HHS Public Access

Author manuscript

J Immigr Minor Health. Author manuscript; available in PMC 2016 July 10.

Breastfeeding and asthmatic symptoms in the offspring of Latinas- the role of maternal nativity

Gretchen Bandoli[a], **Ondine S. von Ehrenstein**[b], **Marie E.S. Flores**[c], and **Beate Ritz**[a]

[a]University of California, Los Angeles, Fielding School of Public Health, Department of Epidemiology, Los Angeles, CA

[b]University of California, Los Angeles, Fielding School of Public Health, Department of Community Health Sciences, Los Angeles, CA

[c]Montefiore Medical Center, The University Hospital for Albert Einstein College of Medicine, Department of Family & Social Medicine, Bronx, NY

Abstract

Background—Previous research has generally found exclusive breastfeeding to protect against asthma in young children. However, maternal nativity in a Latina population has not been assessed as a potential confounder or effect modifier.

Methods—Using cross sectional data restricted to Latina mothers (n=704) from a birth cohort in Los Angeles interviewed in 2003 and 2006, we estimated risk ratios (RR) for exclusive breastfeeding and asthmatic symptoms in the offspring.

Results—56 children (8 %) had asthmatic symptoms at age 3.5 years. We found a 49% reduction in risk of asthmatic symptoms with ≥3 months of exclusive breastfeeding (aRR=0.51, 95% CI 0.28, 0.90). Foreign-born Latinas were more likely to initiate and continue breastfeeding for at least three months compared with US-born Latinas.

Discussion—Three or more months of exclusive breastfeeding reduced the risk of asthmatic symptoms in the offspring of Latinas, and maternal nativity did not confound or modify this association.

Keywords

Immigrant health; breastfeeding; asthma; epidemiology; asthmatic symptoms; maternal nativity in Latino children

Background

From the 1980's until its peak in 1995, asthma prevalence in children aged 0–17 years more than doubled, stabilizing in 2001 in the United States (1,2). In 2005, the prevalence of asthma in Latino children (7.8%) aged 0–17 was comparable to white children (8.0%). However, among Latino children, lower asthma rates are found amongst those of Mexican

Address for correspondence: Gretchen Bandoli, Department of Epidemiology, University of California Los Angeles, School of Public Health, Box 951772, Los Angeles, CA 90095 USA, Phone: +1-310-825-8579, Fax: +1-310-206-6039, gbandoli@ucla.edu.

origin (6.4%) compared to Puerto Rican origin (19.2%) (2). Apart from genetics, multiple factors are thought to contribute to the risk of asthma, including obesity, exposure to tobacco smoke, and environmental and dietary factors (3). Breastfeeding has been investigated as a protective factor against asthma. One hypothesis is that this association is mediated through breastfeeding's protective effects on early respiratory illness (4). However, it has recently been found that asthma and allergy risks are lower when the degree of microbial biodiversity in the gut is higher; notably, exclusive breastfeeding has been hypothesized as one mechanism to establish a higher level of microbial diversity in infancy (5).

Theoretical/Conceptual Framework

A recent meta-analysis of breastfeeding and asthma found a 22% reduction in the pooled odds ratio, with the strongest protection observed in children 0–2 years old, slightly weaker protection in 3–6 year olds, and protection bordering on null in children aged 7 and up. The role of maternal atopy was not assessed (6). Two earlier meta-analyses reported similar results for young children, but also reported stronger associations among those with a maternal history of atopy (4,7). The authors of the recent meta-analysis concluded that additional work should to be done to analyze potential confounders and mediators such as daycare attendance and early respiratory illness, and to explore potential difference by ethnicity in the relationship of breastfeeding and childhood asthma (6,8,9).

To our knowledge, there are no studies to date examining the role of characteristics associated with immigration and acculturation that may influence both breastfeeding behaviors and the risk of asthma in the offspring of Latina immigrant and Latina native-born populations living in the US. Overall, Latinas in the US have breastfeeding initiation rates (79.8%) comparable with white women (10). However, longer time spent in the US has been shown to lower both breastfeeding initiation and duration among foreign-born immigrant Latinas (11,12). Asthma rates in Latino children may also differ by the mother's nativity, with a higher prevalence reported in children of US-born Latinas (13) than foreign-born Latinas.

We hypothesized that associations between breastfeeding and asthma symptoms in young Latino children may be confounded or modified by maternal nativity. In order to study this association, we used cross sectional data from a cohort study with oversampling of preterm and low birth weight children in Los Angeles, CA. In analyses restricted to Latinas and their offspring, we examined whether exclusive breastfeeding reduces the risk of asthmatic symptoms in our population of young (3.5 year old) children born to Latina women, and assessed effect measure modification by maternal nativity.

Methods

Participants

The UCLA Environment and Pregnancy Outcomes Study (EPOS) was originally designed to assess effects of air pollution on birth outcomes as previously described (14) The source population was identified among all live births from January 1, 2003 to December 31, 2003, to mothers who resided in one of 111 Los Angeles County ZIP codes (41% of all LA County

births). After exclusions, the final cohort consisted of 58,316 eligible births (87% of the original total). All cases of low birth weight (<2,500 g) or preterm birth (<37 completed weeks gestation) and an equal number of randomly sampled controls (≥2,500-g weight and full term) from the set of 24 ZIP codes located in close proximity to South Coast Air Quality Management District air monitoring stations were selected. An additional 30 percent of cases and an equal number of controls were selected from the set of 87 ZIP codes containing major population centers and located close to major roadways. Of the 6,347 women sampled, 2,543 were interviewed (in English or Spanish) (40% response rate) 3–6 months post-partum and provided detailed information on pregnancy exposures and behaviors.

In 2006–2007, a longitudinal cohort of the original EPOS nested case-control study was created (Environment and Child Health Outcome Study (ECHOS)) (15). 1201 women participated in the survey by phone or mail (49.3% of those who agreed to be re-contacted); the majority of attrition resulted from the inability to locate women 3-years after the first contact. For the current study we include 704 women who self-identified Latina ethnicity.

Measures

In the 2006–2007 interviews, we assessed asthmatic symptoms via maternal report according to the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire for 6–7 year olds (16). We asked all questions in the core questionnaire wheezing module, in addition to “has a doctor said your child has asthma,” “age at doctor diagnosed asthma,” and “has your child visited the emergency room because of asthma?” We here defined our outcome as “doctor diagnosed asthma” combined with “dry cough at night occurring in the past 12 months” and/or “any history of wheezing or whistling in the chest.”

Mothers reported the number of months of exclusive breastfeeding (breastfeeding without formula or food supplementation) in the follow up interview (2006/7). We used categories for exclusive breastfeeding of 0 months, 1–2 months, ≥3 months, and < 3 vs ≥3 months in sensitivity analysis and stratified analysis assessing effect measure modification.

Covariates collected from the 2002 birth certificates and from the 2003 survey interview included maternal age, maternal education, maternal nativity, income, maternal pregnancy smoking, preterm birth, antibiotics in breast milk, insurance type, and work outside of the home in pregnancy. In the 2006–2007 follow-up interviews, we collected data on smoking in the residence, both maternal and paternal history of atopy, pets in the home before age 1, daycare before age 1, doctor diagnosed bronchitis and doctor diagnosed severe cold or flu before age 1, number of residents under age 18, maternal birthplace and preferred language if the participant identified as Latina/Hispanic, and years lived in the US among the foreign-born Latinas, as defined in Table I.

Analysis

We estimated risk ratios (RR) for the effect of exclusive breastfeeding on the child’s asthmatic symptoms using Poisson regression models with robust error variance and a log link function (17). Multivariate analysis was conducted including potential confounders added sequentially. Retained covariates (on the basis of previous literature (8) or changing

the effect estimate by >10%) included preterm birth, maternal education, maternal age, maternal pregnancy smoking, parental history of atopy, and income. Maternal nativity, insurance type, pets in the home, daycare, antibiotics in breast milk, doctor diagnosed bronchitis, doctor diagnosed severe cold/flu before age 1, number of other residents in home under 18, and work outside of the home did not change the effect estimate for exclusive breastfeeding and were removed from the multivariate analysis. There were too few respondents who affirmed smokers in the house, thus the variable could not be included.

Information for income was missing in 16.2% of responses, thus multiple imputations were performed utilizing standard SAS procedures with 5 imputation datasets to replace all missing values. The effect estimate for exclusive breastfeeding did not change appreciably (<5%), thus to maintain a sufficient sample size the imputed datasets were used in final multivariate models and for propensity score adjustment. Propensity scores were calculated by regressing exclusive breastfeeding on all aforementioned retained covariates in a multinomial logistic regression, with inclusion of the predicted probabilities of exposure in the final model. Fully adjusted models and propensity score adjusted models are both reported in Tables II–III.

Effect measure modification was assessed by examining risk ratios in stratified analyses. Maternal nativity was assessed for our main hypothesis, and preterm birth and maternal history of atopy were assessed in sensitivity analyses. Risk estimates for the stratum with a positive maternal history of atopy did not converge due to the small sample size and number of covariates for adjustment; however, we were able to estimate the risk in all strata using propensity score adjustment. Dichotomous breastfeeding (<3 months vs. ≥3 months) was used as the exposure due to small cell sizes in the strata.

In additional sensitivity analyses we explored the risk of asthmatic symptoms and exclusive breastfeeding using <3 months of exclusive breastfeeding as the reference group. We also explored predictors of breastfeeding initiation and duration using Poisson regression with robust error variance and a log link function adjusting for nativity, education, age, daycare attendance prior to age 1 year and work outside the home during pregnancy. In a model restricted to foreign-born Latinas only, we also included years lived in the US (continuous).

The UCLA Office for Protection of Research Subjects and the California State Committee for the Protection of Human Subjects approved this research; informed consent was obtained from the women.

Results

Table I provides demographic characteristics for our study participants. In the ECHOS sub-sample of children born to Latina mothers (n=704), 56 (8.0%) had asthmatic symptoms (doctor diagnosed asthma with wheeze (n=28) or dry cough (n=3) or both (n=25). Children with asthmatic symptoms were more likely to be born to US-born women, to women who smoked prior to pregnancy, and were exclusively breastfed for shorter durations.

When examining demographic characteristics by nativity (Web appendix I) several factors differed; particularly US-born Latinas were younger, had more years of formal education and were more likely to have a child with asthmatic symptoms than foreign-born Latinas.

Foreign-born Latinas were more likely to initiate breastfeeding (RR 1.19 95% CI 1.07, 1.32) and more likely to breastfeed for a minimum of 3 months (RR 1.45 95% CI 1.15, 1.80) than US-born Latinas after adjusting for age, education, daycare and work outside the home in pregnancy. Years lived in the US did not predict breastfeeding initiation or duration in foreign-born Latinas (data not shown).

The children's risk of asthmatic symptoms in relation to 3+ months of exclusive breastfeeding was reduced by 49% (RR=0.51, 95% CI 0.28, 0.90) in multivariate models adjusted using propensity scores (Table II). No effect measure modification was observed by maternal nativity (data not shown).

In sensitivity analysis, there was a suggestion of effect measure modification by maternal history of atopy with the reduced risk of asthmatic symptoms from breastfeeding being lower among children of mothers without a history of atopy; however the number of mothers with history of atopy was small (Table III). There was no effect measure modification observed by preterm birth (data not shown).

The reduction in risk of asthmatic symptoms was not as strong when the reference group included women who breastfed for <3 months (Table II).

Discussion

Using cross sectional data from a cohort study restricted to Latinas, exclusive breastfeeding for 3 or more months reduced the risk of asthmatic symptoms in their offspring by 49% in adjusted models. Risk reduction from breastfeeding was not modified or confounded by nativity of the mother.

We were interested in maternal nativity in Latinas as immigration and acculturation may be related to both asthma risk in the offspring and breastfeeding in this dominant minority in the US. While breastfeeding initiation and duration in Latinas is comparable to whites (10), there is considerable heterogeneity of breastfeeding within Latinas by nativity: US-born Latinas initiate less and breastfeed for shorter time than foreign-born Latinas (11,12,18). Furthermore, time lived in the US as a measure of acculturation is a negative predictor of breastfeeding, with increasing time of residency in the US leading to less breastfeeding (12,19). Similarly in our sample, US-born Latinas were less likely to initiate breastfeeding and had shorter duration of exclusive breastfeeding than foreign-born Latinas. However, among our foreign-born (75.6% Mexican origin) Latinas, we did not observe any reduction in the initiation or duration of exclusive breastfeeding with years lived in the US in either crude models or models adjusted for socio-demographic variables. Although the median time lived in the US among our immigrant Latinas was 15 years, breastfeeding practices remained similar for recent and long-time immigrants. One explanation for this is the relative homogeneity in our Latina foreign-born immigrant population: 80% had a 12th grade education or less, and of those reporting income, 80% earned $30,000 or less a year.

Although low education and income are generally negative predictors for breastfeeding, they are not as strong of determinants in Latinas (12), and in our sample may represent a group who resisted such “negative acculturation” despite the duration lived here, and have retained breastfeeding behaviors from their home countries.

Foreign maternal nativity has previously also been studied as a protective factor for asthma in Mexican-Americans. In a predominantly Mexican-American sample of Latinos in Los Angeles, CA, 0–17 year old children of immigrant mothers exhibited a lower odds ratio of asthma (OR 0.64, 95% CI 0.44–0.94) than those born to US-born mothers (13). While our data was initially suggestive of a lower risk of asthmatic symptoms in offspring of foreign-born Latinas (crude RR= 0.67, 95% CI 0.41, 1.12), the results were attenuated in multivariate models that included exclusive breastfeeding (RR=0.79, 95%CI 0.44, 1.41). The previous study of LA children did not adjust for breastfeeding (13). This suggests breastfeeding may influence risk of asthmatic symptoms while maternal nativity may only be an indicator of breastfeeding practices.

Some studies have found either no or an increased risk of asthma with breastfeeding (20–22). These inconsistencies may be due to differences in phenotypes and related to the age of the child. The protective effect of breastfeeding appears to attenuate in older children, with the most pronounced effects found in children under the age of 3 (8,21,23). Indeed, wheezing that may get diagnosed as “asthma” in young children is heterogeneous; as many as 6 wheezing phenotypes have been identified in longitudinal studies, and are quite different in their risk for subsequent development of asthma (24). These phenotypes cannot be established reliably until the child reaches age 6 (25); thus given our single time point of assessment, what is classified by health care providers as asthma at this young age may in fact be transient wheeze. Given that we found stronger protection for those without a maternal history of atopy, our results may be strongly influenced by transient wheezers in our population. However, our findings relied on few women reporting atopy (n=84; 11.9% of the sample) and confidence limits overlapped largely for both estimates.

Categorizations used for breastfeeding and the choice of reference group may also result in heterogeneous effects. A large cluster randomized study conducted in Belarus, found no association between breastfeeding intervention and asthma at age 6.5, but both the intervention and control groups included a substantial proportion of women who breastfed, thus these null results are difficult to interpret (26). We observed stronger reduction in risk of asthmatic symptoms from exclusive breastfeeding in analysis using 0 months of exclusive breastfeeding as the reference as compared to a reference of <3 months of exclusive breastfeeding. This suggests that any duration of exclusive breastfeeding reduces the risk, and including short duration of exclusive breastfeeding in the reference group as done in previous studies may underestimate the protective benefits that any breastfeeding offers.

Strengths of this study include the large proportion of immigrant Latinas, enabling us to study the association of breastfeeding and asthmatic symptoms in an understudied population, and to simultaneously investigate the role of maternal nativity. Also, we have a sample rich in covariate information linked to birth certificate data for multivariate adjustment, including detailed duration of exclusive breastfeeding, daycare attendance,

parental atopy, pets, and child bronchitis/cold and flu history. These latter covariates allowed us to explore the hypothesis that the benefits from breastfeeding might be due to a reduction in virus-associated wheeze (9,22). However, including both bronchitis and severe cold/flu prior to one year in our models did not change the estimate for breastfeeding.

Limitation to our study include the young age of children studied, as wheeze and "doctor diagnosed asthma" may in fact be transient wheeze and thus may not be consistent with actual chronic asthma in later childhood. Additionally, the ISAAC questionnaire was not validated for children aged 3–4 in our sample. Another potential limitation is maternal recall of breastfeeding; women reported duration of breastfeeding when the child was 3.5 years old, and there may be correlation between the self-reported outcome and exposure. However, there is evidence that women recall breastfeeding quite well (27), and as this study was not specifically aimed at studying breastfeeding or asthma and a range of questions were administered, the likelihood of strongly correlated self-report is reduced. Breastfeeding and asthmatic symptom data were collected at the same visit (cross sectional) from a cohort study. We know that between the start of the cohort (2003, 3–6 months after giving births) and the follow up visit (2006) when the data were collected we disproportionately lost women who had not initiated breastfeeding at the 2003 assessment. However, overall our 2006 sample had breastfeeding initiation rates (80.0%) similar to that of Latinas in the US (79.8%) (10). Also, our percentage of children with asthma diagnosis (7.95%) was similar to that of Mexican-American children 5 years and younger in LA County (7.26%) from the Los Angeles Family and Neighborhood Survey (LAFANS) as was the educational attainment of the mothers (13), indicating that our sample was generally representative of the target population. Finally, this cohort contains a large portion of preterm births (38.6%), which may limit generalizability. Preterm birth was, however, included in all adjusted models and assessed for effect measure modification. In post-hoc sensitivity analysis, we excluded births prior to 36 weeks of gestation to determine whether our observed association was biased by those very preterm that may not be able to breastfeed and be at a higher risk of asthmatic symptoms. The association between breastfeeding and asthmatic symptoms changed minimally (RR 0.45, 95% CI 0.22, 0.92; n=524).

New contributions to the literature

To our knowledge this is the first study of the association between breastfeeding and the risk of asthmatic symptoms among children aged 3.5 years in a Latina and largely immigrant population who gave birth in LA. This study suggests that duration of breastfeeding may need to be considered in Latino populations, and that maternal nativity (i.e. US-born status) may be a risk factor for asthma at least in part because it is related to breastfeeding behavior. Also of interest, we found that breastfeeding practices did not change with length of residency in foreign-born (predominantly Mexican) Latinas in Los Angeles. This suggests that there are factors that determine breastfeeding practices in this population that if better understood could be also be used to design and target programs that promote this beneficial behavior among US-born Latinas.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This work was supported by the National Institutes of Environmental Health Sciences [R01ES010960-01,R03ES017119-01].

References

1. Akinbami LJ, Moorman JE, Bailey C, Zahran HS, King M, Johnson Ca, et al. Trends in asthma prevalence, health care use, and mortality in the United States, 2001–2010. NCHS Data Brief. 2012 May.(94):1–8. [PubMed: 22617340]
2. Akinbami L. The state of childhood asthma, United States, 1980–2005. Adv Data. 2006 Dec 12. (381):1–24. [PubMed: 17180851]
3. Von Mutius E, Hartert T. Update in asthma 2012. Am J Respir Crit Care Med. 2013 Jul 15; 188(2): 150–6. [PubMed: 23855691]
4. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, et al. Breastfeeding and maternal and infant health outcomes in developed countries. Evid Rep Technol Assess (Full Rep). 2007 Apr. (153):1–186.
5. Heine RG. Preventing atopy and allergic disease. Nestle Nutr Inst Workshop Ser. 2014 Jan.78:141–53. [PubMed: 24504215]
6. Dogaru CM, Nyffenegger D, Pescatore AM, Spycher BD, Kuehni CE, Dogaru, et al. Respond to "Does Breastfeeding Protect Against 'Asthma'?". Am J Epidemiol. 2014 Apr 11; 179(10):1171–2. [PubMed: 24727805]
7. Gdalevich M, Mimouni D, Mimouni M. Breast-feeding and the risk of bronchial asthma in childhood: a systematic review with meta-analysis of prospective studies. J Pediatr. 2001 Aug; 139(2):261–6. [PubMed: 11487754]
8. Dogaru CM, Nyffenegger D, Pescatore AM, Spycher BD, Kuehni CE. Breastfeeding and Childhood Asthma: Systematic Review and Meta-Analysis. Am J Epidemiol. 2014 Apr 11; 179(10):1153–67. [PubMed: 24727807]
9. Kramer MS. Invited Commentary: Does Breastfeeding Protect Against "Asthma"? Am J Epidemiol. 2014 Apr 11; 179(10):1168–70. [PubMed: 24727808]
10. Centers for Disease Control. Progress in Increasing Breastfeeding and Reducing Racial/Ethnic Differences — United States, 2000–2008 Births. 2008; 62(05):77–80.
11. Gill SL. Breastfeeding by Hispanic women. J Obstet Gynecol Neonatal Nurs. 2009; 38(2):244–52.
12. Gibson-Davis CM, Brooks-Gunn J. Couples' immigration status and ethnicity as determinants of breastfeeding. Am J Public Health. 2006 Apr; 96(4):641–6. [PubMed: 16507724]
13. Camacho-Rivera M, Kawachi I, Bennett GG, Subramanian SV. Revisiting the Hispanic Health Paradox: The Relative Contributions of Nativity, Country of Origin, and Race/Ethnicity to Childhood Asthma. J Immigr Minor Health. 2014 Jan 1.
14. Ritz B, Wilhelm M, Hoggatt KJ, Ghosh JKC. Ambient air pollution and preterm birth in the environment and pregnancy outcomes study at the University of California, Los Angeles. Am J Epidemiol. 2007 Nov 1; 166(9):1045–52. [PubMed: 17675655]
15. Hoggatt KJ, Flores M, Solorio R, Wilhelm M, Ritz B. The "Latina epidemiologic paradox" revisited: the role of birthplace and acculturation in predicting infant low birth weight for Latinas in Los Angeles, CA. J Immigr Minor Health. 2012 Oct; 14(5):875–84. [PubMed: 22160842]
16. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, et al. International study of asthma and allergies in childhood (ISAAC): rationale and methods. Eur Respir J. 1995 Mar 1; 8(3):483–91. [PubMed: 7789502]
17. Fang, J. Using SAS ® Procedures FREQ, GENMOD, LOGISTIC, and PHREG to Estimate Adjusted Relative Risks A Case Study. SAS Global Forum; 2011; 2011. p. 345

18. Lee HJ, Elo IT, Culhane JF. Racial/Ethnic Differences in Breastfeeding Initiation and Duration Among Low-income, Inner-city Mothers. Soc Sci Q. 2010; 90(5):1251–71. [PubMed: 20160902]
19. Harley K, Stamm N, Eskenazi B. The Effect of Time in the U.S on the Duration of Breastfeeding in Women of Mexican Descent. Matern Child Heal J. 2007; 11(2):119–25.
20. Sears MR, Greene JM, Willan AR, Taylor DR, Flannery EM, Cowan JO, et al. Long-term relation between breastfeeding and development of atopy and asthma in children and young adults: a longitudinal study. Lancet. 2002 Sep 21; 360(9337):901–7. [PubMed: 12354471]
21. Silvers KM, Frampton CM, Wickens K, Pattemore PK, Ingham T, Fishwick D, et al. Breastfeeding protects against current asthma up to 6 years of age. J Pediatr. 2012 Jun; 160(6):991–6. e1. [PubMed: 22289356]
22. Brew BK, Allen CW, Toelle BG, Marks GB. Systematic review and meta-analysis investigating breast feeding and childhood wheezing illness. Paediatr Perinat Epidemiol. 2011 Nov; 25(6):507–18. [PubMed: 21980940]
23. Matheson MC, Erbas B, Balasuriya A, Jenkins MA, Wharton CL, Tang ML-K, et al. Breast-feeding and atopic disease: a cohort study from childhood to middle age. J Allergy Clin Immunol. 2007 Nov; 120(5):1051–7. [PubMed: 17764732]
24. Henderson J, Granell R, Heron J, Sherriff a, Simpson a, Woodcock a, et al. Associations of wheezing phenotypes in the first 6 years of life with atopy, lung function and airway responsiveness in mid-childhood. Thorax. 2008 Nov; 63(11):974–80. [PubMed: 18678704]
25. Morgan WJ, Stern Da, Sherrill DL, Guerra S, Holberg CJ, Guilbert TW, et al. Outcome of asthma and wheezing in the first 6 years of life: follow-up through adolescence. Am J Respir Crit Care Med. 2005 Nov 15; 172(10):1253–8. [PubMed: 16109980]
26. Kramer MS, Matush L, Vanilovich I, Platt R, Bogdanovich N, Sevkovskaya Z, et al. Effect of prolonged and exclusive breast feeding on risk of allergy and asthma: cluster randomised trial. BMJ. 2007 Oct 20.335(7624):815. [PubMed: 17855282]
27. Natland ST, Andersen LF, Nilsen TIL, Forsmo S, Jacobsen GW. Maternal recall of breastfeeding duration twenty years after delivery. BMC Med Res Methodol BMC Medical Research Methodology. 2012 Jan.12(1):179.

Table I

Demographic and Pregnancy Characteristics by Child Asthmatic Symptoms among Latina respondents to the Environment and Child Health Outcomes Study in Los Angeles County, California, 2006 (n=704).

	Asthmatic symptoms[a]	
	Yes[b] n=56 (8.0)	No[b] n=648 (92.0)
Maternal Age		
< 20	5 (8.9)	57 (8.8)
20–24	11 (19.6)	164 (25.3)
25–29	18 (32.1)	171 (26.4)
30–34	16 (28.6)	161 (24.9)
≥ 34	6 (10.7)	95 (14.7)
Maternal Education		
< 8 years	8 (14.3)	119 (18.7)
9–11 years	10 (17.9)	158 (24.8)
12 years	16 (28.6)	195 (30.6)
13–15 years	16 (28.6)	96 (15.1)
≥ 16 years	6 (10.7)	69 (10.8)
Maternal nativity		
Foreign-born	33 (58.9)	446 (68.8)
Income		
<$10k	18 (32.1)	138 (21.3)
$10k–<$30k	16 (28.6)	261 (40.3)
$30k–<$50k	10 (17.9)	77 (11.9)
≥$50k	5 (8.9)	65 (10.0)
missing	7 (12.5)	107 (16.5)
Maternal pregnancy smoking		
Nonsmoker	35 (62.5)	486 (75.0)
Former smoker	19 (33.9)	148 (22.8)
Pregnancy smoker	2 (3.6)	14 (2.2)
Preterm birth		
Preterm (<37 weeks)	26 (46.4)	246 (38.0)
Antibiotics in breast milk		
Yes	5 (8.9)	56 (8.6)
Insurance		
Public	35 (62.5)	444 (68.5)
Work outside of the home in pregnancy		
Yes	32 (57.1)	332 (51.2)
missing	1 (1.8)	4 (0.6)
Smoking inside of the home		
No	56 (100.0)	636 (98.1)
Yes	0 (0.0)	9 (1.4)

	Asthmatic symptoms[a]	
	Yes[b] n=56 (8.0)	**No[b] n=648 (92.0)**
Yes, child not at home	0 (0.0)	3 (0.5)
History of maternal asthma, eczema, hayfever		
Yes	11 (19.6)	73 (11.3)
History of paternal asthma, eczema, hayfever		
Yes	5 (8.9)	47 (7.2)
Pets before age 1		
Yes	12 (21.4)	130 (20.1)
missing	0 (0.00)	2 (0.3)
Daycare before age 1		
Yes	6 (10.7)	35 (5.4)
missing	1 (1.8)	16 (2.5)
Doctor diagnosed bronchitis		
Yes	14 (25.0)	48 (7.4)
Doctor diagnosed severe cold/flu before age 1		
Yes	31 (55.4)	177 (27.4)
missing	0 (0.00)	2 (0.31)
Exclusive breastfeeding (months)		
≥ 3 months	19 (33.9)	310 (47.8)
missing	0 (0.0)	8 (1.2)
Exclusive breastfeeding (months)		
0 months	30 (53.6)	224 (34.6)
1–2 months	7 (12.5)	106 (16.4)
≥3 months	19 (33.9)	310 (47.8)
missing	0 (0.0)	8 (1.2)
Number of residents under age 18[c]	1.18 (1.2)	1.37 (1.2)

[a] Defined by doctor-diagnosed asthma with wheeze and/or dry cough.

[b] n (%).

[c] Mean (sd).

Table II

Crude, multivariate and propensity adjusted risk estimates for asthma with exclusive breastfeeding in a Latina population from the Child Health Outcomes Study in Los Angeles County, California, 2006 (n=704).

	N case/non-case	Crude model[a] (n=696)	N case/non-case	Multivariate model imputed (n=704)[a,b]	Propensity adjusted model (n=704)[a,c]
Exc. breastfeeding (months)					
0 Months	30/224	Reference	30/224	Reference	Reference
1–2 months	07/106	0.52 (0.24, 1.16)	7/108	0.49 (0.22, 1.07)	0.47 (0.21, 1.05)
≥ 3 months	19/310	0.49 (0.28, 0.85)	19/316	0.52 (0.29, 0.91)	0.51 (0.28, 0.90)
Exc. breastfeeding (months)					
< 3 months	37/330	Reference	37/331	Reference	Reference
≥ 3 months	19/310	0.57 (0.34, 0.98)	19/317	0.62 (0.36, 1.06)	0.62 (0.36, 1.07)

[a] RR (95% CI).

[b] Multivariate model adjusted for preterm birth, maternal age, maternal education, pregnancy smoking, parental history of asthma/eczema/hayfever, and income.

[c] Propensity scores include all covariates in the multivariate model.

Table III

Effect measure modification of risk ratios of breastfeeding and asthmatic symptoms by maternal history of asthma/eczema/hayfever in a Latina population from the Child Health Outcomes Study in Los Angeles County, California, 2006 (n=704).

Exclusive breastfeeding (in months)	N case/non-case	Crude model[a]	N case/non-case	Multivariate model[a,b]	Propensity adjusted model[a,c]
Positive maternal history (n=84)					
< 3 months	07/40	Reference	07/40	Reference	Reference
≥ 3 months	04/33	0.73 (0.23, 2.29)	04/33	n/a[d]	0.72 (0.23, 2.22)
Negative maternal history (n=620)					
< 3 months	30/290	Reference	30/291	Reference	Reference
≥ 3 months	15/277	0.55 (0.30, 1.00)	15/284	0.57 (0.32, 1.06)	0.59 (0.32, 1.10)

[a] RR (95% CI).

[b] Multivariate model adjusted for preterm birth, maternal age, maternal education, pregnancy smoking, parental history of asthma/eczema/hayfever, and income.

[c] Propensity scores include all covariates in the multivariate model.

[d] Model did not converge due to small cell sizes in multivariate model.