

# Pregnancy desires, and contraceptive knowledge and use among prevention of mother-to-child transmission clients in Rwanda

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**Objective:** To understand pregnancy intentions and contraception knowledge and use among HIV-positive and negative women in the national prevention of mother-to-child transmission (PMTCT) program in Rwanda.

**Design:** A cross-sectional survey of 236 HIV-positive and 162 HIV-negative post-partum women interviewed within 12 months of their expected delivery date in 12 randomly selected public-sector health facilities providing PMTCT services.

**Methods:** Bivariate analyses explored fertility intentions, and family planning knowledge and use by HIV status. Multivariate analysis identified socio-demographic and service delivery-related predictors of reporting a desire for additional children and modern family planning use.

**Results:** HIV-positive women were less likely to report wanting additional children than HIV-negative women (8 vs. 49%,  $P < 0.001$ ), and although a majority of women reported discussing family planning with a health worker during their last pregnancy (HIV-positive 79% vs. HIV-negative 69%,  $P = 0.057$ ), modern family planning use remained low in both groups (HIV-positive 43% vs. HIV-negative 12%,  $P < 0.001$ ). Condoms were the most commonly used method among HIV-positive women (31%), whereas withdrawal was most frequently reported among HIV-negative women (19%). In multivariate analysis, HIV-negative women were 16 times more likely to report wanting additional children and nearly 85% less likely to use modern family planning. Women who reported making two or less antenatal care visits were 77% less likely to use modern family planning.

**Conclusion:** Our results highlight success in provision of family planning counseling in PMTCT services in Rwanda. As family planning use was low among HIV-positive and negative women, further efforts are needed to improve uptake of modern methods, including dual protection, in Rwandan PMTCT settings.

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*AIDS* 2009, **23** (suppl 1):S19–S26

**Keywords:** family planning, HIV, pregnancy intentions, prevention of mother-to-child transmission, Rwanda

## Introduction

Prevention of mother-to-child HIV transmission (PMTCT) programs offer an opportunity to strengthen

maternal health services and, in particular, to improve family planning services among women accessing antenatal, delivery and postnatal services [1,2]. In addition, provision of family planning counseling and

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methods (when desired) to HIV-positive women is an important component of a comprehensive PMTCT strategy [3,4]. Indeed, reducing unintended pregnancies among HIV-positive women decreases their vulnerability to morbidity and mortality related to pregnancy, and has been shown to be a cost-effective approach to avert new infections when compared with single-dose nevirapine (SD-NVP) provision [5–7]. Yet, PMTCT programs in Africa often miss opportunities to provide HIV-positive, as well as HIV-negative, clients with family planning counseling and services [8].

In Rwanda, where an estimated 3.6% of women of reproductive age are HIV-positive and PMTCT services have been integrated into over 85% of antenatal care (ANC) clinics [9,10], a recent analysis [11] showed that 5615 unintended births occur annually among HIV-positive women, resulting in approximately 1684 unintended HIV-positive births annually. Understanding the pregnancy intentions and family planning knowledge and practices of HIV-positive women accessing PMTCT services, and how they may vary from those of their HIV-negative counterparts, is an important step to addressing the reproductive health needs of PMTCT clients in Rwanda. The aim of our study was to explore pregnancy intentions, family planning knowledge and use among HIV-positive and negative women receiving PMTCT services in Rwanda.

## Methods

Data were collected in April–May 2006 as part of a cross-sectional study on the acceptability and utilization of and adherence to the national PMTCT program in Rwanda. The primary results have been presented elsewhere [12,13].

### Study sites

The study was conducted in 12 public-sector health facilities providing PMTCT services. Using 2005 aggregate PMTCT data collected by the Ministry of Health, we first selected all PMTCT sites that had been offering PMTCT services since 1 January 2005 and were expected to have sufficient numbers of HIV-positive women to meet site sampling requirements, resulting in a site sampling frame of 79 sites. We then randomly selected four sites per region (i.e. Kigali or capital region, North-East and South-West) stratifying by residential area (i.e. urban vs. rural) and PMTCT program performance (i.e. higher vs. lower performance) within each region. Sites were categorized as ‘higher’ performing if more than 80% of women delivering at the site ingested SD-NVP according to the 2005 aggregate data collected by the Ministry of Health. All other sites were considered ‘lower’ performing.

### Study participants

We aimed to recruit 240 HIV-positive women and 180 HIV-negative women. To be eligible, women had to be at least 18 years of age, have received ANC services at the study sites during the index pregnancy and have either an estimated or confirmed date of delivery in the 12 months preceding data collection.

#### *HIV-positive women*

Preexisting patient registers at each site were used to identify the last 20 HIV-positive women meeting the eligibility criteria. Site staff, otherwise unaffiliated with the study or the local association of people living with HIV/AIDS, contacted the selected individuals and invited them to return to the study sites for an interview.

#### *HIV-negative women*

HIV-negative women were recruited when they presented with their infants for routine immunization visits. Given high immunization rates (97%) in Rwanda [14], this approach was assumed to generate an unbiased sample of HIV-negative women. Data collection teams collected patient-held ANC or infant vaccination cards from all women who presented during the registration period of the immunization session. After excluding the cards of women who did not meet the eligibility criteria or who were designated as HIV-positive on the patient-held cards (as per national practice), the interviewers randomly selected 15 women to participate per site. At sites where fewer than 15 eligible women presented, all were invited to participate.

None of the HIV-positive or negative women invited to participate refused to be interviewed. HIV-positive women received 1000 RWF (approximately 1.8\$US) to cover transportation costs to the health facility. No compensation was offered to participating HIV-negative women as they were interviewed during routine child immunization visits.

### Data collection, management and analysis

Trained interviewers completed closed-ended interviews with study participants using a pretested questionnaire translated into Kinyarwanda. Of relevance to this analysis, the questionnaire collected information on socio-demographic characteristics, experiences with ANC services, fertility intentions and family planning knowledge and use.

Data were double entered into an Access database and analysis was done using Stata version 10.0 (StataCorp, College Station, Texas, USA). The Chi-square test and Mann–Whitney *U*-test were used as appropriate to test for differences between HIV-positive and negative women in socio-demographic factors, ANC experiences, fertility intentions and family planning knowledge and use. Crude and adjusted generalized estimating equation logit models were fit for two dependent variables: desire

for additional children (model 1) and modern family planning use (model 2). Desire for additional children was assessed by asking participants if they wanted to have additional children now or in the future. Modern family planning use was assessed by asking participants to indicate all of the methods they were familiar with and currently using. Respondents were not queried about each method separately but methods were coded separately on the questionnaire to facilitate accurate documentation by the interviewers. Modern family planning included condoms, oral contraceptive pills (OCPs), injectables, intrauterine device, and female/male sterilization. Variables significant at the 0.20 level in the crude models were included in the adjusted analyses and retained if significant based on the likelihood ratio test using a backward stepwise procedure. Age and time since delivery of last pregnancy were forced into the final models, which also accounted for clustering by site.

### Ethical considerations

The study protocol was approved by the 'Commission Nationale de Lutte Contre le Sida' in Rwanda, as well as by the Institutional Review Boards at Columbia University and the Institute of Tropical Medicine, Antwerp. All participants provided written informed consent prior to interview.

## Results

### Characteristics of participants

A total of 236 HIV-positive and 162 HIV-negative women were interviewed (Table 1). HIV-positive women were slightly but significantly older than their HIV-negative counterparts (30 vs. 28 median years,  $P < 0.001$ ). Overall, 42% of women interviewed had completed no or minimal schooling (0–3 years), 41% had completed primary school (4–6 years) and 18% had completed at least some secondary school, with no significant differences by HIV status. The majority of all women, but significantly fewer HIV-positive than negative women (73 vs. 91%,  $P < 0.001$ ) were married or in a consensual union at the time of data collection. Most respondents across both groups were subsistence agricultural workers (74%) and affiliated with either Catholic/Protestant (48%) or Evangelical (29%) churches. As per the sampling methodology, both groups were evenly divided across rural and urban areas. HIV-positive women, however, were significantly more likely to be classified as having a lower socioeconomic status than HIV-negative women (48 vs. 24%,  $P < 0.001$ ). On average, women attended three ANC visits and this did not differ by HIV status. Although the two groups did not differ in household size, HIV-positive women had more living children (3 vs. 2,  $P = 0.023$ ) and were more likely to have lost a child (53 vs. 32%,  $P < 0.001$ ). HIV-positive women were also more likely to have had their last

delivery 6 or more months before the interview than HIV-negative women (50 vs. 28%,  $P < 0.001$ ). Finally, there were more known discordant couples among HIV-positive than negative women (21 vs. 3%,  $P < 0.001$ ) and although the vast majority of all women reported disclosing their HIV status to their partners, HIV-positive women were significantly less likely to report disclosing their status than HIV-negative women (84 vs. 96%,  $P < 0.001$ ).

### Pregnancy desires and family planning knowledge and use

As shown in Table 2, HIV-positive women were substantially less likely than HIV-negative women (8 vs. 49%,  $P < 0.001$ ) to report wanting additional children at the time of the interview or in the future. Most women (75%) reported discussing family planning with a health worker during/after their most recent pregnancy, with a trend towards a significant difference by HIV status (positive 79% vs. negative 69%,  $P = 0.057$ ). In most cases (~60%), these discussions occurred during posttest counseling. Hormonal contraceptives were reportedly discussed most frequently among both HIV-positive and negative women. Only 68% of HIV-positive women and 45% of HIV-negative women reported that condoms were discussed during these sessions.

Although 97 and 93% of all women were familiar with at least one family planning method and at least one modern family planning method, respectively, far more HIV-positive than HIV-negative women knew of condoms (62 vs. 37%,  $P < 0.001$ ). Fifty-four percent of HIV-positive women reported using any family planning method at the time of data collection, almost twice the proportion of HIV-negative women (32%,  $P < 0.001$ ). Modern family planning use was similarly more common among HIV-positive than negative women (43 vs. 12%,  $P < 0.001$ ). Condom use accounted for the majority of contraceptive use among HIV-positive women (31% of all women and 70% of modern methods users), whereas withdrawal was the most frequently reported method among HIV-negative women (19%). Dual method use was virtually nonexistent, with only two HIV-positive women reporting using condoms and another method; one woman reported using condoms and withdrawal and the other reported using a combination of condoms and OCPs or injectables. Among the 281 women who desired to limit childbearing, family planning use was low with 51% reporting use of any method and 39% reporting use of a modern method. However, HIV-positive women who desired to limit childbearing were significantly more likely to use any method (57 vs. 33%,  $P < 0.001$ ) and particularly a modern method (47 vs. 15%,  $P < 0.001$ ) than HIV-negative women who wanted to limit childbearing. Regardless of pregnancy desires, the majority (54%) of the 276 women not using family planning at the time of the study reported an intention to do so in the future, with no difference by HIV status.

**Table 1. Socio-demographic characteristics of study participants by HIV status, N = 398.**

	All		HIV-positive		HIV-negative		P
	N = 398		N = 236		N = 162		
	n	%	n	%	n	%	
Age (years)							
≤25	123	30.9	59	25.0	64	39.5	0.008
26–35	207	52.0	135	57.2	72	44.4	
>35	68	17.1	42	17.8	26	16.1	
Median (IQR)	29.0	(24.0–34.0)	30.0	(25.3–34.0)	27.5	(23.0–33.0)	<0.001
Years of schooling							
None/very low (0–3 years)	165	41.5	105	44.5	60	37.0	0.256
Primary school (4–6 years)	161	40.5	88	37.3	73	45.1	
Secondary school or higher (≥7 years)	72	18.1	43	18.2	29	17.9	
Marital status							
Married/consensual union	320	80.4	173	73.3	147	90.7	<0.001
Single	35	8.8	26	11.0	9	5.6	
Divorced/separated/widowed	43	10.8	37	15.7	6	3.7	
Occupation							
Housewife/unemployed/unskilled labor	78	19.6	53	22.5	25	15.4	0.128 <sup>a</sup>
Subsistence agricultural worker	296	74.3	173	73.3	123	75.9	
Skilled labor/professional	17	4.3	7	3.0	10	6.2	
Unknown	7	1.8	3	1.3	4	2.5	
Partner occupation							
Unemployed/unskilled labor	55	13.8	32	13.6	23	14.2	<0.001
Subsistence agricultural worker	210	52.8	108	45.8	102	63.0	
Skilled labor/professional	53	13.3	31	13.1	22	13.6	
Unknown	80	20.1	65	27.5	15	9.2	
Religion							
Catholic/protestant	190	47.7	109	46.2	81	50.0	0.043 <sup>a</sup>
Evangelical churches (Pentecostal)	114	28.6	68	28.8	46	28.4	
Adventist/muslim	84	21.1	49	20.8	35	21.6	
None	10	2.5	10	4.2	0	0	
Residential area							
Urban	197	49.5	115	48.7	82	50.6	0.711
Rural	201	50.5	121	51.3	80	49.4	
Socioeconomic status <sup>b</sup>							
Lower	153	38.4	114	48.3	39	24.1	<0.001
Higher	228	57.3	114	48.3	114	70.4	
Unknown	17	4.3	8	3.4	9	5.5	
Number of ANC visits during index pregnancy							
1–2 visits	143	35.9	82	34.7	61	37.7	0.552
≥3 visits	255	64.1	154	65.3	101	62.3	
Median (IQR)	3.0	(2.0–3.0)	3.0	(2.0–4.0)	3.0	(2.0–3.0)	0.501
Number of people in household							
≤4 people	153	38.4	82	34.7	71	43.8	0.071
5–8 people	207	52.0	134	56.8	73	45.1	
≥8 people	38	9.6	20	8.5	18	11.1	
Median (IQR)	5.0	(4.0–6.0)	5.0	(4.0–6.0)	5.0	(4.0–7.0)	0.189
Number of living children							
0–1 children	81	20.3	38	16.1	43	26.5	
2–3 children	181	45.5	112	47.5	69	42.6	0.038
≥4 children	136	34.2	86	36.4	50	30.9	
Median (IQR)	3.0	(2.0–4.0)	3.0	(2.0–4.0)	2.0	(1.0–4.0)	0.023
Ever experienced death of a child							
Yes	176	44.2	124	52.5	52	32.1	<0.001
No	222	55.8	112	47.5	110	67.9	
Time since delivery of index pregnancy							
<6 months	231	58.0	115	48.7	116	71.6	
≥6 months	165	41.5	119	50.4	46	28.4	<0.001 <sup>a</sup>
Unknown	2	0.5	2	0.9	0	0	
Median (IQR)	4.0	(2.0–8.0)	6.0	(2.0–8.0)	3.0	(1.0–7.0)	<0.001
Partner's HIV status discordant							
Known concordant	220	55.3	92	39.0	128	79.0	
Known discordant	53	13.3	49	20.8	4	2.5	<0.001 <sup>a</sup>
Unknown	125	31.4	95	40.2	30	18.5	
Disclosure of HIV status to partner							
Yes	353	88.7	198	83.9	155	95.7	
No	41	10.3	34	14.4	7	4.3	<0.001 <sup>a</sup>
Unknown	4	1.0	4	1.7	0	0	

ANC, antenatal care; IQR, interquartile range.

<sup>a</sup>Fisher's exact test.<sup>b</sup>Score combining means of lighting and ownership of functioning radio.

**Table 2. Pregnancy desire, and family planning knowledge and use by HIV status, N = 398.**

	All		HIV-positive		HIV-negative		P
	N = 398		N = 236		N = 162		
	n	%	n	%	n	%	
Desire additional children now or in the future							
Yes	99	24.9	19	8.1	80	49.4	<0.001
No	281	70.6	208	88.1	73	45.1	
Unknown	18	4.5	9	3.8	9	5.5	
ANC staff discussed family planning during/after last pregnancy							
Yes	297	74.6	186	78.8	111	68.5	0.057 <sup>b</sup>
No	97	24.4	48	20.3	49	30.3	
Unknown	4	1.0	2	0.9	2	1.2	
Timing of discussion about family planning							
Upon receipt of HIV results	176	59.3	112	60.2	64	57.7	0.077 <sup>b</sup>
During another ANC visit	67	22.6	37	19.9	30	27.0	
After delivery	31	10.4	23	12.4	8	7.2	
At child consultation	20	6.7	14	7.5	6	5.4	
Unknown	3	1.0	0	0	3	2.7	
Among women with whom healthcare provider discussed about family planning, types of methods discussed <sup>a</sup>							
None	4	1.4	2	1.1	2	1.9	0.625 <sup>b</sup>
OCPs	255	87.0	160	86.0	95	88.8	0.498
Injection	266	90.8	166	89.2	100	93.5	0.230
Condoms	174	59.4	126	67.7	48	44.9	<0.001
IUD	57	19.5	36	19.4	21	19.6	0.955
Sterilization	29	9.9	20	10.8	9	8.4	0.518
Rhythm/withdrawal	73	24.9	35	18.8	38	35.5	0.001
Breastfeeding/LAM	3	1.0	1	0.5	2	1.9	0.302 <sup>b</sup>
Knowledge of family planning methods <sup>a</sup>							
None	19	4.8	8	3.4	11	7.0	0.109
OCPs	325	82.9	198	84.6	127	80.4	0.275
Injection	329	83.9	199	85.0	130	82.3	0.465
Condoms	204	52.0	146	62.4	58	36.7	<0.001
IUD	66	16.8	37	15.8	29	18.4	0.509
Sterilization	40	10.2	29	12.4	11	7.0	0.081
Rhythm/withdrawal	95	24.2	44	18.8	51	32.3	0.002
Breastfeeding/LAM	3	0.8	2	0.9	1	0.6	1.000 <sup>b</sup>
Other	31	7.9	22	9.4	9	5.7	0.182
Knowledge of modern family planning <sup>c</sup>							
Yes	368	92.5	226	95.8	142	87.7	0.009 <sup>b</sup>
No	24	6.0	8	3.4	16	9.9	
Unknown	6	1.5	2	0.8	4	2.5	
Current use of family planning methods <sup>a</sup>							
None	220	55.3	109	46.2	111	68.5	<0.001
OCPs	15	3.8	10	4.2	5	3.1	0.605 <sup>b</sup>
Injection	24	6.0	19	8.1	5	3.1	0.041
Condoms	82	20.6	74	31.4	8	4.9	<0.001
IUD	1	0.3	0	0	1	0.6	0.407 <sup>b</sup>
Sterilization	4	1.0	3	1.3	1	0.6	0.649 <sup>b</sup>
Rhythm/withdrawal	53	13.3	23	9.8	30	18.5	0.011
Breastfeeding/LAM	5	1.3	3	1.3	3	1.2	1.000 <sup>b</sup>
Dual method (condom + any other)	2	0.6	2	1.2	0	0	0.500 <sup>b</sup>
Current use of modern family planning <sup>c</sup> current used							
Yes	122	30.6	102	43.2	20	12.3	<0.001
No	276	69.4	134	56.8	142	87.7	
Current use of family planning among women who do not desire additional children							
Yes	143	50.9	119	57.2	24	32.9	<0.001
No	138	49.1	89	42.8	49	67.1	
Current use of modern family planning <sup>c</sup> among women who do not desire additional children							
Yes	109	38.8	98	47.1	11	15.1	<0.001
No	172	61.2	110	52.9	62	84.9	
If not currently using family planning, intend to use in future							
Yes	149	54.0	77	57.4	72	50.7	0.496
No	58	21.0	25	18.7	33	23.2	
Unknown	69	25.0	32	23.9	37	26.1	

ANC, antenatal care; IUD, intrauterine device; LAM, lactational amenorrhea method; OCPs, oral contraceptive pills.

<sup>a</sup>May sum to more than 100% as multiple responses were possible.<sup>b</sup>Fisher's exact test.<sup>c</sup>Modern family planning includes condoms, OCPs, injectables, IUD, and sterilization.

## Determinants of reporting a desire for additional children and modern family planning use

In multivariate analyses (Table 3) examining determinants of reporting a desire for additional children (model 1) and modern family planning use (model 2), HIV status was by far the strongest predictor of both outcomes. Indeed, HIV-negative women were 16 times as likely as HIV-positive women to report a desire for additional children (model 1) and nearly 85% less likely to be using modern family planning (model 2) after controlling for other participant characteristics. As expected, several socio-demographic variables were significantly associated with both outcomes: Women who were not in a union at the time of data collection were significantly less likely than those in a union to report a desire for additional children (model 1) and use modern family planning (model 2). Additionally, women with more than four living children also had decreased odds of reporting a desire for additional children when compared with women with one to two living children (model 1). Among the service delivery-related factors included in our model, only the number of ANC visits was associated with family planning use. Indeed, women who reported having made two or less

ANC visits during their last pregnancy were 72% less likely to report using a modern method of family planning.

## Discussion

We examined pregnancy intentions and contraceptive knowledge and use among both HIV-positive and negative women receiving PMTCT services at 12 public-sector facilities in Rwanda, and identified determinants of desire for additional children and use of modern family planning. To our knowledge, this is the first study to explore these issues in the context of a national PMTCT program.

As noted in other studies [15,16] conducted in resource-constrained settings, our results indicate that HIV status may strongly influence the way women desire to plan their families and their use of family planning. Nearly all HIV-positive women (88%) interviewed reported not wanting additional children at the time of the study or in

**Table 3. Factors associated with reporting a desire for additional children and modern family planning use, N = 380.**

Covariates	Model 1: desire for additional children				Model 2: modern family planning use <sup>a</sup>			
	Crude OR	95% CI	Adjusted OR <sup>b</sup>	95% CI	Crude OR	95% CI	Adjusted OR <sup>b</sup>	95% CI
HIV status								
Negative (vs. positive)	12.00	6.81–21.15	16.09	7.71–33.60	0.19	0.11–0.32	0.16	0.09–0.32
Age (years)								
26–35 (vs. ≤25)	0.28	0.17–0.46	1.26	0.59–2.70	1.55	0.94–2.55	0.87	0.49–1.55
>35 (vs. ≤25)	0.09	0.03–0.25	0.64	0.18–2.30	1.24	0.64–2.40	0.64	0.30–1.37
Education (years)								
4–6 (vs. 0–3)	1.50	0.91–2.49	–	–	1.17	0.72–1.89	–	–
≥7 (vs. 0–3)	1.00	0.5–1.98	–	–	1.96	1.10–3.51	–	–
Marital status								
Not in union (vs. married/in union)	0.27	0.12–0.58	0.12	0.04–0.36	0.57	0.32–1.03	0.22	0.12–0.43
Religious affiliation								
Catholic/Protestant (vs. other)	0.88	0.55–1.39	–	–	0.83	0.54–1.28	–	–
Residential area								
Rural (vs. urban)	1.10	0.69–1.74	–	–	0.55	0.36–0.84	–	–
Number of ANC visits								
≤2 (vs. ≥3)	0.92	0.57–1.48	–	–	0.35	0.21–0.57	0.28	0.16–0.49
Number of living children								
2–3 (vs. 0–1)	0.26	0.15–0.45	0.10	0.04–0.26	1.28	0.70–2.35	–	–
>4 (vs. 0–1)	0.04	0.02–0.09	0.01	<0.01–0.04	2.02	1.09–3.75	–	–
Ever experienced death of a child								
No (vs. yes)	1.82	1.13–2.93	–	–	1.05	0.68–1.61	–	–
Time since delivery of index pregnancy (months)								
<6 (vs. ≥6)	1.80	1.11–2.94	1.24	0.61–2.56	0.52	0.34–0.81	0.85	0.53–1.39
ANC staff discussed family planning during last pregnancy								
No (vs. yes)	1.71	1.03–2.86	–	–	0.39	0.22–0.70	–	–
Knowledge of modern family planning <sup>a</sup>								
No (vs. yes)	3.71	1.55–8.89	–	–	NA	NA	NA	NA
Desire additional children now or in future								
No (vs. yes)	NA	NA	NA	NA	5.07	2.59–9.92	2.79	1.30–5.98
Partner's HIV status discordant								
No (vs. yes)	2.62	1.16–5.88	–	–	0.60	0.32–1.10	–	–
Disclosed HIV status to partner								
No (vs. yes)	0.58	0.25–1.37	–	–	0.61	0.28–1.31	–	–

ANC, antenatal care; CI, confidence interval; GEE, generalized estimating equation; IUD, intrauterine device; OCPs, oral contraceptive pills; OR, odds ratio.

<sup>a</sup>Modern family planning included condoms, OCPs, injectables, IUD, and sterilization.

<sup>b</sup>Multivariate GEE models account for clustering by site; age, and time since delivery of index pregnancy forced in models.

the future as compared with about half of HIV-negative women. HIV-negative women were 16 times more likely to report a desire for additional children as compared with HIV-positive women in multivariate analysis after controlling for other respondent differences. Studies in Kenya, Zambia and Malawi have also shown significantly stronger desires to limit childbearing among HIV-positive than negative women [8,17]. Similarly, when compared with HIV-negative women, HIV-positive respondents were significantly more likely to use a modern method of family planning and particularly more likely to use condoms. This result differs from studies [8,17] conducted in Kenya and Zambia where HIV-positive women had similar contraceptive use rates as HIV-negative women receiving PMTCT services.

Receipt of family planning information in the antenatal period was widely reported by both HIV-positive and negative women, suggesting some success in a key step in the integration of family planning and HIV services. However, even after receiving information about family planning during an ANC consultation, the proportion of HIV-positive and negative women in our study using any modern family planning method remained low at 43 and 12%, respectively. As modern family planning method use rates were virtually unchanged when we considered solely women who reported a desire to limit childbearing, these data suggest a large gap between family planning counseling and uptake among women attending PMTCT services. Further efforts are needed to explore the reasons behind these findings, including, among others, missed opportunities during ANC, poor linkages between ANC and family planning services, lack of method availability, and sociocultural factors, including gender dynamics.

The significantly lower proportion of HIV-negative women who reported receiving counseling regarding condoms, who were familiar with condoms and who reported using condoms are troubling. With an HIV prevalence of 3.6% among women [9], the majority of clients seeking ANC services in Rwanda are likely to be HIV negative, and thus greater focus is needed in promoting an effective method of HIV prevention among HIV-negative women. Primary prevention is an important component of a comprehensive PMTCT strategy and programs should increase their efforts in this area in order to prevent incident infections among women testing HIV negative, especially as new infection during pregnancy or breastfeeding is associated with an increased risk of transmission to the fetus or infant [18–20].

Our results also indicate that in addition to HIV status, both socioeconomic and service delivery factors were associated with pregnancy desires and modern family planning use. Multivariate analysis showed that women currently in a union and those with fewer children had a stronger desire for additional children, after controlling

for HIV status and other respondent differences. A similar relationship between the number of living children and pregnancy desires was observed among HIV-negative but not HIV-positive women recruited from PMTCT clinics in South Africa [21]. In our study, women in union were also more likely to report modern contraceptive use, a finding observed among HIV-positive women receiving PMTCT services in Côte d'Ivoire [22]. With regard to service delivery factors, women who made fewer ANC visits were less likely to report modern family planning. Providing family planning services to those who do not optimally utilize ANC services is a challenge for the healthcare system. The results indicate the need to explore novel ways to bring family planning services to these women, including community-based healthcare workers or services, which have been shown to effectively promote family planning use in other settings [23,24].

Our study has some limitations. First, we cannot generalize about pregnancy intentions, and family planning knowledge and behaviors among all women in Rwanda, as our sample included only women who had delivered within the past 12 months and who accessed ANC services at least once. However, as Demographic and Health Surveys data suggest that the vast majority (97%) of women in Rwanda make at least one ANC visit [9], it is plausible that these findings can be generalized to the Rwandan population. Second, as HIV-positive women were recruited from their homes, whereas HIV-negative women were enrolled upon presentation at immunization clinics, our sample of HIV-negative women biased towards women who had living children when compared with the sample of HIV-positive women. Controlling for the number of living children and experiences with child death in our regression models, however, likely limited the effect of this bias in our analysis of determinants of pregnancy desires and family planning use. Third, as the HIV-positive women interviewed were more likely to have delivered their last child less recently than HIV-negative women, it is possible that the information they reported on interactions that occurred during ANC may have been subject to more recall bias, and other outcomes that varied by HIV status may actually reflect differences that occurred over time since delivery. To account for this, we controlled for time since last delivery in our multivariate analyses. Fourth, given that PMTCT services in Rwanda include a discussion about the risks of perinatal HIV transmission, it is possible that responses to querying about pregnancy desires among HIV-positive women were subject to social desirability bias and therefore that HIV-positive women were less likely to accurately report their desires for additional children than their negative counterparts. Finally, we were unable to assess the quality of family planning counseling provided at the study sites, the availability of certain family planning methods at those sites, or beliefs around family planning, all of which have been shown to effect uptake [25,26].

With this study, we reinforce the urgency of providing family planning counseling and a full range of contraceptive methods, including dual protection, to women accessing PMTCT services and who wish to postpone or prevent childbearing. Not only is family planning a cost-effective intervention [6] but it is in line with global policy advocacy around integration of family planning and HIV services as part of a comprehensive PMTCT package. Family planning provision during ANC is also crucial to meet women's and couples' reproductive health needs and to ensure a client-centered approach to care [11,27]. As national programs improve availability of PMTCT and provision of more effective PMTCT prophylaxis regimens, policy makers and funders should not ignore the continued importance of providing adequate education about and access to family planning.

## Acknowledgements

We thank Vianney Nizeyimana, Joseph Ntaganira and Njeri Micheu for assistance with interviewer training and data collection; Jonathan Gordin and Cedric Yambabariye for inputs related to data management; and Sarah Gorrell for assistance with preparation of the final manuscript. We also thank the *Titulaires de Santé* at the participating clinics and the 12 interviewers for their contributions. This study was funded by PEPFAR's University Technical Assistance Program.

*Conflicts of interest:* None.

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