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Psychosocial and Sociodemographic Contributors to Breastfeeding Intention in First-Time Mothers

Tondy Baumgartner[1] · Surya Sruthi Bhamidipalli[1] · David Guise[1] · Joanne Daggy[1] · Corette B. Parker[2] · Melissa Westermann[3] · Samuel Parry[4] · William A. Grobman[5] · Brian M. Mercer[6] · Hyagriv N. Simhan[7] · Robert M. Silver[8] · Ronald J. Wapner[9] · George R. Saade[10] · Uma M. Reddy[11] · David M. Haas[1] · for the nuMoM2b study

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Abstract

Objective Breastfeeding has multiple benefits for women and babies. Understanding factors contributing to intention to exclusively breastfeed may allow for improving the rates in first-time mothers. The study objective was to examine factors associated with a woman's intention to breastfeed her first child.

Methods A secondary analysis of the prospective "Nulliparous Pregnancy Outcomes Study: monitoring mothers-to-be" (nuMoM2b) study of nulliparous women in the U.S. with singleton pregnancies was performed. Sociodemographic and psychosocial factors were analyzed for associations with breastfeeding intention.

Results For the 6443 women with complete information about breastfeeding intention and all factors under consideration, women who intended to breastfeed (either exclusively or any breastfeeding) were more likely to be older, not black, have reached a higher level of education, have higher incomes, have a lower body mass index (BMI), and be nonsmokers. Reporting a planned pregnancy and several psychosocial measures were also associated with intention to breastfeed. In the multivariable analysis for exclusive breastfeeding, in addition to age, BMI, race, income, education, and smoking, of the psychosocial measures assessed, only women with higher hassle intensity ratios on the Pregnancy Experience Scale had lower odds of exclusive breastfeeding intention (OR 0.71, 95% CI 0.55–0.92). Other psychosocial measures were not associated with either exclusive breastfeeding or any breastfeeding after controlling for demographic characteristics.

Conclusions for Practice Several sociodemographic factors, having a planned pregnancy, and fewer intense pregnancy hassles compared to uplifts are associated with intention to exclusively breastfeed. Identifying these factors may allow providers to identify women for focused, multilevel efforts to enhance breastfeeding rates.

Keywords Breastfeeding · Breastfeeding intention · Nulliparous women · Pregnancy experience scale · Psychosocial measures

✉ David M. Haas
dahaas@iupui.edu

[1] Indiana University, Indianapolis, USA

[2] RTI International, Durham, USA

[3] University of California, Irvine, USA

[4] University of Pennsylvania, Philadelphia, USA

[5] Northwestern University, Evanston, USA

[6] Case Western Reserve University, Cleveland, USA

[7] University of Pittsburgh, Pittsburgh, USA

[8] University of Utah, Salt Lake City, USA

[9] Columbia University, New York, USA

[10] University of Texas Medical Branch, Galveston, TX, USA

[11] Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), Bethesda, USA

Significance

Why was the study conducted? To understand ways to potentially improve breastfeeding rates in women after their first delivery, we explored the psychosocial and sociodemographic factors that contributed to a woman's intention to breastfeed.

What does this study add to what is already known? In addition to several sociodemographic characteristics, women who had higher scores on the Pregnancy Experiences Scale- hassle intensity ratio were less likely to intend to exclusively breastfeed. This report may be one of the first studies to associate the validated Pregnancy Experiences Scale with breastfeeding intention, finding that women are less likely to breastfeed if they experience more intense the hassles during pregnancy.

Introduction

Breastfeeding has multiple health benefits for infants and mothers and economic benefits for families and society. Breastfed infants have decreased risk of infections, including gastrointestinal diseases, sepsis, wheezing respiratory tract infections, necrotizing enterocolitis, meningitis, retinopathy and urinary tract infections (Dewey et al. 1995; Furman et al. 2003; Hylander et al. 2001; Levy et al. 2009; Schanler et al. 1999; Victora et al. 2016; Wright et al. 1989). Breastfed infants have decreased long-term risks of childhood cancers and Crohn's disease (Kwan et al. 2004; Rodriguez-Palmero et al. 1999). They also have a lower incidence of obesity and type 2 diabetes mellitus (Victora et al. 2016). Furthermore, there is a positive association between breastfeeding and both brain maturation and scores on intelligence tests (Agho et al. 2016; Mortensen et al. 2002).

Short-term benefits to women who breastfeed include increased caloric expenditure resulting in faster postpartum weight loss (Victora et al. 2016). Studies also associate multiple long-term benefits from breastfeeding including lower risks for cardiovascular disease (including hypertension and hyperlipidemia), type 2 diabetes, ovarian cancer and breast cancer (Gunderson et al. 2018; Horta et al. 2015; Schwarz et al. 2009; Victora et al. 2016).

Societal benefits of breastfeeding include decreased infant feeding costs and health care expenses.(Shakya et al. 2017; Victora et al. 2016) Formula costs approximately $1000 per year per infant which places a high financial burden on parents and community resources. Additionally, low rates of breastfeeding result in approximately $3 billion in additional health care costs in the United States (Centers for Disease Control and Prevention 2019).

The American Academy of Pediatrics (AAP) and World Health Organization recommend that infants be exclusively breastfed for 6 months unless there is a contraindication (WHO/UNICEF 2014). However, despite this recommendation, only 38% of infants worldwide and only one in four infants in the United States are exclusively breastfed for 6 months (Centers for Disease Control and Prevention, 2019; WHO/UNICEF 2014). Understanding factors associated with breastfeeding may help directed interventions, but there are few data available in the United States that detail factors associated with a woman's intention to breastfeed, particularly with her first baby. Although some research has shown that women are more likely to breastfeed if they are better educated, have higher incomes, or if their own mothers had breastfed, (Noble et al. 2001; Victora et al. 2016) there may be many other factors, including psychosocial considerations, that may impact breastfeeding intention and success. Therefore, the objective of this study was to examine multiple contributors, including psychosocial factors, associated with a woman's intention to breastfeed her first child.

Methods

This study was a secondary analysis of a large prospective cohort study in pregnant women. The "Nulliparous Pregnancy Outcomes Study: monitoring mothers-to-be" (nuMoM2b) project recruited 10,038 nulliparous women with singleton pregnancies from eight U.S. medical centers between 2010 and 2013 with the objective of identifying risk factors and predictors of adverse pregnancy outcomes. Detailed methods of the nuMoM2b study are reported elsewhere.(Haas et al. 2015) In brief, women in the nuMoM2b cohort were recruited in the first trimester and had study visits in the 1st (V1: gestational age 6 weeks 0 days to 13 weeks 6 days), 2nd (V2: gestational age 16 weeks 0 days to 21 weeks 6 days), and early 3rd (V3: gestational age 22 weeks 0 days to 29 weeks 6 days) trimesters, and at the time of delivery (V4). During study visits, multiple questionnaires and psychosocial instruments were completed and biological specimens were obtained.(Haas et al. 2015) All women provided informed consent and the study was approved by each site's local Institutional Review Board.

At delivery (V4), women were asked about their intention to breastfeed, with possible outcomes of 'breastfeed only,' 'breastfeed and bottle feed,' 'bottle feed only,' or 'I don't know.' If for some reason a woman did not complete this question during the delivery interview, but the feeding intent was detailed in the medical record, this information was collected by record abstraction instead. Breastfeeding intent responses mirrored breastfeeding practice at discharge.

To assess factors associated with breastfeeding intention, we utilized data from multiple sources during the study.

Factors obtained at V1 included: age, maternal body mass index (BMI), self-reported race and ethnicity, poverty level, educational level, and whether the pregnancy was planned (based on the question: "Was this pregnancy planned?"). Poverty level was categorized according to income and household size relative to the 2013 federal poverty guidelines. Estimated gestational age at birth and route of delivery were obtained from chart abstraction. Tobacco use was obtained at V4 ("Did you smoke any tobacco products in the month before your delivery?").

Psychosocial factors evaluated included: depression (Edinburgh Perinatal Depression Scale (EPDS), V3) (Cox et al. 1996), perceived stress (Cohen Perceived Stress Scale (PSS), V1) (Cole 1999), social support (Multidimensional Scale of Perceived Social Support, V1) (Zimet et al. 1990), perceived anxiety (Spielberger Trait Anxiety Subscale, V1) (Spielberger 1983), resilience (Connor-Davidson Resilience Scale, V2) (Connor and Davidson 2003) and perceived pregnancy experience (Pregnancy Experience Scale (PES), V3) (DiPietro et al. 2008). Characteristics of the psychosocial measures in the overall cohort have been presented elsewhere (Bann et al. 2017; Grobman et al. 2016).

For the Pregnancy Experience Scale-brief version, women were asked to review a list of items that could be uplifting aspects of pregnancy (i.e. discussion about baby names, visits to her provider, thinking about the baby's appearance, how much the baby is moving) and a list of items that could make her feel unhappy, negative, or upset (i.e. getting enough sleep, normal discomforts of pregnancy, her weight, body changes, and thinking about her labor and delivery) and to quantify on a scale of 0 to 3 either how uplifted/happy or how hassled/unhappy they made her feel. The a ratio of hassles to uplifts was calculated first by totaling the total number of answers a woman gave marking "Quite a bit" or "A great deal" for items in each domain. The PES-Hassle frequency ratio was the ratio of the number of hassles to the number of uplifts; thus, values less than 1 indicated that the woman rated the frequency of her pregnancy-specific uplifts higher than her experience of pregnancy-specific hassles. The PES-Hassle intensity ratio was similar but was the ratio of the intensity of hassles to uplifts.

Descriptive statistics were used to describe participant characteristics and psychosocial scales according to three "intention to breastfeed" subgroups: breastfeed only, breastfeed and bottle feed, and bottle feed only. Pairwise comparisons were conducted using a Student's t-test for continuous variables and the chi-square test for categorical variables with a Šidák correction to keep familywise error at 0.05, since there are three comparisons. All scales were assessed for normality, and the Wilcoxon-rank sum test is reported for non-normal distributions.

As intention to breastfeed is ordinal in nature, a cumulative logit model was initially used to assess factors associated with intention to breastfeed. However, this model failed the assumption of proportionality for multiple variables; thus, we opted to fit two logistic regression models with outcomes of (breastfeed only vs. breast and bottle feed/bottle feed only) and (breastfeed only/breast and bottle feed vs. bottle feed only). Additionally, we accounted for possible correlation of outcomes among women from the same study site by using a generalized linear mixed model (GLMM) fit with maximum likelihood that included a random site effect for center.(Brown and Prescott 2015). Model results reported include parameter estimates, standard errors, odds ratios and associated 95% confidence intervals. In addition, the Intraclass Correlation Coefficient (ICC) was obtained from the estimated random effect due to study site, assuming the underlying response (intention to breastfeed) represented a continuous variable. An ICC close to zero would indicate that the outcome does not depend on study site. To additionally estimate the proportion of site-to-site variability that is explained by the participant and psychosocial factors, a model with only the random site effect was also fit. P-values < 0.05 were considered statistically significant. All analyses were conducted in SAS V9.4 (SAS Institute Inc., Cary, NC).

Results

A total of 6443 (69.5%) of the enrolled women from nuMoM2b had complete data on all measures and outcomes for this analysis. Of the original enrolled participants, 592 women were excluded due to responding "I don't know" with regards to intention to breastfeed in V4 and the inability to obtain the information from chart abstraction. Another 2238 women were excluded due to missing psychosocial scales and/or other covariates.

Table 1 displays participant characteristics for women in the three breastfeeding intention groups. Women who intended to exclusively breastfeed were older, had lower mean BMI at V1, and delivered at a later mean gestational age than the other two groups. The racial/ethnic distribution of women in the exclusive breastfeeding group was more prominently Non-Hispanic white (71.1%) compared to the other breastfeeding intention groups ($p < 0.0001$). While 80.6% of Non-Hispanic white women intended to exclusively breastfeed, 53.5% of Non-Hispanic black women, 70.8% of Hispanic women, and 75.0% of Other women intended to exclusively breastfeed ($p < 0.001$). Conversely, 23.1% of black women intended to only bottle feed their infants, compared to 6.3% of white women, 4.6% of Hispanic women, and 7.5% of Other women ($p < 0.001$). Many women intended to use both breast and bottle feeding to provide their baby's nutrition. Women intending to exclusively breastfeed had more education and a higher income than

Table 1 Characteristics of the breastfeeding intention groups

Variable N = 6443	A) Breast feed only (N = 4890, 75.9%)	B) Both breast and bottle feed (N = 1040, 16.1%)	C) Bottle feed only (N = 513, 8.0%)	P-Value* A & B vs. C	P-Value* B & C vs. A	P-Value* A vs. C
Age Mean(SD)	27.90 (5.2)	26.52 (5.7)	24.19 (5.7)	< 0.001	< 0.001	< 0.001
BMI Mean(SD)	25.79 (5.8)	27.02 (6.8)	27.99 (7.4)	< 0.001	0.04	< 0.001
Race or ethnicity				< 0.001	< 0.001	< 0.001
Non-Hispanic white	3475 (71.1%)	564 (53.2%)	270 (52.6%)			
Non-Hispanic black	370 (7.6%)	162 (15.7%)	160 (31.2%)			
Hispanic	616 (12.6%)	214 (20.6%)	40 (7.8%)			
Other	429 (8.8%)	100 (9.6%)	43 (8.4%)			
Poverty				< 0.001	< 0.001	< 0.001
> 200% of fed poverty level	3291 (67.3%)	520 (50%)	175 (34.1%)			
100–200% of fed poverty level	543 (11.1%)	145 (13.9%)	55 (10.7%)			
< 100% of fed poverty level	450 (9.2%)	146 (14.0%)	115 (22.4%)			
Refused	606 (12.4%)	229 (22.0%)	168 (32.8%)			
Education				< 0.001	< 0.001	< 0.001
High school or less	1416 (28.9%)	458 (43.8%)	336 (65.1%)			
Bachelor degree or less	2120 (43.2%)	402 (38.4%)	130 (25.2%)			
Master's degree and higher	1367 (27.9%)	186 (17.8%)	50 (9.7%)			
Was this pregnancy planned?				< 0.001	< 0.001	< 0.001
Yes	3295 (67.4%)	575 (55.3%)	184 (35.9%)			
No	1595 (32.6%)	465 (44.7%)	329 (64.1%)			
Was this delivery by C-section?				< 0.001	0.35	0.31
Yes	1255 (25.7%)	339 (32.6%)	148 (28.8%)			
No	3635 (74.3%)	701 (67.4%)	365 (71.2%)			
Did you smoke any tobacco products in the month before delivery?				0.06	< 0.001	< 0.001
Yes	100 (2.0%)	31 (3%)	62 (12.1%)			
No	3786 (77.4%)	827 (79.5%)	356 (69.4%)			
Refused	1004 (20.6%)	182 (17.5%)	95 (18.5%)			
Gestational age at the time of delivery						
Mean (SD)	39.02 (2.0)	38.67 (2.2)	38.70 (1.8)	< 0.001	0.99	0.001

Data are reported as n (%) unless noted otherwise

The three columns of comparisons denote the groups that were combined, versus the other group. For instance the first P value column shows the comparison of women who intend to do any breastfeeding (A&B) versus women who intend to only bottle feed (C). The final column only compares women intending to exclusively breastfeed (A) versus women who intend to only bottle feed (C)

*P-values obtained from t-test or chi-square test. All P-values are adjusted for the 3 comparisons with a Šidák correction

those intending to both breast/bottle feed and those intending to bottle feed only ($p < 0.001$).

Women who reported that the pregnancy was unplanned were more likely to report intention to exclusively bottle feed (64.1%) versus exclusively breastfeed (32.6%, $p < 0.001$). Tobacco use in the month prior to delivery was higher in the bottle feed only group (12.1%) when compared to the rates in the exclusive breastfeed and breast/bottle feed groups (≤ 3%, $p < 0.001$).

Scores for psychosocial scales increased or decreased across the three groups with the mean of each scale for the breast/bottle feed group typically falling between the means for the other two groups (Table 2). Overall, women who intended to exclusively breastfeed reported lower scores for depression, perceived stress, anxiety, and have both a lower hassle frequency ratio and hassle intensity ratio. Outcomes of perceived social support and resilience were highest in women who intended to exclusively breastfeed. These scales were all significantly different between the bottle feed only and exclusively breastfeed groups (p-value < 0.05), although between-group differences for the exclusive breastfeed group and the breast and bottle feed group were similar

Table 2 Descriptive comparison for behavioral scales by breastfeeding intention group

Variable N = 6443	A) Breast feed only (N = 4890, 75.9%)	B) Both breast and bottle feed (N = 1040, 16.1%)	C) Bottle feed only (N = 513, 8.0%)	P-Value* A & B vs. C	P-Value* B & C vs. A	P-Value* A vs. C
Edinburgh depression scale Mean (SD) [Range 0–24 Higher values = more negative feelings/experiences]	5.32 (3.9)	5.87 (4.2)	6.45 (4.9)	< 0.001	0.07	< 0.001
Perceived social support Mean (SD) [Range 12–84 Higher values = higher agreement]	74.97 (13.8)	73.85 (13.9)	72.25 (14.9)	0.05	0.11	< 0.001
Connor davidson resilience scale Mean (SD) [Range 0–100 Higher values = higher resilience]	79.54 (11.0)	78.17 (11.7)	77.06 (13.4)	0.001	0.30	< 0.001
Spielberg state-trait anxiety scale Mean (SD) [Range 20–74 Higher values = higher anxiety]	33.61 (8.5)	34.47 (8.8)	36.25 (9.6)	0.01	0.001	< 0.001
Cohen's perceived stress scale Mean (SD) [Range 0–39 Higher values = higher stress]	11.00 (6.1)	11.96 (6.4)	12.96 (7.0)	< 0.001	0.02	< 0.001
Pregnancy experience scale median (Range)						
PES-hassle frequency ratio	0.70 (0.1–8)	0.70 (0.1–6)	0.75 (0.1–5)	0.13**	0.14**	0.003**
PES-hassle intensity ratio	0.56 (0.33–2.22)	0.59 (0.33–2.17)	0.63 (0.33–1.82)	< 0.001**	0.01**	< 0.001**

Data are reported as mean (standard deviation)

The three columns of comparisons denote the groups that were combined, versus the other group. For instance the first P value column shows the comparison of women who intend to do any breastfeeding (A&B) versus women who intend to only bottle feed (C). The final column only compares women intending to exclusively breastfeed (A) versus women who intend to only bottle feed (C)

*P-values obtained from t-test. All P-values are adjusted for the 3 comparisons with a Šidák correction

**P-values obtained from Wilcoxon rank sum test

for perceived social support (p-value = 0.05) and the PES-Hassle frequency ratio (p-value = 0.13). Also, there was not a significant difference between the breast and bottle feed group and the bottle feed only group for depression (p-value = 0.07), perceived social support (p-value = 0.11), resilience (p-value = 0.30), or hassle frequency ratio (p-value 0.14).

The logistic regression models included all participant characteristics in Table 1 and psychosocial scales in Table 2 with the exception of the PES-Hassle frequency ratio. The PES-Hassle frequency and intensity ratios were highly correlated (Spearman's rho = 0.54), and the PES-Hassle frequency ratio did not significantly differ for two of the three between group comparisons; thus, only the PES-Hassle intensity ratio was included in the multiple logistic regression models.

For the logistic regression model of intending to exclusively breastfeed, the participant and psychosocial characteristics explain approximately 61% of the site-to-site variability. For the regression model of the bottle feed only vs other groups, 64% of the site-to-site variability was explained by the participant and psychosocial scales.

From Table 3, factors associated with the intention to exclusively breastfeed only from the logistic regression include older age, lower BMI, higher gestational age at delivery, race/ethnicity, poverty level, education level, and not using tobacco products the month before delivery. More specifically, non-Hispanic white women had twice the odds of exclusively breastfeeding when compared to Non-Hispanic black women (OR = 2.04, 95% CI 1.67–2.50) and Hispanic mothers had 1.6 times higher odds of exclusively breastfeeding when compared to Non-Hispanic black mothers (OR = 1.62, 95% CI 1.28–2.06).

The PES-Hassle intensity ratio was the only psychosocial scale that was associated with the intention to exclusively breastfeed in the multiple logistic regression model; thus, women who rate their experience of pregnancy-specific hassles more intense than uplifts were less likely report intention to exclusively breastfeed. (Table 3) Factors associated with the intention to either exclusively breastfeed or breast and bottle feed (i.e., any breastfeeding intent vs. no breastfeeding intent) were similar to those found for the outcome of exclusive breastfeeding intent. In this model, reporting that the pregnancy was planned was associated with any

Table 3 Logistic Regression predicting breastfeeding intention

	Odds of intending to do any breastfeeding (Breast feed only or bottle/breast feed) compared to intending to only bottle feed (reference group)			Odds of intending to exclusively breastfeed (compared to intending to either bottle feed only or breast and bottle feed)		
	Model AUC = 0.777, N = 6443			Model AUC = 0.692, N = 6443		
Variable	OR_1	95% CI	P-value	OR_1	95% CI	P-value
Age[v1]	1.054	1.03–1.08	0.0001	1.022	1.01–1.04	0.01
BMI[v1]	0.974	0.96–0.99	0.0002	0.974	0.97–0.98	< 0.001
Gestational age at delivery[c]	1.027	0.98–1.08	0.25	1.065	1.03–1.10	< 0.001
Race or ethnicity[v1]						
Non-Hispanic black	Reference			Reference		
Non-Hispanic white	1.577	1.20–2.07	0.001	2.041	1.67–2.50	< 0.001
Hispanic	3.241	2.16–4.86	< 0.001	1.624	1.28–2.06	< 0.001
Other	1.594	1.08–2.35	0.02	1.560	1.20–2.03	0.001
Poverty[v1]						
> 200% of Fed poverty level	1.374	0.96–1.96	0.08	1.497	1.19–1.88	0.001
100–200% of Fed poverty level	1.685	1.17–2.43	0.01	1.244	0.98–1.58	0.07
< 100% of Fed poverty level	Reference			Reference		
Refused	1.047	0.78–1.40	0.77	0.939	0.76–1.16	0.57
Education[v1]						
Master's degree and higher	2.505	1.66–3.78	< 0.001	1.701	1.36–2.14	< 0.001
Bachelor degree or less	1.874	1.42–2.48	< 0.001	1.309	1.11–1.55	0.002
High school or less	Reference			Reference		
Planned pregnancy[v1]						
Yes	1.293	1.02–1.64	0.03	1.119	0.97–1.30	0.13
Tobacco use[v4]						
Yes	0.472	0.33–0.68	< 0.001	0.644	0.47–0.88	0.01
No	Reference			Reference		
Refused	1.049	0.81–1.36	0.05	1.303	1.11–1.53	0.002
Edinburgh depression scale[v3]	0.977	0.95–1.01	0.18	0.979	0.96–1.001	0.07
Perceived social support[v1]	0.993	0.99–1.00	0.07	0.996	0.99–1.001	0.08
Connor davidson resilience scale[v2]	1.004	0.995–1.01	0.40	1.006	1.00–1.01	0.05
Spielberg state-trait anxiety scale[v1]	0.995	0.98–1.01	0.50	1.005	0.996–1.02	0.27
Cohen's perceived stress scale[v3]	1.012	0.99–1.04	0.28	1.005	0.99–1.02	0.52
PES-hassle intensity ratio[v3]	0.725	0.48–1.09	0.12	0.707	0.55–0.92	0.01
Random effect estimate(SE)	0.1913 (0.1124)			0.0682 (0.0397)		
ICC	0.0550			0.0203		

V1 (gestational age 6 weeks 0 days to 13 weeks 6 days), V2 (gestational age 16 weeks 0 days to 21 weeks 6 days), V3 (gestational age 22 weeks 0 days to 29 weeks 6 days), V4 (at time of delivery)—Variables obtained at Visits 1, 2, 3, 4 respectively. C—Variables obtained from chart abstraction

breastfeeding intent. No psychosocial scales were significantly associated with the outcome of any breastfeeding intent.

Discussion

In this large cohort of nulliparous women, 92% stated the intention to breastfeed to some degree, with 75.9% stating the intention to exclusively breastfeed. The rates identified for the nuMoM2b cohort are similar to other US cohorts (Sutherland et al. 2012). Factors associated with the intent to exclusively breastfeed included higher maternal age, lower BMI, non-black race/ethnicity, higher income, higher attained education, not using tobacco, and lower PES-Hassle intensity ratio.

Consistent with other studies, we found that non-Hispanic black women have lower rates of intended breastfeeding than their counterparts (Centers for Disease Control and Prevention 2019; Robinson et al. 2018). This

finding is concerning because non-Hispanic black infants have 2.2 times the infant mortality rate, are 3.2 times more likely to die from complications related to low birth weight and have twice the rate of sudden infant death syndrome than non-Hispanic whites (United States Department of Health and Human Services 2010). Breastfeeding is associated with a 36% decrease in SIDS (Victora et al. 2016). Thus, one potential method to address the disparities in infant mortality could be to work on improved breastfeeding rates in non-Hispanic black women. For women who identify as non-Hispanic black programs and services in addition to standard antenatal care can help increase breastfeeding initiation (Robinson et al. 2018).

Enhancing breastfeeding intention and continuation rates for women who are socioeconomically or racially marginalized can be complex, as there are a multitude of factors that can influence breastfeeding practices (Johnson et al. 2015; Temple Newhook et al. 2017). From a public health perspective, it is important to understand and target policies to reduce disparities in breastfeeding rates (Dubois and Girard 2003; Smith James 2017). As the barriers experienced by women are complex and multiple, a more thorough understanding of contributors to breastfeeding intention, including psychosocial and environmental influencers, is needed. Poor outcomes in these groups reinforce the need for an integrative approach to address the complexity of interrelated barriers women experience across layers of the social ecological system (Johnson et al. 2015).

Of the psychosocial measures in the multivariable analysis, only the PES-Hassle intensity ratio being low predicted an intention to exclusively breastfeed. This ratio measures the hassles or frustrations during pregnancy compared to uplifting or positive experiences. Thus, women experiencing more intense hassles over the course of their pregnancy might be less inclined to breastfeed the infant. This may be due to an overall perception of pregnancy as a more negative experience rather than a more positive one. Further exploration regarding individual components of the PES which may contribute more to breastfeeding intention or other outcomes is warranted. We are unaware of other studies in the United States where these psychosocial measures were linked to breastfeeding intention in nulliparous women. A study by McManus et al. noted in 114 primiparous women that those with a more uplifts than hassles in pregnancy were more likely to have longer breastfeeding duration, which correlated to improved infant health (McManus et al. 2017). While some of the other psychosocial measures were not statistically significantly associated with the outcome of exclusive breastfeeding intention in the multivariable model, several were close ($p < 0.10$). These measures could potentially be used as screening tools during prenatal care to help identify women who might need additional encouragement to breastfeed. More work is needed to assess how these measures associate with breastfeeding longevity in the cohort.

The AAP recommends exclusive breastfeeding for at least 6 months with continued breastfeeding and supplemental foods for up to 1 year (Victora et al. 2016). One study evaluated a sample population which was deemed representative of all races in the United States and found that 71% of infants received some form of breastmilk which is consistent with *Healthy People 2020's* report that in 2006, 74% of infants were breastfed in some form (Davis et al. 2018; United States Department of Health and Human Services 2010). Data from *Healthy People 2020* further notes that only 33.6% of infants are exclusively breastfed until 3 months and this further decreases to 14.1% by 6 months. They state a goal of having at least 25.5% of infants exclusively breastfed through 6 months. Given the high rate of breastfeeding intention in this cohort, it is reassuring that more than 92% intend to breastfeed their infants in some capacity postpartum.

Future studies should focus on ways to potentially overcome not only the sociodemographic characteristics of women who do not intend to breastfeed, but also include evaluations of psychosocial and other factors that occur during pregnancy that can contribute to intense hassles. Using mixed methods approaches to understand motivations and barriers to address will be crucial to understanding the complex contributors to breastfeeding intention. Additional studies can then focus on antenatal interventions and support for women which may reduce hassles and improve breastfeeding intention.

Strengths of this cohort are the large number of women who were followed prospectively and had not only rigorously collected and adjudicated pregnancy characteristics data, but also had a multitude of validated psychosocial instruments administered. This amount of data allowed for analysis of multiple potential contributors to breastfeeding intention, starting with pre-pregnancy information and including situations that occurred during the pregnancy.

The nuMoM2b cohort study was subject to the typical limitations of this type of study design (Haas et al. 2015). We only analyzed nuMoM2b participants who answered every question and survey measure completely. Approximately 45% of nuMom2b participants were not included in our analysis because they were missing one or more of the outcome or psychosocial variables. However, this is one of the larger cohorts and was characterized prospectively beginning in the first trimester that included a multitude of psychosocial measures for nulliparous women. Women with missing data were similar to those analyzed. Even with the large number of instruments, some domains, such as attachment, were not captured. Given the independent association of PES-Hassle ratios with exclusive breastfeeding, exploration of a woman's attachment to her developing baby could

enhance understanding of this relationship. It has been documented that attachment and bonding to the developing infant during pregnancy can influence postpartum behaviors (Pearson et al. 2011). Additionally, exploring which intense hassles have the strongest relationship to breastfeeding intention can be explored. A cross-sectional survey showed that life stressors and hassles, particularly financial, are associated with earlier cessation of breastfeeding (Dozier et al. 2012).

There are some other limitations in the information that was collected during the study. For example, an Indonesian study found that women who were aware of breastfeeding recommendations and understood the infant and maternal health benefits of breastfeeding had stronger intentions to exclusive breastfeed (Nuzrina et al. 2016). NuMoM2b participants were not asked about their level of understanding of current breastfeeding recommendations or if they had previous knowledge of the health benefits of breastfeeding. Women were not asked about the breastfeeding education they received during the prenatal period. This study also did not ask participants about cultural or social norms of breastfeeding. A previous study found that women were more likely to breastfeed if their mother's had breastfed (Nuzrina et al. 2016). Studies in the U.S. note that providing women education about the health benefits of breastfeeding and community-based support programs improves rates of exclusive breastfeeding (Keitt et al. 2018). As thoughts about breastfeeding intentions may be established before pregnancy occurs, this report is also limited in that it did not ask about intention to breastfeed at V1 or what may have contributed to those intentions. These can be incorporated into future studies. We also did not use a validated scale for infant feeding intention or detailed questions about employment. This simplified question was asked instead to minimize burden on the woman in the postpartum time frame. Additionally, due to this, we did not ask follow-up questions about reasons behind their intentions or outside influences on their intention, such as plans to return to work.

Conclusions for Practice

In conclusion, nulliparous women were more likely to intend to breastfeed if they were older and of higher socioeconomic status. While most psychosocial measures were not independently associated with breastfeeding intention, having lower intensity of experiencing hassles in comparison to uplifts in pregnancy predicted greater odds of intending to exclusively breastfeed. Additionally, as women who smoked in the month prior to delivery were more likely to bottle feed, early recognition and services for women who use tobacco during pregnancy to encourage breastfeeding may be warranted. Breastfeeding support must come from multiple levels including: legal and policy directives, contextual and multilevel preconception and antenatal education, improvement in women's work provisions for lactation space, employment conditions that remove breastfeeding barriers, and better health-care services (Centers for Disease Control and Prevention 2019; Johnson et al. 2015; Rollins et al. 2016). Overcoming barriers and problematic social determinants of health, particularly for Non-Hispanic black women, may help improve breastfeeding rates (U.S. Department of Health and Human Services Office of Minority Health 2019).

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Compliance with Ethical Standards

Conflict of interest The authors report no conflict of interest related to this project.

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