Correlates of breastfeeding and infant growth in Kenya

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Abstract

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The benefits of breast milk for infant nutrition are well established. Breastfeeding has been shown to reduce infant morbidity and promote optimal growth during infancy. However, the uptake of breastfeeding globally remains low. The objective of this study was to understand the factors that influence a mother's decision to breastfeed, and how breastfeeding impacts infant growth. We used data from a cross sectional survey of mother-infant pairs attending week 6 and month 9 infant immunizations at 140 clinics across Kenya. Self-reported breastfeeding practices were collected by standardized questionnaire and infant weight, length, and mid-upper arm circumference were measured. Exclusive breastfeeding was the outcome at 6-week immunizations, while currently breastfeeding and exclusive breastfeeding during the first 6 months of life were outcomes at the 9-month visit. Infant growth was analyzed using weight and length measurements z-scores.

Among 1,662 mothers at 6-week and 1,180 at 9-month, the breastfeeding prevalence was 100% and 93% respectively. In multivariable analysis, younger maternal age (<25 years) at 6-weeks

postpartum was associated with a 4% (adjusted Prevalence Ratio (aPR)=0.96, 95% CI: 0.93, 0.99, p=0.02) lower prevalence of exclusive breastfeeding compared to older maternal age. HIV-infected mothers had a 5% higher prevalence of exclusive breastfeeding at 6-weeks postpartum (aPR=1.05, 95% CI: 1.01, 1.09, p=0.008) and a 27% higher prevalence (aPR=1.27, 95% CI: 1.17, 1.37, p<0.001) of exclusively breastfeeding during the first six months of life compared to HIV-uninfected mothers. Among HIV-unexposed infants at 6-week visit, exclusive breastfeeding was associated with a 59% (aPR=0.41, 95% CI: 0.22, 0.75, p=0.01) lower prevalence of underweight compared to HIV-unexposed infants that were not exclusively breastfed.

Our findings suggest that uptake of breastfeeding is high among mothers in Kenya. HIV-infected mothers had higher prevalence of exclusive breastfeeding at 6-weeks and during the first 6-months of an infant's life, but lower prevalence of continued breastfeeding at 9-months postpartum. Lower education and maternal depression were associated with lower prevalence of exclusive breastfeeding for the first 6 months of life in both HIV-infected and HIV-uninfected mothers. Intervention studies to reduce barriers and increase support of breastfeeding among mothers, and longitudinal studies on the effect of breastfeeding on infant growth are needed.

Introduction

Breastfeeding is considered the optimal infant feeding practice. Breastfeeding has been shown to reduce illness and early childhood death and promote infant growth and cognitive development.[1-2, 16-17] Breast milk contains nutrients, inflammatory components, and prebiotics that support the development and health of the infant.[3] The World Health Organization (WHO) recommends exclusive breastfeeding for the first 6 months of life and continued breastfeeding while introducing other complimentary feeds for 24 months or beyond.[4] Despite these recommendations, less than 40% of infants globally are exclusively breastfed in the first 6 months of life, and only 73% of infants are being breastfed at one year. [3]

The factors that influence a women's decision to breastfeed are varied. In high income countries, women with higher income and more education are more likely to breastfeed while in low- and middle income countries (LMIC) breastfeeding is less common among women with higher income.[3] Additionally, stress during pregnancy has been associated with earlier cessation of breastfeeding[5] and mothers reporting postpartum depressive symptoms were less likely to believe that breastfeeding was better for their infants.[6] Paternal support has also been shown to influence adherence to exclusive breastfeeding, particularly in LMIC.[7]

A women's HIV status may further influence her decision to breastfeed, despite the known benefits and comparable WHO breastfeeding recommendations for HIV-infected women on antiretroviral therapy. HIV-infected mothers in eastern Kenya were less likely to exclusively breastfeed their infant for 6-months if it was not the norm in their community or if the child was also being taken care of by other family members.[8] In addition, stigma and fear of being

suspected of having HIV infection has been shown to influence a mother's decision to not exclusively breastfeed.[8] Women with HIV may also be at higher risk of depression, leading to difficulty in implementing exclusive breastfeeding.[9]

Limited national-level data are available on the factors that impact breastfeeding practices among HIV-infected and HIV-uninfected women in LMIC and the impact of breastfeeding practices on infant growth. We examined factors that could influence a women's decision to breastfeed, and how breastfeeding practices impact infant growth among mother-infant pairs attending 6 week and month 9 immunizations in Kenya.

Methods

Study design and facility selection:

Data from two cross-sectional surveys evaluating prevention of mother-to-child transmission of HIV and maternal child health (PMTCT MCH 2013) were analyzed in this study.[10] The primary survey used probability proportionate to size sampling to select 121 facilities across Kenya and enrolled HIV-infected and HIV-uninfected women and their infants at week 6 and month 9 immunization visits. The second survey enrolled only HIV-infected women and their infants at week 6 and month 9 immunization visits at 20 clinics in Nyanza province, an area of high HIV prevalence.[10]

Data collection:

Trained mobile study teams consisting of one nurse and one laboratory technician administered standardized questionnaires to enrolled women using Open Data Kit on tablets. The

questionnaire included questions on uptake of antenatal care, maternal HIV testing, use of antiretroviral drugs (ARVs), maternal and paternal demographics, household characteristics, reproductive and family planning history, infant birth outcomes, infant immunizations, infant feeding methods, and infant HIV testing. Data was self-report, but maternal HIV status, use of ARVs and cotrimoxazole, infant HIV testing and results, birth outcomes, and immunizations were verified by the mother's Maternal & Child Health Booklet. Maternal and infant anthropometry [weight, length/height, and mid-upper arm circumference (MUAC)] were measured by trained study staff. Women who did not know their HIV status or women who reported HIV-negative status during pregnancy or at delivery were offered rapid HIV-1 antibody testing using Determine test kit. (Abbott Laboratories, Chicago, Illinois) All HIV-infected women were offered infant HIV testing.

Informed consent was obtained from all study participants prior to enrollment. The study was approved by the University of Washington Institutional Review Board, the Kenya Medical Research Institute Scientific and Ethics Review Unit, and the Associate Director for Science at the U.S. Centers for Disease Control and Prevention.

Exposure and Outcome Measures:

Responses to the Patient Health Questionnaire-9 (PHQ-9) depression assessment were used to dichotomize maternal depression into "Mild or moderate" (defined as a combined PHQ-9 scores of ≥ 5) and "Minimal or none" (scores of <5). Breastfeeding practices were categorized as exclusive breastfeeding for infants attending 6-week immunizations. Among infants at 9-month immunizations, breastfeeding practices were defined as currently breastfeeding and exclusive

breastfeeding for the first 6 months. Infant weight and length measurements were converted to Z-scores using the WHO Child Growth Standards Anthro package.[15] Infant growth was analyzed using continuous weight-for-age (WAZ), weight-for-length (WLZ) and length-for-age (LAZ) and poor growth defined as underweight (WAZ<-2), wasting (WLZ<-2), and stunting (LAZ<-2). In addition, MUAC measurements were evaluated for infants at 9-month visit.

Statistical analysis:

Descriptive analysis was used to present maternal and infant characteristics and prevalence of breastfeeding practices. Poisson generalized linear models with log-link function were used to determine the prevalence ratios (PR) and 95% confidence intervals (95% CI) of the associations between exposures and binary outcomes. Gaussian generalized linear models with identity-link function were used to determine the PR and 95% CI between breastfeeding practices and continuous growth outcomes (WAZ, LAZ, WLZ, and MUAC). Factors that were associated with breastfeeding practices and infant growth at $p<0.05$ in univariate analysis were included in the multivariable models. In addition, infant birth weight was a priori included in the multivariable analysis evaluating WAZ and MUAC, and both birth weight and maternal height were a priori included in the multivariable model evaluating the association between breastfeeding and WLZ and LAZ. All data were analyzed using Stata/SE 16.0 svy commands (StataCorp LLC, College Station, Texas, USA) and accounted for clustering at the clinic level.

Results

Maternal characteristics:

Overall 2,842 mother-infant pairs were included in the analysis: 1,662 (59%) at 6-weeks and 1,180 (41%) at 9-months. Mean maternal age was 26 years at both week-6 and month-9 visit (Table 1). Most (86%) mothers were married and about 56% had primary education or below. Ninety percent of mothers reported that their partner or the child's father provided financial support to the mother and her infant. Ten percent of mothers at the 6-week visit and 13% of mothers at the 9-month visit reported experiencing mild or moderate depressive symptoms. Sixteen percent of mothers attending 6-week visit were HIV-infected compared to 20% of mothers at the 9-month visit.

Breastfeeding characteristics:

Nearly all mothers reported currently breastfeeding their infants at each immunization visit. At the 6-week visit, 92% of all mothers reported exclusively breastfeeding; 96% of HIV-infected and 92% of HIV-uninfected women reported exclusively breastfeeding (data not shown). About three-quarters of mothers at the month-9 visit reported exclusively breastfeeding their infants during the first 6 months of life. Most (95%) mothers reported initiating breastfeeding within 24 hours of birth. Among mothers not exclusively breastfeeding at the 6-week visit, the mean infant age at introduction to other feeds was 1.1 months. At 9-months, mothers reported introducing their infants to other foods at approximately 5.4 months.

Infant characteristics:

Few (5%) infants were born with low birth weight (<2.5 kg). The proportion of underweight was similar among infants at 6-weeks and 9-months (6% and 9%, respectively). Stunting prevalence was higher at 6-weeks (21%) than 9-months (13%).

Factors associated with breastfeeding practices:

Among mothers at 6-weeks postpartum, younger age (PR=0.96, 95% CI: 0.93-0.99, p=0.006) and primary education or below (PR=0.95, 95% CI: 0.92-0.98, p=0.002) were associated with lower exclusive breastfeeding prevalence (Table 2). HIV-infected mothers had higher prevalence of exclusive breastfeeding at 6-weeks postpartum than HIV-uninfected mothers, and this association remained in multivariable analysis [adjusted Prevalence Ratio (aPR) =1.05, 95% CI: 1.01-1.09; p=0.008]. Marital status, mild or moderate depression, and partner/father financial support were not associated with exclusive breastfeeding at 6-weeks.

Among mothers at 9-months postpartum, HIV status (PR=0.74, 95%CI: 0.66, 0.84; p<0.001) was associated with lower prevalence of continued breastfeeding, and this remained in multivariable analysis (aPR = 0.75, 95% CI: 0.66, 0.84; p<0.001). Maternal age, education, depression, and partner/father support and marital status were not associated with continued breastfeeding at 9-months.

Lower education (PR=0.88, 95%CI: 0.81, 0.96, p=0.004) and mild or moderate depression (PR=0.87, 95%CI: 0.76, 0.99; p=0.03) were associated with lower prevalence of exclusive breastfeeding during the first six months of life. These associations remained in the multivariable analysis for lower education (aPR = 0.87, 95%CI: 0.79, 0.94, p=0.001), and mild or moderate depression (aPR = 0.83, 95% CI: 0.72, 0.94, p=0.005). HIV-infected mothers had a higher prevalence of exclusive breastfeeding for 6-months (PR=1.23, 95% CI: 1.14, 1.32; p<0.001) compared to HIV-uninfected mothers. This association also remained in the multivariate analysis

(aPR =1.27, 95% CI: 1.17, 1.37; p<0.001). Partner/father support, maternal age and marital status were not associated with exclusive breastfeeding during the first 6months of life.

Association between breastfeeding practices and infant growth:

Among infants at the 6-week visit, exclusive breastfeeding was associated with higher WLZ among both HIV-unexposed (0.69, 95% CI: 0.15, 1.22, p=0.01) and HIV-exposed infants (1.99, 95% CI: 0.10, 3.87, p=0.04) (Table 3a). At the 9-month visit, HIV-exposed infants that were exclusively breastfed for the first 6-months of life had higher MUAC compared to those not exclusively breastfed for the first 6 months of life (0.83, 95% CI: 0.27-1.39, p<0.01).

The prevalence of underweight (aPR = 0.41, 95% CI: 0.22, 0.75, p=0.01) and wasting (aPR = 0.55, 95% CI: 0.34, 0.89, p=0.02) were lower among HIV-unexposed infants attending 6-week immunizations who were exclusively breastfed than those who were not (Table 3b). Among HIV-exposed infants, wasting prevalence was lower (aPR = 0.20, 95% CI: 0.07, 0.62, p=0.01) for those who were exclusively breastfed compared to those who were not. Among infants at the 9-month visit, there were no differences in prevalence of underweight, wasting or stunting and continued breastfeeding or 6-month exclusive breastfeeding.

Discussion

Among mother-infant pairs attending 6-week and 9-month immunizations, the self-reported prevalence of exclusive breastfeeding at 6-weeks and continued breastfeeding at 9-months was high. Compared to HIV-uninfected women, HIV-infected mothers had higher prevalence of exclusive breastfeeding during the first 6-months of life. However, the prevalence of continued

breastfeeding at 9-months postpartum was 25% lower among HIV-infected mothers than HIV-uninfected mothers. Lower maternal education was associated with lower prevalence of exclusive breastfeeding at the 6-week visit and lower prevalence of 6-month exclusive breastfeeding among mothers at the 9-month visit. Indication of mild or moderate depressive symptoms was associated with 17% lower prevalence of exclusive breastfeeding in the first 6-months of life compared to mothers with minimal or no depressive symptoms.

At the time of data collection, breastfeeding recommendations followed the 2010 WHO Infant Feeding Guidelines. In high HIV prevalence settings, governments were advised to assess the most appropriate and safest way for optimal infant feeding practices with highest chance of being HIV free. In Kenya, efforts were put in place to promote and support exclusive breastfeeding for the first 6 months and continued breastfeeding with maternal and infant receipt of antiretroviral interventions.[11] In our study, over 90% of HIV-infected women reported exclusively breastfeeding at 6-weeks and 86% of HIV-infected women reported that they exclusively breastfed for 6-months. While our results are higher than those reported in a study conducted in a similar timeframe among HIV-infected women in Kilifi County, Kenya, (50% of women reported exclusively breastfeeding) this study included HIV-infected women attending clinics across Kenya.[8] The high prevalence of breastfeeding in our study may be a result of successful healthcare worker training and reinforced messaging to HIV-infected mothers emphasizing exclusive breastfeeding for the first 6 months of life. Alternatively, this reinforced messaging may have led HIV-infected mothers to self-report that they exclusively breastfed for 6-months, even if they had not exclusively breastfed for 6-months.

Our data indicate a lower prevalence of continued breastfeeding among HIV-infected mothers at 9-months postpartum compared to HIV-uninfected women. Between 2000 and 2013, there were several changes to breastfeeding guidelines for HIV-infected women. It is possible that this led to inconsistent messaging related to the timing of complementary feeds and continued breastfeeding after 6-months of age among healthcare workers and confusion for HIV-infected women, particularly those women that may have had an infant during a prior policy in which continued breastfeeding beyond 6-months of age was not recommended. For instance, the 2006 WHO Infant Feeding Guidelines recommended that HIV-infected women exclusively breastfeed their infants for the first 6 months of life followed by complementary foods and continuation of breastfeeding after 6 months if replacement feeding was not acceptable, feasible, affordable, sustainable and safe.[12] Changing guidelines has been shown to cause confusion among healthcare workers and delayed facility-level roll-out of new guidelines in rural communities.[8] These facility-level factors could impact the type of breastfeeding information women received.

Additionally, our results are similar to prior studies indicating that lower education is associated with lower prevalence of exclusive breastfeeding. Similar to our findings, higher education was associated with better uptake of exclusive breastfeeding to six months among women in Mali.[13] Higher educational attainment may play a role in understanding the importance of exclusive breastfeeding during the first 6 months of life, particularly among women in communities where exclusive breastfeeding is not the norm. Designing breastfeeding educational interventions that include women attending antenatal or postnatal care and in the community is critical to increasing uptake and duration of exclusive breastfeeding.

Moreover, women reporting mild or moderate depressive symptoms had significantly lower prevalence of exclusive breastfeeding to six months of age. This is consistent with previous studies and adds to the Liu et al. study in which mothers that experienced stressful life events in late pregnancy were more likely to stop breastfeeding within four-months.[5] Many factors influence maternal depression and understanding how these factors impact a mother's choice and ability to breastfeed are important for improving breastfeeding uptake and designing support strategies for these women.

Lastly, our results also indicated that exclusive breastfeeding was associated with lower prevalence of underweight among HIV-unexposed infants and lower prevalence of wasting among HIV-unexposed and HIV-exposed infants at 6-weeks. This is similar to a meta-analysis reporting that exclusive breastfeeding was associated with reduced risk of undernutrition among children in LMIC.[14] These results underscore the importance of adherence to exclusive breastfeeding for optimizing growth.

Strength and Limitations:

Our study has several strengths and limitations. We used data from a national survey to understand factors that influence breastfeeding practices and how breastfeeding impacts infant growth. As such, we were able to include mother-infant pairs from wide array of communities across Kenya. Due to the cross-sectional design of the survey, we cannot assume temporality for maternal factors and breastfeeding practices or breastfeeding practices and infant growth. Moreover, infant growth is dynamic in the first year of life and assessment at only one time point limits our ability to fully understand the relationship between breastfeeding and infant growth. In

addition, almost all women reported breastfeeding their child at 6-weeks and 9-months, which may be falsely high due to social desirability bias. Finally, this is a facility-based survey so mothers who come to the facility may be different than mothers in the community. However, uptake of infant immunizations at 6-weeks and 9-months is generally high in Kenya.

Conclusions:

In conclusion, breastfeeding uptake is relatively high among women in Kenya and exclusive breastfeeding was shown to be associated with infant weight. Moreover, maternal education, depression and HIV status largely influence a child's likelihood to be fed breast milk and a mother's likelihood to adhere to the recommended feeding guidelines. It is important for mothers, especially in settings where recommended breastfeeding practices are not prevalent or common, to be made aware of its importance and ways of increasing uptake and duration of breastfeeding. Hence, intervention studies are crucial in achieving this goal. Lastly, longitudinal studies are needed to better understand the relationship between breastfeeding practices and infant growth.

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Authors' contribution:

MMD, CJM and JU planned and designed the study. MMD conducted the statistical analysis, while MMD and CJM analyzed the data. MMD, CJM and JU reviewed and edited the thesis. All authors read and approved the final manuscript.

Tables

Table 1. Maternal sociodemographic and infant characteristics at 6-week and 9-month immunization visit*

	% or Mean (95% CI)	
	6-week (n=1,662)	**9-month (n=1,180)**
Maternal characteristics		
Age (years)	25.7 (25.4, 26.0)	26.3 (25.9, 26.7)
HIV-infected	16%	20%
Married/cohabiting	86%	87%
Primary education and below	56%	57%
Partner provides financial support	91%	90%
Depression: mild and above	10%	13%
Breastfeeding characteristics		
Currently breastfeeding	100%	93%
Exclusively breastfeeding	92%	---
Exclusively breastfeeding for 6 months	---	73%
Initiated breastfeeding <24 hours of birth	95%	94%
Age (months) introduced other foods	1.11 (0.9, 1.3)	5.4 (5.3, 5.5)
Infant characteristics		
Female	50%	50%
Age (months)	1.4 (1.3, 1.5)	9.4 (9.3, 9.5)
HIV exposed infants	16%	20%
Low birth weight (<2.5 kg)	5%	4%
Weight-for-age z-score (WAZ)	-0.09 (-0.18, -0.01)	-0.25 (-0.35, -0.15)
Weight-for-length z-score (WLZ)	0.24 (0.02, 0.47)	-0.10 (-0.26, 0.06)
Length-for-age z-score (LAZ)	-0.34 (-0.65, -0.22)	-0.22 (-0.39, -0.05)
Mid-upper arm circumference (MUAC)**	---	14.16 (13.92, 14.39)
Underweight (WAZ<-2)	6%	9%
Wasting (WLZ<-2)	14%	11%
Stunting (LAZ <2)	21%	13%

* Analysis account for facility level clustering

** MUAC was only measured among infants ≥6 months of age

Table 2. Univariate and multivariable analysis evaluating associations between maternal factors and breastfeeding practices

Maternal Factors	**Prevalence Ratio (95% CI)**	***P-value***	**Adjusted PR* (95% CI)**	***P-value***
Exclusive breastfeeding at 6-week visit				
Age <25 years (ref: ≥25)	0.96 (0.93, 0.99)	0.006	0.96 (0.93, 0.99)	0.02
Primary education and below (ref: secondary and above)	0.95 (0.92, 0.98)	0.002	0.95 (0.92, 0.98)	0.001
Married/cohabiting (ref: other)	1.03 (0.98, 1.07)	0.21	-	-
Mild and above depression (ref: minimal or none)	0.98 (0.93, 1.03)	0.43	-	-
Partner provides financial support (ref: no support)	1.03 (0.98, 1.09)	0.26	-	-
HIV-infected mother (ref: HIV-uninfected mother)	1.05 (1.02, 1.09)	0.004	1.05 (1.01, 1.09)	0.008
Continued breastfeeding at 9-month visit				
Age <25 years (ref: ≥25)	1.06 (1.02, 1.10)	0.001	1.02 (0.99, 1.05)	0.136
Primary education and below (ref: secondary and above)	1.00 (0.98, 1.02)	0.87	-	-
Married/cohabiting (ref: other)	1.02 (0.99, 1.05)	0.14	-	-
Mild and above depression (ref: minimal or none)	0.98 (0.95, 1.00)	0.06	-	-
Partner provides financial support (ref: no support)	1.03 (1.00, 1.06)	0.08	-	-
HIV-infected mother (ref: HIV-uninfected mother)	0.74 (0.66, 0.84)	<0.001	0.75 (0.66, 0.84)	<0.001
Exclusive breastfeeding during the first 6-months of life				
Age <25 years (ref: ≥25)	0.97 (0.91, 1.04)	0.45	-	-
Primary education and below (ref: secondary and above)	0.88 (0.81, 0.96)	0.004	0.87 (0.79, 0.94)	0.001
Married/cohabiting (ref: other)	1.02 (0.91, 1.13)	0.76	-	-
Mild and above depression (ref: minimal or none)	0.87 (0.76, 0.99)	0.03	0.83 (0.72, 0.94)	0.005
Partner provides financial support (ref: no support)	1.03 (0.92, 1.16)	0.60	-	-
HIV-infected mother (ref: HIV-uninfected mother)	1.23 (1.14, 1.32)	<0.001	1.27 (1.17, 1.37)	<0.001

*Multivariable models included maternal age, education and HIV status for the 6-week visit. At the 9-month visit, maternal age and HIV status, as well as maternal education, depression and HIV status were included in the multivariable models.

Table 3a. Association between breastfeeding practices and infant growth

		WAZ*		WLZ**		LAZ**		MUAC***	
		Coefficient (95% CI)	**P-value**	**Coefficient (95% CI)**	**P-value**	**Coefficient (95% CI)**	**P-value**	**Coefficient (95% CI)**	**P-value**
HIV-unexposed infants									
6-wk visit (n=1,402)	Exclusive breastfeeding	0.27 (-0.03, 0.56)	0.07	0.69 (0.15, 1.22)	0.01	-0.35 (-0.76, 0.07)	0.10	***	
9-mo visit (n=942)	Continued breastfeeding	-0.00 (-0.96, 0.95)	1.00	0.32 (-0.68, 1.32)	0.53	-0.53 (-1.30, 0.25)	0.18	-0.26 (-1.32, 0.81)	0.63
	Exclusive breastfeeding for 6 months	0.06 (-0.16, 0.28)	0.60	0.26 (-0.01, 0.52)	0.06	-0.17 (-0.49, 0.14)	0.28	-0.40 (-0.80, -0.00)	0.05
HIV-exposed infants									
6-wk visit (n=260)	Exclusive breastfeeding	1.11 (0.06, 2.16)	0.04	1.99 (0.10, 3.87)	0.04	0.72 (-0.71, 2.15)	0.32	***	
9-mo visit (n=238)	Continued breastfeeding	-0.08 (-0.51, 0.34)	0.70	0.10 (-0.46, 0.66)	0.72	-0.04 (-0.54, 0.47)	0.88	-0.33 (-0.94, 0.27)	0.27
	Exclusive breastfeeding for 6 months	0.50 (-0.13, 1.14)	0.12	0.40 (-0.23, 1.03)	0.21	0.45 (-0.37, 1.28)	0.28	0.83 (0.27, 1.39)	<0.01

* Beta coefficient adjusted for infant birth weight; *** MUAC was only measured among infants ≥6 months of age and adjusted for infant birth weight. **Beta coefficient adjusted for infant birth weight and maternal height

Table 3b. Association between breastfeeding practices and infant underweight, wasting and stunting

		Underweight*		Wasting**		Stunting**	
		Adjusted PR (95% CI)	**P-value**	**Adjusted PR (95% CI)**	**P-value**	**Adjusted PR (95% CI)**	**P-value**
HIV-unexposed infants							
6-wk visit (n=1,402)	Exclusive breastfeeding	0.41 (0.22, 0.75)	0.01	0.55 (0.34, 0.89)	0.02	1.84 (0.97, 3.52)	0.06
9-mo visit (n=942)	Continued breastfeeding	0.76 (0.10, 6.06)	0.80	0.56 (0.14, 2.20)	0.40	***	
	Exclusive breastfeeding for 6 months	1.10 (0.66, 1.84)	0.71	1.22 (0.73, 2.04)	0.44	1.97 (1.17, 3.31)	0.01
HIV-exposed infants							
6-wk visit (n=260)	Exclusive breastfeeding	0.49 (0.11, 2.28)	0.36	0.20 (0.07, 0.62)	0.01	0.65 (0.33, 1.25)	0.19
9-mo visit (n=238)	Continued breastfeeding	0.51(0.24, 1.05)	0.07	1.13 (0.46, 2.79)	0.79	0.88 (0.44, 1.76)	0.72
	Exclusive breastfeeding for 6 months	0.56 (0.21, 1.50)	0.24	0.56 (0.20, 1.60)	0.28	0.89 (0.35, 2.24)	0.80

* Prevalence ratio adjusted for infant birth weight; ** Prevalence ratio adjusted for infant birth weight and maternal height; *** Numbers too small

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