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Factors Correlated with Self-Reported History of Fetal Death among Urban, HIV-positive US Women

By

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Abstract

Factors Correlated with Self-Reported History of Fetal Death among Urban, HIV-positive US Women

By Valerie Raziano

Background. Fetal death (broadly classified as stillbirths and miscarriages) among United States women are currently understudied and underreported. Data on fetal death among HIV positive women are especially limited.

Methods. A cross-sectional analysis of data collected at an urban outpatient HIV care clinic in Atlanta, Georgia between July 2003-November 2004 evaluated factors correlated with self-reported history of miscarriage or stillbirth among HV positive women. Crude and adjusted prevalence odds ratios (PORs) and 95% confidence intervals (CIs) from logistic regression models are reported.

Results. Of the 155 women in this analysis 89% of whom were African American, 56 (36%) reported history of fetal death. Factors correlated ($p<0.1$) with history of fetal death included older age (aPOR = 1.09; 95%CI: 1.02-1.18), older age at first vaginal sex (aPOR = 0.84; 95%CI: 0.73-0.96), history of physical abuse (aPOR = 2.00; 95%CI: 0.87-4.59), and being on HIV medications two years or more (protective, aPOR = 0.16; 95%CI: 0.05-0.46), controlling for age of HIV+ diagnosis and lifetime history of multiple sexually transmitted diseases.

Conclusions. Though it is difficult to draw conclusions given the cross-sectional nature of the data, this study found a very high prevalence of fetal death among HIV positive women as well as correlates that warrant further investigation. In particular, whether time on ART in HIV+ women is actually protective for fetal death warrants exploration. Physical abuse has been associated with fetal death in general cross-sectional populations, and this study now indicates this association for HIV positive women.

Keywords: miscarriage, stillbirth, HIV-positive, women, United States

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Introduction

Though stillbirths and miscarriages are common adverse pregnancy outcomes in the United States, they are understudied, underreported, and their etiology is unclear(1). The United States generally defines a stillbirth as a fetal death occurring at 20 completed weeks of gestation or more (2-4). A fetal death is defined as a death during the gestational period which is further divided into early (less than 20 completed weeks of gestation, also called a miscarriage or spontaneous abortion), intermediate (20-27 weeks of gestation) and late (28 weeks of gestation or more) periods(2, 5). As the majority of states only report fetal deaths in the intermediate or late periods of gestation (20 or more weeks of gestation), variation in completeness of fetal death reporting at the lower end of the reporting period results in underreporting(2). Since miscarriages occur prior to 20 weeks of gestation they may not be reflected in national estimates of fetal mortality rates (2). Estimates from obstetric and gynecological literature report that 20% to 25% of all clinically recognized pregnancies result in spontaneous miscarriage(6).

National efforts promote improved, comprehensive understanding of the causes of fetal death to devise prevention strategies. The Maternal and Infant Child Health goals of HealthyPeople2020 urge a swift reduction of the rate of fetal deaths at 20 or more weeks of gestation from 6.2 to 5.6 stillbirths per 1000 live births and fetal deaths by 2020(1, 3). However, the rate of stillbirths in metropolitan areas of the United States was only reduced to 6.0 stillbirths per 1000 live births and fetal deaths in 2012 and 5.96 in 2013(2)., indicating the need for continued research (3).

Racial disparities remain the focus of much of the fetal death research in the United States. During the period of 2000 through 2013, non-Hispanic blacks have consistently had

about twice the fetal mortality rate of non-Hispanic whites (2). The fetal mortality rate for non-Hispanic black women is 10.53 per thousand live births and fetal deaths, over twice that of non-Hispanic whites at 4.88 per 1000 live births and fetal deaths (2). Of 235954 nationally recorded fetal deaths, the fetal mortality rate was 5.96 fetal deaths per 1000 live births and fetal deaths recorded at 20 weeks or more(2). Georgia data from 2013 estimated 1145 fetal deaths at 20 weeks or more statewide, at a rate of 8.88 stillbirths per 1000 live births and fetal deaths(2).

As data for miscarriages are not nationally collected, risk factors for miscarriage remain understudied and sparse (2). Data collected between 1996 and 2002 from the Danish National Birth Cohort identified maternal age of 30 years or more at conception, underweight status, and obesity status as preconception risk factors associated with increased miscarriage risk(7). The same study also determined several modifiable risk factors associated with increased miscarriage risk such as alcohol consumption, lifting of over 20 kg/day, and nighttime work(7). One 2004 cohort study among a population of 119 HIV positive and 83 HIV negative women found an increased risk of miscarriage to be associated with prior miscarriage and marijuana use(8).

Relatively more data exists on stillbirth. A large initiative pursued by the Stillbirth Collaborative Research Network (SCRN) sought to elucidate the extent and causes of the stillbirth burden in the United States (9). SCRN conducted a multisite population-based case control analysis derived from their prospectively enrolled study population of stillbirths and live births in the United States (catchment areas include Rhode Island, Massachusetts, Georgia, Texas, and Utah)(9, 10). Their analysis of 614 stillbirth cases and 1816 control deliveries between March 2006 and September 2008 showed numerous factors as associated

with stillbirth including: non-Hispanic black race/ethnicity, previous stillbirth, nulliparity with and without previous losses at fewer than 20 weeks' gestation, diabetes, maternal age 40 years or older (vs. age 20-34 years), maternal AB blood type, history of drug addiction, smoking during the 3 months prior to pregnancy, obesity/overweight status, not living with a partner, and plurality (vs. singleton) pregnancy(9, 10). Other cohort studies have similarly found the ends of the age spectrum (11) and obesity (12). to be associated with stillbirth in US women. Finally, a more comprehensive approaches to understanding stillbirth mechanisms have included studies of Stressful Lifetime Experiences (SLE) which have explored the extent to which financial, emotional, traumatic and partner-related stress may play roles that increase risk of stillbirth, especially among African American populations (13). A 2013 population based case control study of still and live births in the United States reported an adjusted odds ratio of 2.22 (95% CI 1.43, 3.46) among women who had experienced all four SLE factors within the 12 months prior to pregnancy(13). The same study also showed increased odds of exposure to partner related SLEs among women who had stillbirths (aOR 1.29 95% CI 1.06, 1.58) (13).

Literature describing stillbirth and miscarriage among HIV positive women is even more scant. Women made up 23% of new HIV diagnoses in US in 2014; 62% of those 8,328 HIV diagnoses were among African American women, many of whom are of lower socioeconomic status (SES) and have increased susceptibility to multiple poor health outcomes(14-16). Increasing our understanding of fetal death in this population is critical to improving prevention. Though one retrospective cohort study in 2014 among HIV infected and uninfected United States women with singleton pregnancies showed significantly higher stillbirth rates in pregnancy complicated by HIV compared to those that were not, infectious

disease studies reviewed in 2003 suggested that HIV is unlikely to be a causative agent in stillbirth(5, 17). The same 2014 retrospective cohort study did not find meaningful differences in rates of miscarriage or perinatal death in pregnancies complicated by HIV compared to those that were not (17). A cohort study among Atlanta women who delivered at an inner-city Atlanta hospital showed HIV-infected pregnant women with concomitant sexually transmitted infections (STI) were at increased risk of spontaneous preterm delivery prior to 37 completed weeks of gestation compared to those without concomitant STI (18).

Fetal death is an important public health issue as it can lead to feelings of grief, anxiety, and psychological trauma for mothers, fathers, and families (19, 20). Compounding issues of lasting symptoms of depression, increased risk of maternal death, and direct and indirect financial burden of associated health care costs, create excessive stress among bereaved family members (21-23). These negative health outcomes may be compounded among HIV+ women. Since new research suggests that a portion of fetal deaths are preventable, it prevails upon public health to improve prevention (19, 23). This cross-sectional investigation sought to determine factors associated with history of stillbirth or miscarriage among a sample of HIV-infected Atlanta women.

Methods

Study Design

This was a cross-sectional analysis of previously collected survey data regarding women's reproductive health knowledge, attitudes, and practices. This analysis focused on evaluating associations between a woman's various demographics and clinical characteristics and history of stillbirth or miscarriage. The study participants were recruited from the

waiting room of the Grady Infectious Disease Program (Grady IDP), comprehensive outpatient HIV care clinic in Atlanta, Georgia by study staff between July 23, 2013 and November 3, 2014. Eligibility for the study was determined verbally in a private setting. Eligible women were HIV-positive based on confirmatory testing that was required in order to receive care at the clinic, 18-45 years of age, receiving care at that clinic, self-reported sexual activity within the last 6 months, and English speaking. Emory University IRB and the Grady Research Oversight Committee provided ethical approval for the research study and the informed consent.

Data Collection

Participants were recruited for a 30-minute Audio Computer Assisted Self Interview (ACASI) between July 2013 and November 2014 and provided written informed consent to participate in the survey. The 225 question survey was initially informed by focus groups of detailed interviews with HIV positive women. The survey collected self-reported information relating to sociodemographics, partner dynamics, HIV status disclosure, sexual behaviors, sexually transmitted illness (STI) history, family planning/fertility, contraceptive knowledge, discussions with providers and HIV specific questions including HAART use, knowledge about HIV transmission risk. The primary outcome in this analysis was history of one or more miscarriages or stillbirths.

Statistical Analysis

Data were analyzed using SAS 9.4 (Cary, NC). Covariates of interest are described stratified by the outcome of interest using descriptive statistics. Bivariate associations

between categorical variables (including educational level, ethnicity, residence type, income source, and history of physical abuse among others) and the outcome of interest were calculated using the Chi-square tests. T-tests were used to evaluate differences in continuous variables (including age and age at first vaginal sex) by the outcome of interest.

Crude prevalence odds ratios (cPORs) and 95% confidence intervals (CIs) from logistic regression models evaluated unadjusted associations between covariates and history of miscarriage or stillbirth. Multivariable models were then built using two modeling strategies. First we built a logistic model comprised of covariates with $p<0.05$ in unadjusted analyses. Second, we built a logistic model using backward selection and a p-value cutoff of 0.1. Adjusted prevalence odds ratios (aPORs) and 95%CI are presented. All analyses were done with SAS v 9.4 (Cary, NC).

Results

The survey captured data on 187 participants. For this analysis, 26 women who never had a previous pregnancy were excluded. There were 6 women who lacked outcome data information and were also excluded. The final analysis dataset included observations from 155 participants.

Descriptive Analysis

The mean age of the population was 36 years. Almost half (45%) of participants had completed high school with no further education. Nearly 90% of the study population identified as Black or African American, 66% were unemployed, and 96% had one or more children at the time they took the survey (Table 1). Two thirds of the surveyed population

were unemployed and seventy percent of participants obtained insurance through Medicaid or Medicare at that time. Women with history of stillbirth or miscarriage, on average, first learned of their HIV positive status at a later age than women without a history of stillbirth or miscarriage (Table 1).

Half of the study population reported history of physical abuse. Forty percent of the population had 11 or more lifetime male sex partners, all others reported 10 or fewer. Eighty-five percent of the population had been diagnosed with an STI at some point in their lifetime (Table 1). STI frequencies varied. Sixty-seven percent of the population had a history of chlamydia, 29% had a history of genital herpes, and 30% had a history of Trichomonas infection. Sixty-nine participants reported having a history of more than one STI in their lifetime. Over 80% of the participants reported acquisition of HIV through sexual contact with an HIV positive man (Table 1). One hundred and thirteen participants had previously taken HIV medications, and 125 participants had been on hem for 2 years or more.

Fifty-six percent of the participants analyzed in this study reported history of stillbirth or miscarriage. Women with history of stillbirth or miscarriage were slightly older than women who did not and tended to have first vaginal sex at slightly a younger age. Physical abuse history was significantly increased among women who had experienced stillbirth or miscarriage compared to those who did not (Table 1). History of drug use and history of alcohol abuse were not significantly different between those with a history or stillbirth or miscarriage and those without at $p<0.05$. Seventy-one percent of women who had history of miscarriage or stillbirth had been taking HIV medications for 2 years or more and 86% of women who had no history of miscarriage or stillbirth had done the same.

Bivariate Analysis

Both age at interview and age a woman first learned of her HIV positive status were each positively associated with history of stillbirth or miscarriage, while age at first vaginal sex was inversely associated with the outcome. Length of time on HIV medications was inversely associated with history of stillbirth or miscarriage (Table 2). Those who took HIV medications for 2 years or more were half as likely to also have a history of miscarriage or stillbirth compared to those who took HIV medications for less than 2 years.

Women who had a history of more than one lifetime STD were nearly two times as likely to also have had a previous miscarriage or stillbirth outcome, though this was with borderline statistical significance (cPOR 1.99, 95% CI: 1.0, 3.9). Women who had experienced physical abuse were 2.26 times as likely to have also experienced a previous stillbirth or miscarriage (95% CI: 1.155, 4.428).

Multivariable analysis

The multivariate regression model included age at interview, age first learned of HIV+ status, age at first vaginal sex, history of more than one lifetime STD, length of time on HIV+ medications, and physical abuse history based on covariates from bivariate associations that were significant at P=0.05 (Table 3). Backwards selection at P=0.1 yielded a model that controlled for age, age at first vaginal sex, physical abuse history, length of time on HIV medications. Both models showed that age at first vaginal sex and taking HIV medications for 2 years or longer were significant predictors of a history of stillbirth or miscarriage (Table 3).

Discussion

This analysis identified a high prevalence of fetal death among HIV-infected women and number of factors correlated with history of stillbirth or miscarriage. A woman's increasing age, younger age at first vaginal sex, history of physical abuse, and shorter length of time on HIV medications were found to be statistically associated with a history of miscarriage or stillbirth. These results from an HIV-infected group from a geographic area of high HIV prevalence add important findings for further exploration to the current, relatively scant, evidence-base(24).

The associations between a woman's age at interview and age at her first vaginal sex and a history of miscarriage or stillbirth were not surprising and similarly, the later a woman begins having vaginal sex, the less time she is at risk for pregnancy and therefore stillbirth or miscarriage.

Interestingly, we found that women who had been on HIV medications for 2 years or more had decreased risk of history of stillbirth or miscarriage. Two cohort studies each of over 2400 HIV infected women observed pregnancy specific outcomes of ART and HAART during gestation (25, 26). The studies determined ART use during pregnancy was not associated with increased rates of adverse pregnancy outcomes including stillbirth (25, 26). One of the studies found that late use of HAART therapy recorded at 32 weeks of gestation or at delivery was associated with reduced risk of stillbirth (26). Whether time on ART in HIV+ women is actually protective for fetal death, including stillbirth and miscarriage, warrants exploration.

While history of miscarriage or stillbirth was associated with a twofold increase in odds of exposure to more than one lifetime STD, it was not significant ($p<0.05$) in our

multivariable analyses. The interplay between STD infection and stillbirth has been previously studied among a similar population of women to those examined in this analysis. A prospective cohort study of 414 HIV infected and uninfected women recruited from an inner-city hospital in Atlanta found that those who had a concomitant STI during pregnancy had a 65% increased risk of spontaneous preterm delivery compared to those without a concomitant STI (OR 1.65 95% CI: 0.96-2.85)(18). The findings of that cohort may shed light on possible biological plausibility of the similar association found in our population, which may have failed to reach significance due to our sample size limitations.

History of physical abuse was associated ($p<0.1$) with miscarriage or stillbirth history (aPOR = 2.00; 95%CI: 0.87-4.59). As fetal death research continues to expand, combined life stressors such as physical abuse history and other items are increasingly incorporated into studies of adverse pregnancy outcomes (13). Physical abuse has been associated with fetal death in general cross-sectional populations, and this study now confirms this association for HIV positive women. Although racial differences in miscarriage and stillbirth are frequently studied, these associations were not found in the data. We purport that this association was not seen because of the small sample size of this analysis.

The strengths of this study include its use of a large group of mostly African American women in an urban setting, and among a population of high HIV prevalence(24). Limitations of the study include its inability to draw temporal associations due to its cross-sectional design. Because of this limitation, all conclusions of implied temporality are limited in this hypothesis generating study, yet attempts were made to contextualize the findings of this study among published literature from studies with stronger longitudinal study designs, as well as highlight avenues for future research. In addition, all data except HIV status were

collected by self-report, though we believe that self-administered surveys limits information bias due to social desirability. We expect any exposure misclassification due to recall bias to be non-differential by the outcome of interest, thus potentially biasing our results toward the null. No information was collected on health history, presence of other chronic medical conditions, delivery outcomes of previous pregnancies, maternal weight, or BMI. Because these findings are based off of a population of HIV positive, urban, primarily low socioeconomic African American women their generalizability is limited to this demographic group.

Conclusions

This study found a very high prevalence of fetal death among HIV positive women as well as correlates that warrant further exploration. Extremely little is known about factors associated with miscarriage and stillbirth among HIV-infected US women. This study indicates that the role of time on ART and physical abuse warrant further exploration.

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antiretroviral therapy during pregnancy. *Journal of acquired immune deficiency syndromes (1999)* 2005;38(4):449-73.

Table 1. Description of Covariates

	HIV-Positive women						
	Total (N = 155)		Hx Stillbirth or Miscarriage (N = 56)		No Hx (N = 99)		p-value (2-tailed)*
	N/Mean	%/SD	N/Mean	%/SD	N/Mean	%/SD	
Covariates							
Age	36.21	6.84	38.23	4.85	35.07	7.53	0.01
Highest Level of Education							
Less than High School	25	16%	7	13%	18	18%	
Completed High School	69	45%	23	41%	46	46%	
More than High School	61	39%	26	46%	35	35%	
Race							0.30
Black or AA	138	89%	47	84%	91	92%	
White	10	6%	5	9%	5	5%	
Other	7	5%	4	7%	3	3%	
Currently Employed							0.43
No	103	66%	35	63%	68	69%	
Yes	52	34%	21	38%	31	31%	
Residence Type							0.23
Own house or apartment	94	61%	29	52%	65	66%	
Family's house or apartment	26	17%	11	20%	15	15%	
Non-family's house or apartment/Other	35	23%	16	29%	19	19%	
Insurance Source (n=150)							0.27
Self-Pay, or more than one source of insurance	22	15%	8	15%	14	15%	
Medicaid or Medicare	70	47%	21	39%	49	52%	
Other	57	38%	25	46%	32	34%	

Income Source (n= 153)							0.47
Wages from job/spouse/partner	34	22%	15	28%	19	19%	
Disability/Unemployment	56	37%	18	33%	38	38%	
Family/Friends, Other, or more than one source	63	41%	21	39%	42	42%	
Year first diagnosed with HIV	2001.86	7.47	2001	7.16	2002.00	7.63	0.26
Age first learned of HIV+ Status	24.6	7.66	26.27	7.16	23.66	7.81	0.04
AIDS diagnosis							0.55
No	88	57%	29	52%	59	60%	
Yes	55	35%	23	41%	32	32%	
Don't know	12	8%	4	7%	8	8%	
HIV Transmission via Sex with HIV+ Man (n=154)							0.19
No	28	18%	7	13%	21	21%	
Yes	126	82%	48	87%	78	79%	
Never had STI							0.12
No (has been diagnosed)	132	85%	51	91%	81	82%	
Yes (never diagnosed)	23	15%	5	9%	18	18%	
Chlamydia Hx (Lifetime)							0.11
No	88	57%	27	48%	61	62%	
Yes	67	43%	29	52%	38	38%	
Genital Herpes Hx (Lifetime)							0.31
No	110	71%	37	66%	73	74%	
Yes	45	29%	19	34%	26	26%	
Trichomonas Hx (Lifetime)							0.05
No	109	70%	34	61%	75	76%	
Yes	46	30%	22	39%	24	24%	
More than one STD (Lifetime)							0.04
No	86	55%	25	45%	61	62%	

Yes	69	45%	31	55%	38	38%	
Relationship status							0.94
Married/Committed Relationship	103	66%	37	66%	66	67%	
Single/Dating	52	34%	19	34%	33	33%	
Age at first vaginal sex	16.1	4.13	14.76	3.48	16.87	4.30	0.00
Lifetime Male Sexual Partners (n = 150)							0.60
1 - 4 male partners	43	29%	13	24%	30	31%	
5 - 10 male partners	47	31%	17	31%	30	31%	
11+ male partners	60	40%	24	44%	36	38%	
Physical abuse history							0.02
No	78	50%	21	38%	57	58%	
Yes	77	50%	35	63%	42	42%	
Alcohol use history							0.29
No	41	26%	12	21%	29	29%	
Yes	114	74%	44	79%	70	71%	
Drug use history							0.27
No	81	52%	26	46%	55	56%	
Yes	74	48%	30	54%	44	44%	
Number of children							0.25
No children	6	4%	4	7%	2	2%	
1-2 Children	93	60%	31	55%	62	63%	
3 + Children	56	36%	21	38%	35	35%	
Age at first pregnancy	19.62	4.97	19.52	5.51	19.68	4.66	0.85
HIV positive status during a pregnancy							0.81
No	48	31%	18	32%	30	30%	
Yes	107	69%	38	68%	69	70%	
Unplanned Pregnancy history							0.43
No	73	47%	24	43%	49	49%	

Yes	82	53%	32	57%	50	51%	
Previously taken HIV medications (n=149)							0.07
No	36	24%	9	16%	27	29%	
Yes	113	76%	47	84%	66	71%	
Length of time on HIV medications							0.03
Less than 2 years	30	19%	16	29%	14	14%	
2 years or more	125	81%	40	71%	85	86%	

*For categorical variables, p-values from Chi-square tests (or Fisher's Exact)

*For continuous variables, p-values from t-tests (if normally distributed) or Mann-Whitney U (if non-parametric)

Table 2. Unadjusted associations between Covariates and History of Stillbirth or Miscarriage

	Bivariate associations			
	cPOR	**95%CI**		**p-value**
Covariates				
Age	1.08	1.02	1.14	0.01
Highest Level of Education				
Less than High School	ref			
Completed High School	1.29	0.47	3.52	0.62
More than High School	1.91	0.70	5.24	0.21
Race				
Black or AA	ref			
White	1.94	0.53	7.02	0.34
Other	2.58	0.56	12.01	0.23
Currently Employed				
No	ref			
Yes	1.32	0.66	2.62	0.43
Residence Type				
Own house or apartment	ref			
Family's house or apartment	1.64	0.67	4.01	0.28
Non-family's house or apartment/Other	1.89	0.85	4.18	0.12
Insurance Source (n=150)				
Self Pay, or more than one source of insurance	ref			
Medicaid or Medicare	0.75	0.27	2.06	0.58
Other	1.37	0.50	3.77	0.55
Income Source (n= 153)				

Wages from job/spouse/partner	ref			
Disability/Unemployment	0.60	0.25	1.45	0.25
Family/Friends, Other, or more than one source	0.63	0.27	1.49	0.30
Year first diagnosed with HIV	0.98	0.93	1.02	0.25
Age first learned of HIV+ Status	1.05	1.00	1.10	0.04
AIDS diagnosis				
No	ref			
Yes	1.46	0.73	2.93	0.28
Don't know	1.02	0.28	3.66	0.98
HIV Transmission via Sex with HIV+ Man (n=154)				
No	ref			
Yes	1.85	0.73	4.67	0.20
Never had STI				
No (has been diagnosed)	ref			
Yes (never diagnosed)	0.44	0.15	1.26	0.13
Chlamydia Hx (Lifetime)				
No	ref			
Yes	1.72	0.89	3.34	0.11
Genital Herpes Hx (Lifetime)				
No	ref			
Yes	1.44	0.71	2.94	0.31
Trichomonas Hx (Lifetime)				
No	ref			
Yes	2.02	1.00	4.10	0.05
More than one STD (Lifetime)				

No	ref			
Yes	1.99	1.02	3.87	0.04
Relationship status				
Married/Committed Relationship	ref			
Single/Dating	1.03	0.51	2.05	0.94
Age at first vaginal sex	0.83	0.73	0.95	0.01
Lifetime Male Sexual Partners (n = 150)				
1 - 4 male partners	ref			
5 - 10 male partners	1.31	0.54	3.16	0.55
11+ male partners	1.54	0.67	3.53	0.31
Physical abuse history				
No	ref			
Yes	2.26	1.16	4.43	0.02
Alcohol use history				
No	ref			
Yes	1.52	0.70	3.29	0.29
Drug use history				
No	ref			
Yes	1.44	0.75	2.79	0.28
Number of children				
No children	ref			
1-2 Children	0.25	0.04	1.44	0.12
3 + Children	0.30	0.02	1.78	0.19
Age at first pregnancy	0.99	0.93	1.06	0.85
HIV positive status during a pregnancy				
No	ref			

Yes	0.92	0.45	1.86	0.81
Unplanned Pregnancy history				
No	ref			
Yes	1.31	0.68	2.53	0.43
Previously taken HIV medications (n=149)				
No	ref			
Yes	2.14	0.92	4.96	0.08
Length of time on HIV medications				
Less than 2 years	ref			
2 years or more	0.41	0.18	0.93	0.03

*For categorical variables, p-values from Chi-square tests (or Fisher's Exact)

*For continuous variables, p-values from t-tests (if normally distributed) or Mann-Whitney U (if non-parametric)

Table 3. Multivariate associations between Covariates and History of Stillbirth or Miscarriage

	Multivariate model				Backwards Selection; P=0.1			
	aPOR	**95%CI**		**p-value**	**aPOR**	**95%CI**		**p-value**
Covariates								
Age	1.09	1.02	1.18	0.02	1.09	1.02	1.17	0.11
Age first learned of HIV+ Status	1.02	0.96	1.08	0.62				
More than one STD (Lifetime)								
No								
Yes	1.52	0.67	3.49	0.32				
Age at first vaginal sex	0.84	0.73	0.96	0.01	0.84	0.73	0.96	0.01
Physical abuse history								
No								
Yes	2.00	0.87	4.59	0.10	2.22	0.99	4.96	0.05
Length of time on HIV medications								
Less than 2 years								
2 years or more	0.16	0.05	0.46	0.00	0.18	0.06	0.51	0.00