

Increases in breastfeeding in Latin America and the Caribbean: an analysis of equity

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Background	Breastfeeding has large benefits for mothers and infants. The short-term benefits for child survival and reduced morbidity differ by population subgroup because of differences in underlying risk factors. Although breastfeeding is more common among poor than well-off women, how breastfeeding patterns change between these subgroups is important from a policy perspective as the poor will benefit more from increased duration of breastfeeding.
Methods	We use nationally representative data from eight countries in Latin America and the Caribbean to document changes in breastfeeding duration between 1986 and 2005, and separate the overall change into the portion attributable to changing population characteristics and the portion resulting from changing breastfeeding behaviour within population subgroups.
Results	Breastfeeding duration increased in six out of the eight countries and the changes observed are largely explained by changing behaviour within population subgroups rather than changing population characteristics. Changes in breastfeeding duration did not tend to be equitably distributed, but in four countries (Bolivia, Brazil, Colombia and Peru) the population subgroups whose children are most at risk for mortality and increased morbidity from not being breastfed were least likely to show improvements in breastfeeding duration. Between 1986 and 2004 in Peru, breastfeeding duration declined by 0.6 months among rural women while increasing by 9.7 months among urban women; it increased by 6.3 months among women with prenatal care but only by 3.7 months among women with no prenatal care. Changes in breastfeeding in Guatemala and Haiti tended to favour the well-off compared with the poor, though not consistently. In Nicaragua changes in breastfeeding duration tended to favour the less well-off.
Discussion	While promoting breastfeeding is a must for all women, to maximize its benefits for child survival and health, additional efforts are needed to reach poorly educated and rural women with little access to health care.
Keywords	Breastfeeding, equity, Latin America, Caribbean

KEY MESSAGES

- The short-term benefits of breastfeeding for child survival and reduced morbidity differ by population subgroup because of differences in underlying risk factors.
- To maximize the benefits of breastfeeding for child survival and health, promotion efforts need to reach poorly educated and rural women with little access to health care.

Introduction

Breastfeeding can play an important role in the reduction of global disparities in infant health and development for two important reasons. The first is its large and causal effect on child mortality and a myriad of other short- and long-term effects on infant and maternal health (Leon-Cava *et al.* 2002; Jones *et al.* 2003; Chaparro and Lutter 2007; Horta *et al.* 2007). The second is that interventions to promote breastfeeding are highly effective and cost-effective (Horton *et al.* 1996; Bhutta *et al.* 2008; Black *et al.* 2008). Not only is breastfeeding promotion the single most important intervention to prevent child mortality according to a recent review (Jones *et al.* 2003), but ample evidence exists that individual behaviour is amenable to change and leads to national improvements in breastfeeding duration when investments in breastfeeding promotion result in a favourable breastfeeding environment (Lutter 2000; Bhandari *et al.* 2008).

Although breastfeeding benefits all children, the short-term benefits for child survival and reduced morbidity—and hence the inherent risks of not breastfeeding—differ greatly by population subgroup because of differences in underlying risk factors. These risk factors include exposure to pathogens because of poor sanitation and lack of access to clean water, and lack of health care to deal with the ensuing diseases (Habicht *et al.* 1986). These differences in pathogen exposure and access to health care are compounded by inadequate maternal education to make the best use of available resources (Ruel *et al.* 1992). All these differences are the consequences of poverty and can be used as proxies for poverty (DaVanzo and Habicht 1986). Although poor women breastfeed more than well-off women in developing countries (Perez-Escamilla *et al.* 1995; Perez-Escamilla *et al.* 1997), how breastfeeding patterns change over time is important. From a policy perspective, it matters whether improvements are equitably distributed or favour one group or another. Not only will poor children benefit more from improvements in breastfeeding duration (particularly exclusive breastfeeding), but changes that do not favour the poor further increase the already glaring health inequities between the poor and the well-off (Victora *et al.* 2003).

Health inequities are the differences in health care (Nolen *et al.* 2005), or in the case of breastfeeding, differences in the benefits resulting from investments in breastfeeding promotion, whereby some segments of the population benefit more than others. In this paper, we analyse nationally representative data from Latin America and from Haiti from an equity perspective to address the question of which socio-economic subgroups, if any, tended to experience smaller or greater changes in breastfeeding duration between 1986 and 2005. Following a model previously developed by Grummer-Strawn (1996), we

disentangle how changes in breastfeeding duration differed among these population subgroups and separate the overall change into the portion attributable to changing population characteristics (e.g. increases in urbanization or female education), and the portion resulting from changing breastfeeding behaviour within these population subgroups (e.g. changes in breastfeeding among urban dwelling women). A number of variables associated with poverty were used for the subgroup analysis, including those related to access to health services, parental education and urban or rural residence, among others. We discuss our findings in the context of how public health policies and programmes to promote breastfeeding can help to reduce health inequities.

Data and methods

We analysed data from nationally representative Demographic and Health Surveys (DHS) that took place between 1986 and 2005 in Bolivia, Brazil, Colombia, Dominican Republic, Guatemala, Haiti, Nicaragua and Peru (Table 1). The questionnaires used in DHS are highly standardized worldwide, which permits valid comparisons of population infant feeding practices and demographic characteristics across countries and time. Surveys target women of reproductive age, 15–49 years, and include detailed infant feeding questions among women with a child less than 3 or 5 years of age, depending on the country. The data are publicly available and can be downloaded from the DHS website (<http://www.measuredhs.com>).

The data collected in the DHS allow for the estimation of breastfeeding duration to be made in two ways. One can use the retrospectively reported duration of breastfeeding among women who have stopped breastfeeding, accounting for observations whose duration was not yet complete at the time of the survey (censored observations). Alternatively, one can use only data on whether each child was currently being breastfed at the time of the survey. Lesthaeghe and Page (1980) and Ferry (1981) have demonstrated that when reporting duration of breastfeeding, women tend to round their responses to durations of 6, 12 and 18 months and that these responses do not reflect true increases in weaning at these ages. Trussell *et al.* (1992) documented that these misreported durations bias the estimates of mean or median breastfeeding duration downward by ~1 month. They further argued that the mean based on 'current-status' data is unbiased. For this reason, we chose to use the current-status data for our analysis.

We used the oldest available and most recently completed surveys for countries to assess the trend in the overall predicted mean duration of breastfeeding between survey times. The only exception was Peru, in which we used all four surveys as our preliminary analysis showed that breastfeeding duration

Table 1 Sample size of women of reproductive age by country and year

Country/year	No. of women interviewed	Mother/child pairs included in analysis
Bolivia		
1989	7923	5252
2003	17 654	9802
Brazil		
1986	5892	3305
1996	12 612	4818
Colombia		
1986	5329	2628
2005	41 344	14 290
Dominican Republic		
1986	3885	4416
2002	23 384	11 008
Guatemala		
1987	5160	4320
1998/99	6021	4687
Peru		
1986	4999	2836
1996	28 951	15 783
2000	27 843	13 130
2004	12 465	2448
Haiti		
1994–95	5356	3208
2005	10 757	3791
Nicaragua		
1998	13 634	8084
2001	13 060	6727

increased and then decreased in this country. Methods for data analysis are described in detail in Chaparro and Lutter (2010) and were based on Grummer-Strawn (1996); they are briefly summarized below. In our analysis the effects of various covariates on the probability of still breastfeeding at the time of the survey (and thus indirectly, the mean duration of breastfeeding) were estimated. There are several methods available to deconstruct the role of changes in variables and changes in the structure of relationships (Preston 1976; Preston 1980; DaVanzo and Habicht 1986). We chose the method used in this paper because it had been previously used to deconstruct breastfeeding trends (Grummer-Strawn 1996).

As previously mentioned, covariates included those that have been identified in the literature as associated with breastfeeding behaviour. Covariates hypothesized to have a negative effect on breastfeeding behaviour included urban residence, higher levels of maternal or paternal education, partner's occupation other than agriculture or not employed, maternal employment, prenatal care, assistance at delivery by skilled personnel, younger maternal age, lower parity and use of modern contraceptives (Perez-Escamilla *et al.* 1995). Many of these covariates are also proxies for poverty. Briefly, logistic

regression (PROC LOGISTIC, SAS for Windows, version 9.1) was used to model the log-odds of currently breastfeeding in each month, with age modelled with a natural cubic spline as described by Grummer-Strawn (1993). For each survey for each country, all covariates were entered into the model simultaneously to determine the effect of each variable on the probability of breastfeeding at any given age while controlling for the other covariates. The parameter estimates used for the subsequent calculations are thus from the logistic regression model that simultaneously controlled for all covariates.

In order to assess the overall trend in breastfeeding duration within each country from the first survey to the final survey, an overall predicted mean duration of breastfeeding was calculated for each survey using the logistic regression parameter estimates and the distribution of the covariates of interest in each population. For each population subgroup (e.g. urban vs. rural, each category of maternal education) within each survey, we used the parameter estimates from the logistic regression models to estimate the probability of being breastfed at each age (0–59 months). To calculate the predicted mean duration of breastfeeding for each subgroup, we calculated the area under the curve of the predicted probabilities of being breastfed at each age. Using this calculated predicted mean duration of breastfeeding for each subgroup and the proportion of children falling into each subgroup, we calculated a weighted average to provide an estimate of the overall predicted mean duration of breastfeeding for each survey. The overall trend in breastfeeding duration from the first to the most recent survey for each country was calculated, and then decomposed into the trend attributable to behavioural change and the trend attributable to changes in population characteristics as described in Grummer-Strawn (1996). In order to account for varying lengths of time between surveys across different countries, the compound annual change was calculated for the overall trend as well as the trends attributable to population and behavioural changes using the formula:

$$\text{BF Duration}_y = \text{BF Duration}_b (1 + g)^{y-b}$$

Compound annual growth, g , is the solution to this equation, where b is the base year for which data on breastfeeding duration are first available, and y is the second year for which data on breastfeeding duration is available.

For purposes of describing overall effects of population characteristics on the probability of breastfeeding and the distribution of population characteristics across the region, each country's trend was analysed separately.

Results

Trends in breastfeeding duration: population and behavioural trends

The predicted mean duration of breastfeeding increased in six out of the eight countries studied and the behavioural component of the overall trend explained most of the increase or decrease in breastfeeding duration observed, only being counteracted by a small and negative population trend (Table 2). One country, Guatemala, showed no change in predicted mean duration of breastfeeding; however, it already had the longest duration of breastfeeding. One country, Haiti, showed a

Table 2 Mean predicted breastfeeding (BF) duration and trends by country and survey year

Country	Survey year 1	Survey year 2	Mean predicted BF duration 1 (mo)	Mean predicted BF duration 2 (mo)	Overall change (mo)	Compound annual growth in mean BF duration (mo)	Compound annual growth in mean predicted BF duration due to population characteristic change (mo)	Compound annual growth in mean predicted BF duration due to behavioural change (mo)
Bolivia	1989	2003	16.3	21.0	4.7	1.83	-0.13	1.93
Brazil	1986	1996	9.5	11.8	2.3	2.19	-0.11	2.28
Colombia	1986	2005	11.3	17.5	6.2	2.33	-0.09	2.39
Dominican Republic	1986	2002	9.6	10.9	1.3	0.80	-0.20	0.91
Guatemala	1987	1999	20.8	20.8	0	0.00	-0.04	0.04
Haiti	1995	2005	19.4	18.2	-1.2	-0.64	-0.10	-0.53
Nicaragua	1998	2001	16.8	19.3	2.5	4.73	-0.20	4.91
Peru	1986	2004	17.0	21.7	4.7	1.37	-0.17	1.49

negative trend. The compound annual change in mean predicted breastfeeding ranged from -0.64 months in Haiti to 4.73 months in Nicaragua.

Changes in breastfeeding duration among at-risk population subgroups

The population subgroup analysis showed that increases in breastfeeding duration did not tend to be distributed equitably, but in four countries (Bolivia, Brazil, Colombia and Peru) the population subgroups whose children are most at risk for increased mortality and morbidity from not being breastfed were least likely to show improvements in breastfeeding duration (Table 3). Changes in breastfeeding in Guatemala and Haiti tended to favour the well-off compared with the poor, though not consistently. In the Dominican Republic, only 3 of the 12 variables studied favoured the poor compared with the well-off, with no clear pattern emerging for the remaining variables. In Nicaragua, changes in breastfeeding duration tended to benefit the poor more than the well-off.

With respect to specific covariates, in five countries (Bolivia, Colombia, Guatemala, Haiti and Peru) the increase in breastfeeding duration was greater among urban than rural women; in two countries (Brazil and the Dominican Republic) no difference was observed; and in only one country (Nicaragua) was the increase in favour of rural women (Figure 1). The most dramatic difference was in Peru, where between 1986 and 2004 breastfeeding duration declined by 0.6 months among rural women while increasing by 9.7 months among urban women. In Haiti between 1995 and 2005, breastfeeding duration declined by 3.5 months among rural women while increasing 1.7 months among urban women.

The increase in breastfeeding duration was also greater among more educated women compared with those with little or no education in five out of the eight countries (Figure 2). The most dramatic difference was in Haiti, where between 1995 and 2005 breastfeeding duration decreased by 1.0 months among women with no education and increased by 11.7 months among women with some post-secondary education. Peru also exhibited large differences in breastfeeding duration favouring better-educated women. With the exception of three countries (Dominican Republic, Guatemala and Nicaragua), the greatest increase in breastfeeding duration also occurred in children whose fathers had higher levels of education (Table 3).

Increases in breastfeeding duration also tended to favour women with better access to health care than those with less access, though not consistently (Figure 3). Having a skilled attendant at birth strongly favoured increased breastfeeding duration in four countries and was negatively associated with breastfeeding duration in three countries. The results for prenatal care (yes, no) were very similar to those for skilled attendant at the birth, with four countries showing more breastfeeding among women with prenatal care, two showing the opposite effect and one showing no trend (data for Brazil were not available for this analysis).

Peru merits particular attention as it is the only country in our analysis that shows an increase followed by a decrease in breastfeeding duration. Our subgroup analysis illustrates that the trends in breastfeeding duration with the largest absolute

Table 3 Change in mean breastfeeding (BF) duration by country and socio-demographic characteristic

		Absolute change (mo) or breastfeeding duration (mo)							
		Bolivia 1989– 2003	Brazil 1986–96	Colombia 1986– 2005	Dominican Republic 1986–2002	Guatemala 1987–99	Haiti 1995– 2005	Nicaragua 1998– 2001	Peru 1986– 2004
Variable or breastfeeding duration (mo)	Categories								
Mean predicted BF duration at baseline		16.3	9.5	11.3	9.6	20.8	19.4	16.8	17.0
Mean predicted BF duration at last survey		21.0	11.8	17.5	10.9	20.8	18.2	19.3	21.7
Prenatal care	None	4.89		5.69	2.23	0.13	−1.91	2.91	3.68
	Prenatal care (any)	5.97		6.62	1.34	0.15	−0.97	2.10	6.27
Birth control	None/traditional or folkloric methods	4.37	0.96	4.17	1.54	−0.21	−1.17	1.99	3.99
	‘Modern’ methods	9.24	2.57	7.12	0.16	2.76	0.45	3.10	8.00
	Birth control pill	7.65	2.55	8.97	2.52	3.18	0.40	3.50	11.47
Assistance at delivery	None/unskilled	4.84		6.04	2.46	−0.92	−1.15	4.09	3.32
	Skilled/trained health professional	5.85		6.83	1.51	1.93	−2.46	2.64	6.93
Maternal age	<24 years	4.81	2.38	6.60	1.79	0.03	0.35	2.39	5.14
	25–29 years	4.14	2.12	5.52	1.80	−0.47	−1.26	2.97	5.34
	30–34 years	5.47	3.69	6.30	3.33	0.22	−2.72	2.65	4.35
	35+ years	4.48	1.77	6.15	−2.71	0.64	−9.01	1.43	2.88
Maternal education	None	4.90	1.50	5.33	3.52	−0.03	−0.97	5.30	1.40
	1–6 years	4.67	1.54	7.27	2.15	0.44	0.27	3.18	4.93
	7–12 years	6.27	4.43	7.32	1.63	5.79	6.11	2.05	7.73
	12+ years	6.65	4.05	6.24	1.68	−3.77	11.66	3.13	9.02
Mother currently employed	No	4.08	2.52	6.33	1.34	−0.50	−0.86	2.99	4.84
	Yes	5.78	1.74	7.03	2.08	2.87	−2.07	0.85	4.37
Parity	1	4.08	1.33	6.90	0.90	2.55	−2.29	1.70	5.33
	2–3	5.32	2.77	6.80	1.69	−0.90	−1.56	2.23	6.09
	4–6	4.64	3.02	6.52	2.87	−0.47	−0.81	3.82	5.47
	7+	5.93	4.38	7.26	1.48	0.35	−0.01	5.39	3.36
Partner’s education	None	1.71	1.07	4.14	1.74	−0.30	−0.27	4.09	3.13
	1–6 years	4.11	2.91	6.96	1.71	0.03	−0.33	4.52	3.57
	7–12 years	5.88	4.83	7.19	1.43	3.32	−1.74	0.51	7.57
	12+ years	4.82	6.78	5.90	1.93	3.68	−5.57	−2.11	7.94
Partner’s occupation	Agriculture/not employed	5.05	1.72	5.51	1.68	−0.66	−0.78	3.45	3.63
	Manual (skilled/unskilled)	4.50	2.71	6.68	2.24	0.36	1.40	2.97	4.41
	Service/domestic	2.79	1.96	7.09	1.80	0.38	1.67	3.00	6.25
	Professional/technical	6.49	4.18	5.76	0.77	3.68	−2.49	−2.75	6.65
Sex	Female	4.43	1.69	6.08	1.14	0.51	−1.91	2.50	3.60
	Male	5.00	2.71	6.23	1.38	−0.47	−1.05	2.05	5.78
Children under 5 in household	No other children under 5 years of age in household	3.89	1.28	6.31	0.35	0.54	−0.80	0.52	5.04
	Presence of at least one child (other than index child) under 5 years of age in household	5.44	3.05	6.25	2.17	−0.12	−1.03	3.40	5.32
Residence	Rural	4.57	2.37	4.63	1.31	−2.37	−3.44	3.88	−0.61
	Urban	4.91	2.36	7.33	1.47	2.95	1.70	1.52	9.68

and percentage increases were among women with higher education (and with better-educated partners), using modern birth control methods and living in urban areas (Table 4). These subgroups exhibited between 9.0 and 11.5 month gains in breastfeeding duration during the 14-year period of 1986 to

2000. Between 2000 and 2004, these remained the only subgroups still exhibiting positive gains but the increases were much smaller (0.4–1.7 months). However, rural, uneducated women showed the largest decreases during this same period (between −2.2 and −3.6 months).

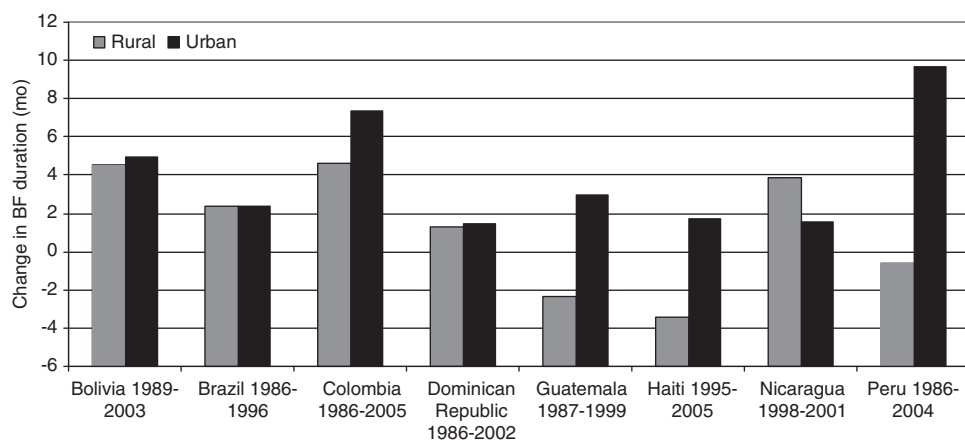


Figure 1 Change in breastfeeding (BF) duration over time for urban versus rural women

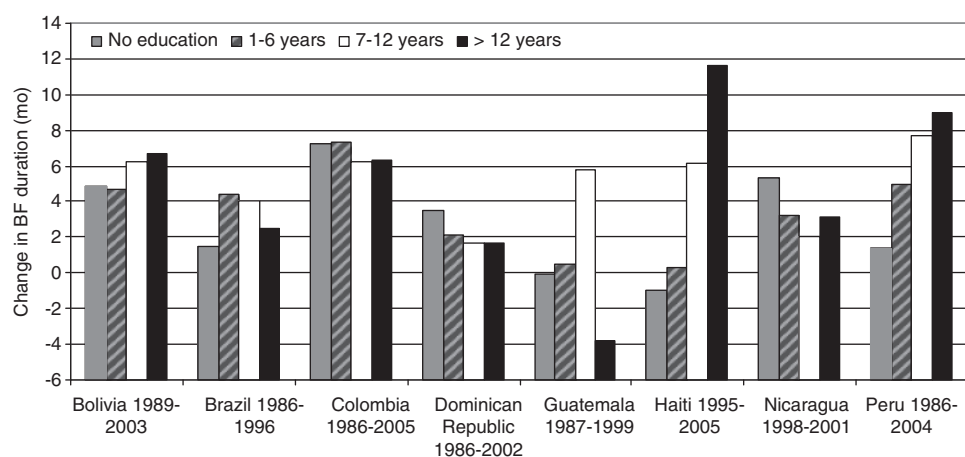


Figure 2 Change in breastfeeding (BF) duration for educated women versus less educated women

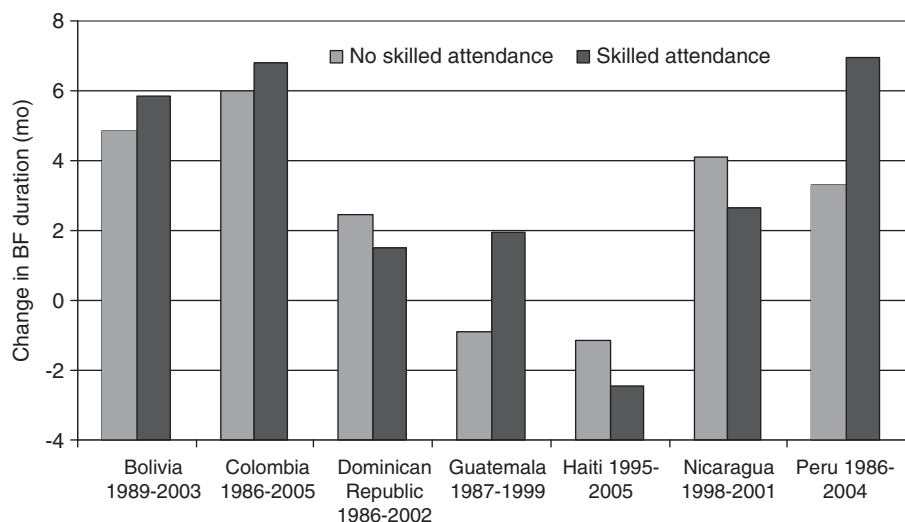


Figure 3 Change in breastfeeding (BF) duration in women with skilled attendance at delivery versus women with no skilled attendance at delivery

Table 4 Changes in predicted mean breastfeeding (BF) duration in Peru by survey year and socio-demographic characteristics

Variable	Category	Predicted BF duration by survey year				Absolute change 1986–2004	Absolute change 2000–04
		1986	1996	2000	2004		
Prenatal care	None	19.87	20.81	24.03	23.56	3.68	−0.47
	Prenatal care (any)	15.32	19.93	22.52	21.59	6.27	−0.93
Birth control	None/traditional or folkloric methods	17.86	20.32	22.61	21.85	3.99	−0.77
	‘Modern’ methods	12.82	20.43	22.53	20.82	8.00	−1.71
	Birth control pill	9.87	17.76	20.54	21.34	11.47	0.79
Assistance at delivery	None/unskilled	20.01	20.86	23.46	23.32	3.32	−0.14
	Skilled/trained health professional	14.12	19.62	21.93	21.05	6.93	−0.88
Maternal age	<24 years	15.51	18.62	21.56	20.65	5.14	−0.91
	25–29 years	16.06	20.07	22.51	21.39	5.34	−1.12
	30–34 years	17.48	20.80	23.68	21.82	4.35	−1.86
	35+ years	21.15	23.48	24.65	24.03	2.88	−0.62
Maternal education	None	23.04	22.80	26.65	24.44	1.40	−2.21
	1–6 years	18.80	20.70	23.69	23.73	4.93	0.04
	7–12 years	12.89	19.56	22.29	20.62	7.73	−1.67
	12+ years	10.00	16.64	18.64	19.02	9.02	0.38
Mother currently employed	No	16.63	19.66	22.77	21.47	4.84	−1.30
	Yes	17.50	20.84	22.77	21.87	4.37	−0.90
Parity	1	14.43	18.92	20.65	19.76	5.33	−0.89
	2–3	15.13	19.03	22.12	21.22	6.09	−0.90
	4–6	18.73	21.58	24.69	24.20	5.47	−0.49
	7+	20.41	22.82	25.75	23.77	3.36	−1.98
Partner’s education	None	22.29	22.75	27.07	25.42	3.13	−1.65
	1–6 years	20.08	20.98	24.03	23.65	3.57	−0.38
	7–12 years	14.14	20.20	22.76	21.71	7.57	−1.04
	12+ years	10.99	18.09	19.98	18.93	7.94	−1.05
Partner’s occupation	Agriculture/not employed	19.56	20.86	23.69	23.19	3.63	−0.50
	Manual (skilled/unskilled)	18.10	20.43	23.47	22.52	4.41	−0.95
	Service/domestic	13.50	20.05	21.78	19.76	6.25	−2.02
	Professional/technical	11.97	18.01	20.04	18.62	6.65	−1.42
Sex	Female	18.30	20.26	22.99	21.90	3.60	−1.09
	Male	15.73	20.20	22.56	21.51	5.78	−1.05
Children under 5 in household	No other children under 5 years of age in household	15.71	20.36	21.72	20.75	5.04	−0.97
	Presence of at least 1 child (other than index child) under 5 years of age in household	17.54	20.15	23.94	22.86	5.32	−1.08
Residence	Rural	20.77	20.87	23.80	20.16	−0.61	−3.64
	Urban	13.62	19.62	21.61	23.30	9.68	1.69

Discussion

Our findings show that changes—both positive and negative—in breastfeeding duration have not been similar among population subgroups and that those experiencing declines have tended to be those whose children are at greatest risk of harm from not being breastfed. An earlier analysis of breastfeeding trends in Peru between 1977 and 1986 found that the largest increases in breastfeeding duration were among women who were less likely to breastfeed: higher educated, urban and

professional women (Elo and Grummer-Strawn 1993). Our analysis showed a continuation of this overall upward trend in breastfeeding duration, with the largest absolute increases among women who are better off with respect to education and access to health care and who live in urban areas. Unfortunately rural and uneducated women, whose infants face greater risks of morbidity and mortality from not being breastfed, had much lower increases or actually had decreases in breastfeeding duration over the same period. Uneducated

women still have breastfeeding durations that are longer than their better-off counterparts because they were so much longer to begin with; however, urban women now breastfeed for ~3 months longer than rural women. Given the many positive effects of breastfeeding for maternal and infant health, our findings that increases in breastfeeding duration observed in many of the countries studied were largest among the better off is cause for concern.

Nicaragua is a clear exception to the tendency for increases in breastfeeding duration to favour more well-off infants. There are several possible explanations for this. The most likely is that the breastfeeding promotion campaigns during this period focused on rural areas and poor communities (USAID *et al.* 2006). The campaigns also relied on community volunteers who themselves had had successful experiences breastfeeding, who were trained to counsel pregnant women and to counsel and help breastfeeding women in their communities. Nicaragua was also the country with the shortest interval between surveys (only 3 years) and the largest compound annual improvement in breastfeeding duration, which may also have contributed to it being an outlier with respect to the tendencies in other countries.

Many aspects of health care play a large role in determining a mother's intentions to initiate and continue breastfeeding. Whether a mother is able to carry through her intentions, however, will also depend greatly on whether opportunities exist for her to act on her infant-feeding choices (Lutter 2000), and these differ between the poor and the well-off. Early initiation of breastfeeding affects infant survival (Edmond *et al.* 2007; Mullany *et al.* 2008). However, for this to occur, a woman must have decided to breastfeed and to have access to her newborn immediately or very soon after giving birth. Poor women may be at a particular disadvantage as they often give birth in large public hospitals that must discharge them quickly because of space and cost constraints, so newborns need to be washed immediately and tended to, and only later returned to their mother. Early discharge also provides little time for breastfeeding support and counselling. For home births, traditional birth attendants may need to be educated to ensure immediate skin-to-skin contact between the mother and newborn after delivery and to encourage the use of colostrum. Access to skilled assistance to prevent and/or address breastfeeding problems is also necessary, and should be a priority in primary health care services where poor women are most likely to access care. Support for breastfeeding during child health care visits can also motivate a mother to overcome problems should they arise, and can encourage her persistence in maintaining a recommended breastfeeding behaviour when other social contacts provide negative pressure. In addition to having skilled care available, services need to adjust their hours so the poor do not have to miss work to use them.

Our study has several limitations. The main limitation is that the method we used to deconstruct changes in variables from changes in the structure of relationships did not permit the testing of statistical significance among the differences observed. A second limitation is that we were unable to examine changes in exclusive breastfeeding, the breastfeeding practice most associated with reduced mortality, as this practice was sufficiently rare that the models we ran using this outcome

would not converge. We had to limit the analysis to the eight countries that had publically available comparable data sets, and therefore could not include the universe of countries in Latin America. Lastly, except in the case of Nicaragua, we lacked specific information on the nature of breastfeeding interventions over the period of time studied to help us to understand possible reasons for the changes observed.

Conclusions

Equity is an important public policy goal. Information on how to ensure that public investments for health benefit the poor is growing; common approaches include geographical targeting, free or subsidized health care, and social marketing (Victora *et al.* 2003). For breastfeeding promotion, however, an equity approach must also address factors outside the health sector that provide the context in which women make and can carry out decisions about how to feed their infants (Lutter 2000). Among others, these could include extending maternity protection to women working in the informal sector so that they do not face economic barriers that prevent them from close contact with their infants during the critical period when frequent breastfeeding is needed to establish and maintain milk supply (Victora *et al.* 1987; WHO Collaborative Study Team 2000). Policies could also address the need for safe and subsidized child care and/or breastfeeding rooms close to where poor women work, such as in city centres where informal worksites are common, to allow for frequent breastfeeding or breastmilk expression and storage (Rea and Morrow 2004). They could also provide free or subsidized refrigerators to ensure safe storage of breastmilk. Public policy needs to ensure a favourable environment for breastfeeding for all women, but especially for poor women who face different barriers to breastfeeding compared with better off women (Beasley and Amir 2007).

Our results show that improvements in breastfeeding duration over the past 20 years in the Latin American and Caribbean countries in this study have not tended to be equitably distributed, but have tended to be negative or had the smallest increase in population subgroups whose children are most at risk for mortality and increased morbidity from not being breastfed. Gaps in child mortality vary greatly among and within countries (DaVanzo and Habicht 1986) as a function of poverty, maternal education and access to adequate housing and quality health care, among other factors (Victora *et al.* 2003). In many ways, breastfeeding can be seen as a great equalizer, benefitting all children, but more so for those that face the greatest risk for mortality and morbidity. While promoting, protecting and supporting breastfeeding is important for all women, additional efforts targeted at poorly educated, rural women with little access to health care is necessary to improve the survival and health of their children.

References

- Beasley A, Amir LH. 2007. Infant feeding, poverty and human development. *International Breastfeeding Journal* **22**: 14.
- Bhandari N, Kabir AK, Salam MA. 2008. Mainstreaming nutrition into maternal and child health programmes: scaling up of exclusive breastfeeding. *Maternal and Child Nutrition* **4**: 5–23.

- Bhutta ZA, Ahmed T, Black RE *et al.* 2008. What works? Interventions for maternal and child undernutrition and survival. *The Lancet* **371**: 417–40.
- Black RE, Allen LH, Bhutta ZA *et al.* 2008. Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet* **371**: 243–60.
- Chaparro CM, Lutter CK. 2007. *Beyond Survival: Integrated Delivery Care Practices for Long-term Maternal and Infant Nutrition, Health and Development*. Washington, DC: Pan American Health Organization.
- Chaparro CM, Lutter CK. 2010. Increases in breastfeeding duration observed in Latin America and the Caribbean and the role of maternal demographic and health care characteristics. *Food Nutr Bull* **31**(2 Suppl):S117–27.
- DaVanzo J, Habicht JP. 1986. Infant mortality decline in Malaysia, 1946–1975: the roles of changes in variables and changes in the structure of relationships. *Demography* **23**: 143–60.
- Edmond KM, Zandoh C, Quigley MA *et al.* 2007. Delayed breastfeeding initiation increases risk of neonatal mortality. *Pediatrics* **117**: e380–6.
- Elo IT, Grummer-Strawn LM. 1993. Changes in breastfeeding initiation and duration in Peru, 1977–1986. *Social Biology* **40**: 224–43.
- Ferry B. 1981. *Breastfeeding*. World Fertility Survey, Comparative Studies no. 13. Voorburg, Netherlands: International Statistical Institute.
- Grummer-Strawn LM. 1993. Regression analysis of current-status data: an application to breastfeeding. *Journal of the American Statistical Association* **88**: 758–65.
- Grummer-Strawn LM. 1996. The effect of changes in population characteristics on breastfeeding trends in fifteen developing countries. *International Journal of Epidemiology* **25**: 94–102.
- Habicht J, DaVanzo J, Butz WP. 1986. Does breastfeeding really save lives, or are apparent benefits due to biases? *American Journal of Epidemiology* **123**: 279–90.
- Horta BL, Bahl R, Martines JC, Victora CG. 2007. *Evidence on the Long-term Effects of Breastfeeding: Systematic Reviews and Meta-analysis*. Geneva: World Health Organization.
- Horton S, Sanghvi T, Phillips M *et al.* 1996. Breastfeeding promotion and priority setting in health. *Health Policy and Planning* **11**: 156–68.
- Jones G, Steketee RW, Black RE *et al.* 2003. How many child deaths can we prevent this year? *The Lancet* **362**: 65–71.
- Leon-Cava N, Lutter CK, Ross J, Martin L. 2002. *Quantifying the Benefits of Breastfeeding: A Summary of the Evidence*. Washington, DC: Pan American Health Organization.
- Lesthaeghe RJ, Page HJ. 1980. The postpartum non-susceptible period: development and application of model schedules. *Population Studies* **34**: 143–69.
- Lutter CK. 2000. Breastfeeding promotion: is its effectiveness supported by scientific evidence and global changes in breastfeeding behaviors? In Koletzko B, Michaelsen KF, Hernell O (eds). *Short and Long Term Effects of Breastfeeding on Child Health*. New York: Kluwer Academic/Plenum Publishers.
- Mullany LC, Katz J, Li YM *et al.* 2008. Breast-feeding patterns, time to initiation, and mortality risk among newborns in Southern Nepal. *Journal of Nutrition* **138**: 599–603.
- Nolen LB, Braveman P, Dachs JN *et al.* 2005. Strengthening health information systems to address health equity challenges. *Bulletin of the World Health Organization* **83**: 597–603.
- Perez-Escamilla R, Lutter CK, Segall A *et al.* 1995. Exclusive breast-feeding duration is associated with attitudinal, socioeconomic and biocultural determinants in three Latin American countries. *Journal of Nutrition* **125**: 2972–84.
- Perez-Escamilla R, Lutter CK, Wickham C *et al.* 1997. Identification of risk-factors for short breastfeeding duration in Mexico City through survival analysis. *Ecology of Food & Nutrition* **36**: 43–61.
- Preston S. 1976. *Mortality Patterns in National Populations: With Special Reference to Recorded Causes of Death*. New York: Academic Press.
- Preston S. 1980. Causes and consequences of mortality decline in less developed countries during the twentieth century. In Esterling RA (ed.). *Population and Economic Change in Developing Countries*. Chicago and London: University of Chicago Press.
- Rea MF, Morrow AL. 2004. Protecting, promoting, and supporting breastfeeding among women in the labor force. *Advances in Experimental Medicine and Biology* **554**: 121–32.
- Ruel MT, Habicht JP, Pinstrup-Andersen P, Grohn Y. 1992. The mediating effect of maternal nutrition knowledge on the association between maternal schooling and child nutritional status in Lesotho. *American Journal of Epidemiology* **135**: 904–14.
- Trussell TJ, Grummer-Strawn LM, Rodriguez G, Van Landingham M. 1992. Trends and differentials in breastfeeding behavior: evidence from WFS and DHS. *Population Studies* **46**: 285–307.
- USAID, UNICEF & Proyecto de Garantía de Calidad. 2006. *Iniciativa de Unidades de Salud de Amigas de la Niñez y la Madre en Nicaragua*. Managua, Nicaragua.
- Victora CG, Smith PG, Vaughan JP *et al.* 1987. Evidence for protection by breastfeeding against infant deaths from infectious diseases in Brazil. *The Lancet* **2**: 319–22.
- Victora CG, Wagstaff A, Schellenberg JA *et al.* 2003. Applying an equity lens to child health and mortality: more of the same is not enough. *The Lancet* **362**: 233–41.
- WHO Collaborative Study Team. 2000. The role of breastfeeding on the prevention of child mortality due to infectious diseases in developing countries: a pooled analysis. *The Lancet* **355**: 451–5.