Factors Associated with Breastfeeding Initiation and Continuation at Two Months Postpartum in American Indian Women: An Exploratory Analysis

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Abstract: This study aimed to determine the prevalence of breastfeeding initiation and continuation at two months postpartum in American Indian (AI) mothers in South Dakota and to identify factors associated with breastfeeding. Using logistic regression, data from the South Dakota Pregnancy Risk Assessment Monitoring System were used to investigate the relationship between binary breastfeeding initiation and continuation outcomes and maternal behaviors and experiences including access to health care, safe sleep practices, ability to handle life events, depression, and sources of breastfeeding information. Higher odds of initiation were seen for factors including access to health care services, ability to handle life events, and sources of breastfeeding information, while lower odds were seen for factors including safe sleep. Higher odds of continuation were seen among mothers who reported not taking long to get over setbacks and among mothers who reported no postpartum depression, while lower odds of continuation were seen among mothers practicing safe sleep. Several modifiable factors were identified as reasons for stopping breastfeeding. This information about factors associated with higher odds of breastfeeding initiation and continuation at two months postpartum can be used to inform interventions, programs, and policies designed to support breastfeeding among AI women and to guide future research in this area.

INTRODUCTION

Breastfeeding and providing human milk are the accepted best practice feeding methods for infants when available (Meek & Noble, 2022). The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding through six months and continuation of breastfeeding for two years (and beyond, if desired) (Meek & Noble, 2022). Healthy People 2020, which aims to improve national health and well-being by setting data-driven objectives around public health priorities as part of the federal government's prevention agenda, set a target for 2020 of increasing the proportion of infants ever breastfed to 81.9% and the proportion of infants breastfed at six months to 60.9% (Office of Disease Prevention and Health Promotion, 2020). Breastfeeding rates across all races and ethnicities are below these goals, with American Indian (AI) breastfeeding rates being among the lowest (CDC, 2022a; Rhodes et al., 2008).

Underrepresented communities, such as AI communities, experience disproportionately higher disease burdens due to health disparities. AI populations are at a significantly increased risk for developing obesity, type 2 diabetes, and other chronic diseases (CDC, 2022b; US DHHS, 2020; Zamora-Kapoor et al., 2017). Breastfeeding has been shown to decrease risk for developing chronic diseases for both mothers and infants throughout their lives (Binns et al., 2016; Ip et al., 2007; Murphy & Wilson, 2008). Due to the historical oppression of AI individuals and communities, it is important to consider how public policies and availability of resources may affect breastfeeding. Additionally, acknowledging the oppression of Indigenous people is vital to creating lasting change within these communities (Danielson et al., 2018).

Existing research has primarily focused on factors associated with *decreased* breastfeeding rather than practices that facilitate breastfeeding. For example, research focuses on high reported rates of alcohol and tobacco use in AI women and the implications on breastfeeding (Louis-Jacques et al., 2017; Rhodes et al., 2008). Focusing on factors associated with *decreased* breastfeeding highlights behaviors that mothers are encouraged to minimize to achieve change. The approach of minimizing individual-level 'negative' behaviors can lead to negative experiences for community members (Hammond & Zimmerman, 2012; McCaskey, 2008). A strengths-based approach allows for the acknowledgment of problems while highlighting resources and community strengths to target for continued behavior change (Hammond & Zimmerman, 2012). Emphasizing

the importance of breastfeeding facilitators at the individual and system-level, while continuing to address barriers, could improve breastfeeding rates within the AI community.

Additionally, breastfeeding should be approached through a psychosocial lens. In addition to being a modifiable health behavior, breastfeeding is influenced by cultural ties and passing of generational knowledge of infant feeding (Houghtaling et al., 2018; Rhodes et al., 2008). Breastfeeding promotion methods must be culturally relevant to the intended audience (Rhodes et al., 2008). For example, it has been found that factors associated with breastfeeding in AI women such as external support from family members, smoking, education, and use of traditional AI medicines have differing influences on breastfeeding initiation and continuation (Rhodes et al., 2008). An inverse relationship has been identified between co-sleeping and breastfeeding initiation, highlighting a need for additional research into how to best promote both safe sleep and breastfeeding simultaneously (Ball, 2003).

By identifying factors associated with breastfeeding initiation and continuation at two months postpartum among AI mothers, more appropriate, culturally tailored 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 initiation and continuation at two months postpartum in AI mothers who gave birth between 2017-2019 in South Dakota, along with associated factors. This serves as an exploratory analysis working to identify and determine factors associated with breastfeeding including various health behaviors, access to health services, and maternal beliefs. This study aims to fill the current gaps in research focusing on breastfeeding in AI women and provide directions for future research in this area.

METHODS

Study Sample

The authors of this paper recognize that not all lactating individuals identify as women and that gender-inclusive language must be utilized to end violence and discrimination against transgender and intersex people. Since all participants in this study identified as cis-gender women, the authors utilize the terms “maternal” and “breastfeeding” rather than gender-inclusive terms such as “parental” or “human milk feeding.”

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 methodology of PRAMS is described elsewhere (Shulman et al., 2018). Briefly, each year birth certificate data are used to identify a random sample of women who have recently given birth. A self-administered questionnaire, which is completed between two and six months postpartum, asks mothers over 100 questions about their behaviors and experiences before, during, and after pregnancy to learn about the health of women and infants in South Dakota. Implementation of the SD PRAMS Project by the South Dakota Department of Health occurred with assistance from staff and students at South Dakota State University.

The AI survey response rate was 44% in 2017, 47% in 2018, and 48% in 2019 (Ahrendt et al., 2017, 2018, 2019). The weighted response rates of all races in 2017, 2018, and 2019 were 67%, 64%, and 68%, respectively. SD PRAMS data are weighted using sampling, non-response, and non-coverage values that ultimately result in the ability to generalize responses to a population. As such, the 996 AI mothers who completed the PRAMS survey in 2017-2019 are representative of 5,759 AI mothers in South Dakota.

Measures

As part of the PRAMS questionnaire, mothers responded to a series of questions around breastfeeding, including the following:

1) Did you ever breastfeed or pump breastmilk to feed your new baby, even for a short period of time (no/yes)?
2) Are you currently breastfeeding or feeding pumped milk to your new baby (no/yes)?
3) How many weeks or months did you breastfeed or feed pumped milk to your baby (less than 1 week/number of weeks or months?)

For the purposes of this study, ‘breastfeeding initiation’ was defined as ever having breastfed or fed pumped breastmilk to the infant for any amount of time, and ‘breastfeeding continuation’ was defined as breastfeeding or feeding pumped breastmilk to the infant at two months postpartum. Two months postpartum was chosen as the timeframe of breastfeeding continuation, as two months postpartum was the earliest that mothers could complete the survey, allowing for a consistent timeframe for analysis of all survey respondents. For ease, throughout this manuscript, any method of providing human milk to infants is referred to as ‘breastfeeding.’

From the over 100 questions asked as part of SD PRAMS, several overarching ‘health factors’ were selected for exploration based on existing breastfeeding literature and plausible relationship with breastfeeding outcomes, as well as for the ability to create interventions for the factor on an individual and system level. These overarching ‘health factors’ included: access to health care services, safe sleep practices, ability to handle life events, depression, and sources of breastfeeding information. Given the exploratory nature of the analysis and the desire to identify areas for continued research, all questions falling under a particular 'health factor’ were included in analyses to see if certain elements were more important than others for determining an association between breastfeeding initiation and continuation. For example, access to healthcare services included three elements including 1) visiting with a healthcare provider 12 months before pregnancy, 2) receiving prenatal care as early as desired, and 3) participating in the Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC). Reasons for stopping breastfeeding were also explored.

Demographic characteristics including self-reported age, education, and income came from the PRAMS survey. Maternal race (AI) and ethnicity (Hispanic or non-Hispanic) were determined through information provided on the infant’s birth certificate which was accessed in partnership with the SD Department of Health. Specific wording for all of the individual PRAMS questions can be found elsewhere (CDC, n.d.).

Data Analysis

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. This weighting allows for the calculation of statewide population-based and race-specific rates, representing live births of eligible South Dakota mothers in 2017, 2018, and 2019. A further description of weighting can be found elsewhere (Shulman et al., 2018).

Differences in demographic factors between breastfeeding groups were analyzed using Rao-Scott chi-square tests for both breastfeeding initiation and breastfeeding continuation at two months postpartum. Those demographic characteristics that differed significantly between groups (marital status, maternal education, and income) were adjusted for in subsequent logistic regression analyses which were used to explore associations between breastfeeding outcomes of interest (initiation and continuation) and individual health factors (in the domains of access to health care services, safe sleep, ability to handle life events, depression, and sources of breastfeeding information). Prevalence

of breastfeeding outcomes of interest, as well as adjusted odds ratios (adjOR) and *p*-values, are presented for each model. Institutional Review Board approval was obtained through the South Dakota State University Institutional Review Board, and participation in the survey was voluntary.

RESULTS

Breastfeeding Initiation

In the present study, 78.1% of AI women reported initiating breastfeeding (Table 1). There were no significant ($p < 0.05$) differences in breastfeeding initiation among AI women based on Hispanic ethnicity, age category, or marital status; however, differences were seen by education and income groups (both $p < 0.001$), with prevalence of higher breastfeeding initiation among AI women who had more years of education and women with higher incomes (Table 1).

Overarching health factors and all SD PRAMS questions that fall under those health factors are provided in Table 2. In terms of health care access (Table 2), adjusted odds of breastfeeding initiation were significantly higher among mothers who reported visiting with a health care provider in the 12 months before pregnancy (adjOR = 1.49, CI [1.04, 2.11]; $p = 0.028$) and receiving prenatal care as early as desired (adjOR = 1.51, CI [1.02, 2.25]; $p = 0.041$). Adjusted odds of breastfeeding initiation did not differ between those who participated in WIC and those who did not participate in WIC ($p = 0.213$). Regarding safe sleep practices (Table 2), in general, mothers who reported the following had lower adjusted odds of breastfeeding initiation: room sharing without bed sharing, baby placed to sleep on back, and baby sleeping on approved sleeping surface (all $p < 0.05$). Breastfeeding initiation did not differ by factors related to a mother's ability to handle life events (Table 2), except for higher adjusted odds of initiation among mothers who reported not taking long to recover from a stressful event (adjOR = 1.51, CI [1.07, 2.13]; $p = 0.018$). Adjusted odds of breastfeeding initiation did not differ by depression status before, during, or after pregnancy (Table 2). Higher adjusted odds of breastfeeding initiation were seen among mothers reporting having received information from the following sources: family friend; support group; nurse, midwife or doula; lactation specialist (all $p \leq 0.01$).

Table 1
Demographic Characteristics of American Indian Mothers in South Dakota by Breastfeeding Initiation Status

Demographic Characteristics	No Initiation of Breastfeeding[1]	Initiation of Breastfeeding[1]	*p* value[2]
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)	

[1] Data presented are weighted prevalence and (95 percent confidence intervals)
[2] *p* value based on Rao-Scott chi-square test

Table 2
Prevalence of Breastfeeding (BF) Initiation of American Indian Mothers in South Dakota, Grouped by Response to Specified Health Factor

Health Factors	Prevalence of BF initiation among those who said 'No' to health factor	Prevalence of BF initiation among those who said 'Yes' to health factor	adjOR[1] for BF initiation	*p* value
Access to Health Care Services				
Visited with health care 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

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Table 2 Continued
Prevalence of Breastfeeding (BF) Initiation of American Indian Mothers in South Dakota, Grouped by Response to Specified Health Factor

Health Factors	Prevalence of BF initiation among those who said 'No' to health factor	Prevalence of BF initiation among those who said 'Yes' to health factor	adjOR[1] for BF initiation	*p* value
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
Ability to Handle Life Events				
Bounces 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
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
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
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
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
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

[1] Adjusted odds ratio of breastfeeding initiation and *p* value based on logistic regression controlling for maternal education, income, and marital status

Breastfeeding Continuation

In the present study, 53.7% of AI women reported continuation of breastfeeding at two months postpartum (Table 3). There were no significant ($p < 0.05$) differences in breastfeeding continuation among AI women based on Hispanic ethnicity or age; however, differences were seen by education, income group, and marital status (all $p < 0.01$), with prevalence of higher breastfeeding continuation among AI women who had more years of education, higher incomes, or were married (Table 3).

Overarching health factors and all SD PRAMS questions that fall under those health factors are provided in Table 4. No differences in adjusted odds of breastfeeding continuation were seen in terms of access to health care services (Table 4). Regarding safe sleep practices (Table 4), lower adjusted odds of breastfeeding continuation were seen among mothers who reported placing baby to sleep on back (adjOR = 0.41, CI [0.22, 0.74]; $p = 0.003$). Breastfeeding continuation did not differ by factors related to a mother's ability to handle life events (Table 4), except for higher adjusted odds of continuation among mothers who reported not taking a long time to get over setbacks in life (adjOR = 1.95, CI [1.23, 3.10]; $p = 0.005$). Adjusted odds of breastfeeding continuation were higher among mothers who reported no postpartum depression (adjOR = 1.63, CI [1.11, 2.40]; $p = 0.013$). Breastfeeding continuation did not differ by any of the sources of breastfeeding information that were examined (Table 4).

Reasons for Stopping Breastfeeding

Mothers who had initiated breastfeeding but stopped by the time of survey completion were surveyed about reasons for stopping breastfeeding, and the relationship with breastfeeding continuation for at least two months postpartum was examined (Table 5). A lower prevalence of breastfeeding continuation at two months postpartum was seen among mothers who reported difficulty latching (28.1% vs. 46.7%, $p = 0.003$), baby jaundiced (22.6% vs. 43.1%, $p = 0.023$), sore nipples (29.9% vs. 44.1%, $p = 0.032$), or concerns about infant weight gain (19.8% vs. 44.6%, $p = 0.002$) (Table 5) compared to those who did not indicate these as reasons for stopping breastfeeding. Mothers who reported stopping breastfeeding because the time felt right (62.7% vs. 37.9%, $p = 0.005$) or they went back to work (61.4% vs. 32.5%, $p < 0.001$) had a higher prevalence of breastfeeding continuation at two months postpartum compared to those who did not indicate these as reasons for stopping breastfeeding.

Table 3
Demographic Characteristics of American Indian Mothers in South Dakota by Status of Continuation of Breastfeeding at Two Months Postpartum

Demographic Characteristics	No continuation of breastfeeding at two months postpartum[1]	Continuation of breastfeeding at two months postpatrum[1]	*p* value[2]
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) %	

[1] Data presented are weighted prevalence and (95 percent confidence intervals)
[2] *p* value based on Rao-Scott chi-square test

Table 4
Prevalence of Breastfeeding (BF) Continuation at 2 Months Postpartum among American Indian Mothers in South Dakota who Initiated Breastfeeding, Grouped by Specified Health Factor

Health Factors	Prevalence of BF initiation among those who said 'No' to health factor	Prevalence of BF initiation among those who said 'Yes' to health factor	adjOR[1] for continued BF	*p* value[1]
Access to Health Care Services				
Visited with health care 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
Ability to Handle Life Events				
Bounces 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
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
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
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
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
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)	0.345
Info from lactation specialist	68.4 (61.6-75.3)	70.6 (66.5-74.6)	1.11 (0.76-1.62)	0.592

[1] Adjusted odds ratio of breastfeeding continuation at two months postpartum and *p* value based on logistic regression controlling for maternal education, income, and marital status

Table 5
Prevalence of Breastfeeding at 2 Months Postpartum among American Indian Mothers in South Dakota who had Stopped by the Time of Survey Completion, Grouped by Specified Reason for Stopping

Reasons for Stopping BF	Prevalence of BF at 2 months postpartum among those who say 'No' to reason for stopping	Prevalence of BF at 2 months postpartum among those who say 'Yes' to reason for stopping	adjOR[1] for BF ≥ 2 months	*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

[1] Adjusted odds ratio of breastfeeding at 2 months postpartum and *p* value based on logistic regression controlling for maternal education, income, and marital status

DISCUSSION

The examination of factors associated with breastfeeding initiation and continuation among AI mothers is an understudied area. Identifying and understanding these factors is the first step in implementing interventions, programs, and policies designed to support and increase breastfeeding in AI women, with the ultimate goal of reducing health disparities. Previous studies have highlighted factors associated with *decreased* breastfeeding, with the aim of minimizing these 'negative' behaviors (Ball, 2003; Danielson et al., 2018; Louis-Jacques et al., 2017; Rhodes et al., 2008). However, the approach of minimizing 'negative' individual-level behaviors places the focus on the mother without considering the broader environment in which the mother lives and works. Instead, interventions, programs, and policies (i.e., systems) should be designed to shift the burden of responsibility away from the individual to focus on changes that lead to a supportive

environment that encourages and supports breastfeeding. This exploratory study, which aimed to identify factors associated with breastfeeding initiation and continuation among AI mothers in South Dakota, can help elucidate factors to be further explored in future observational and intervention research.

The prevalence of breastfeeding initiation among AI women in the present study was 78.1%, which is lower than the Healthy People 2020 goal of 81.9% of women initiating breastfeeding (Office of Disease Prevention and Health Promotion, 2020). The prevalence of breastfeeding continuation at two months postpartum was determined to be 53.7% of AI women, which is also below the Healthy People 2020 goal of 60.9% breastfeeding continuation at six months postpartum (Office of Disease Prevention and Health Promotion, 2020). The results of this study establish a baseline which can be used as a starting point for understanding and addressing the relationships between health factors and breastfeeding outcomes on an individual and system level.

Odds of breastfeeding initiation were higher among AI women who visited with a health care provider 12 months before pregnancy and among those who reported receiving prenatal care as early as desired. Danielson et al. (2018) found that AI women were 8.3 times more likely to have inadequate access to prenatal care and were 2.7 times less likely to breastfeed than their white counterparts. While research indicates that AI women generally have lower access to health care services, there remains limited research identifying the relationship between health care services access and breastfeeding in AI women specifically (Danielson et al., 2018; Johnson et al., 2010; Jones, 2006). Focusing on increasing access to prenatal services and health care services in general, perhaps through telehealth or policies supporting paid time off for medical appointments, or through supporting baby-friendly hospital initiatives, offers opportunities on a system-level to encourage and support breastfeeding initiation and ensure that women have the tools for continued breastfeeding success available to them.

Participation in WIC was included under the access to health care services factor because of the role the program plays in providing nutrition education and breastfeeding support for pregnant and postpartum people. Historically, WIC has struggled to successfully encourage breastfeeding among participants, but this trend is shifting (Jacknowitz et al., 2007; Joyce & Reeder, 2015; Li et al., 2019). In the present analysis, WIC was not found to be a significant factor associated with breastfeeding. However, due to the high enrollment rates of AI women in WIC, it remains a primary vehicle to implement changes. AI enrollment in WIC in 2018 was 8.9% of total

enrollment, despite AIs being only 1.7% of the overall U.S. population (U.S. Department of Agriculture, 2018; National Congress of American Indians, 2020). This high enrollment in WIC is related to the high levels of poverty experienced by AI communities (Warne & Wescott, 2019). Participation in WIC among AI mothers presents an opportunity to target culturally appropriate breastfeeding promotion efforts.

Odds of breastfeeding initiation were lower among AI mothers who reported following safe sleep practices, including room sharing without bed sharing, placing the infant to sleep on their back, and placing the infant to sleep on sleeping surfaces approved by the AAP (Moon et al., 2022). 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 (Bartick et al., 2018; Moon et al., 2022). The AAP recommends that an infant sleeps in the same room as their parent on a separate surface designed specifically for infant sleeping (Moon et al., 2016). 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 (Marinelli et al., 2019; Ward, 2015). The findings in this study confirm previous research that breastfeeding initiation and room sharing without bed-sharing are inversely associated (Ball, 2003). Ball (2003) found that co-sleeping was associated with increased breastfeeding continuation; however, this association was not significant in this analysis. Both breastfeeding and safe sleep are associated with decreased risk of sudden infant death syndrome (SIDS), yet are inversely associated with each other (Ip et al., 2007; Moon et al., 2016). 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 continuation (Ip et al., 2007; Moon et al., 2016). Shifting public health discussions 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. 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 (Ball, 2003, 2017). 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 (Ball, 2003, 2017). This transition could minimize preventable infant deaths and increase breastfeeding across all racial and ethnic groups in the United States.

Questions included in the PRAMS questionnaires identifying women's abilities to handle life events are used as indicators for stress and maternal resiliency (Ahrendt et al., 2019). Odds of breastfeeding initiation were higher among mothers who report that it does not take long to recover from a stressful event. Research supports that resiliency can impact an individual's ability to bounce back from stressful life events (Leitch, 2017; Young-Wolff et al., 2019). These findings highlight areas to continue investigations around the role of protective resiliency factors specifically in AI women.

Odds of breastfeeding initiation did not differ between those who reported perinatal depression and those who did not. A systematic review of the research into breastfeeding and depression found that both pregnancy and postpartum depression was not significantly associated with breastfeeding initiation, a finding that is consistent in this analysis (Dias & Figueiredo, 2015). However, another systematic review found significant associations between maternal depression during pregnancy and decreased breastfeeding initiation (Grigoriadis et al., 2013). Odds of breastfeeding continuation at two months postpartum was higher among those who reported no postpartum depression. The present study findings align with previous research, indicating that higher postpartum depression is associated with interruption in breastfeeding, decreased maternal confidence, and increased breastfeeding complications (Dennis & McQueen, 2009; Dias & Figueiredo, 2015; Vieira et al., 2018).

Odds of initiating breastfeeding were higher among mothers who reported receiving information from a lactation consultant compared to those who did not. This finding aligns with previous research that interactions with lactation consultants increase breastfeeding initiation and highlights a key area for breastfeeding promotion to occur (Cohen et al., 2018; Patel & Patel, 2015). Public health experts could close the gap in health care access, minimize health disparities, and increase prevalence of breastfeeding initiation by ensuring that all AI mothers have access to culturally educated lactation consultants or other breastfeeding specialists. Indigenous breastfeeding counselors, WIC Indigenous peer counselors, and support from maternal family members have been found to support breastfeeding in AI women (Houghtaling et al., 2018; Long et al., 1995). Increasing access to culturally informed breastfeeding specialists is a key step in achieving health equity for AI women. This would not only act as a promoter of breastfeeding but

would also work to eliminate stigma surrounding breastfeeding. Multiple sources of breastfeeding information were associated with increased breastfeeding initiation, including a family friend, a support group, or a nurse, midwife or doula, and the highest odds of breastfeeding initiation were seen among mothers who reported receiving breastfeeding information from lactation consultants. From a public health perspective, increasing access to lactation specialists, nurses, midwives, and doulas could have an impact on breastfeeding initiation within the AI community. Emphasizing the importance of strong breastfeeding support systems is critical to improving breastfeeding initiation. Although certain sources of breastfeeding information were associated with higher odds of breastfeeding initiation, similar relationships were not seen for breastfeeding continuation. This finding conflicts with a previous meta-analysis conducted by Cohen et al. (2018) which found that women who received breastfeeding education were significantly more likely to continue breastfeeding their infant. It could be that knowledge and education is important for initiation, but broader system supports are needed for continuation. Expanding the availability of breastfeeding information from qualified breastfeeding specialists beyond initiation and throughout the postpartum period could potentially address this, if paired with other social supports.

To understand factors associated with breastfeeding among AI mothers, it is important to identify barriers to determine ways to minimize them. The present study allowed for the examination of factors associated with breastfeeding cessation before two months postpartum, indicating that prevalence of breastfeeding at two months postpartum was lower among those who reported difficulty latching, that baby was jaundiced, that they had sore nipples, or that there were infant weight gain concerns. 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 (Cohen et al., 2018; Long et al., 1995; Patel & Patel, 2015). Although they had stopped breastfeeding at the time of survey completion, a higher prevalence of breastfeeding at two months postpartum was seen among mothers whose reasons for stopping were that that they felt it was the right time to stop breastfeeding or that they were going back to work compared to mothers who did not indicate these as reasons for stopping. Kim et al. (2019) identified that workplace lactation interventions were significantly associated with breastfeeding initiation and continuation, highlighting areas for system-level changes. The primary reasons indicated in this analysis as reasons to stop breastfeeding after two months included maternal beliefs and external barriers. 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 on ways to overcome these barriers could improve mothers' ability to continue breastfeeding (Cohen et al., 2018; Long et al., 1995; Patel & Patel, 2015).

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 (Houghtaling et al., 2018; Rhodes et al., 2008). However, prevalence is still below the national average and recommendations as evidenced in this analysis (Chiang et al., 2021). Evidence suggests that strengthening cultural and family relations could significantly increase breastfeeding in AI populations (Rhodes et al., 2008). 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 (Houghtaling et al., 2018). These factors are unique to AI individuals and additional research will be key to creating lasting changes.

This study has several limitations. Although the overall weighted response rates for all three years analyzed were higher than the CDC PRAMS cut-off for inclusion of 50 percent, the AI response rates used in this analysis were below this 50 percent cut-off point. While these data were 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, limiting the length of continued breastfeeding that could be examined. Further, mothers may have difficulty recalling health behaviors and topics discussed before and during pregnancy. Participants of this study were AI women who gave birth in South Dakota; generalizations to the greater AI population should be made cautiously.

CONCLUSIONS

This study highlights specific factors that can be used to inform interventions, programs, or policies that aim to support and increase breastfeeding among AI women while laying the groundwork for continued research in this area. National goals and data do not typically have a

representative breakdown for underrepresented groups within the population, and once a 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, highlighting the need to use data like PRAMS to investigate potential associations between health outcomes and individual behaviors and experiences. Understanding behaviors and the factors outside of individuals that shape those behaviors can lead to making systems-level changes to better support AI women, particularly with breastfeeding, including through access to health care services, adequate social/familial support, and breastfeeding information and support. More research is needed to better understand which factors play the largest role and how they can be changed through different interventions and public health approaches within this community.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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