

Determinants of breastfeeding practices in Ecuador: implications for localized applications of breastfeeding promotion and policies

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Abstract

Background Best practices in breastfeeding are often not followed in spite of appropriate levels of knowledge and positive attitudes regarding the many benefits of human milk. For a variety of reasons, particular, women do not initiate breastfeeding, suspend breastfeeding early, or initiate complementary feeding earlier than recommended. This paper analyzes breastfeeding patterns in three settings in Ecuador: a suburban parish near Quito, the nation's capital, urban and rural parts of a province in the Amazonian lowlands, and the province of Galapagos.

Methods We analyse data produced by surveys conducted in the three locations, each of which included mothers of infants between 0 and 24 months of age. The surveys collected demographic information and data based on breastfeeding indicators established by WHO.

Results Significant differences were found in breastfeeding practices, particularly between the suburban parish near Quito and Galapagos, on one hand, and urban and rural parts of the Amazonian province, on the other.

Conclusions Differences among population segments reflect specific opportunities and barriers to practices related to promoting optimal infant health and nutrition. Consequently, regional or local conditions that often are not apparent in national-level data should orient policies and promotion activities in specific populations.

Background

Many mothers throughout the world do not breastfeed, suspend breastfeeding early, or initiate complementary feeding earlier than recommended by international organizations and most national public health authorities. The World Health Organization [1] recommends that newborns initiate breastfeeding (BF) in the first hour after birth and continue exclusive breastfeeding (EBF) for six months and complementary feeding (CF) for an additional 18 months. The benefits of BF and correct timing of EBF and CF are well established. Human milk is a nutritious and safe food that is easily absorbed and provides appropriate levels of vitamins, minerals, and proteins. Health benefits that accrue to infants include improved nutritional status and survival rates, prevention of infectious disease in infancy and of chronic disease (including diabetes) and obesity in adulthood. Breastfeeding also provides for extension of post-pregnancy amenorrhea and enhanced infant-maternal affective relationships. In social terms, one of the greatest benefits is that BF is free and safe—critical advantages in poor populations [2, 3]. Most mothers can and should breastfeed; only in exceptional circumstances is breastmilk contraindicated [4].

Despite these manifold benefits, reported rates of BF are generally lower than would be expected. Initiation of BF in the first hour after birth occurs in only 44 percent of cases worldwide and appropriate EBF occurs in only 43 percent of cases. Factors associated with less-than-optimal BF, EBF, and CF practices include maternal age, educational level, socioeconomic status, urban residence, characteristics of institutionalized health care, perceived insufficiency of breast milk supply, maternal or infant illness,

discomfort or injury, previous BF experience, lack of social support, emotional stress, and the pressure of advertising that touts what are purported to be the advantages of milk substitutes. Maternal employment represents an important barrier to appropriate BF practices when women are obliged (often for economic reasons) to return to work without appropriate conditions for continuation of BF [2, 5, 6].

This paper analyzes BF patterns in three settings in Ecuador, where the diverse geographical, socioeconomic, and cultural milieu strongly influences health- and nutrition- related behavior in general. This study shows that there are significant regional differences in BF practices related to geographic, socioeconomic, and cultural conditions. While the determinants discussed here may be specific to Ecuador, a similar analysis can be applied elsewhere. This approach is important because we suggest that a subnational approach to BF promotion and policy is necessary in order to effectively address gaps between knowledge, attitudes, and practices that are specific to local contexts. This is an essential point because BF indicators are generally reported at the national level, which limits the ability to obtain accurate estimators for specific age groups and to translate those data into locally appropriate strategies. In contrast, results presented here support the relevance of regional data that can be useful in the design of appropriate BF promotion and policies that reflect social, economic, and cultural specificities.

This paper discusses breastfeeding patterns in a suburban parish near the capital city of Quito in the Andean highlands, urban and rural parts of a province located in Ecuador's Amazonian basin, and the island province of Galapagos. First, located in northern highland region, Cumbayá parish is home to a heterogeneous population of long-time residents who maintain rural lifestyles alongside newer, often wealthier residents, many of whom commute 10 km. to Quito, the nation's capital. According to the most recent census, Cumbayá had 31,463 residents in 2010 compared to a total of 21,078 in the previous (2001) census [7], representing a 10-year growth rate of 33%. Although Cumbayá is classified as a rural parish, its close geographical, economic, and social proximity to Quito and the rapid development of office buildings, shopping centres, and residential clusters referred to as urbanizaciones, so that Cumbayá is similar in many respects to North American or European suburbs in terms of access to goods and services, including health care. In 2010, 3.4% of Cumbayá's residents identified themselves as indigenous, compared to the national figure of 7.0% [8]. In sum, this parish is similar to other places characterized by relatively rapid social change and economic development and where access to health care is favourable.

The province of Morona Santiago, located in the southern part of Ecuador's tropical Amazon region, had a population of 147,940 in 2010, one third of whom lived in urban areas (mostly in the provincial capital of Macas) and two thirds in rural areas. Nearly half (48.4%) of the province's residents identified themselves as indigenous [8]. This province is similar to other parts of the country where social change and economic development have proceeded more slowly and where vulnerability to adverse health conditions is greater.

The province of Galapagos is a renowned for its endogenous animal and plant species, but was also home to 25,124 residents in 2010 and 25,244 in 2015 [8, 9]. In all, 82.5% of residents live in urban areas,

mostly in the two largest cities of Puerto Ayora and San Cristobal. Before regulations were instituted to limit permanent settlement, immigration was rapid, especially from the coastal mainland, although a community of highland indigenous residents also developed, such that 7.0% of Galapageños identified themselves as indigenous in 2010. Galapagos is similar to other tropical parts of Ecuador in terms of climate, but is also place of more rapid, specialized development because of its status as a global tourist attraction. At the same time most of the population lives in the three major urban centers so that the province is relatively isolated in geographic terms and with regard to specialized health care

Methods

Surveys were conducted in the three locations between August 2017 and August 2018 and included mothers of infants between 0 and 24 months of age, who did not suffer from acute or chronic illnesses, and who volunteered to participate. The questionnaire was adopted from an instrument designed by WHO [1, 10]. Demographic information included the informants' age, marital status, employment, educational level, number of childbirths, and type of delivery. The analysis was conducted using indicators established by WHO [10], which we divide into four groups.

The first group of two indicators are linked because the probability of age-appropriate BF practices is closely associated with successful early initiation.

1. *Early initiation of BF*: percentage of children born in the past 24 months who were put to the breast within one hour of birth.

2. *Age-appropriate breastfeeding*: percentage of infants 0-5 months of age who receive only breast milk and of children 6-23 months of age who received breast milk as well as solid, semi-solid, or soft foods during the previous day.

The second group of five indicators reflect appropriate breastfeeding practices during different stages of infancy and early childhood.

3. *Exclusive BF (< 6 months)*: percentage of infants 0-5 months of age who were fed exclusively with breastmilk during the previous day.

4. *Continued BF*: proportion of children 12-15 months who are fed breast milk.

5. *Infants ever breastfed*: percentage of children born in the past 24 months who were ever breastfed.

6. *Continued BF to 24 months*: percentage of children 20-23 months of age who are fed breast milk.

7. *Predominant BF (< 6 months)*: percentage of infants 0-5 months of age who received breast milk as the predominant source of nourishment during the previous day.

The third group is composed of five indicators that reflect different aspects of CF.

8. *Introduction of solid, semi-solid, or soft foods (6-8 months)*: percentage of infants 6- 8 months of age who were fed with solid, semi-solid, or soft foods during the previous day.

9. *Minimum dietary diversity (6-23 months)*: percentage of children 6-23 months of age who received foods from at least 5 out of 8 defined food groups during the previous day.

10. *Minimum meal frequency (6-23 months)*: percentage of children 6-23 months of age who received solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day.

11. *Minimum acceptable diet (6-23 months)*: percentage of children 6-23 months of age who received a minimum acceptable diet during the previous day.

12. *Bottle feeding (0-23 months)*: proportion of children 0-23 months of age who were fed with a bottle during the previous day.

The final indicator refers to children who were not breastfed.

13. *Milk feeding frequency for non-breastfed children*: proportion of non-breastfed children 6-23 months of age who received a least two milk feedings during the previous day.

The questionnaire was applied in Spanish in Cumbayá and Galapagos, while in some cases, it was applied in indigenous languages in Morona Santiago after validation by trained bilingual interviewers. Sample sizes were calculated considering a standard normal

deviation of 1.96, adjusted by expected prevalence of appropriate breastfeeding prevalence for children of 0 -24 months in the regions (e.g. 0.5 in Galapagos [11] and a 5% margin of error [12]. Additional adjustments including finite population size, and non-response rate of 5% in urban areas and 2% in rural areas were applied for each region [13]. These calculations produced a minimum sample size of 256. See Table 1.

Table 1. Sample size by study site and infants' age groups.

	Age group (months)	Study site			
		(Cumbayá)	Galapagos	Morona Santiago (urban)	Morona Santiago (rural)
Age groups	0 to 5	81	51	57	106
	6 to 23	147	187	142	237
	24 to 59	58	0	275	486
	Total:	286	238	474	829

Data collection

Trained personnel conducted face-to-face interviews with eligible mothers in Cumbayá, urban and rural Morona Santiago, and Galapagos. Participants in Cumbayá were identified and selected through non-random sampling among women who attended either of two public health centres. For Morona Santiago, a representative sample of rural and urban residents was employed using national census tracks definitions. For Galapagos, a preliminary list of children from 0 to 24 months of age was obtained from government-operated day care centres. In order to reach the required number of children, snowball sampling was applied to obtain additional participants on the Galapagos islands of San Cristobal and Santa Cruz. A total of 279 women were surveyed and 269 valid interviews were included in the analysis.

Data analysis

Indicators for feeding practices are reported using weighted data and calculated using the DHS approach to handling missing data [10]. Data cleaning and post-stratification were performed for the Galapagos and Morona surveys using additional demographic data and a ranking algorithm. To assess differences in indicators between Cumbayá, Galapagos, and urban and rural Morona Santiago, the Tukey Contrast test was used to assesses multiple comparisons of means (MCT) for each pair of surveys in order to

determine which means among a set of means differ from the others [14]. The test compares the difference between each pair of means with appropriate adjustments for multiple testing.

Results

Table 2 provides information on sociodemographic characteristics of participating mothers. It can be seen that most women in the four study sites were married and lived with a partner, although the proportion was lower in urban and rural Morona Santiago, where the proportion of single mothers was higher. In Cumbayá, over half of women reported having a university education while in Galapagos, over half reported a university education and over half had a high school education. In contrast, less than half of respondents in urban and rural Morona Santiago had attended a university and a high proportion reported a primary school education. In Cumbayá, the largest proportion of mothers was between 30 and 39 years of age, while in Galapagos, more than 90% were almost equally divided between the 20-29- and 30-39-years age groups. In contrast, a higher proportion of mothers in urban and rural Morona Santiago were between 15 and 19 years of age. With respect to type of birth, Cumbayá and Galapagos differ from Morona Santiago in that the proportion of women reporting Caesarean sections was high compared to WHO guidelines [15], while in the latter, few women had delivered via Caesarean section.

Table 2. Mothers' socioeconomic characteristics.

Indicators		Cumbaya		Galapagos		Morona Santiago (urban)		Morona Santiago (rural)	
		n	%	n	%	n	%	n	%
Marital status	Divorced or separated	11	4	15	6	13	4	33	7
	Married with partner	257	85	207	85	240	78	389	79
	Single	33	11	22	9	55	18	73	15
Educational level	Primary	21	7	25	10	125	40	268	54
	Secondary	108	36	143	58	164	53	217	44
	University	172	57	78	32	20	6	10	2
Mother's age	15 to 19	9	3	22	9	58	19	76	15
	20 to 29	123	41	114	46	159	52	256	52
	30 to 49	169	56	111	45	92	30	162	33
Type of birth	Cesarean	175	58	97	39	13	4	7	1
	Vaginal	126	42	149	61	296	96	488	99
	Total	301	100	247	100	309	100	495	100

Table 3 presents comparisons of the indicators listed above for the four study locations. In Panel A, it can be seen that the rates of early BF initiation and age-appropriate BF are significantly higher in urban and rural Morona Santiago than in Cumbayá or Galapagos. The data presented in Panel B suggest that EBF and CF practices do not differ significantly among the four study locations. In general, these data reflect a relatively high rate of EBF for six months, while BF rates are reduced thereafter until two years of age. It can be seen, though, that the EBF rate is higher in rural parts of Morona Santiago, reflecting both the persistence of cultural beliefs of largely indigenous communities as well as limited resources and access to industrialized milk substitutes. Interestingly, though, rates of continued BF are lower in urban and rural Morona Santiago than in their more urbanized counterparts. The comparisons of predominant BF under six months (indicator 7) reveal that proportionately, more than half of infants <6 months are breastfed, and that again, the practice is most evident in rural Morona Santiago.

Panel C of Table 3 reports on data related to CF practices. It can be seen that there are no significant differences between Cumbayá and Galapagos, but that there are with urban and rural Morona Santiago, reflecting less appropriate practices in the latter. Finally, panel D reports on milk feeding frequency for non-breastfed infants from 6 to 23

months of age. These data, collected only in Cumbayá and Galapagos, show no significant differences between those two study sites, in that in both places, a large proportion of infants received at least two portions of milk the day before the survey.

Table 3 about here

Conclusions And Discussion

The dynamics of health and nutrition behaviors are rarely consistent with best practices. It is not surprising, then, that the way in which different groups of women in the study areas manage EBF and CF do not necessarily conform to recommendations established by international organizations or national public health authorities. Nor do they necessarily reflect levels of knowledge and attitudes with regard to the benefits of breastfeeding. Rather, social and economic determinants represent factors that condition the manner in which mothers and families care for infants and children.

Differences among different population segments reflect a variety of opportunities and barriers to practices related to promoting optimal infant health and nutrition. As would be the case elsewhere in the world, an analysis of sociodemographic indicators suggests that in comparing women in the four study sites, those in Cumbayá are somewhat older on average, have higher level of education, are mostly non-indigenous, and are more likely to have given birth via Caesarean section. In contrast, those in Morona Santiago are on average younger, have lower levels of education, are much more likely to be indigenous, and to have not undergone Caesarean sections. The proportions of these indicators are intermediate in Galapagos.

Hence, differences in early initiation of BF and age-appropriate BF may be due to the persistence of cultural practices among indigenous residents of Morona Santiago. Although indigenous populations are not heterogeneous and BF practices may be declining, they may still be protected by the lower rates of Caesareans although conversely, CF practices may be less appropriate due to poorer socioeconomic conditions [16–18]. Conversely, while women in Cumbayá and Galapagos have more advantageous access to health services in general, they are more likely to give birth through Caesarean and in addition, have greater access industrialized milk substitutes and to mass-media advertising.

This analysis provides an understanding of regional or even local conditions that may be obfuscated by national-level data. For example, the proportion of infants who benefitted from timely initiation of BF is quite high in Morona Santiago but surprisingly low in Cumbayá, where mothers can receive prenatal care and give birth in well-equipped private or public hospitals. Ready access to quality health care is clearly advantageous, but at the same time it is contradictory that the rates of Caesarean sections are high, so that early initiation of BF is nearly impossible, which in turn can affect other age-appropriate BF practices. Conversely, CF practices are less adequate in Morona Santiago, where rural mothers, many of them very young, are likely to be poor and hence, may not have access to nutritious complementary foods or to appropriate nutrition and health information.

Optimal BF practices are undermined in many parts of the world by early introduction of industrialized milk substitutes to the detriment of new-borns' health and wellbeing [19]. A study of the violations of the International Code of Marketing of Breast Milk Substitutes carried out in two Ecuadorian cities reported that 70% of paediatricians in public and private hospitals and health centres had contacts with representatives of the milk substitute industry by which, they provided promotional materials, free samples, diapers, and bottles to mothers of new-borns and infants, who were also invited to participate in promotional events. In 49% of cases, paediatricians recommended the use of milk substitutes [20].

WHO BF indicators are widely used in a variety of settings, but they are not sensitive enough to provide information on the variability and quality of the diet that children consume at the local level. Therefore, it may be necessary to investigate more thoroughly the determinants that influence the period of transition from EBF to CF in many settings, when it is essential to introduce appropriate foods that not only guarantee adequate nutrients, but also generate healthy eating practices that will last throughout the life cycle, because even moderately poor nutrition during infancy can lead to irreversible damage [21, 22].

The adequacy of CF depends not only on the availability of a variety of foods in the household, but also on the feeding practices of caregivers. Appropriate feeding of infants and young children requires active care and stimulation, where the caregiver is responsive to infants' clues regarding hunger, but also active or responsive feeding. Conversely, inappropriate feeding practices during infancy can lead to inadequate food intake, so it is essential that those responsible for infant care and feeding possess the appropriate skills to promote and stimulate appropriate complementary feeding [13, 23]. Many determinants are related to this aspect, including level of mothers' education [24–26]. Similarly, it is increasingly clear that behavioural sciences can contribute significantly to positive change among those responsible for CF, using, for example, innovative tools including social media platforms such as Facebook, Twitter, and Messenger to promote appropriate BF behaviours [27]. Finally, the importance of appropriate health services provided by trained personnel in BF protection and promotion cannot be over-emphasized [28].

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Declarations

Ethics approval and consent to participate. The Quito and Galapagos surveys were approved by the IRB of the Universidad San Francisco de Quito, while the Morona Santiago survey was approved by the IRB of the Universidad de las Americas, both in Quito, Ecuador. In all cases, participation was voluntary and informed consent was obtained before initiating each interview. Confidentiality was ensured by assigning an identification number to substitute personal identifiers.

Consent for publication. Not applicable.

Availability of data and materials. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests. The authors declare that they have no competing interests.

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Authors' contributions. **WBF** designed the study, coordinated the creation of the data base, directed the data analysis, and participated in the preparation of the manuscript. **WFW** participated in design of the study and data analysis, and prepared the manuscript. **DR** was responsible for data collection in Cumbayá parish. **PB** was responsible for the organization of the data base and statistical analysis. **EW** was responsible for data collection in Galapagos. **AD** was responsible for data collection in Morona Santiago. **IP** designed and directed field collection. **EB** was responsible for field data collection.

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Table 3

Table 3. Breastfeeding practices.				
Indicator	Study site	n	%	SD
A.				
1. Early initiation of BF.	Cumbaya	296	36.2	0.48
	Galapagos	246	62.5	0.48
	Morona U	277	75.4 ^a	0.43
	Morona R	449	74.7 ^a	0.43
2. Age-appropriate breastfeeding.	Cumbaya	301	47.8	0.50
	Galapagos	247	62.0	0.49
	Morona U	475	20.1 ^a	0.40
	Morona R	834	17.6 ^a	0.38
B.				
3. Exclusive BF to 6 months	Cumbaya	81	51.9 ^{ab}	0.50
	Galapagos	51	55.9 ^{ac}	0.50
	Morona U	52	56.7 ^{bcd}	0.50
	Morona R	96	84.0 ^d	0.37
4. Continued breastfeeding, 12-15 months	Cumbaya	43	76.7 ^{ab}	0.43
	Galapagos	56	82.4 ^{ac}	0.38
	Morona U	32	56.5 ^{cd}	0.50
	Morona R	63	52.4 ^d	0.50
5. Infants ever breastfed.	Cumbaya	301	98.4 ^a	0.13
	Galapagos	247	99.5 ^a	0.07
	Morona U	309	93.0 ^b	0.26
	Morona R	495	90.8 ^b	0.29
6. Continued breastfeeding at 2 years.	Cumbaya	29	24.1 ^{abc}	0.44
	Galapagos	38	41.1 ^{ade}	0.49
	Morona U	27	13.8 ^{bdf}	0.35
	Morona R	56	33.8 ^{cef}	0.47
7. Infants <6 months predominantly breastfed.	Cumbaya	80	61.3 ^{ab}	0.49
	Galapagos	51	65.5 ^{acd}	0.48
	Morona U	52	69.7 ^{bce}	0.46
	Morona R	96	84.0 ^{de}	0.37
C.				
8. .Infants who received solid, semi-solid, or soft foods	Cumbaya	37	97.3 ^a	0.16
	Galapagos	37	92.0 ^a	0.27
	Morona U	29	70.6	0.46
	Morona R	44	43.2	0.50
9. Infants 6-23 months with minimum dietary diversity.	Cumbaya	162	88.3 ^a	0.32
	Galapagos	196	89.6 ^a	0.31
	Morona U	154	57.2	0.50
	Morona R	255	32.4	0.47
10 .Infants 6-23 months with minimum meal frequency.	Cumbaya	162	87.7 ^a	0.33
	Galapagos	196	90.5 ^a	0.29
	Morona U	148	52.1	0.50
	Morona R	250	20.6	0.40
11 Infants 6-23 months with minimum acceptable diet.	Cumbaya	162	72.2 ^a	0.45

	Galapagos	196	74.5 ^a	0.44
	Morona U	149	23.9	0.43
	Morona R	252	8.8	0.28
12. Bottle feeding. Proportion of children 0-23 months of age who are fed with a bottle.	Cumbaya	242	46.7 ^a	0.50
	Galapagos	246	40.8 ^a	0.49
	Morona U	211	28.0	0.45
	Morona R	361	12.8	0.33
D				
12. Milk feeding frequency for non-breastfed. Proportion of non-breastfed children 6-23 months of age who receive at least 2 milk feedings.	Cumbaya	59	79.7	0.41
	Galapagos	63	79.5 ^a	0.40
	Morona U	-	-	-
	Morona R	-	-	-

For each indicator, Tukey Contrasts assessing multiple comparisons of means for each pairs of surveys, or all pairwise comparison using R *multcomp* package (retz 2010), provided statistically significant differences ($p < 0.5$) result. For readability, comparable means are reported with a subscript letter ^{a,b,c...}, the absence of subscript meaning reported mean is statistically different from all other means.