Contraceptive Dynamics Following HIV Testing

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Short Abstract

This study uses Demographic and Health Survey (DHS) data from five sub-Saharan African countries to investigate how receipt of HIV test results influences subsequent contraceptive behavior. We analyze the effect of HIV testing during antenatal care on postpartum adoption of contraception. In two countries with more detailed data, we also examine adoption and discontinuation of contraception among non-postpartum women tested outside of the context of antenatal care. We use longitudinal contraceptive calendar data to estimate hazard models of a change in contraceptive behavior, using women's HIV serostatus and whether and when they had been previously tested for HIV as covariates. Preliminary results find few significant differences in contraceptive patterns following HIV testing by HIV serostatus, but HIV testing itself is associated with quicker adoption of contraception in 4 out of 5 countries studied.

Extended Abstract

Introduction

Policies and programs addressing the reproductive health needs of HIV-positive women encourage contraceptive use as a key intervention for reducing unintended pregnancy and preventing vertical transmission of the virus (Halperin, Stover, and Reynolds 2009; Mazzeo et al. 2012; Reynolds et al. 2006). Women living in countries with high prevalence of HIV, however, have some of the highest levels of unmet need for family planning (Wilcher, Cates Jr, and Gregson 2009), suggesting that access to and adoption of contraception following HIV diagnosis remain important global health priorities.

A large body of literature focusing on contraceptive use dynamics among HIV-positive women suggests extensive heterogeneity across regional, cultural, and programmatic contexts. Nonetheless, many of these studies indicate differences in contraceptive use between HIV-positive and HIV-negative women. One area of research that remains less well explored is how learning one's HIV status alters contraceptive use patterns. The limited research in this area suggests that HIV positive women may have lower fertility intentions than HIV negative women (Bankole, Biddlecom, and Dzekedzeke 2011; Bonnenfant, Hindin, and Gillespie 2012; Heys et al. 2009). Other studies, without a comparison group of HIV-negative women, suggest that contraceptive use may increase among HIV positive women after diagnosis, but these results may not be long lasting (Blanchard et al. 2011; Hoffman et al. 2008).

To date, few studies have investigated the causal impact of receipt of test results on contraceptive use dynamics, such as uptake, method mix, discontinuation, and failure. This study employs Demographic and Health Survey (DHS) data from five countries (Kenya, Lesotho, Malawi, Zambia, and Zimbabwe) to investigate how receipt of HIV status may alter contraceptive use dynamics. In these five countries, the HIV prevalence among women is greater than 4 percent and the most recent survey includes HIV testing and the contraceptive calendar.

Methods

This study uses DHS data from all five countries to investigate how receipt of HIV test results during antenatal care (ANC) influences adoption of contraception following birth (Model 1). In Lesotho and Zimbabwe this study also examines (a) adoption of contraception (Model 2) and (b) discontinuation of contraception (Model 3) among women who did not experience a birth in the past 24 months and for whom the option of an HIV test occurs outside of the context of ANC. We use longitudinal contraceptive calendar data to estimate hazard models of a change in contraceptive behavior, using as covariates (1) HIV status as determined by biomarker testing at the time of the survey and (2) women's self-reported HIV testing experience.

In the first analytic sample of women who gave birth in the past 24 months[1], women enter observation in the month of their most recent birth, with all women being non-users of contraception. The period of observation continues until the woman takes up a contraceptive method, or until the date of interview

[1] We limit the period of observation to the 24 months preceding the survey for all three models in this study because the closer to the time of the survey, the more likely the results of the HIV biomarker test conducted as a part of the DHS survey are to be the same as the results a woman has received at her most recent HIV test.

(censoring). We link this episode of observation with data on whether the woman had antenatal care (ANC) and whether she had an HIV test and received results during ANC[2].

For the second and third models, women enter observation as contraceptive non-users (Model 2) or contraceptive users (Model 3) exactly 24 months before the survey, and continue until their contraceptive status changes, or until the date of interview (censoring). For Lesotho and Zimbabwe only, we are able to link to this episode data on the timing, in months, of the most recent HIV test. Thus, for each woman, we observe not only whether or not she had an HIV test during that episode of contraceptive use or non-use, but also when she had an HIV test and by how many months it precedes a change, if any, in her contraceptive behavior.

The first two hazard models (Models 1 and 2) predicting the adoption of contraception are lognormal accelerated failure time (AFT) hazard models with the baseline survival function (t_j) estimated by:

$$S_0(t_j) = 1 - \Phi\left(\frac{\ln t_j - \beta_0}{\sigma}\right)$$

Where Φ represents the cumulative distribution function with a Gaussian (normal) distribution and where t_j is measured in months (Cleves et al. 2010). The hazard function in a lognormal model increases and then decreases (Cleves et al. 2010) and hazards are not assumed to be proportional. Results are reported as the time ratios, or exponentiated coefficients, to ease interpretation (Allison 1995; Box-Steffensmeier and Jones 2004).

The final model (Model 3), which models a different process than that in the first two models (contraceptive discontinuation rather than adoption), is estimated using a Gompertz hazard model of the form:

$$h(t|x_j) = h_0(t)\exp(x_j\beta_x)$$

We also report results of this model as the exponentiated coefficients, or hazard ratios, to ease interpretation. The shape parameter, indicates an increasing hazard over time if positive and a hazard that decreases over time if negative. Gompertz hazard models assume hazards are proportional across groups (Allison 1995; Cleves et al. 2010); all covariates are tested for violations of the proportional hazards property using Schoenfeld's residuals (Grambsch and Therneau 1994; Schoenfeld 1982). We selected the lognormal and Gompertz models on the basis of their low Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) relative to other parametric models.

The sample of women interviewed in study countries ranges from 7,146 in Zambia to 23,020 in Malawi, and the sample of women with valid HIV biomarker test results ranges from 3,641 in Kenya to 7,313 in Zimbabwe. A sampling weight is applied, which accounts for both sampling probability and non-response response for HIV biomarker testing. Additionally, we use the complex survey (svy) commands available within Stata 13 to account for the clustered sampling design of DHS surveys and estimate robust standard errors.

Preliminary Results

Using this longitudinal study design, the only significant relationship between contraceptive use and HIV status found in multivariate analysis is among women in Kenya who gave birth in the 24 months

[2] In Zimbabwe, the measure captures women who had an HIV test during ANC or during delivery.

preceding the survey. Among these, HIV-positive women have a 53 percent greater expected time to adopting a contraceptive method following birth compared with HIV-negative women, net of other factors. This relationship is not found elsewhere, nor is HIV status associated with adopting or discontinuing contraception among women without a birth in the past 24 months.

There is more evidence from these analyses to suggest that exposure to HIV testing is associated with shorter expected durations to contraceptive adoption among women with a recent birth and among other non-users of contraception at the time of HIV testing. In Lesotho, Zambia, and Zimbabwe, women who have had an HIV test and received results during ANC have shorter expected times to adopting a contraceptive method following birth. In addition, in Zimbabwe, but not Lesotho, having had an HIV test and received results is also associated with a shorter time to adopting contraception among women who did not have a birth in the previous 24 months.

As with HIV status, HIV testing experience is not associated with discontinuing contraception among women who were using contraception at the start of the observation period, net of other factors.

For the most part the results presented here confirm and extend those of the only previous study that assessed differences by HIV status in how knowing one's HIV status affects contraceptive practices. We found almost no significant differences between HIV-positive and HIV-negative women in contraceptive patterns following HIV testing.

The new finding that in four of the five study countries HIV testing experience is associated with quicker adoption of contraception offers tentative support for the conclusion that interaction with health services appears to facilitate contraceptive use, rather than HIV status or knowledge of HIV status per se. However, further exploration is warranted of how HIV status and HIV testing experience are related to interactions with other health services, fertility intentions, and attitudes toward contraception, as well as contraceptive behavior.

Model 1: Time ratios predicting adoption of contraception following birth, among women age 15-49 who have had a birth in the previous 24 months

	Kenya n=1,006 women (9,842 person-months)		Lesotho n=794 women (7.332 person-months)		Malawi n=2,427 women (21,300 person-months)		Zambia n=2,023 women (17,699 person-months)		Zimbabwe n=2,003 women (12,445 person-months)	
	Time ratio	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**
HIV status (ref=HIV-negative)										
HIV-positive	1.53 *	(1.06, 2.21)	0.85	(0.68, 1.05)	1.20	(0.98, 1.47)	1.16	(0.97, 1.39)	1.10	(0.98, 1.24)
HIV test (ref=no test/results)										
Had HIV test and received results during ANC[1]	0.87	0.64,1.18	0.68 **	(0.54, 0.86)	0.90	(0.77, 1.06)	0.84 *	(0.73, 0.97)	0.79 ***	(0.69, 0.90)
Knowledge of family planning index	0.70 **	(0.54, 0.90)	0.84	(0.62, 1.14)	0.70 **	(0.56, 0.87)	0.76 ***	(0.66, 0.88)	0.73 ***	(0.63, 0.86)
Place of delivery (ref=home delivery)										
Medical facility	0.90	(0.68, 1.19)	0.82	(0.64, 1.04)	1.02	(0.90, 1.17)	0.83 *	(0.72, 0.97)	0.90 *	(0.80, 1.00)
Other	0.91	(0.14, 6.01)	1.11	(0.53, 2.32)	1.16	(0.87, 1.56)	1.14	(0.39, 3.31)	1.41 *	(1.00, 1.99)
Married (ref=never married)										
Ever-married	0.67	(0.41, 1.08)	0.64	(0.40, 1.02)	0.54 ***	(0.38, 0.76)	0.48 ***	(0.38, 0.62)	0.43 ***	(0.34, 0.55)
Parity	1.10	(1.00, 1.22)	1.07	(0.98, 1.18)	0.99	(0.95, 1.04)	0.97	(0.92, 1.02)	1.02	(0.97, 1.08)
Age (at start of observation period)	0.98	(0.95, 1.02)	1.00	(0.97, 1.02)	1.00	(0.98, 1.01)	1.02 *	(1.00, 1.04)	1.00	(0.98, 1.01)
Completed years of schooling	0.95 *	(0.91, 0.99)	1.00	(0.96, 1.04)	0.96 ***	(0.94, 0.97)	1.01	(0.99, 1.04)	0.99	(0.97, 1.01)
Residence (ref=urban)										
Rural	1.04	(0.80, 1.34)	1.07	(0.79, 1.46)	1.16	(0.95, 1.43)	0.93	(0.77, 1.14)	0.96	(0.84, 1.10)

(Continued...)

Model 1. – *Continued*

	Kenya n=1,006 women (9,842 person-months)		Lesotho n=794 women (7.332 person-months)		Malawi n=2,427 women (21,300 person-months)		Zambia n=2,023 women (17,699 person-months)		Zimbabwe n=2,003 women (12,445 person-months)	
	Time ratio	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**	**Time ratio**	**95% CI**
Household wealth index (ref=lowest)										
Second	0.83	(0.57, 1.22)	0.84	(0.57, 1.24)	1.00	(0.85, 1.18)	1.52 ***	(1.25, 1.84)	0.96	(0.83, 1.11)
Middle	0.73	(0.48, 1.09)	0.77	(0.54, 1.09)	0.98	(0.84, 1.14)	1.56 ***	(1.28, 1.90)	1.00	(0.87, 1.15)
Fourth	0.82	(0.53, 1.25)	0.65 *	(0.44, 0.95)	0.94	(0.79, 1.12)	1.32 *	(1.06, 1.65)	0.92	(0.78, 1.08)
Highest	0.61	(0.37, 1.02)	0.67	(0.42, 1.08)	1.10	(0.90, 1.34)	1.17	(0.89, 1.53)	0.88	(0.74, 1.04)
Employment status (ref=not currently employed)										
Currently Employed	0.74 **	(0.60, 0.92)	0.89	(0.73, 1.08)	0.94	(0.82, 1.07)	0.94	(0.83, 1.06)	1.02	(0.92, 1.12)
constant	144.21 ***	(45.35, 458.60)	37.13 ***	(10.92, 126.27)	58.14 ***	(23.73, 142.48)	27.13 ***	(12.99, 56.66)	42.30 ***	(23.04, 77.70)
σ (sigma)	1.06	(0.96, 1.16)	1.08	(1.01, 1.16)	0.93	(0.89, 0.97)	1.04	(0.99, 1.08)	0.89	(0.86, 0.93)

Note: Results are from lognormal accelerated failure time hazard models. Data are weighted and adjusted to account for the complex survey design and robust standard errors estimated. Figures are time ratios. Numbers in parentheses are 95% confidence intervals.

***p≤ 0.001; **p≤ 0.01; *p≤ 0.05; † p≤0.10

[1]HIV test occurred during ANC. For Zimbabwe, HIV test occurred during ANC or delivery.

Model 2: Time ratios predicting adoption of contraception among women age 15-49 who have not had a birth in the previous 24 months

	Lesotho n=2,076 (46,681 person-months)		Zimbabwe n=3,320 (81,587 person-months)	
	Time ratio	**95% CI**	**Time ratio**	**95% CI**
HIV status (ref=HIV-negative)				
HIV-positive	0.90	(0.69, 1.17)	1.00	(0.80, 1.26)
HIV test (ref=no test/results)				
Had HIV test and received results[1]	0.86	(0.57, 1.29)	0.42 ***	(0.28, 0.62)
Knowledge of family planning index	0.54 ***	(0.44, 0.66)	0.46 ***	(0.34, 0.62)
Married (ref=never married)				
Ever-married	0.43 ***	(0.31, 0.59)	0.22 ***	(0.17, 0.29)
Parity	0.84 ***	(0.76, 0.92)	0.73 ***	(0.68, 0.79)
Age (at start of observation period)	1.06 ***	(1.04, 1.09)	1.08 ***	(1.06, 1.10)
Completed years of schooling	0.98	(0.93, 1.03)	0.96 *	(0.92, 0.99)
Residence (ref=urban)				
Rural	1.07	(0.74, 1.56)	1.24	(0.92, 1.68)
Household wealth index (ref=lowest)				
Second	0.83	(0.60, 1.15)	1.31	(0.97, 1.76)
Middle	0.76	(0.54, 1.05)	1.26	(0.92, 1.72)
Fourth	0.80	(0.54, 1.16)	0.99	(0.70, 1.39)
Highest	0.64 *	(0.42, 0.97)	1.31	(0.87, 1.96)
Employment status (ref=not currently employed)				
Currently Employed	0.68 **	(0.54, 0.86)	0.82 *	(0.68, 1.00)
constant	339.93 ***	(102.39, 1,128.62)	790.58 ***	(254.67, 2,454.29)
σ (sigma)	1.48	(1.35, 1.64)	1.49	(1.37, 1.64)

Note: Results are from lognormal accelerated failure time hazard models. Data are weighted and adjusted to account for the complex survey design and robust standard errors estimated. Figures are time ratios. Numbers in parentheses are 95% confidence intervals.

***p≤ 0.001; **p≤ 0.01; *p≤ 0.05; † p≤0.10

[1]HIV test occurred during the period of observation.

Model 3: Hazard ratios predicting discontinuation of contraception among women age 15-49 who have not had a birth in the previous 24 months

	Lesotho n=904 women (18,074 person-months)		Zimbabwe n=1,973 women (45,215 person-months)	
	Hazard ratio	**95% CI**	**Hazard ratio**	**95% CI**
HIV status (ref=HIV-negative)				
HIV-positive	0.85	(0.63, 1.16)	0.90	(0.73, 1.12)
HIV test (ref=no test/results)				
Had HIV test and received results[1]	0.94	(0.66, 1.33)	0.99	(0.77, 1.26)
Knowledge of family planning index	0.80	(0.62, 1.03)	1.12	(0.81, 1.55)
Married (ref=never married)				
Ever-married	1.02	(0.66, 1.56)	1.24	(0.81, 1.89)
Parity	0.96	(0.81, 1.14)	0.93	(0.86, 1.01)
Age (at start of observation period)	0.96 **	(0.93, 0.99)	0.97 ***	(0.95, 0.98)
Completed years of schooling	1.01	(0.95, 1.07)	1.00	(0.97, 1.03)
Residence (ref=urban)				
Rural	1.15	(0.76, 1.73)	1.05	(0.84, 1.30)
Household wealth index (ref=lowest)				
Second	0.80	(0.41, 1.54)	0.89	(0.69, 1.15)
Middle	0.55 *	(0.33, 0.93)	0.96	(0.74, 1.24)
Fourth	0.77	(0.45, 1.32)	0.71 *	(0.51, 0.98)
Highest	0.66	(0.36, 1.21)	0.67 *	(0.47, 0.94)
Employment status (ref=not currently employed)				
Currently Employed	1.42 *	(1.01, 2.01)	0.95	(0.80, 1.13)
constant	0.01 ***	(.003, .055)	0.004 ***	(.001, .013)
γ (gamma)	0.13	(0.10, 0.16)	0.15	(0.14, 0.17)

Note: Results are from Gompertz proportional hazard models. Data are weighted and adjusted to account for the complex survey design and robust standard errors estimated. Figures are hazard ratios. Numbers in parentheses are 95% confidence intervals.

***p≤ 0.001; **p≤ 0.01; *p≤ 0.05; † p≤0.10

[1]HIV test occurred during the period of observation.

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