

**HHS PUBLIC ACCESS**

Author manuscript

Matern Child Health J. Author manuscript; available in PMC 2018 March 01.

Published in final edited form as:

Matern Child Health J. 2017 March ; 21(3): 636–647. doi:10.1007/s10995-016-2150-6.

Postpartum Mental Health and Breastfeeding Practices: An Analysis Using the 2010–2011 Pregnancy Risk Assessment Monitoring System

Kathryn Wouk¹, Alison M. Stuebe^{1,2}, and Samantha Meltzer-Brody³¹Carolina Global Breastfeeding Institute, Maternal and Child Health Department; Gillings School of Global Public Health, University of North Carolina, Chapel Hill, North Carolina²Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of North Carolina School of Medicine, Chapel Hill, North Carolina³Department of Psychiatry, University of North Carolina School of Medicine, Chapel Hill, North Carolina

Abstract

Objective—Evidence suggests that women with postpartum depression (PPD) are at risk for early breastfeeding cessation, but previous studies have been limited by small samples. The objective of this analysis is to estimate the association between PPD symptoms and breastfeeding using a national, stratified, random sample of U.S. mothers.

Methods—Data from the 2010–2011 Pregnancy Risk Assessment Monitoring System were analyzed for New York City and the 29 states for which data were available. Multivariable logistic regression was used to explore the association between a pre-pregnancy mental health visit and subsequent breastfeeding initiation as well as PPD and three-month any and exclusive breastfeeding. To identify state-level variation, we created maps of prevalence and adjusted odds of breastfeeding by PPD and pre-pregnancy mental health status.

Results—Women reporting a pre-pregnancy mental health visit had 0.61 (95% CI: 0.56, 0.67) times the odds of initiating breastfeeding compared with women who reported no pre-pregnancy visit. At three months postpartum, women with PPD symptoms since birth had 0.79 (95% CI: 0.70, 0.88) times the odds of any breastfeeding and reduced odds of exclusive breastfeeding modified by race/ethnicity. We found variation in state-level PPD symptoms and pre-pregnancy mental health prevalence and adjusted odds of breastfeeding.

Conclusions for Practice—Our results highlight the importance of providing targeted breastfeeding support to women with PPD symptoms, because they are at risk of early breastfeeding cessation. Given the cross-sectional nature of these data, women with early breastfeeding cessation may also be at risk for PPD, requiring screening and treatment.

Keywords

Perinatal depression; PRAMS; Breastfeeding; Maps

Introduction

Postpartum depression (PPD) is one of the most common complications of childbirth, affecting 10 to 15% of pregnant and postpartum women (Gaynes et al., 2005). While the Diagnostic and Statistical Manual of Mental Disorders (DSM), fifth edition, defines PPD as the onset of mood symptoms during pregnancy or in the four weeks following birth (American Psychiatric Association, 2013), significant variations exist in the timing of onset and severity of symptoms. For example, compared with women whose symptoms begin during the postpartum period, women experiencing prenatal onset are more likely to have a history of mood and anxiety disorders and to experience more severe postpartum symptoms (Postpartum Depression: Action Towards Causes and Treatment (PACT) Consortium, 2015). PPD and anxiety have been shown to precede and lead to the early cessation of breastfeeding (Dennis & McQueen, 2009; Dias & Figueiredo, 2014).

PPD and suboptimal breastfeeding are associated with negative health outcomes for both mothers and infants. PPD is associated with reduced mother-infant attachment (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007), child development and behavior problems (Campbell, Morgan-Lopez, Cox, Mcloyd, & NICHD Early Childcare Research Network, 2009), and increased risk of suicide (Lindahl, Pearson, & Colpe, 2005). For infants, suboptimal breastfeeding is associated with increased risk of infections (Ip, Chung, Raman, Trikalinos, & Lau, 2009), all-cause mortality (Sankar et al., 2015), and chronic diseases such as type 2 diabetes (Horta, de Mola, & Victora, 2015). For mothers, suboptimal breastfeeding is associated with increased risk of breast and ovarian cancers, type 2 diabetes (Chowdhury et al., 2015), hypertension (Stuebe et al., 2011), and cardiovascular disease (Gunderson et al., 2015). As a result of these numerous maternal and infant health risks, research to inform a better understanding of the relationship between perinatal mental health and breastfeeding has the potential to improve targeted support to address these critical public health priorities.

Risk factors for PPD and suboptimal breastfeeding include low socioeconomic status, racial/ethnic minority status, and partner-related stress (Howell, Mora, Horowitz, & Leventhal, 2005; Zayas, Cunningham, McKee, & Jankowski, 2002). While studies have shown an association between PPD and anxiety symptoms and early breastfeeding cessation, many have been limited by small or homogenous samples and by participants who breastfed at rates above national averages (Dias & Figueiredo, 2014). To improve the generalizability of evidence regarding the association between mood and lactation, larger samples representative of the diverse U.S. population are needed.

In this study, we used a national, stratified, random sample of U.S. mothers to determine the extent to which depression and anxiety symptoms are associated with reduced odds of breastfeeding. We examined the association between preexisting mental health symptoms

and breastfeeding initiation as well as PPD symptoms and breastfeeding duration and intensity.

Methods

Data

We conducted a secondary analysis of the most recent years of available data from the 2010–2011 Pregnancy Risk Assessment Monitoring System (PRAMS). The Centers for Disease Control and Prevention (CDC) collected these state-specific and population-based data regarding maternal attitudes and health behaviors before, during, and after pregnancy from a sample of women who delivered a live-born infant between January 1, 2010 and December 31, 2011. PRAMS questionnaires were administered via mail or telephone interview approximately two to four months postpartum and linked to birth certificate data for additional demographic and health information. Thirty-eight of 41 sites participated in PRAMS in 2010–2011. Of these, 29 states and New York City met the response rate threshold of 65% and are included in these analyses.

Each state and New York City selected a stratified random sample of 100–250 new mothers from a sample frame of eligible birth certificates. Most sites oversampled higher risk groups, including low birthweight infants, women with inadequate prenatal care, and racial minorities (Gross, Wells, Radigan-Garcia, & Dietz, 2002). Weighted response rates from sites included in this analysis range from 65% (Alaska, Georgia, Ohio, Texas, and West Virginia) to 83.3% (Vermont) in 2010, with a median response rate of 70.3%, and from 66.1% (Arkansas and Minnesota) to 81.0% (Vermont) in 2011, with a median response rate of 69.6%. Of the 77,679 mothers who responded to the PRAMS questionnaire in 2010–2011, 450 mothers (0.6%) whose infants had died by the time of survey administration were excluded from analyses because of the effects of infant death on both mood and breastfeeding.

The sample for the analysis of pre-pregnancy mental health and breastfeeding initiation included 74,429 respondents with exposure and outcome data. Excluded women were more likely to be younger, lower income, unmarried, and from racial/ethnic minorities compared with women in the sample. The analytic sample for PPD symptoms and any breastfeeding comprised 55,987 women responding at or after three months postpartum; excluded women were slightly more likely to be Hispanic or Asian and married. The sample for PPD symptoms and exclusive breastfeeding included 44,294 women responding at or after three months postpartum; excluded women were slightly more likely to be Black, lower income, and unmarried compared with women in the sample. All participating states and New York City provided data for the above analyses through a core set of shared questions. Two states, Illinois and Maryland, included anxiety questions in their questionnaire; we analyzed postpartum anxiety symptoms and infant feeding for 4778 respondents for three-month any breastfeeding and 3830 respondents for three-month exclusive breastfeeding.

Measures

History of depression or anxiety—Because the survey did not include an exact measure of respondents' pre-pregnancy mental health, we used the following proxy measure:

At any time during the 12 months before you got pregnant with your new baby, did you do any of the following things? For each item, circle Y (Yes) if you did it or N (No) if you did not.

I visited a health care worker to be checked or treated for depression or anxiety.

We considered a “Yes” response to this question to be an indicator of pre-pregnancy anxiety or depression.

Postpartum Depression—PPD symptoms were defined through maternal self-report on a three-item question from the Phase 6 Core Questionnaire:

Below is a list of feelings and experiences that women sometimes have after childbirth. Read each item to determine how well it describes your feelings and experiences. Then write on the line the number of the choice that best describes how often you have felt or experienced things this way since your new baby was born:

- A. I felt down, depressed, or sad.
- B. I felt hopeless.
- C. I felt slowed down

Response options for each item (A, B, C) were on a Likert scale with never=1, rarely=2, sometimes=3, often=4, and always=5. A composite score >9 has been validated in relation to the Structured Clinical Interview for DSM-IV-based diagnosis of major depressive episode with a sensitivity of 57% and a specificity of 87% (O'Hara et al., 2012).

Postpartum Anxiety—Postpartum anxiety symptoms were defined through maternal self-report on a two-item question included on the Standard Questionnaire in Illinois and Maryland:

Below is a list of feelings and experiences that women sometimes have after childbirth. Read each item to determine how well it describes your feelings and experiences. Then, write on the line the number of the choice that best describes how often you have felt or experienced things this way *since your new baby was born*. Use this scale when answering:

- A. I felt panicky.
- B. I felt restless.

Response options for each item (A and B) were on a Likert scale with never=1, rarely=2, sometimes=3, often=4, and always=5. A composite score >5 has been validated in relation to the Structured Clinical Interview for DSM-IV-based diagnosis of generalized anxiety disorder with a sensitivity of 75% and a sensitivity of 77% (O'Hara et al., 2012).

Breastfeeding Outcomes—Breastfeeding initiation was defined as a positive response to the following question: “Did you ever breastfeed or pump breast milk to feed your new baby after delivery, even for a short period of time?” Three-month any breastfeeding was categorized based on responses to the following core question with any time beginning at three months: “How many weeks or months did you breastfeed or pump milk to feed your baby?” Three-month exclusive breastfeeding was defined by women responding with any age greater than three months to both of the following core questions: “How old was your new baby the first time he or she drank liquids other than breast milk (such as formula, water, juice, tea, or cow’s milk)?” and “How old was your new baby the first time he or she ate food (such as baby cereal, baby food, or any other food)?” Respondents who were not yet three months postpartum when they completed the questionnaire were excluded from the analysis of three-month breastfeeding outcomes.

Other Variables—We used a directed acyclic graph (DAG) to illustrate possible causal and non-causal pathways between PPD or anxiety and breastfeeding outcomes and to identify potential confounding and effect measure modification by sociodemographic variables, perinatal behaviors, and birth outcomes [Online Resource 1]. Variables were identified based on the literature and a theoretical conceptualization of the relationship between PPD or anxiety and breastfeeding. Analytic data were available for the following potential covariates: maternal age; race/ethnicity; marital status; pregnancy intention; income; prenatal morbidity; infant admission to the NICU; type of delivery; adequacy of prenatal care determined by calculating the Kotelchuck index (Kotelchuck, 1994); abuse in the 12 months before or any time during pregnancy; and stressful events in the 12 months before birth. Information on potential confounders was obtained from both core questionnaires and linked birth certificates.

Analysis

Multivariable logistic regression was used to estimate the association between 1) having a pre-pregnancy mental health visit and breastfeeding initiation among all respondents and 2) PPD symptoms and three-month any and exclusive breastfeeding among women responding any time at or after three months postpartum. We also conducted a secondary analysis of the association between postpartum anxiety symptoms and three-month any and exclusive breastfeeding among those responding at or after three months. Both crude odds ratios and 95% confidence intervals (CIs) and those adjusted for confounders are presented for all breastfeeding outcomes.

The overarching goal of this analysis was to obtain the least biased and most precise estimate of the association between PPD or anxiety symptoms and breastfeeding outcomes. As a result, covariates were included if they reduced bias or improved precision, but the coefficients for covariates were not of interest. For a covariate to be included as a confounder, it must have a) resulted in a change the exposure-outcome effect estimate by 5% or greater using backward elimination from the full model and b) be considered to address residual confounding in the literature. For a covariate to be included as an effect measure modifier, there must have been a) evidence of heterogeneity in the exposure-outcome relationship when stratified by the covariate and b) an Wald Chi-Square p-value <0.05 for

the interaction variable. We explored collinearity using a scatterplot matrix and correlation table for all covariates, considering variables with a p-value <0.0001 and a Pearson Correlation Coefficient >0.5 to be collinear. Any variable with missing data >5% was imputed. To account for the weighting and survey design used in collecting PRAMS data, SAS-callable SUDAAN was used in all analyses in SAS.V9.4 (SAS Institute, Cary, NC).

We also created choropleth maps to illustrate the state-level prevalence of women reporting a pre-pregnancy mental health visit or PPD symptoms adjusted for survey weights. Additional maps indicate the state-level adjusted odds of breastfeeding initiation by pre-pregnancy mental health status and of three-month any and exclusive breastfeeding by PPD status. Maps of the state-level odds of breastfeeding are adjusted for confounders identified in model building for each analysis. Maps were created using ArcMap 10.1 (ESRI, Redlands, CA).

Results

Sample Characteristics

Approximately 13.4% of the 76,658 women in the pre-pregnancy mental health sample reported having a health care visit to be checked or treated for anxiety and depression in the 12 months before pregnancy. Compared with women reporting no visit, women with a pre-pregnancy mental health visit were more likely to be of White or Other race/ethnicity, younger, lower income, and unmarried; to describe the pregnancy as undesired; to experience more life stresses, partner abuse, infant NICU admission, and cesarean delivery; and to report either “inadequate” or “adequate plus” prenatal care alongside lower levels of prenatal morbidity [Table 1].

Approximately 12% of the 58,630 women responding at or after three months postpartum reported PPD symptoms. Descriptive characteristics were generally similar to those for women reporting a pre-pregnancy mental health visit, though women reporting PPD symptoms were more likely to be White, Black, or Other race/ethnicity and to have had a pre-pregnancy visit for anxiety or depression [Table 1]. Finally, of the 4986 women responding at or after three months postpartum in the two states reporting postpartum anxiety, 16.7% experienced postpartum anxiety symptoms. These women had similar descriptive characteristics as women reporting PPD symptoms.

The only covariate with >5% missing data was income, which also met our criteria for collinearity with marital status. Therefore, we included marital status as a potential confounder in model building in place of income.

Logistic Regression Analyses

Approximately 76.9% and 84.3% of those with and without a pre-pregnancy mental health visit, respectively, initiated breastfeeding. The crude odds of breastfeeding initiation for women reporting a pre-pregnancy visit for depression or anxiety were 0.61 (95% CI: 0.56, 0.67) times the odds for women reporting no pre-pregnancy visit. After adjustment for maternal race/ethnicity and marital status, the odds of initiation were only slightly attenuated: women with a pre-pregnancy mental health visit had 0.71 (95% CI: 0.64, 0.78)

times the odds of initiating compared with women reporting no pre-pregnancy visit [Table 2a].

Approximately 36.9% versus 51.0% of women with and without PPD symptoms, respectively, were breastfeeding at all at three months postpartum, and 18.3% versus 28.1% were exclusively breastfeeding at three months. Crude analyses showed that women with PPD symptoms had 0.60 (95% CI: 0.54, 0.67) times the odds of any breastfeeding and 0.58 (95% CI: 0.50, 0.68) times the odds of exclusive breastfeeding at three months. In the model adjusted for pre-pregnancy mental health visit, prenatal morbidity, pregnancy intention, and stressful events in the 12 months before birth, we found that women with PPD symptoms had 0.79 (95% CI: 0.70, 0.88) times the odds of any breastfeeding at three months [Table 2b]. We also found modification of the association between PPD symptoms and three-month exclusive breastfeeding by race/ethnicity. After adjustment for race/ethnicity, age, prenatal morbidity, and stressful events in the 12 months before birth, the odds of exclusive breastfeeding ranged from 0.41 (95% CI: 0.27, 0.63) for Black mothers to 1.07 (95% CI: 0.70, 1.63) for Hispanic mothers [Table 2b]. Results for these analyses were similar when we limited the sample to women who initiated breastfeeding (data not shown).

Finally, 42.4% versus 53.4% of women with and without postpartum anxiety symptoms, respectively, were doing any breastfeeding at three months, and 17.5% versus 26.1% were exclusively breastfeeding at three months. Crude analyses showed that women reporting symptoms had 0.64 (95% CI: 0.53, 0.78) times the odds of any breastfeeding and 0.66 (95% CI: 0.51, 0.86) times the odds of exclusive breastfeeding at three months compared to asymptomatic women. After adjustment, these estimates were attenuated, and confidence intervals were wide: women reporting postpartum anxiety symptoms had an adjusted 0.87 odds of three-month any breastfeeding (95% CI: 0.70, 1.08) and 0.92 odds of three-month exclusive breastfeeding (95% CI 0.68, 1.24) compared with women without symptoms [Table 2b].

Geographic variation

Figure 1 presents the prevalence of women reporting a pre-pregnancy visit for depression or anxiety adjusted for state-level population for all states and New York City in the PRAMS 2010–2011 data set. Darker tones indicate a higher prevalence of women reporting a pre-pregnancy mental health visit, and the percentage ranges from 6.6% in Georgia to 22.0% in Maine. Figure 2 shows the state-level adjusted odds of initiation between women with and without a pre-pregnancy visit. Women in Alaska, New York City, and Maryland who reported a pre-pregnancy visit had the lowest odds of initiating breastfeeding compared to women without this visit. Figure 3 illustrates the percentage of women reporting PPD symptoms, ranging from 7.0% in Illinois to 16.4% in Arkansas. Figure 4 highlights state-level adjusted odds of three-month any breastfeeding by PPD status, ranging from 0.45 in Georgia to 1.23 in Alaska. Figure 5 presents state-level adjusted odds of three-month exclusive breastfeeding by PPD status, ranging from 0.23 in Arkansas to 1.88 in Ohio.

Discussion

In a national, stratified, random sample of U.S. mothers, we found that PPD and anxiety symptoms were associated with reduced breastfeeding initiation, duration, and intensity. Women who reported visiting a health care worker to be checked or treated for depression or anxiety before pregnancy were less likely than women without a pre-pregnancy visit to initiate breastfeeding. Additionally, women experiencing PPD or anxiety symptoms had reduced odds of any and exclusive breastfeeding at three months postpartum compared with those not reporting symptoms. Maps of participating states and New York City illustrate the generally lower prevalence of any and exclusive breastfeeding for women with a pre-pregnancy mental health visit, PPD, and anxiety symptoms.

Our findings confirm and extend earlier work on the association between PPD and anxiety symptoms and breastfeeding outcomes. Several international studies have observed an association between breastfeeding duration and intensity and PPD (Feldens, Vitolo, Rauber, Cruz, & Hilgert, 2012; Flores-Quijano et al., 2008; Imbula, Okitundu, & Mampunza, 2012; McLearn, Minkovitz, Strobino, Marks, & Hou, 2006; Thome, Alder, & Ramel, 2006; Zubaran & Foresti, 2013) and postpartum anxiety (Adedinsowo et al., 2014; Paul, Downs, Schaefer, Beiler, & Weisman, 2013); however, studies conducted in U.S. populations have been limited (Hatton et al., 2004; McCoy et al., 2008; Yonkers et al., 2001). Our results corroborate these associations in a representative sample of U.S. mothers. While two previous studies did not find the association with breastfeeding initiation that we observed with our proxy for pre-pregnancy mental health, they found that antenatal depression and anxiety predicted shorter breastfeeding intention (Fairlie, Gillman, & Rich-Edwards, 2009; Insaf et al., 2011).

To our knowledge, ours is the first study to assess state-by-state variation in the association between PPD and anxiety symptoms and breastfeeding outcomes. While CDC maps of state-level breastfeeding prevalence show a higher percentage of infants breastfed in West Coast, Mountain Plains, and some Northeastern states (CDC, 2011), our maps highlight state-level variation in breastfeeding outcomes by mental health status. For example, Wisconsin and Georgia had large percentages of women reporting a pre-pregnancy visit, though these women did not have a reduced odds of breastfeeding initiation. The high prevalence of breastfeeding initiation in Wisconsin (CDC, 2011) may reflect broad breastfeeding support that results in smaller differences in the odds of breastfeeding by pre-pregnancy mental health status; however, the low prevalence of breastfeeding initiation in Georgia (CDC, 2011) may indicate a lack of breastfeeding support regardless of mental health. Additionally, the high statewide three-month exclusive breastfeeding prevalence in Oregon (CDC, 2011) may reflect widely available breastfeeding support for both symptomatic and non-symptomatic mothers; however, this contrasts with states like Alaska and Colorado, where exclusive breastfeeding prevalence is high (CDC, 2011), but women reporting PPD symptoms have a markedly reduced odds of breastfeeding. By exploring resources in states where women are able to sustain breastfeeding despite depression or anxiety symptoms, we may be able to identify policies and programs for replication in states where symptoms are more strongly associated with early weaning.

Strengths of these analyses include the large number of survey respondents in this national data set weighted to be representative of postpartum mothers at the state level. The size and diversity of the 29 states and New York City included in the survey make our results broadly generalizable to U.S. mothers. Additionally, the survey provided data on a variety of demographic and clinical variables, allowing us to control for most of the potential confounders identified a priori. The availability of data on the state in which respondents reside facilitated the creation of maps for visually interpreting state-level differences in associations between mood and breastfeeding outcomes.

Our findings must be interpreted within the context of the study design. First, our data are cross-sectional. Since women reported both depression and anxiety symptoms and breastfeeding practices at the same time, the temporality of the association remains unclear; this limitation contributes to the possibility of reverse causation, where reduced breastfeeding prevalence may in fact cause PPD symptoms. Women who responded to the questionnaire later in the postpartum period also had a longer time in which to develop PPD or anxiety, as our measures of postpartum mental health asked about symptoms occurring any time after childbirth. Data were not available on pregnancy depression, which has been shown to predict PPD and shorten breastfeeding duration (Dias & Figueiredo, 2014). While we were able to use women's self-report of a pre-pregnancy healthcare visit to check or treat depression or anxiety as a proxy for mental health history, this question conflates screening with treatment. Targeted questions about pre-pregnancy and prenatal diagnosis or treatment for depression, and separate questions for anxiety, would allow future research to differentiate the effects of pre-pregnancy, prenatal, and postpartum mental health on breastfeeding outcomes.

Our finding that the association between PPD symptoms and three-month exclusive breastfeeding is modified by race/ethnicity suggests possible reporting bias. Mothers may underreport depression symptoms because they are expected to feel joyful about the birth of their babies; this reporting bias may be differential if women of certain race/ethnicity, age, or other demographic factors are more likely to underreport than others due to factors such as discrimination and cultural insensitivity by healthcare providers. PPD symptoms may also affect breastfeeding outcomes differentially by race by exacerbating financial, relational, or physical stressors experienced by some racial/ethnic groups more frequently than others (Liu, Giallo, Doan, Seidman, & Tronick, 2016). Qualitative studies are needed to explore how depression and anxiety symptoms might differentially lead to weaning within diverse racial/ethnic groups. Additionally, some of the racial/ethnic and socioeconomic differences between women included and excluded from analyses indicate potential selection bias. Finally, we did not have data on two of the covariates identified in our DAG, breastfeeding intention and social support, creating the potential for uncontrolled confounding to bias the estimated effect.

In conclusion, our results highlight the importance of providing targeted breastfeeding support to women with postpartum mood and anxiety symptoms, because they are at risk of early breastfeeding cessation. Due to the cross-sectional nature of these data, women experiencing early breastfeeding cessation may also be at increased risk for developing postpartum mood symptoms, requiring mental health support. Future research is needed to

identify policies and healthcare services that will enable women to both address their perinatal mental health needs and meet their breastfeeding goals.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The study was funded in part by a predoctoral training grant from the National Institute of Child Health and Human Development (5T32HD052468-08). This paper uses data collected by the Centers for Disease Control and Prevention's surveillance project, the Pregnancy Risk Assessment Monitoring System (PRAMS). The authors would like to acknowledge the PRAMS Working Group: Alabama—Qun Zheng, MS Alaska—Kathy Perham-Hester, MS, MPH Arkansas—Mary McGehee, PhD Colorado—Alyson Shupe, PhD Connecticut—Jennifer Morin, MPH Delaware—George Yocher, MS Florida—Kelsi E. Williams Georgia—Chinelo Ogbuanu, MD, MPH, PhD Hawaii—Jane Awakuni Illinois—Theresa Sandidge, MA Iowa—Sarah Mauch, MPH Louisiana—Amy Zapata, MPH Maine—Tom Patenaude, MPH Maryland—Diana Cheng, MD Massachusetts—Emily Lu, MPH Michigan—Patricia McKane Minnesota—Judy Punyko, PhD, MPH Mississippi—Brenda Hughes, MPPA Missouri—Venkata Garikapaty, MSc, MS, PhD, MPH Montana—JoAnn Dotson Nebraska—Brenda Coufall New Hampshire—David J. Laflamme, PhD, MPH New Jersey—Ingrid M. Morton, MS New Mexico—Eirian Coronado, MPH New York State—Anne Radigan-Garcia New York City—Candace Mulready-Ward, MPH North Carolina—Kathleen Jones-Vessey, MS North Dakota—Sandra Anseth Ohio—Connie Geidenberger PhD Oklahoma—Alicia Lincoln, MSW, MSPH Oregon—Kenneth Rosenberg, MD, MPH Pennsylvania—Tony Norwood Rhode Island—Sam Viner-Brown, PhD South Carolina—Mike Smith, MSPH Texas—Tanya Guthrie, PhD Tennessee—Ramona Lainhart, PhD Utah—Laurie Baksh, MPH Vermont—Peggy Brozicevic Virginia—Christopher Hill, MPH, CPH Washington—Linda Lohdefinck West Virginia—Melissa Baker, MA Wisconsin—Katherine Kvale, PhD Wyoming—Amy Spieker, MPH CDC PRAMS Team, Applied Sciences Branch, Division of Reproductive Health.

References

- Adedinsowo DA, Fleming AS, Steiner M, Meaney MJ, Girard AW, MAVAN team. Maternal anxiety and breastfeeding: findings from the MAVAN (Maternal Adversity, Vulnerability and Neurodevelopment) Study. *J Hum Lact.* 2014; 30(1):102–109. DOI: 10.1177/0890334413504244 [PubMed: 24065719]
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders: DSM-5.* Arlington, VA: American Psychiatric Press; 2013.
- Campbell S, Matestic P, von Stauffenberg C, Mohan R, Kirchner T. Trajectories of maternal depressive symptoms, maternal sensitivity, and children's functioning at school entry. *Dev Psychol.* 2007; 43(5):1202–1215. DOI: 10.1037/0012-1649.43.5.1202 [PubMed: 17723045]
- Campbell S, Morgan-Lopez A, Cox M, Mcloyd V, NICHD Early Childcare Research Network. A Latent Class Analysis of Maternal Depressive Symptoms over 12 Years and Offspring Adjustment in Adolescence. *J Abnorm Psychol.* 2009; 118(3):479–493. DOI: 10.1037/a0015923.A [PubMed: 19685946]
- CDC. *Nutrition, Physical Activity and Obesity: Data, Trends and Maps.* 2011
- Chowdhury R, Sinha B, Sankar MJ, Taneja S, Bhandari N, Rollins N, Martines J. Breastfeeding and Maternal Health Outcomes: A Systematic Review and Meta-Analysis. *Acta Paediatrica.* 2015; 104:96–113. DOI: 10.1111/apa.13102 [PubMed: 26172878]
- Dennis C, McQueen K. The relationship between infant-feeding outcomes and postpartum depression: a qualitative systematic review. *Pediatrics.* 2009; 123(4):e736–51. DOI: 10.1542/peds.2008-1629 [PubMed: 19336362]
- Dias CC, Figueiredo B. Breastfeeding and depression: A systematic review of the literature. *J Affect Disord.* 2014; 171c:142–154. DOI: 10.1016/j.jad.2014.09.022
- Essex MJ, Klein MH, Miech R, Smider NA. Timing of initial exposure to maternal major depression and children's mental health symptoms in kindergarten. *British Journal of Psychiatry.* 2001; 179:151–156. DOI: 10.1192/bjp.179.2.151 [PubMed: 11483477]

- Fairlie TG, Gillman MW, Rich-Edwards J. High pregnancy-related anxiety and prenatal depressive symptoms as predictors of intention to breastfeed and breastfeeding initiation. *Journal of Women's Health* (2002). 2009; 18(7):945–953. DOI: 10.1089/jwh.2008.0998
- Feldens CA, Vitolo MR, Rauber F, Cruz LN, Hilgert JB. Risk factors for discontinuing breastfeeding in Southern Brazil: A survival analysis. *Maternal and Child Health Journal*. 2012; 16(6):1257–1265. DOI: 10.1007/s10995-011-0885-7 [PubMed: 21948218]
- Flores-Quijano ME, Cordova A, Contreras-Ramirez V, Farias-Hernandez L, Cruz Tolentino M, Casanueva E. Risk for Postpartum Depression, Breastfeeding Practices, and Mammary Gland Permeability. *Journal of Human Lactation*. 2008; 24(1):50–57. DOI: 10.1177/0890334407310587 [PubMed: 18281356]
- Gaynes BN, Gavin N, Meltzer-Brody S, Lohr KN, Swinson T, Gartlehner G, Miller WC. Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess (Summ)*. 2005; (119):1–8.
- Gross KH, Wells CS, Radigan-Garcia A, Dietz PM. Correlates of self-reports of being very depressed in the months after delivery: results from the Pregnancy Risk Assessment Monitoring System. *Maternal and Child Health Journal*. 2002; 6(4):247–253. [PubMed: 12512766]
- Gunderson EP, Quesenberry CP, Ning X, Jacobs DR, Gross M, Goff DC, Lewis CE. Lactation Duration and Midlife Atherosclerosis. *Obstetrics & Gynecology*. 2015; 126(2):381–390. DOI: 10.1097/AOG.0000000000000919 [PubMed: 26241429]
- Hatton DC, Harrison-Hohner J, Coste S, Dorato V, Curet LB, Mccarron DA. Symptoms of Postpartum Depression and Breastfeeding. *Journal of Human Lactation*. 2004; 21(4):444–449. DOI: 10.1177/0890334405280947
- Horta BL, de Mola CL, Victora CG. Long-term consequences of breastfeeding on cholesterol, obesity, systolic blood pressure, and type-2 diabetes: systematic review and meta-analysis. *Acta Paediatrica*. 2015; 104:30–37. DOI: 10.1111/apa.13133 [PubMed: 26192560]
- Howell EA, Mora PA, Horowitz CR, Leventhal H. Racial and ethnic differences in factors associated with early postpartum depressive symptoms. *Obstet Gynecol*. 2005; 105(6):1442–1450. DOI: 10.1097/01.aog.0000164050.34126.37 [PubMed: 15932842]
- Imbula E, Okitundu L, Mampunza M. Postpartum depression in Kinshasa (DR Congo): prevalence and risk factors. *Médecine et Santé Tropicales*. 2012; 22(4):379–384. [PubMed: 23392628]
- Insaf TZ, Fortner RT, Pekow P, Dole N, Markenson G, Chasan-Taber L. Prenatal Stress, Anxiety, and Depressive Symptoms as Predictors of Intention to Breastfeed Among Hispanic Women. *Journal of Women's Health*. 2011; 20(8):1183–1192. DOI: 10.1089/jwh.2010.2276
- Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine: The Official Journal of the Academy of Breastfeeding Medicine*. 2009; 4(Suppl 1):S17–S30. DOI: 10.1089/bfm.2009.0050 [PubMed: 19827919]
- Kotelchuck M. An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index. *American Journal of Public Health*. 1994; 84(9):1414–1420. DOI: 10.2105/AJPH.84.9.1414 [PubMed: 8092364]
- Lindahl V, Pearson JL, Colpe L. Prevalence of suicidality during pregnancy and the postpartum. *Archives of Women's Mental Health*. 2005; 8(2):77–87. DOI: 10.1007/s00737-005-0080-1
- Liu CH, Giallo R, Doan SN, Seidman LJ, Tronick E. Racial and Ethnic Differences in Prenatal Life Stress and Postpartum Depression Symptoms. *Archives of Psychiatric Nursing*. 2016; 30(1):7–12. DOI: 10.1016/j.apnu.2015.11.002 [PubMed: 26804495]
- McCoy SJB, Beal JM, Saunders B, Hill EN, Payton ME, Watson GH. Risk factors for postpartum depression: a retrospective investigation. *The Journal of Reproductive Medicine*. 2008; 53(3):166–170. [PubMed: 18441719]
- McLearn K, Minkovitz C, Strobino D, Marks E, Hou W. Maternal depressive symptoms at 2 to 4 months post partum and early parenting practices. 2006; 160(3):279–284. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=mwic&NEWS=N&AN=2006032531>.
- O'Hara MW, Stuart S, Watson D, Dietz PM, Farr SL, D'Angelo D. Brief scales to detect postpartum depression and anxiety symptoms. *Journal of Women's Health* (2002). 2012; 21(12):1237–43. DOI: 10.1089/jwh.2012.3612

- Paul IM, Downs DS, Schaefer EW, Beiler JS, Weisman CS. Postpartum Anxiety and Maternal-Infant Health Outcomes. *Pediatrics*. 2013; 131(4):e1218–e1224. DOI: 10.1542/peds.2012-2147 [PubMed: 23460682]
- Postpartum Depression: Action Towards Causes and Treatment (PACT) Consortium. Heterogeneity of postpartum depression: a latent class analysis. *The Lancet Psychiatry*. 2015; 2(1):59–67. DOI: 10.1016/S2215-0366(14)00055-8 [PubMed: 26359613]
- Sankar MJ, Sinha B, Chowdhury R, Bhandari N, Taneja S, Martines J, Bahl R. Optimal Breastfeeding Practices and Infant and Child Mortality-A Systematic Review and Meta-analysis. *Acta Paediatrica*. 2015; n/a–n/a. doi: 10.1111/apa.13147
- Stuebe A, Schwarz EB, Grewen K, Rich-Edwards JW, Michels KB, Foster EM, Forman J. Duration of lactation and incidence of maternal hypertension: A longitudinal cohort study. *American Journal of Epidemiology*. 2011; 174(10):1147–1158. DOI: 10.1093/aje/kwr227 [PubMed: 21997568]
- Thome M, Alder EM, Ramel A. A population-based study of exclusive breastfeeding in Icelandic women: is there a relationship with depressive symptoms and parenting stress? *International Journal of Nursing Studies*. 2006; 43(1):11–20. DOI: 10.1016/j.ijnurstu.2004.10.009 [PubMed: 16326160]
- Yonkers KA, Ramin SM, Rush AJ, Navarrete CA, Carmody T, March D, Leveno KJ. Onset and persistence of postpartum depression in an inner-city maternal health clinic system. *Am J Psychiatry*. 2001; 158(11):1856–1863. [PubMed: 11691692]
- Zayas LH, Cunningham M, McKee MD, Jankowski KR. Depression and negative life events among pregnant African-American and Hispanic women. *Womens Health Issues*. 2002; 12(1):16–22. [PubMed: 11786288]
- Zubaran C, Foresti K. The correlation between breastfeeding self-efficacy and maternal postpartum depression in southern Brazil. *Sexual and Reproductive Healthcare*. 2013; 4(1):9–15. DOI: 10.1016/j.srhc.2012.12.001 [PubMed: 23427927]

Significance

Postpartum depression (PPD) is associated with early breastfeeding cessation. This relationship has not yet been explored using a national, stratified, random sample of U.S. mothers. We conducted a cross-sectional analysis of the association between mood and breastfeeding using the Pregnancy Risk Assessment Monitoring System Phase 6 (2010–2011) data set (N =73,894). A pre-pregnancy mental health visit was associated with reduced odds of breastfeeding initiation, and PPD symptoms were associated with reduced odds of three-month any and exclusive breastfeeding. We found state-level differences in these associations, highlighting possible regional differences in support for women at risk for early breastfeeding cessation.

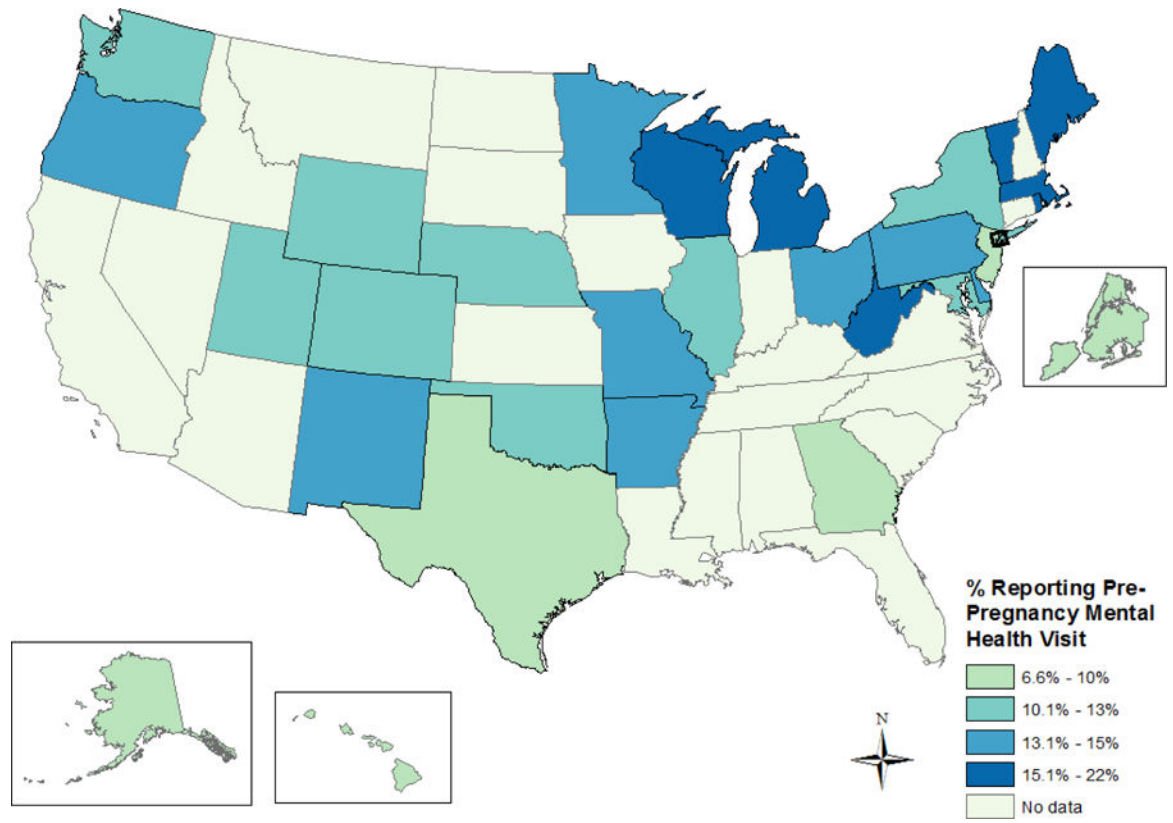


Figure 1.
top. Map of pre-pregnancy mental health visit prevalence, PRAMS states and New York City, 2010–2011

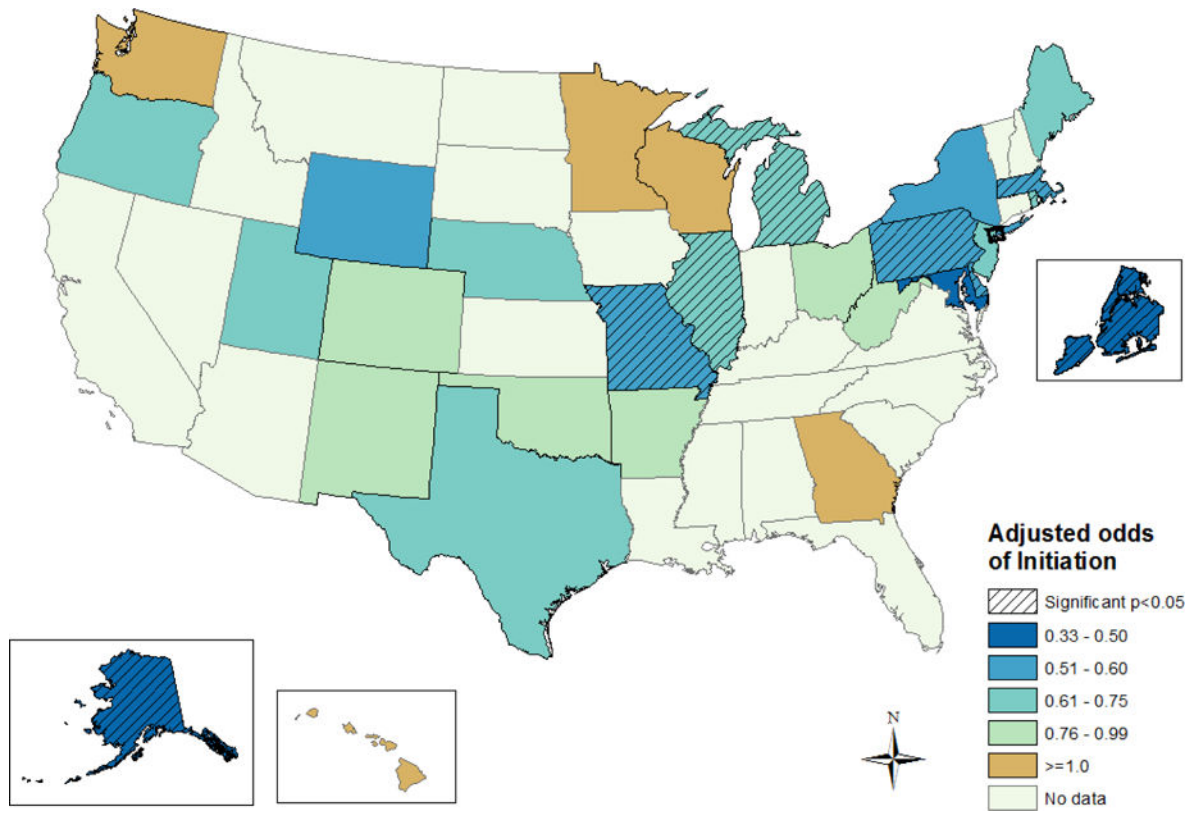


Figure 2.
top. Map of the adjusted odds of breastfeeding initiation between women with and without a pre-pregnancy mental health visit, PRAMS states and New York City, 2010–2011

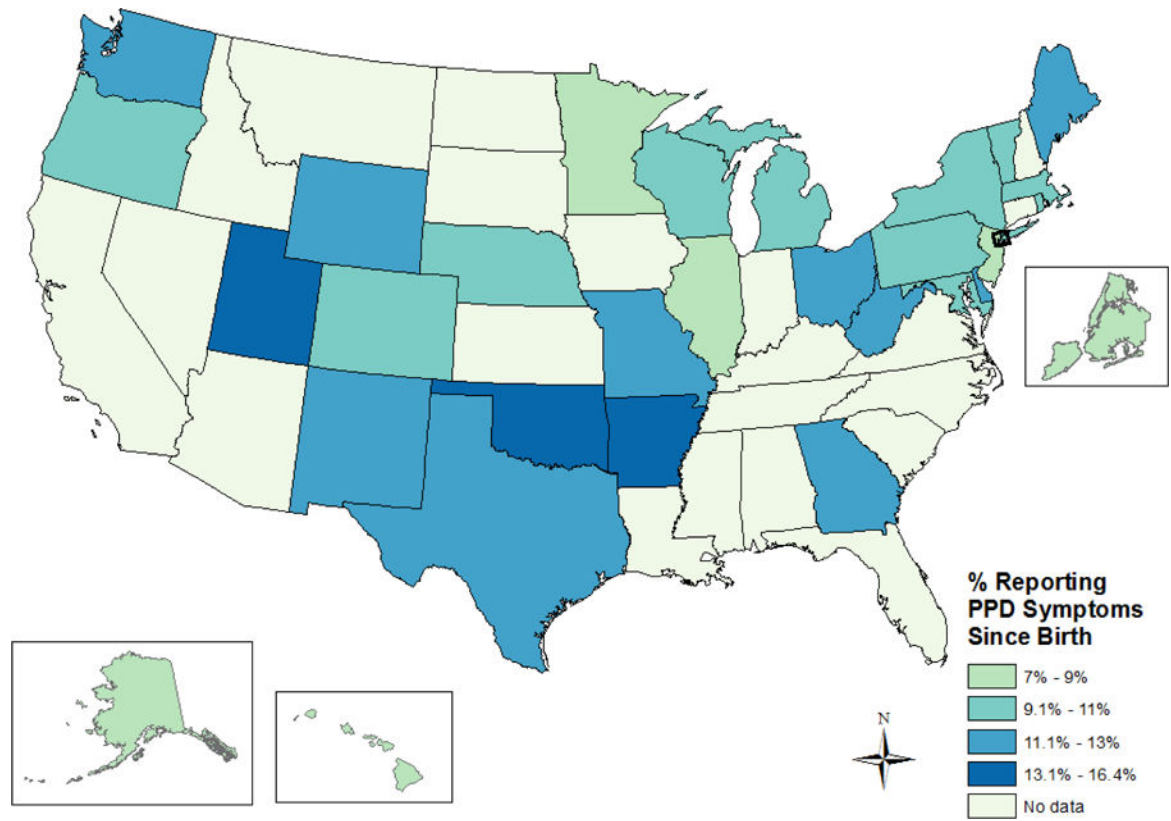


Figure 3. top. Map of postpartum depression (PPD) symptom prevalence since birth, PRAMS states and New York City, 2010–2011

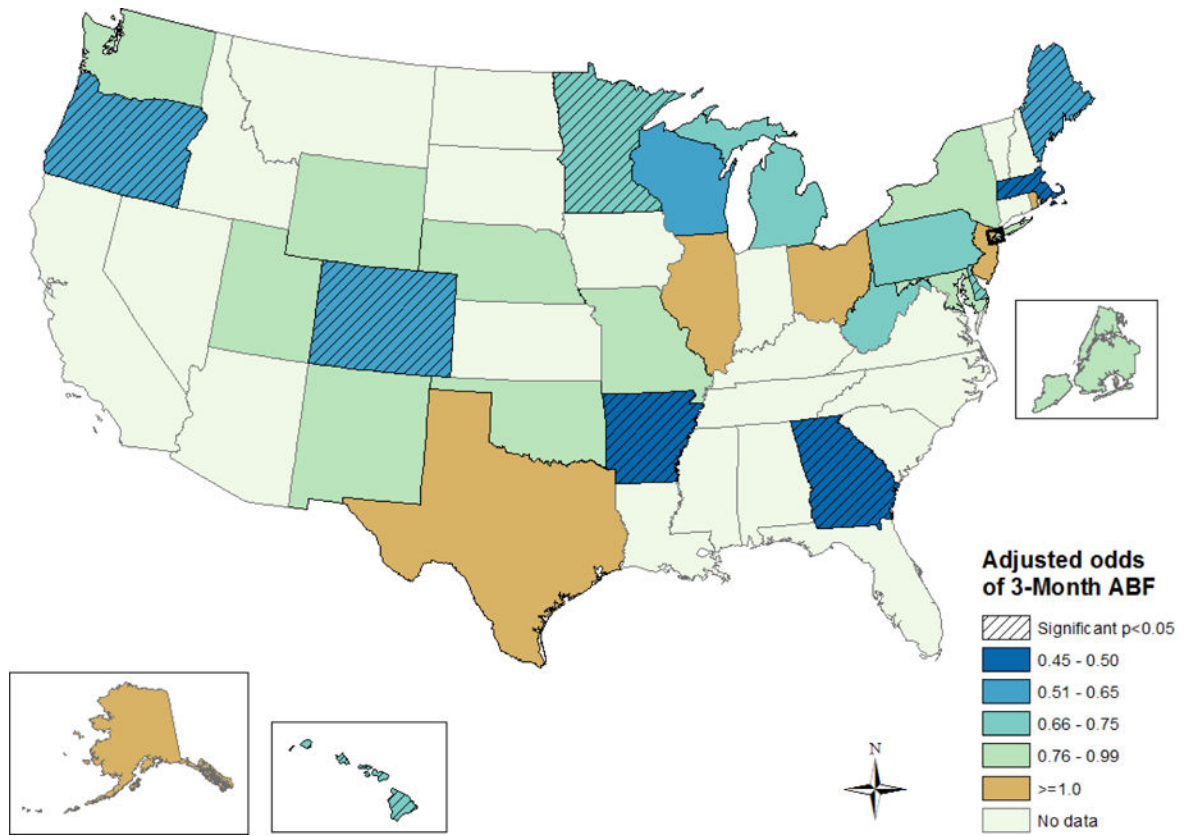


Figure 4.
 top. Map of the adjusted odds of 3-month any breastfeeding (ABF) between women responding at or after 3 months with and without postpartum depression (PPD) symptoms, PRAMS states and New York City, 2010–2011

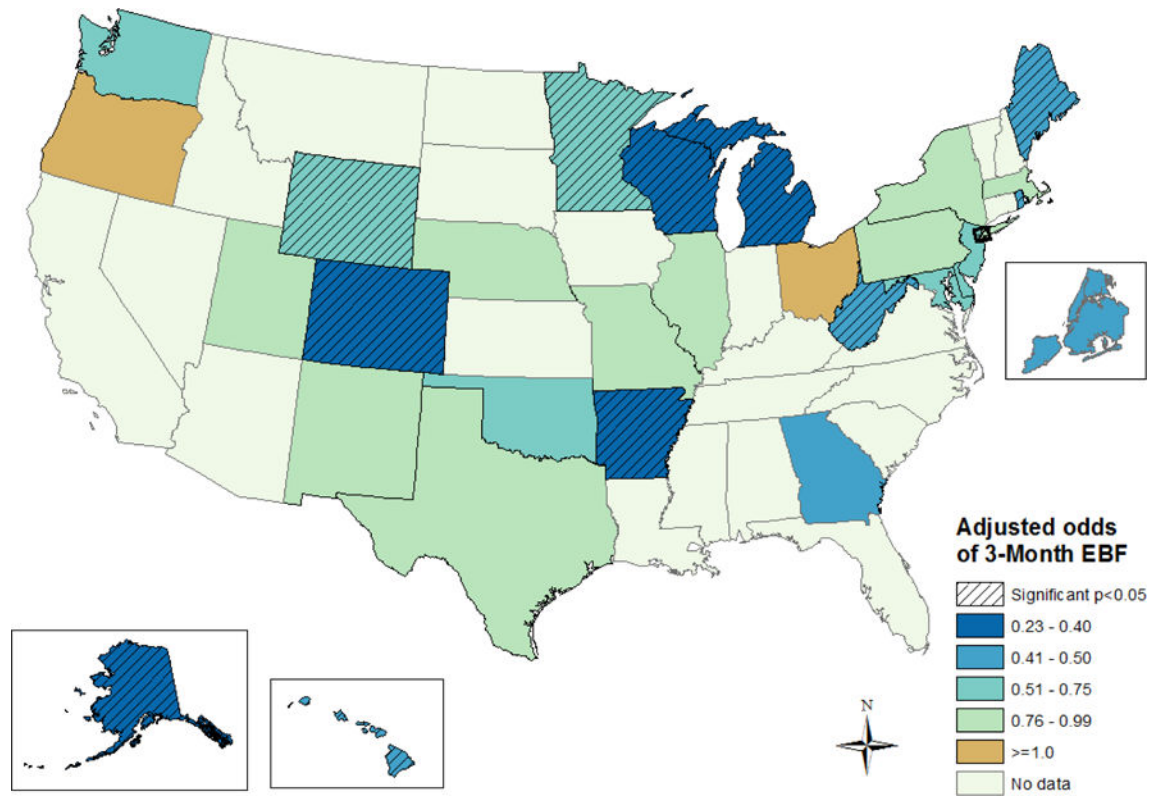


Figure 5.
 top. Map of the adjusted odds of 3-month exclusive breastfeeding (EBF) between women responding at or after 3 months with and without postpartum depression (PPD) symptoms, PRAMS states and New York City, 2010–2011

Table 1

Descriptive statistics by pre-pregnancy mental health visit status among all respondents and self-reported PPD status among those responding at or after 3 months postpartum

	No Pre-Pregnancy Mental Health Visit	Pre-Pregnancy Mental Health Visit	No Postpartum PPD symptoms ^a	Postpartum PPD symptoms ^a
<i>N</i> (%)	66,419 (86.6)	10,239 (13.4)	51,809 (88.4)	6821 (11.6)
Race/Ethnicity, <i>N</i> (%)				
White	32,905 (51.9)	5862 (60.9)	25,761 (51.9)	3572 (54.8)
Black	9912 (15.6)	1412 (14.7)	8013 (16.2)	1133 (17.4)
Hispanic	10,383 (16.4)	1118 (11.6)	7866 (15.9)	903 (13.9)
Asian	5249 (8.3)	352 (3.7)	4027 (8.1)	320 (4.9)
Other	4919 (7.8)	880 (9.1)	3935 (7.9)	590 (9.1)
Missing	3051	615	2207	303
Maternal Age, <i>N</i> (%)				
Less than 18	1615 (2.4)	341 (3.3)	1379 (2.7)	221 (3.2)
18–24	18,849 (28.4)	3247 (31.7)	14,956 (28.9)	2439 (35.8)
25–34	35,277 (53.1)	5163 (50.4)	27,112 (52.3)	3259 (47.8)
35 and older	10,676 (16.1)	1486 (14.5)	8360 (16.1)	902 (13.2)
Missing	2	2	2	0
Income, <i>N</i> (%)				
Less than \$20,000	22,508 (36.5)	4594 (48.7)	17,871 (37.3)	3256 (50.4)
\$20,000 to \$49,999	17,016 (27.6)	2356 (25.0)	13,088 (27.3)	1723 (26.7)
\$50,000 and over	22,142 (35.9)	2477 (26.3)	17,016 (35.5)	1477 (22.9)
Missing	4753	812	3834	365
Marital Status, <i>N</i> (%)				
Not married	25,495 (38.4)	5170 (50.5)	20,706 (40.0)	3528 (51.8)
Married	40,883 (61.6)	5061 (49.5)	31,073 (60.0)	3285 (48.2)
Missing	41	8	30	8
Pre-pregnancy visit for anxiety/depression				
No	–	–	45,629 (88.6)	4858 (71.6)
Yes	–	–	5867 (11.4)	1931 (28.4)
Missing			313	32
Pregnancy Intention				
Desired	58,715 (90.0)	8616 (86.0)	45,868 (90.1)	5470 (81.6)
Not desired	6510 (10.0)	1408 (14.0)	5034 (9.9)	1230 (18.4)
Missing	1194	215	907	121
Stresses during pregnancy				
None	20,646 (31.3)	1760 (17.4)	16,304 (31.5)	893 (13.1)
1–2	28,226 (42.8)	3561 (35.1)	22,024 (42.6)	2232 (32.8)

	No Pre-Pregnancy Mental Health Visit	Pre-Pregnancy Mental Health Visit	No Postpartum PPD symptoms ^a	Postpartum PPD symptoms ^a
3–5	14,058 (21.3)	3370 (33.3)	11,130 (21.5)	2449 (36.0)
6–18	3023 (4.6)	1440 (14.2)	2236 (4.3)	1232 (18.1)
Missing	466	108	115	15
Adequate number of prenatal care visits				
Inadequate	7448 (11.7)	1222 (12.5)	5859 (11.8)	974 (15.0)
Intermediate	7834 (12.3)	1068 (10.9)	6169 (12.4)	748 (11.5)
Adequate	26935 (42.3)	3740 (38.1)	20,753 (41.9)	2325 (35.7)
Adequate plus	21,442 (33.7)	3774 (38.5)	16,774 (33.8)	2463 (37.8)
Missing	2760	435	2254	311
Prenatal Morbidity				
No	41,647 (63.7)	7728 (76.6)	32,910 (64.2)	5354 (79.2)
Yes	23,738 (36.3)	2360 (23.4)	18,332 (35.8)	1409 (20.8)
Missing	1034	151	567	58
Partner abuse in 12 months pre-pregnancy or during pregnancy				
No	62,548 (96.0)	8989 (90.2)	49,188 (96.2)	5860 (87.2)
Yes	2612 (4.0)	979 (9.8)	1922 (3.8)	857 (12.8)
Missing	1259	271	699	104
Infant admission to neonatal intensive care unit (NICU)				
No	52,403 (80.1)	7572 (75.5)	41,334 (80.4)	4823 (71.5)
Yes	13,012 (19.9)	2453 (24.5)	10,065 (19.6)	1926 (28.5)
Missing	1004	214	410	72
Type of delivery				
Vaginal	43,899 (66.2)	6446 (63.0)	34,245 (66.2)	4143 (60.9)
Cesarean	22,391 (33.8)	3782 (37.0)	17,471 (33.8)	2664 (39.1)
Missing	129	11	93	14

^aPostpartum depression symptoms were defined through maternal self-report to the following question: “Below is a list of feelings and experiences that women sometimes have after childbirth. Read each item to determine how well it describes your feelings and experiences. Then write on the line the number of the choice that best describes how often you have felt or experienced things this way since your new baby was born: (A) I felt down, depressed, or sad. (B) I felt hopeless. (C) I felt slowed down. Women responded to each question using a Likert scale with never=1, rarely=2, sometimes=3, often=4, and always=5, and we used a composite score >9 to indicate postpartum depression symptoms.

Table 2a

Proportion of women initiating breastfeeding and odds of initiation for women reporting a pre-pregnancy mental health visit vs. women reporting no pre-pregnancy visit

	Breastfeeding Initiation
	OR (95% CI)
Pre-Pregnancy Mental Health	
No visit, N (%)	54,484 (84.3)
Pre-pregnancy visit, N (%)	7515 (76.9)
Pre-Pregnancy Visit vs. No Visit	
Crude Odds	0.61 (0.56, 0.67)
Adjusted Odds ^a	0.71 (0.64, 0.78)

^aPre-pregnancy visit model adjusted for maternal race/ethnicity and marital status.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2b

Proportion of women breastfeeding and odds of any and exclusive breastfeeding by postpartum depression (PPD) and postpartum anxiety status among women responding at or after 3 months postpartum

	Any Breastfeeding at 3 Months	Exclusive Breastfeeding at 3 Months
PPD v No PPD symptoms		
No symptoms, N (%)	25,351 (51.0)	11,063 (28.1)
With symptoms, N (%)	2305 (36.9)	890 (18.3)
Crude Odds (95% CI)	0.60 (0.54, 0.67)	0.58 (0.50, 0.68)
Adjusted Odds ^a (95% CI)	0.79 (0.70, 0.88)	White: 0.65 (0.54, 0.77) Black: 0.41 (0.27, 0.63) Hispanic: 1.07 (0.70, 1.63) Asian: 1.04 (0.58, 1.86) Other: 0.51 (0.26, 1.01) ^b
Postpartum anxiety v. No Postpartum anxiety		
No symptoms, N (%)	2135 (53.4)	842 (26.1)
With symptoms, N (%)	331 (42.4)	107 (17.5)
Crude Odds	0.64 (0.53, 0.78)	0.66 (0.51, 0.86)
Adjusted Odds ^c	0.87 (0.70, 1.08)	0.92 (0.68, 1.24)

^a Any breastfeeding model adjusted for pre-pregnancy mental health visit, prenatal morbidity, pregnancy intention, and stressful events in the twelve months before birth; exclusive breastfeeding model adjusted for race/ethnicity, age, prenatal morbidity, and stressful events in the twelve months before birth.

^b Results are stratified due to the presence of effect measure modification by race in the final adjusted model.

^c Any breastfeeding model adjusted for maternal race/ethnicity, age, marital status, pre-pregnancy mental health visit, and prenatal morbidity; exclusive breastfeeding adjusted for maternal race/ethnicity, marital status, pre-pregnancy mental health visit, prenatal morbidity, stressful events in the twelve months before birth, abuse during or in the twelve months before pregnancy, and delivery type.