV-positive.

**Chart and Clinic Data.** Data was abstracted from patients’ charts, including the patient’s age, gender, educational attainment, number of children, and job status. Partner serostatus and disclosure status to partner at the time of enrollment into care were also recorded. Number and ages of children, children’s current HIV testing status, and enrollment into care if HIV-positive were abstracted from the FIT.

**FIT Utilization.** Utilization of the FIT was assessed by comparing number of children (18 years old and younger) and HIV testing status of each child listed on the FIT against verbal report by the parent during the clinic visit. Client verbal reports were treated as the gold standard for current family member testing information. A FIT was deemed well-utilized if all children were listed, a test status was recorded (positive, negative, unknown, or not tested), and the test status conformed with the parent’s report. Enrollment to care for positive children was ascertained via parent verbal report.

**Statistical Analysis.** Frequencies and proportions are presented for categorical variables; the median and range are presented for continuous variables. Patient charts had substantial proportions of missing data for child’s age (46/933, 5%), parent’s educational attainment (58/384, 15%), and parent’s job status (90/384, 23%), with at least one of the patient’s or child’s characteristics missing in 29% of all observations (272/933). A sensitivity analysis of our data found missingness of occupational status dependent on site, supporting the use of multiple imputations over complete case analysis. The Markov Chain Monte Carlo (MCMC) method was used to construct a multiple imputation model. Disclosure

to a partner was omitted from the imputation model because just 1% of patients indicated they had not disclosed. All categorical variables were investigated for multi-collinearity using the Pearson's correlation coefficient.

Generalized estimating equations were employed to assess outcomes while adjusting for the correlation of responses for children of the same parent. Effect estimates are reported in the form of odds ratios and their associated 95% confidence intervals. The dependent variable in each analysis was the child's test status (tested vs. not tested). An initial set of bivariate models were fit to assess the crude odds of having been tested by the child's age and parent's clinical and demographic factors. Multivariable models were then fit, which included all predictors from the crude analyses. All analyses were conducted using SAS version 9.3.

**Ethical Review.** These data are routinely collected through the FACES program. An evaluation protocol is reviewed and approved annually by the KEMRI Ethical Review Committee, UCSF Committee on Human Research, and the Associate Director for Science, Division of Global HIV/AIDS, U. S. Centers for Disease Control and Prevention.

## Results

**Participants.** A total of 384 HIV-infected adults with 933 children were identified. Of these, 59% were female; median age was 36 years (IQR 30-43). At the time of enrollment into care, over 50% of the participants had attended school for less than seven years; 80% were working; and participants had a median of 2 (IQR 1-3) children in the family. At the time of the clinic visit, 99% of patients had disclosed to their partner or did not have a partner, and 52% of partners were reported as HIV-positive (Table 1).

**FIT Utilization.** Of the 384 FITs examined, 323 (84%) correctly listed all children, and 340 (89%) had HIV testing status documented for all children. When comparing the report at clinic visit to the FIT, 75% of patients reported all children in the family tested versus only 46% of FITs ( $OR=13.5$ , 95% CI: 6.5, 27.8).

## HIV Status of Children and Enrollment into Care.

Overall, 933 children were verbally reported; median age was 9 years (IQR 5-13) and 739 (79%) children had been tested for HIV leaving 194 (21%) untested. Of those tested, 55 (7.4%) tested positive, 667 (90.3%) were negative, and 17 (2.3%) were HIV-exposed infants (HEI). Of 63 adult patients with HIV-positive children or HEI, 60 (95%) reported enrolling their children into HIV care or HEI monitoring.

## Demographic and Clinical Variables and Likelihood of Testing Children.

On crude analysis, the odds that a child had been tested decreased with increasing age of the child. Testing rates were highest among children ages 0-4 years and lowest among those 14-18 years (Table 2). The odds that a child had been tested were lower in patients without a partner ( $OR=0.5$ , 95% CI: 0.29, 0.86) or whose partner had an unknown HIV serostatus compared to patients with a HIV-seropositive partner ( $OR=0.4$ , 95% CI: 0.18, 0.91). Whether the child had been tested was not associated with parent's gender, parent's age, parent's educational attainment, number of children in the household, parent's work status, disclosure to the partner, or clinic site.

In multivariable regression, child's age and knowledge of partner's serostatus remained strong predictors of testing status (Table 2). Compared to children  $>4$  years old, children  $\leq 4$  were almost twice as likely to be tested ( $aOR=1.98$ , 95%CI: 1.37, 2.88). The age of the parent also emerged as a potential predictor of the child's test status with patients aged 30-39 years old more likely to have their children tested as compared to patients aged 18-29 years old ( $aOR=2.10$ , 95% CI: 1.03, 4.31).

## Conclusion

Our results show a high utilization of the FIT incorporated into routine clinic visits, with 84% of FITs correctly listing all children and 89% documenting HIV testing status of children. Furthermore, there was high uptake of pediatric testing amongst children of HIV positive parents (79%) and high reported enrollment to care for HIV positive children (95%). These figures are higher than Kenyan national estimates, which suggest only 41% of HIV-

## Evaluation of Family Information Table

**Table I** Socio-demographic characteristics of families assessed using the Family Information Table (FIT)

Measure- Parent	N (%) N=384	Measure-Child	N (%) N=933
<b>Gender</b>		<b>Child's age, median*</b>	9 (5-13)
Female	226 (58.9)	0-4	200 (21.4)
Male	155 (40.4)	5-9	278 (29.8)
Missing	3 (0.7%)	10-13	206 (22.1)
		14-18	203 (21.8)
		Missing	46 (4.9)
<b>Age* (median = 36)</b>		<b>Child's testing status*</b>	
18-29	94 (24.5)	Tested	739 (79.2)
30-39	157 (40.9)	Positive	55 (7.4)
40-49	88 (22.9)	Negative	667 (90.3)
50+	41 (10.7)	Exposed	17 (2.3)
Missing	4 (1.0)	Not tested	194 (20.8)
<b>Educational attainment†</b>			
<7 years	177 (46.1)		
7-11 years	114 (29.7)		
>12 years	35 (9.1)		
Missing	58 (15.1)		
<b>Number of children (median)*</b>	2 (1-3)		
1	112 (29.2)		
2	117 (30.5)		
3	78 (20.3)		
4+	77 (20.0)		
Missing	0 (0.0)		
<b>Job status†</b>			
Not working	59 (15.4)		
Working	235 (61.2)		
Missing	90 (13.4)		
<b>Partner serostatus*</b>			
Negative	60 (15.6)		
Positive	198 (51.6)		
Unknown	27 (7.0)		
Single/Not sexually active	99 (25.8)		
Missing	0 (0.0)		
<b>Has disclosed to partner*</b>			
Yes	285 (74.2)		
No	4 (1.0)		
No partner	95 (24.7)		
Missing	0 (0.0)		

\* At current visit.

† At enrollment.

**Table 2** Crude and adjusted odds ratios for association between parent and child measures with child testing status using generalized estimating equations (n=933)†

Measure	Crude Odds Ratio†	95% CI	p-value	Adjusted Odds Ratio‡	95% CI	p-value
<i>Parent</i>						
Gender						
Female	Ref			Ref		
Male	0.82	0.51, 1.31	0.41	0.64	0.36, 1.13	0.12
Age						
18-29	Ref			Ref		
30-39	1.39	0.74, 2.61	0.30	2.10	1.03, 4.31	0.04
40-49	0.91	0.47, 1.75	0.78	1.64	0.79, 3.43	0.19
50+	0.80	0.35, 1.84	0.60	1.57	0.58, 4.20	0.37
<i>Educational attainment</i>						
<7 years	Ref			Ref		
7-11 years	0.82	0.50, 1.34	0.44	0.89	0.54, 1.47	0.66
>12 years	0.80	0.39, 1.66	0.56	0.82	0.38, 1.77	0.62
<i>Number of children</i>						
1	Ref			Ref		
2	1.24	0.67, 2.30	0.49	1.06	0.55, 2.03	0.86
3	0.91	0.47, 1.77	0.79	0.71	0.35, 1.47	0.36
4+	1.16	0.61, 2.23	0.65	0.71	0.33, 1.52	0.38
<i>Job status</i>						
Not working	Ref			Ref		
Working	0.92	0.55, 1.56	0.76	0.94	0.53, 1.66	0.82
<i>Partner serostatus</i>						
Negative	0.89	0.44, 1.79	0.73	1.05	0.49, 2.24	0.90
Positive	Ref			Ref		
Unknown	0.40	0.18, 0.91	0.03	0.32	0.13, 0.83	0.02
Single/Not sexually active	0.50	0.29, 0.86	0.01	0.20	0.01, 2.94	0.24
<i>Has disclosed to partner</i>						
Yes	Ref			Ref		
No	0.64	0.18, 2.29	0.49	0.46	0.03, 6.87	0.58
<i>Clinic Sites</i>						
Site 1	REF			REF		
Site 2	0.95	0.51, 1.79	0.88	0.92	0.47, 1.80	0.81
Site 3	0.67	0.36, 1.25	0.21	0.71	0.36, 1.38	0.31
Site 4	2.09	0.69, 6.31	0.19	2.60	0.81, 8.36	0.11
Site 5	0.51	0.25, 1.04	0.07	0.52	0.24, 1.13	0.10
<i>Child</i>						
<i>Age</i>						
0-4	Ref			Ref		
5-9	0.60	0.43, 0.86	0.00	0.58	0.40, 0.84	0.00
10-13	0.53	0.36, 0.77	0.00	0.48	0.32, 0.73	0.00
14-18	0.45	0.30, 0.67	<.0001	0.40	0.26, 0.63	<.0001

\* Based on multiple imputation of parent's gender, age, educational attainment, and job status.

† Crude odds ratios.

‡ Odds ratios after adjustment for child's age and parent's: age, parent's gender, parent's educational attainment, household number of children, parent's job status, partner serostatus, disclosure to a partner, and HIV clinic site.

infected children have been identified,<sup>[10]</sup> and only 1 in 5 of those needing treatment are receiving it. Our study indicates that use of a FIT as part of routine HIV care may substantially increase screening of at-risk children and support enrollment to care for HIV infected children.

However, the discrepancies between data gathered from the in-person clinic visits and the data from FITs in the charts suggest the FIT may be underutilized. While 75% of patients reported all children tested, only 46% of children were documented as tested on the FIT. This may reflect a failure to update the FIT with current information at each visit. Alternatively, it is possible that parents were influenced by social desirability bias to report their children tested even when they had not been. It is essential that providers update the FIT at each visit to identify and test at-risk children and new partners. Additionally, 25% of parents reported some untested children. It is critical these children be tested and enrolled into care if positive.

The odds a child had been tested decreased with increasing age of the child, reflecting a potential gap in identification and testing of older children. Early infant diagnosis programs in Kenya have recently improved dramatically, with an increase in the total number of early-infant diagnosis sites in Kenya increasing from 434 to 1216 between 2007 to 2009;<sup>[11]</sup> this increased focus on infant testing may have benefited younger children more. In addition, since the odds of testing children decreased if the patient did not know the serostatus of the partner, couples counseling and partner testing may increase the likelihood of testing of children.

Strengths of our study include evaluation of the FIT during routine care in a real world setting, data from multiple clinic sites, access to both clinical charts and parent in-person reports, and the ability to examine a variety of parent and infant clinical and demographic factors that could influence child testing status. One limitation of this study is reliance on parent self-report to establish children's HIV status, which could introduce the risk of social desirability bias. Clinicians should be encouraged to corroborate self-reports with official documentation of the children's HIV testing results.

## Global Health Implications

An estimated 3.4 million children are currently living with HIV,<sup>[1]</sup> and over seventy percent are not receiving life-saving treatment.<sup>[12]</sup> The use of a family information table as part of routine HIV care is an inexpensive and effective resource for targeting at-risk children and has the potential to facilitate early identification and linkage to care. As with many potential interventions to improve the care of children living with HIV, evaluation in real-world settings to identify challenges and limitations of these interventions is important in order to maximize impact. Currently, a version of the FIT is being implemented nationally in Kenya for all HIV-positive individuals in care, and could eventually be implemented globally for greater impact.

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## References

1. UNAIDS. 2013 progress report on the global plan towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive. Progress Report. Joint United Nations Program on HIV/AIDS (UNAIDS), Geneva; 2013.
2. World Health Organization. Consolidated guidelines on the use of antiretroviral drugs for

- treating and preventing HIV infection. World Health Organization, Geneva, June 2013
3. Rosen S, Fox MP, Gill CJ. Retention in HIV care between testing and treatment in sub-Saharan Africa: A systematic review. PLoS Medicine 2007;8(7):1691-170.
  4. If you build it, will they come? Kenya healthy start pediatric HIV study: A diagnostic study investigating barriers to HIV treatment and care among children. Horizons Final Report. USAID, Washington DC; 2008.
  5. Global HIV/AIDS Response: Epidemic update and health sector progress towards Universal Access. Progress Report. WHO, UNAIDS, and UNICEF, Geneva; 2011.
  6. Desgrees-Du-Lou A, Brou H, Djohan G, Becquet R, Ekouevi DK, Zanou B, et al. Beneficial effects of offering prenatal HIV counselling and testing on developing a HIV preventive attitude among couples. Abidjan, 2002-2005. AIDS and Behavior. 2007.
  7. Msuya SE, Uriyo J, Hussain A, Mbizvo EM, Jeansson S, Sam NE, et al. Prevalence of sexually transmitted infections among pregnant women with known HIV status in northern Tanzania. Reproductive Health. 2009;6:4.
  8. Semrau K, Kuhn L, Vwalika C, Kasonde P, Sinkala M, Kankasa C, et al. Women in couples antenatal HIV counseling and testing are not more likely to report adverse social events. AIDS. 2005;19:603-609.
  9. Lewis Kulzer J, Penner JA, Marima R, Oyaro P, Oyanga AO, Shade SB, et al. Family model of HIV care and treatment: a retrospective study in Kenya. Journal of the International AIDS Society. 2012, Feb 22;15:8.
  10. National AIDS and STI Control Programme, Ministry of Health, Kenya. Kenya AIDS Indicator Survey: Preliminary Results Nairobi, Kenya: Government of Kenya; Sept 2013.
  11. Vakil S. Early Infant Diagnosis: Improving PMTCT and Paediatric HIV. EID Meeting: Improving PMTCT and Paediatric HIV program. Arusha, Tanzania, May 13-15th, 2010.
  12. Ahmed S, Kim MH, Sugandhi N, Phelps BR, Sambelli R, Diallo MO, et al. Beyond early infant diagnosis: case finding strategies for identification of HIV-infected infants and children. AIDS. 2013 Nov;27 Suppl 2:S235-45.