Asteroid Publishers

Current Trends in Advanced Nursing

Titus-Glover
Research Article
Volume 2 : Issue 1

Received Date: 19 July, 2020
Accepted Date: 09 November, 2020
Published Date: 13 November, 2020

# Prepregnancy Body Mass Index Does Not Predict Early Breastfeeding Termination among Low-Income Women: A Secondary Analysis

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**Citation:** Titus-Glover D, Rodan M, Pawloski L, Nettey CE (2020) Prepregnancy Body Mass Index Does Not Predict Early Breastfeeding Termination among Low-Income Women: A Secondary Analysis. Curr Trends Adv Nurs 2: 004.CTAN-003.000004.

## Abstract

**Background:** The experience of breastfeeding is challenging for women who were overweight or obese before pregnancy or with high prepregnancy body mass index (BMI). Multiple studies reveal an inverse relationship between above normal BMI, (≥25) and early termination of breastfeeding. The evidence among low-income women with high prepregnancy BMI is inconclusive and studies are limited. Therefore, the primary purpose of this study was to explore the extent to which prepregnancy BMI is associated with early breastfeeding termination among low-income women, as well as, explore what maternal characteristics best predict early termination at four weeks postpartum.

**Methods:** A secondary analysis was conducted of a sample of low-income women (n=434), derived from a combined dataset of two studies: The Nurses' Intervention Project, a randomized control trial; and, the Infant Feeding Practices Study II, a longitudinal survey. The two studies had similar objectives focused on infant nutrition and breastfeeding, demographic variables and characteristics, and postpartum data collection points that justified combination. In this current study, data were explored with univariate, bivariate and logistic regression analysis.

**Results:** Initial testing showed prepregnancy BMI was not significantly associated with early termination of breastfeeding in this sample and was therefore not selected for multivariate testing. The data revealed that previous breastfeeding experience was the best predictor of continued breastfeeding after multivariate testing (OR 6.15, 95% CI [2.59, 14.62], p=.001). Other factors such as age, support, parity, and race were predictive of breastfeeding continuation, after controlling for covariates, consistent with the literature.

**Conclusions:** Our findings suggest that experienced low-income women with high prepregnancy BMI have the best chance of sustaining breastfeeding past 4 weeks and should therefore be engaged in breastfeeding promotion strategies. Additional research is needed to determine whether prepregnancy BMI stratified by race/ethnicity affects breastfeeding performance.

**Keywords**: Prepregnancy body mass index; Breastfeeding termination; Breastfeeding duration; Previous breastfeeding experience; Low-income women.

## Introduction

Numerous studies have documented the positive benefits of breast milk for both mothers and babies [1-3]. Breast milk has protective and immunological properties that prepare babies immediately after birth and well into adulthood [4]. The American Academy of Pediatrics (AAP) [5], the World Health Organization (WHO) [6], the Centers for Disease Control and Prevention (CDC) [7] and the Institute of Medicine (IOM) [8], recommend mothers breastfeed exclusively for at least six months and continue breastfeeding, complemented with solid foods for a minimum of one to two years to reap the full benefits of breastfeeding [5,9,10]. Breastfeeding reduces the risks of ovarian and breast cancer, type II diabetes, rheumatoid arthritis, and cardiovascular disease [5,11]. Mothers who breastfeed realize an earlier return of the uterus to normal size, decreased postpartum bleeding, regressed uterine fibroids [12], decreased rates of depression [5,12-14], and some evidence suggests increased bonding with their babies [15,16]. Breastfeeding is cost-effective compared to formula feeding, and provides health-related savings to Medicaid [17-20]. Exclusive breastfeeding provides benefits even if babies are fed for a few days [5,21]. Hence, it is critical that healthcare professionals promote and support continued breastfeeding as a natural choice of nutrition for infants [22,23].

Significant evidence has shown that breastfeeding is challenging for women who were overweight or obese prior to pregnancy [24-27]. Women with prepregnancy body mass index (BMI≥25 are more likely to terminate breastfeeding practices earlier than women with normal BMI in the United States, Europe, and Australia [24-33]. The WHO (1995) [34], defines excess weight gain, or maternal obesity, as maternal prepregnancy BMI (derived by formula from prepregnancy weight in kilograms (kg) divided by the square of the height in meters ($kg/m^2$). Overweight is defined as a BM≥25, and obese, as BMI≥30 [34-36]. Multiple studies have concluded that a dose-response relationship exists between prepregnancy BMI and breastfeeding outcomes [23-26], Hilson et al. [33], concluded overweight and obese women were more likely to terminate breastfeeding within the first week and less likely to be breastfeeding at discharge (OR 3.63, p<0.01; OR 3.12, p<0.01). Approximately 18% of overweight women and 37% of obese women stopped breastfeeding 14-60 days postpartum, after adjusting for known covariates such as parity, length of gestation, birth weight, mother's age, and highest-grade level attained in this study [32,33]. Further, increasing obesity categories appear to progressively intensify breastfeeding cessation from weeks one through twenty, based on WHO classification: Class I (30-34.9), II (35-39.9), and III (≥40) [30,32,37,38].

The results of most of the studies concerning prepregnancy overweight/obesity and breastfeeding cessation were not generalizable to all races/ethnicities and socioeconomic status because the populations studied were mostly White, of high socioeconomic status, and geographically spread out across urban and rural areas. Studies of prepregnancy BMI have had mixed results by race and ethnicity [28,39-42]. While obese Hispanic women were linked to early termination of breastfeeding, no association was found among Blacks [42], even where stratified by income [43]. Kitsantas et al. [43], showed the odds of not breastfeeding past two and four months were highest for low-income overweight and obese Black women, compared to women of higher socioeconomic levels. Approximately 20% of low-income women stopped breastfeeding within 4 weeks [43,44]. While findings suggest that medical complications contribute to early breastfeeding termination among women with high prepregnancy BMI, Kitsantas & Pawloski [45], found overweight/obese women without medical complications, notwithstanding, carried an 11% increased risk of early termination compared to normal BMI.

Most of the literature shows that breastfeeding termination among overweight and obese women are multi-factorial, and include biological factors such as delays in prolactin hormone release [46-48], and a reduced milk supply [48]. Medically, cesarean deliveries and poor neonatal birth outcomes also contribute to a lack of breastfeeding [31,49,50]. Physiologically, large breasts become problematic for the baby to latch properly [51] and a small number of studies have reported that obese women are also not comfortable with their body image and are reluctant to nurse in public [52,53]. Additional challenges, such as, poor socio-economic status [45], mental health [54] and intention to breastfeed [29,54-56], negatively impact lactation performance. However, much of this literature lacks evidence in diverse and low-income populations.

Prepregnancy BMI impacts gestational weight gain, for which the Institute of Medicine (IOM) has recommended guidelines to reduce risk factors [57]. Overweight and obesity have been linked to other adverse maternal and neonatal outcomes including, infertility, cesarean delivery, and macrosoma risks [31,50,58,59]. Increasing prevalence of overweight and obesity is evident in pregnancy data [36,60-63]. The 2013 Prepregnancy Risk Assessment Monitoring System (PRAMS) data showed obesity prevalence rates at 22.6% in 2009, compared to 21.9% in 2004 and 17.6% in 2003 [64-66].

In general, regarding overweight and obesity, there is cause for concern as recent data from the National Center for Health Statistics (NCHS) showed overweight and obesity prevalence of more than 50% among 47 states and the District of Columbia [63] and disparities by race/ethnicity [36]. Blacks were more likely to be obese (34.7%) compared to Hispanics (27.3%) and Whites (22.7%) [63]. The differential prepregnancy overweight/obesity prevalence rates and related co-morbidities, when coupled with adverse breastfeeding outcomes, signals the loss of potential benefits for improving maternal and child health, posing a singular challenge to meeting Healthy People 2020 goals which aim for 81.9% for infants ever breastfed and 60.1% target for continued breastfeeding for at least 6 months [65,67,68].

Thus, while much of the literature reveals there is a relationship between early breastfeeding termination and high BMI, what is lacking is a deeper knowledge of what additional factors impact such a relationship particularly among low-income women. This study evaluates the hypothesis that there is a relationship between prepregnancy BMI, and early breastfeeding termination among low-income mothers. Therefore, the primary purpose of this paper is to explore the extent to which prepregnancy BMI is associated with early breastfeeding termination at 4 weeks among low-income women as well as explore what mother's characteristics best predict early termination. To examine these relationships, we use the conceptual framework, the Life Course

Health Development (LCHD) model, to test the interrelationships among variables. The LCHD model [69], describes the balancing effects of increased and reduced risk factors and protective strategies that uniquely support individual health trajectories.

The specific research questions in this secondary analysis include:

1. What is the relationship between prepregnancy BMI and early breastfeeding termination at 4 weeks postpartum among low-income women?
2. Which characteristics of the mother (e.g. age, race, experience, BMI, parity and socio-economic status) are the best predictors of early breastfeeding termination at 4 weeks postpartum among low-income women?

## Methods

A secondary analysis was conducted using combined data from two studies, Infant Feeding Practices Study II (IFPS II) and the Nurses' Intervention Project [70,71]. Data sources have Institutional Review Board (IRB) approval on record. A full IRB approval was sought for this secondary analysis. The Nurses' Study and IFPS II were combined (Diagram 1) as one dataset for secondary analysis. Questions were matched for similar descriptions and recoded to create operational definitions. For example, Special Supplemental Nutrition Program for Women, Infants and Children (WIC) eligibility was defined as low income, between 100% to 185% below the poverty level (United States Department of Agriculture). WIC participation was operationalized by dichotomous responses to WIC enrollment and coded as "WIC" (1=WIC participation and 0=No WIC participation.) The item was used as inclusion criteria for the study sample. In the Nurses' Study, we identified from hospital medical summary the question: WIC enrolled? Yes, or No. In the Nurses' Study, WIC enrollment was inclusion criteria, determined from reported financial information [71]. In the IFPS II Neonatal questionnaire, we identified Question N3A: Mother enrolled in WIC in past month? Yes, or No. If yes, mother was eligible for study. The entire sample was enrolled in the WIC program.

| Sample size | Nurses' Study | Infant Feeding Practices Study II |
|---|---|---|
| Original studies | 328 | 4902 |
| WIC enrollees selected for current study | 328 | 988 |
| Initial combined sample (N=1316) | | |
| Final combined sample for current study (after applying eligibility criteria) **n=434** | | |

**Diagram 1:** Sample size of original and current studies.

## Description of original studies

**Infant Feeding Practices Study II:** The IFPS II is a widely used dataset from a national consumer panel of 500,000 households with pregnant women from across the US. While the initial study, IFPS I, focused on infant feeding from 1992-1993, IFPS II was conducted as a longitudinal survey of pregnant women from the third prenatal trimester to the postpartum first year of infant life from 2005-2007 [70]. The survey was aimed at understanding nutritional activities and practices of mothers and their infants [70]. The inclusion criteria included: women ≥18 years; women and infants with no medical and feeding complications at birth; singleton birth of at least five pounds; gestational age >35 weeks; and infants with a NICU stay less than three days [70]. Exclusion criteria included: women who experienced disruptions in mail delivery from the US Postal Service as a result of the 2005 Gulf Coast hurricane, and women/infants with previous illnesses or who developed long-term health problems.

In this dataset, the sample (n=4902) of respondents were: mostly White (84%), compared to Blacks (5%) and other races (10%); married (80%); college educated (79%); reported high incomes (42%); employed (60%); reported not smoking (90%), and were more likely to have multiple children prior to the index pregnancy (70%). Approximately half were 25 to 34 years, a third, 18 to 24 years (33%), and the rest 35 to 43 years (12%). Geographically, participants were recruited from the West to the Northeastern parts of the US, with more representation (33%) from the South. Data were collected through questionnaires and telephone interviews during the third prenatal trimester and up to 12 months postpartum on variables that include infant/family dietary intake, type of delivery, employment status, breastfeeding experiences, and WIC participation [70]. Questionnaires were mailed to women over a period of 18 months from May 2005-June 2007. Fein et al. [70], reported the prospective study design, high response rate (> 60%), large sample size, detailed content, and the use of pilot-tested questionnaires as strengths of the study. Limitations included lack of generalizability from a large sample of women of higher socioeconomic backgrounds.

**Nurses' Intervention Project:** In the Nurses' Intervention Project (Nurses' Study), a randomized clinical trial was conducted to assess breastfeeding rates at 6, 12 and 24 weeks and to determine the effects of a community-based breastfeeding intervention from 2005-2007 [71]. In this dataset, the sample (n=328) were predominantly Black (87%), compared to Whites (5%); young, 13-17 (10%), 18-24 (59%) and 25-43 years (31%); first time mothers (51%); single (80%); some college education (37%); employed (42%), and in school while employed (22%). Mother-infant dyads were recruited after childbirth from two large urban hospitals, in Baltimore and were randomized into an intervention (n=168) and control group (n=160) [71]. Inclusion criteria were as follows: infant ≥37 weeks' gestation; intention to breastfeed; English-speaking abilities; WIC-eligibility at enrollment; telephone access; and, residence ≤ 25 miles of birthing hospital. Multiple births, babies with medical diagnosis, admission to intensive care at birth, and mother/baby with positive drug test were excluded from the study [71]. Exclusive breastfeeding was not established as most infants received formula milk in the hospital after delivery.

The intervention was delivered by nurse/peer counselor teams, called the Breastfeeding Support Team (BST). The BST delivered a 24-week structured home visitation program with skilled nursing and peer counselor visits; and, telephone consultations, particularly intense during the first 4 weeks. Demographics and longitudinal breastfeeding data were collected; breastfeeding status was self-reported and the date for "stopped breastfeeding" or the "last date of contact" was recorded. The usual care group received breastfeeding instructions prior to hospital discharge, 24-hour access to lactation consultants and scheduled postpartum visit with regular obstetricians [71]. Outcomes revealed more women breastfeeding (66.7%) in the intervention group, compared to the usual care group (56.9%) at 6 weeks postpartum (OR 1.17, 95% CI, [1.07-2.76]). Limitations in the study included sampling only English-speaking women and assigning data collection to the support team. Pugh et al. [20], concluded that the intensity of the intervention during early postpartum contributed to high breastfeeding rates and recommended early promotion/support in the first few weeks of breastfeeding prior to return to work, school, or other significant changes.

## Study design

**Definition of main variables:** The dependent variable, "early breastfeeding termination," was defined as the outcome of any breastfeeding at one month or 4 weeks of infant life and also referred to as breastfeeding duration, or early cessation of breastfeeding. The IOM [72], definition of BMI (normal, 18.5-24.9; overweight, 25.0-29.9; obese, ≥30) was adapted for this study and regrouped as: normal, 18.5-24.9, and above normal 25.0-43.30, as a result of an operational decision to reduce the impact of outliers (13.91 and 73.60, M-27.93, SD=7.30). BMI is calculated by: weight in kilograms divided by the square of the height in meters ($kg/m^2$).

**Overview of combined sample:** Postpartum women were identified as the target population. The inclusion criteria included: 1. WIC enrollees and recipients; 2. Mothers with prepregnancy BMI ranging from 18.50 to 43.3; 3. Women, ≥18 years; 4. Black or White race; 5. Mothers of infants born at ≥37 weeks gestation; and, 6. Mothers of infants weighing ≥2500 grams, were eligible for the study. The exclusion criteria applied to any cases in the merged sample that did not meet the eligibility requirements. The final sample (n=434) was inclusive of all the criteria. Given the sample size and proportions of overweight/obese women (25.00 $kg/m^2$ and above) in the IFPS II and Nurses' Study (29.6% and 27.6%), respectively and based on previous studies, power was calculated at 80% and alpha set at 0.05 [73]. Medium overall effects were obtained for obese and overweight women who were more likely to terminate breastfeeding early.

**Statistical analysis:** The study conducted univariate, bivariate, and multivariate statistical analyses. Descriptive statistics including frequencies, means and standard deviations, were performed for the entire sample and for demographic, pregnancy and breastfeeding characteristics, health belief, and infant characteristics variables such as: age, BMI, education, race, marital status, employment, smoking, previous breastfeeding experience, parity, infant gender, gestational age, and birth weight. Chi-square tests and Student's t-tests were conducted for bivariate analysis to test associations among the independent variable and breastfeeding termination. Correlations were performed to measure the degree of relationships among the independent variables and reported as a Pearson's correlation coefficient (r). Logistic regression was computed using the enter selection method in the final multivariate testing to evaluate the relationship between the dependent variable and independent variable, while controlling for covariates. Goodness-of-fit tests, including the Homer and Lemeshow test, a generalized coefficient of determination (R-square), and an adjusted generalized coefficient of determination (adj R-square) were calculated to test the model. One-tailed tests were used to test differences. Univariate, bivariate, and multivariate analyses were performed using SPSS [1], software. A probability of $p<.05$ was considered to indicate statistical significance for all tests.

### Rationale for merging IFPS and Nurses' Study

A careful examination of the methodology of the two studies revealed similarities that informed the decision to merge the data sets. The two studies were conducted during similar time periods, approximately two years apart: 2003 to 2005 (Nurses' Study); and May 2005 to June 2007 (IFPS II). Primarily, the studies were parallel in objectives, content, and context. Both the Nurses' Study and IFPS II datasets focused on key topic areas such as infant nutrition and breastfeeding; prenatal and immediate postpartum data collection points; and a study design comprised of questionnaires and telephone interviews that helped to match datasets. Prenatal and postpartum demographic variables and infant characteristics were comparable in the two studies. For example, WIC enrollment, education, race, type of delivery, previous breastfeeding history and infant birth weight were identical variables in both datasets.

The racial composition of women in the IFPS II was mostly White, while the sample in the Nurses' Study were predominantly Black women. Merging the two datasets provided a unique sample of Black and White low-income women, a representation not found in other studies to advance the body of knowledge among low-income women of different races. While there was evidence of the association of BMI and breastfeeding among White women, a clear link had not been conclusively established among Black women, making this study important. A study sample with such mixed representation would advance the evidence for disparity-related interventions. A combined dataset increases our understanding of relationships by race among prepregnancy BMI, and early termination of breastfeeding.

## Analysis

**Sample Characteristics (Table 1):** The sample (n=434) included all WIC enrollees for whom data were available for computing BMI, and who had a record of early breastfeeding outcomes (stopped or continued) at 4 weeks. Univariate analysis revealed that overall, the sample was comprised of women from ages 18 to 43 years, White (62.9%) compared to Blacks (37.1%), overweight and obese, (58.3%), multiparous (57.4%), and with previous experience in breastfeeding (48.6%). By week four, about one-third (28.8%) of the women had stopped breastfeeding early, while most (71.2%) continued breastfeeding (Table 1). Infant gestational ages and birth weight (not reported in table) met the inclusion criteria between 37-44 weeks (average gestational age at 39.3 weeks); birth weight 2522-5050 grams, (average weight, 3400 grams). Gender compositions were approximately equal for females (47%) and males (53%). Among this sample (n=434), 18% of women from the Nurses' Study were exposed to an intervention from a breastfeeding support team and which was controlled for in this study.

| **Sample Characteristics** | ***Mean (M) ± Standard Deviation (SD)** | **n=434 (100%)** |
|---|---|---|
| **<u>Demographics</u>** | | |
| Age (years) | 25.0 ± (5.60) | |
| Range (18-43) | | 206 (47.5%) |
| 18-23 | | 228 (52.5%) |
| 24+ | | |
| Body Mass Index (kg/m²) | 27.3 ± (5.76) | |
| Range (>=18.50 - 43.30) | | |
| Normal (18.50 - 24.99 | | 181 (41.7%) |
| Above normal (25.00 - 43.30) | | 253 (58.3%) |
| Race | | |
| White | | 273 (62.9%) |
| Black | | 161 (37.1 %) |
| Education (n=414) | | |
| High school and less | | 182 (41.9%) |
| College (any) | | 232 (53.5%) |
| Unknown | | 20 (4.6%) |
| Marital status (n=414) | | |
| Single | | 225 (51.8%) |
| Married | | 189 (55.1%) |
| Unknown | | 20 (4.6%) |
| Employment (n=419) | | |
| Yes | | 180 (41.5%) |
| No | | 239 (55.1%) |
| Unknown | | 15 (3.4%) |
| **<u>Pregnancy characteristics</u>** | | |
| Delivery type | | |
| Vaginal | | 336 (77.4%) |
| Cesarean section | | 98 (22.6%) |
| Parity (number of children) | | |
| 1 | | 185 (42.6%) |
| 2+ | | 249 (57.4%) |

| | |
|---|---|
| **Smoking status** | |
| Currently smoking | 44 (10.1%) |
| Yes | 390 (89.9%) |
| No | |
| **Breastfeeding characteristics** | |
| Breastfeeding experience | |
| Yes | 211 (48.6%) |
| No | 223 (51.4%) |
| Early breastfeeding termination | |
| Stopped breastfeeding at 4 weeks | 125 (28.8%) |
| Continued breastfeeding at 4 weeks | 309 (71.2%) |
| BST intervention | |
| Yes | 78 (18%) |
| No | 356 (82%) |

**Table 1:** Sample characteristics.

**Bivariate and multivariate analysis:** Eleven demographic and maternal/infant characteristics were analyzed for associations with the dependent variable (Table 2). All variables were introduced for multivariate testing in the final model for characteristics of early breastfeeding termination. BMI was not selected and advanced for testing.

| Variables | Stopped Breastfeeding (n=125) | Continued Breastfeeding (n=309) | Df (degrees of freedom) | $\chi^2$ (chi-square) | p-value |
|---|---|---|---|---|---|
| **Demographics**<br>Age (years)<br>18-23<br>24+ | <br>125<br>76 (60.8%)<br>49 (39.2%) | <br>309<br>130 (42.1%)<br>179 (57.9%) | 1 | 11.78 | **0.01** |
| BMI (kg/m²)<br>Normal (18.50-24.99)<br>Above normal (25.00-43.30) (Overweight/obese) | 125<br>50 (40.0%)<br>75 (60.0%) | 309<br>131 (42.4%)<br>178 (57.6%) | 1 | 0.12 | 0.73 |
| Race<br>Black<br>White | 125<br>30 (24.0%)<br>95(76.0%) | 309<br>131 (42.4%)<br>178 (57.6%) | 1 | 12.13 | **0.01** |
| Education<br>High school and less<br>College (any) | 116<br>59 (50.9%)<br>57 (49.1%) | 298<br>123 (41.3%)<br>175 (58.7%) | 1 | 2.74 | 0.10 |
| Marital status<br>Married<br>Single | 116<br>53 (45.7%)<br>63 (54.3%) | 298<br>136 (45.6%)<br>162 (54.4%) | 1 | 0.00 | 1.00 |
| Employment<br>Yes<br>No | 118<br>49 (41.5%)<br>69 (58.5%) | 301<br>131 (43.5%)<br>170 (56.5%) | 1 | 0.07 | 0.79 |

| | | | | | |
|---|---|---|---|---|---|
| **Pregnancy characteristics**<br>Delivery type<br>Cesarean section<br>Vaginal delivery | <br>125<br>24 (19.2%)<br>101 (80.8%) | <br>309<br>74 (23.9%)<br>235 (76.1%) | 1 | 0.89 | 0.35 |
| Parity (number of children)<br>1<br>2 + | 125<br>69 (55.2%)<br>56 (44.8%) | 309<br>116 (37.5%)<br>193 (62.5%) | 1 | 10.64 | **0.01** |
| **Smoking status**<br>Smoking<br>Yes<br>No | <br>125<br>18 (14.4%)<br>107 (85.6%) | <br>309<br>26 (8.4%)<br>283 (91.6%) | 1 | 2.87 | 0.09 |
| **Breastfeeding characteristics**<br>Breastfeeding experience<br>Yes<br>No | <br>125<br>39 (31.2%)<br>86 (68.8%) | <br>309<br>172 (55.7%)<br>137 (44.3%) | 1 | 20.35 | **0.01** |
| BST intervention<br>Yes<br>No | 125<br>8 (6.4%)<br>117 (93.6%) | 309<br>70 (22.7%)<br>239 (77.3%) | 1 | 14.87 | **.001** |
| **Infant characteristics**<br>Infant gender<br>Male<br>Female | <br>125<br>56 (44.8%)<br>69 (55.2%) | <br>307<br>173 (56.4%)<br>134 (43.6%) | 1 | 4.31 | **0.04** |

**Table 2:** Bivariate Analysis of Study Variables by Early Termination.

**Results**

Bivariate results (Table 2) showed five variables: maternal age, race, parity, previous breastfeeding experience and BST intervention were significantly associated with early breastfeeding termination ($p<.05$) but not prepregnancy BMI ($p=.73$). An independent t-test did not yield statistical significance among main study variables. Additional cross-tabulation analysis of BMI with all study variables found significant associations among three variables: age ($\chi^2$ (1) = 4.26, p=.04), delivery type ($\chi^2$ (1) =9.69, p=.01) and parity, ($\chi^2$ (1) =4.15, p=.04). Multivariate results of regression coefficients, using the enter method and after adjusting for covariances, showed breastfeeding experience, BST intervention, age, race, and parity remained strong predictors of early breastfeeding termination at 4 weeks (Table 3). Women with no breastfeeding experience were more likely to stop breastfeeding by 4 weeks (OR 6.15, 95% CI [2.53, 14.62], p=.001); followed by women in the no BST intervention group (OR 3.59, 95% CI [1.45, 8.87], p=.00); and younger women, (OR 2.03, 95% CI [1.13, 3.64], p=.02). Black women were less likely to stop breastfeeding compared to Whites (OR 0.48, 95% CI [0.24, 0.95], as well as, primiparous mothers (OR .39, 95% CI [0.16-0.94].

| | | | | **95% CI, Odds Ratio** | | |
|---|---|---|---|---|---|---|
| **Predictor** | **b (SE)** | **Wald** | **P** | **Odds ratio** | **Lower** | **Upper** |
| Breastfeeding experience<br>Yes<br>No | 1.82 (0.44) | 16.89 | 0.001 | **6.15** | 2.59 | 14.62 |
| Intervention<br>Yes<br>No | 1.28 (0.46) | 7.65 | 0.006 | **3.59** | 1.45 | 8.87 |
| Age<br>18-23<br>24+ | 0.71 (0.30) | 5.67 | 0.017 | **2.03** | 1.13 | 3.64 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Race<br>White<br>Black | -.731 (0.35) | 4.44 | 0.035 | **0.48** | 0.24 | 0.95 |
| Parity<br>1<br>2+ | -.935 (0.44) | 4.42 | 0.035 | **0.39** | 0.16 | 0.94 |

**Table 3:** Odds Ratio Analysis.

## Discussion

This study demonstrated the extent of the relationship between prepregnancy BMI and early breastfeeding termination among a sample of low-income women participating in WIC. The results did not show statistical significance between prepregnancy BMI and early termination of breastfeeding, determined [74-77], but the results did show that breastfeeding termination was associated with previous experience, maternal age, parity, and race [74-77]. While the sample size many not have been large enough to show significance between high prepregnancy BMI and early breastfeeding termination, these results add significance to the literature in that they are one of the few to examine an entire dataset of low-income women participating in WIC that include a significant number of both Black and White participants.

When reviewing similar mixed sample studies, it was noted the association of breastfeeding initiation and duration with obesity was not significant among Blacks, in one sample of Black and White women [28,40] and in another sample of Black and Hispanic women [41]. Though multiple other studies have documented positive associations between obesity and breastfeeding, particularly among homogeneous White populations [26-28,40,41,74], it appears such results are inconclusive among Blacks when heterogeneous samples are studied. Kugyelka et al. [41], suggested that the reasons for the contradictory findings among Blacks may be due to biological differences, and the belief that the burden of abnormal BMI was unequally shared across racial groups. High BMI among Blacks did not necessarily carry the same adverse outcomes among other races [41]. Additional research on race/ethnicity can provide evidence on the outcomes among overweight and obese women.

Previous experience. This study found that the best predictor for early termination of breastfeeding was prior experience. Our data were consistent with findings for normal BMI studies [78,79], such that the odds of continuing breastfeeding were at least six times higher for women with no experience. In the LCHD conceptual framework, exposure to experienced breastfeeding mothers exemplifies a risk-reducing factor that positively impacts breastfeeding outcomes [71].

Maternal Age and Parity. A cross-tabulation with other study variables, revealed breastfeeding experience was significantly associated with age (p=.00), race (p=.02), marital status (p=.00), and parity (p=.00). Older women, Whites, married, and multiparous women were more likely to have breastfeeding experience [56,80]. Therefore, women with positive experience can provide guidance to inexperienced women.

The findings related to age in this study are consistent with the literature [81]. Younger women (18-23 years) in this sample were more likely to stop breastfeeding earlier than older women at 4 weeks. Younger women were less educated, single, and unemployed, thereby at higher risk for stopping breastfeeding compared to older women, 24 years and greater. The experience of breastfeeding has been proven to be a critical factor in increasing duration; therefore, younger women with first pregnancies should be a focus of promotion efforts. Older women with previous positive experience can help younger women increase the duration of breastfeeding. In this sample, primiparous women continued rather than stopped breastfeeding, which is contrary to most findings, and, possibly the result of the intense early intervention to increase the duration of breastfeeding past the first few weeks. Additionally, peer pressure and body image issues can lead to early termination of breastfeeding [82,83].

Race. Many studies show Blacks trailing Whites in breastfeeding initiation and duration and PRAMS data found Black women were among those with the lowest prevalence (22.1%) of breastfeeding duration [81]. In this sample, however, Blacks surpassed Whites in breastfeeding past 4 weeks, which is an interesting finding. It is rare to find evidence of such high rates of breastfeeding continuation among predominantly low-income Black women. Therefore, we delved deeper into the data to understand the differential findings.

One reason may be found within the composition of the sample of Black women in the original Nurses' Study [71]. Among Blacks in this study, about 48% self-described as immigrants from Africa and the Caribbean. It is plausible that the women originated from supportive breastfeeding cultures that were strengthened by the intensity of the intervention in the first few weeks, thereby, boosting breastfeeding rates. Since Blacks in the IFPS II study accounted for less than 15% of the total sample, we surmise that the majority of the effect came from two compounding reasons: the breastfeeding cultural background of the Blacks and from the Nurses' Study interventions. The effects of the intervention on Blacks in the Nurses' Study is better explained through multivariate analysis; however, race, when offered to the model, suggested that it was not as powerful a predictor, (OR 0.481, 95% CI [.24, .95], p=.035). There is substantial evidence that among WIC recipients, breastfeeding rates are lower than in the general population but are improving where aggressive interventions are introduced [84,85], consistent with our findings among Blacks [64,81]. In this study, it appears that the sample of low-income women became an atypical group that did not stop breastfeeding in early postpartum (62% versus 28%) due, in part to the intervention in the Nurses' Study. While significant, we focused on other predictors since not all participants had access to such an intervention. Participants who received the intervention were included to ensure the study had a large enough sample size that allowed it to best address other variables of interest, however, introducing a limitation as noted.

**Strengths and limitations**

The compilation of two data sets told a unique and compelling story of breastfeeding among low-income women. Differences have been found among socio-economic and racial groups, but not many have attempted to control for income. The study addressed the critical immediate post-partum period when women attempt breastfeeding in the home environments and before the ACOG recommended perinatal 4-6-week scheduled visit with healthcare providers [86].

Several limitations were noted in the study. Predetermined variables, definitions and methodology in a secondary data analysis can limit potential findings. Combining two datasets places even more limits on matching and merging variables. The study did not measure the length or duration of breastfeeding, but rather the date when breastfeeding was discontinued, which may, in retrospect, have allowed for a deeper understanding of the variable. The amount of breastfeeding education or intervention provided to each WIC participant was also unknown.

The sample size although large, may not have been adequate to detect differences in BMI. For this secondary analysis, at least 8000 more women would be needed to make a difference. Although adjusted for in the analysis, and affecting only few women, the Nurses' Study had the advantage of an intervention that increased breastfeeding duration, whereas the IFPS II group did not receive the same systematic intervention, potentially introducing a bias. The study selected cut-off points that precluded sick mothers or babies from inclusion in the sample, which may reduce generalizability. Women self-reported their weights and heights for BMI calculations and self-reported weight is often underreported, particularly among women with high prepregnancy BMI and may be biased by memory recall during postpartum [87-88]. The study conducted prior to new guidelines recommending a 3-week postpartum check-in and a complete evaluation at 12 weeks [86] for new mothers.

**Implications for nursing practice**

Nurses must make appropriate referrals for breastfeeding consultation in the prenatal period, guided by characteristics that best predict continued breastfeeding among overweight and obese women, such as breastfeeding experience. Timely identification of women at risk for early termination of breastfeeding is critical, particularly before the postpartum visit for planning interventions since that lack of support and services after hospital discharge may lead to early termination of breastfeeding [89]. Additional supports and consistent maternity benefits through the Family and Medical Leave Act (1993) across employments [90], leaves few options for women in low-paying jobs in the U.S. to return to work sooner, because of unpaid benefits [91]. The early post-partum period provides an opportune time for nursing interventions.

The LCHD conceptual framework [92] adapted by the study can be useful in providing a structure for planning and implementing early breastfeeding interventions for low-income women breastfeeding women [93-96]. In addition, the increasing prevalence of overweight and obesity (22.1%) among reproductive age women from PRAMS data [67], underscores the need to highlight potential health risks associated [31,50,97], with women with above normal BMI. Nurses should avoid making assumptions about who will continue or stop breastfeeding, while recognizing that multiple factors play a role beyond obesity, socioeconomic status, race and background.

## Conclusion

This study explores the relationship among prepregnancy BMI and breastfeeding termination and examines characteristics that predict early termination among low-income women. While we did not find a significant relationship between prepregnancy BMI and early breastfeeding termination, we found out that women with breastfeeding experience were more likely to continue breastfeeding past four weeks. Strategies to promote continued breastfeeding should engage women with experience who have the best chance of sustaining breastfeeding, Women with prepregnancy BMI should be encouraged to maintain breastfeeding, given the preponderance of evidence reported among homogenous groups [24-27,31], even though we did not see statistical significance among women with high prepregnancy BMI and early termination in this sample. We recommend that Black and White women enrolled in WIC remain a target for interventions to meet 2020 goals. Breastfeeding continuation rates continue to lag behind for Black and low-income women. Given the scarcity of breastfeeding studies among overweight and obese Black women, additional research is needed to determine whether prepregnancy BMI stratified by race/ethnicity affects breastfeeding performance. This study adds to the body of knowledge on early breastfeeding termination among a sample of low-income Black and White women with prepregnancy BMI.

## Acknowledgement:

We would like to thank Dr. Linda C. Pugh and Dr. Renee A. Milligan for access to the original data, their expertise, exceptional support and encouragement.

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