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Cesarean Delivery as a Barrier for Breastfeeding Initiation: The Puerto Rican Experience

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Abstract

The study's objective was to examine the relationship between cesarean section delivery and the initiation of breastfeeding in a representative sample of 1695 Puerto Rican women aged 15 to 49 years, who delivered their last healthy singleton child in Puerto Rico between 1990 and 1996. Secondary analysis of data collected in the population-based cross-sectional study *Puerto Rico Reproductive Health Survey* was performed. Bivariate and multivariate logistic regression analyses were used to examine the crude and covariate adjusted association between type of childbirth and initiation of breastfeeding. Overall, 36% of all births were performed by cesarean section, while initiation of breastfeeding was achieved by 61.5% of the women. Cesarean section was negatively related to breastfeeding initiation in multivariable logistic regression models (odds ratio = .64; 95% CI = 0.51–0.81) after controlling for confounding variables. Intervention programs that aim to promote breastfeeding and that provide special assistance to women undergoing this procedure should be developed.

Keywords

breastfeeding; breastfeeding barriers; breastfeeding initiation; lactation; cesarean section; Puerto Rico

Introduction

Breast milk continues to be the optimal form of nourishment for a baby,1,2 as it provides the newborns with all the proteins, sugars, fats, vitamins, and immunological components that they need for healthy growth and development.2–4 The World Health Organization (WHO) has recommended exclusively breastfeeding for 6 months and that breastfeeding continue, with the introduction of complementary foods, for at least the first 2 years of life.5 Multiple studies have demonstrated that babies who are breastfed have less possibility of suffering

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from multiple health complications, including ear infections, respiratory illnesses (such as pneumonia and bronchiolitis), meningitis, infections of the urinary tract, vomiting, and diarrhea,3,4 as compared with babies who have not been breastfed. In addition, when breastfed babies are ill, their illness tends to be less severe and their recovery tends to be faster.2,6 Breast milk is not only beneficial for the baby but is also favorable for the mother7,8 and the economy.2,6,9 Breastfeeding prevents possible hemorrhages and anemia in the mother,7 helps her lose weight,8 and reduces her risk of breast cancer10–12 and ovarian cancer.13,14 Breast milk also reduces expenses for the family as it is available free of charge and is accessible to every infant at anytime, unlike formula whose cost can reach $1500 per family in the baby's first year of life alone.9,15

Despite all its benefits, research has shown that there are some barriers to the initiation of breastfeeding.16–18 Cesarean section has been shown to be a barrier for breastfeeding initiation in multiple studies,19–22 although this association has not been consistent.23,24 The mechanism by which cesarean section affects breastfeeding initiation is thought to be related to the fact that this surgical procedure has a longer recovery period than a vaginal birth26 and can cause serious complications, including pain, uterine hemorrhage, infections, and loss of mobility in the mother.25,27–29 All these aggravated health outcomes can compromise the mother's ability to breastfeed,25,27–30 not only by prolonging maternal–infant separation20 but also by forcing mothers to concentrate more on their recovery, rather than on their baby's nutritional needs.

Rates of cesarean section have increased dramatically during the last decades in the United States31,32 and worldwide.33 A recent study documented that international cesarean section rates, by subregions, range from 1.8% in Middle-Africa to 40.5% in Eastern Asia.34 Although not reported by the previous study, Puerto Rico has also shown a rapid increase in cesarean section rates over the last few decades.35–37 During the 1970s, Puerto Rico had a 6.0% cesarean section rate,26 which over the years increased drastically to reach 47.7% in 2004 (most recent statistic available).35,36 As these data demonstrate, the high rate of cesarean sections observed in Puerto Rico is of major public health concern, as it seems to be among the highest worldwide and as it dramatically surpasses objectives proposed by the Healthy People 2010 (< 15.0%).38

There is no concrete explanation for the high cesarean section rates seen in Puerto Rico during the last few decades. Even though Puerto Rico has had historically high rates of cesarean section, studies on the impact of this surgical procedure on breastfeeding initiation in this population are lacking. The present study aimed to examine the association between cesarean section delivery and the initiation of breastfeeding in a representative sample of 1695 Puerto Rican women aged 15 to 49 years, who had their last healthy singleton child between 1990 and 1996.

Methods

Study Design

The current study is a secondary analysis of data collected in the cross-sectional study *Puerto Rico Reproductive Health Survey*. This survey, conducted between 1995 and 1996 by

the Graduate School of Public Health of the Medical Sciences Campus, University of Puerto Rico, and the Centers for Disease Control and Prevention (CDC), was the eighth and last of its kind to have been conducted in Puerto Rico, and it represents the most recent population-based data on reproductive health in the island. This study recruited women aged 15 to 49 years that represented, by health region,39 the general population of women of reproductive age in Puerto Rico during that time period. As part of their participation in the study, women were asked to respond an interviewer-administered questionnaire, which collected information on demographics, reproductive health status, and lifestyle characteristics. From this survey, information regarding the mother's demographic characteristics and reproductive events (birth type, hospital practices, mother's diagnosis during pregnancy, mother's age at delivery, and breastfeeding) of their lastborn child, born within the period of 1990 to 1996, was used for the present analysis. This study was approved by the Institutional Review Board of the Medical Sciences Campus, University of Puerto Rico.

Subject Selection Criteria

From the *Puerto Rico Reproductive Health Survey*'s39 original study sample (N = 5944), 4011 women had at least one born child but, information on childbirth experiences was collected only for those women who gave birth to their lastborn child during the period of 1990 to 1996 (n = 1970). Of these women, those whose pregnancy consisted of multiple babies (n = 18) and those who had an unhealthy newborn (n = 239) were excluded from this analysis to eliminate the effect that unhealthy and multiple births have on the initiation of breastfeeding.40,41 Babies hospitalized during their first year of life either for premature birth or in an intensive care unit were considered unhealthy. Thus, only women recruited into the study and who delivered a healthy singleton between 1990 and 1996 were eligible for this analysis. It should be highlighted that the twinning rate observed in our study is comparable with that observed in Puerto Rico in the 1990 to 1996 period (1.4% to 1.8%), thus, highlighting the representativeness of our study sample. Among the 1713 eligible participants, 1695 (98.9%) completed information for the questions related to the type of birth ("Was your child born by cesarean section?") and breastfeeding initiation ("Did you breastfeed your child at/after you went out of the hospital?"), and thus were included in this analysis.

Study Variables

Our outcome variable, "breastfeeding initiation," was defined as a dichotomous variable (yes/no). The main independent variable, "birth type," was also defined as a dichotomous variable (cesarean/vaginal). Relevant variables identified in the literature to be associated with breastfeeding initiation were also evaluated for their potential confounding effects. Variables evaluated included demographic characteristics; Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participation; clinical diagnoses during pregnancy; cesarean section preferences and experiences; and hospital practices.

Demographic characteristics—The age of the mothers (15–24, 25–34, and 35–49 years) and their employment status (employed, unemployed) at the time of interview were recorded. In addition, the mother's educational attainment (0–8 school years, 9–11 school years, high-school diploma, associate degree/some university without diploma,

baccalaureate/postgraduate) and marital status (married, living together, without a partner) at time of interview were assessed.

Women's participation in WIC during pregnancy (yes/no) was also evaluated.

Clinical diagnoses during pregnancy—The following diagnoses during pregnancy (yes/no) were also evaluated as potential confounders: diabetes (included both diabetes mellitus and gestational diabetes), hypertension, cardiovascular disease, anemia, kidney infection, and vaginal or placental bleeding.

Cesarean section preferences and experiences—Women were asked about their preferences toward a cesarean section (yes/no) previous to their labor. For those who underwent a cesarean section, information was also assessed regarding "if the doctor explained to them the reasons for performing a cesarean section" (yes/no) and "if he or she explained the consequences of this procedure."

Hospital practices—Factors associated to the hospital's practices during the mother's stay were considered as dichotomous variables (yes/no) and included "baby fed without mother's permission" (with substances other than breast milk) and "breastfeeding persistence and aid from hospital personnel." Promotion of formula within the hospital and whether artificial formula was included at the time the baby was brought to the mother for feedings were also assessed. The variables "breastfeeding persistence" and "promotion of formula" were obtained from specific questions in the survey such as: "In the hospital before birth did the hospital personnel insist you breastfeed your baby?" and "While you were in the hospital, did you receive promotion of formula or already prepared milk?"

Statistical Analysis

Data were analyzed using SPSS version 13 (SPSS Corporation, Chicago, Illinois) and STATA version 8.2 (Stata Corporation, College Station, Texas). Frequency distributions were used to describe our study sample by demographic characteristics, clinical diagnoses during pregnancy, cesarean section preferences and experiences, and hospital practices. χ^2 statistics,42 by means of contingency tables, were used to describe bivariate associations between independent variables and breastfeeding initiation. Variables associated with breastfeeding initiation in bivariate analyses ($P < .05$) were included in the multivariate logistic regression model. All possible interactions in our model were analyzed. Each pair was examined using the likelihood ratio test (LRT).43 None of them were significant.

Results

Characteristics of the Study Population

A total of 35.3% of all births occurred through cesarean section, whereas initiation of breastfeeding was achieved by 64.7% of women. The mean age of interviewed women at the time of the interview was 28.3 years and 72% had an educational attainment equal to or more than 4 years of high school. Most of these women were married (61.4%), 34.0% worked at time of interview, and 78.9% participated in the WIC program during their pregnancies (Table 1). The main diagnoses reported during pregnancy among women in the

study were anemia (16.0%), hypertension (13.1%), vaginal or placental bleeding (9.7%), diabetes (7.6%), kidney infection (3.8%), and heart diseases (2.9%).

Previous to the birth of their last healthy singleton born child, 89.0% of the mothers reported that they did not prefer to deliver their baby by means of a cesarean section. Of the mothers who actually went through a cesarean delivery (n = 598), 10.3% reported that the doctor did not explain to them the reasons for having a cesarean section and 41.7% of cases the doctor did not explain the consequences of a cesarean delivery.

With respect to the hospital's practices after labor, 68.8% were not encouraged to breastfeed their baby and 48.3% did not receive any aid to begin lactation. In addition, 78.2% of the mothers received promotion of artificial milk or formulas, 74.2% of these mothers were provided with formula when the hospital personnel brought their baby, and 69.6% indicated that during their stay in the hospital, hospital personnel fed the baby without the mother's permission (Table 1).

Factors Associated With Breastfeeding Initiation

Bivariate analysis—A significantly lower proportion of women (61.5%) that had a cesarean section initiated breastfeeding in comparison to those (66.4%) that had a vaginal delivery ($P = .04$). Meanwhile, breastfeeding initiation was more frequent among those women with a higher educational attainment (>60.0%), and those who were married (70.2%) and employed (71.9%) at time of interview ($P < 0.05$). Mothers who participated in the WIC program during pregnancy (63.0%) were less likely to initiate breastfeeding ($P = .004$) (see Table 2).

Diagnosis of hypertension, anemia, diabetes, heart disease, kidney infection, and vaginal or placental bleeding were not significantly associated with breastfeeding initiation in this study ($P > .05$) (see Table 2).

In our study, mother's preference toward a cesarean section ($P = .65$), doctor explained the reasons ($P = .30$), and consequences of a cesarean ($P = .75$); the inclusion of formulas when the hospital personnel took the baby to his mother ($P = .30$) and feeding the baby without his/her mother's permission ($P = .27$) did not show a statistically significant impact on breastfeeding initiation. On the contrary, breastfeeding persistence ($P < .0001$), and aid ($P < .0001$) from hospital personnel and promotion of artificial formula ($P = .023$) were positively associated with breastfeeding initiation in bivariate analysis.

Multivariate analysis—Results from the multivariate logistic regression model are shown in Table 3. After evaluation, no interaction was found between breastfeeding initiation, birth type, and the covariates included in the model ($P = .51$), thus we kept the reduced model without the interaction terms. Overall, women with a cesarean section were 36% less likely than women with a vaginal delivery to breastfeed their last newborn child (odds ratio, OR = 0.64; 95% CI = 0.51–0.81), after adjusting for educational attainment, marital status, employment status, WIC participation during pregnancy, breastfeeding persistence, breastfeeding aid, and artificial milk promotion as confounding variables. Even though some of the other variables lost statistical significance in the multivariable analysis, we observed

that as educational attainment increased, the likelihood of breastfeeding initiation decreased. In addition, women exposed to breastfeeding persistence (OR = 1.47; 95% CI = 1.55–1.88) and aid from hospital personnel (OR = 1.40; 95% CI = 1.11–1.76) were more likely to breastfeed as compared with women who did not receive this support.

Discussion

This population-based study of Puerto Rican women of reproductive age provides strong evidence that cesarean section was negatively associated with breastfeeding initiation among the Puerto Rican female population that had a healthy singleton child, in Puerto Rico, between 1990 and 1996. Overall our estimates indicate that only 64.7% of mothers of reproductive age began breastfeeding their lastborn child at some point. This rate is higher than the one reported in Puerto Rico during 1982, when only 37.3% of the mothers breastfed,37 although it is still lower than the ones observed in other populations such as Mexico (80.9%)20 and the United States (76.0%)10 during similar time periods. When stratified by birth type, the difference found in breastfeeding initiation between vaginal (66.4%) and cesarean section (61.5%) births in our study was statistically significant ($P < .05$) and also clinically significant, given that women who delivered vaginally were more able to initiate breastfeeding and were closer to achieving recommended rates of the Healthy People 2000 and 201038 (75% of the mothers should breastfeed). The difference observed emphasizes the importance of creating educational and promotional breastfeeding strategies for the women who have had a cesarean section, especially in a country like ours where cesarean section rates are still rising. Nonetheless, it is important to highlight that breastfeeding rates in Puerto Rico have increased dramatically for both cesarean and vaginal deliveries. Given that population-based campaigns on breastfeeding in Puerto Rico started in the mid-1990s,44 these interventions could not have affected the observed increase. Thus, the increase observed in this study could be related to an increased knowledge among caregivers and the general population of the multiple benefits of breastfeeding. To appropriately understand this phenomenon, future studies designed to evaluate the reasons for this increase are recommended.

In our study we found that 89.0% of mothers in our study did not prefer a cesarean delivery; however, 35.3% gave birth through this method. Nevertheless, the mothers' birth preference was not statistically associated with breastfeeding initiation. This result is consistent with previous studies,45–47 which have reported that women's preference toward a specific birth type does not affect breastfeeding. However, studies aimed at determining factors associated with preference of birth type in the Puerto Rican women are highly warranted.

The frequency of cesarean section observed in this population (35.3%) did not achieve the recommendations established at the time by the WHO and the Healthy People 200048 (<12%) but it is consistent with the increases observed in the rate of cesarean sections in Puerto Rico during the 1970s and 1980s (6% to 27%)30,37 and in the year 2004 (47.7%).36 This high rate of cesarean section in the Puerto Rican population is of special concern, as our study showed that Puerto Rican women with a cesarean section were less likely than women with a vaginal delivery to breastfeed their lastborn child (see Table 3), after adjusting for confounding variables. This is consistent with other studies16,20–22,49 that have shown

that cesarean section is a barrier for breastfeeding initiation. Pérez-Escamilla et al20 found that cesarean section was a risk factor for not initiating breastfeeding among Mexican women, where those with a cesarean section were 36% less likely to initiate breastfeeding. Dewey et al49 and Theofilogiannakou et al21 observed similar results among women in the United States and Greece that underwent this procedure. Factors proposed to explain these associations include prolonged hospitalization, and thus prolonged maternal-infant separation, lack of appropriate breastfeeding counseling during hospital stay, and maternal endocrine changes induced by this surgical procedure.20

The results of this study are of special public health concern, as our results suggest that the high rate of cesarean section in Puerto Rico could potentially impact the health of thousands of mothers and infants in our population due to the fact that this procedure impedes the initiation of breastfeeding, and thus inhibits both mothers and children from receiving the multiple benefits breastfeeding provides.1–4 Even though new policies have been created in the island favoring breastfeeding,50 their impact on lactation among Puerto Rican women, and particularly those who undergo a cesarean section, is yet to be determined.

Other risk factors associated with not initiating breastfeeding were being married, higher educational attainment, and not receiving breastfeeding aid and persistence from the hospital personnel. In our study, unmarried women were more likely to initiate breastfeeding as compared with those married; this is contrary to what has been observed in the United States,51 where married women breastfeed more than their unmarried counterparts. However, this result needs to be interpreted with caution, as marital status at the time of the survey does not necessarily reflect marital status at time of childbirth. The association observed in our study for educational attainment is also different from the one observed in a previous study in Puerto Rico in the 1980s52 and from multiple studies in the United States, where more educated mothers were the ones that breastfed more.51 Although factors related to educational, working, and socioeconomic status at time of pregnancy could be interplaying as a barrier for breastfeeding initiation among highly educated Puerto Rican women, additional studies are recommended in order to further understand this result, especially because educational attainment in this study was also collected at time of interview (not labor), which represents up to 6 years postpartum. With respect to the positive effect of breastfeeding persistence and aid from hospital personnel on breastfeeding initiation, our results are consistent with previous studies in the United States and in other countries worldwide.53,54

As for the variable of WIC participation during pregnancy, we observed in the bivariate analysis that mothers who participated in the WIC program during pregnancy were 31% less likely to initiate breastfeeding. Even though this variable lost its significance during the multivariate analysis, it could still be clinically relevant since other studies have also found that breastfeeding initiation rates among WIC participants were far behind those of non-WIC participants.55 This study suggested that this outcome might be closely related to the lower socioeconomic status of WIC participants and to the fact that the program provides them with artificial formula and other supplements free of charge.55

Several study limitations need to be acknowledged. First, the data analyzed in our study represent the child-bearing experience of women of reproductive age in Puerto Rico from 1990 to 1996. However, this survey is the most recent in its class and its analysis is of special relevance given the increasing rate of cesarean section in Puerto Rico and the limited existence of population-based surveys that represent health tendencies of the whole territory. This study is also very relevant as cesarean section rates appear to be rising not only in Puerto Rico (from 36% in 1994 to 47.7% 2004)36 but also worldwide.31–34 In addition, even though our study described the hospital practices in Puerto Rico approximately 10 years ago, these unfortunately still reflect the hospital practices of Puerto Rican and many US hospitals that are not Baby Friendly.56

Among other study limitations, given that we performed a secondary data analysis, the variables of mother's age, educational attainment, marital status, and employment were assessed only at the time of the interview because information on their status when the mother was pregnant with her lastborn child was not collected by the parent study. In addition this study did not collect information about the type of cesarean delivery (elective vs urgent). Given that some studies relate these variables to breastfeeding initiation, 19,20,45–47,51,57,58 residual confounding could exist in our results. Also, no information regarding the mothers' length of hospital stay, previous experience and attitudes toward breastfeeding, the influence of third parties on their decision to breastfeed, and the use of medication during or after labor was available, all of which could also act as potential confounders of the association between type of birth and breastfeeding initiation.54,58–63

Despite the limitations mentioned above, our study is the first to document that cesarean section was a barrier for breastfeeding initiation among women of reproductive age in Puerto Rico that had their lastborn healthy singleton child between 1990 and 1996. Given that the incorporation of adequate counseling and support techniques54,64,65 has been proven effective in the elimination of the negative effect cesarean sections have on breastfeeding initiation, intervention programs that provide special breastfeeding assistance should be developed and put into practice to promote breastfeeding initiation among women who undergo this procedure in Puerto Rico. The Baby Friendly Hospital Initiative should be considered in these efforts as its methods have proven to be effective in other countries in increasing breastfeeding initiation rates no matter the mode of birth the mothers underwent. 66 In Puerto Rico, a recent study has also shown evidence that mother's perception of a better hospital compliance with the 10 steps of the Baby Friendly Hospital Initiative, increases the probability of the mother choosing full or exclusive breastfeeding of her newborn.67 Given that no hospital in Puerto Rico has been officially accredited as a Baby Friendly Hospital, the hospital policy model suggested by Parrilla and Capriles68 should be widely used in Puerto Rico to increase the number of Baby Friendly Hospitals in the island.

In addition, existing public health policy needs to be further encouraged to increase breastfeeding rates, reduce cesarean section deliveries, and eventually achieve current and future proposed goals from the *Healthy People 2010* and *2020*.38 Local health agencies should take part in the efforts to reduce cesarean section rates by creating programs that reward those institutions that lower their cesarean section rates within a few years. Educational campaigns should also be developed with the objective of increasing women's

and physicians' knowledge of the benefits of the selection of natural delivery methods, when appropriate. With respect to future research, additional studies need to be performed in Puerto Rico to determine the current rate of breastfeeding initiation, and if cesarean section continues to be a barrier for breastfeeding initiation in the population of reproductive age women currently living in the island. Future prospective studies that determine current hospital practices and their effect on breastfeeding initiation and cesarean section rates are also highly warranted. Longitudinal studies should also assess the association between cesarean section with breastfeeding type (exclusive vs mixed feeding) and duration.

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References

1. Eiger, M., Wendkos, S. The Complete Book of Breastfeeding. 3rd ed. New York, NY: Workman Publishing; 1999.
2. Nacimiento MB, Issler H. Breastfeeding: making the difference in the development, health and nutrition of term and preterm newborns. Rev Hosp Clin Fac Med S Paulo. 2003; 58:49–60. [PubMed: 12754591]
3. Oddy WH. Breastfeeding protects against illness and infection in infants and children: a review of the evidence. Breastfeed Rev. 2001; 9:11–18. [PubMed: 11550600]
4. Oddy WH. The impact of breastmilk on infant and child health. Breastfeed Rev. 2002; 10:5–18.
5. Kramer M, Kakuma R. The optimal duration of exclusive breastfeeding: a systematic review. Adv Exp Med Biol. 2004; 554:63–77. [PubMed: 15384567]
6. PAHO. Cuantificación de los Beneficios de la Leche Materna: Reseña de la Evidencia. Beneficios Económicos de la Lactancias Materna. Pan-American Health Organization Web site; 2002. http://www.paho.org/Spanish/HPP/HPN/BOB6.pdf. [Accessed October 6, 2004]
7. Valdés, V., Pérez, A., Labbok, M. Lactancia para la madre y el niño. Publicaciones Técnicas Mediterráneo; 1994.
8. Gorrín J, Parilla A. The management of labor and delivery and its implications for breastfeeding. P R Health Sci J. 2000; 19:375–381. [PubMed: 11293890]
9. Ball T, Wright A. Health care cost of formula-feeding in the first year of life. Pediatrics. 1999; 103:870–876. [PubMed: 10103324]
10. Furberg H, Newman B, Moorman P, Millikan R. Lactation and breast cancer risk. Int J Epidemiol. 1999; 28:396–402. [PubMed: 10405840]
11. Jernström H, Lubinski J, Lynch H, et al. Breast-feeding and the risk of breast cancer in BRCA1 and BRCA2 mutation carriers. J Natl Cancer Inst. 2004; 96:1094–1098. [PubMed: 15265971]
12. Shema L, Ore L, Ben-Shachar M, Haj M, Linn S. The association between breastfeeding and breast cancer occurrence among Israeli Jewish women: a case control study. J Cancer Res Clin Oncol. 2007; 133:539–546. [PubMed: 17453241]
13. Greggi S, Parazzini F, Paratore MP, et al. Risk factors for ovarian cancer in central Italy. Gynecol Oncol. 2000; 79:50–54. [PubMed: 11006030]
14. Danforth KN, Tworoger SS, Hecht JL, Rosner BA, Colditz GA, Hankinson SE. Breastfeeding and risk of ovarian cancer in two prospective cohorts. Cancer Causes Control. 2007; 18:517–523. [PubMed: 17450440]
15. United State Breastfeeding Committee. Economic Benefits of Breastfeeding *[issue paper]*. Raleigh, NC: United States Breastfeeding Committee; 2002.

16. Chapman DJ, Escamilla R. Identification of risk factors for delayed onset of lactation. J Am Diet Assoc. 1999; 99:450–453. [PubMed: 10207398]
17. Hogan SE. Overcoming barriers to breastfeeding: suggested breastfeeding promotion programs for communities in eastern Nova Scotia. Can J Public Health. 2001; 92:105–108. [PubMed: 11338146]
18. Centers for Disease Control and Prevention. Racial and Socioeconomic Disparities in Breastfeeding—United States, 2004 [serial online]. MMWR Morb Mortal Wkly Rep. 2006; 55:335–339. [Accessed February 25, 2006] [PubMed: 16572102]
19. Batal M, Boulghaurjian C. Breastfeeding initiation and duration in Lebanon: are the hospitals "mother friendly.". J Pediatr Nurs. 2005; 20:53–59. [PubMed: 15834361]
20. Pérez-Escamilla R, Maulen-Radovan I, Dewey K. The association between cesarean delivery and breast-feeding outcomes among Mexican women. Am J Public Health. 1996; 86:832–836. [PubMed: 8659658]
21. Theofilogiannakou M, Skouroliakou M, Gounaris A, Panagiotakos D, Markantonis S. Breast-feeding in Athens, Greece: factors associated with its initiation and duration. J Pediatr Gastroenterol Nutr. 2006; 43:379–384. [PubMed: 16954963]
22. Cakmak H, Kuguoglu S. Comparison of the breastfeeding patterns of mothers who delivered their babies per vagina and via cesarean section: an observational study using the LATCH breastfeeding charting system. Int J Nurs Stud. 2007; 44:1128–1137. [PubMed: 16839557]
23. Chertok IR, Shoham-Vardi I, Hallak M. Four-month breastfeeding duration in postcesarean women of different cultures in the Israeli Negev. J Perinat Neonat Nurs. 2004; 18:145–160.
24. Chertok IR. Breastfeeding initiation among post-caesarean women of the Negev, Israel. Br J Nurs. 2006; 15:205–208. [PubMed: 16603986]
25. Cárdenas R. Complicaciones asociadas a la cesárea: la importancia de un uso módicamente justificado. Gac Med Mex. 2002; 138:357–361. [PubMed: 12200880]
26. Vázquez J. El impacto de los partos por cesárea sobre la fecundidad en Puerto Rico. P R Health Sci J. 1990; 9:60–73.
27. Liu S, Heaman M, Joseph K, et al. Risk of maternal postpartum read-mission associated with mode of delivery. Obstet Gynecol. 2005; 105:836–842. [PubMed: 15802414]
28. Liu S, Heaman M, Kramer M, Demissie K, Wu S, Marcoux S. Length of hospital stay, obstetric conditions at childbirth, and maternal read-mission: a population-based cohort study. Am J Obstet Gynecol. 2002; 187:681–687. [PubMed: 12237648]
29. Lydon-Rochelle M, Holt V, Martin D, Easterling T. Association between method of delivery and maternal rehospitalization. JAMA. 2000; 283:2411–2416. [PubMed: 10815084]
30. Vázquez J. Cesarean childbirth in Puerto Rico: the facts. P R Health Sci J. 1997; 16:395–400. [PubMed: 9547831]
31. Hamilton B, Martin J, Ventura S, Sutton P, Menacker F. Births: preliminary data for 1996. Mon Vital Stat Rep. 1996; 46:1–40.
32. Hamilton B, Martin J, Ventura S, Sutton P, Menacker F. Births: preliminary data for 2004. Natl Vital Stat Rep. 2005; 54:1–17.
33. Villar J, Valladares E, Wojdyla D, et al. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. Lancet. 2006; 367:1819–1829. [PubMed: 16753484]
34. Betrán A, Merialdi M, Lauer J, et al. Rates of caesarean section: analysis of global, regional and national estimates. Paediatr Perinat Epidemiol. 2007; 21:98–113. [PubMed: 17302638]
35. Centers for Disease Control and Prevention. Rates of cesarean delivery among Puerto Rican women: Puerto Rico and the US Mainland 1992–2002 [serial online]. MMWR Morb Mortal Wkly Rep. 2006; 55:68–71. [Accessed March 15, 2006] 16437056]http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5503a2.htm. [PubMed: 16437056]
36. Departamento de Salud de Puerto Rico. Informe de Estadísticas Vitales: Nacimientos por el método de parto. Secretaría Auxiliar de Planificación y Desarrollo; 1994–2004.
37. Vázquez Calzada JL, Velasco E, Moralez Z, Ramirez de Arellano AB. Cesarean childbirth in Puerto Rico: a world record. P R Health Sci J. 1983; 2:59–64.

38. US Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington, DC: US Government Printing Office; 2000.
39. Dávila, AL., Ramos, G., Mattei, H. Mujeres de 15 a 49 años que tuvieron su ultimo hijo(a) nacido(a) vivo(a) a partir del I de enero de 1990. Universidad de Puerto Rico. Recinto de Ciencias Médicas. Escuela Graduada de Salud Pública; 1998. Encuesta de Salud Reproductiva: Puerto Rico 1995–1996.
40. Williams K, Galerneau F. Intrapartum influences on cesarean delivery in multiple gestation. Acta Obstet Gynecol Scand. 2003; 82:241–245. [PubMed: 12694120]
41. Nkyekyer K. Twin and singleton births in Ghana—a case control study. Twin Res. 2002; 5:265–269. [PubMed: 12217231]
42. Rosner, B. Fundamentals of Biostatistics. 5th ed. Pacific Grove, CA: Duxbury Press; 2000.
43. Kleinbaun, D., Kupper, L., Muller, K., Nizam, A. Applied Regression Analysis and Other Multivariable Methods. 3rd ed. Pacific Grove, CA: Duxbury Press; 1998.
44. Parilla AM, Gorrín P. Aspectos éticos en la promoción de la lactancia humana y el amamantamiento. P R Health Sci J. 2000; 19:145–151. [PubMed: 10909710]
45. Angeja A, Washington A, Vargas J, Gomez R, Rojas I, Caughey A. Chilean women's preference regarding mode of delivery: which do they prefer and why? BJOG. 2006; 113:1253–1258. [PubMed: 17014679]
46. Nerum H, Halvorsen L, Sorlie T, Oian P. Maternal request for cesarean section due to fear of birth: can it be changed through crisis-oriented counseling? Birth. 2006; 33:221–228. [PubMed: 16948722]
47. Schindl M, Birner P, Reingrabner M, Joura E, Husslein P, Lanter M. Elective cesarean section vs. spontaneous delivery: a comparative study of birth experience. Acta Obstet Gynecol Scand. 2003; 82:834–840. [PubMed: 12911445]
48. National Center for Health Statistics. Healthy People 2000 Final Review. Hyatsville, MD: Public Health Service; 2001.
49. Dewey KG, Nommsen-Rivers LA, Heining J, Cohen RJ. Risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss. Pediatrics. 2003; 112:607–619. [PubMed: 12949292]
50. Parilla, AM. Guía Práctica para una lactancia exitosa. Qué leyes en Puerto Rico protegen mi derecho a lactar a mi bebé?. San Juan, PR: Editorial de la UPR; 2006.
51. Kruse L, Denk CH, Feldman L, Mojta F. Comparing sociodemo-graphic and hospital influences on breastfeeding initiation. Birth. 2005; 32:81–85. [PubMed: 15918863]
52. Becerra JE, Smith JC. Breastfeeding patterns in Puerto Rico. Am J Public Health. 1990; 80:694–697. [PubMed: 2343952]
53. Awi DD, Alikor EA. Barriers to timely initiation of breastfeeding among mothers of healthy full-term babies who deliver at the University of Port Harcourt Teaching Hospital. Niger J Clin Pract. 2006; 9:57–64. [PubMed: 16986292]
54. Deshpande A, Gazmararian J. Breast-feeding education and support: association with the decision to breast-feed. Eff Clin Pract. 2000; 3:116–122. [PubMed: 11182959]
55. Ryan AS, Zhou W. Lower breastfeeding rates persist among the Special Supplemental Nutrition Program for Women, Infants, and Children participants, 1978–2003. Pediatrics. 2006; 117:1136–1146. [PubMed: 16585308]
56. UNICEF. Baby Friendly Hospital Initiative USA. 2006http://www.babyfriendlyusa.org/eng/03.html.
57. Blyth R, Creedy D, Dennis C, et al. Breastfeeding duration in an Australian population: the influence of modifiable antenatal factors. J Hum Lact. 2004; 20:30–37. [PubMed: 14974698]
58. Scott J, Landers M, Hughes R, Binns C. Factors associated with breastfeeding at discharge and duration of breastfeeding. J Paediatr Child Health. 2001; 37:254–261. [PubMed: 11468040]
59. Witters R. Increasing breastfeeding rates in working mothers. Fam Syst Health. 2003; 21:415–434.
60. Ito S, Koren G, Einarson T. Maternal noncompliance with antibiotics during breastfeeding. Ann Pharmacother. 1993; 27:40–42. [PubMed: 8431618]

61. Volmanen P, Valanne J, Alahuhta S. Breast-feeding problems after epidural analgesia for labor: a retrospective cohort study of pain, obstetrical procedures and breast-feeding practices. Int J Obstet Anesth. 2004; 13:25–29. [PubMed: 15321436]

62. Dulon M, Kersting M, Schach S. Duration of breastfeeding and associated factors in western and eastern Germany. Acta Paediatr. 2001; 90:931–935. [PubMed: 11529545]

63. Waldenström U, Aarts C. Duration of breastfeeding and breastfeeding problems in relation to length of postpartum stay: a longitudinal cohort study of a national Swedish sample. Acta Pediatr. 2004; 93:669–676.

64. Raj VK, Plichta SB. The role of social support in breastfeeding promotion: a literature review. J Hum Lact. 1998; 14:41–45. [PubMed: 9543958]

65. Gupta A. Promoting and supporting breastfeeding for optimal nutrition during infancy. J Indian Med Assoc. 2000; 98:543–547. [PubMed: 11291788]

66. Pérez Escamilla R. Evidence based breast-feeding promotion: the Baby Friendly Hospital Initiative. J Nutr. 2007; 137:484–487. [PubMed: 17237332]

67. Rivera-Lugo M, Parilla AM, Dávila R, Albizu C, Ríos R. Full breastfeeding during the postpartum hospitalization and mother's report regarding Baby Friendly practices. Breastfeed Med. 2007; 2:19–26. [PubMed: 17661616]

68. Parrilla AM, Capriles JA. Public policy for the promotion of maternal lactation in hospitals. P R Health Sci J. 2000; 19:259–262. [PubMed: 11076372]

Table 1

Frequency Distribution of Selected Characteristics of Puerto Rican Women Aged 15 to 49 Years Who Had Their Last Healthy Singleton Child Between 1990 and 1996 (N= 1695)[a,b]

Characteristics	n (%)
Birth type	
Cesarean section	598 (35.3)
Vaginal birth	1097 (64.7)
Breastfeeding initiation[i]	
Yes	1096 (64.7)
No	598 (35.3)
Age, y	
15–24	496 (29.3)
25–34	903 (53.3)
≥ 35	296 (17.5)
Mean age, y (28.3 ± 6.3)	
Educational attainment	
0–8 school years	223 (13.2)
9–11 school years	253 (14.9)
12 years or equivalency of high school diploma	528 (31.2)
Associate degree/some university without diploma	420 (24.8)
Baccalaureate/postgraduate	271 (16.0)
Marital status	
Married	1040 (61.4)
Living with a partner	353 (20.8)
Without a partner	302 (17.8)
Work status	
Employed	576 (34.0)
Unemployed	1119 (66.0)
WIC participation during pregnancy[ii]	
Yes	1335 (78.9)
No	358(21.1)
Mother preferred cesarean	
Yes	186 (11.0)
No	1509(89.0)
Doctor explained reasons for cesarean[ix]	
Yes	534 (89.7)
No	61 (10.3)
Doctor explained consequences of cesarean[viii]	
Yes	345 (58.3)
No	247(41.7)
Breastfeeding persistence[iii]	
Yes	525 (31.0)

Characteristics	n (%)
No	1167 (69.0)
Breastfeeding aid[v]	
Yes	861 (52.3)
No	785 (47.7)
Artificial formula promotion[iv]	
Yes	1320(78.3)
No	366 (21.7)
Artificial formula included[vii],[c]	
Yes	558 (74.5)
No	191 (25.5)
In hospital baby fed without permission[vi]	
Yes	1135 (69.4)
No	501 (30.6)

Abbreviation: WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a] Data from *Reproductive Health Survey: Puerto Rico 1995–1996*.

[b] Number of missing values: [i] n = 1, [ii] n = 2, [iii] n = 3, [iv] n = 9, [v] n = 49, [vi] n = 59, [vii] n= 10, [viii] n = 6, [ix] n = 3.

[c] Only among women whose baby was brought to them for feeding during their hospital stay (n = 759).

Table 2

Association Between Breastfeeding Initiation, Birth Type, and Other Covariates in a Sample of Reproductive Age Puerto Rican Women Who Had Their Last Healthy Singleton Child Between 1990 and 1996 (N = 1695)[a, b]

	Breastfeeding Initiation			
	Yes, n (%)	***No, n (%)***	**χ^2**	**P**
Birth type			4.04	.044*
Vaginal birth	728 (66.4)	368 (33.6)		
Cesarean section	368 (61.5)	230 (38.5)		
Demographics				
Mother's age, y			7.44	.024*
15–24	304(61.3)	192 (38.7)		
25–34	611 (67.7)	292 (32.2)		
≥ 35	181 (61.4)	114 (38.6)		
Mother's education			70.19	.0001*
0–8 school	110 (49.5)	112 (50.5)		
9–11 school	140 (55.3)	113(44.7)		
High school diploma	333 (62.9)	196(37.1)		
Associate degree/some university	294 (70.0)	126 (30.0)		
Baccalaureate/postgraduate	220(81.2)	57(18.8)		
Marital status			36.26	.0001*
Married	730 (70.2)	310 (29.8)		
Living with a partner	192 (54.5)	160 (45.5)		
Without a partner	174(57.6)	128 (42.4)		
Work status			19.68	.0001*
Unemployed	682(61.0)	436 (39.0)		
Employed	414(71.9)	162 (28.1)		
WIC participation during pregnancy[ii]			8.44	.004*
No	255(71.2)	103 (28.8)		
Yes	840 (63.0)	494 (37.0)		
Mother's experiences with cesarean section				
Mother preferred cesarean			3.40	.650
No	987 (65.5)	521 (34.5)		
Yes	109(58.6)	77(41.4)		
Doctor explained reason for cesarean[ix]			1.08	.300
No	34 (55.7)	27 (44.3)		
Yes	334 (62.5)	200 (37.5)		
Doctor explained consequences of cesarean[viii]			0.10	.749
No	150 (60.7)	97 (39.3)		
Yes	214(62.0)	131 (38.0)		

	Breastfeeding Initiation			
	Yes, n (%)	***No, n (%)***	**χ^2**	**P**
Hospital practices				
Breastfeeding persistence[iii]			15.11	< .0001 *
No	719 (61.7)	447 (38.3)		
Yes	375 (71.4)	150(28.6)		
Breastfeeding aid[v]			35.78	< .0001 *
No	456 (58.1)	329 (41.9)		
Yes	621 (72.1)	240 (27.9)		
Artificial formula promotion[iv]			5.17	.023 *
No	218(59.6)	148 (40.4)		
Yes	871(66.0)	449 (34.0)		
Artificial formula included[vii],[c]			1.06	.303
No	140 (73.3)	51 (26.7)		
Yes	387 (69.4)	171 (30.1)		
In hospital baby fed without permission[vi]			1.24	.265
No	315(62.9)	186(37.1)		
Yes	746 (65.7)	389 (34.3)		
Diagnosis during pregnancy				
Diabetes *			0.82	.366
No	1000 (64.5)	40(31.5)		
Yes	87 (68.5)	550 (35.5)		
Hypertension´			3.64	.056
No	959 (65.7)	500 (34.3)		
Yes	130(59.1)	90 (40.9)		
Heart problems"			0.05	.822
No	1056 (64.8)	573 (35.2)		
Yes	31 (63.3)	18(36.7)		
Vaginal/placental bleeding"			0.17	.678
No	978 (64.6)	536 (35.4)		
Yes	108 (66.3)	55 (33.7)		
Anemia´			2.41	.121
No	922 (65.5)	485 (34.5)		
Yes	163 (60.6)	106 (39.4)		

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a] Data from *Reproductive Health Survey: Puerto Rico 1995–1996*.

[b] Number of missing values: [ii] n = 2, [iii] n = 3, [iv] n = 9, " n = 16, ´ n = 17, [x] n = 18, [v] n = 49, [vi] n = 59, [vii] n = 10, [viii] n = 6, [ix] n = 3.

[c] Only among women whose baby was brought to them for feeding during their hospital stay (n = 759).

* Statistically significant values ($P < .05$).

Table 3

Logistic Regression Model for the Predictors of Breastfeeding Initiation in a Sample of Reproductive Age Puerto Rican Women Who Had Their Last Healthy Singleton Child Between 1990 and 1996[a, b]

	Crude OR	95% CI. Min-Max	Adjusted OR	95% CI, Min-Max
Birth type				
Cesarean section	1.00		1.00	
Vaginal birth	0.81	0.66–0.99*	0.64	0.51–0.81*
Age, y				
15–24	1.00		1.00	
25–34	0.76	0.60–0.95*	1.04	0.81–1.35
≥ 35	1.00	0.74–1.34	1.39	1.00–1.95
Education				
0–8 years	1.00		1.00	
9–11 years	0.79	0.55–1.14	0.88	0.60–1.29
High school diploma	0.58	0.42–0.08*	0.67	0.47–0.94*
Associate degree/some university	0.42	0.30–0.59*	0.49	0.34–0.72*
Baccalaureate/postgraduate	0.23	0.15–0.34*	0.29	0.17–0.45*
Marital status				
Married	1.00		1.00	
Living with partner	1.96	1.53–2.52*	1.55	1.18–2.05*
Without a partner	1.73	1.33–2.26*	1.45	1.09–1.92*
Work status				
Unemployed	1.00		1.00	
Employed	1.63	1.31–2.03*	1.15	0.89–1.48
WIC participation during pregnancy[ii]				
No	1.00		1.00	
Yes	0.69	0.53–0.89*	1.03	0.76–1.39
Breastfeeding persistence[iii]				
No	1.00		1.00	
Yes	1.55	1.24–1.94*	1.47	1.15–1.88*
Breastfeeding aid[v]				
No	1.00		1.00	
Yes	1.87	1.52–2.29*	1.41	1.12–1.77*
Artificial formula promotion[iv]				
No	1.00		1.00	
Yes	1.32	1.04–1.67*	1.18	0.91–1.53

OR, odds ratio; CI, confidence interval; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a] Data from *Reproductive Health Study: Puerto Rico 1995–1996*.

[b] Number of missing values: [ii] n = 2, [iii] n = 3, [iv] n = 9, [v] n = 49.

*Statistically significant values ($P < .05$).