Original Article

Breastfeeding practices and child growth outcomes in Haiti: an analysis of data from Demographic and Health Surveys

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Abstract

Haiti's national nutrition policy prioritises breastfeeding, but limited data are available to inform strategy. We examined national trends in early initiation of breastfeeding (ErIBF) and exclusive breastfeeding (EBF) over a 10-year period using data from three Haitian Demographic and Health Surveys (1994–1995, 2000 and 2005–2006). We used multivariate regression methods to identify determinants of ErIBF and EBF in the 2005–2006 data set and to examine relationships to growth. There was no change in ErIBF across surveys [1994–1995: 36.6%, 95% confidence interval (CI) 29.9–43.9; 2000: 49.4%, 95% CI 44.1–54.8; 2005–2006: 43.8%, 95% CI 40.5–47.1]. EBF among 0–5-month-olds increased sharply (1994–18995: 1.1%, 95% CI 0.4–3.2; 2000: 22.4%, 95% CI 16.5–29.5; 2005–2006: 41.2%, 95% CI 35.4–47.2). The proportion of breastfeeding children 0–5 months who received soft, solid or semi-solid foods decreased (1994–1995: 68.5%, 95% CI 57.3–77.9; 2000: 46.3%, 95% CI 39.3–53.4; 2005–2006: 30.9%, 95% CI 25.9–36.5). Child age at time of survey [odds ratio (OR) 1.73; $P = 0.027$], lower maternal education (OR = 2.14, $P = 0.004$) and residence in the Artibonite Department (OR 0.31; $P = 0.001$) were associated with ErIBF among children 0–23 months. Age group and department were significant predictors of EBF among children 0–5 months. ErIBF was associated with higher weight-for-age *z*-scores [effect size (ES) 0.22; $P = 0.033$] and height-for-age *z*-scores (ES 0.20; $P = 0.044$). There was no statistically significant relationship between EBF and growth. The 10-year ErIBF and EBF trends in Haiti echo global and regional trends. ErIBF and EBF are related practices but with different determinants in the Haitian context. These differences have implications for intervention delivery.

Keywords: breastfeeding, breastfeeding initiation, child growth, health policy, infant and child nutrition, low-income countries.

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Introduction

Optimal breastfeeding practices are associated with reduced child mortality (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000) and other health benefits for both child and mother (Leon-Cava *et al*. 2002; Horta *et al*. 2007). Breastfeeding recommendations include initiation of breastfeeding within 1 h of birth, exclusive breastfeeding (EBF) until 6 months of age and continued breastfeeding until at least 2 years of age with appropriate introduction of complementary foods (Pan American Health Organization and Dewey 2003; World Health Organization 2005).

An estimated 1.30–1.45 million child deaths globally could be prevented each year with improved breast-feeding practices (Lauer *et al.* 2006). There are cost-effective strategies for improving breastfeeding practices at population scale (Bhutta *et al.* 2008; Black *et al.* 2008).

An analysis of country-level trends in eight Latin America and Caribbean (LAC) countries over the past two decades showed improved duration of breastfeeding in all countries, except Haiti where average duration of breastfeeding declined by 1.2 months between 1994–1995 and 2005–2006 (Lutter *et al.* 2011). Despite this overall negative trend, several subgroups of women in Haiti demonstrated a positive increase in breastfeeding duration across the 10-year period, including those with more education, those living in urban environments and those employed in manual or service occupations (Lutter *et al.* 2011). In the Haitian Demographic and Health Survey (HDHS) 2005–2006, mean duration of any breastfeeding remained relatively high compared with other LAC countries at 18.2 months (Cayemittes *et al.* 2007).

Little information is available on recent trends and determinants of other key breastfeeding practices in Haiti including early initiation of breastfeeding (ErIBF) and EBF. Published literature related to Haitian breastfeeding practices is focused on HIV-affected populations (Bordes *et al.* 1982; Graitcer *et al.* 1984; Kirkpatrick & Cobb 1990; Coreil *et al.* 1998). Since the January 2010 Haiti earthquake, there has been renewed emphasis on promotion of breast-feeding by the Haitian Ministry of Public Health and Population (MOPHP) (Ministère de la Santé Publique et de la Population 2012) and its partners. The aims of this analysis are to describe national trends in ErIBF and EBF using HDHS data from 1994–1995 to 2005–2006; to examine determinants of ErIBF and EBF in Haiti; and to describe the relation-ship between these breastfeeding practices and growth outcomes among Haitian infants and young children. We will consider the implications of the find-ings for the targeting of breastfeeding promotion efforts by the MOPHP.

Methods

Study design

The paper presents results from two sets of analyses using the HDHS data. The trend analyses used data from the three available HDHS surveys (1995–1996, 2000 and 2005–2006) to describe changes in breast-feeding practices over a 10-year period. Each survey used a two-stage cluster sampling design to generate nationally representative cross-sectional samples of households. All three surveys collected data on women age 15–49 years and children under 5 within the households. The multivariate analysis of deter-minants of breastfeeding practices uses only the most recent data for children 0–23 months (HDHS 2005–2006). For analyses involving child growth out-comes, we further restricted our analysis to half of the sample whose weight and height were measured and recorded during the survey. Informed consent was obtained from all survey participants prior to data collection. More information about design, data collection and data management for each survey is

Key messages

- While Haiti's early initiation of breastfeeding (ErIBF) rate (41.2%) is on par with the Latin American and Caribbean region (42.1%) and global average (43.0%), Haiti's higher-than-average neonatal mortality rate suggests potential to benefit from interventions to improve ErIBF.
- The improvement in exclusive breastfeeding (EBF) rate among Haitian children 0–5 months is consistent with global trends but remains below the World Health Organization's (WHO) 50% target.
- ErIBF and EBF are related practices but with different determinants. For ErIBF, special effort is needed to reach more educated women.
- Consistent with findings from other regions, growth of Haitian children 0–23 months is associated with ErIBF but not EBF.

available in the HDHS final reports (Cayemittes *et al.* 1995, 2007; Cayemittes 2001). Permission to use the data was obtained from ICF International (Calverton, MD, USA).

Data collection

Breastfeeding outcomes

ErIBF was defined as the proportion of children age 0–23 months whose mothers reported putting them to the breast within 1 h of birth. Each HDHS survey collected data about child dietary intake in the previous 24 h, including breastfeeding, other liquids, and soft, semi-soft and solid foods. EBF was defined as the proportion of children age 0–5 months who received only breast milk in the previous 24 h before the survey.

Covariates for the multivariate regression analyses comprised those previously identified as being associated with breastfeeding practices or growth (Senarath *et al.* 2007, 2010, 2011). These included variables related to household socio-economic status, maternal and child biological factors, and access to health care.

Residence was categorised as urban or rural. Departments included Sud, Sud-Est, Grand-Anse, Nippes, Nord, Nord-Est, Nord-Quest, Artibonite, Centre and Ouest (including metropolitan Port-au-Prince). The HDHS wealth index quintile was calculated using factor analysis based on household size, water source, type of toilet, primary cooking method, materials used in housing construction and ownership of household assets. More information on construction of the DHS wealth index can be found elsewhere (Rutstein *et al.* 2004). Other socio-economic variables comprised maternal education (none, primary, secondary or higher) and current maternal employment (yes, no).

Biological factors included child age, multiple or single birth, child sex and maternal body mass index (BMI), classified as normal (18.5–24.9 kg m^{-2}), underweight (<18.5 kg m^{-2}) or overweight (≥25.0 kg m^{-2}). Maternal height and weight were measured by the survey team.

Access to health care was assessed for two periods, pregnancy and early childhood. Infant feeding counselling and other antenatal care (ANC) services may influence breastfeeding initiation and duration (Vieira *et al.* 2010; Agho *et al.* 2011); so, based on World Health Organization (WHO) Focused ANC guidelines (World Health Organization 2002), we classified children born to mothers who reported the recommended ≥4 ANC visits vs. those with 0–3 visits. Access to health care for the child was assessed by whether the mother reported currently having a MOPHP child health card. Per MOPHP protocols, all children age 0–59 months who access health care in Haiti receive a 'Road to Health' card and receive routine growth monitoring and infant feeding counselling from health care workers. It was assumed that children with a card accessed the health system at least once. Children of mothers who reported a lost card or never having received a card were classified as not having a health card.

Anthropometric measurements were collected for children in a random sample of half of the households surveyed in the HDHS 2005–2006. Weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) *z*-scores were calculated using the WHO Child Growth Standards Macro for SPSS (WHO Multicentre Growth Reference Study Group 2006). Children with extreme observations outside range of −7 < WAZ < 7 were excluded from the data set before analysis.

Data analysis

All statistical analyses were performed using SPSS software version 19 (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0; Armonk, NY, USA). We used the SPSS 19 Complex Sample module to account for the two-stage cluster sampling design of each HDHS survey. Probability weights were applied to all analyses to account over-sampling and under-sampling of certain groups to produce a nationally representative sample. All sample sizes reported are estimated based on these weights.

Given the separate complex survey designs for each HDHS, we considered non-overlapping confidence interval (CI) around estimates of the same variable as statistically significant. This approach may have underreported statistical significance (Knezevic 2008). Within individual HDHS surveys, unadjusted

prevalence estimates were compared across categories using Pearson's chi-square test. Means were compared across categories using analysis of variance. Values presented in the text are means or percentages with 95% CI.

Multiple logistic regression was used to identify variables associated with ErIBF and EBF in the HDHS 2005–2006. Logistic regression results are presented as odds ratios (OR) with 95% CI and *P*-values. We used multiple linear regression to assess the relationship between each breastfeeding indicator and achieved growth *z*-score (WAZ, HAZ and WHZ) after adjusting for the other covariates in the model. Results are presented as *β* parameter estimates with 95% CI and *P*-values. Observations with missing data were excluded for each regression analysis.

For all analyses, significance was accepted at a $P < 0.05$ level and all tests were two-sided.

Results

Trends analysis

The HDHS 1994–1995, 2000 and 2005–2006 samples included 4994, 9678 and 10 038 households, respectively. For the trends analysis, we used data on 1241 (HDHS 1994–1995), 2342 (HDHS 2000) and 2155 (HDHS 2005–2006) children age 0–23 months living with the respondent at the time of survey.

ErIBF reported for children 0–23 months of age increased from 36.6% (95% CI 29.9–43.9) in 1995–1996 to 49.4% (95% CI 44.1–54.8) in 2000 and then decreased to 43.8% (95% CI 40.5–47.1) in 2005–2006. Changes between years were not statistically significant. There were 283 (HDHS 1994–1995), 549 (HDHS 2000) and 577 (HDHS 2005–2006) children 0–5 months in the respective samples. Rates of EBF among children 0–5 months of age increased statistically significantly across the years from 1.1% (95% CI 0.4–3.2) in 1995–1996 to 22.4% (95% CI 16.5–29.5) in 2000 to 41.2% (95% CI 35.4–47.2) in 2005–2006.

Patterns of any breastfeeding also changed over the 10-year period (Fig. 1). The proportion of breastfeeding children 0–5 months who received soft, solid or semi-solid foods decreased steadily from 68.5% (95% CI 57.3–77.9) in 1994–1995 to 46.3% (95% CI 39.3–53.4) in 2000 to 30.9% (95% CI 25.9–36.5) in 2005–2006. Declines between surveys were statistically significant. The proportion of breastfeeding children under 2 months of age who received solid, semi-solid or soft foods was 23.1% (95% CI 9.0–47.7) in
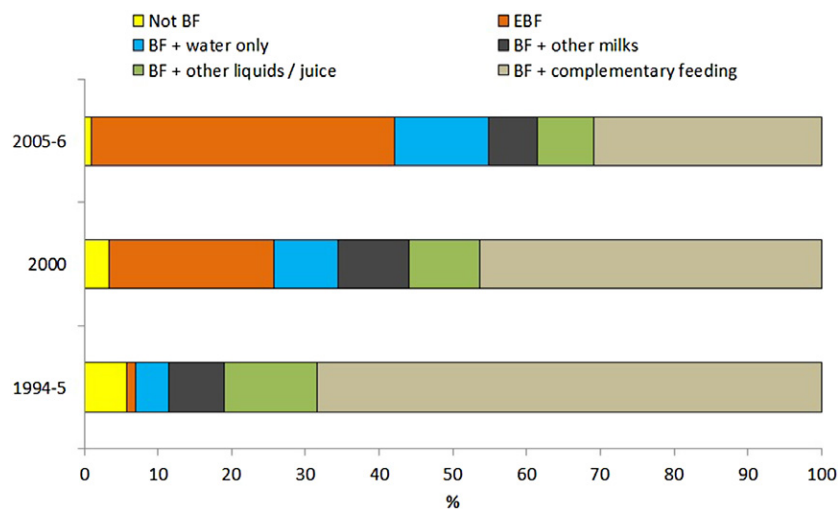

Fig. 1. Breastfeeding pattern among children 0–5 months by year of survey (HDHS 1994–1995, 2000 and 2005–2006). Shaded regions present proportion of all children 0–23 months who received no breast milk (not BF), only breast milk (EBF) or breast milk in addition to other liquids (water, milk, other liquids/juice) or complementary foods as specified. Each child can fall into only one category so, for example, a child who received BF + complementary foods might also have received milk and/or juice.

Table 1. Characteristics of children age 0–23 months who live with mother, Haitian Demographic and Health Survey 2005–2006

	n	%	95% CI				*n*	%	95% CI	
Child characteristics						Household characteristics				
Sex						Wealth Quintile				
Female	1129	49.4	47.1	51.7		Lowest	566	24.8	21.1	28.8
Male	1157	50.6	48.3	52.9		Second	477	20.9	18.2	23.7
Age group						Middle	452	19.8	17.0	22.8
0–5 months	585	25.6	23.5	27.8		Fourth	460	20.1	17.2	23.3
6–8 months	299	13.1	11.3	15.1		Highest	332	14.5	12.0	17.4
9–11 months	274	12.0	10.5	13.7		Residence				
12–17 months	608	26.6	24.3	29.0		Urban	770	33.7	30.6	36.8
18–23 months	520	22.8	20.8	24.8		Rural	1516	66.3	63.2	69.4
Type of birth						Department				
Multiple	48	2.1	1.3	3.5		Nord-Quest	147	6.4	5.1	8.0
Single	2238	97.9	96.5	98.7		Nippes	58	2.6	2.1	3.2
Currently has child health card						Sud-Est	128	5.6	4.4	7.1
Yes	1817	79.5	76.2	82.6		Nord	221	9.7	8.3	11.3
No	467	20.5	17.4	23.8		Nord-Est	85	3.7	3.0	4.5
Maternal characteristics						Artibonite	407	17.8	15.1	20.9
Maternal BMI						Centre	288	12.6	9.7	16.2
Underweight	140	12.7	10.4	15.5		Sud	131	5.7	4.7	7.0
Overweight	196	17.8	14.9	21.1		Grand-Anse	97	4.3	3.3	5.5
Normal	763	69.5	65.9	72.8		Ouest (including PAP)	723	31.6	28.5	34.9
Maternal Education										
No school	321	29.0	25.1	33.2						
Primary	495	44.8	40.8	48.8						
Secondary+	290	26.2	22.8	30.0						
Mother antenatal visit										
Yes	1120	50.8	47.5	54.1						
No	1085	49.2	45.9	52.5						
Mother currently employed										
Yes	1007	44.3	41.1	47.5						
No	1266	55.7	52.5	58.9						

BMI, body mass index. Total sample size included in analysis = 2286.

1994–1995, 25.0% (95% CI 17.5–34.5) in 2000 and 11.6% (95% CI 5.7–22.2) in 2005–2006.

Multivariate analyses

Table 1 describes the general characteristics of the HDHS 2005–2006 sample of children 0–23 months old (*n* = 2286). Child and household variables were generally as expected with equal numbers of male and female children and a low prevalence of multiple births. 79.5% of children had a health card, suggesting they had seen a health provider at least once since birth.

Compared with other variables in the model, maternal BMI (*n* = 1099) and maternal education (*n* = 1106) were available for fewer children. Preva-lence of maternal overweight (17.8%) was higher than underweight (12.7%). The majority of mothers had a normal BMI (69.5%). More than two-thirds of mothers had at least some primary education. Half of the mothers completed at least four ANC visits during their last pregnancy. More than half of mothers (55.7%) identified themselves as unemployed at the time of the survey.

Fewer children in our sample were in the highest wealth category (14.5%). Approximately one-third of the sample lived in the Ouest department, which includes metropolitan Port-au-Prince. Two-thirds of the overall sample was rural.

ErIBF among children 0–23 months was most common in the Nord-Ouest (57.1%) and Nord (55.4%) and least common in the Artibonite (31.1%).
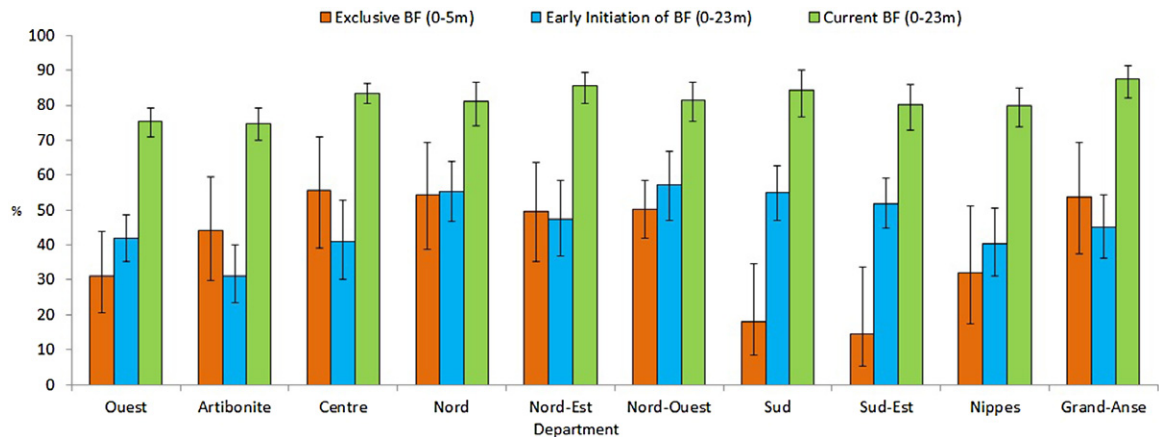
Fig. 2. Breastfeeding (BF) practices by department among children 0–23 months living with caregiver, Haitian Demographic and Health Survey 2005–2006. EBF is reported for children 0–5 months only. Current breastfeeding is proportion of children who received any breast milk in previous 24 h.

Prevalence of EBF from 0–5 months was highest overall in Centre (55.5%), followed by the four other departments in the northern half of the country (Nord 54.3%, Nort-Ouest 50.1%, Nord-Est 49.5%, Artibonite 44.1%) and the Grand-Anse (45.2%) in the southwest. EBF rates were lowest in Sud (18.1%) and Sud-Est (14.5%). Prevalence of EBF in Ouest (31.0%) and Nippes (32.1%) were between the other departments (Fig. 2). Overall, 79.1% of children 0–23 months had been breastfed in the previous 24 h. As expected, current breastfeeding rates significantly decreased with age (99.1% 0–1 months, 98.8% 6–8 months, 91.0% 9–11 months, 77.8% 12–17 months, 40.3% 18–23 months; $P < 0.001$) and varied by department ($P = 0.002$) (Fig. 2).

In multivariate analyses, department, child age and maternal education level were associated with ErIBF among children 0–23 months (Table 2). Compared with Ouest, only the Artibonite had significantly lower rates of ErIBF after controlling for other variables in the model (OR 0.31; $P = 0.001$). The relationship between ErIBF and age was not consistent across groups. Children in the 9–11 month age group had higher odds than younger age groups of reporting ErIBF using children age 18–23 months as the reference group (OR 1.73; $P = 0.027$). Less educated women had higher odds of reporting ErIBF compared to mothers with secondary or more education.

Age group and department were the two statistically significant predictors of EBF among children 0–5 months (Table 3). Children age 0–1 months had 5.14 times higher odds of being exclusively breastfed compared to children age 4–5 months ($P < 0.001$). Children in the three farthest north departments had higher odds of being exclusively breastfed than children in Ouest (Nord-Ouest OR 5.05; $P = 0.006$, Nord OR 5.42; $P = 0.022$, Nord-Est OR 3.65; $P = 0.041$).

Breastfeeding and growth

Table 4 presents a summary of multiple linear regression models testing the relationship between each breastfeeding practice as a predictor and child anthropometry as the outcome. After adjusting for other covariates in the model, ErIBF was predictive of growth among children 0–23 months. Children of mothers who reported ErIBF had higher WAZ [effect size (ES) 0.22; $P = 0.033$] and HAZ (ES 0.20; $P = 0.044$) than those who did not report ErIBF. There was no relationship between EBF and any of the growth outcomes. However, the sample size for the 0–5-month-olds was small.

Discussion

In this study, we examined the trends and determinants of ErIBF and EBF in Haiti. We also assessed

Table 2. Predictors of Early Initiation of Breastfeeding among children age 0–23 months who live with mother, Haitian Demographic and Health Survey 2005–2006

Characteristics variable		*n*	OR	95% CI		*P*-value
Intercept						<0.001
Residence	Urban	343	1.31	0.84	2.03	0.23
	Rural	687				
Department	Nord-Quest	69	1.22	0.64	2.30	0.55
	Nippes	28	0.90	0.42	1.94	0.79
	Sud-Est	57	1.30	0.78	2.20	0.32
	Nord	113	1.15	0.65	2.02	0.63
	Nord-Est	43	0.91	0.47	1.77	0.78
	Artibonite	154	0.31	0.16	0.60	0.001
	Centre	131	0.76	0.32	1.79	0.53
	Sud	68	1.09	0.58	2.06	0.80
	Grand-Anse	46	0.89	0.50	1.59	0.69
	Quest	320				
Sex	Female	502	1.18	0.88	1.59	0.27
	Male	528				
Birth type	Multiple	10	0.69	0.18	2.61	0.58
	Single	1021				
Age group	0–5	266	0.85	0.56	1.29	0.44
	6–8	119	1.07	0.64	1.80	0.79
	9–11	136	1.73	1.06	2.82	0.027
	12–17	302	1.21	0.78	1.87	0.40
	18–23	207				
Wealth	Poorest	250	1.43	0.74	2.76	0.29
	Poorer	253	1.44	0.77	2.66	0.25
	Middle	179	1.15	0.60	2.20	0.68
	Richer	200	1.15	0.68	1.96	0.60
	Richest	147				
Mother BMI	Underweight	128	0.85	0.54	1.33	0.47
	Overweight	179	1.26	0.84	1.89	0.26
	Normal	723				
Mother education	No school	302	2.14	1.27	3.60	0.004
	Primary	468	1.97	1.26	3.08	0.003
	Secondary+	260				
Mother currently working	Yes	501	0.76	0.54	1.08	0.12
	No	529				
Mother ANC visits	4+	506	1.26	0.90	1.76	0.18
	0–3 times	524				

ANC, antenatal care; BMI, body mass index; CI, confidence interval; OR, odds ratio. Total sample size included in analysis = 1031. Small variation in total *n* for some variables reflects that sample size is a weighted estimate.

the relationships between these two practices and growth outcomes in children 0–23 months.

Early initiation of breastfeeding

While there appears to be levelling off or decline in ErIBF between 2000 and 2005–2006 rates of ErIBF, the HDHS 2005–2006 (41.2%) are on par with the LAC region (42.1%) and the global average (43.0%) (UNICEF 2012). ErIBF is an important intervention for reducing neonatal deaths (Edmond *et al*. 2006). The neonatal mortality rate in Haiti is 27 per 1000 live births compared to 11 per 1000 for all the LAC (United Nations Inter-agency Group for Child Mortality Estimation 2011). There is a need to prioritise interventions that target the critical neonatal period. Education and peer support during ANC and simple actions at the time of delivery including

Table 3. Predictors of EBF among children age 0–5 months who live with mother, Haitian Demographic and Health Survey 2005–2006

Characteristics variable		*n*	OR	95% CI		*P*-value
Intercept						0.004
Residence	Urban	75	2.31	0.73	7.26	0.15
	Rural	192				
Department	Nord-Quest	22	5.05	1.62	15.78	0.006
	Nippes	8	1.01	0.16	6.57	0.99
	Sud-Est	13	0.56	0.07	4.46	0.56
	Nord	25	5.42	1.28	23.04	0.022
	Nord-Est	11	3.65	1.05	12.66	0.041
	Artibonite	43	2.99	0.65	13.76	0.16
	Centre	48	2.37	0.66	8.57	0.19
	Sud	18	1.46	0.40	5.27	0.56
	Grand-Anse	11	1.72	0.34	8.64	0.51
	Quest including PAP	66				
Sex	Female	119	1.74	0.90	3.35	0.097
	Male	147				
Birth type	Multiple	2	1.35	0.09	20.83	0.83
	Single	265				
Age group	<2 months	67	5.14	2.14	12.36	<0.001
	2–3 months	106	1.55	0.73	3.28	0.25
	4–5 months	93				
Wealth	Poorest	77	2.22	0.45	10.92	0.32
	Poorer	70	2.81	0.58	13.66	0.20
	Middle	50	0.85	0.21	3.43	0.82
	Richer	38	0.92	0.28	2.99	0.88
	Richest	32				
Mother BMI	Underweight	29	0.70	0.18	2.67	0.60
	Overweight	46	0.91	0.38	2.15	0.82
	Normal	191				
Mother education	No school	74	0.88	0.33	2.34	0.80
	Primary	128	1.06	0.46	2.47	0.89
	Secondary+	65				
Mother currently working?	Yes	93	0.82	0.40	1.69	0.60
	No	174				
Child has health card	Yes	153	1.08	0.49	2.38	0.85
	No	113				
Mother ANC visits	4+	123	0.60	0.31	1.15	0.12
	0–3 times	143				

ANC, antenatal care; BMI, body mass index; CI, confidence interval; OR, odds ratio. Total number of children included in analysis = 267 Small variation in total *n* for some variables reflects that sample size is a weighted estimate.

immediate skin-to-skin contact have been shown to be effective in improving ErIBF rates among low-income women in the United States (Jana 2009). Although included in Haitian health policy and protocols, these interventions have weak coverage.

Results of the multivariate analyses have implications for the design and targeting of ErIBF interventions. Maternal education, age group and residence in the Artibonite department were the three variables associated with ErIBF in our model. Women with primary or less education were two times more likely to report ErIBF than women with secondary or higher education. This is in contrast to findings from Sri Lanka where higher-educated women were more likely to initiate BF within 1 h of birth (Senarath *et al*. 2012). While there was no statistically significant relationship between wealth and ErIBF in our Haiti analyses, this relationship varies across other countries. South Asian women in higher wealth quintiles were more likely to initiate breastfeeding within the

Table 4. Summary of results of multivariate linear regression models of the relationship between breastfeeding practices and child anthropometry[1], Haitian Demographic and Health Survey 2005–2006

	n	WAZ			HAZ			WHZ		
		Coefficient*	95% CI	*P*-value	Coefficient*	95% CI	*P*-value	Coefficient*	95% CI	*P*-value
ErIBF[†] (0–23 months)	996	0.22	0.02 0.42	0.033	0.20	0.01 0.40	0.044	0.16	−0.05 0.38	0.13
EBF[‡] (0–5 months)	253	0.16	−0.29 0.62	0.48	−0.09	−0.52 0.33	0.67	0.25	−0.12 0.61	0.19

EBF, exclusive breastfeeding; ErIBF, early initiation of breastfeeding; BMI, body mass index; CI, confidence interval; HAZ, height-for-age z-scores; WAZ, weight-for-age z-scores; WHZ, weight-for-height z-scores. *Estimated regression coefficient and 95% CI for ErIBF or EBF in models predicting the specified growth outcome when other variables in the model are adjusted for. [†]Models adjusted for child sex, age group, birth type, mother BMI, wealth, residence, department, mother education level, mother antenatal visit and current breastfeeding status. [‡]Models adjusted for child sex, age group, birth type, mother BMI, wealth, residence, department, mother education level and mother antenatal visit.

first hour of birth, but in other regions, women in lower wealth quintiles are more likely to practise ErIBF (UNICEF 2012).

It is not clear why there are significantly lower rates of ErIBF in the Artibonite department compared with Ouest but not in any other department. While it is one of the poorest departments of Haiti, it does not have the lowest rates of ANC or other breastfeeding practices (Cayemittes *et al*. 2007). We can speculate that given the isolation of mountain communities in the Artibonite, certain traditional practices including discarding colostrum and giving newborns a traditional purgative might persist, but further investigation is needed to confirm. There is also no clear reason for the higher rates of ErIBF associated with children 9–11 months. This may reflect some form of age-related recall bias given the tendency for all age groups under 18 months to report higher rates of ErIBF compared with the 18–23 month group.

Our analysis suggests that ErIBF needs to be broadly promoted during ANC in Haiti and special effort is needed to target wealthier and more educated women. We cannot assume that these women will be reached through the same channels as lower income or less educated women. Targeted messages through the media, school-based interventions during adolescence, women's groups and private health care providers may be effective in reaching these groups.

Exclusive breastfeeding

Trends towards improving EBF rates in Haiti echo global improvements in EBF rates over the last 10 years. Excluding Brazil and Mexico, the rate of EBF in the LAC increased from 30% to 46% from the mid-1990s to mid-2000s (UNICEF 2012). The extremely low rates of EBF reported in HDHS 1994–1995 are confirmed by UNICEF Haiti documentation from 1995, which reported a national EBF rate of only 0.6%. Breastfeeding promotion efforts by the government and partners in the late 1990s included a 6-month national breastfeeding promotion campaign launched by UNICEF in August 1995 (UNICEF Haiti 1995). Messages discouraging the use of 'lok' a traditional homemade purgative given to newborn infants were prominent during this period. It is possible that increased awareness of EBF recommendations may have also led to increased reporting bias with mothers responding that they were practicing EBF because of social desirability.

Haiti's EBF rate in the HDHS 2005–2006 (41.2%) is higher than the other developing countries (37%) (UNICEF 2012) but remains below the WHO target of at least 50% (World Health Organization 2012). Reported breastfeeding patterns suggest that early introduction of solid, semi-solid and soft foods is prevalent in Haiti. More research around the types of foods and motivations for their early introduction should be carried out to help develop specific messages and programme strategies.

In multivariate analysis, the strong association between child age and EBF was in the expected direction with youngest children most likely to be exclusively breastfed. While there was no relationship between EBF and wealth or residence in the HDHS 2005–2006 analysis, department was a significant

predictor of EBF. Most departments had higher odds of EBF compared with predominantly urban Ouest. Higher EBF rates among the rural poor compared to urban populations has been consistently shown in other countries (UNICEF 2012). However, the lowest rates of EBF in our analyses were in the predominantly rural Sud and Sud-Est departments. Differences in both EBF and ErIBF at department level may reflect differences in coverage, quality and intensity of non-governmental organisation (NGO) and MOH-led maternal child health and nutrition activities in these areas. Individual NGOs develop and receive funds to implement programmes that are targeted to specified sub-regions of the country. As with ErIBF, there was no relationship between access to ANC and EBF in our analysis. A positive relationship between ANC and EBF has been shown in African contexts (Agho *et al.* 2011).

Intensive education and peer support interventions are effective in improving EBF practice (Kramer *et al.* 2001; Bhandari *et al.* 2003; Aidam *et al.* 2005; Aksu *et al.* 2011; Tylleskar *et al.* 2011). While again, these interventions are needed nationally in Haiti, special effort should be made to target women living in Port-au-Prince and the Sud and Sud-Est departments. Interestingly, these regions were among those most affected by the January 2010 earthquake and the subsequent efforts to sustain and improve breastfeeding practices through 'Baby Tents' and other emergency nutrition interventions. It is expected that the results of the just-completed 2012 HDHS survey may reflect these efforts.

Breastfeeding practices and child growth outcomes

Findings related to the relationship between breastfeeding practices and growth were consistent with other analyses, which found that ErIBF was associated with reduced risk of underweight and that EBF was not associated with any growth faltering outcomes (Marriott *et al.* 2012). The lack of growth effect for EBF might reflect the small sample size and that often undernutrition is a cumulative process and so more likely to impact older children.

Limitations

Primary limitations of this study are the cross-sectional survey design and use of recall data to assess breastfeeding practices. The recall approach is subject to respondent bias, particularly for mothers of children who report practice around time of delivery. Also, EBF practices were categorised based on behaviours reported for the previous 24 h only and may not reflect usual practice (e.g. child was ill on the day before interview and was not fed other foods per usual). As discussed earlier, mothers may report practising EBF due to a social desirability bias. The most recent publicly available HDHS was conducted several years prior to the January 2010 Haiti earthquake, which had significant and likely long-term social and economic impacts on populations living in metropolitan Port-au-Prince and other affected regions. There is a need to understand the impacts of this traumatic episode on infant feeding practices.

Rates of ErIBF and EBF in Haiti improved between 1995 and 2006. Child age, maternal education level and having a child health card were associated with ErIBF among children 0–23 months, whereas age group was a significant predictor of EBF among children 0–5 months. Only ErIBF was predictive of growth outcomes among children 0–23 months.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

RH designed the study, conducted analysis, obtained literature, interpreted results and wrote the manuscript. MAA, INT, JPM, RJS generated the concept of the study, reviewed and revised the manuscript.

References

Agho K.E., Dibley M.J., Odiase J.I. & Ogbonmwan S.M. (2011) Determinants of exclusive breastfeeding in Nigeria. *BMC Pregnancy and Childbirth* **11**, 2.

Aidam B.A., Perez-Escamilla R. & Lartey A. (2005) Lactation counseling increases exclusive breast-feeding rates in Ghana. *The Journal of Nutrition* **135**, 1691–1695.

Aksu H., Kucuk M. & Duzgun G. (2011) The effect of postnatal breastfeeding education/support offered at home 3 days after delivery on breastfeeding duration and knowledge: a randomized trial. *The Journal of Maternal-Fetal and Neonatal Medicine* **24**, 354–361.

Bhandari N., Bahl R., Mazumdar S., Martines J., Black R.E., Bhan M.K. & Infant Feeding Study Group (2003) Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: a cluster randomised controlled trial. *Lancet* **361**, 1418–1423.

Bhutta Z.A., Ahmed T., Black R.E., Cousens S., Dewey K., Giugliani E. *et al*. (2008) What works? Interventions for maternal and child undernutrition and survival. *Lancet* **371**, 417–440.

Black R.E., Allen L.H., Bhutta Z.A., Caulfield L.E., De Onis M., Ezzati M. *et al*. (2008) Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* **371**, 243–260.

Bordes A., Allman J. & Verly A. (1982) The impact on breastfeeding and pregnancy status of household contraceptive distribution in rural Haiti. *American Journal of Public Health* **72**, 835–838.

Cayemittes M. (2001) *Enquête mortalité, morbidité et utilisation des services EMMUS-III, Haïti 2000*. Pétionville, Haïti, Institut haïtien de l'enfance; Calverton, Maryland ORC Macro.

Cayemittes M. & Institut Haïtien de l'enfance. Macro International. Institute for Resource Development. Demographic And Health Surveys (1995) *Enquête mortalité, morbidité et utilisation des services (EMMUS-II): Haïti, 1994-95*. Pétionville, Haïti and Calverton, MD, USA, Institut haïtien de l'enfance; Macro International.

Cayemittes M., Placide M.F., Mariko S., Barrere B., Severe B. & Alexandre C. (2007) *Enquête mortalité, morbidité et utilisation des services (EMMUS-IV): Haïti, 2005-2006*. Calverton, MD, USA, Ministere de la Sante Publique et de la Population, Institut Haïtien de l'Enfance,Macro International.

Coreil J., Losikoff P., Pincu R., Mayard G., Ruff A.J., Hausler H.P. *et al*. (1998) Cultural feasibility studies in preparation for clinical trials to reduce maternal-infant HIV transmission in Haiti. *AIDS Education and Prevention* **10**, 46–62.

Edmond K.M., Zandoh C., Quigley M.A., Amenga-Etego S., Owusu-Agyei S. & Kirkwood B.R. (2006) Delayed breastfeeding initiation increases risk of neonatal mortality. *Pediatrics* **117**, e380–e386.

Graitcer P.L., Allman J., Amedee-Gedeon M. & Gentry E.M. (1984) Current breast-feeding and weaning practices in Haiti. *Journal of Tropical Pediatrics* **30**, 10–16.

Horta B., Bahl R., Martines J. & Victora C. (2007) *Evidence on the Long-term Effects of Breastfeeding: Systematic Reviews and Meta-analysis*. World Health Organization: Geneva.

Jana A. (2009) Interventions for promoting the initiation of breastfeeding: RHL commentary (last revised: 2 March 2009). The WHO Reproductive Health Library. World Health Organization: Geneva.

Kirkpatrick S.M. & Cobb A.K. (1990) Health beliefs related to diarrhea in Haitian children: building transcultural nursing knowledge. *Journal of Transcultural Nursing* **1**, 2–12.

Knezevic A. (2008) StatNews # 73: Overlapping Confidence Intervals and Statistical Significance. Ithaca, NY: Cornell Statistical Consulting Unit.

Kramer M.S., Chalmers B., Hodnett E.D., Sevkovskaya Z., Dzikovich I., Shapiro S. *et al*. (2001) Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. *JAMA: the journal of the American Medical Association* **285**, 413–420.

Lauer J.A., Betran A.P., Barros A.J. & De Onis M. (2006) Deaths and years of life lost due to suboptimal breastfeeding among children in the developing world: a global ecological risk assessment. *Public Health Nutrition* **9**, 673–685.

Leon-Cava N., Lutter C., Ross J. & Martin L. (2002) *Quantifying the Benefits of Breastfeeding: A Summary of the Evidence*. Pan American Health Organization: Washington, DC.

Lutter C.K., Chaparro C.M. & Grummer-Strawn L.M. (2011) Increases in breastfeeding in Latin America and the Caribbean: an analysis of equity. *Health Policy and Planning* **26**, 257–265.

Marriott B.P., White A., Hadden L., Davies J.C. & Wallingford J.C. (2012) World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. *Maternal and Child Nutrition* **8**, 354–370.

Ministère de la Santé Publique et de la Population (2012) *Politique Nationale de Nutrition.* Unité De Coordination Du Programme National D'alimentation Et De Nutrition (ed.). Port-au-Prince, Haiti.

Pan American Health Organization, & Dewey K. (2003) Guiding principles for complementary feeding of the breastfed child. Washington, DC.

Rutstein S.O., Johnson K. & Orc Macro (2004) Measure/ Dhs+ (Programme). The DHS wealth index. Calverton, Md., ORC Macro, MEASURE DHS+.

Senarath U., Dibley M.J. & Agho K.E. (2007) Breastfeeding practices and associated factors among children under 24 months of age in Timor-Leste. *European Journal of Clinical Nutrition* **61**, 387–397.

Senarath U., Dibley M.J. & Agho K.E. (2010) Factors associated with nonexclusive breastfeeding in 5 east and southeast Asian countries: a multilevel analysis. *Journal of Human Lactation* **26**, 248–257.

Senarath U., Siriwardena I., Godakandage S.S., Jayawickrama H., Fernando D.N. & Dibley M.J. (2011) Determinants of breastfeeding practices: an analysis of the Sri Lanka Demographic and Health Survey 2006-2007. *Maternal and Child Nutrition* **8** (3), 315–329.

Senarath U., Siriwardena I., Godakandage S.S., Jayawickrama H., Fernando D.N. & Dibley M.J. (2012) Determinants of breastfeeding practices: an analysis of the Sri Lanka Demographic and Health Survey 2006-2007. *Maternal and Child Nutrition* **8**, 315–329.

Tylleskar T., Jackson D., Meda N., Engebretsen I.M., Chopra M., Diallo A.H. *et al.*; PROMISE-EBF Study Group (2011) Exclusive breastfeeding promotion by peer counsellors in sub-Saharan Africa (PROMISE-EBF): a cluster-randomised trial. *Lancet* **378**, 420–427.

UNICEF (2012) Childinfo: Monitoring the situation of women and children.

UNICEF Haiti (1995) *UNCIEF Haiti Comitè Elargi de Coordinations poru la promotion, la protection et l'Appui à l'Alaitement Maternal, Information Gènèrales: Capagne nationale de la promotion, la protection, et l'appui a l'allaitement maternel en Haïti.*

United Nations Inter-agency Group for Child Mortality Estimation (2011) Levels & Trends in Child Mortality – 2011 Report. UNICEF: New York.

Vieira T.O., Vieira G.O., Giugliani E.R., Mendes C.M., Martins C.C. & Silva L.R. (2010) Determinants of breastfeeding initiation within the first hour of life in a Brazilian population: cross-sectional study. *BMC Public Health* **10**, 760.

WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality (2000) Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet* **355**, 451–455.

WHO Multicentre Growth Reference Study Group (2006) WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. WHO: Geneva.

World Health Organization (2002) WHO antenatal care randomized trial: manual for the implementation of the new model. WHO: Geneva.

World Health Organization (2005) Guiding principles for feeding non-breastfed children 6-24 months of age. WHO: Geveva.

World Health Organization (2012) Proposed Global targets for maternal, infant and young child nutrition: WHO discussion paper.