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Breastfeeding Practices among Poor Women in Mesoamerica[1–3]

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Abstract

Background: Breastfeeding is an effective intervention to reduce pediatric morbidity and mortality. The prevalence of practices and predictors of breastfeeding among the poor in Mesoamerica has not been well described.

Objectives: We estimated the prevalence of ever breastfeeding, early initiation of breastfeeding, exclusive breastfeeding, and breastfeeding between 6 mo and 2 y of age using household survey data for the poorest quintile of families living in 6 Mesoamerican countries. We also assessed the predictors of breastfeeding behaviors to identify factors amenable to policy interventions.

Methods: We analyzed data from 12,529 children in Guatemala, Honduras, Mexico (Chiapas State), Nicaragua, Panama, and El Salvador using baseline survey data from the Salud Mesoamérica 2015 Initiative. We created multivariable Poisson regression models with robust variance estimates to calculate adjusted risk ratios (aRRs) and 95% CIs for breastfeeding outcomes and to control for sociodemographic and healthcare-related factors.

Results: Approximately 97% of women in all countries breastfed their child at least once, and 65.1% (Nicaragua) to 79.0% (Panama) continued to do so between 6 mo and 2 y of age. Breastfeeding in the first hour of life varied by country ($P < 0.001$), with the highest proportion reported in Panama (89.8%) and the lowest in El Salvador (65.6%). Exclusive breastfeeding also varied by country ($P = 0.037$), ranging from 44.5% in Panama to 76.8% in Guatemala. For every 20% increase in the proportion of peers who exclusively breastfed, there was an 11% (aRR: 1.11, 95% CI: 1.04, 1.18) increase in the likelihood of exclusive breastfeeding.

Conclusion: Our study revealed significant variation in the prevalence of breastfeeding practices by poor women across countries surveyed by the Salud Mesoamérica 2015 initiative. Future interventions to promote exclusive breastfeeding should consider ways to leverage the role of the community in supporting individual women. *J Nutr* 2015;145:1958–65.

Keywords: breastfeeding, initiation, exclusivity, duration, Central America, predictors

Introduction

Breastfeeding reduces child mortality and is associated with lower risk of pediatric gastrointestinal tract, upper respiratory, and lower respiratory infections, as well as overweight and obesity (1–3). In addition, breastfeeding has been associated with higher intelligence quotient scores and may be associated with improved educational attainment and income in adulthood (4). Accordingly, the WHO has made a series of breastfeeding-related recommendations. The first is that infants should be exclusively breastfed for their first 6 mo of life (5). In order to specifically target reduction in neonatal mortality, and based on the increased probability of exclusive breastfeeding up to 6 mo among early initiators (6, 7), the WHO also recommends breastfeeding initiation within 1 h of birth (8). In addition, the WHO recommends continued breastfeeding with complementary foods for up to 2 y (5).

Despite widespread knowledge of the health benefits of infant breastfeeding, exclusive breastfeeding in Mesoamerica is not common (9). Mothers in the region may face cultural and social pressures not to breastfeed exclusively (10), and up to one-third of mothers in some settings provide their infants with drinks other than breast milk in the first week of life (11). For example, it has been reported that Nicaraguan mothers exclusively breastfeed for a median of 21 d (12). In Mexico, it has been reported that as few

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[3] Supplemental Tables 1–25 are available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at http://jn.nutrition.org.
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as 8–14% of infants were exclusively breastfed for 6 mo (13, 14). A study in 4 peri-urban areas around Guatemala City reported that 99% of mothers had breastfed at one point, but <25% were breastfeeding exclusively at the time of the survey (15). Other studies in Guatemala have found that the majority of mothers did not exclusively breastfeed within 1 mo of birth and that the median duration of exclusive breastfeeding was only 8 d (16, 17). Similarly, in a small study of Honduran multiparous women, only one-third reported having exclusively breastfed a child for 6 mo (9). Data for other Mesoamerican countries are sparser, and crosscountry comparability is limited because of differences in study designs and data collection at different time points.

The reasons why a child may or may not be breastfed are complex. As much as possible, it would be useful to consider breastfeeding predictors from a socioecological perspective rather than focusing solely on mother-child dyad characteristics (18, 19). A conceptual framework could be comprised of 3 levels of factors: individual, group, and societal (18). Individual-level factors are characteristics or actions of the mother or child, such as maternal skills and knowledge, and are often associated with sociodemographic characteristics (18). As an example, a 2006 cohort study reported that maternal infant feeding attitudes were associated with breastfeeding duration (20). Group-level factors are attributes of the environment surrounding the mother and child, including their home, work, and medical facilities. For example, a 2011 study assessed the impact of fathers' attitudes toward breastfeeding on breastfeeding practices in rural Guatemala (21). Societal-level factors describe the context in which breastfeeding does or does not occur and include "cultural norms regarding breastfeeding, … the role of women in society, … [and] the extent to which men's social role includes support for breastfeeding mothers (18)."

Our objective was to estimate the prevalence of ever breastfeeding, early initiation of breastfeeding, exclusive breastfeeding, and breastfeeding between 6 mo and 2 y of age using population-based household survey data for the poorest quintile of families living in Guatemala, Honduras, Mexico (Chiapas State), Nicaragua, Panama, and El Salvador. In addition, we sought to apply a socioecological framework to assess the potential predictors of breastfeeding behaviors with the intent of identifying factors amenable to policy interventions.

Methods

Study design and setting. We used baseline data from the Salud Mesoamérica 2015 Initiative (SM2015)[6]. The SM2015 is a results-based financing scheme that seeks to "deliver integrated, evidenced based supply- and demand-side interventions" to poor, indigenous, and rural populations in Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Mexico (Chiapas State), Panama, and El Salvador (22). The SM2015 baseline survey was conducted to provide a historical reference point for follow-up surveys that will evaluate the effectiveness of SM2015 interventions.

The survey's methodology has already been described in detail (22). Briefly, based on aggregate level measures, the poorest one-fifth of municipalities within each country were identified. However, in Mexico, surveys were limited to Chiapas because it is known to be the poorest state. A list of localities, typically villages, was randomly generated from among all SM2015 municipalities, with probability proportional to size. Each locality consisted of ~150 households and served as the primary sampling unit (PSU). We conducted a census in each selected locality, which was used to randomly select 30 households with children under 5 y or women aged 15–49 y. Interviewers revisited households up to 3 times, including workdays and weekends, in order to maximize the likelihood of interviewing mothers and caretakers who work outside the home. Computer-assisted personal interviews were conducted with the use of DatStat Illume on netbooks, which allowed field staff to input data in real time. Data were securely transmitted to the Institute for Health Metrics and Evaluation for quality assurance. All surveys were conducted in Spanish or, when applicable, indigenous languages.

Study population. SM2015 baseline household surveys were collected between April and August 2013 in Guatemala; January and June 2013 in Honduras; March and August 2013 in Nicaragua; July 2012 and May 2013 in Mexico; April and August 2013 in Panama; and March and July 2011 in El Salvador. Relevant data were not available for Belize and Costa Rica. In order to reduce recall bias, we limited our analysis to responses regarding the mother's youngest child who was under 5 y old.

Breastfeeding definitions. Ever-breastfeeding was determined by asking mothers of children under 5-y old, "Have you ever breastfed your child?" Early initiation of breastfeeding was limited to children under 24 mo and was defined as the mother putting the child to her breast within 1 h of birth (23). Exclusive breastfeeding under 6 mo was limited to children 0–5 mo and was based on the mother's recall of what the child had consumed in the most recent 24 h before the survey (23). Breastfeeding between 6 mo and 2 y of age was assessed via a 24 h food recall questionnaire for children aged 6–23 mo.

Data analysis. Individual- and group-level potential correlates of breastfeeding were stratified by country and compared using chi-square tests. Sociodemographic variables included the child's age and sex, and the mother's age, education, literacy, marital status, relationship to the head of household, whether she was a housewife, whether she was of indigenous ethnicity (Guatemala, Mexico, and Nicaragua only), and urban residence (except for Panama). Indigenous ethnicity was defined as the mother speaking any indigenous language. Questions regarding the languages spoken were not included in the El Salvador and Panama surveys because the populations were expected to be nearly entirely nonindigenous and indigenous, respectively. Similarly, urban residence was not assessed in Panama because our surveyed areas were entirely rural. We assessed household wealth using a relative asset index. The index was created by giving 1 point for each of the following assets: water piped into the home, flush toilet, a separate kitchen, electricity, radio, stereo system, television, mobile phone, fixed line telephone, refrigerator, washing machine, computer, guitar, bicycle, scooter, car, truck, land, bull, mule, goat, chicken, or pig. The resulting distribution was divided into quintiles.

Healthcare-related variables included having had any antenatal care (ANC), whether the child was born in a health facility, whether the woman used a maternal waiting home (Mexico, Nicaragua, and Panama only), medical personnel who attended the delivery, and whether the woman had received instruction regarding breastfeeding while receiving antenatal, delivery, or postnatal care (except for Guatemala). Birth-related factors included primiparity, whether the mother desired to become pregnant, and whether the child was delivered vaginally or through cesarean section.

In order to examine the impact of peer practices or community norms, we sought to estimate the strength of association between an individual woman's breastfeeding practices and those of other women in her PSU. Each breastfeeding practice was converted into a binary variable (no = 0, yes = 1) and the mean value of that practice was calculated for each PSU, excluding the contribution of that individual woman. We divided the resulting distribution into fifths (0–20%, 21–40%, etc.) to generate a 5-tiered ordinal variable with each subsequent value representing a 20% increase in the prevalence of the given breastfeeding practice in the woman's PSU.

Statistical analysis. We performed Poisson regression with robust variance estimates to calculate RRs and 95% CIs for 4 different binary outcomes: ever-breastfed, early breastfeeding, exclusive breastfeeding, and breastfeeding for up to 2 y. We assessed potential collinearity among the multivariable candidates with the use of variance inflation factors. We removed medical personnel attending delivery from regression analyses because of collinearity with delivery in a birth facility (variance inflation factor >10). There was no other evidence of collinearity. Multivariable analyses were adjusted for all variables assessed in univariable analyses. We

[6] Abbreviations used: ANC, antenatal care; aRR, adjusted risk ratio; PSU, primary sampling unit; SM2015, Salud Mesoamérica 2015 Initiative.

performed multiple imputation (24) with 50 imputations for whether the mother wanted to become pregnant, because this variable was missing for 19% of Panamanian mothers. All other variables had <5% missing data. We used Stata/IC 13.1 for the analyses and we used "svy," the survey prefix command, to adjust for the complex survey design. All P values are 2-sided, and $P = 0.05$ was set as our a priori threshold for statistical significance.

Ethics statement. The study received institutional review board approval from the University of Washington, partnering data-collection agencies, and the ministry of health in each country. Informed consent was obtained from all participants.

Results

Crosscountry results have been presented in **Tables 1–5**, with country-specific results presented in **Supplemental Tables 1–25**.

Study population. We analyzed data from 2817 mothers with a youngest child under 5 y old in Guatemala, 1732 in Honduras, 3178 in Mexico, 1168 in Nicaragua, 741 in Panama, and 2893 in El Salvador, for a total 12,529 mothers (Table 1 and **Figure 1**). The median age of the youngest child was 1 y in Guatemala, Mexico, and Panama, and 2 y in Honduras, Nicaragua, and El Salvador (Kruskal-Wallis test, $P = 0.001$). The mother's median age was between 26 and 28 y in each country (Kruskal-Wallis test, $P = 0.009$), and Honduran woman were the most likely to have some education (92.9%), whereas Guatemalan women were the least likely (67.8%) ($P < 0.001$). The proportion of married mothers was between 31.3% and 35.2% for all countries except Panama, where it was 8.2% ($P < 0.001$). Relationships to the head of household varied by country ($P < 0.001$), with 73.8% of Guatemalan women saying she or her partner was the head of household compared with a mean of 39.8% in the other countries. Between 85.7% and 93.0% of women reported being housewives, with significant differences between countries ($P = 0.001$). Indigenous women constituted 78.6% of the surveyed population in Guatemala, 66.1% in Mexico, 11.2% in Nicaragua, and <1% in Honduras ($P < 0.001$). Breastfeeding instruction differed by country ($P < 0.001$) and was most common in El Salvador (92.6%) and least common in Mexico (38.1%).

Ever-breastfeeding. Greater than 96% of women breastfed their child at least once, with no statistically significant differences between countries. Overall, an individual level factor, maternal age between 35–49 y, was associated with a slightly reduced probability of ever breastfeeding [adjusted risk ratio (aRR): 0.98; 95% CI: 0.97, 0.99] compared with a maternal age between 15–24 y (Table 2). Those in households with high numbers of assets (aRR: 0.98; 95% CI: 0.97, 1.00) and firstborn children (aRR: 0.97; 95% CI: 0.96, 0.98), both group-level factors, also had a slightly decreased probability of ever breastfeeding (Table 2).

Guatemalan women who received any ANC were slightly more likely to have ever breastfed (aRR: 1.03; 95% CI: 1.01, 1.05), and Honduran mothers who had a cesarean section were less likely to do so (aRR: 0.96; 95% CI: 0.94, 0.99) (Supplemental Tables 1 and 2, respectively). In Chiapas, those with a secondary level education were slightly more likely to ever breastfeed (aRR: 1.03; 95% CI: 1.00, 1.05) (Supplemental Table 3). The likelihood of ever having breastfed increased by 5% (aRR: 1.05; 95% CI: 1.01, 1.09) among Nicaraguan women who delivered in a health facility and by 4% (aRR: 1.04; 95% CI: 1.00, 1.08) among Panamanian mothers who had a cesarean section (Supplemental Tables 4 and 5, respectively). Salvadoran children 36–47 mo old (aRR: 0.95; 95% CI 0.93, 0.98) and 48–59 mo old (aRR: 0.97; 95% CI: 0.94, 0.99) were less likely to have ever been breastfed compared with those 0–5 mo (Supplemental Table 6).

Early initiation of breastfeeding. Breastfeeding within the first hour of life ranged between 89.8% in Panama and 65.6% in El Salvador ($P < 0.001$). In the crosscountry analysis, individual- and group-level factors were significant predictors of early initiation (Table 3). Mothers who delivered in a health facility were more likely to breastfeed early (aRR: 1.06; 95% CI: 1.00, 1.13). Primiparous women were 11% less likely to breastfeed early (aRR: 0.89; 95% CI: 0.84, 0.94) and those who delivered via cesarean section were 31% less likely to initiate breastfeeding early (aRR: 0.69; 95% CI: 0.62, 0.76). For every 20% increase in the proportion of peers who breastfed early, there was an 8% (aRR: 1.08; 1.05, 1.12) increased likelihood for breastfeeding early.

Peer effects were positively associated with early initiation of breastfeeding in Guatemala (aRR: 1.22; 95% CI: 1.15, 1.30) but not in Honduras (aRR: 1.06; 95% CI: 1.99, 1.14) (Supplemental Tables 7 and 8). Peer influence was also positively associated with early breastfeeding in Chiapas (aRR: 1.09; 95% CI: 1.03, 1.14) (Supplemental Table 9). In Nicaragua, receiving breastfeeding instruction was negatively associated with early breastfeeding (aRR: 0.92; 95% CI: 0.85, 0.99) (Supplemental Table 10). In Panama, cesarean section was associated with a nearly 70% reduced likelihood of early breastfeeding (aRR: 0.32; 95% CI: 0.12, 0.91) (Supplemental Table 11). In El Salvador, mothers with a cesarean section were 44% less likely to initiate early breastfeeding (aRR: 0.56; 95% CI: 0.47, 0.65) (Supplemental Table 12).

Exclusive breastfeeding. Prevalence of exclusive breastfeeding varied by country ($P < 0.001$), ranging from 44.5% in Panama to 76.8% in Guatemala. The child's age, an individual-level factor, was associated with exclusive breastfeeding (Table 4). Compared with those in the first month of life, 3-mo-old (aRR: 0.68; 95% CI: 0.55, 0.83), 4-mo old (aRR: 0.54; 95% CI: 0.43, 0.69), and 5-mo-old (aRR: 0.48; 95% CI: 0.36, 0.63) children all had a decreased probability of being exclusively breastfed. Group-level factors were also positively associated. Women who received any ANC were less likely to breastfeed exclusively (aRR: 0.78; 95% CI: 0.63, 0.97). In addition, every 20% increase in the proportion of peers who breastfed exclusively was associated with an 11% increased likelihood of doing likewise (aRR: 1.11; 95% CI: 1.04, 1.18).

In Guatemala, women who wanted to become pregnant were less likely to breastfeed exclusively (aRR: 0.82; 95% CI: 0.72, 0.95) (Supplemental Table 13). Compared with 15- to 24-y-old mothers, Honduran mothers 35–49 y of age were 45% less likely to breastfeed exclusively (aRR: 0.55; 95% CI: 0.034–0.90) (Supplemental Table 14). Honduran women with a high school education were 75% less likely to breastfeed exclusively than were those without an education (aRR: 0.25; 95% CI: 0.08, 0.76). In Chiapas, receipt of breastfeeding instruction was negatively associated with exclusive breastfeeding (aRR: 0.72; 95% CI: 0.59, 0.89) (Supplemental Table 15). In Nicaragua, housewives were more likely to breastfeed exclusively than were those who worked (aRR: 1.56; 95% CI: 1.05, 2.30) (Supplemental Table 16). Compared with single mothers, Panamanian mothers in a domestic partnership were 75% less likely to breastfeed exclusively (aRR: 0.25; 95% CI: 0.07, 0.89) (Supplemental Table 17). Peer effects were significantly associated with exclusive breastfeeding in El Salvador (aRR: 1.11; 95% CI: 1.00, 1.24) (Supplemental Table 18).

Breastfeeding between 6 mo and 2 y. Breastfeeding between 6 mo and 2 y of age also differed by country ($P < 0.001$), and was most common in Panama (79.0%) and least common in

TABLE 1 Characteristics of mothers and their youngest children <5 y old in the Salud Mesoamérica 2015 initiative, 2011–2013[1]

	Guatemala (n = 2817)	Honduras (n = 1732)	Mexico (n = 3178)	Nicaragua (n = 1168)	Panama (n = 741)	El Salvador (n = 2893)	P
Child's age, mo							0.06
0–5	12.7 (11.3, 14.3)	10.7 (9.1, 12.5)	12.1 (10.9, 13.5)	10.6 (8.6, 13.0)	15.4 (13.1, 17.9)	10.2 (8.9, 11.7)	
6–11	14.4 (13.1, 15.7)	12.6 (10.8, 14.6)	13.7 (12.4, 15.0)	13.8 (12.0, 15.9)	13.7 (11.2, 16.7)	11.3 (9.9, 12.9)	
12–23	26.1 (24.4, 27.9)	24.5 (22.4, 26.6)	26.0 (24.3, 27.7)	23.7 (21.2, 26.4)	28.4 (25.1, 32.1)	27.0 (25.1, 28.9)	
24–35	20.6 (18.8, 22.4)	22.1 (19.8, 24.6)	18.6 (17.2, 20.0)	20.1 (17.9, 22.6)	19.5 (17.2, 22.1)	21.7 (20.0, 23.5)	
36–47	15.5 (13.9, 17.2)	17.4 (15.5, 19.6)	17.1 (15.6, 18.8)	17.2 (15.1, 19.4)	14.9 (12.1, 18.2)	17.1 (15.7, 18.7)	
48–59	10.8 (9.5, 12.1)	12.7 (11.2, 14.4)	12.5 (11.3, 13.8)	14.5 (12.7, 16.6)	8.0 (6.2, 10.3)	12.7 (11.4, 14.1)	
Child's sex							0.57
M	50.1 (48.3, 51.9)	49.7 (47.1, 52.4)	50.9 (48.8, 53.0)	50.9 (47.9, 53.8)	49.4 (46.1, 52.7)	47.8 (45.8, 49.7)	
F	49.9 (48.1, 51.7)	50.3 (47.6, 52.9)	49.1 (47.0, 51.2)	49.1 (46.2, 52.1)	50.6 (47.3, 53.9)	52.2 (50.3, 54.2)	
Mother's age, y							0.020
15–24	37.1 (35.1, 39.1)	37.5 (35.2, 39.9)	35.0 (32.8, 37.2)	40.7 (36.9, 44.6)	37.6 (33.5, 41.8)	39.3 (36.8, 41.8)	
25–34	42.0 (40.2, 43.9)	42.1 (39.5, 44.9)	44.9 (42.8, 46.9)	39.9 (36.4, 43.5)	37.7 (33.7, 41.8)	40.5 (38.3, 42.8)	
35–49	20.9 (19.2, 22.7)	20.3 (18.0, 22.8)	20.2 (18.4, 22.1)	19.4 (17.0, 22.0)	24.8 (21.9, 28.0)	20.2 (18.4, 22.1)	
Highest level of education							<0.001
None	32.2 (28.8, 35.9)	7.1 (5.5, 9.1)	15.9 (13.6, 18.4)	11.8 (9.1, 15.3)	18.4 (12.6, 26.1)	10.6 (8.9, 12.5)	
Primary	50.8 (48.4, 53.3)	72.2 (69.1, 75.2)	50.4 (47.0, 53.8)	54.0 (49.3, 58.6)	56.1 (50.2, 61.7)	56.6 (53.5, 59.7)	
Secondary	8.6 (7.0, 10.5)	9.6 (7.9, 11.6)	20.3 (18.2, 22.6)	24.2 (21.2, 27.3)	19.4 (15.4, 24.1)	28.4 (25.3, 31.6)	
High school or higher	8.4 (6.2, 11.2)	11.1 (9.2, 13.3)	13.4 (10.7, 16.6)	10.0 (7.1, 14.0)	6.1 (4.0, 9.4)	4.4 (3.4, 5.7)	
Mother is literate	40.9 (36.9, 45.1)	64.4 (60.6, 68.0)	59.0 (55.1, 62.8)	71.1 (66.5, 75.2)	55.7 (48.4, 62.8)	77.4 (74.4, 80.1)	<0.001
Household asset index							<0.001
Low	55.2 (51.0, 59.4)	48.8 (44.6, 53.1)	52.2 (47.9, 56.4)	48.0 (42.7, 53.4)	46.7 (37.7, 55.9)	55.9 (52.1, 59.6)	
Medium	25.4 (23.2, 27.8)	35.4 (32.1, 38.8)	30.2 (27.7, 32.7)	41.4 (37.2, 45.7)	37.8 (31.3, 44.7)	29.9 (27.6, 32.3)	
High	19.3 (16.5, 22.5)	15.8 (13.2, 18.8)	17.6 (15.2, 20.4)	10.6 (8.4, 13.2)	15.5 (10.4, 22.6)	14.2 (12.0, 16.8)	
Marital status							<0.001
Single	8.6 (7.3, 10.1)	15.3 (13.4, 17.4)	1.9 (1.4, 2.6)	15.2 (12.5, 18.3)	8.0 (6.1, 10.4)	13.3 (11.6, 15.3)	
Married	34.7 (31.3, 38.3)	31.3 (28.7, 34.1)	35.2 (31.6, 39.0)	34.5 (31.3, 37.8)	8.2 (5.8, 11.6)	33.9 (30.8, 37.1)	
Domestic partnership	50.9 (47.4, 54.5)	50.4 (47.6, 53.2)	57.0 (53.1, 60.7)	45.2 (41.8, 48.7)	77.1 (72.5, 81.1)	41.5 (38.7, 44.4)	
Other	5.8 (4.9, 6.7)	3 (2.2, 4.0)	5.9 (5.0, 7.0)	5.1 (3.7, 7.1)	6.7 (5.0, 8.9)	11.2 (9.7, 13.0)	
Relationship to head of household							<0.001
Self or partner	73.8 (70.6, 76.8)	39.6 (36.8, 42.5)	39.4 (35.8, 43.1)	40.1 (36.2, 44.1)	34.1 (29.6, 38.9)	44.4 (41.2, 47.6)	
Daughter	11.7 (10.3, 13.3)	13.3 (11.7, 15.1)	7.2 (6.1, 8.6)	15.2 (12.7, 18.0)	33.3 (28.8, 38.1)	18.7 (17.0, 20.5)	
Daughter-in-law	11.9 (10.0, 14.1)	6.2 (5.0, 7.6)	5.9 (4.8, 7.3)	7.3 (5.7, 9.4)	6.2 (4.4, 8.7)	5.3 (4.4, 6.4)	
Other	2.6 (1.8, 3.7)	40.9 (37.9, 43.9)	47.5 (43.6, 51.4)	37.4 (33.9, 41.1)	26.4 (21.8, 31.5)	31.6 (28.7, 34.6)	
Mother is a housewife	93.0 (90.7, 94.8)	89.8 (87.5, 91.7)	91.2 (88.8, 93.1)	85.7 (82.0, 88.7)	92.8 (89.7, 94.9)	88.8 (86.8, 90.6)	0.001
Indigenous[2]	78.6 (72.7, 83.5)	0.1 (0.0, 0.5)	66.1 (59.3, 72.3)	11.2 (4.7, 24.3)	—	—	<0.001
Urban residence	16.7 (10.8, 24.8)	13.5 (8.3, 21.3)	39.3 (31.7, 47.5)	19.2 (10.3, 32.9)	—	22.8 (16.6, 30.4)	0.001
Any antenatal care	81.9 (79.0, 84.5)	95.7 (94.2, 96.8)	94.2 (92.8, 95.4)	95.9 (94.2, 97.1)	81.6 (76.0, 86.2)	97.8 (97.1, 98.4)	<0.001
Birth in a health facility	23.4 (19.7, 27.6)	80.1 (75.3, 84.1)	48.2 (42.8, 53.6)	85.0 (80.5, 88.6)	55.9 (46.0, 65.4)	84.6 (81.1, 87.5)	<0.001
Used a maternal home[3]	—	—	4.0 (3.0, 5.3)	14.9 (11.7, 18.8)	11.9 (8.5, 16.4)	—	<0.001
Delivery attendant							<0.001
Professional nurse	1.8 (1.3, 2.5)	3.4 (2.4, 4.8)	1.1 (0.7, 1.7)	3.3 (2.4, 4.7)	5.5 (3.3, 8.8)	1.3 (0.9, 1.9)	
Doctor	22.0 (18.4, 26.1)	76.0 (71.3, 80.1)	48.3 (43.0, 53.6)	82.0 (77.5, 85.7)	55.1 (46.3, 63.6)	83.3 (80.1, 86.1)	
Other	76.2 (72.1, 79.9)	20.6 (16.6, 25.4)	50.6 (45.2, 56.0)	14.7 (11.2, 19.1)	39.4 (30.7, 48.9)	15.4 (12.5, 18.7)	
Breastfeeding instruction[4]	—	48.5 (45.2, 51.8)	38.1 (34.3, 41.9)	54.9 (48.6, 61.1)	44.1 (37.3, 51.2)	92.6 (91.2, 93.7)	<0.001
Primiparous	32.0 (29.7, 34.4)	33.9 (31.7, 36.1)	26.1 (24.0, 28.2)	33.3 (29.8, 37.1)	19.4 (16.3, 22.8)	35.0 (32.8, 37.2)	<0.001
Wanted to conceive this child	87.6 (85.5, 89.4)	71.9 (69.4, 74.3)	78.6 (76.3, 80.8)	67.9 (64.5, 71.2)	65.6 (59.1, 71.7)	69.7 (67.0, 72.3)	<0.001
Cesarean section	6.9 (5.5, 8.8)	13.3 (11.6, 15.0)	15.8 (13.5, 18.4)	17.1 (14.1, 20.5)	2.6 (1.8, 3.8)	24.3 (22.1, 26.7)	<0.001
Ever breastfed	97.9 (97.3, 98.4)	97.2 (96.2, 98.0)	97.7 (97.0, 98.2)	97.3 (96.3, 98.1)	98.0 (96.5, 98.8)	96.8 (96.0, 97.5)	0.54
Early initiation of breastfeeding[5]	73.0 (68.4, 77.1)	76.9 (73.2, 80.3)	71.0 (67.5, 74.3)	84.8 (81.5, 87.6)	89.8 (85.4, 92.9)	65.6 (62.1, 68.9)	<0.001
Exclusive breastfeeding[6]	76.8 (71.4, 81.4)	47.6 (38.8, 56.5)	58.5 (51.8, 64.9)	60.0 (48.4, 70.6)	44.5 (36.1, 53.3)	59.2 (51.6, 66.4)	0.037
Breastfeeding up to 2 y[7]	78.2 (75.4, 80.9)	75.5 (71.4, 79.2)	76.8 (73.7, 79.7)	66.1 (61.0, 70.7)	79.0 (71.4, 85.1)	76.1 (72.6, 79.2)	<0.001

[1] Values are survey-weighted percentages (95% CIs).
[2] Not assessed in El Salvador and Panama surveys because the populations were expected to be nearly entirely nonindigenous and indigenous, respectively.
[3] Not assessed in Guatemala, Honduras, and El Salvador.
[4] Not assessed in Guatemala.
[5] Limited to 6337 children who were 0–23 mo old. The denominator is 1490 for Guatemala, 825 for Honduras, 1677 for Mexico, 562 for Nicaragua, 426 for Panama, and 1357 for El Salvador.
[6] Limited to 1456 children who were <6 mo old. The denominator is 355 for Guatemala, 190 for Honduras, 387 for Mexico, 128 for Nicaragua, 112 for Panama, and 284 for El Salvador.
[7] Limited to 4881 children who were 6–23 mo old. The denominator is 1135 for Guatemala, 635 for Honduras, 1290 for Mexico, 434 for Nicaragua, 314 for Panama, and 1073 for El Salvador.

TABLE 2 Predictors for ever- vs. never-breastfeeding in the Salud Mesoamérica 2015 initiative, 2011–2013[1]

	Univariable (n = 12,521)	Multivariable[2] (n = 12,203)[3]
Child's age, mo		
0–5	Reference	Reference
6–11	0.99 (0.97, 1.01)	0.99 (0.97, 1.01)
12–23	1.00 (0.98, 1.01)	1.00 (0.98, 1.01)
24–35	0.99 (0.98, 1.00)	0.99 (0.98, 1.01)
36–47	0.99 (0.98, 1.01)	1.00 (0.98, 1.01)
48–59	0.99 (0.97, 1.00)	0.99 (0.98, 1.01)
Child's sex		
M	Reference	Reference
F	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
Mother's age, y		
15–24	Reference	Reference
25–34	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)
35–49	0.99 (0.98, 1.00)	0.98 (0.97, 0.99)**
Highest level of education attained		
None	Reference	Reference
Primary	1.00 (0.99, 1.01)	1.00 (0.99, 1.02)
Secondary	1.00 (0.99, 1.02)	1.01 (0.99, 1.03)
High school or higher	0.99 (0.97, 1.01)	1.00 (0.98, 1.03)
Mother is literate	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Household asset index		
Low	Reference	Reference
Medium	0.99 (0.98, 1.00)*	0.99 (0.98, 1.00)
High	0.98 (0.97, 1.00)*	0.98 (0.97, 1.00)*
Marital status		
Single	Reference	Reference
Married	1.00 (0.99, 1.02)	0.99 (0.97, 1.01)
Domestic partnership	1.01 (0.99, 1.02)	1.00 (0.98, 1.01)
Other	1.00 (0.98, 1.02)	1.00 (0.98, 1.02)
Relationship to head of household		
Self or partner	Reference	Reference
Daughter	0.99 (0.98, 1.01)	1.00 (0.98, 1.02)
Daughter-in-law	1.01 (0.99, 1.02)	1.01 (0.99, 1.02)
Other	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)
Mother is a housewife	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)
Any antenatal care	1.02 (1.00, 1.04)	1.02 (1.00, 1.05)
Health facility birth	1.00 (0.99, 1.01)	1.01 (1.00, 1.02)
Primiparous	0.98 (0.97, 0.99)**	0.97 (0.96, 0.98)**
Wanted to become pregnant	1.01 (1.00, 1.02)	1.01 (1.00, 1.02)
Delivery type		
Vaginal delivery	Reference	Reference
Cesarean section	0.98 (0.97, 1.00)*	0.99 (0.97, 1.00)
Country		
Guatemala	Reference	Reference
Honduras	0.99 (0.98, 1.00)	0.99 (0.98, 1.01)
Mexico	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Nicaragua	0.99 (0.98, 1.00)	0.99 (0.98, 1.01)
Panama	1.00 (0.99, 1.01)	0.99 (0.98, 1.01)
El Salvador	Reference	Reference

[1] Values are survey-weighted RRs (95% CIs). *$P < 0.05$; **$P < 0.01$.
[2] Adjusted for all variables assessed in univariable analyses.
[3] Including permuted values of the variable "Wanted to become pregnant." Otherwise, n = 11,994.

Nicaragua (66.1%). Age, an individual-level factor, was associated with continued breastfeeding between 6 mo and 2 y of age. Compared with children 6–11 mo old, those 12–23 mo old were 22% less likely (aRR: 0.78; 95% CI: 0.75, 0.82) to breastfeed up to 2 y (Table 5). Another individual-level factor, early initiation of breastfeeding, was associated with an increased likelihood for breastfeeding at the time of the survey (aRR: 1.07; 1.01, 1.13). For every 20% increase in the proportion of peers who breastfed

TABLE 3 Predictors of early initiation of breastfeeding in the Salud Mesoamérica 2015 initiative, 2011–2013[1]

	Univariable (n = 6337)	Multivariable[2] (n = 6135)[3]
Child's age, mo		
0–11	Reference	Reference
12–23	1.01 (0.97, 1.05)	1.01 (0.97, 1.05)
Child's sex		
M	Reference	Reference
F	0.99 (0.94, 1.03)	0.99 (0.95, 1.04)
Mother's age, y		
15–24	Reference	Reference
25–34	1.02 (0.97, 1.07)	0.98 (0.93, 1.03)
35–49	1.01 (0.96, 1.07)	0.96 (0.91, 1.02)
Highest level of education attained		
None	Reference	Reference
Primary	1.00 (0.93, 1.08)	1.01 (0.94, 1.08)
Secondary	0.95 (0.87, 1.03)	1.00 (0.91, 1.10)
High school or higher	0.85 (0.76, 0.96)**	0.97 (0.87, 1.08)
Mother is literate	0.94 (0.89, 0.98)**	0.98 (0.93, 1.03)
Household asset index		
Low	Reference	Reference
Medium	0.92 (0.88, 0.97)**	0.94 (0.89, 0.98)**
High	0.91 (0.84, 0.98)*	0.97 (0.90, 1.03)
Marital status		
Single	Reference	Reference
Married	0.94 (0.87, 1.02)	0.97 (0.89, 1.06)
Domestic partnership	0.94 (0.87, 1.01)	0.95 (0.88, 1.03)
Other	0.91 (0.81, 1.02)	0.92 (0.83, 1.01)
Relationship to head of household		
Self or partner	Reference	Reference
Daughter	1.04 (0.97, 1.12)	1.08 (0.99, 1.18)
Daughter-in-law	0.97 (0.89, 1.06)	1.03 (0.93, 1.13)
Other	1.01 (0.95, 1.06)	1.01 (0.94, 1.09)
Mother is a housewife	1.04 (0.95, 1.15)	1.03 (0.94, 1.12)
Any antenatal care	1.00 (0.91, 1.09)	1.00 (0.92, 1.09)
Health facility birth	0.99 (0.93, 1.05)	1.06 (1.00, 1.13)*
Primiparous	0.89 (0.84, 0.93)**	0.89 (0.84, 0.94)**
Wanted to become pregnant	1.02 (0.97, 1.08)	1.05 (0.99, 1.10)
Delivery type		
Vaginal delivery	Reference	Reference
Cesarean section	0.67 (0.61, 0.75)**	0.69 (0.62, 0.76)**
Peer effects[4]	1.12 (1.08, 1.15)**	1.08 (1.05, 1.12)**
Country		
Guatemala	Reference	Reference
Honduras	1.05 (0.97, 1.14)	1.03 (0.96, 1.11)
Mexico	0.97 (0.90, 1.05)	1.00 (0.93, 1.07)
Nicaragua	1.16 (1.08, 1.25)**	1.12 (1.04, 1.21)**
Panama	1.23 (1.14, 1.33)**	1.11 (1.03, 1.19)**
El Salvador	0.90 (0.83, 0.97)**	0.95 (0.88, 1.03)

[1] Values are survey-weighted RRs (95% CIs). *$P < 0.05$; **$P < 0.01$.
[2] Adjusted for all variables assessed in univariable analyses.
[3] Including permuted values of the variable "Wanted to become pregnant." Otherwise, n = 6022.
[4] Per 20% increase in the proportion of women in each primary sampling unit reporting early initiation of breastfeeding.

TABLE 4 Predictors for exclusive breastfeeding <6 mo in the Salud Mesoamérica 2015 initiative, 2011–2013[1]

	Univariable (n = 1456)	Multivariable[2] (n = 1411)[3]
Child's age, mo		
0	Reference	Reference
1	0.84 (0.70, 1.00)	0.84 (0.69, 1.02)
2	0.89 (0.76, 1.05)	0.96 (0.82, 1.12)
3	0.70 (0.58, 0.85)**	0.68 (0.55, 0.83)**
4	0.57 (0.45, 0.73)**	0.54 (0.43, 0.69)**
5	0.52 (0.41, 0.66)**	0.48 (0.36, 0.63)**
Child's sex		
M	Reference	Reference
F	0.99 (0.86, 1.13)	1.06 (0.93, 1.20)
Mother's age, y		
15–24	Reference	Reference
25–34	1.08 (0.95, 1.23)	1.03 (0.90, 1.19)
35–49	1.02 (0.84, 1.24)	0.99 (0.80, 1.23)
Highest level of education attained		
None	Reference	Reference
Primary	1.00 (0.82, 1.22)	1.09 (0.90, 1.31)
Secondary	0.96 (0.78, 1.18)	1.16 (0.92, 1.45)
High school or higher	0.63 (0.45, 0.89)**	0.96 (0.68, 1.36)
Mother is literate	0.91 (0.79, 1.05)	1.00 (0.86, 1.17)
Household asset index		
Low	Reference	Reference
Medium	0.81 (0.69, 0.95)*	0.82 (0.71, 0.95)**
High	0.93 (0.75, 1.13)	1.07 (0.88, 1.29)
Marital status		
Single	Reference	Reference
Married	1.26 (0.96, 1.67)	1.29 (0.96, 1.73)
Domestic partnership	1.44 (1.11, 1.86)**	1.28 (0.96, 1.70)
Other	1.29 (0.85, 1.97)	1.30 (0.90, 1.89)
Relationship to head of household		
Self or partner	Reference	Reference
Daughter	0.81 (0.63, 1.04)	0.97 (0.76, 1.23)
Daughter-in-law	1.04 (0.82, 1.30)	0.98 (0.76, 1.27)
Other	1.13 (0.97, 1.32)	1.17 (0.94, 1.45)
Mother is a housewife	1.52 (1.06, 2.18)*	1.21 (0.93, 1.58)
Breastfeeding within 1 h of birth	1.13 (0.96, 1.32)	1.06 (0.92, 1.22)
Any antenatal care	0.83 (0.67, 1.04)	0.78 (0.63, 0.97)*
Health facility birth	0.77 (0.67, 0.87)**	0.88 (0.74, 1.03)
Primiparous	0.84 (0.73, 0.97)*	0.96 (0.81, 1.13)
Wanted to become pregnant	1.00 (0.84, 1.20)	0.94 (0.80, 1.11)
Delivery type		
Vaginal delivery	Reference	Reference
Cesarean section	0.71 (0.57, 0.90)**	0.95 (0.78, 1.16)
Peer effects[4]	1.14 (1.07, 1.22)**	1.11 (1.04, 1.18)**
Country		
Guatemala	Reference	Reference
Honduras	0.62 (0.51, 0.76)**	0.77 (0.62, 0.95)*
Mexico	0.76 (0.67, 0.86)**	0.79 (0.68, 0.91)**
Nicaragua	0.78 (0.64, 0.95)*	0.88 (0.71, 1.08)
Panama	0.58 (0.47, 0.72)**	0.66 (0.53, 0.82)**
El Salvador	0.77 (0.66, 0.89)**	0.92 (0.76, 1.10)

[1] Values are survey-weighted RRs (95% CIs). *$P < 0.05$; **$P < 0.01$.
[2] Adjusted for all variables assessed in univariable analyses.
[3] Including permuted values of the variable ''Wanted to become pregnant.'' Otherwise, n = 1381.
[4] Per 20% increase in the proportion of women in each primary sampling unit reporting 6 mo of exclusive breastfeeding.

between 6 and 23 mo, there was a 4% (aRR: 1.04; 95% CI: 1.00, 1.09) increased likelihood of doing likewise.

In Guatemala, women who lived with their parents-in-law were 11% less likely to breastfeed between 6 and 23 mo (aRR: 0.89;

TABLE 5 Predictors for breastfeeding between 6 mo and 2 y of age in the Salud Mesoamérica 2015 initiative, 2011–2013[1]

	Univariable (n = 4881)	Multivariable[2] (n = 4724)[3]
Child's age, mo		
6–11	Reference	Reference
12–23	0.79 (0.75, 0.82)**	0.78 (0.75, 0.82)**
Child's sex		
M	Reference	Reference
F	0.98 (0.93, 1.02)	1.00 (0.95, 1.04)
Mother's age, y		
15–24	Reference	Reference
25–34	1.01 (0.96, 1.07)	1.01 (0.95, 1.08)
35–49	1.06 (0.99, 1.13)	1.04 (0.96, 1.13)
Highest level of education attained		
None	Reference	Reference
Primary	1.01 (0.95, 1.07)	1.05 (0.98, 1.13)
Secondary	0.88 (0.81, 0.96)**	0.95 (0.86, 1.04)
High school or higher	0.80 (0.72, 0.89)**	0.88 (0.77, 1.00)
Mother is literate	0.90 (0.86, 0.94)**	0.99 (0.93, 1.05)
Household asset index		
Low	Reference	Reference
Medium	0.95 (0.90, 1.01)	1.01 (0.95, 1.07)
High	0.86 (0.79, 0.94)**	0.93 (0.85, 1.01)
Marital status		
Single	Reference	Reference
Married	1.14 (1.01, 1.28)*	1.10 (0.95, 1.27)
Domestic partnership	1.19 (1.05, 1.35)**	1.15 (1.00, 1.33)*
Other	1.07 (0.89, 1.27)	0.99 (0.84, 1.17)
Relationship to head of household		
Self or partner	Reference	Reference
Daughter	0.97 (0.90, 1.04)	1.11 (1.00, 1.23)
Daughter-in-law	0.99 (0.89, 1.11)	0.97 (0.88, 1.08)
Other	1.03 (0.97, 1.09)	0.98 (0.89, 1.07)
Mother is a housewife	1.21 (1.07, 1.36)**	1.06 (0.94, 1.21)
Breastfeeding within 1 h of birth	1.09 (1.02, 1.16)*	1.07 (1.01, 1.13)*
Any antenatal care	0.95 (0.86, 1.05)	0.97 (0.89, 1.06)
Health facility birth	0.89 (0.85, 0.94)**	1.00 (0.94, 1.07)
Primiparous	0.94 (0.89, 0.98)**	0.98 (0.92, 1.04)
Wanted to become pregnant	1.03 (0.97, 1.10)	1.00 (0.94, 1.06)
Delivery type		
Vaginal delivery	Reference	Reference
Cesarean section	0.91 (0.84, 0.97)**	1.00 (0.93, 1.09)
Peer effects[4]	1.08 (1.04, 1.12)**	1.04 (1.00, 1.09)*
Country		
Guatemala	Reference	Reference
Honduras	0.97 (0.91, 1.03)	0.98 (0.91, 1.07)
Mexico	0.98 (0.93, 1.03)	1.01 (0.95, 1.08)
Nicaragua	0.84 (0.78, 0.91)**	0.88 (0.81, 0.96)**
Panama	1.01 (0.92, 1.11)	0.97 (0.89, 1.05)
El Salvador	0.97 (0.92, 1.03)	1.00 (0.93, 1.08)

[1] Values are survey-weighted RRs (95% CIs). *$P < 0.05$, **$P < 0.01$.
[2] Adjusted for all variables assessed in univariable analyses.
[3] Including permuted values of the variable ''Wanted to become pregnant.'' Otherwise, n = 4641.
[4] Per 20% increase in the proportion of women in each primary sampling unit reporting some breastfeeding for their youngest child who was 6–23 mo old.

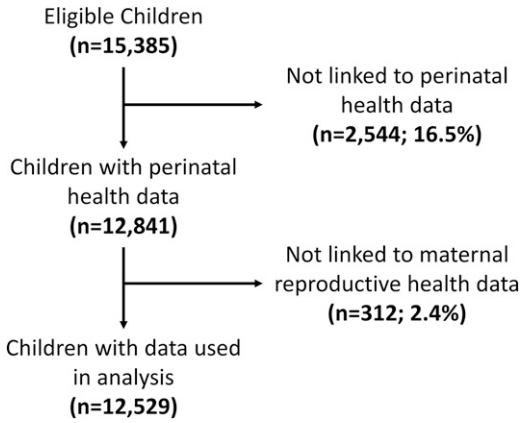

FIGURE 1 Flow diagram of the study population in the Salud Mesoamérica 2015 Initiative baseline survey, 2011–2013.

95% CI: 0.80, 0.99) and indigenous women were 15% more likely to do so (aRR: 1.15; 95% CI: 1.06, 1.25) (Supplemental Table 19). In Honduras, cesarean section was associated with a decrease in breastfeeding up to 2 y (aRR: 0.81; 95% CI: 0.68, 0.97) (Supplemental Table 20). Indigenous ethnicity (aRR: 1.19; 95% CI: 1.06, 1.33) was associated with increased likelihood of breastfeeding between 6 mo and 2 y of age in Chiapas (Supplemental Table 21). Nicaraguan women with a primary education were more likely to breastfeed between 6 and 23 mo than were uneducated women (aRR: 1.51; 95% CI: 1.07, 2.12), as were those in a domestic partnership (aRR: 1.43; 95% CI: 1.08, 1.89) and those who delivered in a health facility (aRR: 1.34; 95% CI: 1.00, 1.80) (Supplemental Table 22). In Panama, mothers who delivered via cesarean section (aRR: 1.42; 95% CI: 1.18, 1.70) were more likely to breastfeed between 6 and 23 mo (Supplemental Table 23). In El Salvador, peer effects were positively associated with breastfeeding between 6 mo and 2 y of age (aRR: 1.08; 95% CI: 1.02, 1.15) (Supplemental Table 24).

Prelacteals. Among children who were breastfed, between 7.9% (Panama) and 16.4% (Mexico) received something to drink besides breastmilk in the first 24 h of life ($P < 0.001$) (Supplemental Table 25). In Guatemala, the most common prelacteals were water and sugar water; in Honduras, they were milk and tea. In Mexico, Panama, and El Salvador, formula was the most common prelacteal, followed by milk. In Nicaragua, it was milk followed by formula.

Discussion

To our knowledge, our study is the largest ever conducted in poor areas in these 6 Mesoamerican countries. We found that the prevalence of ever breastfeeding was high but that of exclusive breastfeeding was comparatively low. Among all of our comparisons, we found very few predictors of breastfeeding practices that were meaningful from a public health perspective. No individual-level factors were consistently associated with breastfeeding indicators overall and across countries. However, one group-level factor, peer effects, had a consistently positive association with early initiation of breastfeeding, exclusive breastfeeding, and breastfeeding between 6 mo and 2 y of age.

The association between peer breastfeeding practices and those of an individual woman in our study deserves further attention. Previous studies did not show such a strong effect. In 1999, Morrow et al. (25) demonstrated the efficacy of peer counseling for promotion of exclusive breastfeeding in Mexico. A 2010 study (26) reported a strong association with peer parents, but no studies have examined community effects. Cohen et al. (9) stated more than a decade ago that breastfeeding promotion campaigns need to target entire communities. Our findings support such a conclusion. Therefore, in these poor areas, breastfeeding promotion activities conducted during ANC and delivery should be complemented by programs that contain a community component.

As expected, increasing age of the child was associated with a drop in exclusive breastfeeding. However, all public health is local and it is worth noting that although the overall drop occurred at 3 mo, significant drops did not occur until the fifth month in Guatemala, Honduras, and El Salvador. Any interventions seeking to improve exclusive breastfeeding must therefore be catered to the nuances of the local context.

In country-specific analyses, there were no individual- or group-level factors that were consistently associated with breastfeeding outcomes.

This study has some limitations. First, we used a cross-sectional study design and hence cannot determine causality. Second, our data were based on self-report and are subject to recall bias and social desirability bias. However, a 2009 reliability study in Mexico found recall to perform well in measuring breastfeeding duration, albeit less so for exclusive breastfeeding (27). Third, our study was unable to assess societal-level factors that may be strongly correlated with breastfeeding practices. Finally, our study was limited to the poorest quintile within each country and was therefore not representative of the entire population. However, our study was based on a large sample size and used a standard methodology across countries that allowed us to compare between and within countries.

Our study revealed that poor mothers in Mesoamerica initiated and continued to breastfeed their children, but not exclusively, for the first 6 mo. These findings are of great importance and should be used to improve breastfeeding practices in Mesoamerica. Moreover, our data showed the importance of communities in supporting positive breastfeeding practices. Future interventions and studies should seek ways to leverage peer relationships for improved adherence to recommended practices.

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