Breastfeeding Among Women Living With HIV in the Era of Lifelong ART: An Observational Multicountry Study in Eastern and Southern Africa

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Background: Lifelong antiretroviral treatment (ART) use is recommended for pregnant and breastfeeding (BF) women living with HIV (WLWH) to prevent perinatal HIV transmission and improve maternal health. We address 2 objectives in this analysis: (1) determine timing and factors associated with BF cessation and (2) assess the impact of BF on health of WLWH on ART.

Setting: This multicountry study included 8 sites in Uganda, Malawi, Zimbabwe, and South Africa.

Methods: This was a prospective study of WLWH on lifelong ART. These women initially participated from 2011 to 2016 in a randomized clinical trial (PROMISE) to prevent perinatal HIV transmission and subsequently reenrolled in an observational study (PROMOTE, 2016–2021) to assess ART adherence, safety, and impact.

Results: The PROMOTE cohort included 1987 women on ART. Of them, 752 breastfed and were included in analyses of objective 1; all women were included in analyses of objective 2. The median time to BF cessation varied by country (11.2–19.7 months). Country of residence, age, and health status of women were significantly associated with time to BF cessation (compared with Zimbabwe: Malawi, adjusted hazard ratio [aHR] 0.50, 95% confidence interval [95% CI]: 0.40 to 0.62, $P < 0.001$; South Africa, aHR 1.49, 95% CI: 1.11 to 2.00, $P = 0.008$; and Uganda, aHR 1.77, 95% CI: 1.37 to 2.29, $P < 0.001$). Women who breastfed had lower risk of being "unwell" compared with women who never breastfed (adjusted rate ratio 0.87, 95% CI: 0.81 to 0.95 $P = 0.030$).

Conclusion: Women on lifelong ART should be encouraged to continue BF with no concern for their health. Time to BF cessation should be monitored for proper counseling in each country.

Key Words: Africa, ART, breastfeeding, HIV, maternal health, women living with HIV

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INTRODUCTION

Breastfeeding (BF) protects against diarrheal and respiratory diseases and undernutrition in African children. Exclusive BF for the first 6 months of life continued with complementary foods for up to 2 years or beyond is recommended.[1] In southern and eastern Africa where child mortality rates are among the highest in the world,[2] substantial progress has been made in the prevention of perinatal HIV transmission through the use of antiretroviral treatment

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(ART).[3,4] In a recent report from a multicountry study from Africa, we showed high adherence to ART and better health status among women living with HIV (WLWH) who had been followed up for approximately 10 years.[5] ART is now the standard of care, and all pregnant and BF women are recommended to receive lifelong ART.[1] Although the WHO recommendations for BF are generally followed within Africa, local guidelines may influence timing to BF cessation.

Multiple studies have provided rich data on the historical evolutions of HIV and BF, associated risk factors, and benefits of BF for both mothers and children. Some studies predating the introduction of universal ART in Africa reported interesting but inconsistent associations of BF with maternal HIV disease progression.[6–10] Other studies reported on the impact of HIV and BF on maternal postpartum weight.[7,11,12] The impact of prophylactic and therapeutic ART use was extensively evaluated in sub-Saharan Africa and were the basis for implementing programs that have led to the successful prevention of perinatal HIV transmission.[13–16] A more recent study conducted in 4 African countries showed that BF was not associated with mother's HIV disease progression; however, only women who were not on ART per prevailing recommendations then were included.[17]

After the implementation of successful ART programs in sub-Saharan Africa, studies of HIV/ART impact on BF duration have become scarce. It is important to evaluate the potential impact of BF among women using lifelong ART. In addition, some studies have shown that obese women (a potential consequence of ART)[18] breastfeed less and for shorter durations than nonobese women.[19] Maternal health has also been described as a predictor of BF self-efficacy: healthier women may feel confident in their BF ability, and women with illnesses are more likely to wean infants sooner.[20,21] Therefore, monitoring BF trends in the era of universal ART use is essential. This analysis has to 2 main objectives: (1) determine time to BF cessation among WLWH on lifelong ART in 4 African countries with diverse populations and practices and identify factors associated with cessation of BF and (2) determine the impact of BF on the general health status of WLWH on lifelong ART.

METHODS

Study Design and Population

We analyzed data from the large observational PROMOTE study. WLWH on ART were enrolled and followed up from 2016 to 2021 at 8 sites in 4 African countries: Uganda (1), Malawi (2), Zimbabwe (3), and South Africa (2).[5,22] Women were originally enrolled in IMPAACT PROMISE, a randomized clinical trial conducted between 2011 and 2016 that investigated regimens to prevent perinatal HIV transmission (NCT01061151).[3] In brief, inclusion criteria for women taking part in the PROMISE study were a CD4 count of more than 350 cells/mm^3 (or higher according to each country's threshold for initiating ART then), hemoglobin >7.0 grams/dL, white blood cell count >1500 cells/mm^3, absolute neutrophil count >750 cells/mm^3, platelets >50,000 cells/mm^3, alanine aminotransferase (ALT) ≤ 2.5 × upper limit of normal, and estimated creatinine clearance of ≥60 mL/min. For this study, we included all women who provided consent to reenroll in the PROMOTE study. Reenrollment criteria for the PROMOTE study were mothers willing to provide informed consent to enroll and continue follow-up in the PROMOTE study for herself and for her children, living within the study catchment area, and having no plans to move during the study period.[22] The 8 PROMOTE sites represented the main enrolling sites in the previous PROMISE trial. Level of CD4 count was not a criterion for enrollment in the PROMOTE study.

Study Procedures

Maternal follow-up evaluations were scheduled every 6 months and included questionnaires on clinical and reproductive history, physical examinations, anthropometry, and ART adherence history. Women were counseled on ART adherence and received ART supplied locally per each country's national guidelines. The ART regimens used at the start of the PROMOTE study in 2016 consisted of efavirenz/nevirapine–based regimen for all sites except for the Kampala, Uganda site, which used lopinavir/ritonavir (Lpv/r)–based regimen. All sites switched to using the new ART regimen dolutegravir (DTG) before the PROMOTE study closed in 2021 (approximately 37% of women reported using DTG at the last recorded visit[5]). Laboratory investigations included maternal complete blood count, CD4 cell count, and HIV load. The reproductive history questionnaires collected data on new pregnancies, BF history, and health status.

Statistical Analysis

We first described time to BF cessation and characterized factors associated with earlier BF cessation. We included data only on time to first pregnancy and do not consider time to cessation of BF in subsequent pregnancies. For this analysis, population included women who were pregnant at enrollment into the PROMOTE study or became pregnant during follow-up, had a live birth, and at least 1 postnatal follow-up visit. We then evaluated the impact of BF on maternal health, using data from all WLWH who enrolled in the PROMOTE study.

Time to BF cessation was defined as time from date of delivery to reported date of last BF; if this date was not available, the midpoint between the first visit when mothers reported no longer BF and the date of the immediate prior visit was used. Participants who never reported BF cessation were censored at the last follow-up visit of their first pregnancy. For participants who had a live birth but did not report BF at their first follow-up visit, their data were censored at the midpoint between birth and first postnatal visit (to minimize bias).

In objective 2 of this analysis were considered 2 outcomes: (1) body mass index (BMI) (weight in kilogram/height in square meters) categorized as normal (<25 kg/m^2), overweight (≥25–<30 kg/m^2), and obese (≥30 kg/m^2) and (2) maternal health status defined as "well" if participants

self-reported their health as "excellent" or "very well," had no hospitalizations, and no unscheduled visits for adverse effects since last study visit or as "unwell" if they self-reported their health as worse than "very well," had been hospitalized, or had had unscheduled visits for adverse effects. The information on reported maternal health (well/unwell), including hospital admissions, unscheduled visits to the clinic, and adverse events was obtained through structured questionnaires. Review of structured case report forms, medical records, and laboratory tests to assess adverse events (eg, abnormalities of complete blood count or liver enzymes) was conducted by trained clinical staff at each site. BF was considered the main predictor variable.

We first performed descriptive analyses to compare different characteristics across countries using the Pearson χ^2 test for categorical data and Kruskal–Wallis rank sum test for continuous data. In assessment of time to BF cessation, we conducted time-to-event analysis using the Kaplan–Meier method to estimate the median time to BF cessation and the corresponding interquartile range (IQR). We compared these estimates with the log-rank test. We used multivariable Cox proportional hazards regression to determine risk factors associated with BF cessation; we presented hazard ratios (HRs) and 95% confidence intervals (CIs). Selection of risk factors included in these models was based on biological, epidemiological, and statistical considerations. Both time-fixed (country, work status, marital status, and availability of electricity or tap water in the dwelling) and time-varying (age, BMI, and health status) variables were included in the models. We also performed separate analyses to determine the impact of BF on the outcomes of BMI and reported health status over time in women who breastfed and the rest of the cohort of women in the PROMOTE study who never breastfed. For this longitudinal repeated measures correlated data, we used generalized estimating equation (GEE) models to assess the association of BF and other factors with the outcomes of interest. For the GEE models, we estimated rate ratios using the log link and an exchangeable correlation structure clustered on the participant level. P values < 0.05 were considered statistically significant. All analyses were performed using R (Version 4.1.3, R Core Team, Vienna, Austria) using RStudio (Version 2022.02.01 Build 461, R Studio Team, Boston, MA).

Ethical Approvals

The PROMOTE study was approved by all relevant Institutional Review Boards in the United States and at each collaborating African research site. All women provided written informed consent to all aspects of the study.

RESULTS

A total of 1987 WLWH on lifelong ART were included in the PROMOTE study (Fig. 1). Of them, 752 BF women were included in the analysis to asses timing and factors associated with BF cessation (1032 women who never became pregnant in the PROMOTE study, 96 women with BF missing data, and 107 women with nonviable births were excluded). All 1987 women who enrolled in the PROMOTE study were included in the second objective analyses. Table 1 summarizes selected characteristics of the 752 BF women included in these analyses, stratified by country. The median age at delivery varied by country (30.8–32.3 years). Other characteristics also varied by country: in Malawi, only 16% of women completed secondary schooling, while in South Africa, 51% of women completed secondary school or more. Similarly, in Zimbabwe, only 11% of women had formal employment, compared with 37% in South Africa. A lower proportion of women in Malawi reported having electricity in their household (43%) compared with 60% in Zimbabwe, 80% in Uganda, and 99% in South Africa. There were no significant differences in proportions of women married or with a regular partner by country. At enrollment (PROMOTE baseline), 84% of women had an undetectable viral load; this was highest in South Africa (93%) and lowest in Malawi (78%). At enrollment, 90% of women had a CD4 cell count of more than 500 cells/mm^3; highest in Uganda (96%) and Zimbabwe (95%) and lowest in Malawi (85%).

Table 2 summarizes median times to BF cessation among these 752 women, obtained from the Kaplan–Meier analyses; the accompanying survival curves are shown by country, maternal BMI, and health status categories (see Figure S1, Supplemental Digital Content 1, http://links.lww.com/QAI/C121 showing time to BF cessation). Overall, BF cessation occurred at a median of 16 months (IQR 12.2–20.1). These results differed by country and were statistically significant ($P < 0.001$): South African women stopped BF earliest (median 11.2, IQR 6.2–16.2), followed by women in Uganda (median 12.2, IQR 10.2–13.2), Zimbabwe (median 15.5, IQR 13.3–17.7), and Malawi (median 19.7, IQR 16.9–21.9). The differences in the median time to cessation of BF by BMI category were statistically significant ($P = 0.004$) and showed an interesting trend: "obese" (14.9 month), "overweight" (16.0 months), and "normal" (16.3 months). There were no differences in the median time to BF cessation by health status category ("unwell" 16.9 vs. "well" 16.0 months). In a subanalysis stratified by country (data not shown), no statistically significant differences were noted for time to BF cessation by health status category at delivery. The only statistically significant difference was an association between time to BF cessation by BMI category in Malawi; as is in the overall results, cessation of BF was early (18.2 months) in obese women; intermediate (19.2 months) in overweight women; and late (20.2 months) in women with normal weight ($P = 0.022$).

Table 3 summarizes the results of the Cox proportional hazards analysis to assess the association of BF cessation with selected risk factors. In the multivariable model, a 5-year increase in age was associated with a lower hazard of BF cessation (adjusted HR 0.90, 95% CI: 0.81 to 0.98, $P = 0.023$). There was a strong and statistically significant association between BF cessation and country of residence: compared with WLWH on ART from Zimbabwe, women from Malawi had lower hazard of BF cessation (HR = 0.50, 95% CI: 0.40 to 0.62, $P < 0.001$), while women from Uganda (HR 1.77, 95% CI: 1.37 to 2.29, $P < 0.001$) and South Africa (HR 1.49, 95% CI: 1.11 to 2.00, $P = 0.008$) had higher hazards of BF cessation. In addition, women who reported

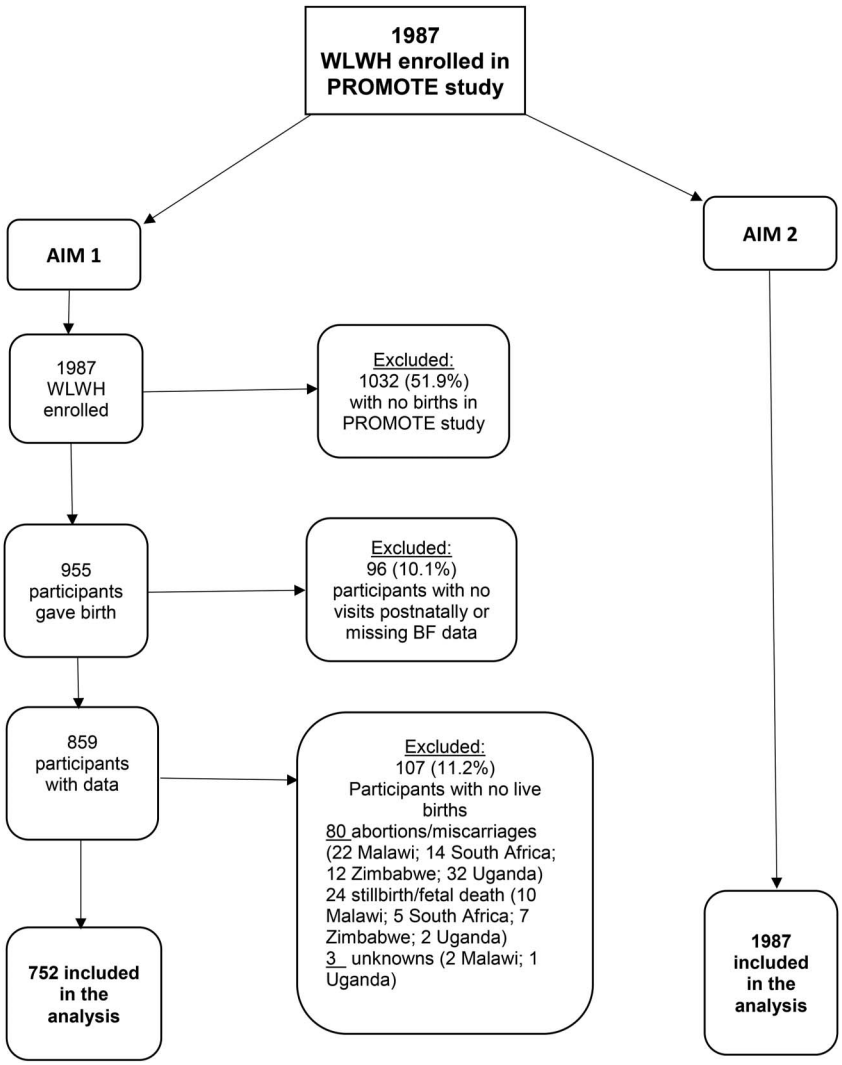

FIGURE 1. Flowchart showing distribution of women living HIV who participated in the PROMOTE study.

their health status as "unwell" had lower hazards of BF cessation compared with those who reported their health as "well" (HR 0.79, 95% CI: 0.61 to 0.99, $P = 0.049$). BMI and having electricity at home (indicator of socioeconomic status) were significantly associated with BF cessation in the univariate analyses but not after adjusting for other factors. Similarly, having tap water in the house, employment of the participant, or marital status was not significantly associated with BF cessation.

Table 4 summarizes the results of 2 GEE models for the associations of BF (exposure) with 2 outcomes: reported health status and BMI, after adjusting for other covariates. These models examine the impact of BF on the health status of WLWH on lifelong ART. In the health status model, women who breastfed had lower risk of being "unwell" compared with women who never breastfed (adjusted RR = 0.87, 95% CI: 0.81 to 0.95, $P = 0.030$). Other variables significantly associated with "unwell" compared with "well" health status included the following: increase in age had lower risk and being from Malawi, South Africa, or Uganda (all compared with being from Zimbabwe) was associated with increased risk. In addition, women with an undetectable viral load had a lower risk of being "unwell" compared with women with detectable viral load (adjusted rate ratio [aRR] 0.91, 95% CI: 0.84 to 0.98, $P = 0.015$), and women in the lowest quartile of BMI (compared with women in upper quartiles) had a statistically significant increased risk of being "unwell." When BMI was the outcome measure, BF was not associated with lower BMI. However, increase in age was associated with a lower risk of being in the lowest quartile of BMI (aRR = 0.93, 95% CI: 0.91 to 0.98, $P = 0.027$); and being from South Africa (aRR = 0.55, 95% CI: 0.43 to 0.68, $P < 0.001$) or Uganda (aRR 0.72, 95% CI: 0.57 to 0.90, $P = 0.005$) was significantly associated with a lower risk of being in the lower quartile of the BMI compared with those from Zimbabwe. In addition, women who had electricity in their household (indicator of higher socioeconomic status) had a lower risk of being in the lower BMI quartile (aRR 0.78, 95% CI: 0.67 to 0.90, $P < 0.001$) compared with women without household electricity. In addition, women with

TABLE 1. Characteristics of WLWH on Long-Term ART Who Became Pregnant During the PROMOTE Study by Country (N = 752)

Characteristic	Country				*P*
	Malawi N = 279	South Africa N = 140	Uganda N = 134	Zimbabwe N = 199	
Median (IQR) age at delivery, yr*	31.7 (27.3, 34.9)	31.9 (29.2, 35.4)	30.8 (27.6, 34.0)	32.3 (28.7, 36.1)	0.009§
Median BMI (IQR) at enrollment, kg/m^2	23.1 (20.5, 26.5)	27.8 (23.1, 33.0)	25.4 (22.3, 29.4)	23.7 (21.4, 28.1)	<0.001§
Highest education†					<0.001¦
Secondary or more	44 (16%)	72 (51%)	22 (16%)	111 (56%)	
Up to primary	235 (84%)	68 (49%)	112 (84%)	88 (44%)	
Has regular partner/married†	233 (84%)	118 (84%)	114 (85%)	181 (91%)	0.120¦
Work status†					<0.001¦
Formal employment	36 (13%)	52 (37%)	29 (22%)	22 (11%)	
Self-employed	97 (35%)	6 (4.3%)	51 (38%)	79 (40%)	
Unemployed/Housewife	146 (52%)	82 (59%)	54 (40%)	98 (49%)	
Has electricity at home†	120 (43%)	138 (99%)	107 (80%)	120 (60%)	<0.001¦
HIV viral load at enrollment†					<0.001¦
Detectable	62 (22%)	10 (7.1%)	23 (17%)	22 (11%)	
Undetectable‡	216 (78%)	130 (93%)	111 (83%)	177 (89%)	
Unknown	1	0	0	0	
CD4 cell count at enrollment†					<0.001¦
<500 cells/mm^3	41 (15%)	15 (11%)	6 (4.5%)	10 (5.0%)	
≥500 cells/mm^3	235 (85%)	125 (89%)	128 (96%)	189 (95%)	
Unknown	3	0	0	0	

*Median (IQR).
†n (%).
‡No RNA detected or below limit of detection (<20 copies/mL in Uganda and <40 copies/mL in Malawi, Zimbabwe, and South Africa).
§Kruskal–Wallis rank sum test.
¦Pearson χ^2 test.

"unwell" health status (compared with women with "well" health status) had a statistically significant increased risk of being in the lowest BMI quartile (aRR 1.07, 95% CI: 1.03 to 1.10, $P < 0.001$). We also examined the impact of BF with a more objective measure of maternal health status—detectability of viral load—by calendar time (to account for variabilities of testing during the COVID-19 restrictions) during the conduct of the study (see Table S1, Supplemental Digital Content 2, http://links.lww.com/QAI/C121, listing viral load detectability by BF status) and did not observe differences between those who breastfed and did not breastfeed throughout the study.

DISCUSSION

This multicountry study focused on BF in WLWH on long-term ART in eastern and southern Africa. We showed that the median BF cessation varied by country. For example, in Malawi, the median time to cessation of BF extended to 22 months (close to the WHO recommendation of 24 months), compared with South Africa where the median duration of BF was relatively short—less than 12 months. The observed variability in BF duration by country is most likely due to differences in local BF guidelines and underlying cultural and contextual differences, such as mothers' return to formal employment among mothers in South Africa.[23]

The observation that cessation of BF is associated with women's BMI category postnatally is of interest and may have implications in the context of ART regimens that are currently being recommended throughout Africa. Recently, WLWH were advised to switch to a DTG-based regimen.[24] In several studies, DTG was reported to increase weight and potentially noncommunicable disease complications.[25] A systematic review found that obese women have lower intent to breastfeed, and of those who do, it was associated with shorter BF duration for any BF mode (exclusive or complementary)[26]; the authors suggested difficulties with BF for obese women, perceived lower quality of BF, and association with socioeconomic status as potential explanations.[19] This is an area that needs further monitoring and assessment.

In the multivariate analysis, after adjusting for other factors, there were strong and statistically significant associations between BF cessation and country of residence confirming our univariate observations; the risk of earlier cessation of BF was lower in Malawi where the median BF was long, and the risk of BF cessation was higher in countries such as South Africa and Uganda where the median BF was short. Other interesting associations with BF cessation in this cohort included the following: less healthy (unwell) women had a lower hazard of BF cessation, possibly these women cannot afford an alternative to feed the baby; older women also had lower hazard, likely an intergenerational or cultural tradition. The other contextual factors such as availability of water, electricity, maternal employment, and marital status we included in the model for their link with safer alternatives to BF were not statistically significant after adjusting for other

TABLE 2. Median Time in Months to BF Cessation Among WLWH on Long-Term ART (N = 752)

	Median (mo)	IQR	*P**
Overall (N = 752)	16.0	12.2–20.1	
By country			
Malawi (n = 279)	19.7	16.9–21.9	**<0.001**
South Africa (N = 140)	11.2	6.2–16.2	
Uganda (N = 134)	12.2	10.2–13.2	
Zimbabwe (N = 199)	15.5	13.3–17.7	
By BMI at delivery†			
Normal (N = 349)	16.3	12.3–20.9	**0.004**
Overweight (N = 222)	16.0	12.2–20.0	
Obese (N = 179)	14.9	11.9–18.4	
By health status after delivery			
Unwell (N = 168)	16.9	12.8–20.9	0.270
Well (N = 584)	16.0	12.2–19.9	

*Log-rank test.
†Normal (<25 kg/m^2); overweight (≥25–<30 kg/m^2); obese (≥30 kg/m^2).
The values that are statistically significant are bolded.

factors. However, these factors may still be important within each country (a factor strongly associated with BF cessation —ie, these factors may be highly correlated).

The PROMOTE study data we have from a large cohort of WLWH on long-term ART provided an opportunity to assess the impact of BF on HIV disease progression. In the era predating use of ART, some studies suggested that BF may influence HIV disease progression or even increase mortality.[6] Although these observations were not confirmed, examination of these hypotheses in women using lifelong ART is of interest. Our data show that BF is not associated with lower (unwell) health status or lower BMI (wasting). In addition, a more objective measure of HIV disease progression, detectability of viral load, was also not associated with BF in this cohort. The factors that showed statistically significant associations (GEE models) with adverse health status and lower BMI in this study were explainable and epidemiologically and biologically plausible. These findings are encouraging, and women should be counseled to continue BF for as long as they can.[27] However, our findings showing no association of BF with adverse health status or BMI should be interpreted with caution. The challenge of reverse causality in determining the directionality of a relationship between exposure and outcome (eg, women being healthier or with higher BMI may be the reason for BF) has been frequently raised in several areas of research—including BF and HIV studies.[28] In our analysis, we controlled for health status and BMI categories in the respective models (Table 4) to minimize this issue of reverse causality when assessing the impact of BF on health status and BMI over time. These findings support our statement that BF is not associated with adverse health outcomes independent of health status or BMI

TABLE 3. Cox Proportional Hazards Model for BF Cessation With Selected Risk Factors (N = 752)

	Unadjusted Hazard Ratio (HR)			aHR		
Variable	**HR**	**95% CI**	***P***	**HR**	**95% CI**	***P***
Maternal age, 5-year increments	0.92	0.85–1.01	0.095	0.90	0.81–0.98	**0.023**
Country, Malawi*	0.48	0.39–0.59	**<0.001**	0.50	0.40–0.62	**<0.001**
Country, South Africa*	1.47	1.11–1.93	**0.006**	1.49	1.11–2.00	**0.008**
Country, Uganda*	1.93	1.52–2.47	**<0.001**	1.77	1.37–2.29	**<0.001**
Has electricity, yes vs. no	1.57	1.32–1.86	<0.001	1.05	0.86–1.28	0.620
Has tap water, yes vs. no	1.03	0.87–1.22	0.690		†	
Work status, self-employed vs. unemployed	0.99	0.82–1.20	0.945	1.04	0.87–1.27	0.622
Work status, formally employed vs. unemployed	1.21	0.96–1.52	0.113	1.06	0.84–1.35	0.609
Marital status, married/coupled vs. not	1.18	0.90–1.53	0.229	1.05	0.81–1.37	0.70
BMI, <lower quartile vs. ≥lower quartile‡	0.75	0.62–0.88	**0.007**	0.88	0.71–1.03	0.098
Health status, unwell vs. well§	0.68	0.54–0.86	**0.001**	0.79	0.61–0.99	**0.049**

*Reference is Zimbabwe.
†Not included in adjusted model because this variable is highly correlated with electricity variable.
‡Lowest quartile of BMI versus upper 3 quartiles of BMI.
§Well: self-reported health status "excellent" or "very well," no hospitalizations and no unscheduled visits due to sickness; Unwell: self-reported health status worse than "very well," hospitalizations or unscheduled visits due to sickness.
The values that are statistically significant are bolded.

TABLE 4. GEE Models for the Association of BF With Health Status and BMI (N = 1945)

	Association with Health Status (Unwell vs. Well)¦			Association with BMI (<First Quart. vs. ≥First Quar.)§		
Variable	**aRR†**	**95% CI**	***P***	**aRR†**	**95% CI**	***P***
Breastfed, yes vs. no	0.87	0.81–0.95	**0.030**	1.02	0.98–1.07	0.448
Age, 5-year increments	0.90	0.87–0.92	**0.010**	0.93	0.91–0.98	**0.027**
Country, Malawi*	1.71	1.54–1.93	**<0.001**	1.12	0.94–1.32	0.214
Country, South Africa*	2.24	1.98–2.47	**<0.001**	0.55	0.43–0.68	**<0.001**
Country, Uganda*	1.41	1.23–1.59	**<0.001**	0.72	0.57–0.90	**0.005**
Electricity, yes vs. no	0.99	0.90–1.07	0.859	0.78	0.67–0.90	**<0.001**
Highest education, up to primary vs. secondary	1.09	1.01–1.17	**0.022**	0.99	0.85–1.16	0.888
Viral load, undetectable vs. detectable‡	0.91	0.84–0.98	**0.015**	1.03	0.96–1.09	0.474
BMI, <first quart. vs. ≥first quart§	1.16	1.09–1.24	**<0.001**	—	—	—
Health status: unwell vs. well¦	—	—	—	1.07	1.03–1.10	**<0.001**

*Reference is Zimbabwe.
†Adjusted risk ratio.
‡Undetectable: no RNA detected, or below limit of detection (<20 copies/mL in Uganda and <40 copies/mL in Malawi, Zimbabwe, and South Africa).
§Lowest quartile of BMI versus upper 3 quartiles of BMI.
¦Well: Self-reported health status "excellent" or "very well," no hospitalizations and no unscheduled visits due to sickness; Unwell: Self-reported health status worse than "very well," hospitalizations or unscheduled visits due to sickness.
The values that are statistically significant are bolded.

at an earlier visit. However, we acknowledge post hoc analytic techniques alone are not adequate to address a "common sense" issue of reverse causality.

A limitation we had in this study is that we did not have data on BF modalities (exclusive, predominant, or mixed). In addition, misclassification of data in determining time of BF cessation and biases with reported data are inevitable and unavoidable. Nonetheless, the diversity of the populations and settings we studied provided us with a broader perspective about the status of BF in several countries in eastern and southern Africa at a time when use of ART has become the standard of care. The PROMOTE data showed that women have become experienced in use of ART and are maintaining high adherence despite changes in ART regimens being used.[5] We did not collect data on BF from women who were not living with HIV at these sites; such data could have provided useful comparisons duration of BF in the overall population, enhanced generalizability, and an assessment of impact of ART. An important follow-up we were not able to complete in the PROMOTE study is evaluation of BF, weight gain, and ART (especially with the recently introduced regimen of DTG).

In conclusion, this multicountry study of WLWH on lifelong ART showed that cessation of BF varied by country and seemed to be driven by local guidelines; this may need regular monitoring in each country to avoid unnecessarily shortening of BF. In addition, BF was not associated with adverse maternal health effects. This encouraging result complements the benefits of ART in improving health of WLWH and preventing perinatal HIV transmission. Clinicians and health care providers attending to the needs of WLWH should emphasize these benefits.

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