Initial Outcomes of Provider-Initiated Routine HIV Testing and Counseling During Outpatient Care at a Rural Ugandan Hospital: Risky Sexual Behavior, Partner HIV Testing, Disclosure, and HIV Care Seeking

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Abstract

Provider-initiated routine HIV testing is being scaled up throughout the world, however, little is known about the outcomes of routine HIV testing on subsequent behavior. This study examined the initial outcomes of provider-initiated routine HIV testing at a rural Ugandan hospital regarding partner HIV testing, sexual risk behavior, disclosure, and HIV care seeking. In a prospective cohort study, 245 outpatients receiving routine HIV testing completed baseline and 3-month follow-up interviews. After receiving routine HIV testing the percentage of participants engaging in risky sex decreased from 70.1% to 50.3% among HIV-negative and from 75.0% to 53.5% among HIV-positive participants, the percentage knowing their partner(s)' HIV status increased from 18.7% to 34.3% of HIV-negative and from 14.3% to 35.7% of HIV-positive participants. Among those reporting risky sex at baseline, HIV-positive participants were more likely to eliminate risky sex in general and specifically to become abstinent at follow-up than were HIV-negative participants. Similarly, unmarried participants who were risky at baseline were more likely to become safe in general, become abstinent, and start 100% condom use than were married/cohabitating participants. Rates of disclosure were high. Over 85% of those who tested HIV positive enrolled in care. Routine HIV testing in this setting may promote earlier HIV diagnosis and access to care but leads to only modest reductions in risky sexual behavior. To fully realize the potential HIV prevention benefits of routine HIV testing an emphasis on tailored risk-reduction counseling may be necessary.

Introduction

UGANDA IS ONE OF THE COUNTRIES most affected by the HIV epidemic. Nearly 5.5% of the adult population, or approximately 1 million adults, are HIV positive.[1] Like many places throughout the world,[2] the majority of people in Uganda who are HIV positive do not know they are positive.[3,4] The problem of undiagnosed HIV infection in Uganda is exacerbated by high prevalence of serodiscordance among couples. For example, one study in which household members of HIV-positive patients were offered HIV counseling and testing in their homes, 69% of spouses had never been tested and 43% of these couples were serodiscordant.[5] Fur-

thermore, the recent Uganda Sero-Behavioral survey found that there were a greater percentage of couples who were discordant than there were couples in which both members were HIV positive.[3] These data indicate a need to increase uptake of partner testing through increased access to HIV testing services generally.

In response to a critical need to address the problem of undiagnosed HIV infection, in accord with World Health Organization (WHO) recommendations for HIV testing in generalized epidemics where treatment is available,[2,6] Uganda is scaling up routine HIV testing and counseling in many health care facilities.[7] In contrast to client-initiated opt-in HIV testing services in which clients present to a clinic

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or HIV testing center to receive HIV testing, routine HIV testing is a provider-initiated opt-out approach in which all medical patients are routinely offered HIV testing and counseling and given the opportunity to decline testing.[6] It is hoped that expanding access to HIV testing, in part through routine HIV testing, will dramatically increase the number of people who know their status, promote earlier access to follow-up care, promote disclosure, reduce sexual risk behavior, and, as a result, reduce HIV incidence.[6]

Several countries in sub-Saharan Africa including Botswana, South Africa, Zimbabwe, Kenya, and Uganda have implemented routine HIV testing in various clinical settings including antenatal, surgical, emergency, sexually transmitted infections (STI), tuberculosis, and inpatient and outpatient departments.[8–15] Reports from Botswana indicate that their country-wide routine HIV testing program is acceptable to the community and has increased HIV testing rates and uptake of mother-to-child transmission prevention programs.[11,14] One study among hospital inpatients in Uganda indicated that over 95% of patients offered testing in routine HIV testing accepted HIV testing and received their results.[13] More modest acceptance rates (48.6%) were found among outpatients in South Africa.[15]

In addition to the main objectives of increasing the number of people who know their HIV status and promoting earlier access to care, secondary goals of routine HIV testing include increasing the uptake of partner HIV testing, decreasing sexual risk behavior following routine HIV testing and promoting disclosure.[7] Despite reports that have described encouraging acceptance rates for routine HIV testing throughout sub-Saharan Africa,[8–15] to date none have examined the effect of routine HIV testing programs in sub-Saharan Africa with regard to the program's success at achieving the secondary objectives mentioned above. The present prospective cohort study examined the initial outcomes of a provider-initiated routine HIV testing program in an outpatient department of a rural public hospital in central Uganda regarding partner HIV testing, sexual risk behavior, disclosure, and HIV care seeking.

Methods

Participants and setting

Two hundred forty-five (126 females, 119 males) patients attending an outpatient clinic and receiving provider-initiated routine HIV testing and counseling at a rural hospital in Mpigi District, Uganda, participated in a longitudinal cohort study to evaluate the routine HIV testing program. Gombe Hospital is one of several rural hospitals in Uganda offering routine HIV testing free of charge to all outpatients. The hospital also provides free antiretroviral treatment (ARVs) to patients eligible to receive treatment based on the WHO guidelines (CD4$^+$ cell count less than 200 cells/mm^3 and/or WHO clinical stage III and IV).[16]

Between February and June 2008 a research assistant nonsystematically approached outpatients waiting to be seen by the clinician. Of 566 persons approached, 149 (71 men, 78 women) declined to participate, 417 agreed, and 250 were eligible. Because of a power failure, data were lost for 5 eligible participants resulting in a baseline sample size of 245. Eligibility required being at least 18 years of age, not having tested for HIV within the prior 3 months, not having previously tested HIV positive, having had sexual contact within the prior 6 months, and not attending the clinic specifically for HIV testing. Only 1 member of a couple was allowed to participate. Of those who agreed, 167 (85 men, 82 women) were ineligible for the following reasons: sexual inactivity (71.7%), tested for HIV less than 3 months ago (17.6%), and underage (10.8%). Institutional Review Boards in the United States and Uganda and the Uganda National Council for Science and Technology approved the study.

Procedure

At enrollment, participants provided written informed consent, were seen by the clinician in the outpatient clinic, received pretest information about the routine HIV test, had their blood drawn for the HIV test, completed a one-on-one structured interviewer-administered computer-assisted personal interview (CAPI) in Luganda using QDS software (version 2.5; Nova Research Company, Bethesda, MD), were provided with HIV testing referral cards to give to their partner(s), were given an appointment date to return for a 3-month follow-up interview, and then were escorted back to clinical staff to receive their rapid HIV test results and individual posttest counseling.

The routine HIV testing and counseling was conducted by hospital staff according to standard hospital procedures which follow the Ministry of Health guidelines for routine HIV testing.[17] Routine HIV testing procedures consist of: (1) provider with first clinical contact with patient (doctor, nurse) offers the HIV test, (2) provider (nurse, doctor, lay HIV counselor) explains the test and possible results, (3) patient consents to test, (4) blood draw for the HIV test, (5) wait 15–30 minutes for test results, (6) provider explains test results and provides didactic risk-reduction information including recommendations for partner HIV testing, and (7) provider refers patient for HIV care if appropriate. Pretest procedures last approximately 2–3 minutes and provision of test results and posttest information and counseling lasts approximately 2–10 minutes.

Per hospital protocol, Determine HIV-1/2 Assay (Abbott Laboratories, Abbott Park, IL) test kits were used for rapid testing. Those found reactive with Determine were immediately confirmed reactive using Clearview HIV 1/2 STAT-PAK (Inverness Medical Innovations, Inc., Princeton, NJ). If reactive with STAT-PAK they were confirmed positive. Uni-Gold HIV (Trinity Biotech, Bray, Ireland) was used as a tie breaker if the patient was found reactive using Determine but nonreactive to STAT-PAK.

Approximately 3 months after the routine HIV test and baseline interview, participants returned to the hospital to complete a follow-up interview. To compensate for their time and transportation costs, participants received UGS 4,000 (approximately USD $2.25) and UGS 11,000 (approximately USD $6.10), respectively, for completing the baseline and 3-month follow-up interviews.

Measures

At baseline, we collected data on demographics and socioeconomic status and the participant and his/her partners' HIV testing history. Regarding partner HIV testing and knowledge of partner(s)' HIV status, we asked about the length of time since the partner(s)' last HIV test (less than prior

6 months versus more than 6 months ago). For populations at potential risk of HIV infection testing every 6 months is recommended by WHO.[6] The Ugandan Ministry of Health guidelines suggest routine offer of HIV testing for patients who have not tested within the prior 3 months.[7]

Using cued recall techniques,[18] we assessed details about the participant's sexual behavior during the prior 3 months including (1) the number and type of sexual partners (marital/cohabiting or nonmarital/cohabiting), (2) the number of vaginal and anal sex acts with each partner (however, no participants reported anal sex), and (3) how many of the reported sex acts with each partner were protected by a condom. The questions were based upon measures of sexual behavior used in sub-Saharan African settings.[19,20]

Risky sex was conceptualized from the perspective of the participant. Prior to HIV testing participants are unaware of their HIV status but implicitly assume unprotected sex with partners of unknown or presumed serodiscordant (HIV-positive) status is risky but unprotected sex with HIV-negative partners is safe. Those who become aware of their HIV-positive status still perceive unprotected sex with partners of unknown or serodiscordant status to be risky but now know that a serodiscordant partner is one who is HIV negative. This change in perception is evidenced by risk reduction behavior change among HIV-positive individuals who become aware of their status and an absence of behavior change among those who are unaware of being HIV positive.[21] Similarly, after receiving HIV test results, those learning they are HIV negative know that unprotected sex with partners of unknown or serodiscordant (HIV positive) status poses a risk of acquiring HIV. Consistent with other studies,[22] at baseline risky sex acts were defined as unprotected sex acts with partners of unknown or HIV-positive (presumed serodiscordant) status. At follow-up risky sex acts were unprotected sex acts with partners of unknown or serodiscordant HIV status. Classifying unprotected sex with a seroconcordant partner as low-risk or safe is consistent with the notion of negotiated safety which is characterized as unprotected sex with a partner of concordant serostatus in a mutually monogamous relationship.[23,24]

As with the baseline measure, at 3-month follow-up, we obtained details about participants' sexual behavior. At follow-up participants reported if their partner(s) were tested for HIV since the baseline interview and the test results. We also obtained data about partner HIV testing from hospital records by collecting the HIV testing referral cards that were provided to the participant at baseline and would have been returned if the participant's sexual partner(s) came in for testing. Participants also reported to whom they disclosed their HIV test results including spouses/partners, other family members, friends, and others. Finally, we assessed HIV care seeking for those who tested HIV positive by obtaining self-reports of accessing care; we verified these reports with clinical records. HIV-positive participants who failed to access care were asked why they did not seek care.

Data analysis approach

We used SPSS 15.0 software for data management and analysis (SPSS, Inc., Chicago, IL.). To examine differential changes over time between participants who tested HIV positive and those who tested HIV negative and between single and married/cohabiting participants we used generalized estimating equation (GEE) analyses to account for the correlated nature of repeated measures data. GEE models with a binomial distribution and logit link were used for dichotomous and proportional models (number of events occurring in a specified number of trials) and models with a Poisson distribution and log link were used for count outcomes (number of events). We present exponentiated coefficients which we tested for statistical significance using Wald χ^2 tests.

We examined changes over time in knowledge of partner(s)' HIV status reflecting uptake of partner HIV testing and in several sexual risk behavior outcomes including (1) if participants engaged in any risky sexual behavior (yes versus no), (2) the proportion of sex acts with a serodiscordant or unknown status partner that were unprotected (no condom used), and (3) the number of risky sex acts among those who reported sexual contact.

To determine if routine HIV testing changed behavior among participants who were risky (reported one or more risky sex act) at baseline we examined categorical changes between baseline and 3-month follow-up in behavior for the following categories (1) became safe (no risky sex acts), (2) became abstinent, (3) started using condoms every time they had sex with partner of unknown or serodiscordant serostatus, and (4) among HIV-negative participants, if they had their partner tested for HIV and learned the partner was HIV negative. We used logistic regression to test for differences between HIV-positive and HIV-negative and between single and married/cohabiting participants in reported disclosure of HIV test results. For all outcomes we compared results between HIV-negative and HIV-positive participants and between single and married/cohabiting participants. Time invariant sociodemographic characteristics (gender, polygamous marriage [Y/N], age, religion, tribe, education level, income) were tested as covariates in univariate models and those which were statistically significant ($p < 0.05$) were included in the multivariate models. If not reported below, there were no differences in results by sociodemographic characteristics.

Results

A majority of participants were of the Baganda tribe (64.9%), 7.3% were Bayankole, and the remainder were of other tribes. Average age was 35.2 (standard deviation [SD] 11.3; range, 18–76), 65.3% had primary 7 or less education, 22.9% had secondary 1–4, and 11.9% had secondary 5 or greater education; 37.1% were Catholic, 28.6% were Protestant, and 25.7% were Muslim. Most (89.2%) were married or cohabiting with a partner (in the local context cohabiting with a partner is considered as marriage even if the couple has not been legally married), 21.7% of married men had multiple wives (range, 2–3), and 43.9% of married women had one or more co-wife (range, 1–4). Of those in polygamous marriages, which are common in this area, 37.7% were Catholic, 34.0% were Muslim, and 20.8% were Protestant. Average monthly income was 109,217 Ugandan shillings (approximately $60), (SD 102,874; range, 0–500,000 UGS). Malaria was the most common presenting outpatient diagnosis (29.6%) at the time of provider-initiated routine HIV testing. Other reasons for the clinic visit included: 13.4% brought child or family member for treatment, 10.5% abdominal pain/diarrhea, 8.9%

pulmonary symptoms, 7.7% STI symptoms, 4.5% epilepsy, and 25.4% presented with/for other symptoms/treatment (dental, hypertension, dermatology, pain/swelling, headache, back pain, accident, picking up medication, family planning). Thirty-two of the 245 participants tested HIV positive (13.1%), 11.1% of women and 15.1% of men. Nearly half (41.5%) of the participants were first-time testers and of those testing HIV positive, 65.6% were first-time testers.

Two hundred fifteen (187 HIV negative, 28 HIV positive) of the 245 participants (87.8%) completed the follow-up interview and are included in the analyses.

Reasons for lost to follow-up included: moved greater than 80 km away (14), unable to contact (8), contacted but failed to return (6), died (1), and data lost (1). Participants lost to follow-up did not differ from those who completed the follow-up interview on any sociodemographic characteristics, HIV test results, knowledge of partner HIV status, or sexual risk behavior. Average time between baseline and 3-month follow-up interviews was 100 days (SD 16.78; range, 82–192).

Partner HIV testing and knowledge of partner(s)' HIV status

The 187 participants who tested HIV negative had 220 partners at baseline. Through 3-month follow-up, 64 (29.1%) partners presented for HIV testing, of whom 4 (6.3%) tested HIV positive. Ten (31.3%) of these 64 partners were tested in the clinic but did not report their results to the participant. Thirty-two (50%) of the 64 partners had already tested within the prior 6 months. The 28 participants who tested HIV positive had 38 sexual partners at baseline. Thirteen of the 38 partners came for HIV testing (35.1%); 7 tested HIV positive (53.9%) and 6 tested HIV negative. Two (15.4%) of these 13 partners who were tested in the clinic did not report their results to the participant.

Despite high rates of repeat testing among partners of HIV-negative participants, as shown in Table 1, there was a significant increase in the percent of HIV-negative and HIV-positive participants who knew their partner(s)' HIV status between baseline and 3-month follow-up (odds ratio [OR] 5.13, confidence interval [CI] 1.67–15.82). The rate increase did not differ between HIV-negative and HIV-positive participants. As shown in Table 2, married/cohabiting participants were more likely to know their partner(s)' HIV status than were single sexually active participants but there was no significant difference in change over time by marital status. Women were nearly two times less likely than men to know their partner(s)' HIV status before or after receiving routine HIV testing and regardless of HIV test results, (OR 0.59, CI 0.35–1.00, χ^2 3.80, $p = 0.05$).

Effect of routine HIV testing on changes in sexual risk behavior

At baseline, before participants knew their HIV status, risky sex was defined as unprotected sex with a partner of unknown or HIV-positive (presumed serodiscordant) status. At follow-up risky sex was defined as unprotected sex with a partner of unknown or serodiscordant HIV status. As shown in Table 1, comparing behavior in the 3 months preceding the provider-initiated routine HIV test to behavior in the 3 months after testing and receiving HIV test results the percentage of participants who reported engaging in risky sex

TABLE 1. DIFFERENCE IN INDICATORS OF SEXUAL RISK BEHAVIOR BY HIV TEST RESULTS, CHANGE BETWEEN BASELINE AND THREE-MONTH FOLLOW-UP, AND DIFFERENTIAL CHANGE OVER TIME BY HIV TEST RESULTS

	Baseline		3-month follow-up		Difference by HIV test results	Change over time	Time×test results
	HIV– (n = 187)	HIV+ (n = 28)	HIV–	HIV+			
Percent who know partner(s) status[a] (No.)	18.72% (35)	14.29% (4)	34.25% (62)	35.71% (10)	OR 0.76 CI (0.25–2.38) χ^2 0.22, $p = 0.64$	OR 5.13 CI (1.67–15.82) χ^2 8.11, $p = .004$	OR 1.46 CI (0.53–3.98) χ^2 0.54, $p = 0.46$
Percent engaging in risky sex[b] (No.)	70.05% (131)	75.00% (21)	50.27% (98)	53.51% (15)	OR 1.41 CI (0.56–3.57) χ^2 1.53, $p = 0.47$	OR 0.15 CI (0.07–0.36) χ^2 18.55, $p < 0.001$	OR 0.70 CI (0.23–2.18) χ^2 0.38, $p = 0.54$
Mean no. of risky sex[b] acts prior 3-mo among participants reporting sexual contact (SD)	18.13 (25.56)	20.64 (23.26)	19.83 (25.72)	18.21 (21.62)	Exp(β) 1.05 CI (0.69–1.59) χ^2 0.05, $p = 0.83$	Exp(β) 3.16 CI (0.65–15.42) χ^2 2.03, $p = 0.15$	Exp(β) 0.75 CI (0.42–1.36) χ^2 0.90, $p = 0.34$
Average percentage of risky sex[b] acts that were unprotected (SD)	93.14% (17.61)	92.38% (19.59)	93.96% (17.28)	85.55% (29.14)	Exp(β) 1.03 CI (0.96–1.07) χ^2 0.22, $p = 0.64$	Exp(β) 0.96 CI (0.76–1.22) χ^2 0.10, $p = 0.75$	Exp(β) 0.89 CI (0.77–1.02) χ^2 2.78, $p = 0.09$

[a]Of those having sexual partners.
[b]At baseline, before participants knew their HIV status, risky sex was defined as unprotected sex with a partner of unknown or HIV-positive (presumed serodiscordant) status. At follow-up risky sex was defined as unprotected sex with a partner of unknown or serodiscordant HIV status.
For statistical model tests, HIV-negative is the reference group.
OR, odds ratio; CI, confidence interval.

TABLE 2. DIFFERENCE IN INDICATORS OF SEXUAL RISK BEHAVIOR BY MARITAL STATUS AND DIFFERENTIAL CHANGE FROM BASELINE TO THREE-MONTH FOLLOW-UP

	Baseline		3-month follow-up		Difference by marital status	Time×marital status
	Single (n = 27)	Married/cohabiting (n = 189)	Single (n = 27)	Married/cohabiting (n = 189)		
Percent who know partner(s) status[a] (No.)	5.56% (2)	20.67% (37)	24.24% (8)	36.36% (64)	OR 3.03 CI (0.97–9.42) χ^2 3.67, p = 0.056	OR 0.42 CI (0.13–1.32) χ^2 2.22, p = 0.14
Percent engaging in risky sex[b] (No.)	63.89% (23)	72.07% (129)	22.22% (8)	58.66% (105)	OR 2.43 CI (1.38–4.34) χ^2 9.47, p = 0.002	OR 3.74 CI (1.52–9.22) χ^2 8.24, p = 0.004
Mean No. of risky sex[b] acts prior 3-mo among participants reporting sexual contact (SD)	2.66 (3.37)	21.47 (26.47)	8.37 (27.23)	21.00 (24.78)	Exp(β) 7.50 CI (4.60–12.22) χ^2 65.43, p < 0.001	Exp(β) 0.31 CI (0.06–1.53) χ^2 2.07, p = 0.15
Average percentage of risky sex[b] acts that were unprotected (SD)	87.09% (21.10)	93.98% (17.18)	83.08% (31.98)	93.82% (17.66)	Exp(β) 1.12 CI (1.02–1.22) χ^2 5.45, p = 0.02	Exp(β) 1.04 CI (0.82–1.32) χ^2 0.10, p = 0.75

[a]Of those having sexual partners.
[b]Risky sex: At baseline, before participants knew their HIV status, risky sex was defined as unprotected sex with a partner of unknown or HIV-positive (presumed serodiscordant) status. At follow-up risky sex was defined as unprotected sex with a partner of unknown or serodiscordant HIV-status.
For statistical model tests, Single is the reference group.
OR, odds ratio; CI, confidence interval.

decreased (OR 0.15, CI 0.07–0.36) and the percentage of sex acts with unknown or serodiscordant HIV status partners that were unprotected decreased among HIV-positive participants (see Table 1; marginally significant: OR 0.89, CI 0.77–1.02). There were no other differences between HIV-negative and HIV-positive participants and no change in the number of risky sex acts reported per participant.

As shown in Table 2, compared to single participants a greater percentage of married/cohabiting participants reported risky sex and were more likely to report still being risky at follow-up. Regardless of time, married/cohabiting participants also reported more unprotected sex acts and a greater percentage of their sex acts with unknown or serodiscordant HIV status partners were unprotected. There were no other significant differences in changes in sexual risk behavior over time between married/cohabiting participants and single participants.

Regardless of time and HIV status, women engaged in slightly fewer risky sex acts than did men (Exp(β) 0.76, CI 0.57–1.00, χ^2 3.73, p = 0.05). There were no other gender differences in sexual risk outcomes.

Categorical changes in sexual risk behavior

Nearly three quarters of participants (n = 152) were classified as "risky" at baseline, meaning that they reported unprotected sex with one or more partners of unknown or HIV-positive serostatus. Between baseline and 3-month follow-up risky participants could become "safe," meaning that they became abstinent, started using condoms during all sex acts with partners of serodiscordant or unknown HIV status, or learned that both they and their partner(s) were HIV negative. Those who were risky could stay risky, those who were safe could stay safe, and those who were safe could become risky. As shown in Figure 1A, nearly half of both HIV-negative and HIV-positive participants were risky at baseline and remained risky at 3-month follow-up. Twenty percent of those who tested HIV negative and 32.1% of those who tested HIV positive were risky at baseline and became safe at 3-month follow-up. Among participants who were risky at baseline, compared to HIV-negative participants, HIV-positive participants were more likely to become safe (Table 3; OR 2.73, CI 1.03–7.30). Twenty-six percent of HIV-negative participants and 14.3% of HIV-positive participants were classified as safe at baseline and remained safe at follow-up. A small percentage of participants (3.7% of HIV-negatives and 10.7% of HIV-positives) were safe and baseline but became risky after testing. Differences were also evident between married/cohabiting and single participants (Fig. 1B). Over half of married/cohabiting participants and 20% of single participants were risky at baseline and remained risky at follow-up. Forty-three percent of those who were single and 17% of those who were married/cohabiting were classified as risky at baseline but became safe at follow-up. Married/cohabiting participants who were risky at baseline were less likely than single participants to become safe (Table 3; OR 0.15, CI 0.05–0.44). Twenty-four percent of single participants and 31% of married/cohabiting participants were classified as safe at baseline and remained safe at follow-up. Six percent of single and 5% of married/cohabiting participants changed from being safe at baseline to being risky at follow-up.
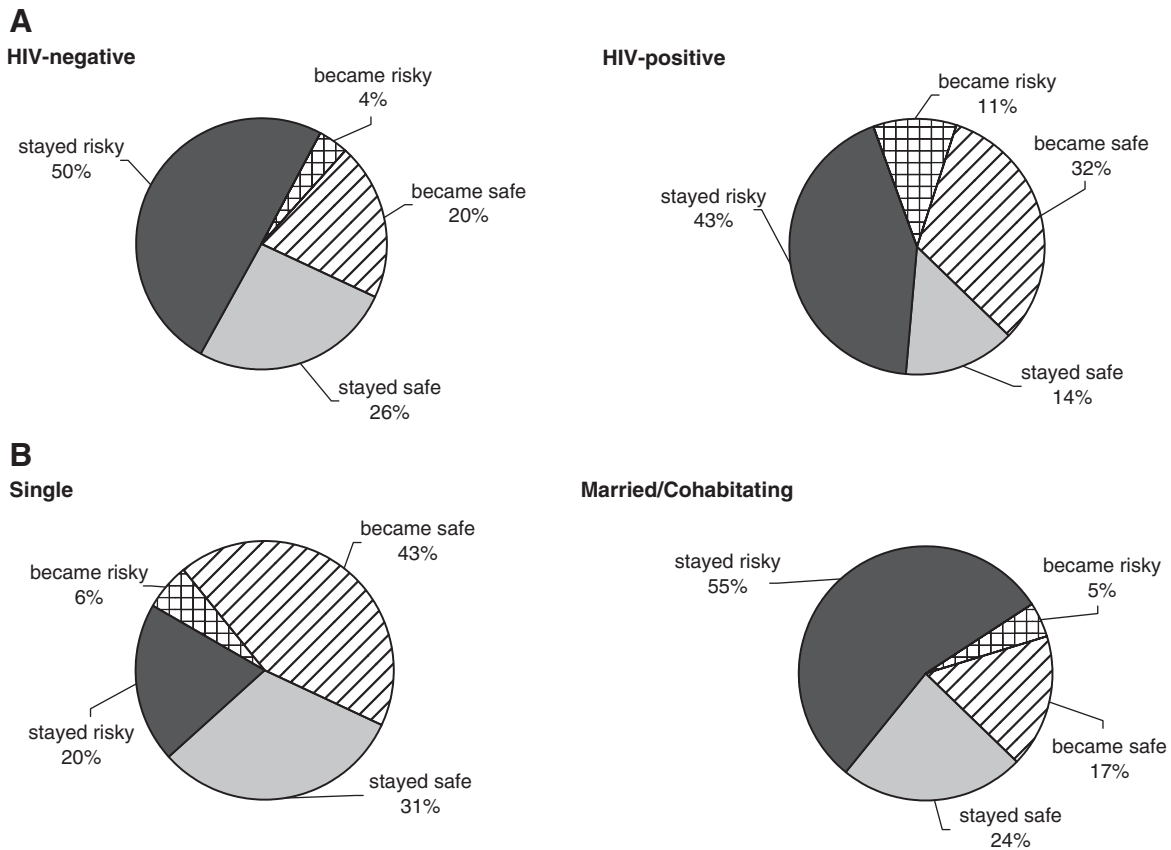
A

HIV-negative

HIV-positive

B

Single

Married/Cohabitating

FIG. 1. **A** and **B.** Categorical changes in sexual risk behavior between baseline and 3-month follow-up for HIV-negative and HIV-positive participants and single and married/cohabitating participants.

At baseline, before participants knew their HIV status, being "risky" was defined as reporting one or more unprotected sex acts with a partner of unknown or HIV-positive status and "safe" was defined as reporting no unprotected sex acts with these types of partners. At follow-up being "risky" was defined as reporting one or more unprotected sex acts with a partner of unknown or serodiscordant HIV-status and "safe" was defined as reporting no unprotected sex acts with these types of partners.

Stayed risky: classified as risky at baseline and follow-up.
Stayed safe: classified as safe at baseline and follow-up.
Became risky: classified as safe at baseline and risky at follow-up.
Became safe: classified as risky at baseline and safe at follow-up.

Differences in behavior change among risky participants

Among participants who were risky at baseline, compared to HIV-negative participants, HIV-positive participants were more likely to become abstinent (Table 3; OR 6.25, CI 1.77–22.07), but they were no more likely to start using condoms during every sex act with a serodiscordant or unknown status partner. Married/cohabitating participants were less likely than single participants to become abstinent (Table 3; OR 0.11, CI 0.03–0.41) and to start using condoms during every sex act with a serodiscordant or unknown status partner (Table 3; OR 0.21, CI 0.05–0.83). Among those who were HIV negative, married/cohabitating participants were not significantly more likely than single participants to have their partner tested and learn that their partner was HIV negative (Table 3). Women who were risky at baseline were less likely than men who were risky at baseline to have their partner tested and learn that their partner was HIV negative (OR 0.25, CI 0.08–0.81, χ^2 5.31, $p = 0.021$). Overall, risky participants who did

not disclose their HIV test results to their partner were more likely to become abstinent than were those who disclosed (OR 5.12, CI 1.39–18.82, χ^2 6.04, $p = 0.014$).

Disclosure

Among participants with partners or spouses there were no differences by HIV status in the likelihood that participants disclosed their HIV test results following routine HIV testing to their spouse/partner or to other family members (Table 4). Self-reported disclosure to spouse/partner was over 85%. Compared to single participants (who had a partner), married/cohabitating participants were more likely to disclose their HIV test results to their partner (85.6% versus 60.0%) (OR 3.31, CI 1.31–8.39, χ^2 6.37, $p = 0.012$), but were no more likely to disclose to other family members.

There were differences in to whom participants first disclosed their test results. Compared to participants who tested HIV negative, those who tested HIV positive were four times less likely to first disclose to their spouse/partner compared to

TABLE 3. DIFFERENCES IN SEXUAL RISK BEHAVIOR CHANGE BETWEEN BASELINE AND THREE-MONTH FOLLOW-UP AMONG PARTICIPANTS CLASSIFIED AS RISKY AT BASELINE BY HIV STATUS AND MARITAL STATUS

	Difference by HIV status % (no.)			Difference by marital status % (no.)		
	HIV− (n = 131)	HIV+ (n = 21)	OR	Single (n = 17)	Married/ cohabitating (n = 135)	OR
Changed from risky[a] to safe	27.48% (36)	42.86% (9)	OR 2.73 CI (1.03–7.30) χ^2 4.04, p = 0.045	64.71% (11)	25.19% (34)	OR 0.15 CI (0.05–0.44) χ^2 11.41, p = 0.013
Became abstinent	7.63% (10)	28.57% (6)	OR 6.25 CI (1.77–22.07) χ^2 8.11, p = 0.04	35.29% (6)	7.41% (10)	OR 0.11 CI (0.03–0.41) χ^2 10.97, p = 0.001
Started 100% condom use with risky partners[b]	7.63% (10)	14.29% (3)	OR 2.39 CI (0.56–10.23) χ^2 1.38, p = 0.24	23.53% (4)	6.67% (9)	OR 0.21 CI (0.05–0.83) χ^2 5.01, p = 0.025
Partner tested HIV-negative	12.21% (16)	—	—	6.67%[c] (1)	11.91%[c] (15)	OR 2.14 CI (0.25–17.99) χ^2 0.49, p = 0.48

[a]Risky sex: At baseline, before participants knew their HIV status, risky sex was defined as unprotected sex with a partner of unknown or HIV-positive (presumed serodiscordant) status. At follow-up risky sex was defined as unprotected sex with a partner of unknown or serodiscordant HIV-status.
[b]Risky partners: partners of unknown or serodiscordant HIV status.
[c]of the 15 HIV-negative single participants and the 126 HIV-negative married/cohabitating participants.
For statistical model tests, HIV-negative and Single are the reference groups.
OR, odds ratio; CI, confidence interval.

first disclosing to another family member (Table 4). However, as shown in Table 4, overall a slightly greater percentage of HIV-positive participants (who had spouses/partners) reported first disclosing to their spouse/partner than to another family member. Among participants with partners, those who were married/cohabitating were more likely to first disclose to their partner compared to another family member than were single participants (69.3% married/cohabitating versus 28.0% single; OR 6.18, CI 2.03–18.79; χ^2 10.31, p = 0.001). There were no significant gender differences for these effects.

Accessing HIV care

Twenty-eight of the 32 participants who tested HIV positive completed the follow-up interview and of those 24 (85.7%) accessed HIV care. Reasons reported for failing to seek care were: unaware that treatment is free (1), did not want to enroll in care (1), and thought they were HIV negative (2). Average CD4$^+$ count among those with CD4$^+$ count data available (n = 11) was 697.91/mm (SD 683.38; range, 136–2417). Three patients were eligible for and were put on antiretroviral therapy (following modified WHO recommendations: CD4$^+$ count < 250). Twenty participants had medical records documenting the date they accessed care, and the average number of days between HIV diagnosis and seeking care was 49.90 (SD 67.67; range, 0–282; median 26).

Discussion

In this prospective cohort study we examined the initial outcomes of provider-initiated routine HIV testing at a rural hospital in Uganda. We found that routine HIV testing in this

TABLE 4. DIFFERENCES IN DISCLOSURE BY HIV TEST RESULTS

	HIV− % (no.)	HIV+ % (no.)	Difference by HIV test results
Disclosed to partner/spouse (Y/N)[a]	86.93% (153)	91.67% (22)	OR 1.43 CI (0.31–6.67) χ^2 0.21, p = 0.64
Disclosed to other family (Y/N)	43.18% (76)	55.56% (15)	OR 1.49 CI (0.66–3.39) χ^2 0.91, p = 0.34
To whom first disclosed HIV status[a] Partner/spouse	75.90% (126)	44.44% (12)	OR 0.21 CI (0.09–0.52) χ^2 11.66, p = 0.001
Other family (ref)	18.07% (30)	33.33% (9)	

[a]Among those married or with partners.
In statistical model test, HIV− is the reference group.

setting promoted uptake of partner HIV testing and increased the likelihood that participants knew their partner(s)' HIV status. Nonetheless, at follow-up only a third of participants knew their partner(s)' HIV status. Twenty-nine percent of partners of HIV-negative participants and 35% of partners of HIV-positive participants sought HIV testing, but 15%–31% of these partners did not disclose their test results to the participant and a large percentage of partners of HIV-negative participants who sought testing had already tested in the prior 6 months. These data suggest that routine HIV testing promotes partner HIV testing but new strategies are needed to increase partner HIV testing further and to encourage disclosure. Women were less likely than men to know their partners' HIV status. Interventions are needed to assist women with getting their partners to come for HIV testing. Such interventions should consider culturally constructed gender power differentials and the manifestations of gender inequality including intimate-partner violence.[25–28]

Compared to the percentage of participants reporting risky sexual behavior prior to routine HIV testing, the percentage of both HIV-negative and HIV-positive participants engaging in risky sexual behavior decreased at follow-up (Table 1). Behavior change to reduce the risk of HIV transmission was conceptualized in this study as: knowing that one's partners within and outside of marriage have tested and are seroconcordant, 100% condom use with partners of unknown or serodiscordant HIV status, or abstinence. However, 3 months following provider-initiated routine HIV testing more than 50% of all participants still reported engaging in risky sex.

Behavior change was more evident among participants who tested HIV positive. Overall, approximately 40% of the 43% of HIV-positive participants who became safer did so by becoming abstinent. In contrast, roughly equal proportions of the 27% of HIV-negative participants who became safer did so through 100% condom use with partners of unknown or serodiscordant HIV status, learning their partner was HIV negative through partner HIV testing, and by becoming abstinent. Despite the fact that only a third of HIV-positive participants who changed their behavior did so by adopting 100% condom use, overall HIV-positive participants did begin using condoms more frequently. Interestingly, among both HIV-negative and HIV-positive participants abstinence was favored by those who did not disclose their test results to their partner. This suggests that if these participants disclose to their partner(s) they may adopt another risk reduction strategy such as condom use or learning their partner(s)' HIV status. Cultural factors such as beliefs that if someone does not have a sexual partner he/she must have something "wrong" with him/herself and gender roles which limit women's control over adopting safer sexual behaviors may undermine efforts to reduce HIV risk behavior.[29] Long-term abstinence may be especially difficult to maintain and could result in decreased quality of life and subsequent behavioral disinhibition leading to increases in risky behavior. Qualitative research is needed to understand how cultural factors influence short and long term behavior change following routine HIV counseling and testing.

The low rate of behavior change among married/cohabiting participants is especially concerning. Between 14% and 19% of married/cohabiting participants had concurrent nonmarital partners, a percentage that did not decrease following HIV testing. Because the majority of participants were married or cohabiting, intervention efforts need to focus on decreasing risky behavior in long-term relationships and reducing the prevalence of concurrent nonmarital partnerships. Reducing concurrent partnerships has been cited as a key focus of future HIV prevention efforts that are likely to yield the greatest reduction in HIV incidence.[30–32]

Despite evidence of some behavior change, the magnitude of reduction in risk of HIV transmission in this sample was modest. The total number risky sex acts across all participants only decreased by 4% (152 acts), which was a nonsignificant decrease. Routine HIV testing may promote short-term behavior change through increased abstinence and increased condom use with partners of unknown or serodiscordant HIV status, especially among those testing HIV positive and those who are unmarried/cohabiting. But as with all standard-of-care HIV testing programs, it is unknown if these changes were due to the HIV test alone or the test plus the minimal risk-reduction counseling.

The majority of participants disclosed their HIV test results to their spouse or partner and about half disclosed to another family member. Our findings are consistent with others from sub-Saharan Africa showing that many HIV-positive individuals first disclose to a close family member before disclosing to a partner or spouse.[33,34] The high rates of reported disclosure to partners yet relatively low uptake of partner HIV testing highlight areas for intervention. During routine HIV testing, instead of providing primarily didactic information about disclosure and partner testing, counselors could assist patients in enacting these behaviors. For example, counselors could suggest that when patients disclose to their partner they offer to accompany their partner to HIV testing. For patients who find disclosure challenging the counselor could offer disclosure support by suggesting that patients bring their partner for HIV testing so that the couple can be tested together and the counselor can assist with disclosure.

In Uganda, an estimated 40% of individuals who need ARV treatment are receiving it.[35] In contrast, more than 85% of the participants in our study who tested HIV positive enrolled in care, and of those, all who were eligible for ARVs[16] received free ARV treatment. However, delays in enrolling in free care indicate that routine HIV testing providers need to improve methods for linking patients with care.

Limitations

In our evaluation of the initial outcomes a standard-of-care provider-initiated routine HIV testing and counseling program we used a pretest–posttest quasi-experimental design[36] that limits our ability to confirm causal relationships between receiving routine HIV testing and the behavioral changes we observed. Our eligibility criteria required participants to be sexually active within the prior 6 months, which limits the generalizability of our findings. However, the HIV-positive rate from all outpatients tested in routine HIV testing at the research site during the study period was 12.0% compared to the 13.1% observed in our sample. The similar incidence rate suggests that our sample was not markedly different than the general outpatient population in terms of past HIV risk behavior.

Conclusions

Routine provision of provider-initiated HIV testing in health care settings if widely implemented in countries with

generalized epidemics may reach many individuals who have not previously accessed client-initiated HIV testing, allowing earlier HIV diagnosis and access to care. In our sample, over 65% of those testing HIV positive were first time testers and 85% of patients who tested HIV positive were linked with care. In a recent paper reporting $CD4^+$ counts from patients tested in stand-alone, hospital inpatient, family member testing, and door-to-door testing settings the percentage of individuals with $CD4^+$ counts of less than 200/mm ranged from 36.4% to 71.3%.[37] Fewer than 10% of the HIV-positive participants in our sample had $CD4^+$ counts less than 200/mm indicating that routine HIV testing in an outpatient setting may have detected individuals sooner after infection.

Our results suggest that provider-initiated routine HIV testing in an outpatient setting may increase knowledge of partners' HIV status through referrals for partner HIV testing. However, to realize greater prevention benefits from routine HIV testing, counselors will need to enhance sexual risk reduction messages, including attention to increasing condom use and reducing concurrent nonmarital partnerships. Counseling should emphasize partner HIV testing, as even at follow-up, fewer than 40% of patients in our study knew their partner's HIV status. Counseling may also need to be client-centered to address more effectively the risk-reduction needs of a particular patient.[38] Given that fewer women than men knew their partner's HIV status, future research and programs should develop methods to increase male partner uptake of HIV testing. Redoubling efforts to link patients who test HIV positive to care will also offer additional opportunities for HIV transmission risk reduction counseling, which in cohort studies among patients receiving ARVs, has reduced HIV transmission sexual risk behavior.[39–41] As the first study to examine the outcomes of a provider-initiated routine HIV testing program, our data support the continued scale-up of routine HIV testing programs in generalized epidemics, but future research is needed regarding how to optimally tailor counseling during routine HIV testing to a population or individual's specific risk-reduction needs.

Acknowledgments

Author Disclosure Statement

No competing financial interests exist.

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