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International Journal of Current Research
Vol. 9, Issue, 11, pp.60970-60977, November, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

RACE, BODY MASS INDEX AND BREASTFEEDING OUTCOMES AMONG BLACK AND WHITE MOTHERS

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ARTICLE INFO

Article History:
Received 19th August, 2017
Received in revised form
05th September, 2017
Accepted 28th October, 2017
Published online 30th November, 2017

Key words:
Breastfeeding,
Lactation,
Nutrition,
Birth,
Mother,
Women's health,
Body mass index,
Race and nutrition.

ABSTRACT

The purpose of this study is to examine the association between race, body mass index and breastfeeding outcomes among black and white women in Mississippi. A secondary analysis from of the 2009 – 2011 Mississippi Pregnancy Risk Assessment Monitoring System was conducted. Multivariable hazard ratios were investigated to assess the relationship between marital status and breastfeeding duration at 8 weeks postpartum. Stratified analyses were performed for white and black women. In terms of breastfeeding initiation and race, black women (63.1%) had a higher percentage of not initiating breastfeeding than white women (36.6%). The Chi-Square results, $\chi^2(1) = 105.872$ ($p<0.001$), indicating that there was a statistically significant association between race and breastfeeding initiation. Overall, both black and white women included in the study breastfed for approximately 3.08 weeks postpartum. Black women breastfeed for an average of 2.61 weeks compared to white women who breastfed for 3.62 week. At 8 weeks postpartum, the estimated probability of breastfeeding among white mothers was statistically different than white women. For body mass index, the results showed that there was no statistically significant association between BMI and breastfeeding initiation ($p = 0.122$). The Kaplan Meier analysis indicated that at 8 weeks postpartum, there was a statistically significant difference in breastfeeding duration within the BMI groups. However, after adjusting for confounding factors using the Cox regression the results indicated that BMI was not a predictor for breastfeeding duration. The results obtained from this study showed that 18.4%, 29.3%, 27.9%, and 25.7% of women underweight, obese, overweight, and normal BMI group, respectively, were breastfeeding at 8 weeks. There was a statistically significant difference between the BMI groups in breastfeeding duration (p<0/05). The survival curve showed that the probability of continuing breastfeeding was lower for underweight women than all of the other age groups at all time points. The overall average of weeks in which mothers continued to breastfeed for each corresponding age group was 3.094 weeks followed by 2.36, 3.19, 3.15, and 3.05; respectively for each BMI category. The results for BMI showed that the breastfeeding rate at 8 weeks postpartum was statistically different among each weight group ($p<0.005$). After adjusting for the following covariates: race, age, education, income, marital status, prenatal education, WIC participation and postpartum education (Cox Regression), the results showed that women were no more likely to continue breastfeeding at 8 weeks based on BMI (underweight, normal, overweight and obese).

Citation: Tonitrice Wicks, Hamed Benghuzzi, Michelle Tucci and Elgenaid Hamadain, 2017. "Race, body mass index and breastfeeding outcomes among black and white mothers", *International Journal of Current Research*, 9, (11), 60970-60977.

INTRODUCTION

Human milk is the optimal form of infant nutrition (Academy of Nutrition and Dietetics, 2015). Research has shown that breastfeeding plays a major role in reducing the risk for reproductive cancers in mothers and leukemia for infants (NH Comprehensive Cancer Control, 2013). The evidence that breastfeeding protects against both breast and ovarian cancer mothers who have breastfed their children is well established in epidemiological studies. Studies have shown a 26% reduction for breast cancer and a 37% reduction for ovarian cancer for women who have breastfed for a year or more (Shulman *et al*., 2006). Reduced risk of reproductive cancers related to breastfeeding makes sense physiologically as breastfeeding, particularly prolonged and exclusive breastfeeding, results in longer periods of time during which women do not ovulate or have their menstrual cycles. Later onset of puberty and first menstrual cycles, and an earlier menopause, both of which mean fewer lifetime ovulatory cycles, are associated with decreased risk of breast and ovarian cancer. Conversely, women who have never had children are at increased cancer risk, as they typically experience more lifetime ovulatory cycles (Chapman *et al*., 2012). In addition to the 9 months of pregnancy during which a woman does not ovulate, exclusive and frequent breastfeeding for baby's first year can lead to an additional 6 to 12 months without a menstrual cycle, which is thelikely source of the cancer protection. Longer periods of lifetime breastfeeding confer additional cancer risk reductions (Chin *et al*., 2008). Furthermore, new research suggests that the physical characteristics of breastmilk itself, such as fluidity and calcium concentration, may play a direct role in breast cancer prevention (Chin, 2008). Breastfeeding confers particular protection against an aggressive and hard to treat breast cancer subtype, "triple negative" breast cancer. The triple negative

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refers to being negative for estrogen, progesterone and HER2 receptors, cancers which have a poor prognosis and are more likely to occur in younger women (Thulier, 2009). Ovarian cancer risk is reduced by about half for women who have experienced two pregnancies and who breastfeed each child for at least 6 months (Chin *et al*., 2008). The overall length of breastfeeding appears to be a protecting factor independent of the total number of lifetime births (Taveras *et al*., 2009). Emerging evidence suggests that longer lifetime breastfeeding is also protective against endometrial cancer (Thulier, 2009). For infants, there are bioactive components in human milk that create an immunological protection and facilitate the development, tolerance and appropriate inflammatory response (Wambach, 2004). Human milk contains immunoglobulin (specifically, immunoglobulin A), which coats the intestinal mucosa and prevents bacteria from entering the cells. White blood cells, also called leukocytes, which are cellular components of the blood that lacks hemoglobin, has a nucleus, is capable of motility, and defends the body against infection and disease by ingesting foreign materials and cellular debris, by destroying infectious agents or by producing antibodies (Wagner, 2015). Human milk also consists of whey proteins (lysozymes and lactoferrin) and oligosaccharides (Riordan, Auerbach, 1998). Lysozyme is an antimicrobial enzyme produced by animals that forms part of the innate immune system. A unique property of lysozymes in breastfeeding mothers is that while other components of human milk vary widely between well-nourished and poorly nourished mothers, the amount of lysosyme is conserved. Lactoferrin is an iron-binding protein that is found in human milk that limits the availability of iron to bacteria in the intestines and alters, which "healthy bacteria" will thrive in the gut. Lactoferrin is not available in formula (Riordan, Auerbach, 1998). It is found in the highest concentration in colostrums, but persists throughout infants first year of life. Lactoferrin has a direct effect on bacteria such as staphylococci and E. coli. Some literature has even suggested that milk is the communication vehicle between the maternal immune system and the infant, a system actively directing the immune, metabolic and microflora systems within the infant, while conferring multiple means of protection from pathogens. The physiological and protective functions of many of the immune components in human milk have been deduced not from studies in infants but from what is known in other species and in vitro models.

Though conclusive evidence had been lacking, a recent large study demonstrated that 14 to 19% of childhood leukemia could be prevented by breastfeeding for 6 months or more (Chin). The evidence for prevention of childhood lymphomas is mixed, and is inconclusive at this time (Scalon *et al*). Research has also shown breastfeeding to be protective against obesity later in life for the infant and possibly over a lifetime, meaning that the child will have a lower risk of obesity associated diseases such as diabetes, kidney cancer and pancreatic cancer (Scalon *et al*). Despite the link in the reduction of cancer for both infant and mother breastfeeding rates low in the United States remain low. The American Academy of Pediatricsrecommends that mothers exclusively breastfeed theirinfants for approximately the first 6 months of life followed by breastfeeding in combination with the introduction of complementary foods until at least 12 months of age. Even though breastfeeding duration rates have increased in recent years, rates remain well below the Healthy People 2020 target of 60.6% at 6 months among black women in Mississippi. Research has identified race and regional location as predictors of breastfeeding outcomes in the United States. Throughout the literature many studies showed a disparity in breastfeeding outcomes among blacks and whites as well as for women located in southern states. National Immunization Survey (NIS) data from 2011 – 2015 were analyzed for children born during 2010–2013 to describe breastfeeding initiation, exclusivity through 6 months and duration at 12 months among black and white infants. Among the 34 states with sufficient sample size (≥50 per group), initiation rates were significantly (p<0.05) lower among black infants than white infants in 23 states. Fourteen out of these 23 states, including Mississippi, were located in the south. Being that Mississippi has one of the highest rates of cancer and one of the lowest rates of breastfeeding in the United States it is imperative that health professionals examine state specific facilitators and inhibitors to breastfeeding that could ultimately positively impact overall health outcomes. Also, since research has identified both race and location as a predictor of low breastfeeding outcome rates, studying Mississippi, a state with a large African American population located in the south adds a wealth of knowledge to current research and fills in gaps that could address health disparities.

Maternal obesity's association with adverse health outcomes for mother and infant has become an important global public health issue (Godfrey *et al*., Poston *et al*.). A reduction in breastfeeding outcomes (initiation and duration) has been observed in obese women in different countries (Baker, Michaelsen, Sørensen, & Rasmussen; Castillo, Santos, & Matijasevich, Donath & Amir; Guelinckx, Devlieger, Bogaerts, Pauwels, & Vansant, Hauff, Leonard, & Rasmussen; Winkvist *et al*.). This negative relationship may involve various factors. Maternal obesity has been shown to be associated with a set of sociodemographic factors (Kim, Dietz, England, Morrow, & Callaghan), themselves associated with shorter breastfeeding duration (Bartok, Schaefer, Beiler, & Paul). Maternal obesity is a risk factor in adverse maternal and neonatal outcome, especially Caesarean delivery (Poston *et al*). After controlling for psychosocial factors, a study found that women with high prepregnancy body mass index (BMI) remained at greater risk of not initiating or continuing to breastfeed. This research suggests that biological factors also mediate this association via a lower prolactin response (Rasmussen & Kjolhede) and delayed onset of lactogenesis (Rasmussen).

A comprehensive questionnaire concerning breastfeeding difficulties reported that obese women were more likely to report insufficient milk production in the first 2 weeks postpartum than normal-weight women (O'Sullivan, Perrine, & Rasmussen). These concerns may have led to stopping exclusive breastfeeding (EBF) in the first weeks (Wagner *et al*). In a recent study obese woman were more likely to initiate mixed feeding and less likely to exclusively breastfeed at birth. Mixed feeding could be purposely chosen by the parents, but it could also reflect difficulties in successfully initiating exclusive breastfeeding. Studies concerning intention to breastfeed according to BMI show mixed findings. Indeed, some authors observed that obese women were less likely to intend to breastfeed than normal-weight women (Guelinckx *et al*., Visram *et al*). In other studies, no association was found between BMI and breastfeeding intention (Hauff & Demerath, Hauff *et al*). Furthermore, when they intended to breastfeed, obese women were less likely than normal-weight women to exclusively breastfeed at maternity discharge (Perrine,

Scanlon, Li, Odom, & Grummer-Strawn) or at 1 week postpartum (Donath & Amir). This may be explained by a lower prolactin response to suckling (Rasmussen & Kjolhede) and delayed onset of lactogenesis (after 72 hr postpartum; Rasmussen) among obese mothers, which is associated with greater risk of stopping breastfeeding in the early postpartum period. Median duration of breastfeeding was 3 months for obese and overweight women in our study. In a retrospective study at a university hospital in Belgium between 2006 and 2007 (Guelinckx *et al*), obese mothers breastfed for a median of less than 2 months and overweight mothers for 3 months. Such durations are substantially lower than those observed in the U.S. (Hauff *et al*) Australian (Donath & Amir), Norwegian (Winkvist *et al*), and Danish (Baker *et al*.) studies. These wide differences between countries in breastfeeding duration in obese women may reflect differences in the social environment, especially social norms concerning EBF and public financial support (e.g., duration of paid maternity leave).

In line with numerous studies (Baker *et al*, Castillo *et al*., Donath & Amir, Guelinckx *et al*., Hauff *et al*., Li, Jewell, & Grummer-Strawn, Winkvist *et al*), we observed that obesity before pregnancy was associated with shorter breastfeeding duration compared to normal-weight women. In contrast, in two studies performed during the 2000s in the United States (Bartok *et al*., O'Sullivan *et al*.), obesity was no longer associated with breastfeeding duration after controlling for sociodemographic and perinatal characteristics and breastfeeding intention. In the study, the negative association between maternal obesity and b duration was independent sociodemographic factors, pregnancy outcomes, and psychosocial factors, suggesting the involvement of other factors.The purpose of the present study is to explore the relationship between body mass index and breastfeeding outcome among two groups in Mississippi - black and white mothers.

MATERIALS AND METHODS

This study is a secondary analysis of data from the phase VI (20010-2012) Mississippi Pregnancy Risk Assessment Monitoring System (PRAMS). All available datasets were combined to increase precision. The Pregnancy Risk Assessment Monitoring System (PRAMS) is a surveillance system funded by the Centers for Disease Control and Prevention (CDC) and administered by state health departments. PRAMS is an ongoing, population-based surveillance system of maternal behaviors, attitudes and experiences before, during and shortly after pregnancy established by the CDC in 1987. In 2002, the Mississippi State Department of Health through a collaborative agreement between the CDC began collecting state specific data for PRAMS. The Mississippi (MS) PRAMS sample consists of women who have had a recent live birth, which is identified from Mississippi's Vital Statistics' birth certificate files. Every month a systematic stratified sample of mothers is randomly selected and contacted by mail. Subsequent questionnaires are mailed and attempts are made to interview non-respondent mothers by telephone between 2 and 6 months postpartum. Completed surveys are linked to their infant's birth certificate data. Details on the methods used in PRAMS are described elsewhere (Shulman *et al*., 2006). The analyses were restricted to black (n = 2058) and white (n =1717) women that completed the appropriate PRAMS survey and birth certificate application questions since the study focuses on racial differences. Women were excluded from the breastfeeding duration analysis if information on breastfeeding duration were missing (n = 245). This research was approved by the University of Mississippi Medical Center Institutional Review Board. The outcome variable was breastfeeding duration. Breastfeeding status was assessed among mothers whose infants lived with them at the time of interview. Breastfeeding duration was assessed by asking mothers that initiated breastfeeding if they were still breastfeeding. If a mother was not breastfeeding, questions regarding breastfeeding duration were skipped. If a woman was still breastfeeding, breastfeeding duration was determined by calculating the difference between the infant's date of birth and the date of the survey. Breastfeeding duration was not restricted to exclusive breastfeeding. Data for marital status and maternal race (non-Hispanic white and non-Hispanicblack) was taken from the birth certificate. Chi square test of independence was usedto test for significant associations between breastfeeding duration and marital status. The Kaplan–Meiermethod was used to determine if the cumulative probabilitiesof breastfeeding at a given week after delivery differedmarital status for breastfeeding duration. Mothers who were still breastfeeding at the time of the survey were censored for the purposes of the analysis. All women in the sample could provide at least 8 weeks of information on breastfeeding, therefore, the probability of breastfeeding at 8 weeks was calculated and the associated 95% confidence intervals (CIs). The Cox proportional hazards model was used to calculate the hazard ratio (HR) of discontinuing breastfeeding within 8 weeks postpartum. The proportional hazard assumption was verified by examining the survival curve versus time. Control variables were entered simultaneously as indicator variables into proportional hazard models. The control variables were maternal race, age, education, income, body mass index, prenatal breastfeeding education, and postpartum breastfeeding education. All data were analyzed with SPSS version 24. All differences discussed are significant at $p<0.05$.

RESULTS

Race

Breastfeeding Initiation

Table 1 provides a description of breastfeeding initiation based on race. Of the total 3555 participants, 55.9% (n=1986) initiated breastfeeding and 44.1% (n = 1569) did not initiate breastfeeding. Within the women that initiated breastfeeding, 46% were black compared to 54% white. Within the respective races, the majority (65.1%) of white women initiated breastfeeding and approximately half (47.9%) of the black women initiated breastfeeding. Figure 1 provides a visual depiction of the breastfeeding initiation results within the breastfeeding initiation categories showing that black women (63.1%) have a higher percentage of not initiating breastfeeding than white women (36.6%). The Chi-Square results, $\chi^2(1) = 105.872$ ($p< .001$), as shown in Table 2 indicates that there was a statistically significant association between race and breastfeeding initiation.

Breastfeeding Duration

The Kaplan-Meier curve presents the possibilities of breastfeeding by number of weeks postpartum among study

participants. Figure 2 displays the survival curve, which gives a visual representation of the life tables. The horizontal axis shows the time to event. In this plot and the others included in this section, drops in the survival curve occur whenever the mother discontinues breastfeeding. The vertical axis shows the probability of survival (probability of not experience the treatment effect). The survival curve displayed in Figure 2 shows that the probability of breastfeeding is lower for blacks at all points in time. Therefore, black women are less likely to continue to breastfeed at 8 weeks postpartum compared to white women. Table 3 shows that at 8 weeks 13.9% of the women overall (black and white) were still breastfeeding. Specifically, at eight weeks postpartum 19.2% of white (n= 1638) and 9.2% of black women (n = 1892) were still breastfeeding.

Table 3 also provides the average (estimate) number of weeks mothers continued to breastfeed. Overall, both black and white women included in the study breastfed for approximately 3.08 weeks postpartum. Black women breastfeed for an average of 2.61 weeks compared to white women who breastfed for 3.62 week. For race, the results show that there is a difference in the survival distributions at $p < 0.001$. The Mantel-Cox log rank test presented in Table 3 tested the null hypothesis that there is no difference in the overall breastfeeding distributions between groups. To test the null hypothesis, the Mantel-Cox log rank test calculates a χ^2- statistic (54.561), which is compared at a χ^2- distribution with two degrees freedom. Therefore, at 8 weeks postpartum, the estimated probability of breastfeeding among white mothers was statistically different than white women.

Body Mass Index

Breastfeeding Initiation

Body Mass Index (BMI) was calculated by using the height and weight data from Mississippi PRAMS and categorized as underweight, normal, overweight and obese based on the most recent guidelines. The BMI categories are as follows: 1) underweight = < 18.5; 2) normal weight = 18.5 – 24.9; 3) overweight = 25 – 19.9; and 4) obese = 30 or greater. Table 2 shows a total of 3466 (n = 109; missing) women were included in the BMI analysis. A total of 1942 (56%) women indicated breastfeeding initiation. The underweight group included women with 48.2% (92) reporting breastfeeding initiation. The normal weight group had a total of 1530 participants with 55.9% (855) initiating breastfeeding. The overweight group consisted of 829 women with 56.3% (467) initiating breastfeeding. The obese group consisted of 916 women with 57.6% (528) reporting breastfeeding initiation. The Chi-Square results $\chi^2(1) = 5.803$ ($p = .122$) presented in Table 2 indicates that there is no statistically significant association between BMI and breastfeeding initiation. Figure 5 provides a view of the percentages of women within each initiating breastfeeding group categorized by body mass index where one can see where the error bars overlap indicating no statistically different association.

Breastfeeding Duration

The results presented in Table 3 showed that 18.4%, 29.3%, 27.9%, and 25.7% of women underweight, obese, overweight, and normal BMI group, respectively, were breastfeeding at 8 weeks. Since the significance value is less than 0.05 ($p = .005$), there is a statistically significant difference between the BMI groups in breastfeeding duration. Figure 4 displays the visual representation of the life tables for BMI. The survival curve in Figure 4 shows that the probability of continuing breastfeeding is lower for underweight women than all of the other age groups at all time points. Table 2 provides the average (estimate) number of weeks mothers continued to breastfeed for each corresponding age group. The overall average is 3.094 weeks followed by 2.36, 3.19, 3.15, and 3.05 respectively for each BMI category.

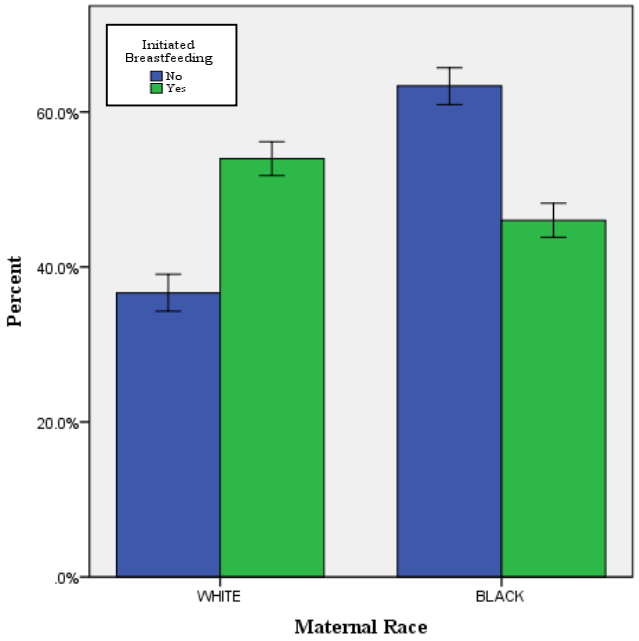

Figure 1. Race and Breastfeeding Initiation. The graph illustrates the percent of women within the initiated breastfeeding response categories by race. The results include black and white MS PRAMS survey participants that responded to the appropriate breastfeeding initiation and maternal race questions (n= 3555). The error bars display a 95% confidence interval.

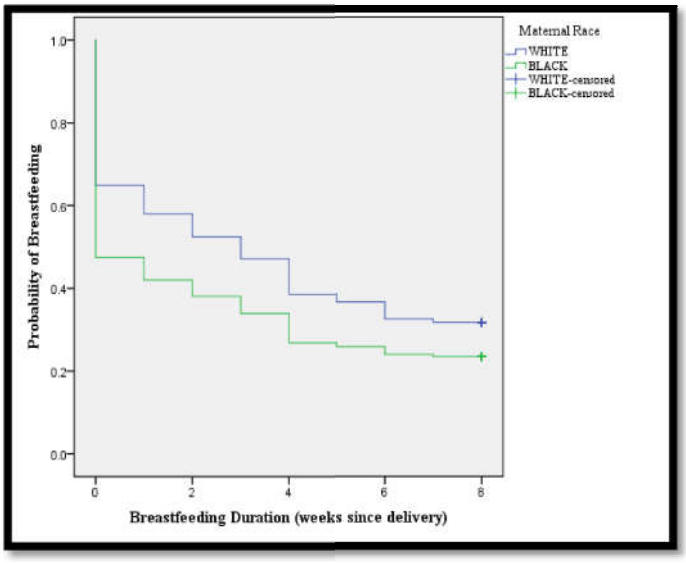

Figure 2. Maternal Race Survival Curve. Kaplan-Meier estimates of probability of breastfeeding duration by postpartum week and maternal race during pregnancy among white and black women who initiated breastfeeding.

Table 1. Race and Breastfeeding Initiation

			Initiated Breastfeeding		Total
			No	Yes	
Maternal Race	WHITE	No.	575	1072	1647
		% within Maternal Race[b]	34.9%	65.1%	100.0%
		% within Initiated BF[a]	36.6%	54.0%	46.3%
		% of Total	16.2%	30.2%	46.3%
	BLACK	No.	994	914	1908
		% within Maternal Race[b]	52.1%	47.9%	100.0%
		% within Initiated BF[a]	63.4%	46.0%	53.7%
		% of Total	28.0%	25.7%	53.7%
Total		No.	1569	1986	3555
		% within Maternal Race[b]	44.1%	55.9%	100.0%
		% within BF[a] Initiation	100.0%	100.0%	100.0%
		% of Total	44.1%	55.9%	100.0%

a.BF = Breastfeeding
b.Within race indicates statistics based on the total number of participants of the same race
c.Within Initiated BF statistics include the black and white participants that indicated 'yes' to the breastfeeding initiation question

Table 2. Lifestyle Factors and Breastfeeding Initiation

Characteristic	Total No. (%)	Initiated BF	Did not Initiate BF	*p*-value
BMI	3466(100%)	1942 (56%)	1524 (44%)	0.122
Underweight	191 (5.5%)	92 (2.7%)	99 (2.9%)	
Normal	1530 (44.1%)	855 (24.7%)	675 (19.5%)	
Overweight	829 (23.9%)	467 (13.5%)	362 (10.4%)	
Obese	916 (26.4%)	528 (15.2%)	388 (11.2%)	

Table excludes women with missing information on breastfeeding initiation
a Numbers of women were from unweighted sample distribution
b Percentages were weighted to account for survey oversampling, nonresponse, and noncoverage
c p value is from the $\chi 2$ test of independence between the breastfeeding initiation and the characteristics

Table 3. Race, BMI and Breastfeeding Duration

Characteristics	No . of women[a] (%)[b]	Percentage Breastfeeding at 8weeks	Estimate (95% CI)	*p* vaue[c]
Race				<0.001
Race Overall[d]	3530 (100%)	27.3%	3.080 (2.968, 3.193)	
White	1638 (46.4%)	31.7%	3.618 (3.453, 3.784)	
Black	1892 (53.6%)	23.4%	2.614 (2.464, 2.764)	
Body Mass Index				0.005
Body Mass Index Overall	3441(100.0)	27.4%	3.094 (2.980, 3.208)	
Underweight	190 (5.5%)	18.4%	2.363 (1.922, 2.804)	
Normal	1519 (44.1%)	29.3%	3.187 (3.013, 3.361)	
Overweight	824 (23.9%)	27.9%	3.146 (2.911, 3.380)	
Obese	908 (26.4%)	25.7%	3.046 (2.829, 3.264)	

Table excludes women with missing information on breastfeeding duration
a Numbers of women were from unweighted sample distribution
b Percentages were weighted to account for survey oversampling, nonresponse, and noncoverage
c p value is from the Log Rank (Mantel-Cox) breastfeeding duration and the socioeconomic characteristics
d Only includes participants that responded to the corresponding survey questions for both breastfeeding duration and the designated characteristics

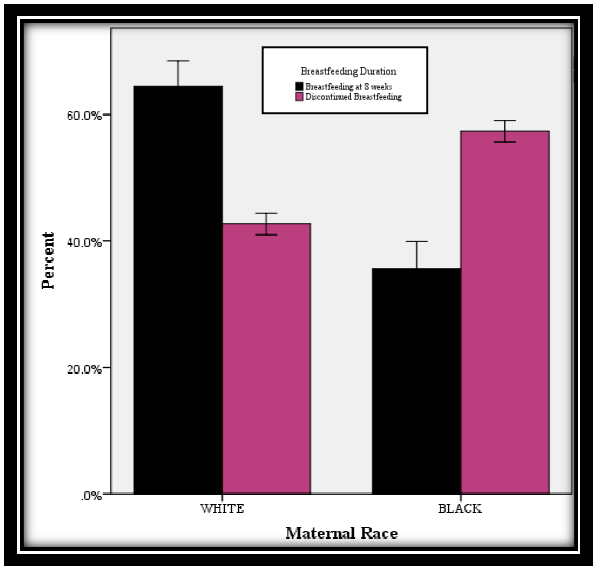

Figure 3. Maternal Race and Breastfeeding Duration. The graph illustrates the percent of women within the breastfeeding duration response categories by maternal race. The results include black and white MS PRAMS survey participants that responded to the appropriate breastfeeding duration and maternal race questions (n=3530). The error bars display a 95% confidence interval.

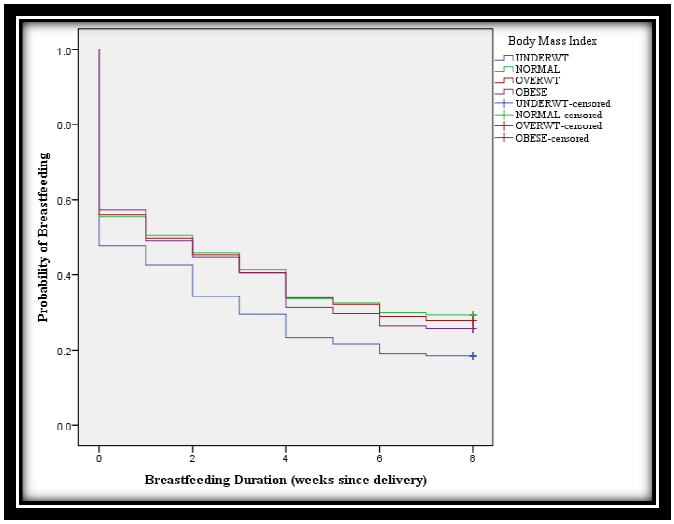

Figure 4. Body Mass Index Survival Curve. Body Mass Index Survival Curve Kaplan-Meier estimates of probability of breastfeeding duration by postpartum week and body mass index during pregnancy among white and black women who initiated breastfeeding. The abbreviation for weight is Wt. BMI: underwt (< 18.5), normal (18.5 – 24.9), overwt (25 – 29.9), and obese (> 29).

The results for BMI show that the breastfeeding rate at 8 weeks postpartum is statistically different among each weight group (p =.005). Figure 5 illustrates the percent of women within the breastfeeding duration response categories by BMI categories.After adjusting for the following covariates: race, age, education, income, marital status, prenatal education, WIC participation and postpartum education (Cox Regression) the results showed that women were no more likely to continue breastfeeding at 8 weeks based on BMI (underweight, normal, overweight and obese).

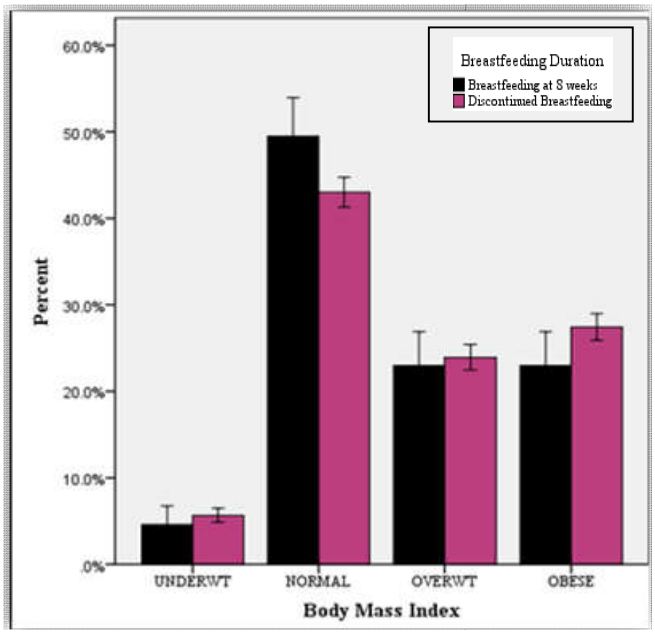

Figure 5. Body Mass Index and Breastfeeding Duration. The graph illustrates the percent of women within the breastfeeding duration response categories by body mass index. WT is the abbreviation for weight. BMI: underwt (< 18.5), normal (18.5 – 24.9), overwt (25 – 29.9), and obese (> 29). The results include black and white MS PRAMS survey participants that responded to the appropriate breastfeeding duration and body mass index questions (n=3441). The error bars display a 95% confidence interval.

DISCUSSION

Prior research has attempted to identify factors that impact breastfeeding initiation and duration. Many demographic factors such as maternal age, marital status, education, race, socioeconomic status, cultural factors, parity, number of children at home, and social support have been shown to potentially influence a woman's decision to breastfeed (Goksen *et al*., 2002; Li*et al*., 2002). Research has also shown that other factors such as BMI, marital status, and breastfeeding knowledge play a role in outcomes. The purpose of the proposed study is to add to current body of knowledge and identify state specific factors that impact breastfeeding outcomes, specifically race and BMI.

Race

In terms of breastfeeding initiation, the hypothesis that there was no association between race and breastfeeding initiation was tested was rejected because p = 0.001 ($\chi^2(1) = 105.87$) as shown in Table 3; therefore, we rejected the hypothesis. The analysis determined that there was a statistically significant association between race and breastfeeding initiation and the association was strong according to Phi and Cramer's V, p < .005. The results were consistent with other studies that found a relationship between breastfeeding initiation and race. When it comes to breastfeeding duration at eight weeks postpartum, 19.2% of white (n= 1638) and 9.2% of black women (n = 1892) that initiated breastfeeding were still breastfeeding. For race, the results show that there was a difference in the survival distributions at p = 0.037. However, we were able to conclude that at 8 weeks postpartum, the estimated probability of breastfeeding among black mothers was statistically different than white women. After adjusting for the following covariates: race, age, education, income, BMI, prenatal education, WIC participation and postpartum education (Cox Regression) the results showed that white women were no more likely to continue breastfeeding at 8 weeks than black women (p= .440). Results of this study provided evidence that the black race is a strong predictor of low breastfeeding rates in the United States, and the disparity in breastfeeding rates between whites and blacks exists across a number of sociodemographic characteristics. This racial disparity may be due to social and cultural influences, such as the covariates analyzed in this study. However, research was limited in examining confounding factors such as age, education, income, BMI, marital status, prenatal education, WIC participation and postpartum education and even more limited in terms of Mississippi specific studies. However, many studies did not study duration and adjust for covariates that act as confounding factors. Thus, the study adds to the current body of knowledge by providing evidence that there is no statistically significant association with race and breastfeeding duration at 8 weeks postpartum.

Body Mass Index

The results indicated that (χ^2= 5.803; p = 0.122) that there was no statistically significant association between BMI and breastfeeding initiation. Therefore, we failed to reject the hypothesis and determine that there was no association

between BMI and breastfeeding initiation. In terms of breastfeeding duration at eight weeks postpartum, our results showed that that there was a statistically significant difference in breastfeeding duration among BMI groupsat $p = 0.005$. After adjusting for the following covariates: race, age, education, income, marital status, prenatal education, WIC participation and postpartum education (Cox Regression) the results showed that women were no more likely to continue breastfeeding at 8 weeks based on BMI (underweight, normal, overweight and obese). Therefore, the results of the Kaplan Meier were impacted by confounding factors. Studies concerning intention to breastfeed according to BMI show mixed findings. Some authors observed that obese women were less likely to intend to breastfeed than normal-weight women (Guelinckx *et al*., Visram *et al*). For instance, Baker et.al found that maternal prepregnant BMI was strongly associated with infant feeding, which is contrary to our research results. Compared with normal-weight women, overweight or obese women introduced complementary foods sooner and breastfed for shorter periods. Infants of obese women were introduced to complementary foods an average of 0.5 week sooner than were infants of normal-weight women. The study found that infants of obese women were breastfed an average of 4 weeks less than were infants of normal-weight women. In other studies, no association was found between BMI and breastfeeding intention (Hauff & Demerath, Hauff *et al*). Our results support the finding that there was no statistically significant association with BMI and breastfeeding outcomes. Although the association between the duration of breastfeeding and later infant or childhood weight has been examined in several studies, researchers have not adjusted carefully for the effect of prepregnant BMI. The failure to do this, especially in contemporary cohorts that contain a high proportion of overweight and obese women, may lead to the overestimation of the effect of breastfeeding. There are both strengths and limitations to the study. Before we discuss the limitations it is worth noting that one of the strengths of our study includes having access to data from a state population-based survey with high response rates and a number of factors associated with breastfeeding outcomes. This study was the first to examine breastfeeding duration and body mass index among black and white mothers in Mississippi. However, the study does have limitations that should be considered, specifically being a secondary analysis of a dataset whose main purpose was not breastfeeding. The Mississippi PRAMS dataset has not always included questions about breastfeeding.

Additionally, because of the design of the original survey, not all factors pertaining breastfeeding duration and body mass index could be considered. There was no specific information on whether the married mothers received paternal support or discouragement for breastfeeding. The main study limitation was our reliance on parental reports of breastfeeding behaviors. Another limitation was that the breastfeeding duration analysis was focused on a limited follow-up period of 8 weeks. Despite the limitations, this study is unique in examining the association between state-specific factor (body mass index) and breastfeeding duration among both white and black women. To our knowledge, this study is one of the first to do so with the most recent MS PRAMS data. Overall, our study increased understanding of the impact of race and BMIon breastfeeding initiation and duration among white and black mothers. With evidence supporting breastfeeding as a low cost solution for health issues such as cancer, obesity and hypertension our study recommends that the poorest state in the nation with some of the worst health outcomes, Mississippi, consider focusing on breastfeeding initiatives as a solution to health outcomes. Increasing breastfeeding rates in Mississippi could positively impact health outcomes such as cancer, obesity, and hypertension. Recently, Mississippi breastfeeding stakeholders and community advocates have taken steps to promote breastfeeding. This research can be used to inform policy and other efforts such as Baby Friendly Hospital initiative that is occurring in Mississippi.

Acknowledgements

All data included in this study was provided by the Mississippi PRAMS working group and the Centers for Disease Control and Prevention.

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