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Original Research

Breastfeeding and Infant Illness in Low-Income, Minority Women: A Prospective Cohort Study of the Dose-Response Relationship

Katherine Freeman, DrPH, Karen A. Bonuck, PhD, and Michelle Trombley, MPH

Abstract

The authors' objective was to determine whether cumulative weekly breastfeeding duration by 13 weeks was associated with infant otitis media, respiratory and gastrointestinal illness, and total illness visits up to 12 months. The authors performed a secondary analysis of data from a randomized clinical trial of low-income, primarily Hispanic and Black women enrolled from 2 medical center affiliated clinics. "Breastfeeding sensitive" (BFS) outpatient and emergency room (ER) visit data for the above illnesses were obtained for 255 mother/infant dyads. Outcome measures were unadjusted and adjusted rates of outpatient and ER visits with sick and BFS diagnoses. The authors found no significant associations between breastfeeding intensity and infant visits for otitis media, respiratory and gastrointestinal illness, or total illness visits. In this low-income, multiethnic sample, breastfeeding intensity was not associated with infant health service use, in contrast to other evidence-based reports. Low exclusive breastfeeding rates and lack of coverage for health visits may be reasons for this finding. *J Hum Lact*. 24(1):14-22.

Keywords: benefits, infant health, infant morbidity

Human milk is the optimal form of infant nutrition, conferring nutritional, immunologic, and developmental advantages to infants.[1] Breastfeeding has been associated with reduced incidence and severity of otitis media,[2-9] respiratory infections,[10-18] and gastrointestinal (GI) illness[14,19-21] through the first year of life, illnesses herein referred to as "breastfeeding sensitive" (BFS) diagnoses. Greater breastfeeding duration and exclusivity have been associated with greater protective effects.[4,6,17,22,23] Few studies find diminished protective effects from breastfeeding.[24-27]

Although the above data are compelling, they are not specific to low-income, minority women and their infants. National surveys that collect data both on infant feeding and infant illness[6,22,23] are limited in their assessment of these factors and do not focus on low-income multiethnic women. In addition, infant feeding and health outcomes data should be collected prospectively at frequent intervals, with appropriately defined measures. However, breastfeeding is often assessed as dichotomous (eg, ever/never), or trichotomous (exclusive vs partial vs none), or by duration. Prospective, population-based studies using a longer ordinal scale find significant dose-response effects for BFS diagnoses.[6,22,28] Finally, most data relating infant feeding to infant illness are based solely upon maternal report of infant illness over varying recall periods. Studies assessing infant illness via objective measures such as clinical exam, cultures, or medical record data are the minority[2,4,8,12,13]

Finally, observational studies must control for confounding factors and effect modifiers associated with

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both breastfeeding (exposure) and infant health (outcome), including maternal age[16,29]; country of origin[30-32]; education, income, and employment[33,34]; health coverage[35]; smoking; siblings; breastfeeding experience; and/or day care use[14,22,36]; and infant factors including gestational age, birth weight, gender, and admission to neonatal intensive care unit.

In this report, we examine the association between breastfeeding and BFS diagnoses at infant illness visits. In contrast to prior work, (1) this is a low-income minority multiethnic sample, (2) breastfeeding was assessed prospectively via maternal report of weekly feeding patterns according to a 7-level scale, and (3) both medical record data and maternal recall were used to obtain data on infant health visits.

Methods

Study Design

This is a secondary analysis of data to determine the association between early breastfeeding exposure and infant health visits for BFS diagnoses. The primary dataset was derived from a randomized controlled trial to compare a lactation consultant intervention with standard of care regarding breastfeeding duration and intensity, and infant health visits up to 12 months. The randomized controlled trial's methodology to assess breastfeeding outcomes[30] and infant health outcomes by treatment group are reported elsewhere.[35] Ascertainment of exposure, and confounding and outcome variables as described below, are the same as for the randomized controlled trial.

Medical record data for infant outpatient and emergency room (ER) visits to participants' primary medical center and its affiliated sites to 1 year postpartum were obtained. Visits to sites outside the medical center were obtained from maternal self-report at follow-up interviews to 1 year postpartum. Analyses are based upon breastfeeding intensity data through 13 weeks because (1) this interval proposes a temporal relationship with health outcomes to 12 months, (2) exclusive breastfeeding to 3 months has demonstrated reduced risk of BFS illnesses,[37] and (3) this interval ensures heterogeneity of exposure, given that half the sample had ceased any breastfeeding by 13 weeks.

Subject Selection Criteria

The randomized controlled trial enrolled prenatal care patients at 2 Bronx, New York, medical center–affiliated health centers who were recruited between August 1, 2000, and November 30, 2002. Eligibility criteria included the following variables: English or Spanish speaking, twin or singleton pregnancy, and plans to use medical center–affiliated sites for prenatal and infant care up to 12 months. Exclusion criteria included the following variables: HIV+ status, chronic therapy with medications incompatible with breastfeeding (left to clinician's discretion), or pregestational diabetes mellitus. Although not generally considered exclusions, women with human T-cell leukemia virus-1, hepatitis B or C, and breast reduction surgery were excluded. Participants were consented and enrolled in the study during pregnancy, typically through the second trimester, by a research assistant at the site. Study and consent forms were approved by the medical center's Institutional Review Board for the Protection of Human Subjects. The consent specified that medical center data for participants' infant health visits up to 12 months of age would be obtained from medical records. The findings presented here report on the subset of trial participants: (1) whose infants appear in the medical center MIS database and (2) who were interviewed postpartum, at which time feeding and self-report data on illness visits were obtained.

Evaluation Schedule

Data were collected at the prenatal baseline interview regarding demographics and breastfeeding experience and intentions. Postpartum phone interviews were conducted at 1, 2, 3, 4, 6, 8, 10, and 12 months to assess both infant feeding and infant outpatient and emergency room visits *outside* the medical center. These maternal self-reported data (both feeding and visits) are referred to as "SR" data. Participants received gift cards after completing study interviews.

Medical center ("MC") MIS data for visits for the index infant to any medical center–affiliated site were obtained by a medical center data analyst. Data were extracted using maternal and infant names and birth dates, and maternal medical record numbers. After interview and MIS data were combined, individual identifiers were removed from the database.

Visit data combine ER and outpatient visits, from both MC and SR data sources. Only 5 infants (2%) were hospitalized with a BFS illness (15 total BFS hospitalizations: 2 children hospitalized once, 1 child hospitalized 3 times, and 2 children hospitalized 5 times), among 21 infants hospitalized. The incidence of these BFS illnesses is captured in ER data, as this is the primary route of inpatient admission. Thus, hospitalizations per se are excluded from the analysis.

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Assessment of Infant Health Outcomes

Maternal Self-report of Visits Outside the Medical Center (SR Data)

Postnatal follow-up interviews asked women to recall any ER or outpatient visits *outside the medical center* (SR) for illness in general, and for GI-, respiratory-, or otitis media–related illness, in particular. Visits made expressly for well-child care were not assessed. The recall period was the time since the last interview or from birth to first follow-up interview.

Medical Center Database (MC Data)

Medical center (MC) MIS data identified the date, site, and diagnoses (International Classification of Diseases, 9th Rev [ICD-9]) of all visits to ERs or health clinics affiliated with the medical center, including the 2 recruitment sites.

A physician panel reviewed the ICD-9 diagnoses[38] from the MC data and classified BFS illnesses as follows. Respiratory BFS illnesses included viral enteritis not otherwise specified (008.80), unspecified viral condition (079.99), acute pharyngitis (462.00), croup (464.40), acute upper respiratory infections (465.90), acute bronchitis (466.00), nasal and sinus disease not elsewhere classified (478.10), pneumonia organism, unspecified (486.00), bronchitis (490.00), asthma (493.90), cough (786.20), and respiratory syncytial virus (466.11). Gastrointestinal BFS diagnoses included esophageal reflux (530.81), gastritis/gastroduodenitis (535.50), noninfectious gastroenteritis not elsewhere classified (558.90), unspecified constipation (564.00), vomiting alone (787.03.91), and reflux esophagitis (530.11). Otitis media BFS diagnoses included suppurative otitis media not otherwise specified (382.40) and unspecified otitis media (382.90).

Breastfeeding Intensity Levels

Intensity and duration of breastfeeding was measured in weeks, via maternal self-report, using the standardized 7-level schema below.[39,40] Exclusive breastfeeding was defined as no artificial milk or solids; intake of water, liquids other than artificial milk, and vitamin drops were not assessed. Our broader definition of exclusive breastfeeding does not conform to the WHO definition[41] but is similar to that used by others.[34] Breastfeeding is defined as follows:

1. 100% breast milk: exclusive breastfeeding
2. ≥ 80% breast milk combined with < 20% artificial milk or solids
3. 50 > 80% breast milk and the rest artificial milk or solids
4. 50% breast milk and 50% artificial milk or solids
5. 20 > 50% breast milk and the rest artificial milk or solids
6. ≤ 20% breast milk combined with > 80% artificial milk or solids
7. 100% artificial milk or solids: exclusive formula (includes weaned)

A breastfeeding intensity score was created by summing weekly scores (range = 1 to 7). Data for the 10% with missing values were imputed according to that participant's treatment group's median value for that week.[30] The sum of weekly intensity scores was derived for each participant through week 13 (TOTAL13), range = 13-91. Scores were dichotomized at the median for deriving odds ratios.[30,35]

Power Analysis

A power analysis was conducted to establish a minimal dose-response relationship. To yield a correlation coefficient of .2, 194 participants would be required for a 2-tailed test for $\alpha = .05$ for 80% power.[42]

Statistical Methods

Demographic differences between participants with low (below the median) versus high (median or greater) TOTAL13 scores were compared with *t* tests or Wilcoxon ranks sum tests as appropriate for continuous data, and chi-square or exact tests for categorical data.

For MC data, we assumed a 52-week observation period (ie, no missing data). For SR outcomes data, the observation period was defined as the period from birth to the date of the last interview. Any missing SR outcomes data were extrapolated to 52 weeks, assuming visits were distributed uniformly. MC and SR data were combined to determine the number of visits across 52 person-weeks of observation. Data for ER and outpatient visits were combined after reviewing ICD-9 diagnosis codes for ER visits, to represent illness episodes not requiring overnight hospitalization.

Bivariate associations between TOTAL13, considered a long-scale ordinal variable, and variables potentially related to infant health outcomes were assessed by Wilcoxon rank sum tests for dichotomous variables and Spearman rank correlations for continuous variables. Maternal variables included age, education,

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marital status, race/ethnicity, country of origin (US mainland vs other), Medicaid status, and parity. Infant variables included infant sex, low birth weight, neonatal intensive care unit (NICU) admission, newborn health problems (maternal report), day care ≤ 1 month, and baby's age at last interview. Maternal smoking was not included as a covariate, given an implausibly low (< 5%) reported rate of any cigarette use. Our assessment of day care use was restricted to ≤ 1 month, given varying observation periods after the first follow-up interview at 1 month.

Variables with associations $P < .20$ were used in initial multiple linear regression models with the number of infant-specific sick visits (transformed by adding 1 and taking the log) as the dependent variable, along with the exposure variable. Initial models included number of infant health visits as a continuous variable, using a monitored backward stepwise procedure. Interaction terms were explored in later models. Covariates with associations $P < .05$ were retained in final multiple linear regression models. Infant health visits were then dichotomized as total illness: 0-4 vs ≥ 5; total BFS: 0-2 vs ≥ 3; gastrointestinal: 0 vs ≥ 1; respiratory tract: 0-1 vs ≥ 2; and otitis media: 0 vs ≥ 1, as per other work.[43] Multiple logistic regression models were derived using the subset of variables in initial multiple regression models as confirmatory analyses and to express results in terms of odds ratios and 95% confidence intervals (CIs). A backward-monitored stepwise procedure was used, and variables retained in the final model were those significant at $P < .05$, with the exposure variable. TOTAL13 was dichotomized at the median, whereas infant health visits were dichotomized as described above. As findings between multiple linear and multiple logistic regression did not differ appreciably, results of the latter are presented for ease of interpretation. Furthermore, models were derived both including and excluding treatment group status, as well as type and amount of intervention received. As findings for both models were similar, findings reported here exclude treatment group characteristics.

Results

As shown in Figure 1, 385 mother-infant dyads (382 women) were enrolled in the original trial. Of these, 21 were excluded at contact for postnatal follow-up, including twins (a decision was made after data collection was complete to exclude the 3 mothers and their twins), women who withdrew (n = 5), and women who miscarried or terminated their pregnancy (n = 10) since baseline. Of the remaining 364 mother-infant dyads, 109 were excluded as follows: (1) 49 infants did not appear in the MIS data, (2) 34 dyads were lost to follow-up (ie, no SR data, and thus neither breastfeeding nor non–medical center health visit data), and (3) 26 were lost to both MIS and SR data. Thus, the study sample is composed of 255 women for whom breastfeeding, MC, and SR data are available. This represents 70% of women enrolled into the original trial who were not otherwise excluded (255/364). Data were not collected on women who were approached but did not enroll.

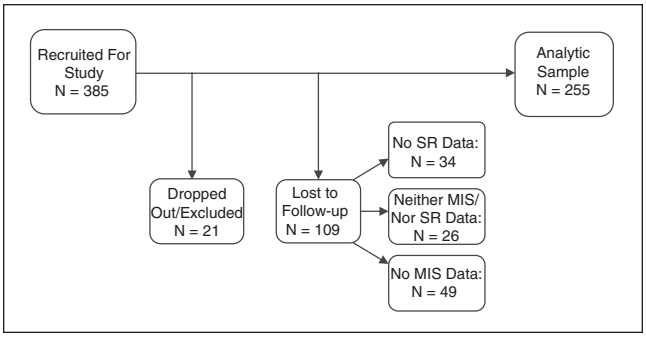

Figure 1. Study enrollment flow chart. SR = self-report.

We compared baseline characteristics of participants with SR data at 13, 26, 39, 48, and 52 weeks to those without SR data (ie, lost to follow-up interview) at those weeks, and there were no significant differences in characteristics (not shown).

Table 1 presents a description of the sample's mother-child dyads. Mean maternal age was 25.2 years. Just over 60% had graduated from high school, whereas less than half were married or in a stable domestic relationship. Reflective of the locale, 58% were Hispanic and 35% were Black. More than 40% were born outside of the US mainland. Detailed data on the ancestry of foreign-born women are reported elsewhere.[44] Table 1 also presents characteristics of participants with high versus low breastfeeding intensity by 13 weeks. Women with high breastfeeding intensity were more likely to be older, foreign-born, and multiparous. There were no other significant differences in maternal or infant characteristics.

Rates of any, 50%+, and exclusive breastfeeding at selected weeks up to 1 year are shown in Figure 2. Although breastfeeding initiation was high (75% at 2 weeks), only 54% breastfed at least 50% of the time,

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Table 1. Maternal and Infant Characteristics of the Sample

Variable	*Units*	*Total Sample (N = 255) % (N)*	*High 13-Week BF Intensity (n = 121) %*	*Low 13-Week BF Intensity (n = 134) %*	P *Value*[a]
Mother:					
Age > 25 years	> 25 years	40.0 (102)	63.7	36.3	<.0001
High school graduate	Yes	61.2 (156)	51.9	48.1	.0726
Married/cohabiting	Yes	45.7 (117)	43.5	56.5	.1677
Race/ethnicity	Black	35.3 (90)	53.3	46.7	.3331
	Hispanic	57.6 (147)	43.5	56.5	
	Other	7.1 (18)	50.0	50.0	
Country of origin	Foreign-born[b]	42.4 (108)	66.7	33.3	<.0001
Medicaid	Yes	56.9 (145)	44.8	55.7	.3354
Other children	Yes	59.2 (151)	57.6	42.4	<.0001
Infant:					
Female	Yes	53.4 (134)	46.2	53.9	.7095
Low birth weight	Yes	6.3 (16)	50.0	50.0	.8330
NICU admission	Yes	11.0 (28)	39.3	60.7	.3591
Newborn health problem	Yes	23.1 (59)	40.7	59.3	.2347
Day care at ≤ 1 month	Yes	25.5 (65)	43.1	56.9	.4133
Baby's age at last interview > 52 weeks	> 52 weeks	53.7 (137)	46.7	53.3	.7999

BF = breastfeeding; NICU = neonatal intensive care unit.
[a]All associations were tested using chi-square tests except for the variables maternal age and infant age at last interview, for which *t* tests were conducted.
[b]Women born in Puerto Rico were classified as foreign-born, given cultural and linguistic differences from the continental United States, even though Puerto Rico is a US territory.

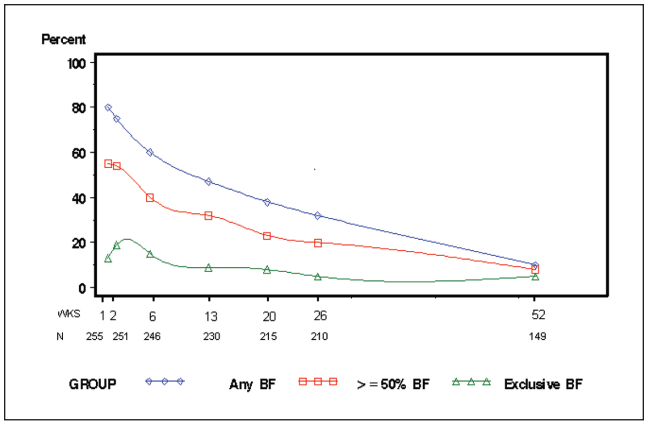

Figure 2. Any, 50%+, and exclusive breastfeeding at selected weeks. BF = breastfeeding.

and just 19% were exclusively breastfeeding. Rates of any, 50%+, and exclusive breastfeeding show steady declines throughout the first year. Note that report of exclusive breastfeeding at 12 months was likely to have included solids, but not artificial or cow's milk, from which breast milk was clearly differentiated. In prior work, we found that 87% initiated breastfeeding in the hospital.[30] Furthermore, 32% indicated prenatally that they intended to breastfeed exclusively, and 59% intended to combine breast milk with formula (not shown).

Table 2 describes retention rates for the SR/feeding and MC utilization data. For MC data, we assume 12-month

Table 2. Infant Feeding and Health Outcomes Follow-up, by Data Source

	Total (N = 255)
SR/feeding data,[a] % (n) in follow-up:	
Up to 3 months	91.4% (233)
Up to 6 months	82.4% (210)
Up to 9 months	74.5% (190)
Up to 12 months	65.5% (167)
MC data,[b] % (n) with any visits:	
0-3 months	97.6% (249)
3-6 months	82.0% (209)
6-9 months	74.7% (191)
9-12 months	70.2% (179)

SR = self-reported; MC = medical center.
[a]SR/feeding data: % (n) of sample whose weekly infant feeding patterns and ER and outpatient visits to non–medical center affiliated sites were obtained through that period. Infants of participants in SR/feeding data may also be counted in the MC data.
[b]MC connotes participants' infants with ≥1 encounter identified in the medical center MIS data for any reason, not including predischarge newborn data, up to 12 months of age.

observation period for all infants. Thus, MC data indicate the sample's utilization of the medical center for infant care for any reason, exclusive of the hospitalization during which the birth occurred. More than 90% of the sample had both SR/outcomes data (retention) and MC (utilization) data through 3 months, 82% at 6 months, 75% at 9 months, and approximately 70% by 12 months. Baseline characteristics of those with SR data did not differ significantly from those lost to follow-up at those weeks.

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Table 3. Unadjusted Infant Health Visits in the First Year of Life, by Low Versus High Breastfeeding Intensity at 13 Weeks

Infant Health Visits	*High % (N)*	*Low % (N)*	*OR (95% CI)*
Total illness			
0-4	51% (63)	49% (60)	1.34 (0.82-2.19)
≥ 5	44% (58)	56% (74)	
Total BFS			
0-2	49% (65)	51% (68)	1.13 (0.69-1.84)
≥ 3	46% (56)	54% (66)	
Respiratory tract			
0-1	50% (79)	50% (78)	1.35 (0.81-2.24)
≥ 2	43% (42)	57% (56)	
Gastrointestinal			
0	48% (88)	52% (96)	1.06 (0.61-1.83)
≥ 1	46% (33)	54% (38)	
Otitis media			
0	48% (97)	52% (96)	1.01 (0.59-1.75)
≥ 1	47% (34)	53% (38)	

OR = odds ratio; CI = confidence interval; BFS = breastfeeding sensitive.

Table 3 presents infant health visits for total illness, BFS, respiratory tract, GI, and otitis media by high/low breastfeeding intensity, unadjusted odds ratios, and 95% CIs. Although no odds ratio was significant, all point in the direction of increased illness risk with low breastfeeding intensity.

In adjusted analyses, breastfeeding intensity was not associated with any of the following visits: ≥ 5 illness-related, ≥ 3 with a BFS diagnosis, ≥ 2 with a respiratory tract illness diagnosis, ≥ 1 with a gastrointestinal illness, or ≥ 1 with an otitis media diagnosis. Adjusted odds ratios and 95% CIs are shown in Table 4. Boys (OR = 1.88, 95% CI = 1.13-3.14) and infants of primiparous women (OR = 1.82, 95% CI = 1.07-3.11) were more likely to have any illness visits. Gastrointestinal-related visits were more likely among infants of primiparous mothers (OR = 1.96, 95% CI = 1.10-3.47). Otitis media–related visits were more likely in Medicaid recipients (OR = 2.04, 95% CI = 1.12-3.71) and low birth weight infants (OR = 5.77, 95% CI = 1.95-17.08).

Discussion

We conducted a secondary analysis of data from a randomized clinical trial of a breastfeeding promotion intervention to evaluate the association between breastfeeding duration and intensity and infant illness and number of BFS-related outpatient and ER visits in the first year of life in low-income, multiethnic women. We found no association between breastfeeding intensity and either total illness-related health visits or visits with the BFS-related diagnoses of otitis media, gastrointestinal tract illness, and respiratory tract illness. Results did not vary by whether the exposure (breastfeeding) and outcomes (infant illness visits) were analyzed as dichotomous or continuous measures, or whether the analysis accounted for randomization group. This study's failure to demonstrate an association stands in contrast to the preponderance of evidence that increased breastfeeding

Table 4. Multiple Logistic Regression Adjusted Odds Ratios for Increased Infant Health Visits[a]

Variable[b]	*Total Illness, OR (95% CI)*	*Total BFS, OR (95% CI)*	*GI, OR (95% CI)*	*Respiratory, OR (95% CI)*	*Otitis Media, OR (95% CI)*
Breastfeeding intensity					
Low breastfeeding	1.20 (.71-2.02)	1.13 (0.69-1.84)	0.89 (0.50-1.59)	1.35 (0.81-2.24)	0.98 (0.56-1.73)
High breastfeeding	1.00	1.00	1.00	1.00	1.00
Medicaid					
Yes					2.04 (1.12-3.71)[c]
No					1.00
Parity					
Primiparous	1.82 (1.07, 3.11)[c]		1.96 (1.10,3.47)‡		
Multiparous	1.00		1.00		
Infant sex					
Boy	1.88 (1.13-3.14)[c]				
Girl	1.00				
Low birth weight					
Yes					5.77 (1.95-17.08)[c]
No					1.00

[a]The frequency of infant illness visits with the following diagnoses was dichotomized as total illness = 0-4 vs ≥ 5 visits; BFS = 0-2 vs ≥ 3 visits; gastrointestinal = 0 vs ≥ 1; respiratory tract illness = 0-1 vs ≥ 2; and otitis media = 0 vs ≥ 1.

[b]None of the following were significantly associated with the outcomes or exposure and therefore are not adjusted for in the analyses and are excluded from the table: maternal variables: age, education, marital status, US born, race/ethnicity, breastfed before, baseline breastfeeding intention; infant variables: NICU admission, maternal perception of newborn health problem, day care use, and age at last interview.

[c]$P < .05$.

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is associated with reduced infant illness visits. We note that our study is based on a subset of low-income multiethnic women; the sample size had sufficient power to detect a modest correlation.

To our knowledge, this is the first analysis of breastfeeding and infant health in a US, low-income multiethnic sample. Compared with national data for women of childbearing age, our cohort was more likely to be Black or Hispanic (31% vs 93%)[45] and to be of low-income as evidenced by Medicaid participation (10% vs 57%).[46] In contrast to our cohort, national surveys, which found a significant dose-response relationship, were conducted in populations more representative of the United States as a whole.[6,22,23] Further underscoring the importance of research on feeding and infant health is the higher birthrate per thousand for non-Hispanic Black (15.7) and Hispanic (22.9) women compared with non-Hispanic White women (11.7),[47] though such data, stratified by income, are not collected.

Our findings must be placed in the context of 2 prior reports from these data, as well as an intervention in low-income Latinas. Findings presented here analyze data collected from a randomized controlled trial of a pre- and postnatal lactation consultant intervention to assess the "dose-response" relationship between breastfeeding and infant illness. Previously, we reported that the intervention was associated with 5- and 8-fold increases in 13-week breastfeeding intensity in primiparous and multiparous women, respectively.[30] Subsequently, we reported that the intervention was not associated with reductions in any of the infant health outcomes analyzed herein, except for otitis media in a subset of the intervention group.[35] A peer counseling intervention to promote exclusive breastfeeding did reduce diarrheal episodes at 3 months,[48] though this intensive intervention (13+ visits) may be difficult to sustain in practice.[49]

The lack of any significant protective effects in this study was unexpected, although this negative effect was found in this sample's randomized data.[35] In seeking to interpret these negative findings, the following possibilities must be considered. First, there may not be an association between breastfeeding intensity and infant health visits among low-income, multiethnic women in these health centers. Findings with regard to otitis media and Medicaid both in this study and our prior work suggest that coverage for infant health visits may be important. Furthermore, other undocumented variables related to socioeconomic status (ie, reliance on public transportation, missing paid work, cultural beliefs, and support to deal with infant illness) may cause our findings to differ from others.

Second, there may truly be an association, but the sample's breastfeeding intensity may not have been sufficient to produce an effect, as found in prior US surveys.[6,22,28] Although the sample achieved the Healthy People 2010 goal of 75% of women breastfeeding in the early postpartum period, it did not achieve the goal for 50% at 6 months[50] and was far from proposed goals of 60% exclusive breastfeeding at 3 months.[51] Thus, results underscore the difficulties in achieving Healthy People 2010 goals in these women.

Our power analyses were based on available data comparing infants exclusively breastfed for 3 months (34% and 14% in 2 middle-class, primarily White non-Hispanic samples) to never-breastfed infants.[52] In sharp contrast, just 9% of our sample was exclusively breastfeeding at 3 months. Given our sample's lower breastfeeding intensity, it is likely that the true difference between the groups is less than that from which the power analysis was based. Thus, a much larger study or more effective intervention to increase breastfeeding "dose" would be required to detect such a difference.

A third possible explanation is that the protective effect of breastfeeding upon the illnesses studied may have been limited to the first 3 or 6 months, and/or the period of breastfeeding itself. Unfortunately, our self-reported health care visit data were based on report of visits since the last interview, rather than specific dates (as used in the MC data) or a weekly schema (as used in the feeding data). Thus, self-report visit data could not clearly be aligned with a 3- or 6-month observation period.

There are several limitations to our study. We had anticipated collecting infant feeding and infant health visit data outside the medical center through 12 months. Unfortunately, difficulties in contacting participants led to varying observation periods. This source of bias is minimized by the fact that those lost to follow-up, both over time and from the SR and MC data, did not differ. Maternal recall of illness visits outside the medical center may be another source of bias. However, our comparison of medical center MIS visit data with maternal SR data found that any such bias was nondifferential, that is, as likely to be underreported as overreported. Also, imputation of missing SR data (for feeding and non–medical center visits) may have reduced variability slightly, thus increasing

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power; however, the association between breastfeeding intensity and illness visits was not significant.

It is possible that an unobserved characteristic of the mother or her infant was associated both with report of infant feeding and/or infant health outcomes. Our analysis attempted to control for major variables used by other researchers but did not assess others such as infant use of pacifiers or sleeping arrangements. We did find a nonsignificant association by 13 weeks in a subset who previously breastfed. Another possible limitation is that this breastfeeding intensity score does not account for the timing of intensity. Finally, our assessment of breastfeeding did not explicitly include water, teas, whole milk, and so on, as examples of non–breast milk intake, nor did we assess them.

In this prospective cohort of 255 low-income, urban-dwelling multiethnic women and their infants, no association between increased breastfeeding intensity during the first 13 weeks and reduced physician visits during infancy was found. Inadequate power due to low rates of exclusive breastfeeding may explain the disparity between our findings and the preponderance of related evidence. As our results are inconsistent with prior data, future research should replicate this analysis in a larger sample, with well-characterized levels of breastfeeding.

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Resumen

Nuestro objetivo fue determinar si la duración cumulativa de lactancia materna semanal a la semana 13 estaba asociada con otitis media infantil, y enfermedad gastro-intestinal en un total de visitas de niño enfermo hasta los 12 meses. Se hizo un análisis secundario de datos de un estudio clínico aleatorio en mujeres de bajos recursos económicos, mayormente Hispanas y Negras en dos centros médicos afiliados. Los pacientes ambulatorios con "sensibilidad a la lactancia" (SL) y datos de visitas a la sala de emergencia (SE) se obtuvieron en los dos enfermedades mencionadas anteriormente en 255 parejas de madre/bebe. Los resultados fueron rangos ajustados y no ajustados de pacientes ambulatorios y visitas a la SE con diagnósticos de enfermedad y SL. Encontramos que no había una asociación significativa entre la intensidad de la lactancia materna y las visitas de bebe por otitis media, enfermedad respiratoria, gastrointestinal, o el total de visitas por enfermedad. En este grupo de bajos ingresos económicos, muestra multiétnica, la intensidad de lactancia materna no se asocia con el uso de servicios de salud al infante, en contraste a otros reportes basados en evidencias. Es posible que las razones de estos hallazgos sean bajos índices de lactancia materna exclusiva y poca cobertura de consultas medicas.

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