2022

Factors Associated with Increased Breastfeeding at Initiation and Continuation at Two Months in American Indian Women

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FACTORS ASSOCIATED WITH INCREASED BREASTFEEDING AT INITIATION AND CONTINUATION AT TWO MONTHS IN AMERICAN INDIAN WOMEN

BY

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A thesis submitted in partial fulfillment of the requirements for the

Master of Science

Major in Nutrition and Exercise Science

Specialization in Nutritional Sciences

South Dakota State University

2022

THESIS ACCEPTANCE PAGE

Addison Reimer

This thesis is approved as a creditable and independent investigation by a candidate for the master's degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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ACKNOWLEDGMENTS

I would like to acknowledge my advisor, Dr. Lacey McCormack, who has been an incredible help and inspiration throughout this process. Dr. McCormack has helped me to unveil a passion for research that I never knew I had. Completing graduate school during a pandemic was a unique experience, but Dr. McCormack truly made me feel like a valued member of South Dakota State University and the Ethel Austin Martin Program. Dr. McCormack's ability to push me outside of my comfort zone and motivate me to think about nutrition on a population-based level was remarkable. I am so thankful to have her as a mentor. Thank you so much for everything, Dr. McCormack!

I would like to thank my thesis committee for their time and support throughout this process including Dr. Bonny Specker, Dr. Christine Wey Hockett, and Dr. Songxin Tan. I am very appreciative of your contributions to my thesis. A special thanks to all the mothers who responded to the PRAMS survey, ultimately making this thesis possible.

Lastly, I would like to thank my family for their support throughout my graduate and undergraduate studies. Thank you to Rafael Cohn-Gruenwald for all the emotional support and encouragement you've given me throughout my graduate degree. An extra special thanks to my parents, Russ and Julie, for always encouraging me to follow my dreams and pursue a higher education. Thank you for always picking up the phone and listening to me talk about my research for hours. I love you!

CONTENTS

ABBREVIATIONS

AAP	American Academy of Pediatrics
AI	American Indian
BF	Breastfeeding
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
EAM	Ethel Austin Martin
IHS	Indian Health Services
SD PRAMS	South Dakota Pregnancy Risk Assessment Monitoring System
SIDS	Sudden Infant Death Syndrome
T2DM	Type 2 Diabetes Mellitus
WIC	Supplemental Nutrition Program for Women, Infant, and Children

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ABSTRACT

FACTORS ASSOCIATED WITH INCREASED BREASTFEEDING AT INITIATION AND CONTINUATION AT TWO MONTHS IN AMERICAN INDIAN WOMEN

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Introduction: The purpose of this report was to determine the prevalence of breastfeeding at initiation and two months continuation in American Indian South Dakota mothers who gave birth between 2017-2019 and determine the factors associated with breastfeeding and various health behaviors and beliefs. This study serves to fill the current gaps in research focusing on breastfeeding in American Indian women in South Dakota.

Methods: Data from the South Dakota Pregnancy Risk Assessment Monitoring System (SD PRAMS), a state-based surveillance system, was used to investigate the relationship between breastfeeding and maternal behaviors, attitudes, and experiences. Logistic regression was used to determine which factors were associated with breastfeeding rates.

Results: Women who ever breastfed were significantly more likely to have received prenatal care in the 1st trimester ($p=0.002$), attended >80% of prenatal visits ($p=0.045$), visited with a healthcare provider 12 months before pregnancy ($p=0.028$), and were significantly less likely to have practiced safe sleep ($p<0.05$). Additionally, mothers who ever breastfed were more likely to have received relevant information from a family friend (OR 2.19), a breastfeeding support group (OR 2.04), a lactation specialist (OR 3.69), and a nurse, midwife, or doula (OR 1.76) (all, $p<0.05$). Most of these factors ceased to be statistically significant when looking at breastfeeding continuation at two months postpartum. Mothers who terminated breastfeeding prior to two months reported

barriers associated with the act of breastfeeding while women who stopped breastfeeding after two months postpartum were more likely to attribute this to maternal beliefs and external factors.

Conclusion: Breastfeeding initiation and continuation rates among American Indian mothers are not meeting the goals set in Healthy People 2020. If appropriate changes are made to the built environment, access to healthcare services, and breastfeeding information and support is made available to AI women, these would likely support an increase in breastfeeding initiation and continuation.

CHAPTER 1: THESIS INTRODUCTION

Breastfeeding is the accepted best practice feeding method for infants when available. The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding through six months and continuation of breastfeeding for at least one year.[1] This recommendation encouraged Healthy People 2020 to set a target of increasing the proportion of infants ever breastfed to 81.9% and the proportion of infants breastfed at six months to 60.9%.[2] The practice of breastfeeding provides protective effects to both the mother and infant. Through these protective effects, public health concerns such as Type 2 Diabetes (T2DM), obesity, and infant mortality may be alleviated.[3–5] Across all races/ethnicities, breastfeeding rates are below these goals with American Indian (AI) breastfeeding rates being among the lowest.[6,7]

Identifying exacerbators of health disparities is necessary to lessen the disease burden on communities. This is especially important in underrepresented communities, such as the AI community. American Indian individuals are at significantly increased risk for developing obesity, T2DM, and other chronic diseases.[4,5,8] The development of chronic diseases can be limited by encouraging health prevention measures, such as breastfeeding. In promoting breastfeeding, interventions must be culturally relevant to the target audience. Due to the historical oppression of AI individuals, it is important to consider how public policies and availability of resources are affecting breastfeeding rates. Acknowledging the oppression of indigenous people is vital to creating change within these communities.

The current research available focuses on factors associated with decreased breastfeeding rates rather than facilitators of breastfeeding. Focusing on barriers can lead

to stigmatization and shaming of mothers who are not breastfeeding. Breastfeeding is a health behavior and needs to be approached through a psychosocial lens. The current research has been using an "avoidance goal" outlook, indicating what behaviors need to be minimized to achieve change.[9] Conversely, "approach goals" are centered around achieving outcomes through positive goal setting techniques.[9] Approach goals lead to greater positive outcomes and are associated with improved psychological health.[9] By making this change in how facilitators and barriers to breastfeeding are viewed, there is a possibility of improving breastfeeding rates.

Based on the noted evidence, there is a need for investigating facilitators of breastfeeding in AI communities. The current research into AI breastfeeding is sparse and limited. Additionally, generalization of research from multiple tribes must be interpreted carefully due to geographical and cultural differences. By identifying factors associated with breastfeeding initiation and continuation in these communities, more appropriate interventions can be identified. In this thesis, breastfeeding initiation is defined as ever breastfeeding and breastfeeding continuation is defined as breastfeeding at two months postpartum. In addition to understanding the barriers to breastfeeding, highlighting facilitators to breastfeeding will be crucial in creating behavior change. The aim of this study is to evaluate factors associated with increased breastfeeding initiation and continuation in AI women. To examine this, data from the South Dakota Pregnancy Risk Assessment Monitoring System (SD PRAMS) was used in this analysis.

CHAPTER 2: LITERATURE REVIEW

A literature review was conducted to better understand the importance of breastfeeding in American Indian (AI) communities. The prevalence of breastfeeding in AI and white women was reviewed. Health consequences and racial disparities were also reviewed.

The practice of breastfeeding provides protective effects for both infants and mothers. The AAP states that breastfeeding should be used as the benchmark when comparing between all other feeding practices due to the nutritional and caloric properties of breastmilk.[1] The benefits to breastfed infants are well-researched and accepted, including decreased risks of gastrointestinal infections, respiratory infections, leukemia, obesity, T2DM, and infant mortality. When adjusting for confounding variables, ever breastfeeding appears to be associated with decreased risk in non-specific gastrointestinal tract infections.[3] Infants who breastfed for more than six months were four times less likely to develop pneumonia than infants who breastfed for only four to six months[10] Additionally, breastfeeding for at least six months has been seen to potentially decreased risk of childhood leukemia.[3]

The association between obesity and breastfeeding is harder to track due to many confounding factors. This has led to conflicting results on whether breastfeeding is related to obesity later in life. The AAP's position states that ever breastfeeding is associated with a decreased risk of obesity later in life.[1] Increasing the duration of breastfeeding is associated with a greater mean difference in Body Mass Index (BMI) during childhood and adolescence in AIs than Non-Hispanic Whites.[4] This study conducted by Zamora-Kapoor et al. emphasized the long term benefits of breastfeeding

on BMI in AIs.[4] Infants fed at the breast have improved appetite regulation compared with bottle-fed infants which can influence weight later in life.[11]

Breastfeeding has been identified as a predictor of reduced T2DM risk. Children breastfed for the first 12 months of their lives have a significantly lower risk of developing T2DM later in life.[12] Analysis of multiple studies has shown an adjusted odds ratio of 0.61 when comparing subjects who were ever breastfed with those formula fed, indicating that breastfeeding is associated with a decreased risk of developing T2DM later in life.[3]

The protective effects of breastfeeding mentioned above are key components of the decreased risk of infant mortality in breastfed infants. In addition to preventing specific complications such as respiratory and gastrointestinal infections, breastfeeding is also related to lower incidence of Sudden Infant Death Syndrome (SIDS). Infants who are formula fed have twice as great a risk of SIDS than breastfed infants.[3] Breastfeeding initiation later than 24 hours post birth was associated with a 78% increased risk of infant mortality.[13] Children breastfed for any amount of time had .79 times the risk of infant mortality as infants never breastfed.[14] Increased duration of breastfeeding was related to lower risk of postnatal death.[14] Initiating breastfeeding as soon as possible following birth and the continuation of breastfeeding is associated with improved birth outcomes.

While the benefits of breastfeeding for infants are evident, breastfeeding improves maternal health as well. Mothers without gestational diabetes that breastfed have a decreased risk of developing diabetes later in life.[15] Breastfeeding for any amount of time has shown a protective effect over developing hormone receptor-negative breast cancer.[16] Additionally, the bonding that is experienced by both mother and child is thought to have

positive effects on maternal mental health. Ultimately, the benefits of breastfeeding extend beyond nutrient and caloric content and may influence both mother's and infant's life for years to come.

Breastfeeding has been an area of interest due to its association with minimized health consequences later in life. The AAP recommends exclusive breastfeeding for the first six months of life followed by complementary breastfeeding until the infant is at least one year old.[1] This recommendation is based on evidence-based research indicating both nutritional and non-nutritional benefits to the infant.

The Healthy People objectives strive to build a healthier nation by setting preventative recommendations for the country. Healthy People 2020 breastfeeding goals aimed to increase the proportion of infants who are breastfeed. Specifically, the goals are to increase the proportion of infants ever breastfed to 81.9%, the proportion of infants breastfed at six months to 60.9% and the proportion of infants exclusively breastfed at six months to 25.5%.[2] The breastfeeding goals of Healthy People 2030 are to increase the proportion of exclusively breastfed infants at six months to 42.4% and continually breastfed infants at one year to 54.1%.[17]

Traditionally, breastfeeding was an encouraged practice within AI communities. However, the mistrust and historical trauma experienced by AI communities have inhibited the social acceptability and passing of breastfeeding knowledge to future generations.[18] Consequently, rates are still below the national average and recommendations. Evidence suggests that strengthening cultural and family relations could significantly increase rates of breastfeeding in AI populations.[7]

According to the Centers for Disease Control and Prevention (CDC), in 2015, 76.4% of AI infants had been breastfed for any amount of time, 55% were breastfed at six months, and 19.6% were exclusively breastfed at six months.[6] There was an increase in all categories compared to the 2010 National Immunization Survey breastfeeding report card. However, these percentages are still below the Healthy People 2020 and 2030 targets, making this a public health concern. Researchers looking into breastfeeding attitudes in an AI population in Minnesota discovered that most of their participants (94%) agreed that breastfeeding was better for their baby than formula.[7] However, only 58% of mothers had ever breastfed and that percentage decreased to 20% of women still breastfeeding at 6 months postpartum. There is an indication that breastfeeding initiation and continuation are associated with more than merely knowing it is a healthful practice.

Previous research has established significant health disparities that affect AIs at greater rates than the majority of the population. It is important to note that due to the geographical and cultural differences between tribes, health issues do not occur uniformly amongst tribes.[19,20] Many of these health disparities are cyclical in nature and require early intervention to help limit their effect within the greater community.

Historically, the oppression of AI individuals has inhibited the volume of research conducted within these communities. To understand the health disparities of AI individuals, it is critical to acknowledge the historical oppression of their communities. The Indian Removal Act of 1830 and other policies have led to the relocation of many AI individuals to reservations.[21] This forced relocation from ancestral lands inhibited access to foods, specifically foods that are culturally appropriate.[21] Extreme poverty on reservations and among AI individuals in general has exacerbated health disparities.

Lower income levels, which are present in many AI communities, have been associated with poor nutritional status.[22]

The CDC reports that 71% of AIs older than 18 are overweight or obese compared to 59% of Non-Hispanic Whites.[23] Rates of childhood obesity are the highest in AIs among all races at 21.1%.[24] Breastfeeding has been linked to improved appetite regulation throughout life while early introduction of foods has been seen to increase risk of childhood obesity.[25] The encouragement of breastfeeding through at least six months would help to decrease risk of obesity later in life.

These populations also have disproportionately high rates of T2DM. Development of T2DM can be related to nutritional choice, weight, genetics, and other social determinants of health. Preterm birth and macrosomia are common within AI communities and can be attributed to maternal diabetes.[26] Many AI reservations are located in food deserts which limit access to healthy food options.[21] Due to the barriers experienced by many AIs later in life, it is critical that preventative measures are taken early in life. These barriers range from limited access to food and preventative health services to greater poverty and adverse childhood events.[21]

According to the National Diabetes Statistic Report in 2020, AIs have the highest prevalence of diagnosed diabetes at 14.7% while Non-Hispanic Whites experience approximately half that rate at 7.4%.[8] A study focused on women from five Pacific Northwest tribes found that merely 39% were aware of the protective effects of breastfeeding on diabetes risk.[25,27] Children breastfed for at least 12 months had less than one-quarter of the chance of developing diabetes when compared to bottle-fed infants.[12]

Breastfeeding's role in appetite and weight regulation is one potential mechanism in understanding the lower incidence of T2DM later in life.

It is well accepted that the practice of breastfeeding provides protection to both the infant and mother. Both perinatal and infant mortality rates are highest among AIs compared with all other races.[28] Protective effects of breastfeeding on maternal outcomes include decreased postpartum blood loss, postpartum depression, and risk of cardiovascular disease, rheumatoid arthritis, and certain cancers.[1,3] Breastfeeding passes antibodies from the mother to the infant, increasing immunity and helps minimize risk of SIDS. The Healthy People 2020 target for infant mortality is 6.0 or less infant deaths per 1,000 live births.[2] The CDC infant mortality data shows that the AI population is not meeting this goal with 8.2 infant deaths per 1,000 live births.[5] Initiation of breastfeeding later than 24 hours post-birth has been associated with a 78% increase in infant mortality.[13] By encouraging breastfeeding in communities with higher levels of infant mortality, the number of infant deaths can be expected to decrease. It is evident that the AI population is suffering disproportionately from the health problems listed above. Increasing the proportion of women breastfeeding will help to narrow this gap and minimize health consequences following birth and throughout life.

Indian Health Service (IHS) is an agency within the Department of Health and Human Services that provides health services to AIs and Alaska Natives.[29] IHS works directly with recognized Tribes to elevate the health of native people.[30] In an effort to improve overall native health, IHS hospitals have attempted to transition their hospitals to implement baby-friendly policies. Baby-Friendly hospitals provide mothers with the tools and knowledge to initiate and continue breastfeeding.[31] As of 2014, 70% of the IHS

obstetric hospitals had achieved Baby-Friendly certification which is much higher than the national average of 6%.[30] With the low rates of breastfeeding initiation and continuation in AI women, this was a critical step to improve overall health.

Outside of IHS, Tribes have begun to implement their own policies to encourage breastfeeding among AIs. The Native Breastfeeding Council was established by the Sonoma County Indian Health Project to improve breastfeeding among their community.[32] The Native Breastfeeding Council uses tribal leadership and engagement to promote breastfeeding as a way to reconnect with native tradition.[32] The Navajo Nation Breastfeeding Coalition passed the Healthy Start Act in 2008 requiring employers on Navajo land to accommodate breastfeeding practices.[32] There are additional Native Breastfeeding Coalitions located throughout the United States with the aim of improving breastfeeding among AIs.[25]

American Indian enrollment in The Special Supplemental Nutrition Program for Women, Infant, and Children (WIC) in 2016 was 10.29% of total enrollment despite AIs being only 1.7% of the overall United States population.[33,34] This high enrollment in WIC is related to the high levels of poverty experienced by AI communities.[21] Although WIC provides information on breastfeeding, the mean percentage of infants enrolled in WIC that were fully formula fed in 2016 was 70.5%.[35] This high percentage of fully formula fed WIC infants could be attributed to WIC providing formula at no cost to enrollees or the mass generalization of this data.[21,35] No matter the reason, it is evident that WIC has room to improve when it comes to encouraging breastfeeding. Ultimately, there are programs to promote breastfeeding among AI women. However, it is critical that these programs continue to strive for improvement and reach a larger number of women.

The published research on AI women and breastfeeding has focused heavily on factors associated with decreased breastfeeding. These barriers include sociodemographic characteristics, drug and alcohol use, and historical trauma/mistrust. Poor birth outcomes are often associated with limited breastfeeding, and therefore are of greater concern for AI communities.[36]

Sociodemographic characteristics including maternal age, education level and socioeconomic status put AI women at higher risk of poor birth outcomes and compromised breastfeeding. Compared to white women, AI women in North Dakota are over 3.5 times more likely to have teen pregnancies and 2.5 times more likely to have no more than a high school education.[36] Living in affluent neighborhoods has been associated with increased likelihood of breastfeeding.[37] These neighborhoods are often home to wealthier, privileged, educated individuals, factors which are associated with increased breastfeeding. In addition, low-income mothers often return to work more quickly than mothers of higher SES. Returning to work poses additional barriers such as lack of comfortable areas to express milk and stigmatization within the workplace.[38]

WIC participation has also been associated with decreased rates of breastfeeding. Conflicting information surrounding the efficacy of WIC in encouraging breastfeeding has been found. WIC services appear to highlight the benefits of breastfeeding while providing additional social support to mothers.[38,39] However, the accessibility to free infant formula may be deterring mothers from breastfeeding.[35] It is important to note that this information is self-reported, and inaccurate reporting may be influencing the data.

Smoking is often referenced as a barrier to breastfeeding initiation and continuation. Nonsmoking mothers are significantly more likely to initiate and continue

breastfeeding than smoking mothers.[40] According to the 2019 SD PRAMS, AI mothers had the highest rates of smoking across all race categories. The report found that in the three months prior to pregnancy 58.9% of AI women reported smoking compared to 16.4% of white women.[41] Additionally, 28.1% of AI women reported smoking during the last three months of pregnancy compared with 6% of white women and 3.7% of women identifying with other races. The Oregon PRAMS found that after adjusting for confounding variables, the probability of weaning infants off breastmilk early was consistently greater in smokers than non-smokers.[42] This may be contributing to the lower rates of breastfeeding in AI women.

Historical trauma is seen as a continual stressor within Native communities, ultimately affecting culture. The effects of experienced trauma by AI individuals transcends into areas of health and social norms. Not only does historical trauma influence the passing of cultural knowledge between generations, but it also contributes to negative psychosocial issues such as impaired mental health, increased substance use, and greater mistrust of healthcare providers.[43,44] These risk factors are unique to AI individuals and ultimately elevate their risk of not breastfeeding.

While not all these barriers are associated with modifiable risk factors, some of them are. Being aware of the factors associated with decreased breastfeeding is critical to understanding the current research and overall framework of breastfeeding in AI communities. It is important to emphasize that these risk factors may vary due to cultural and geographical differences between tribes.

The benefits of breastfeeding are well understood and ultimately impact the lives of both mother and infant beyond the duration of breastfeeding. However, Americans are

still not meeting breastfeeding goals set by the AAP and Healthy People 2020. American Indian women have breastfeeding rates much lower than the overall American population. The information found emphasizes that to increase the practice of breastfeeding, additional work must be done beyond just education. To minimize the gap in health disparities and overcome potential barriers, more research into factors associated with increased breastfeeding is needed.

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CHAPTER 3: MANUSCRIPT

INTRODUCTION

Breastfeeding is the accepted best practice feeding method for infants when available. The practice of breastfeeding provides protective effects to both the mother and infant which may alleviate public health concerns such as Type 2 Diabetes (T2DM), obesity, and infant mortality.[2–4] The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding through six months and continuation of breastfeeding for at least one year.[1] This recommendation encouraged Healthy People 2020 to set a target of increasing the proportion of infants ever breastfed to 81.9% and the proportion of infants breastfed at six months to 60.9%.[5] Breastfeeding rates across all races and ethnicities are below these goals, with American Indian (AI) breastfeeding rates being among the lowest.[6,7]

It is necessary to identify exacerbators of health disparities to lessen the disease burden on communities. This is especially important in underrepresented communities, such as the AI community. There are nine AI reservations in the state of South Dakota.[8] Approximately 9% of South Dakota's population identifies as AI, accounting for over 79,000 individuals.[9] American Indian individuals are at a significantly increased risk for developing obesity, T2DM, and other chronic diseases.[3,4,10] The development of chronic diseases can be limited by encouraging health promotion measures, such as breastfeeding. Breastfeeding promotion methods must be culturally relevant to the intended audience. Due to the historical oppression of AI individuals, it is important to consider how public policies and availability of resources are affecting breastfeeding

rates. Acknowledging the oppression of indigenous people is vital to creating lasting change within these communities.

Existing research has primarily focused on factors associated with decreased breastfeeding rates rather than practices that facilitate breastfeeding. Focusing on barriers can lead to stigmatization and shaming of mothers who are not breastfeeding. Breastfeeding is a health behavior and needs to be approached through a psychosocial lens. The current research has been conducted using an "avoidance goal" outlook, indicating what behaviors need to be minimized to achieve change.[11] Conversely, "approach goals" are centered around achieving outcomes through positive goal-setting techniques.[11] Approach goals lead to greater positive outcomes and are associated with improved psychological health.[11] Emphasizing the importance of breastfeeding facilitators while continuing to address barriers could substantially improve breastfeeding rates within the AI community.

Based on the noted evidence, there is a need for investigating facilitators of breastfeeding in AI communities. The current research into AI breastfeeding is sparse and limited. By identifying factors associated with breastfeeding initiation and continuation at two months among AI mothers, more appropriate interventions can be identified. In addition to understanding the barriers to breastfeeding, highlighting facilitators to breastfeeding will be crucial in creating behavior change. The purpose of the following analysis is to determine the prevalence of breastfeeding at initiation and continuation at two months in AI mothers who gave birth between 2017-2019 in South Dakota. It also serves to determine the factors associated with breastfeeding and various health behaviors

and beliefs. This study aims to fill the current gaps in research focusing on breastfeeding in AI women.

METHODS

Data from the 2017-2019 South Dakota Pregnancy Risk Assessment Monitoring System (SD PRAMS) surveys were used in this analysis. PRAMS is a state-based surveillance system that originated from the Centers for Disease Control and Prevention (CDC) and has since been implemented in the state of South Dakota. The PRAMS surveys are sent to mothers at two months postpartum and can be completed between two and six months postpartum. The methodology of PRAMS is described elsewhere.[12] Implementation of the SD PRAMS Project occurred with the help of the Ethel Austin Martin (EAM) Program at South Dakota State University and the South Dakota Department of Health. The self-administered survey asks mothers about their behaviors and experiences before, during, and after pregnancy to learn about the health of women and infants in South Dakota.

In 2017, 2018, and 2019, a total of 996 AI mothers completed the PRAMS survey. The weighted count of AI mothers was determined to be 5,759 mothers. The overall PRAMS weighted response rate of all races must meet at least 50% for the CDC to consider the data sufficient for state-wide analysis.[12] The response rate of AI women is generally lower than that of white women or women of other races. Due to differences in response rates, mothers who identify as AI and other non-white mothers are oversampled to obtain representative prevalence estimates within these race strata. In 2017 the AI response rate was 44%, in 2018 the response rate was 47%, and in 2019 the response rate was 48.3%.[13–15] The weighted response rates of all races in 2017, 2018, and 2019 were

67%, 64.3% and 68.1% respectively, indicating that the PRAMS data was appropriate for analysis.

Breastfeeding initiation was defined as ever breastfeeding and breastfeeding continuation was defined as breastfeeding at two months postpartum. Women self-reported their breastfeeding status on the surveys. Various demographic factors that may be associated with breastfeeding were taken into consideration such as age, education, and income. Maternal race was determined through information provided on the mother's birth certificate. Health behaviors included prenatal care, access to healthcare services, safe sleep practices, and sources of breastfeeding information. Health outcomes included postpartum depression, gestational diabetes and hypertension, NICU admission, birthweight, and preterm birth.

Data were analyzed using procedures for complex survey analyses within the StataCorp® software (StataCorp®Software, College Station, TX), which incorporates the sampling design and non-response weights. Weighting allows for the calculation of population-based statewide and race-specific rates representing live births to eligible South Dakota mothers in 2017, 2018 and 2019. A further description of weighting can be found elsewhere.[12] Demographic factors and differences between groups were analyzed using Rao-Scott chi-square tests. Those demographic characteristics that differed significantly were adjusted for in subsequent analyses (marital status, maternal education, and income). Logistic regression was used to determine the association between breastfeeding and outcomes. Adjusted odds ratios (adjOR) were determined. Institutional Review Board approval was obtained through the South Dakota State University Institutional Review Board, and participation in the survey was voluntary.

RESULTS

According to the 2017-2019 SD PRAMS data, 78.1% of AI women reported ever breastfeeding (Table 1). There were no significant ($p<0.05$) differences in breastfeeding initiation among AI women based on marital status, age category, or Hispanic vs non-Hispanic ethnicity. However, differences were seen in breastfeeding initiation among AI women based on education and income using the federal poverty line (both $p<0.001$).

Mothers who received prenatal care in the 1st trimester ($p=0.002$), attended greater than 80% of prenatal visits ($p=0.045$), and did not smoke the last three months of their pregnancy ($p=0.041$) were more likely to initiate breastfeeding than those who did not (Table 2). Mothers who visited with a healthcare provider in the 12 months prior to pregnancy were more likely to initiate breastfeeding ($p=0.028$). There was no significant difference in breastfeeding initiation between those who participated in The Supplemental Nutrition Program for Women, Infants, and Children (WIC) and those who did not participate in WIC ($p=0.213$). Mothers who practiced the following safe sleep methods: room sharing without bed sharing, placing their baby to sleep on their back, and baby sleeping on an approved sleeping surface were significantly less likely to ever breastfeed their infant (Table 2).

Certain sources of breastfeeding information were significantly associated with breastfeeding initiation rates (Table 3). The odds of initiation of breastfeeding were higher among AI mothers who reported receiving information from a lactation consultant compared to mothers who did not (OR 3.69; CI 2.57-5.30; $p<0.001$; Table 3). Similarly, mothers who reported receiving breastfeeding information that originated from family

friends, support groups, and nurses, midwives, or doulas were more likely to initiate breastfeeding than mothers who did not (all, $p<0.01$).

Of the AI women surveyed, 53.7% reported continuation of breastfeeding at two months (Table 4). There were no significant ($p<0.05$) differences in breastfeeding continuation at 2 months among AI women based on age categorization or ethnicity. However, differences were seen in breastfeeding continuation at 2 months among AI women based on education, income, and marital status (all $p<0.01$).

Mothers who did not smoke before, during, or after pregnancy were more likely to still be breastfeeding two months postpartum (all, $p<0.02$; Table 5). Women who did not report experiencing emotional abuse during their pregnancy were significantly more likely to still be breastfeeding two months postpartum (72.0% vs 58.9%, OR 1.17, $p=0.008$). American Indian mothers with infants that were not born low birth weight, preterm or admitted to the NICU were more likely to still be breastfeeding their infants at two months postpartum (Table 6). Most safe sleep indicators were not significantly associated with breastfeeding at two months postpartum. However, mothers who placed their infant to sleep on their back were significantly less likely to report breastfeeding (68.4% vs 83.9%, OR 0.41, $p=0.003$).

Among mothers who had initiated breastfeeding, but had stopped by the time of survey completion, odds of breastfeeding at 2 months postpartum were lower if the following issues were reported: difficulty latching (OR 0.44, $p=.003$), baby jaundiced (OR .38, $p=.023$), sore nipples (OR .54, $p=.032$), and concerns about infant weight gain (OR .30, $p=.002$) (Table 7). Among mothers who had initiated breastfeeding, but had stopped by the time of survey completion, odds of breastfeeding at 2 months postpartum

were higher if the following factors were reported: felt like right time to stop (OR 2.8, p=.005) and returning to work (OR 3.3, p<0.001).

DISCUSSION

The factors associated with increased breastfeeding rates among AI women is an understudied area. Identifying and maximizing these factors is a key part of implementing policy designed to increase breastfeeding rates and ultimately minimize health disparities. Previous studies have highlighted factors associated with decreased breastfeeding rates with the aim of minimizing these behaviors. However, that approach places focus on each individual mother rather than creating policy changes that lead to a supportive environment which encourages breastfeeding. This study aimed to identify factors that increased breastfeeding rates among the AI community. Mothers who received prenatal care in the 1st trimester, attended >80% prenatal visits and had greater access to healthcare services were more likely to ever breastfeed their infant. Women who received breastfeeding information from a lactation specialist were over three times as likely to ever breastfeed their infant while safe sleep was inversely associated with ever breastfeeding among AI mothers.

The breastfeeding initiation rate of AI women in South Dakota between 2017-2019 was 78.1% which is lower than the Healthy People 2020 goal of 81.9% of women initiating breastfeeding.[5] Education was associated with breastfeeding initiation which is a finding that is consistent with previous research.[16,17] This report found that women who received prenatal care in the 1st trimester and attended over 80% of prenatal visits had significantly higher rates of breastfeeding. Additionally, AI women who visited with a healthcare provider 12 months before pregnancy and reported receiving prenatal care as

early as desired were more likely to initiate breastfeeding. Focusing on increasing access to prenatal services and healthcare services in general offers an opportunity to encourage breastfeeding initiation and ensure that women have the tools for breastfeeding success available to them.

Historically, WIC has struggled to successfully encourage breastfeeding among WIC mothers, but this trend is shifting.[18–20] In this analysis, WIC was not found to be a significant factor in rates of breastfeeding. However, due to the high enrollment rates of AI women in WIC, it remains a primary vehicle to implement changes. American Indian enrollment in WIC in 2016 was 8.9% of total enrollment despite AIs being only 1.7% of the overall United States population.[21,22] This high enrollment in WIC is related to the high levels of poverty experienced by AI communities.[23] Participation in WIC among AI mothers presents an opportunity to target culturally appropriate breastfeeding promotion efforts.

Odds of ever breastfeeding were higher among mothers who reported receiving information from a lactation consultant compared to those who did not (OR 3.69, $p<0.001$). This finding aligns with previous research that interactions with lactation consultants increases breastfeeding initiation and highlights a key area for breastfeeding promotion to occur.[24] Public health experts could close the gap in health care access, minimize health disparities, and increase breastfeeding initiation rates by ensuring that all AI mothers in the state of South Dakota have access to lactation consultants or other breastfeeding specialists. This is a key step in achieving health equity for AI women. Additionally, this highlights an area of intervention that can be implemented by policy makers and health care providers, alleviating the responsibility on the individual level.

This would not only act as a promoter of breastfeeding but would also work to eliminate stigma surrounding breastfeeding. While other sources of breastfeeding information were associated with increased breastfeeding initiation, lactation consultants had the greatest effect (Table 3). Receiving breastfeeding information from a family friend, breastfeeding support group, and nurse midwife or doula also had significant impacts on initiation. From a public health perspective, increasing access to lactation specialists, nurses, midwives, and doulas will have the greatest impact on increasing breastfeeding rates within the AI community. Emphasizing the importance of strong breastfeeding support systems is also critical to improving breastfeeding initiation rates.

It is important to note that the source of breastfeeding information was less influential on breastfeeding continuation rates as it was for breastfeeding initiation rates. However, by expanding the availability of breastfeeding information from qualified breastfeeding specialists, there may be an increase in continuation. Lactation specialists and breastfeeding support groups can provide support to overcome barriers to continuation such as difficulty latching, sore nipples, and concerns about infant weight gain.

American Indian women who followed safe sleep practices were significantly less likely to initiate breastfeeding (Table 2). Safe sleep in this analysis was defined as room sharing without bed sharing, placing the infant to sleep on their back, and placing the infant to sleep on HRSA and AAP approved sleeping surfaces. It is important to consider whether this definition of safe sleep is appropriate for this population. While the AAP definition of safe sleep was determined based on an abundance of peer-reviewed research, the definition took little account of differing cultural factors.[25] The AAP

recommends that an infant sleeps in the same room as their parent on a separate surface designed specifically for infant sleeping.[26] Research reports that mothers who co-sleep attribute this in part to deep rooted cultural and religious beliefs as well as citing breastfeeding as reasons for bed-sharing despite contrary recommendations from these professional health organizations.[27,28] These findings confirm previous research that breastfeeding initiation and room sharing without bed-sharing are inversely associated.[29] Ball (2003) found that co-sleeping was associated with increased breastfeeding continuation rates, however, this association was not significant in this analysis. Both breastfeeding and safe sleep are associated with decreased risk of SIDS, yet are inversely associated with each other.[2,26] A possible solution to this dilemma could be to adjust what is universally promoted as safe sleep practices through the AAP and health care providers.

While there has been a concerted effort to promote and encourage safe sleep practices both in South Dakota and throughout the country, these practices may inadvertently be decreasing breastfeeding rates. Shifting public health policy to acknowledge that co-sleeping does occur and offering education on ways to safely co-sleep has the potential to encourage breastfeeding while prioritizing the mental and physical health of both mother and infant. There is a potential for the United States to adopt similar messaging surrounding co-sleeping to mimic the messaging in the United Kingdom. The United Kingdom acknowledges that co-sleeping occurs while discussing conditions in which this may be dangerous for the infant rather than advising against bed sharing for all mothers.[29,30] This approach acknowledges the intersection of breastfeeding and safe sleep practices, empowering women to make the most appropriate decisions for

themselves while considering cultural and religious diversity. This transition could both minimize preventable infant deaths and increase breastfeeding across all racial and ethnic groups in the United States.

The breastfeeding continuation rate at two months postpartum was determined to be 53.7% of AI women. While there is no Healthy People 2020 goal targeted specifically at two months postpartum, there is a Healthy People 2020 goal aimed at increasing breastfeeding continuation rates at six months postpartum to 60.9%.[5] Based on the PRAMS data analyzed here, it is evident that AI mothers in the state of South Dakota are well below this goal.

While the goal of this manuscript is to identify factors associated with increased rates of breastfeeding in AI women, it is important to highlight barriers to continuation and identify methods to minimize these barriers for mothers. The PRAMS surveys can be completed by mothers between two and six months postpartum. This timeline allowed for the analysis of barriers among women who had started breastfeeding but had stopped at the time of survey completion. Breastfeeding at 2 months postpartum was less likely among those who reported difficulty latching ($p=0.003$), baby jaundiced ($p=0.023$), sore nipples ($p=0.032$), and infant weight gain concerns ($p=0.002$). Addressing these barriers by providing AI mothers with greater support and education from trained breastfeeding specialists could improve mothers' rates of breastfeeding continuation through 2 months. Breastfeeding at 2 months postpartum was more likely among those who reported their reason was that they felt it was the right time to stop breastfeeding (62.7% vs 37.9%, OR 2.78, $p=0.005$) and among those who reported going back to work (OR 3.36, $p<0.001$). The primary reasons indicated in this analysis as reasons to stop breastfeeding after two

months included maternal beliefs and external barriers. Mothers who reported breastfeeding cessation prior to two months postpartum were more likely to report difficulty latching (p=0.003), baby jaundiced (p=0.023), sore nipples (p=0.032), and infant weight gain concerns (p=0.002) as reasons for stopping breastfeeding. These results indicate that AI women who breastfeed for less than two months are encountering barriers with the act of breastfeeding at a greater proportion than women who continue to breastfeed. Addressing these barriers by providing AI mothers with greater support and education from trained breastfeeding specialists could improve mothers' continuation rates.

Investigations into the influence of tradition and cultural relations on breastfeeding is a key area for future AI breastfeeding research. Traditionally, breastfeeding was an encouraged practice within AI communities. However, rates are still below the national average and recommendations as evidenced in this analysis. Evidence suggests that strengthening cultural and family relations could significantly increase rates of breastfeeding in AI populations.[7] Acknowledging and combating the oppression of indigenous people is vital to creating change within these communities as oppression acts as a continual stressor. The mistrust and historical trauma experienced by AI communities have inhibited the social acceptability and passing of breastfeeding knowledge to future generations.[31] These risk factors are unique to AI individuals and additional research will be key to creating lasting changes.

This study has several limitations. The overall weighted response rates for all three years analyzed were higher than the CDC PRAMS cut-off for inclusion of 50 percent. However, the AI response rates used in this analysis were below this 50 percent cut-off

point. While this data was weighted for non-response to minimize potential bias, the race-specific response rates should still be noted as a limitation as this process is not error-proof. Data collected in the PRAMS survey is self-reported, making it prone to self-reporting bias and recall bias. The PRAMS surveys are sent to mothers at two months postpartum and can be completed up to six months postpartum. Mothers may have difficulty recalling health behaviors and topics discussed before and during pregnancy.

CONCLUSION

This study highlights specific areas of policy that can be targeted to improve breastfeeding rates of AI women. Due to the unique racial makeup of the state of South Dakota, this data set provides insights into AI health that are not able to be investigated in other states. When looking at the Healthy People 2020 goals and data collected nationwide, there is not a representative breakdown for underrepresented groups of the population. Additionally, once a Healthy People goal is met, there is movement towards meeting the next goal instead of identifying disparities within these areas and working to eliminate them to create health equity. Since AI women make up a smaller portion of the population there is less research conducted specifically into this community. If appropriate changes are made to the built environment, access to healthcare services, and breastfeeding information and support is made available to AI women, these would likely support an increase in breastfeeding initiation and continuation. More research is needed to identify health disparities and determine ways to bridge the gap in access to healthcare while identifying how different public health approaches impact AI women specifically.

TABLE 1. Comparison of demographic characteristics by breastfeeding initiation status in American Indian mothers responding to the PRAMS survey, weighted.

Demographic Characteristics	Never Breastfed	Ever Breastfed	P-value*
Overall	21.9 (19.4-24.7)	78.1 (75.3-80.6)	
Ethnicity			0.1757
Non-Hispanic	96.8 (93.8-98.4)	94.7 (92.9-96.2)	
Hispanic	3.2 (1.6-6.2)	5.3 (3.9-7.1)	
Age			0.4425
Less than 20 years	9.6 (6.2-14.6)	13.7 (11.3-16.5)	
20-24	27.3 (21.6-33.8)	30.0 (26.9-33.3)	
25-29	31.6 (25.4-38.6)	28.1 (25.0-31.3)	
30-34	19.8 (14.8-25.9)	17.9 (15.5-20.7)	
Greater than 35	11.7 (8.1-16.6)	10.4 (8.5-12.7)	
Education			<0.001
Less than high school	45.8 (38.8-52.8)	33.8 (30.4-37.4)	
High school	31.7 (25.5-38.5)	30.2 (27.1-33.6)	
Greater than high school	22.6 (17.7-28.4)	36.0 (32.8-39.3)	
Income			<0.001
<100% federal poverty line	90.2 (85.1-93.7)	70.8 (67.4-74.0)	
<150% federal poverty line	5.3 (3.0-9.2)	13.6 (11.3-16.3)	
>150% federal poverty line	4.5 (2.2-9.0)	15.6 (13.2-18.4)	
Marital Status			0.0604
Married	15.6 (11.1-21.4)	21.6 (19.0-24.5)	
Not married	84.4 (78.6-88.9)	78.4 (75.5-81.0)	

In total 947 AI women were included in this analysis which was adjusted to 5,471 after weighting. Data are weighted (95 percent confidence intervals).
*p-value based on Rao-Scott chi-square test

TABLE 2. Odds of ever breastfeeding (and weighted percentages) by health behavior and access to healthcare services (no/yes). Controlled for income, education, and marital status.

Behavior or Outcome	No	Yes	adjOR	P-value*
Health Behaviors				
Intended Pregnancy	77.0 (73.4-80.6)	81.0 (76.3-85.8)	1.29(0.90-1.94)	0.199
Mother was trying to get pregnant	77.6 (74.3-81.0)	80.6 (75.8-85.5)	1.21 (0.82-1.78)	0.334
Insured before pregnancy	77.7 (70.2-85.1)	78.9 (76.0-81.8)	1.08 (0.66-1.75)	0.760
Did not smoke 3 months before pregnancy	77.7 (74.0-81.4)	80.2 (76.0-84.4)	1.17 (0.82-1.67)	0.383
Did not smoke last 3 months of pregnancy	73.5 (67.5-79.6)	80.4 (77.2-83.5)	1.50 (1.02-2.21)	0.041
No maternal postpartum smoking	72.6 (67.8-77.5)	82.3 (79.0-85.7)	1.795 (1.26-2.55)	0.001
Baby not exposed to smoke	65.2 (49.0-81.4)	79.7 (76.7-82.7)	2.18 (0.99-4.81)	0.053
Did not consume alcohol 3 months before pregnancy	79.6 (75.8-83.5)	77.9 (73.9-81.9)	0.898 (0.63-1.27)	0.545
Did not drink alcohol last 3 months of pregnancy^	-	-	-	-
No illicit drugs the month before pregnancy^	-	-	-	-
No illicit drugs last 3 months of pregnancy^	-	-	-	-
Healthy pre-pregnancy BMI (18.5-24.9 kg/m^2)	78.5 (75.1-81.9)	78.4 (73.5-83.2)	0.99 (0.69-1.43)	0.965
Low ACE score	81.6 (77.7-85.5)	76.5 (72.7-80.3)	0.72 (0.51-1.03)	0.071
Prenatal care in the 1st trimester	70.7 (64.1-77.2)	81.3 (78.3-84.3)	1.86 (1.25-2.75)	0.002
Attended >80% of prenatal visits	75.4 (70.9-79.8)	81.1 (77.6-84.6)	1.42 (1.01-2.01)	0.045
Teeth cleaned during pregnancy	76.9 (73.4-80.4)	82.1 (77.5-86.6)	1.39 (0.95-2.04)	0.086
Did not experience emotional abuse during pregnancy	79.2 (72.4-86.1)	78.6 (75.6-81.6)	0.96 (0.60-1.54)	0.861
No diagnosis of high blood pressure, gestational diabetes, or depression	77.7 (73.4-82.0)	79.3 (75.8-82.9)	1.11 (0.78-1.56)	0.571
Access to Healthcare Services				
Visited with healthcare provider 12 months before pregnancy	75.8 (71.6-80.1)	82.1 (78.5-85.7)	1.49 (1.04-2.11)	0.028
Received prenatal care as early as desired	73.6 (67.3-79.9	80.6 (77.5-83.6)	1.51 (1.02-2.25)	0.041
Participated in WIC	75.6 (69.7-81.6)	79.8 (76.8-82.8)	1.29 (0.87-1.91)	0.213
Safe sleep				
Room sharing without bed sharing	83.2 (79.8-86.7)	73.0 (68.5-77.5)	0.53 (0.37-0.75)	<0.001
Baby placed to sleep on back	87.8 (81.2-94.3)	77.5 (74.5-80.4)	0.47 (0.24-0.89)	0.021
HRSA approved sleeping surface	80.7 (77.4-84.1)	73.0 (67.6-78.3)	0.63 (0.43-0.91)	0.014
AAP approved sleeping surface	80.6 (77.5-83.7)	72.0 (66.0-78.0)	0.60 (0.41-0.88)	0.009
No soft objects in bed	77.4 (73.7-81.2)	80.0 (75.7-84.3)	1.17 (0.82-1.68)	0.389

* p-value based on logistic regression controlling for maternal education, income, and marital status.
^ Unable to analyze due to collinearity

TABLE 3. Odds of ever breastfeeding (and weighted percentages) by maternal/infant outcomes and sources of breastfeeding information (no/yes). Controlled for income, education, and marital status.

Behavior or Outcome	No	Yes	adjOR	P-value*
Birth Outcomes				
No C-section delivery	78.0 (72.7-83.3)	79.0 (75.8-82.1)	1.06 (0.73-1.55)	0.755
Not low birth weight (<2500g)	84.0 (74.4-93.5)	78.4 (75.6-81.2)	0.68 (0.32-1.45)	0.319
Not high birth weight (>4000g)	80.9 (73.8-88.0)	78.4 (75.5-81.4	0.85 (0.51-1.42)	0.541
Not preterm birth	77.6 (69.2-86.0)	78.8 (75.9-81.7)	1.08 (0.63-1.84)	0.785
No NICU admission	83.3 (75.3-91.3)	78.2 (75.3-81.1)	0.71 (0.38-1.32)	0.274
Ability to Handle Life Events				
Mother reports bouncing back quickly after hard times	77.5 (72.9-82.2)	79.3 (76.0-82.8)	1.12 (0.79-1.60)	0.531
Mother reports she does not have a hard time making it through stressful events	75.5 (69.4-81.6)	79.6 (76.5-82.6)	1.28 (0.86-1.91)	0.229
Mother reports it does not take long to recover from a stressful event	75.1 (70.8-79.4)	81.7 (78.2-85.3)	1.51 (1.07-2.13)	0.018
Mother reports it is not hard to snap back when something bad happens	75.4 (68.5-82.3)	79.5 (76.5-82.5)	1.28 (0.83-1.98)	0.268
Mother reports she usually comes through a difficult time with little trouble	76.9 (73.1-80.8)	80.7 (76.8-84.6)	1.26 (0.89-1.79)	0.191
Mother reports she does not take a long time to get over setbacks in her life	78.1 (70.5-85.6)	78.8 (75.8-81.7)	1.05 (0.64-1.72)	0.857
Depression				
No depression before pregnancy	81.3 (76.4-86.2)	77.7 (74.3-81.0)	0.79 (0.53-1.18)	0.247
No depression during pregnancy	78.6 (73.1-84.0)	79.0 (75.8-82.3)	1.03 (0.69-1.53)	0.889
No postpartum depression	78.3 (72.7-83.9)	79.0 (75.8-82.1)	1.04 (0.70-1.55)	0.835
Sources of Breastfeeding Information				
Info from baby's doctor	76.7 (70.4-83.1)	79.0 (76.0-82.1)	1.15 (0.76-1.76)	0.510
Info from mom's doctor	79.4 (72.8-86.0)	78.6 (75.5-81.6)	0.95 (0.60-1.50)	0.816
Info from family friend	70.0 (64.8-75.2)	83.1 (79.9-86.3)	2.19 (1.54-3.12)	<0.001
Info from support group	76.6 (73.3-79.9)	86.6 (81.9-91.4)	2.04 (1.29-3.23)	0.002
Info from breastfeeding (BF) hotline	77.4 (74.3-80.5)	85.2 (78.7-91.6)	1.71 (0.98-3.00)	0.059
Info from nurse, midwife, or doula	70.2 (62.7-77.7)	80.2 (77.2-83.1)	1.76 (1.15-2.71)	0.010
Info from lactation specialist	64.0 (58.5-69.6)	86.1 (83.2-89.0)	3.69 (2.57-5.30)	<0.001

* p-value based on logistic regression controlling for maternal education, income, and marital status.
^ Unable to analyze due to collinearity

TABLE 4. Comparison of demographic characteristics by breastfeeding continuation at two months postpartum status in American Indian mothers responding to the PRAMS survey, weighted.

Demographic Characteristics	Not Breastfeeding at 2 months	Breastfeeding at 2 months	P-value*
Overall	46.3 (43.2-49.5)	53.7 (50.5-56.8)	
Ethnicity			0.0650
Non-Hispanic	96.5 (94.4-97.8)	94.0 (91.6-95.7)	
Hispanic	3.5 (2.2-5.6)	6.0 (4.3-8.4)	
Age			0.0517
Less than 20 years	15.3 (12.1-19.2)	10.5 (8.0-13.7)	
20-24	25.1 (21.3-29.3)	32.5 (28.6-36.6)	
25-29	30.6 (26.4-35.2)	27.8 (24.3-31.7)	
30-34	18.5 (15.1-22.4)	18.2 (15.2-21.7)	
Greater than 35	10.5 (8.1-13.6)	11.0 (8.6-13.8)	
Education			<0.001
Less than high school	41.4 (36.7-46.2)	31.2 (27.2-35.4)	
High school	33.2 (28.8-37.8)	28.7 (24.9-32.8)	
Greater than high school	25.4 (21.8-29.5)	40.2 (36.2-44.3)	
Income			<0.001
<100% federal poverty line	85.5 (81.7-88.6)	66.0 (61.8-70.0)	
<150% federal poverty line	7.8 (5.6-10.8)	15.3 (12.4-18.7)	
>150% federal poverty line	6.7 (4.6-9.6)	18.7 (15.6-22.3)	
Marital Status			0.0032
Married	16.4 (13.2-20.1)	23.9 (20.5-27.5)	
Not married	83.6 (79.9-86.8)	76.1 (72.5-79.5)	

In total 937 AI women were included in this analysis which was adjusted to 5,414 after weighting. Data are weighted (95 percent confidence intervals).
*p-value based on Rao-Scott chi-square test

TABLE 5. Odds of breastfeeding at 2 months (and weighted percentages) by health behavior and access to healthcare services. Controlled for income, education, and marital status.

Behavior or Outcome	No	Yes	adjOR	P-value*
Health Behaviors				
Intended Pregnancy	67.6 (63.1-72.1)	74.7 (69.0-80.4)	1.43 (0.98-2.08)	0.063
Mother was trying to get pregnant	68.5 (64.3-72.8)	72.4 (66.1-78.7)	1.21 (0.83-1.77)	0.322
Insured before pregnancy	70.3 (60.5-80.0)	69.9 (66.2-73.6)	0.98 (0.59-1.64)	0.952
Did not smoke 3 months before pregnancy	65.4 (60.5-70.3)	75.9 (71.0-80.8)	1.68 (1.18-2.38)	0.004
Did not consume alcohol 3 months before pregnancy	72.3 (67.5-77.0)	68.0 (62.9-73.2)	0.81 (0.58-1.14)	0.235
Illicit drugs the month before pregnancy^	-	-	-	-
Healthy pre-pregnancy BMI (18.5-24.9 kg/m^2)	68.7 (64.4-73.0)	72.7 (66.8-78.6)	1.22 (0.85-1.75)	0.283
Low ACE score	71.1 (66.1-76.0)	69.1 (64.4-73.9)	0.91 (0.65-1.27)	0.582
Prenatal care in the 1st trimester	72.8 (64.9-80.8)	69.6 (65.6-73.5)	0.85 (0.54-1.34)	0.483
Attended >80% of prenatal visits	73.4 (67.8-78.9)	69.4 (64.9-73.8)	0.82 (0.57-1.17)	0.274
Teeth cleaned during pregnancy	69.8 (65.4-74.1)	70.0 (64.3-75.8)	1.01 (0.71-1.44)	0.939
Did not experience emotional abuse during pregnancy	58.9 (49.5-68.4)	72.0 (68.3-75.8)	1.82 (1.17-2.83)	0.008
No diagnosis of high blood pressure, gestational diabetes, or depression	67.8 (62.2-73.4)	71.3 (66.9-75.7)	1.18 (0.84-1.66)	0.333
Did not smoke	61.4 (53.3-69.6)	72.4 (68.6-76.2)	1.66 (1.11-2.49)	0.013
Did not drink^	-	-	-	-
Did not use illicit drugs^	-	-	-	-
Baby not exposed to smoke	71.9 (52.7-91.1)	69.5 (65.7-73.3)	0.89 (0.33-2.39)	0.811
No maternal postpartum smoking	60.3 (53.7-66.8)	75.5 (71.4-79.6)	2.06 (1.44-2.95)	<0.001
Access to Healthcare Services				
Visited with healthcare provider 12 months before pregnancy	72.3 (67.2-77.4)	68.3 (63.5-73.1)	0.82 (0.58-1.17)	0.272
Received prenatal care as early as desired	69.2 (61.1-77.3)	70.6 (66.7-74.5)	1.07 (0.69-1.65)	0.770
Participated in WIC	72.7 (65.7-79.7)	68.8 (64.8-72.8)	0.83 (0.55-1.24)	0.357
Safe Sleep				
Room sharing without bed sharing	72.4 (68.0-76.7)	67.6 (61.9-73.2)	0.79 (0.56-1.11)	0.179
Baby placed to sleep on back	83.9 (76.3-91.4)	68.4 (64.6-72.2)	0.41 (0.22-0.74)	0.003
HRSA approved sleeping surface	71.0 (66.9-75.1)	67.6 (60.8-74.4)	0.85 (0.58-1.24)	0.392
AAP approved sleeping surface	71.6 (67.8-75.4)	65.9 (58.2-73.6)	0.76 (0.51-1.14)	0.184
No soft objects in bed	69.8 (65.3-74.3)	71.7 (66.1-77.2)	1.10 (0.77-1.56)	0.612

* p-value based on logistic regression controlling for maternal education, income, and marital status.
^ Unable to analyze due to collinearity

TABLE 6. Odds of breastfeeding at 2 months (and weighted percentages) by maternal/infant outcomes and sources of breastfeeding information. Controlled for income, education, and marital status.

Behavior or Outcome	No	Yes	adjOR	P-value*
Birth Outcomes				
No C-section delivery	64.3 (57.1-71.4)	71.9 (68.0-75.9)	1.44 (0.99-2.09)	0.057
Not low birth weight (<2500g)	52.9 (38.2-67.5)	71.1 (67.6-74.7)	2.25 (1.20-4.24)	0.012
Not high birth weight (>4000g)	70.5 (61.1-79.8)	69.9 (66.2-73.6)	0.97 (0.59-1.59)	0.910
Not preterm birth	49.5 (38.1-60.8)	72.3 (68.8-75.9)	2.76 (1.66-4.56)	<0.001
No NICU admission	50.4 (38.8-62.1)	72.4 (68.8-75.9)	2.65 (1.58-4.43)	<0.001
Ability to Handle Life Events				
Mother reports bouncing back quickly after hard times	0.68 (61.8-73.6)	71.2 (67.0-75.3)	1.18 (0.84-1.67)	0.344
Mother reports she does not have a hard time making it through stressful events	64.4 (56.6-72.1)	71.4 (67.5-75.2)	1.39 (0.94-2.06)	0.101
Mother reports it does not take long to recover from a stressful event	68.4 (63.1-73.6)	71.5 (67.0-76.0)	1.16 (0.83-1.63)	0.376
Mother reports it is not hard to snap back when something bad happens	69.4 (60.9-78.0)	70.1 (66.3-73.9)	1.03 (0.66-1.62)	0.887
Mother reports she usually comes through a difficult time with little trouble	69.4 (64.6-74.2)	70.5 (65.5-75.4)	1.05 (0.75-1.47)	0.758
Mother reports she does not take a long time to get over setbacks in her life	57.1 (47.0-67.2)	71.9 (68.2-75.5)	1.95 (1.23-3.10)	0.005
Depression				
No depression before pregnancy	66.1 (59.3-72.8)	71.6 (67.5-75.7)	1.30 (0.90-1.89)	0.167
No depression during pregnancy	65.4 (58.2-72.5)	71.3 (67.3-75.3)	1.33 (0.91-1.94)	0.145
No postpartum depression	62.1 (54.5-69.8)	72.6 (69.8-76.4)	1.63 (1.11-2.40)	0.013
Sources of Breastfeeding Information				
Info from baby's doctor	73.4 (66.0-80.9)	68.9 (65.0-72.8)	0.798 (0.52-1.23)	0.302
Info from mom's doctor	76.7 (69.1-84.3)	68.7 (64.9-72.5)	0.66 (0.42-1.05)	0.080
Info from family friend	69.2 (63.1-75.3)	70.2 (66.0-74.5)	1.05 (0.73-1.50)	0.784
Info from support group	69.1 (65.0-73.2)	73.0 (66.2-79.7)	1.21 (0.81-1.81)	0.348
Info from BF hotline	69.9 (66.1-73.8)	67.3 (57.9-76.7)	0.88 (0.55-1.42)	0.600
Info from nurse, midwife, or doula	74.1 (65.5-82.8)	69.4 (65.6-73.2)	0.79 (0.48-1.29)	0.035
Info from lactation specialist	68.4 (61.6-75.3)	70.6 (66.5-74.6)	1.11 (0.76-1.62)	0.592

* p-value based on logistic regression controlling for maternal education, income, and marital status.
^ Unable to analyze due to collinearity

TABLE 7. Odds of breastfeeding at 2 months (and weighted percentages) by reason for stopping (no/yes) among women who initiated breastfeeding but reported cessation at the time of survey completion. Controlled for income, education, and marital status.

Reasons for Stopping	No	Yes	adjOR	P-value*
Difficulty Latching	46.7 (40.1-53.3)	28.1 (18.9-37.3)	0.44 (0.26-0.75)	0.003
Too Many Household Duties	39.2 (33.3-45.1)	48.0 (35.0-60.9)	1.44 (0.80-2.58)	0.224
Mom Sick/Stopped for Medical Reasons	41.5 (35.8-47.1)	33.6 (17.3-50.0)	0.71 (0.33-1.55)	0.390
Baby Jaundiced	43.1 (37.3-48.8)	22.6 (8.8-36.3)	0.38 (0.16-0.88)	0.023
Mother Thought Not Producing Enough Milk	36.1 (28.4-43.7)	44.9 (37.5-52.4)	1.45 (0.92-2.30)	0.108
Breastmilk Did Not Satisfy Baby	38.0 (31.6-44.4)	47.9 (38.1-57.6)	1.51 (0.93-2.46)	0.098
Sore Nipples	44.1 (37.9-50.3)	29.9 (19.4-40.4)	0.54 (0.30-0.95)	0.032
Felt Like the Right Time to Stop	37.9 (32.2-43.6)	62.7 (47.4-78.0)	2.78 (1.37-5.67)	0.005
Weight Gain Problems	44.6 (38.7-50.5)	19.8 (8.5-31.1)	0.30 (0.14-0.65)	0.002
Support Problems	40.4 (35.0-45.8)	44.6 (6.8-82.4)	1.19 (0.25-5.74)	0.828
Went Back to School	41.1 (35.6-46.6)	35.2 (12.2-58.3)	0.78 (0.27-2.23)	0.639
Went Back to Work	32.5 (26.5-38.4)	61.4 (51.3-71.4)	3.36 (2.01-5.62)	<0.001

* p-value based on logistic regression controlling for maternal education, income, and marital status.

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