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Fertility treatment use and breastfeeding outcomes

Chloe M. Barrera, MPH,
Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), Atlanta, GA

Jennifer F. Kawwass, MD,
Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, Atlanta, GA

Division of Reproductive Endocrinology and Infertility, Department of Gynecology and Obstetrics, Emory University, Atlanta, GA.

Sheree L. Boulet, DrPH,
Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, Atlanta, GA

Jennifer M. Nelson, MD, MPH,
Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), Atlanta, GA

Cria G. Perrine, PhD
Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), Atlanta, GA

Abstract

BACKGROUND: About 15% of women aged 15–44 years in the United States experience infertility. Factors associated with infertility and fertility treatments may also be associated with lactation difficulties. Limited data exist examining the impact of infertility or mode of conception on breastfeeding outcomes.

OBJECTIVE: The objectives of this study were to report breastfeeding outcomes (initiation and duration at 8 weeks) among women who conceived spontaneously compared to women who conceived using fertility treatments (assisted reproductive technology [ART], intrauterine insemination, or fertility-enhancing drugs).

MATERIALS AND METHODS: Maternal-reported data from 4 states from the 2012–2015 Pregnancy Risk Assessment and Monitoring System (PRAMS) were used to explore use of

Reprints: Chloe M. Barrera, MPH, 4770 Buford Hwy NE, Mailstop F-77, Atlanta, GA 30341. chloe.marie.barrera@emory.edu.

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fertility treatment and breastfeeding initiation and continuation at 8 weeks (n = 15,615). Data were weighted to represent all women delivering live births within each state; SAS survey procedures were used to account for PRAMS complex survey design. Stepwise, multivariable logistic regression, adjusted for maternal demographics, parity, plurality, mode of delivery, preterm birth, and maternal pre-pregnancy health conditions, was used to quantify the associations between fertility treatment use and breastfeeding.

RESULTS: Mode of conception was not associated with breastfeeding outcomes when comparing women who conceived spontaneously to women who conceived using any fertility treatment. The odds of breastfeeding at 8 weeks were lower among women who conceived using ART, after adjusting for basic demographic covariates (adjusted odds ratio [aOR], 0.71; 95% confidence interval [CI], 0.52–0.97) and additionally adjusting for maternal health conditions (aOR, 0.68; 95% CI, 0.49–0.93), but this difference was no longer significant after adjusting for plurality and preterm birth (aOR, 0.74; 95% CI, 0.54–1.02).

CONCLUSION: This study suggests that mothers who conceive using ART may breastfeed for shorter durations than mothers who conceive spontaneously, partially mediated by an increased likelihood of multiples and infants born preterm. Studies are needed to elucidate these associations and to understand the intentions and barriers to breastfeeding among women who conceive with the help of ART.

Keywords

assisted reproductive technology; breastfeeding; fertility treatment

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The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding for about the first 6 months of life.[1] Despite 83% of infants in the United States initiating breastfeeding, only 25% meet this recommendation.[2] Increasing breastfeeding rates to improve the health of mothers and infants and to meet national recommendations requires an understanding of populations who may be at risk for experiencing lactation difficulties. One such population is women who experience infertility,[3] defined as the inability to conceive within 1 year of well-timed unprotected intercourse.[4] In the United States, it is estimated that about 15% of nonpregnant, sexually active women aged 15–44 who are not using contraception and are trying to become pregnant experience infertility.[5] Infertility can be treated with fertility-enhancing drugs, intrauterine insemination (IUI), or assisted reproductive technology (ART), which includes treatments in which eggs or embryos are handled in the laboratory for the purpose of establishing a pregnancy. In the United States, over 99% of ART procedures involve in vitro fertilization (IVF).[6]

It is unclear whether and to what degree fertility treatments may be associated with breastfeeding outcomes, in part because women who conceive with the help of fertility treatment are often characterized by factors that have been associated with both positive and negative breastfeeding outcomes. Women who conceive with the help of fertility treatment tend to be older, more educated, of higher income status, and nonsmokers,[7] all of which have previously been associated with being significantly more likely to initiate breastfeeding.[8]

Conception through fertility treatment is associated with giving birth to twins or other higher-order multiples, and a higher likelihood of cesarean deliveries, maternal hemorrhage, pregnancy-related hypertension, and gestational diabetes.[9] In addition, both singleton and multiple birth infants conceived through fertility treatment are at increased risk for being born premature or small for gestational age.[9–11] All of these characteristics associated with fertility treatment have been associated with lactation difficulties.[12] In addition, poor maternal mental and emotional health has been found to have a negative impact on breastfeeding,[3] and women who undergo fertility treatments often experience unique stresses and anxieties.[13] Finally, breast milk production has been found to be lower among mothers who give birth to infants conceived through fertility treatment.[14]

Several studies have been conducted in developed countries aimed at exploring the relationship between fertility treatments and breastfeeding outcomes; however, these studies have yielded inconsistent results.[13,15–18] To our knowledge, only 1 study in the United States has looked at the association between mode of conception and breastfeeding outcomes, and that study was conducted in a single state.[19] The aims of our study were to examine breastfeeding initiation and continuation (at 8 weeks) (1) among women who conceived using any fertility treatment, and (2) by type of fertility treatments used, specifically among women who conceived using ART, IUI, or fertility-enhancing drugs compared to women who conceived spontaneously.

Materials and Methods

Data source and study sample

This study uses data from the Pregnancy Risk Assessment and Monitoring System (PRAMS), a cross-sectional surveillance system that provides state-specific population-based data on maternal behaviors before, during, and after pregnancies that result in live births. PRAMS is administered by the Centers for Disease Control and Prevention (CDC) in collaboration with state health departments.[16] The PRAMS protocol was approved by the CDC's Institutional Review Board, and participating states approved the study analysis plan. Each questionnaire is linked to the child's birth certificate, so the PRAMS analytic dataset contains both maternal responses and selected state vital statistics data. (Detailed PRAMS methodology can be found at: www.cdc.gov/prams/methodology.htm.)

In brief, each participating state samples 1300 to 3400 women every year from live birth certificate registries. The primary means of data collection is a single, self-administered questionnaire mailed to women 2–4 months after giving birth. Nonrespondents are mailed up to 2 additional questionnaires, followed by up to 15 attempted telephone calls.

The PRAMS questionnaire includes core questions that are asked by all states, standard questions developed and pre-tested by the CDC from which states can choose to include or not include, and questions developed by states. Thus, each state has a unique PRAMS questionnaire. This study uses data from Phase 7 (2012–2015) PRAMS from Massachusetts, Maryland, New York, and Utah. These 4 states were the only states that included standard questions to assess receipt of any fertility treatment, as well as the type of fertility treatment

that a woman received. For the release of Phase 7 data, PRAMS had a minimum survey response rate threshold of at least 60%.[6]

Data were available for 19,657 women from the 4 states. Women who reported their infant was not alive (n = 219) or was not living with them (n = 97), and teenage mothers (<20 years, n = 1238) were not eligible for this analysis. Among the 18,135 women who were eligible, 17,190 had data on our predictors and outcomes of interest. We excluded the 1,574 women who were missing covariate data, resulting in an analytic sample of 15,615 participants.

Measures

Our exposure of interest was women's reported use of fertility treatment. The pregnancies of women who were not trying to get pregnant were considered spontaneous conceptions; these women were not asked about receipt of fertility treatment. Women who were trying to conceive were asked, "Did you take any fertility drugs or receive any medical procedures from a doctor, nurse, or other healthcare worker to help you get pregnant with your new baby?" (yes/no). Those who responded "yes" were then asked, "Did you use any of the following fertility treatments during the month that you got pregnant with your new baby?" This was a "check all that apply" question. Answer choices included "Fertility-enhancing drugs prescribed by a doctor," "Artificial insemination or intrauterine insemination," "Assisted reproductive technology," "Other medical treatment" (with a free text field prompting respondents to "Please tell us: _____"), and "I wasn't using fertility treatments during the month that I got pregnant with my new baby."

To categorize type of fertility treatment received, we created a hierarchical classification according to the highest treatment intensity used: (1) women who conceived with the help of ART, either alone (n = 311) or combined with any other treatment (n = 228), were placed in the ART group;(2) women who conceived with the help of intrauterine insemination only (n = 36) or combined with fertility-enhancing drugs (n = 153) were placed in the intrauterine insemination group; (3) women who conceived only with the help of fertility-enhancing drugs prescribed by a doctor were placed in the fertility-enhancing drugs group (n = 328); and (4) women who conceived spontaneously (n = 14,559) (women who were not trying to get pregnant, women who answered "no" to having taken fertility drugs, and women who responded that they were not using fertility treatments during the month in which they got pregnant with their new baby). Responses to the open-ended "Other medical treatment" option were recoded as ART, intrauterine insemination, fertility-enhancing drugs, or no treatment, based on the written responses.

Our outcomes of interest were breastfeeding initiation (based on any breastfeeding, yes/no) and any breastfeeding at 8 weeks (based on the reported number of weeks/months that mothers breastfed or pumped milk). Mothers were asked, "Did you ever breastfeed or pump breast milk to feed to your new baby after delivery, even for a short period of time?" (yes/no). Those who responded "yes" were asked "Are you currently breastfeeding or feeding pumped milk to your new baby?" (yes/no); of which, those who responded "no" were asked, "How many weeks or months did you breastfeed or pump milk to feed your baby?" For our

sample, no mothers completed a survey before 8 weeks, so any mother who answered that she was still breastfeeding was put in the any breastfeeding at 8 weeks group.

We accounted for covariates including maternal age (20–24, 25–29, 30–34, ≥35 years), maternal race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, other), maternal education (less than high school, high school, more than high school), maternal pre-pregnancy body mass index (BMI; <18.5,18.5–24.9,25.0–29.9,30kg/m^2), marital status (married, other), participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) during pregnancy (yes/no), maternal smoking status during pregnancy (smoker, nonsmoker), parity (primiparous, multiparous), plurality (singleton, multiples), vaginal delivery (yes/no), preterm birth (gestational age <37 weeks), and maternal pre-pregnancy health conditions including whether or not a woman was diagnosed by a doctor or nurse with type 1 or type 2 diabetes (not the same as gestational diabetes), high blood pressure or hypertension, and/or depression before getting pregnant. The above maternal health variables were included because they were likely to be associated with fertility and breastfeeding outcomes. With the exception of WIC and the medical conditions diagnosed before pregnancy (PRAMS questionnaire variables), all other covariates were from the birth certificate.

Statistical analysis

We used χ^2 tests to describe differences in demographic and birth characteristics by mode of conception. We then described breastfeeding outcomes by specific type of fertility treatment. We used bivariable and stepwise multivariable logistic regression models to assess the odds of ever breastfeeding and breastfeeding at 8 weeks among women who conceived with any fertility treatment and by specific type of fertility treatment, compared to women who conceived spontaneously. Model 1 included maternal age, maternal race/ethnicity, maternal education, marital status, WIC status, parity, and mode of delivery. Model 2 included these variables plus maternal health conditions (maternal BMI, smoking status during pregnancy, and maternal pre-pregnancy health history), and model 3 included all previously mentioned covariates as well as plurality and preterm birth.

We assessed our models for collinearity using the %COLLIN_2011 macro, and we assessed our models for an interaction with plurality; neither was detected.[20]

All estimates are weighted to represent all women delivering live births within each state, adjusting for sampling design, noncoverage, and nonresponse. We used SAS version 9.4 survey procedures for all statistical analyses.[21]

Results

Of the 15,615 women included in the analysis, 5.8% (n = 1,056) conceived with the use of fertility treatment. Women who conceived with fertility treatment were more likely to be older, non-Hispanic white, married, and more educated, to have given birth to multiples, and to have given birth to a preterm infant (all $P < .01$), compared with women who conceived spontaneously. Women who conceived with fertility treatments were less likely than women with spontaneous conceptions to be participating in WIC, to smoke during pregnancy, to be

multiparous, to deliver via vaginal delivery, and to have pre-pregnancy health conditions (all $P < .03$) (Table 1).

Women who conceived with the help of any fertility treatment were more likely to ever breastfeed and to be breastfeeding at 8 weeks than women who conceived spontaneously in unadjusted analyses, but these relationships were no longer significant after adjusting for covariates (Table 2). When examining specific types of fertility treatment, in unadjusted analysis, the odds of ever breastfeeding were higher among women who used IUI and fertility-enhancing drugs compared to women who conceived spontaneously, but these relationships were no longer significant after adjusting for covariates. The odds of breastfeeding at 8 weeks were significantly different between those who conceived by fertility-enhancing drugs and those who conceived spontaneously in unadjusted analyses but not after adjusting for covariates (Table 2). The odds of breastfeeding at 8 weeks was lower among women who conceived using ART than among women who conceived spontaneously in model 1 (adjusted odds ratio [aOR], 0.71; 95% confidence interval [CI], 0.52–0.97) and model 2 (aOR, 0.68; 95% CI, 0.49–0.93); however, this difference was no longer significant in model 3 (aOR, 0.74; 95% CI, 0.54–1.02) (Table 2).

Comment

Although breastfeeding rates appeared to be higher among women who received fertility treatment, differences were not significant after adjusting for covariates. Breastfeeding rates may have appeared higher in the unadjusted analyses because women receiving fertility treatment tended to be older, more educated, married, and with higher income, all factors known to be associated with an increased likelihood of breastfeeding. The only association that was significant in any of the adjusted models was women who conceived with the help of ART having a reduced odds of breastfeeding at 8 weeks. This association became nonsignificant in the final model, suggesting that the effect of ART on breastfeeding duration may be mediated by the increased likelihood of multiple births and infants born preterm.

Some of the characteristics that are associated with both use of fertility treatment and non-initiation and shorter duration of breastfeeding may be mitigated by a strong desire to breastfeed that is unique to women who undergo fertility treatment. A study that examined the breastfeeding experiences of new mothers who conceived with the use of fertility treatments found that these mothers expressed internal pressure because they believed that it was their only chance to breastfeed, and they believed that it was the one natural thing that they should be able to do.[17] They expressed the feeling that not breastfeeding meant failing at motherhood.[22] Another study had similar findings, and the authors reported that women who conceived through fertility treatment were determined to breastfeed to counteract the need for fertility treatment intervention.[23]

Few previous studies have examined breastfeeding outcomes following fertility treatments, and of those that have, results are conflicting.[13,15–18] One Canadian study compared women who used any type of fertility treatment to women who conceived spontaneously and found no significant differences between groups in terms of breastfeeding initiation, duration at 4 months, or breastfeeding difficulties.[17] Another Canadian retrospective cohort study found

that the odds of breastfeeding exclusively at hospital discharge were significantly higher among mothers who conceived without reproductive assistance.[18] A study from New York found women who conceived with the help of fertility treatments were more likely to be breastfeeding at 4 months but less likely to be breastfeeding at 12 months than women who conceived spontaneously.[19] This study also asked women who were not breastfeeding at 4 months why they had stopped; women who conceived with the use of fertility treatments were more likely to say they stopped “due to an inability to establish a milk supply” than women who conceived spontaneously.[19] Further research regarding fertility treatments and an ability to establish an adequate milk supply may help elucidate a better understanding of whether certain underlying fertility diagnoses are associated with a pathophysiologic limitation on breast milk production.

Our study found that women who conceived with ART did not differ in breastfeeding initiation from women who conceived spontaneously, but they may be less likely to be breastfeeding at 8 weeks. A study of an Australian prospective cohort found that women who conceived with the use of ART were significantly more likely to initiate breastfeeding but significantly less like to be breastfeeding exclusively at 3 months compared to women who conceived spontaneously.[13]

Women in our study who conceived with the help of ART were more likely than women who conceived spontaneously to give birth to multiples (13.3% vs 1.3%, $P < .0001$), to give birth to a preterm infant (16.0% vs 7.2%, $P < .0001$), or to give birth via cesarean delivery (44.5% vs 32.8%, $P < .0001$). We adjusted for these factors in our final models to assess how these factors may help explain why women who conceived with the help of ART breastfed for shorter durations. Mothers of multiples may have difficulty continuing to breastfeed due to the demands associated with caring for multiple infants.[24] Furthermore, multiples are more likely to be born preterm, and women who conceive with the help of ART are more likely to have a preterm baby, even when the baby is a singleton.[9] Babies born preterm can experience multiple issues that make breastfeeding difficult, including the following: being less alert; issues with latch, suck, and swallowing; and a higher likelihood than term babies of being admitted to the neonatal intensive care unit.[25] Finally, women who give birth via cesarean delivery may experience both delayed breastfeeding initiation and shorter duration of breastfeeding.[26] As such, the women who conceive with the help of ART may benefit from additional breastfeeding counseling and support, especially those with multiples and infants born preterm.

The findings in this report are subject to limitations. First, we are unable to determine the degree to which the association between the use of fertility treatment and breastfeeding could potentially be explained by the underlying subfertility; the questions in PRAMS do not allow us to distinguish women with subfertility from women undergoing fertility treatment for other reasons, such as male partner fertility issues or not having a male partner. Because of the hierarchical groupings of fertility treatment type received, we are unable to conclude whether a specific treatment or a combination of treatments may have an impact on breastfeeding. In addition, PRAMS data are based on maternal report and cannot be verified by in-facility observation or medical chart review. PRAMS data also does not include other variables, such as breastfeeding intention and duration of stay in the neonatal intensive

care unit, which could affect breastfeeding continuation. Finally, because only 4 states in PRAMS had data on fertility treatment that could be included in this analysis, results of this study are not generalizable to all mothers in the United States.

Strengths of this study include that PRAMS is a robust surveillance system that provides us with data representative of the women living in each included state. Furthermore, this study had a large sample size, and we were able to examine differences in breastfeeding outcomes by type of fertility treatment received. Finally, PRAMS questions pertaining to prevalence of ART have been compared to other surveillance systems that collect data on ART, and were found to be useful in describing ART prevalence and its associated outcomes.[27]

Although our results suggest that women who conceive with the help of ART may breastfeed for a shorter duration than women who conceive spontaneously, breastfeeding duration may be improved with prenatal clinical counseling and postnatal breastfeeding support, particularly for women with multiples or infants born preterm. More research is needed to elucidate these associations and to understand the intentions and barriers to breastfeeding among women who conceive with the help of ART.

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AJOG at a Glance

Why was this study conducted?

This secondary data analysis was conducted to assess whether women who conceive with fertility treatment have different breastfeeding outcomes than women who conceive spontaneously.

Key findings

Although initiation rates were comparable between women who conceived with and without any fertility treatment, results of this study suggest that women who conceive with the help of assisted reproductive technology may breastfeed for shorter durations than women who conceive spontaneously.

What does this add to what is known?

This study is unique in the size of the population and in the resultant ability to stratify women by the type of fertility treatment received.

TABLE 1

Comparison of selected demographic characteristics by mode of conception among women participating in PRAMS, 2012–2015 ($n = 9041$)

Variable	Mode of conception: Spontaneous (n = 14,559) % [a]	Mode of conception: Fertility treatment (n = 1,056) % [a]	*P* value [b]
Maternal age (y)			<.0001
20–24	19.2	3.2	
25–29	30.6	17.9	
30–34	31.8	38.6	
≥35	18.4	40.3	
Maternal race/ethnicity			<.0001
Non-Hispanic white	65.2	78.7	
Non-Hispanic black	12.7	3.9	
Hispanic	13.7	6.0	
Asian	5.7	8.8	
Other	2.6	2.6	
Maternal education			<.0001
Less than high school	8.6	2.3	
High school graduate	19.1	8.0	
More than high school	72.3	89.7	
Maternal BMI (kg/m^2)			0.075
Underweight, <18.5	3.7	2.3	

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Variable	Mode of conception: Spontaneous (n = 14,559) %[a]	Mode of conception: Fertility treatment (n = 1,056) %[a]	*P* value[b]
Normal, 18.5–24.9	50.9	56.0	
Overweight, 25.0–29.9	24.1	21.6	
Has obesity, ≥30	21.3	20.1	
Married			<.0001
Yes	68.5	94.4	
No	31.5	5.6	
WIC during pregnancy			<.0001
Yes	35.6	7.5	
No	64.4	92.5	
Smoked during pregnancy			<.0001
Yes	7.4	1.1	
No	92.6	98.9	
Multiparous			<.0001
Yes	62.6	47.5	
No	37.4	52.5	
Plurality			<.0001
Singleton	98.7	86.7	
Multiples	1.3	13.3	

Variable	Mode of conception		*P* value[b]
	Spontaneous (n = 14,559)	Fertility treatment (n = 1,056)	
	%[a]	%[a]	
Vaginal delivery			<.0001
Yes	67.2	55.5	
No	32.8	44.5	
Preterm birth			<.0001
Gestational age <37 wk	7.2	16.0	
Gestational age ≥37 wk	92.8	84.0	
Maternal pre-pregnancy health condition			0.021
Yes	13.6	10.2	
No	86.4	89.8	

BMI, body mass index; *PRAMS*, Pregnancy Risk Assessment and Monitoring System; *WIC*, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a]Weighted prevalence

[b]Comparison of spontaneous conception and fertility treatment.

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TABLE 2

Prevalence and odds of breastfeeding (ever and at 8 weeks) by conception method, PRAMS 2012–2015 (n = 15,615)

				Unadjusted		Model 1		Model 2		Model 3	
	Mode of conception	**n**	**% Breastfeeding**	**OR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**
Ever breastfed	Spontaneous	14,559	88.2	1.00	—	1.00	—	1.00	—	1.00	—
	Any fertility treatment	1056	93.5	1.93[a]	1.30—2.86[a]	1.15	0.76–1.75	1.11	0.74–1.68	1.13	0.75–1.72
	Assisted reproductive technology	539	90.6	1.29	0.77–2.14	0.70	0.42–1.19	0.69	0.41–1.16	0.69	0.40–1.19
	Artificial or intrauterine insemination	189	95.6	2.86[a]	1.17—7.03[a]	1.67	0.65–4.29	1.65	0.65–4.19	1.67	0.66–4.25
	Fertility-enhancing drugs	328	96.3	3.43[a]	1.58—7.43[a]	2.35	0.99–5.55	2.17	0.95–4.98	2.18	0.95–5.01
Breastfeeding at 8 wk	Spontaneous	14,559	69.6	1.00	—	1.00	—	1.00	—	1.00	—
	Any fertility treatment	1056	76.0	1.38[a]	1.12–1.71[a]	0.86	0.69–1.09	0.85	0.68–1.07	0.90	0.71–1.14
	Assisted reproductive technology	539	73.4	1.21	0.89–1.64	0.71[a]	0.52–0.97[a]	0.68[a]	0.49–0.93[a]	0.74	0.54–1.02
	Artificial or intrauterine insemination	189	78.0	1.55	0.94–2.55	0.96	0.58–1.58	1.01	0.61–1.65	1.04	0.63–1.73
	Fertility-enhancing drugs	328	78.3	1.57[a]	1.11—2.23[a]	1.08	0.72–1.61	1.05	0.72–1.54	1.07	0.73–1.57

Model 1 is adjusted for maternal age, maternal race/ethnicity, maternal education, marital status, WIC status, parity, and mode of delivery.

Model 2 Includes all covariates In model 1, plus maternal body mass Index, smoking status during pregnancy, and maternal pre-pregnancy health history.

Model 3 Includes all covariates In model 2, plus plurality, and preterm birth.

CI, confidence Interval; *OR*, odds ratio; *PRAMS*, Pregnancy Risk Assessment and Monitoring System; *WIC*, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a]Statistically significant.