

## **Predictors of Breastfeeding in Nevada's WIC Population**

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## Abstract

**Background:** Half of the annual births in the United States each year are to women who participate in the Supplemental Nutrition Program for Women, Infants, and Children (WIC). WIC provides an opportunity to reach a large population of low-income women to promote breastfeeding. To guide the development of breastfeeding programs and policies for Nevada's WIC program, we conducted the first statewide analysis of WIC breastfeeding data. The objectives of this study were to: 1) determine the prevalence of breastfeeding initiation and duration (at least 6 months) among women who participate in Nevada's WIC program; 2) assess maternal factors associated with breastfeeding initiation and duration; and 3) provide recommendations for promoting breastfeeding among Nevada's WIC population based on study findings.

**Methods:** We used statewide participant data from Nevada's WIC system for visits that occurred in 2010. We linked records for women and children and used simple and multiple logistic regression to determine maternal predictors associated with breastfeeding initiation and continued duration for at least 6 months.

**Results:** Of the sample of women, 59.7% initiated breastfeeding and 24.2% breastfed for at least 6 months. In the final models, the maternal factors that were significant predictors for both breastfeeding initiation and duration were race/ethnicity, maternal age, and concurrent participation in another federal assistance program. Additional predictors for breastfeeding initiation were region of residence and pre-pregnancy BMI.

**Conclusion:** Results from this study can be used to direct Nevada's program and policy developments to target breastfeeding efforts towards non-Hispanic black women and women under 25 years of age, of lower income, of urban areas, and are underweight.

## **Background**

The American Academy of Pediatrics recommends exclusive breastfeeding until infants are 6 months of age and continued breastfeeding, while introducing complementary foods, for at least the first year of life (Eidelman & Schanler, 2012). These recommendations are based on substantial evidence that breastfeeding is associated with positive outcomes for infants and children, mothers, and society. In their breastfeeding policy statement, the American Academy of Pediatrics advocates that given its benefits, breastfeeding should not only be considered a lifestyle choice, but it should also be acknowledged as a public health issue (Eidelman & Schanler, 2012).

## **Positive Effects for Infants and Children**

Compared to infants who are not breastfed, those who are breastfed have a lower risk of sudden infant death syndrome (SIDS) which accounts for 21 percent of infant mortality in the United States (Ip et al., 2007; Chen & Rogan, 2004). Infants who are breastfed also have lower odds of developing types 1 and 2 diabetes later in life (Gerstein, 1994; Owen, Martin, Whincup, Smith, & Cook, 2006). Breastfed infants, compared to formula-fed infants, have a lower risk of obesity, and infants who are introduced to formula at a later stage than an earlier stage have a lower risk of developing asthma during their childhood (Singhal, Faroogi, O'Rahilly, Cole, Fewtrell, & Lucas, 2002; Oddy, Peat, & de Klerk, 2002). Furthermore, infants who are breastfed have lower odds for developing cancers such as leukemia and lymphoma (Ip et al., 2007; Bener, Denic, & Galadari, 2001).

Breastfeeding is associated with the cognitive development for children. Longer breastfeeding duration is associated with improved cognitive and motor development, and infants who are fed breast milk as opposed to formula have an average higher verbal intelligence quotient (IQ) score (Bernard et al., 2013; Lucas, Morley, & Cole, 1998). It has also been hypothesized that breast milk affects brain growth. A recent study found a significant association between the percent of expressed maternal breast milk in the diet of infants and their total brain volume in addition to the growth of their white brain matter (Isaacs, Fischl, Quinn, Chong, Gadian, & Lucas, 2010).

Breast milk also protects infants and children against infectious diseases. Infants and children who receive human milk have a decreased risk of diseases such as bacterial meningitis, respiratory tract infection, and necrotizing enterocolitis (Ip et al., 2007). Infants who exclusively breastfeed from four to six months are at a four-fold increase for contracting pneumonia compared to infants who exclusively breastfeed for at least six months, and any initiation of breastfeeding reduces the incidence of otitis media by 23 percent than if the infant is exclusively fed formula (Chantry, Howard, & Auinger, 2006; Ip et al., 2007). It has been estimated that if 90 percent of mothers in the United States would exclusively breastfeed for six months, 911 deaths could be prevented annually, most of which would be infant deaths (Bartick & Reinhold, 2010).

### **Positive Effects for the Mother**

Due to increased concentrations of oxytocin, mothers who breastfeed have decreased postpartum bleeding compared to mothers who do not (Chua, Arulkumara, Lim, Selamat, & Ratnam, 1994). Breastfeeding frequency and total time breastfeeding

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positively affects a woman's ability to return to pre-pregnancy weight. Women who breastfeed more frequently and women who breastfeed for more than six months have a higher energy output, so they are more successful with maternal weight loss compared to women who breastfeed less often and for a shorter duration (Dewey, Heinig, & Nommsen, 1993). On the other hand, mothers who do not breastfeed or who wean early are more likely to struggle from postpartum depression, which poses a threat to her infant's health if she is unable to fully care for her newborn (Henderson, Evans, Straton, Priest, & Hagan, 2003).

For long-term health outcomes, women with a cumulative lactation history for one to two years, compared to women who breastfeed for less than one year, have lower odds of developing hypertension, cardiovascular disease, and types 1 and 2 diabetes (Schwarz et al., 2009; Ip et al., 2007). Also, women who breastfeed have a decreased risk for breast cancer and ovarian cancer (Ip et al., 2007). In fact, each year of breastfeeding can reduce the chance of developing breast cancer by 4.3 percent (Collaborative Group on Hormonal Factors in Breast Cancer, 2002).

### **Social Benefits**

The social benefits of breastfeeding include decreases in health care costs and costs for public health programs, decreased loss of family income related to parental employee absenteeism, and more attention to siblings and family members as a result of decreased infant illness (Cohen, Mrtek MB, & Mrtek RG, 1995). A recent cost analysis showed that if 90 percent of mothers could breastfeed for at least six months, the United States economy could save \$13 billion per year in direct and indirect

pediatric health care costs (Bartick & Reinhold, 2010). The U.S. would also save \$3.9 billion per year on infant formula (Bartick, 2011). Other social and community benefits include a decreased environmental burden from disposing formula cans and bottles and conserving energy for producing and transporting artificial feeding products (Levine, Huffman, & Center to Prevent Childhood Malnutrition, 1990).

### **Breastfeeding in the United States**

Despite the demonstrated benefits of breastfeeding for infants and children, women, and society and the clear breastfeeding recommendations of leading health agencies, breastfeeding rates in the U.S. are still suboptimal. The Healthy People 2020 target for the proportion of infants who ever breastfed is 81.9 percent, and the target for the proportion of infants who were breastfed for at least six months is 60.6 percent (U.S. Department of Health and Human Services, 2012). However, according to the Centers for Disease Control and Prevention (CDC), 76.9 percent of women with children in the United States have ever breastfed, or initiated breastfeeding at least once, and 47.2 percent of women have breastfed for at least six months (CDC, 2012). In order to target breastfeeding promotion efforts to reach the Healthy People 2020 goals for breastfeeding and to improve the health of our women, children, and communities, it is critical to identify subpopulations that have lower rates of breastfeeding.

Studies focusing on demographic correlates of breastfeeding have shown that compared to non-Hispanic white women, non-Hispanic black women have a 25 to 50 percent lower odds of ever breastfeeding, and Hispanic women can have almost twice the odds of ever breastfeeding (Forste & Hoffman, 2008; Park, Meier, & Song, 2003).

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Women 19 years or younger have a lower odds of ever breastfeeding than women over 30 years of age, and the odds of ever breastfeeding increases as education level increases (Forste & Hoffmann, 2008; Park, Meier, & Song, 2003). Compared to women who are married, single women have half the odds of ever breastfeeding, and the odds of breastfeeding increases as income level increases (Forste & Hoffmann, 2008). The National Health and Nutrition Examination Survey (NHANES) indicates that from 1996 to 2006, 57 percent of lower income women had ever breastfed while 74 percent of higher income women ever breastfed (McDowell, Wang, & Kennedy-Stephenson, 2008).

The mother's previous and current health status also affects her likeliness to breastfeed. Underweight and obese women have 10 to 15 percent lower odds of initiating breastfeeding than women who have a normal pre-pregnancy body mass index (BMI) (Thompson et al., 2012). Compared to women who have received prenatal care, women who do not receive prenatal care have about half the odds of initiating breastfeeding. Women who have not had a previous child have lower odds of ever breastfeeding than women who have had previous live births and who have had previous breastfeeding experience (Forste & Hoffmann, 2008).

Studies have also shown that social influence affects breastfeeding initiation. Women who have more support from health care professionals, familial support from the infant's father or from their own mothers, and women who have peer counselors or breastfeeding role models are more likely to breastfeed (Cricco-Lizza, 2006; Anderson, Damio, Young, Chapman, and Perez-Escamilla R, 2005). In addition, women with a



smaller household size and women remaining at home instead of returning to work are more likely to breastfeed (Mitra, Khoury, Hinton, & Carothers, 2004; Raisler, 2000;).

### **Use of WIC to Reach Women with Low Rates of Breastfeeding**

The Supplemental Nutrition Program for Women, Infants, and Children (WIC) is one way to reach out to women who have many of the demographic, health, and social characteristics associated with not breastfeeding. WIC, established as a pilot program in 1972 and made permanent in 1974, is federally administered by the Food and Nutrition Service of the U.S. Department of Agriculture [USDA], (USDA, 2012). In addition to providing complementary supplemental food packages and referrals to health care and social services, WIC provides nutrition education to participants. Nutrition education topics cover dietary habits, health, physical activity, and breastfeeding (7 CFR 246.11). WIC promotes breastfeeding by WIC staff providing breastfeeding information to mothers, distributing breast pumps and other breastfeeding aids, and using peer-counselors and lactation consultants for follow-up support. Mothers who breastfeed also have a higher priority level for program certification, a greater quantity and variety of foods, and a longer certification period than non-breastfeeding mothers (USDA, 2011).

Nationally, women enrolled in the WIC program are young, are ethnically and racially diverse, and have a lower education level compared to the national average. According to national WIC participant characteristic reports, of women who participate in the WIC program, the average maternal age is approximately 25 years, almost half are

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of Hispanic ethnicity and 20 percent are African American, and 27 percent have less than a high school education (USDA, 2012).

In 2011, only 28.2 percent of women participating in WIC nationally were breastfeeding, and 71.8 percent of women were feeding their infants formula (USDA, 2012). Additionally, WIC served approximately nine million participants per month in 2011, and nearly half of all infants born in the U.S. each year are enrolled in the WIC program (USDA, 2012). This translates to WIC serving a large proportion of newborn children each year but also serving women of subpopulations who are identified as less likely to breastfeed. Therefore, WIC has the potential to address social factors that would improve breastfeeding among its population. In order to increase WIC breastfeeding rates as a whole and to reduce disparities in breastfeeding rates among subpopulations with low breastfeeding rates, it is critical to identify methods of promoting breastfeeding initiation within the WIC program.

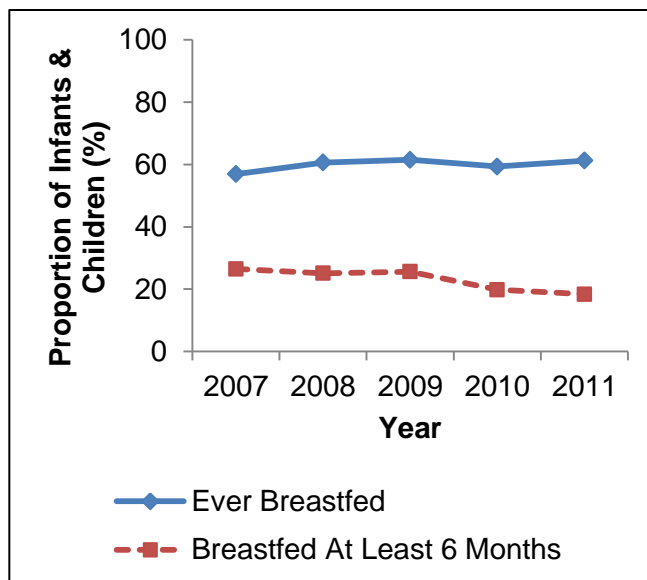
While national studies have shown that enrollment in WIC is positively associated with breastfeeding initiation, some analyses by state show that WIC enrollment can be negatively associated with breastfeeding initiation and that WIC enrollment can lead to shorter breastfeeding duration (Jensen, 2012). WIC breastfeeding policies and programs vary between states with differences in which breastfeeding benefits are offered and how breastfeeding is promoted (U.S. General Accounting Office, 2001). Certain states have conducted their own studies on breastfeeding in their WIC participants which have helped them to make data-driven decisions on how to modify their WIC program. Such state-specific analyses of breastfeeding predictors and outcomes are critical for the development of targeted breastfeeding initiatives.

### Breastfeeding in Nevada’s WIC Population

Compared to the U.S. overall, Nevada has a slightly higher proportion of women who ever breastfed (79.5%) but a lower proportion of women who breastfed for at least six months (37.4%) (CDC, 2012). Rates of breastfeeding among Nevada’s WIC population are substantially lower. According to the CDC, in 2011, 61.2% of infants and children participating in Nevada’s WIC program had ever been breastfed, and 18.4% were breastfed for at least six months (CDC, 2012).

Nevada’s WIC program promotes breastfeeding by providing breastfeeding information to mothers through pamphlets and through counseling appointments, by providing breast pumps, and by utilizing peer breastfeeding counselors. Despite Nevada WIC’s efforts to promote breastfeeding, progress in breastfeeding status has not substantially improved over the years. As shown in Figure 1, the

**Figure 1: Breastfeeding Rates, Nevada WIC Program, 2007-2011**



proportion of Nevada WIC’s infants and children who had ever been breastfed increased from 56.9% in 2007 to 61.2% in 2011. However, the proportion of infants and children who were breastfed for at least six months decreased from 26.5% in 2007 to 18.4% in 2011 (CDC, 2012). It is essential to explore the factors underlying breastfeeding rates within this population to guide policy and program development related to breastfeeding promotion.

## **Purpose of Study**

This paper will examine maternal characteristics associated with breastfeeding in Nevada's WIC population. The specific objectives are to: 1) determine the prevalence of breastfeeding initiation and duration (at least six months) among women who participate in Nevada's WIC program; 2) assess maternal factors associated with breastfeeding initiation and duration; and 3) provide program and policy recommendations for promoting breastfeeding among Nevada's WIC population based on study findings.

## **Methods**

### **Participants**

#### ***Program Eligibility***

To be eligible for Nevada's WIC program and the analysis, participants must meet residential, categorical, income, and nutritional risk requirements. First, the participant must reside in Nevada or a neighboring state's local service area. Second, the participant must be one of the following: A pregnant woman, a non-breastfeeding woman up to six months postpartum, a breastfeeding woman up to one year postpartum, or an infant or child up to five years of age. Third, the participant's gross household income must fall at or below 185 percent of the U.S. Poverty Guidelines set by the U.S. Department of Health and Human Services. However, WIC applicants who participate in Medicaid, the Supplemental Nutrition Assistance Program (SNAP), or the Temporary Assistance for Needy Families (TANF) Program are considered adjunctively eligible and meet the income eligibility without proof of income. Lastly, the participant

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must be determined to be at nutritional risk by a Competent Professional Authority (CPA), who is an individual on the staff of the local agency authorized to determine nutritional risk and prescribe supplemental foods (USDA, 2011).

### ***Participant Data***

Participant data from the Nevada WIC management information system (MIS) was extracted for infants, children, and women. Records were extracted for health assessments, or clinic visit dates, that occurred from January 1, 2010 through December 31, 2010. Personal identifiers such as name, address, and mother's maiden name were excluded. Each participant had a unique 11-digit identifier (ID), which was a combination of the 3-digit clinic number, 6-digit household number, and 2-digit member number.

### ***Critical Errors***

Data cleaning was conducted using the CDC's Pediatric Nutrition Surveillance System (PedNSS) and Pregnancy Nutrition Surveillance System (PNSS) data edit and analyses criteria (CDC, 2009). First, data were reviewed for the presence of critical errors such as state, ID, visit date, date of birth. For all participants, records were excluded from analyses if missing state, ID, visit date, or date of birth. Records were also excluded from analyses for all participants if the state was not Nevada or a neighboring state (i.e., California, Oregon, Arizona, Utah, or Idaho) or if the date of visit or the original certification date was before the participant's date of birth. For women, records were further excluded if missing the expected delivery date (EDD) and infant's date of birth. For infants and children, records were further excluded if missing sex.

### ***Duplicates***

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Using the CDC's PedNSS/PNSS protocol, duplicate records were identified and deleted using six criteria so that each participant had one record for analyses. Only one record was kept if there were records that had the same combination of the following:

1. For all participants – State, ID, date of birth, and date of visit;
2. For all participants – State, ID, and date of birth;
3. For women - State, ID, and EDD;
4. For women - Household number and date of birth;
5. For infants and children – State, ID, date of birth, height, and weight;
6. For infants and children – Household number, member number, and date of birth.

### ***Unlinkable Records***

A WIC family identifier was created for each record by combining the clinic number and the household number. Women were linked to their children if the woman and child had a common WIC family ID. Women who were unable to be linked to any child and children who were unable to be linked to any woman were excluded from analyses.

### ***Final Study Sample***

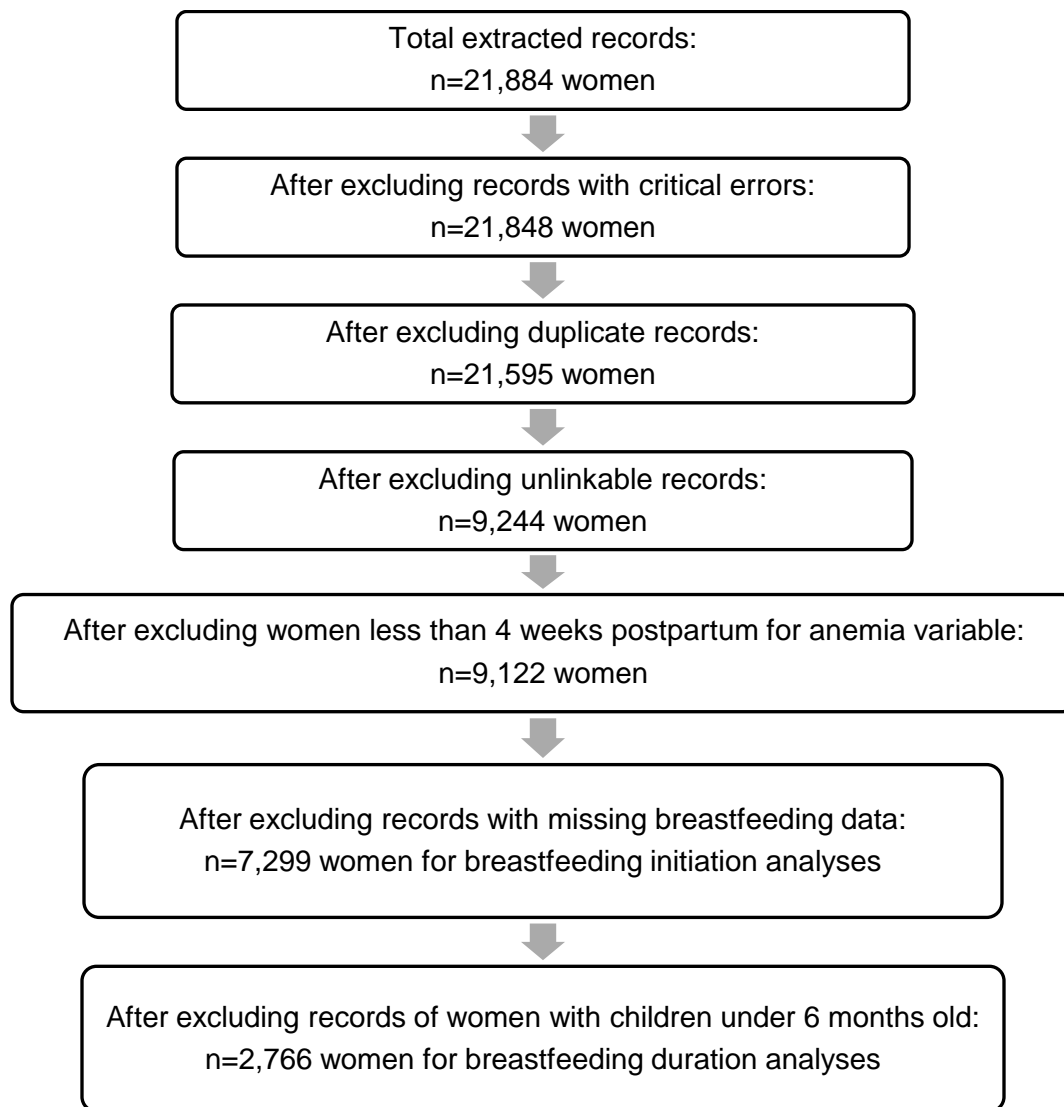
A total of 61,058 records (n=21,884 women and n=39,174 infants and children) were extracted from the MIS for clinic visit dates that occurred in 2010. After excluding critical errors, duplicate records, and records that could not be linked with a WIC family identifier, there were 9,244 records for women and 22,721 records for infants and children.

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Prenatal women and women at least 4 weeks postpartum were included in the analyses, because according to the CDC's PNSS protocol, this is when hemoglobin measurements are expected to return to pre-pregnancy or first trimester levels as the red cell mass that expands during pregnancy contracts to normal body storage levels (CDC, 2009). After excluding women that were less than 4 weeks postpartum, the sample size for women was n=9,122.

After excluding records of women with missing breastfeeding data, n=7,299 women were included in the breastfeeding initiation analyses. Of this sample, n=2,766 had children at least 6 months of age at the time of the visit, so these women were included in the breastfeeding duration analyses (Figure 2).

**Figure 2:** The Study Sample



## Measures

### ***Outcomes: Maternal Breastfeeding Initiation and Duration***

The outcome of interests, breastfeeding initiation and duration, were taken from the infants' and children's records, which were self-reported by their mothers. The woman was determined to have initiated breastfeeding if she reported either currently breastfeeding (partially or fully), or if not, if she had ever breastfed at least once. The



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woman was determined to have not initiated breastfeeding if she was not currently breastfeeding and had never breastfed at least once.

Analyses for breastfeeding duration excluded women who did not have a child who was at least 6 months of age at the time of the clinic visit. The age of the child was calculated from their date of birth and date of visit. A woman was determined to have breastfed at least 6 months if she responded in either of the following ways: Currently breastfeeding; or not currently breastfeeding but had ever breastfed and had breastfed for at least 24 weeks. A woman was determined to have not breastfed at least 6 months if she responded in either of these ways: Not currently breastfeeding and had never breastfed; or not currently breastfeeding but have ever breastfed, but did not breastfeed for at least 24 weeks. The cut-off value of 6 months was used, because this is the target breastfeeding length for Nevada WIC's performance measure indicators for breastfeeding.

### ***Predictors: Maternal Demographic and Health Characteristics***

Predictors of breastfeeding initiation and duration were obtained from the maternal records. The demographic characteristics included: Maternal race/ethnicity; age; participation in additional federal assistance programs (Medicaid, SNAP, or TANF); household size; county of residence; and time of WIC enrollment. The health characteristics included pre-pregnancy body-mass index (BMI) and anemia.

Maternal race/ethnicity was categorized into: Non-Hispanic white; non-Hispanic black; Hispanic; and other, which included Asian/Pacific Islanders, Native American/Alaska Natives, and multiple races. Maternal age was calculated from the mother's date of birth and the date of visit. Previous studies were used to categorize

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maternal age: 13-19 years, 20-24 years, 25-29 years, 30-34 years, and 35-45 years.

Household size was also categorized according to previous studies: Small household size or 2-3 people, medium household size or 4-6 people, and large household size or 7-15 people (Forste & Hoffman, 2008; Tenfelde, Finnegan, & Hill, 2011).

County of residence was categorized into urban or rural/frontier. Participant county of residence was determined by the location of the clinic from the 3-digit clinic number. Clinics in Clark County, Washoe County, and Carson City were considered to be in urban regions according to the USDA definition and census population size (USDA, 2012). Clinics in all other counties were considered to be in rural or frontier regions.

The time of WIC enrollment was determined by when the woman initially enrolled in the program and calculated from the original certification date and her most recent expected delivery date. This indicator determines the length of exposure to the WIC program during and after pregnancy. The time of WIC enrollment was categorized into prenatal or postpartum.

Pre-pregnancy BMI was calculated from the woman's pre-pregnancy weight and height. Pre-pregnancy BMI categories were based on the Institute of Medicine (IOM) guidelines as follows: Underweight (BMI<18.5), normal weight (BMI 18.5-24.9), and overweight/obese (BMI>24.9) (IOM, 2009).

Criteria to define anemia was based on the trimester of pregnancy and postpartum maternal age according to the CDC's 1998 "Recommendations to Prevent and Control Iron Deficiency in the United States" (CDC, 2009). Hemoglobin values were adjusted for altitude based on area of residence because people who reside at

higher altitude have higher hematology levels, but hemoglobin values were not adjusted for smoking status. Women were categorized into anemic or not anemic.

## **Analyses**

We calculated the prevalence of women who initiated breastfeeding their children and the prevalence of women who breastfed their child for at least 6 months. We evaluated the effects of maternal characteristics on breastfeeding initiation and breastfeeding duration for at least 6 months, separately, by conducting Chi-square tests to determine if the distributions within levels of our predictor variables were statistically different. We calculated unadjusted odds ratios by using proc logistic to examine these maternal predictors for breastfeeding initiation and duration, individually. Multivariate analysis evaluated the relationship of individually statistically significant maternal predictors of breastfeeding initiation. The same was done for breastfeeding duration for at least 6 months. Final models controlling for covariates included maternal predictors that were found to be individually significantly ( $p < 0.05$ ) related to breastfeeding initiation and duration for 6 months.

All analyses were conducted with SAS, Version 9.3 (SAS Institute, Inc., Cary, NC). We set the significance level for all statistical tests at  $p < 0.05$ .

## **Results**

### **Participants**

Demographic and health characteristics of the women are presented in Table 1. The sample was racially and ethnically diverse with 41% self-reporting that they were

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Hispanic, 35% self-identifying as non-Hispanic white, and 14% non-Hispanic black. Half of the women were under the age of 25 years and 42% were concurrently enrolled in Medicaid, with smaller proportions enrolled in SNAP (26%) and TANF (8%). Almost half of the women were concurrently enrolled in any of the three federal assistance programs. The majority of the women had a small or medium household size, lived in urban regions, and initially enrolled in WIC prenatally. Nineteen percent of women were underweight during pre-pregnancy, 41% were overweight or obese during pre-pregnancy, and 20% were anemic (Table 1).

### **Maternal Predictors of Breastfeeding Initiation**

Of the 7,299 women in the sample, 4,359 (59.7%) had initiated breastfeeding (Table 1). The prevalence of breastfeeding initiation by maternal characteristics is shown in Appendix 1. Non-Hispanic black women had 46% lower odds of breastfeeding initiation [unadjusted Odds Ratio (OR) = 0.54; 95% CI (0.46, 0.62)] while Hispanic women had 19% higher odds of breastfeeding initiation [OR = 1.19, 95% CI (1.07, 1.33)] compared to non-Hispanic white women. Compared to women who were above 34 years of age, women of younger age in the age category 13-19 years [OR = 0.75, 95% CI (0.62, 0.91)] had 25% lower odds of initiating breastfeeding, and women in the age category 20-24 years [OR = 0.79, 95% CI (0.67, 0.95)] had 21% lower odds of initiating breastfeeding. Women who were concurrently participating in Medicaid, SNAP, or TANF had 28% lower odds of breastfeeding initiation [OR = 0.72, 95% CI (0.66, 0.79)] than women who were not concurrently participating in any of the three federal assistance programs. Women who resided in rural or frontier areas had 25% higher

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**Table 1:** Maternal Characteristics, Nevada WIC, 2010, n=7,299

<b>Characteristics of Women</b>	<b>n (%)</b>
<b>Demographic Characteristics</b>	
Race/Ethnicity	
White, non-Hispanic	2,539 (34.8)
Black, non-Hispanic	1,030 (14.1)
Hispanic	2,995 (41.0)
Other	735 (10.1)
Age (Years)	
13-19	1,131 (15.5)
20-24	2,517 (34.5)
25-29	1,876 (25.7)
30-34	1,109 (15.2)
35-45	666 (9.1)
Participation in Medicaid	3,037 (41.6)
Participation in SNAP	1,882 (25.8)
Participation in TANF	555 (7.6)
Participation in any Federal Assistance Program	
Yes	3,251 (44.5)
No	4,048 (55.5)
Household Size*	
Small (2-3)	2,951 (40.4)
Medium (4-6)	3,837 (52.6)
Large (7-15)	508 (7.0)
County of Residence	
Urban	6,494 (89.0)
Rural/Frontier	805 (11.0)
Time of WIC Enrollment	
Prenatal	4,432 (60.7)
Postpartum	2,867 (39.3)
<b>Health Characteristics</b>	
Pre-pregnancy BMI*	
Underweight	1,372 (18.8)
Normal Weight	2,852 (39.1)
Overweight/Obese	2,963 (40.6)
Anemic*	
Yes	1,455 (19.9)
No	5,081 (69.6)
<b>Initiated Breastfeeding</b>	<b>4,359 (59.7)</b>
<b>Breastfed for At Least 6 Months</b>	<b>670 (24.2)</b>

\*Percent of sample may not add up to 100% due to records with missing data, miscoded data, or biologically implausible values.

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odds of breastfeeding initiation [OR = 1.25, 95% CI (1.08, 1.46)] than women who resided in urban areas of Nevada (Table 2).

Women who were underweight during pre-pregnancy had 22% lower odds of initiating breastfeeding [OR = 0.78, 95% CI (0.68, 0.89)] than women who were of normal BMI. Also, women who were anemic had 31% lower odds of initiating breastfeeding [OR = 0.69, 95% CI (0.61, 0.78)] compared to women who were not anemic (Table 2).

To determine independent predictors of breastfeeding, multivariate logistic regression was conducted. The variables included in the final model for predicting breastfeeding initiation were: Race/ethnicity, maternal age, participation in any federal assistance program, county of residence, and pre-pregnancy BMI. Anemia was not included in the final model, because after excluding women with inapplicable, missing, or inaccurate hemoglobin data, n=763 additional women would have been excluded from the multivariate analyses.

After controlling for age, federal assistance program participation, residence, and pre-pregnancy BMI, non-Hispanic black women still had lower odds of initiating breastfeeding by 42% [adjusted Odds Ratio (AOR) = 0.58; 95% CI (0.50, 0.67)] and Hispanic women had higher odds of initiating breastfeeding by 17% [AOR = 1.17; 95% CI (1.05, 1.31)] than non-Hispanic white women. After controlling for race/ethnicity, federal assistance program participation, residence, and pre-pregnancy BMI, maternal age of 13-19 years [AOR = 0.76; 95% CI (0.62, 0.93)] and 20-24 years [AOR = 0.82; 95% CI (0.69, 0.98)], compared to maternal age of over 34 years, also had lower odds of breastfeeding initiation by 24% and 18%, respectively. Maternal age of 30-34 years

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**Table 2:** Maternal Factors Associated with Initiation of Breastfeeding, Nevada WIC 2010, n=7,299

Maternal Predictors	Initiated Breastfeeding					
	Unadjusted OR (95% CI)		p-value	Adjusted OR (95% CI)		p-value
Race/Ethnicity	Referent			Referent		
White, non-Hispanic	Referent			Referent		
Black, non-Hispanic	0.54	(0.46, 0.62)	<.0001*	0.58	(0.50, 0.67)	<.0001*
Hispanic	1.19	(1.07, 1.33)	0.0018*	1.17	(1.05, 1.31)	0.0058*
Other	0.95	(0.81, 1.13)	0.5734	0.91	(0.77, 1.08)	0.2864
Age (Years)	Referent			Referent		
13-19	0.75	(0.62, 0.91)	0.0037*	0.76	(0.62, 0.93)	0.0074*
20-24	0.79	(0.67, 0.95)	0.0095*	0.82	(0.69, 0.98)	0.0282*
25-29	1.01	(0.84, 1.21)	0.9097	1.02	(0.85, 1.23)	0.8404
30-34	1.21	(0.99, 1.48)	0.0632	1.23	(1.00, 1.50)	0.0477*
35-45	Referent			Referent		
Participation in Any Federal Assistance Program	Referent			Referent		
Yes	0.72	(0.66, 0.79)	<.0001*	0.79	(0.72, 0.87)	<.0001*
No	Referent			Referent		
Household Size	Referent			Referent		
Small (2-3)	1.14	(0.94, 1.37)	0.1869	--	--	--
Medium (4-6)	1.18	(0.98, 1.42)	0.0834	--	--	--
Large (7-15)	Referent			Referent		
County of Residence	Referent			Referent		
Urban	Referent			Referent		
Rural/Frontier	1.25	(1.08, 1.46)	0.0036*	1.27	(1.09, 1.49)	0.0029*
Time of WIC Enrollment	Referent			Referent		
Prenatal	Referent			Referent		
Postpartum	0.91	(0.83, 1.01)	0.0621	--	--	--
Pre-pregnancy BMI	Referent			Referent		
Underweight	0.78	(0.68, 0.89)	0.0002*	0.78	(0.68, 0.89)	0.0002*
Normal Weight	Referent			Referent		
Overweight/Obese	1.01	(0.91, 1.12)	0.8395	0.94	(0.85, 1.05)	0.2925
Anemic	Referent			Referent		
Yes	0.69	(0.61, 0.78)	<.0001*	--	--	--
No	Referent			Referent		

\*p<0.05

compared to over 34 years was not a significant predictor of breastfeeding initiation in the bivariate analyses but was statistically significant in the multivariate analyses. After controlling for confounders, women aged 30-34 years had a 23% higher odds [AOR =

1.23; 95% CI (1.00, 1.50)] than women aged over 34 years to initiate breastfeeding, although the association was not highly significant.

After controlling for other confounders in the final model for breastfeeding initiation, women who were also participating in another federal assistance program had 21% lower odds [AOR = 0.79; 95% CI (0.72, 0.87)] than women who were not receiving additional assistance, women residing in a rural/frontier area had 27% higher odds [AOR = 1.27; 95% CI (1.09, 1.49)] than women residing in an urban area, and underweight women had 22% lower odds [AOR = 0.78; 95% CI (0.68, 0.89)] of initiating breastfeeding compared to women of normal pre-pregnancy BMI (Table 2). Overall, after controlling for potential confounders, the odds of initiating breastfeeding were similar to the odds before controlling for confounders. Additionally, all variables in the final model remained as having similarly statistically significant predictors for breastfeeding initiation. This suggests that there were minimal confounding effects between race/ethnicity, age, federal assistance program participation, area of residence, and pre-pregnancy BMI in predicting breastfeeding initiation from these maternal characteristics.

### **Maternal Predictors for Breastfeeding Duration**

Of the 2,766 women included in the breastfeeding duration analysis, 670 (24.2%) breastfed their child for at least 6 months (Table 1). The prevalence of breastfeeding duration by maternal characteristics is shown in Appendix 2. Non-Hispanic black women had a 54% lower odds of breastfeeding for at least 6 months [OR = 0.46, 95% CI (0.33, 0.64)] compared to non-Hispanic white women. Women of younger age in the



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age categories 13-19 years [OR = 0.29, 95% CI (0.20, 0.42)], 20-24 years [OR = 0.43, 95% CI (0.32, 0.58)], and 25-29 years [OR = 0.74, 95% CI (0.55, 1.00)] had lower odds of breastfeeding for at least 6 months than older women (34 years and older) by 71%, 57%, and 26%, respectively. Women who were concurrently participating in Medicaid, SNAP, or TANF had 35% lower odds of breastfeeding for at least 6 months [OR = 0.65, 95% CI (0.54, 0.78)] compared to women who were not concurrently participating in any of the three federal assistance programs. Women who initially enrolled in WIC during their postpartum period had 31% higher odds of breastfeeding for at least 6 months [OR = 1.31, 95% CI (1.10, 1.55)] than women who initially enrolled prenatally. Women who were anemic had 34% lower odds of breastfeeding for at least 6 months [OR = 0.66, 95% CI (0.51, 0.84)] compared to women who were not anemic (Table 3).

For multivariate analysis, the variables included in the final breastfeeding duration model were: Race/ethnicity, maternal age, participation in any federal assistance program, and time of WIC enrollment. Again, anemia was excluded from the final due to loss of sample size from records with inapplicable, missing, or inaccurate hemoglobin data. After adjusting for the other variables in the model, non-Hispanic black women still had about half the odds of breastfeeding for at least 6 months [AOR = 0.49; 95% CI (0.34, 0.68)] than non-Hispanic white women, and compared to older women of 34 years and older, women aged 13-19 years [AOR = 0.30; 95% CI (0.21, 0.44)] and 20-24 years [AOR = 0.44; 95% CI (0.33, 0.60)] had lower odds of breastfeeding for at least 6 months by 70% and 56%, respectively. Participation in another federal assistance program resulted in a 24% lower odds [AOR = 0.76; 95% CI (0.62, 0.92)] of breastfeeding for at least 6 months. After controlling for race/ethnicity,

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**Table 3:** Maternal Factors Associated with Breastfeeding At Least 6 Months, Nevada WIC 2010, n=2,766

Maternal Predictors	Breastfed At Least 6 Months		Adjusted OR (95% CI)	p-value
	Unadjusted OR (95% CI)	p-value		
Race/Ethnicity				
White, non-Hispanic	Referent		Referent	
Black, non-Hispanic	0.46 (0.33, 0.64)	<.0001*	0.49 (0.34, 0.68)	<.0001*
Hispanic	0.94 (0.77, 1.14)	0.4978	0.93 (0.76, 1.14)	0.4902
Other	0.90 (0.66, 1.24)	0.5217	0.81 (0.58, 1.12)	0.1931
Age (Years)				
13-19	0.29 (0.20, 0.42)	<.0001*	0.30 (0.21, 0.44)	<.0001*
20-24	0.43 (0.32, 0.58)	<.0001*	0.44 (0.33, 0.60)	<.0001*
25-29	0.74 (0.55, 1.00)	0.0489*	0.75 (0.55, 1.01)	0.0576
30-34	0.84 (0.61, 1.16)	0.2832	0.84 (0.61, 1.17)	0.3088
35-45	Referent		Referent	
Participation in Any Federal Assistance Program				
Yes	0.65 (0.54, 0.78)	<.0001*	0.76 (0.62, 0.92)	0.0045*
No	Referent		Referent	
Household Size				
Small (2-3)	0.91 (0.64, 1.30)	0.6149	--	
Medium (4-6)	0.99 (0.70, 1.39)	0.9293	--	
Large (7-15)	Referent		--	
County of Residence				
Urban	Referent		--	
Rural/Frontier	1.08 (0.82, 1.43)	0.5866	--	
Time of WIC Enrollment				
Prenatal	Referent		Referent	
Postpartum	1.31 (1.10, 1.55)	0.0028*	1.18 (0.98, 1.41)	0.0822
Pre-pregnancy BMI				
Underweight	1.25 (0.99, 1.59)	0.0606	--	
Normal Weight	Referent		--	
Overweight/Obese	1.00 (0.82, 1.21)	0.9588	--	
Anemic				
Yes	0.66 (0.51, 0.84)	0.0008*	--	
No	Referent		--	

\*p<0.05

age, and concurrent federal assistance program participation, the time of enrollment in WIC was not a significant maternal predictor for breastfeeding at least 6 months. This suggests that race/ethnicity, age, and income (assuming that federal assistance

participation serves as a proxy for income) may be influencing when a woman enrolls in WIC and may be the maternal factors that are affecting breastfeeding duration instead of the time of WIC enrollment itself (Table 3).

### **Discussion**

This was the first study to explore predictors of breastfeeding among Nevada's WIC population. Overall, this study found that breastfeeding rates are suboptimal within Nevada's WIC population with 60% of women initiating breastfeeding and 24% breastfeeding for the minimum duration of 6 months. The study findings also demonstrated that there are different maternal predictors for breastfeeding initiation and duration among Nevada's WIC population. The maternal predictors that were significantly associated with both breastfeeding initiation and duration (at least 6 months) were race/ethnicity, maternal age, and concurrent participation in any federal assistance program. Additional predictors for breastfeeding initiation were region of residence and pre-pregnancy BMI.

Consistent with existing literature, this study showed that Hispanic women are more likely to initiate breastfeeding compared to non-Hispanic white women. Furthermore, non-Hispanic black women are less likely to initiate and to continue breastfeeding for at least 6 months (Forste & Hoffman, 2008; Park, Meier, & Song, 2003). The lower rates of breastfeeding among non-Hispanic black women may be related to their experience of health disparities as a whole, due to historical discrimination and lack of access to services. Additionally, African American cultural norms may oppose breastfeeding. In order to address these issues, Nevada's WIC

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program can explore barriers for this subpopulation in accessing WIC program benefits and make larger efforts for African American mothers to have access to services provided by lactation consultants and breastfeeding peer counselors. To shape cultural norms so that breastfeeding becomes more socially acceptable for African Americans, Nevada's WIC program can tailor part of their program to be culturally competent for non-Hispanic black women by using education, communication, and support for breastfeeding.

The findings of this study were consistent with existing literature in that younger women under 25 years of age, especially women under 19 years of age, are less likely to initiate and continue breastfeeding for at least 6 months (Forste & Hoffman, 2008). If these young women are single parents, they may lack the social support that can encourage initiation and continuation of breastfeeding. In addition, if they are unaware of the importance of breastfeeding, do not know how to breastfeed, or are embarrassed to breastfeed, it may be more convenient for them to rely on formula feeding. Therefore, Nevada's WIC program can tailor part of their program to a younger population for breastfeeding education in a group setting, establishing social networking opportunities for communication and peer support while involving other family members such as grandparents to help with breastfeeding efforts. Nevada's WIC program already has group education classes for family members, but efforts to encourage family members to attend these group classes can be strengthened.

Among this study sample of women participating in WIC, those concurrently enrolled in another federal assistance program had lower odds of initiating breastfeeding and breastfeeding for at least 6 months. For this study, there is an

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assumption that participation in another federal assistance program could be a proxy for socioeconomic status within the WIC population. This assumption is that women who are concurrently participating in Medicaid, SNAP, or TANF are more likely to have lower income levels than those who are not participating in these programs due to program-specific income qualifications. It is important to note, however, that not all women who are eligible for these federal assistance programs actively participate in these programs. Based on these assumptions, the findings support current literature that women with lower income are less likely to breastfeed (McDowell, Wang, & Kennedy-Stephenson, 2008). In WIC, women who do not breastfeed are able to receive formula in their food package but are eligible to receive benefits from the program for a shorter period of time. If during certification appointments, this is made clear when discussing their breastfeeding status and food package options, perhaps more lower income women will be convinced to breastfeed if they are aware that instead of formula, they could receive an expanded food package for a longer time period, which saves more money for them over time.

For both younger women and for women of lower income, increasing knowledge of the benefits of breastfeeding and increasing social support within the WIC program can increase breastfeeding rates. Additionally, at the community level, WIC clinical staff can communicate with local hospital staff to make support for breastfeeding transitions smooth from hospitals to clinics. This can be done by increasing the number of breast pumps available by the WIC program in the hospital at the time of delivery, and hospital staff can also be trained by WIC lactation consultants to aid new mothers in the hospital on breastfeeding methods.

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The study findings add to current literature by examining area of residence. Women who lived in rural or frontier regions of Nevada had higher odds of initiating breastfeeding compared to women who lived in urban areas. This may be due to a few different reasons. Increased social support from family and community members can contribute to higher rates of breastfeeding (Cricco-Lizza, 2006; Anderson, Damio, Young, Chapman, and Perez-Escamilla, 2005). Women in rural areas may be living in households with multiple generations, or they could be living in communities that are isolated and thus have a tightly-knit social network within the town. Another possible reason for the difference in breastfeeding rates by region is that women in rural or frontier areas may have less access to purchasing formula due to distance from a local grocery store. Clinics in rural areas may also have different approaches to breastfeeding compared to clinics in urban areas. Lastly, the turnover of staff can be less in rural clinics, and participants in rural areas can be more likely to stay at the same clinic over time, which can increase continued social support. Visiting clinics or receiving WIC staff input from both rural and urban areas can help explore if there are differences in approaches to breastfeeding promotion according to region. Using clinic level data reports on staff and participants can also help to identify variations on breastfeeding rates among clinics across the state.

The study findings departed from current literature in three areas: Household size, time of WIC enrollment, and pre-pregnancy BMI. Contrary to past studies, this study suggested that household size and time of WIC enrollment are not significant predictors of breastfeeding initiation or duration (Bronner et al., 2009; Thompson et al., 2012). Although the findings that underweight women compared to women of normal

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weight have a lower odds of breastfeeding initiation was consistent with current literature, pre-pregnancy BMI was not a significant predictor for breastfeeding duration (Thompson et al., 2012). The discrepancies in these findings may be due to categorization of household size, confounding between variables, and inaccurate or missing data.

In addition to the WIC program recommendations based on study findings, there are several additional recommendations for policy to increase breastfeeding rates within Nevada's WIC population. Since mothers participating in the WIC program have a choice of having formula included in their food package, it is important to ensure that the promotion of infant formula is conducted in a way that minimizes its negative impacts on breastfeeding. This may be difficult to do with the marketing of formula on a national level due to the lobbying power of pharmaceutical companies who promote infant formula. However, under WIC federal regulations, there is a policy that requires states to establish standards for WIC clinics to create a clinic environment that endorses breastfeeding as the preferred method of infant feeding (7 CFR 246.11). As part of this standard, the Nevada WIC program is currently working towards not allowing clinics to display formula or materials (i.e., posters, pictures, and brochures) featuring formula or bottle feeding. Second, a national or local campaign to promote breastfeeding can help increase awareness of the benefits of breastfeeding. This has been done by Nevada's WIC program with a bus campaign and radio announcements, but alternate methods that target the subpopulations of interest can be explored. Lastly, Nevada can work toward expanding the use of programs in the workplace that allow lactating mothers to have direct access to their babies. A recent development is the successful

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implementation of the Nevada's Infant-at-Work Program where mothers can bring their babies to work and breastfeed while continuing to do their jobs.

There are three major limitations for this study which include: The accuracy of linking mother to child data, missing or miscoded values for health characteristics, and limited availability of variables. First, the study methods were limited to linking women to children by the same clinic and household number, because the breastfeeding initiation and duration is collected for the records of infants and children but not for records of women. Linking a mother to her children was problematic because of the uncertainty that the combination of a common clinic and household number was an accurate method of linking mother to all of her children. Therefore, although the study attempted to examine multiple births, plurality, and inter-pregnancy interval as additional maternal predictors for breastfeeding initiation and duration, these analyses were not included in the study due to potential inaccuracies of the findings.

Second, there was a large amount of missing data for anemia and miscoded data for weight among records for women. These errors in data fields for WIC participants can be attributed to questions not being asked or answered during certification appointments, participants not getting their hemoglobin levels checked, or human data entry errors into the system. Furthermore, this study attempted to explore health outcomes (stature, weight, and anemia) for infants and children who had ever been breastfed, but breastfeeding data is primarily collected on children less than 2 years of age. Therefore, we were not able to identify any significant health outcomes from breastfeeding among infants and children with breastfeeding data. The benefits of



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breastfeeding among Nevada's WIC population can be identified in future studies by linking with other datasets that have variables for long-term child health outcomes.

Lastly, there are relevant variables collected by other state WIC or pregnancy surveillance systems that Nevada's WIC information system currently does not capture. These include marital status, education level, employment, prenatal care, delivery method, and smoking in the household. Blood iron levels are affected by elevation and exposure to smoke, so we adjusted blood iron levels according to area of residence but not for smoking since we did not have this information. Capturing data on these additional variables would be helpful to ensure accurate adjustments for hemoglobin levels and to identify further demographic, health, and behavioral characteristics that contribute to disparities in breastfeeding rates among Nevada's WIC participants. Some of this information is actually collected from participants on paper surveys during clinic visits, but not all fields completed in the survey are entered in the electronic data system. If this collected information was entered and stored in a database, Nevada's WIC program can use this data in future studies to detect and monitor additional indicators in order to target breastfeeding promotion efforts. An additional question on the survey can include a question regarding reasons for not initiating breastfeeding or reasons for terminating breastfeeding before 6 months so that qualitative analyses can be conducted for examining why Nevada's WIC participants may not breastfeed as recommended. Although not used in this study, WIC also collects information on breastfeeding exclusivity, which can be used in future studies to compare predictors and outcomes of partial and exclusive breastfeeding.

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Most importantly, however, this study was able to provide data-driven conclusions on breastfeeding predictors within Nevada's WIC population, which currently serves a large population with low rates of breastfeeding. These implications will be useful in developing consistent breastfeeding policies and programs across WIC programs in Nevada. Increasing the amount of women who initiate breastfeeding and being able to keep these women to continue breastfeeding according to recommended practices will help us produce and maintain healthier future generations of women and children for our society.

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## Appendices

**Appendix 1: Maternal Characteristics for Breastfeeding Initiation, Nevada WIC, 2010, n=7,299**

Characteristics of Women	Total n (%)	Initiated Breastfeeding		p-value
		Yes, n (%)	No, n (%)	
<b>Demographic Characteristics</b>				
Race/Ethnicity				<.0001*
White, non-Hispanic	2,539 (34.8)	1,532 (35.2)	1,007 (34.3)	
Black, non-Hispanic	1,030 (14.1)	463 (10.6)	567 (19.3)	
Hispanic	2,995 (41.0)	1,929 (44.3)	1,066 (36.3)	
Other	735 (10.1)	435 (10.0)	300 (10.2)	
Age (Years)				<.0001*
13-19	1,131 (15.5)	622 (14.3)	509 (17.3)	
20-24	2,517 (34.5)	1,420 (32.6)	1,097 (37.3)	
25-29	1,876 (25.7)	1,168 (26.8)	708 (24.1)	
30-34	1,109 (15.2)	736 (16.9)	373 (12.7)	
35-45	666 (9.1)	413 (9.5)	253 (8.6)	
Participation in Medicaid				<.0001*
Yes	3,037 (41.6)	1,680 (38.5)	1,357 (46.2)	
No	4,262 (58.4)	2,679 (61.5)	1,583 (53.8)	
Participation in SNAP				<.0001*
Yes	1,882 (25.8)	967 (22.2)	915 (31.1)	
No	5,417 (74.2)	3,392 (77.8)	2,025 (68.9)	
Participation in TANF				<.0001*
Yes	555 (7.6)	268 (6.2)	287 (9.8)	
No	6,744 (92.4)	4,091 (93.9)	2,653 (90.2)	
Participation in any Federal Assistance Program				<.0001*
Yes	3,251 (44.5)	1,800 (41.3)	1,451 (49.4)	
No	4,048 (55.5)	2,559 (58.7)	1,489 (50.7)	
Household Size**				0.2642
Small (2-3)	2,951 (40.4)	1,755 (40.3)	1,196 (40.7)	
Medium (4-6)	3,837 (52.6)	2,316 (53.1)	1,521 (51.7)	
Large (7-15)	508 (7.0)	288 (6.6)	220 (7.5)	
County of Residence				0.0036*
Urban	6,494 (89.0)	3,840 (88.1)	2,654 (90.3)	
Rural/Frontier	805 (11.0)	519 (11.9)	286 (35.5)	
Time of WIC Enrollment				0.0620
Prenatal	4,432 (60.7)	2,685 (61.6)	1,747 (59.4)	
Postpartum	2,867 (39.3)	1,674 (38.4)	1,193 (40.6)	
<b>Health Characteristics</b>				
Pre-pregnancy BMI**				<.0001*
Underweight	1,372 (18.8)	750 (17.2)	622 (21.2)	
Normal Weight	2,852 (39.1)	1,743 (40.0)	1,109 (37.7)	
Overweight/Obese	2,963 (40.6)	1,808 (41.5)	1,155 (39.3)	
Anemic**				<.0001*
Yes	1,455 (19.9)	760 (17.4)	695 (23.6)	
No	5,081 (69.6)	3,114 (71.4)	1,967 (66.9)	
<b>Initiated Breastfeeding</b>	<b>7,299 (100.0)</b>	<b>4,359 (59.7)</b>	<b>2,940 (40.3)</b>	

\*p&lt;0.05

\*Percent of sample may not add up to 100% due to records with missing data, miscoded data, or biologically implausible values.

NEVADA WIC BREASTFEEDING

**Appendix 2: Maternal Characteristics for Breastfeeding Duration, Nevada WIC, 2010, n=2,766**

Characteristics of Women	Total n (%)	Breastfed At Least 6 Months		p-value
		Yes, n (%)	No, n (%)	
<b>Demographic Characteristics</b>				
Race/Ethnicity				<.0001*
White, non-Hispanic	940 (34.0)	249 (37.2)	691 (33.0)	
Black, non-Hispanic	339 (12.3)	48 (7.2)	291 (13.9)	
Hispanic	1,226 (44.3)	309 (46.1)	917 (43.8)	
Other	261 (9.4)	64 (9.6)	197 (9.4)	
Age (Years)				<.0001*
13-19	406 (14.7)	55 (8.2)	351 (16.8)	
20-24	949 (34.3)	180 (26.9)	769 (36.7)	
25-29	712 (25.7)	205 (30.6)	507 (24.2)	
30-34	436 (15.8)	137 (20.5)	299 (14.3)	
35-45	263 (9.5)	93 (13.9)	170 (8.1)	
Participation in Medicaid				<.0001*
Yes	1,044 (37.7)	203 (30.3)	841 (40.1)	
No	1,722 (62.3)	467 (69.7)	1,255 (59.9)	
Participation in SNAP				<.0001*
Yes	619 (22.4)	104 (15.5)	515 (24.6)	
No	2,147 (77.6)	566 (84.5)	1,581 (75.4)	
Participation in TANF				0.0001*
Yes	169 (6.1)	20 (3.0)	149 (7.1)	
No	2,597 (93.9)	650 (97.0)	1,947 (92.9)	
Participation in any Federal Assistance Program				<.0001*
Yes	1,133 (41.0)	223 (33.3)	910 (43.4)	
No	1,633 (59.0)	447 (66.7)	1,186 (56.6)	
Household Size**				0.6954
Small (2-3)	1,020 (36.9)	238 (35.5)	782 (37.3)	
Medium (4-6)	1,550 (56.0)	383 (57.2)	1,167 (55.7)	
Large (7-15)	195 (7.1)	49 (7.3)	146 (7.0)	
County of Residence				0.5865
Urban	2,476 (89.5)	596 (89.0)	1,880 (89.7)	
Rural/Frontier	290 (10.5)	74 (11.0)	216 (10.3)	
Time of WIC Enrollment				0.0027*
Prenatal	1,534 (55.5)	338 (50.5)	1,196 (57.1)	
Postpartum	1,232 (44.5)	332 (49.6)	900 (42.9)	
<b>Health Characteristics</b>				
Pre-pregnancy BMI**				0.0988
Underweight	530 (19.2)	147 (21.9)	383 (18.3)	
Normal Weight	1,030 (37.2)	239 (35.7)	791 (37.7)	
Overweight/Obese	1,148 (41.5)	268 (40.0)	880 (42.0)	
Anemic**				0.0007*
Yes	514 (18.6)	94 (14.0)	420 (20.0)	
No	1,960 (70.9)	499 (74.5)	1,461 (69.7)	
<b>Breastfed At Least 6 Months</b>	<b>2,766 (100.0)</b>	<b>670 (24.2)</b>	<b>2,096 (75.8)</b>	

\*p<0.05

\*\*Percent of sample may not add up to 100% due to records with missing data, miscoded data, or biologically implausible values.