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Maternal Care Quality and Utilization Focus Study

North Dakota Department of Health and Human Services
Medical Services Division

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NORTH Dakota | Health & Human Services

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Executive Summary

This study aims to understand patterns of healthcare utilization by Medicaid enrollees during the perinatal period and one-year post-partum, with the objective of furnishing insights to the Department of Health and Human Services (HHS) related to access and quality of care. This report contributes to the existing body of evidence in North Dakota by identifying risk factors associated with underuse of needed healthcare services, and mediators of positive birth outcomes. The factors examined include personal characteristics, clinical conditions, and regional disparities in healthcare resources. Additionally, this study evaluates healthcare utilization for 12 months postpartum to establish rates of health care utilization for women who retained Medicaid coverage. Researchers examined fee-for-service claims and vital statistics data for all Medicaid members who gave birth between September 1, 2021, and March 31, 2022.

The study found:

- Prenatal care was underutilized by Medicaid enrollees. Just 56.3% of Medicaid fee-for-service enrollees received a prenatal care visit in the first trimester, far less than the overall statewide average of 78.9% or the national average of 74.9%.[1]
    - Some subgroups of pregnant people were more likely to get prenatal care than others, possibly due to their established connections with health care providers. For example, pregnant people with a diagnosis of overweight, obesity, or excessive weight gain during pregnancy were more likely to receive timely prenatal care[1] compared to pregnant people without such a diagnosis.
    - Subgroups who were less likely to get prenatal care in the first trimester were those living with a behavioral health condition including substance abuse disorder (SUD) or alcohol dependence and tobacco users.

- Utilization of postpartum care was comparable for people giving birth in North Dakota who were Medicaid enrollees and non-Medicaid enrollees. Forty-one percent of Medicaid fee-for-service enrollees with a live birth attended a postpartum care visit in the recommended time period of 7 to 84 days post-delivery, compared with the statewide average of 43.8%.[2]
    - Birthing people living with serious mental illness or diabetes, or who had timely prenatal care, were more likely to receive postpartum care.
    - Those living in maternity shortage and/or rural areas were less likely to receive timely postpartum care.
    - Racial disparities were identified, with birthing people identifying as Hispanic and American Indian/Alaska Native being less likely to receive timely postpartum care compared to individuals identifying as white, non-Hispanic.
    - Birthing people over age 40 received less postpartum care than younger birthing people.

- Preterm births (before 37 weeks gestation) are less common among Medicaid members compared to the overall North Dakotan population. Just 5.4% of births to Medicaid members occurred prematurely compared to a statewide average of 10.3%.[3]
    - Use of tobacco products, living with a diagnosis of overweight, obesity, or excessive weight gain during pregnancy, and delivering a baby with low birthweight were correlated with delivering a baby prematurely.

- Babies born to Medicaid members were slightly more likely to have a low birthweight (e.g., weighed less than 2,500 grams) compared to the statewide population. A total of 8.5% of babies born to Medicaid birthing people during the study period were low birthweight, compared to 7.1% of live births in ND.[4]
    - Correlates of delivering a low birthweight baby included identifying as Black, non-Hispanic or Asian American/Pacific Islander, non-Hispanic; living with a behavioral health diagnosis such as both SUD or

[1]One or more prenatal care visits in the first trimester, on or before the enrollment start date or within 42 days of enrollment in the organization.

alcohol dependence and SMI, or only having SUD or alcohol dependence; and residing in rural areas without access to obstetric health providers or facilities (maternity shortage areas).
    - Attending a timely prenatal care visit served as a protective factor. Individuals who received timely prenatal care were significantly less likely to deliver a baby with low birthweight.

- Healthcare utilization during the period between 61 and 365 days postpartum was also explored using claims data. Although the study period predated the January 2023 expansion of Medicaid benefits to 12 months postpartum, many people retained Medicaid coverage during this period due to the COVID-19 Public Health Emergency, therefore these results provide insights into utilization during the extension of benefits postpartum. For those people giving birth in the study period and retaining coverage:
    - A total of 36.0% of Medicaid fee-for-service enrollees attended a preventive care visit that did not include a postpartum care visit.
    - Nearly 30.0% of birthing people received contraception care, including hormonal contraception, intrauterine devices (IUDs), and permanent contraception, compared to 28.3% and 6.2% of North Dakota Medicaid beneficiaries ages 21-44 who were provided most/moderately effective methods of contraception or long-acting reversible methods of contraception, respectively[5]. Access to effective contraception decreases the risk of short interval pregnancy and preterm birth.
    - 15.9% obtained dental services including preventive, diagnosis, and restorative care.
    - 10.0% utilized behavioral health services, including inpatient and outpatient services for mental health and substance use disorders.

Introduction

Background

Medicaid plays a vital role in providing access to healthcare for low-income pregnant people and newborns. In 2020, Medicaid financed 24.6% of North Dakota births, a rate that has remained relatively consistent since 2016.[6] Pregnancy-related healthcare coverage improves health outcomes including rates of full-term birth, healthy birthweight (infants born weighing at least 2500g or 5.5 pounds), and maternal well-being during pregnancy and postpartum (including reduced risk of postpartum depression).[7] While healthcare insurance coverage is essential, geographic access to maternity care services is also important in assuring a person's ability to use needed services. North Dakota faces challenges regarding the distribution of providers, with 71.7% of North Dakota counties considered maternity care deserts compared to 32.6% in the United States.[8] A maternity care desert is a county without a hospital or birth center offering obstetric care and without any obstetric providers. A total of 43.8% of birthing people in North Dakota have no access to a birthing hospital within 30 minutes of their residence compared to 9.7% nationally.[9]

Reducing infant mortality remains an important focus in healthcare. A total of 125 infants born in North Dakota died before reaching their first birthday between 2020-2022, an average infant mortality rate of 5.3 per 1,000 live births.[10] This is compared to an average national infant mortality rate of 5.5 in the same time period.[11,12] The leading causes of infant mortality nationally include preterm birth and low birthweight.[13] Approximately 1 in 10 babies are born prematurely in North Dakota, a rate that has increased over time.[14] Between 2012 and 2022, the percentage of live births born preterm rose from 9.1 to 10.3 in North Dakota,[15] while in 2022, 1 in 14 live births had a low birthweight in North Dakota, both contributing to an increased risk of infant mortality and morbidity.[16] Cesarean delivery is another risk factor for poor birth outcomes. In North Dakota, 26.0% of all live births were Cesarean deliveries,[17] and among birthing people who had Cesarean births, 20.1% were considered low risk.[18] A low-risk for Cesarean birth refers to people with a first-time pregnancy, carrying a single baby, positioned head-first, and at least 37 weeks gestation at the time of delivery.

The postpartum period for a birthing person and their newborn is important for both short-term and long-term health and well-being. In 2022, only 43.8% of North Dakota Medicaid fee-for-service birthing people who delivered a live birth received timely postpartum care[19] (on or between 7-84 days after delivery) compared to an average of 83.5% nationally for Medicaid beneficiaries in 2021.[20]

In North Dakota, the deathrate was 24.2 birthing people per 100,000 births from 2018-2021 compared to 23.5 nationally.[21] Most maternal deaths and poor health outcomes are preventable with timely access to postpartum care.[22] Approximately 36.0% of all maternal deaths occur during labor or within the first week postpartum and 33.0% occur one week to one year postpartum, nationally.[23] Age is also a significant risk factor for maternal death. Across the United States, rates of maternal death per 100,000 live births were 20.4 for birthing people under age 25 years, 31.3 for those aged 25–39 years, and 138.5 for those aged 40 years and over in 2021.[24] Compared to the rate for birthing people under age 25 years, maternal deaths for birthing people aged 40 years and over was 6.8 times higher in 2021, nationally.[25]

Disproportionately high rates of maternal racial disparities are also noted. Nationally, Black and American Indian/Alaska Native birthing people have higher pregnancy-related deaths (39.9 and 32.0 deaths per 100,000 live births, respectively) compared to white birthing people (14.1 deaths per 100,000 live births).[26] The rate of live births born preterm (birth before 37 weeks gestation) also varies by a birthing person's race and ethnicity. In North Dakota, American Indian/Alaska Native infants have the highest preterm birth rates (14.5%), followed by Asian/Pacific Islander (11.1%), black (10.0%), Hispanic (10.1%), and white (9.3%) from 2020-2022.[27]

Medicaid Coverage

States are only required to ensure pregnancy-related Medicaid coverage through 60 days postpartum. Medicaid coverage may continue for some birthing people through other eligibility pathways, yet 20.0% of those with pregnancy-related Medicaid coverage ultimately become uninsured.[28] In 2023, North Dakota extended Medicaid coverage for eligible pregnant and birthing people from 60 days to 12 months postpartum. Extended coverage can increase utilization of contraceptive services, decrease incidence of short interval pregnancies, and increase utilization of other needed healthcare including dental, preventive, and behavioral health services.[29] North Dakota also provides Medicaid telehealth coverage via live video, remote patient monitoring, and audio services[30] and provides Medicaid reimbursement for certified nurse-midwives.[31] This increases access to maternity care services, reduces overall Medicaid costs, and helps to eliminate health disparities. The state has also recently implemented its Maternal Mortality Committee (MMRC) which identifies, evaluates, and addresses maternal mortality cases (2022).[32] Other initiatives include the North & South Dakota Perinatal Quality Collaborative (NSDPQC) which has used quality improvement strategies to address obstetric care and outcomes since 2018.[33]

Methodology

Study Design, Eligibility, and Data Source

This study identified the prevalence, risk factors, and disparities related to the receipt of timely prenatal and postpartum care, delivering preterm, and delivering a baby with low birthweight. To identify beneficiaries eligible for the data analysis, IPRO started with vital statistics records to identify birthing people with any live births, on or between September 1, 2021 and March 31, 2022 (to allow for 12 months of utilization and 90 days claims run out after the last possible delivery date).[2] To be included in the sample, beneficiaries also had to have at least one Medicaid claim in that time period. Only claims data from 1-365 days after delivery were included as part of the analyses. These claims were matched to beneficiary characteristics from enrollment data. Beneficiaries were excluded if they were enrolled in Blue Cross Blue Shield of North Dakota Medicaid Expansion health insurance program or if their Medicaid Category of Eligibility code was unknown. This created a sample of only fee-for-service enrollees. The HEDIS Value Set Directory Delivery Value code was used to exclude anyone with non-live births. The final dataset included 1,233 birthing people enrolled in fee-for-service Medicaid.[2]

Enrollee Data and Measurement

Variables examined in this study included:

- **demographic characteristics**: age group, race/ethnicity, and area of residence. Enrollee counties of residence were grouped into maternity shortage counties (i.e., residing in a county without access to hospitals or birth centers offering obstetric care and no obstetric providers) and rural counties.
- **clinical characteristics**: tobacco use, serious mental illness (SMI), alcohol dependence, substance use disorder (SUD), weight diagnosis, any high blood pressure, and any diabetes. SMI included diagnoses of schizophrenia or other psychotic disorders, mood disorders, and anxiety/trauma. Weight diagnosis included overweight, obesity, and excessive weight gain during pregnancy. Any high blood pressure included preexisting hypertension, unspecified hypertension, eclampsia, gestational hypertension, and preeclampsia. Any diabetes included preexisting diabetes and gestational diabetes.
- **pregnancy and delivery characteristics**: preterm delivery, type of delivery, and birthweight.
    - **Preterm delivery**: birth before 37 weeks gestation identified using ICD-10 codes;
    - **Type of delivery:** vaginal or Caesarean; and
    - **Birthweight:** low birthweight was defined as a birthweight of less than 2,500 grams.
- **healthcare utilization:** receiving timely prenatal and postpartum care.

[2]One woman delivered a set of multiples via both vaginal and cesarean delivery and was removed from the study to streamline the analysis.

[2] n = 1,143 for CMS Core Set Measures that required continuous enrollment for the eligible population.

    - **Timely prenatal care**: one or more prenatal care visits in the first trimester, on or before the enrollment start date or within 42 days of enrollment in the organization, using the Timeliness of Prenatal Care Measure as specified in the CMS Core Set Measure PPC-AD: Prenatal and Postpartum Care;
    - **Timely postpartum care:** one or more postpartum visit(s) on or between 7-84 days after delivery, as specified in the CMS Core Set Measure PPC-AD: Prenatal and Postpartum Care.
- **extended healthcare coverage:** frequency of healthcare utilization to measure the use of extended Medicaid coverage for eligible pregnant and birthing people from 60 days to 12 months after pregnancy.
    - **Postpartum preventive care visit**: one or more ambulatory or preventive care visits, using the Ambulatory Value sets, and excluding any individuals with at least one postpartum care visit on or between 7-84 days, as specified in the CMS Core Set Measure PPC-AD: Prenatal and Postpartum Care;
    - **Dental care visit**: one or more dental care visits, using procedure codes;
    - **Contraception services**: one or more contraception services using CCP-C codes to identify the provision of most or moderately effective contraceptive methods and CCP-D codes to identify the provision of long-acting reversible contraception methods; and
    - **Behavioral health visit:** behavioral health visit defined using ICD-10, CPT, and HCPCS codes with provider type claim code (i.e., 10), provider specialty codes (017, 050,069, 070, 071, 074, 121, 131, 145, 155, 184, 186, 190, 191, 193, 194, 254, 274, 343, 357, 360, 362, 363, 364, 451, 460, 461, 462, 463, 464, 467, 509, 537, 544, 547, 580, 604, 623, 652, 660, 661, 669, 671, 672, 680, 681, 724, 762, 763, 797, 858, 890, 891, 922), or provider taxonomy claim code (i.e., clinic/center: adult mental health, clinic/center: mental health, including community mental health, clinic/center: methadone, clinic/center: rehab, substance use disorder, clinical nurse specialist, psychiatric/mental health, community/behavioral health, psychiatric hospital, psychiatric unit).

Statistical Methods

The *chi*-square test of independence was performed to examine the relation between demographic, clinical, pregnancy and delivery outcomes, and healthcare utilization with timeliness of prenatal care (prenatal care visit in the first trimester, on or before the enrollment start date or within 42 days of enrollment in the organization), preterm delivery (birth before 37 weeks gestation), low birthweight (baby weighing less than 2,500 grams), and timeliness of postpartum care (postpartum care visit on or between 7 - 84 days after delivery). The c*hi*-square test is a statistical computation that assesses whether categorical variables (e.g., yes/no) are significantly related or if they are independent of one another. Statistically significant findings in this section indicate there is an association between the variable and the outcome but do not indicate that the variable is a risk factor for the outcome. Statistical significance is determined if the asymptotic significance, or *p* value, is less than .05. If no significant association between the compared variables is identified, results indicate uniform distribution. For contingency tables with smaller sample sizes (cell sizes less than 5), a Fisher's exact test was used. With small sample sizes, the chi-square test is over estimated.

Multiple logistic regression was used to calculate the odds ratios (OR) and associated 95% confidence intervals (CI) of not receiving timely prenatal care, preterm delivery, low birthweight, and not receiving a timely postpartum care visit. With this type of analysis, we can calculate the likelihood of an outcome occurring (or not) while controlling for all other variables in the model. The interpretation of the OR > 1 indicates a higher likelihood of the outcome occurring. A statistically significant finding for an OR >1 provides evidence to support that the variable is a risk factor for the outcome relative to the reference group. This study interpreted a p-value of <0.05 as statistically significant. The 95% confidence interval (CI) is used to estimate the precision of the OR. A large CI indicates a low level of precision of the OR, whereas a small CI indicates a higher precision of the OR. Some of the subgroup analyses contain sample sizes of less than 30 and should be interpreted with caution. Many health-related variables are interrelated and can impact analyses (e.g., being overweight/obese/gaining excessive weight during pregnancy and diabetes). To address this potential issue, variance inflation factor (VIF) and tolerance were examined to detect multicollinearity among all variables. No issues were found.

Results

Descriptive Characteristics

Table 1 provides descriptive statistics and sample sizes for North Dakota Medicaid fee-for-service beneficiaries included in this study.

Demographic Characteristics

Birthing people in the study were mostly between 25 and 39 years of age (66.5%). In this study, most birthing people identified as white, non-Hispanic (55.5%) and American Indian/Alaska Native, non-Hispanic (18.9%). Similarly, across the state, of all live births in North Dakota during 2020-2022 (average), the majority identified as white (73.7%), followed by American Indian/Alaska Native (7.4%), black (6.5%), Hispanic (6.5%), and Asian/Pacific Islander (2.6%).[34] A total of 28.9% of birthing people in this study reside in a county that is both rural and classified as a maternity shortage area compared to 43.8% of all North Dakota birthing people.[35]

Clinical Characteristics

Sixteen percent of birthing people in this study used tobacco products (16.1%) compared to 8.5% of North Dakota birthing people who reported smoking during their pregnancy in 2021.[36] Among behavioral health conditions, 18.3% of birthing people had serious mental illness (SMI), 6.2% had both SMI and SUD or alcohol dependence, and 5.1% had SUD or alcohol dependence. Almost 18% lived with an overweight/obesity diagnosis and/or gained excessive weight during pregnancy, compared to 34.0% of all women in North Dakota in 2022.[37] A small number of birthing people had any high blood pressure (8.1%) or any diabetes (5.0%). In comparison, 34.0% of all women in North Dakota reported ever being told they have hypertension, 1.0% had pregnancy-related hypertension, and 11% had diabetes in 2022.[38]

Pregnancy and Delivery Outcomes

In this study, 5.4% of birthing people gave birth prematurely (birth before 37 weeks gestation), compared to 10.0% of all births in North Dakota.[39] Almost three-quarters of births were delivered vaginally (74.2%) which is similar to all North Dakota vaginal delivery rates (76.0%).[40] A total of 8.5% of babies in this study were born weighing less than 2,500 grams (low birthweight) compared to 7.1% of all births in North Dakota.[41]

Healthcare Utilization

More than 40% of birthing people in this study did not receive timely prenatal care (43.7%) compared to 21.1% of all live births in North Dakota.[42] Additionally, underutilization of postpartum care was observed as almost 60% of birthing people did not receive a timely postpartum care visit (59.5%; on or between 7-84 days after delivery) which is more than other observed rates of postpartum care utilization among North Dakota fee-for-service beneficiaries (43.8%).[43]

Table 1: Characteristics of Birthing People in the Study

Characteristics (n = 1,233)	% (Number of Enrollees)
Demographic characteristics	
Age group	
Less than 25 years	30.82% (380)
25–39 years	66.50% (820)
40+ years	2.68% (33)
Race/Ethnicity	
White non-Hispanic	55.47% (684)
Black non-Hispanic	13.95% (172)
American Indian/Alaska Native non-Hispanic	18.90% (233)
Asian American/Pacific Islander non-Hispanic	3.08% (38)
Multirace/Unknown	1.30% (16)
Hispanic	7.30% (90)
Area of residence	
Neither in a maternity shortage or rural area	39.74% (490)
Maternity shortage area only	11.60% (143)
Rural residence only	19.79% (244)
Both a maternity shortage and rural area	28.87% (356)
Clinical characteristics	
Tobacco use (Yes)	16.14% (199)
Behavioral health condition	
None	70.48% (869)
Serious mental illness only	18.25% (225)
Substance use disorder or alcohol dependence	5.11% (63)
Both serious mental illness and substance use disorder or alcohol dependence	6.16% (76)
Overweight/obesity/excessive weight gain during pregnancy (Yes)	17.60% (217)
Any high blood pressure (Yes)	8.11% (100)
Any diabetes (Yes)	4.95% (61)
Pregnancy and delivery characteristics	
Preterm delivery (Yes)	5.35% (66)
Vaginal birth (Yes)	74.21% (915)
Birthweight	
Not low birthweight	91.48% (1128)
Low birthweight (less than 2,500 grams)	8.52% (105)
Healthcare characteristics	
Receive timely prenatal care (Yes)	56.26% (643)
Receive timely postpartum care (Yes)	40.51% (463)

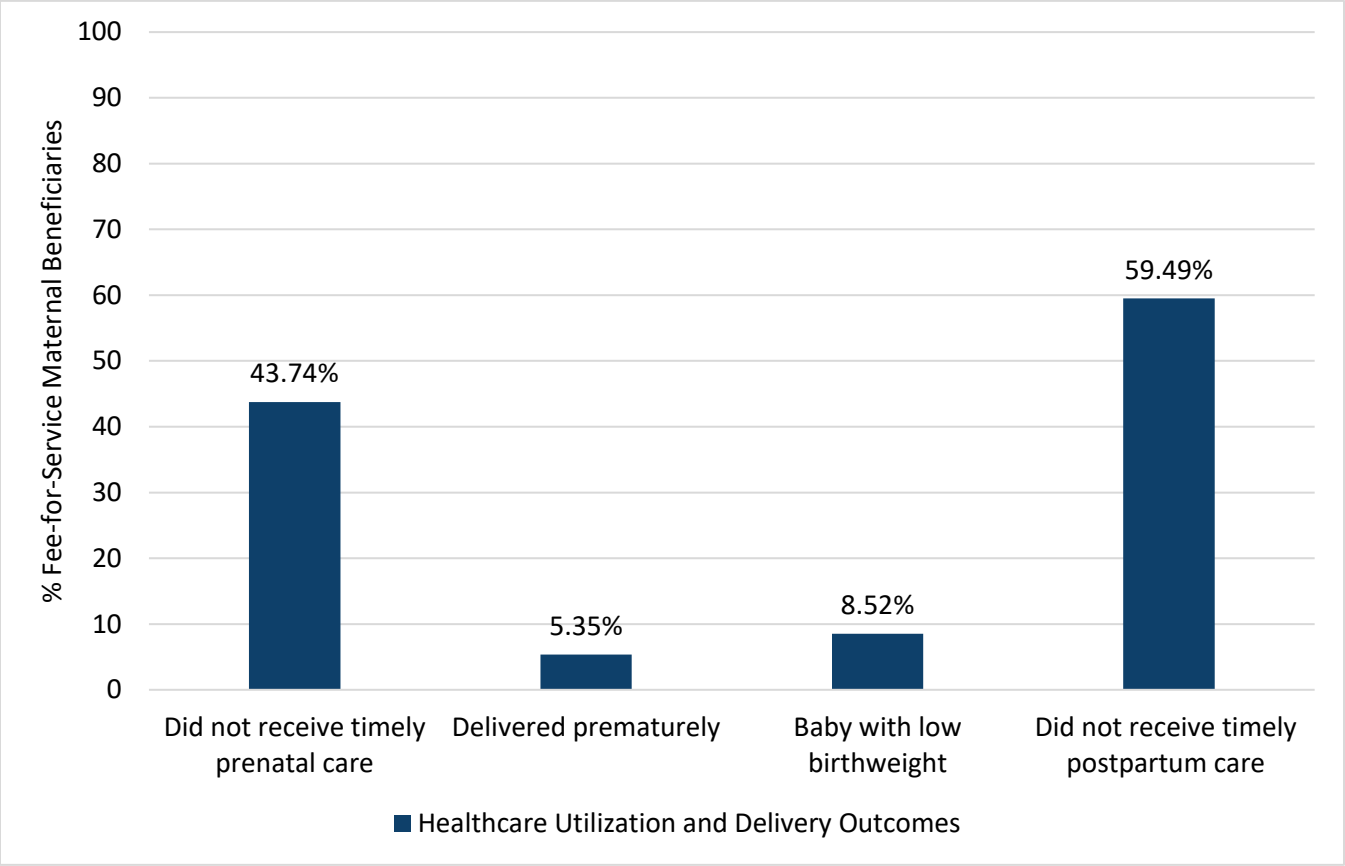
[1] Sample size (n) only includes eligible population who met continuous enrollment criteria, n = 1,143

Healthcare Utilization and Delivery Outcomes

Table A1 (found in the appendix) and **Figure 1** (below) show the rates of the four healthcare indicators of primary interest in this study:

- timely prenatal care (prenatal care visit in the first trimester, on or before the enrollment start date or within 42 days of enrollment in the organization),
- preterm delivery (before 37 weeks of age),
- low birthweight (less than 2,500 grams) and
- timely postpartum care (postpartum care visit on or between 7–84 days after delivery).

Figure 1: Patterns of Healthcare Utilization and Delivery Outcomes among ND Medicaid Birthing People



Sample sizes are shown in **Table 1.**

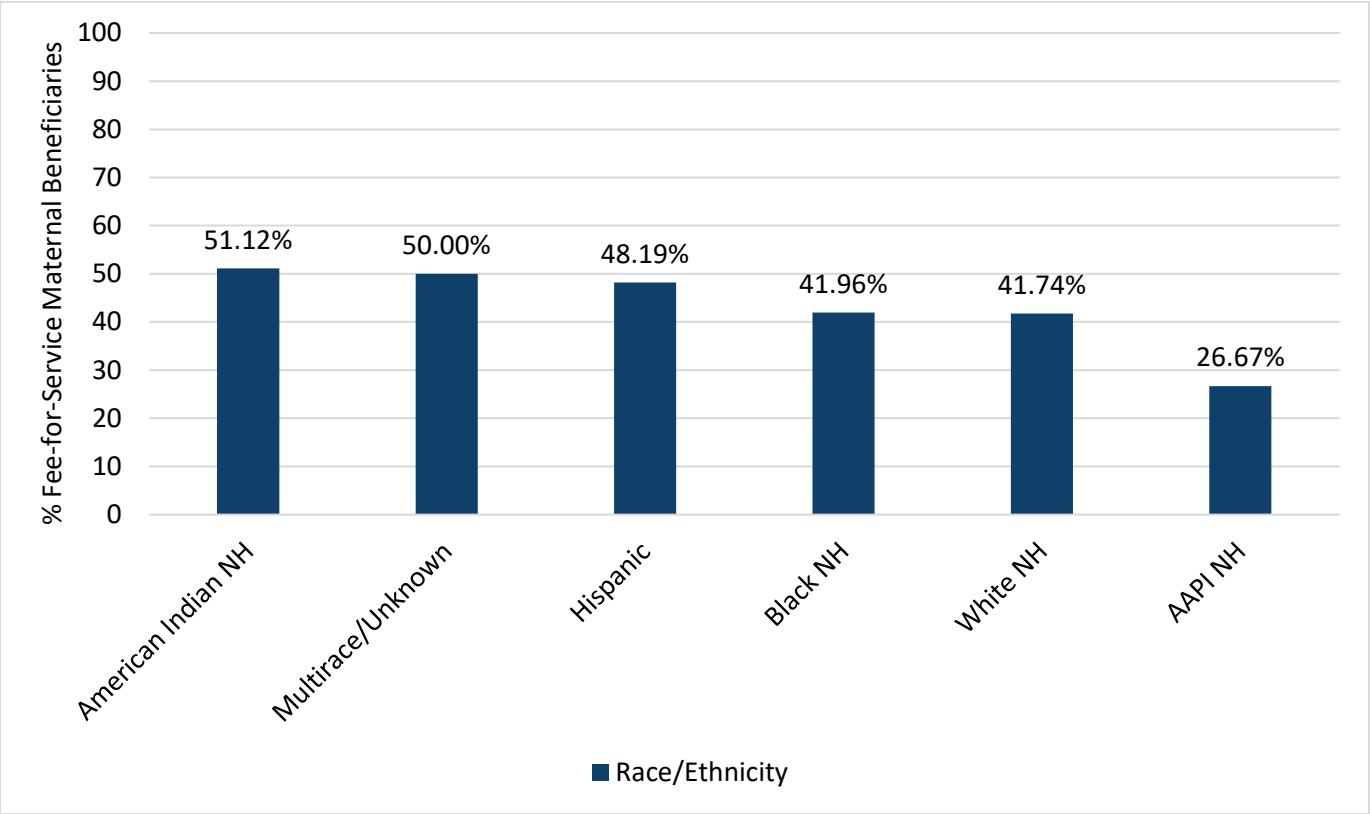
Characteristics Associated with Late Initiation of Prenatal Care

Only three of the characteristics measured in this study had a statistically significant association with late initiation of prenatal care: race/ethnicity, tobacco use, and SUD or alcohol dependence.

- **Racial disparities** were observed. 51.1% of American Indian/Alaskan Native, non-Hispanic (**Figure 2**). By comparison, just 26.7% of Asian American/Pacific Islander (AAPI), non-Hispanic members received late prenatal care.
- Over half of birthing people who used **tobacco products** (52.3%) were late initiating prenatal care, compared to 42.0% who did not use tobacco products (**Figure 3**).
- Among birthing people, 61.3% of those with **SUD or alcohol dependence**, and 42.7% of members without a behavioral health condition were late to initiating prenatal care, whereas 39.2% SMI only did not obtain timely prenatal care (**Figure 3**).

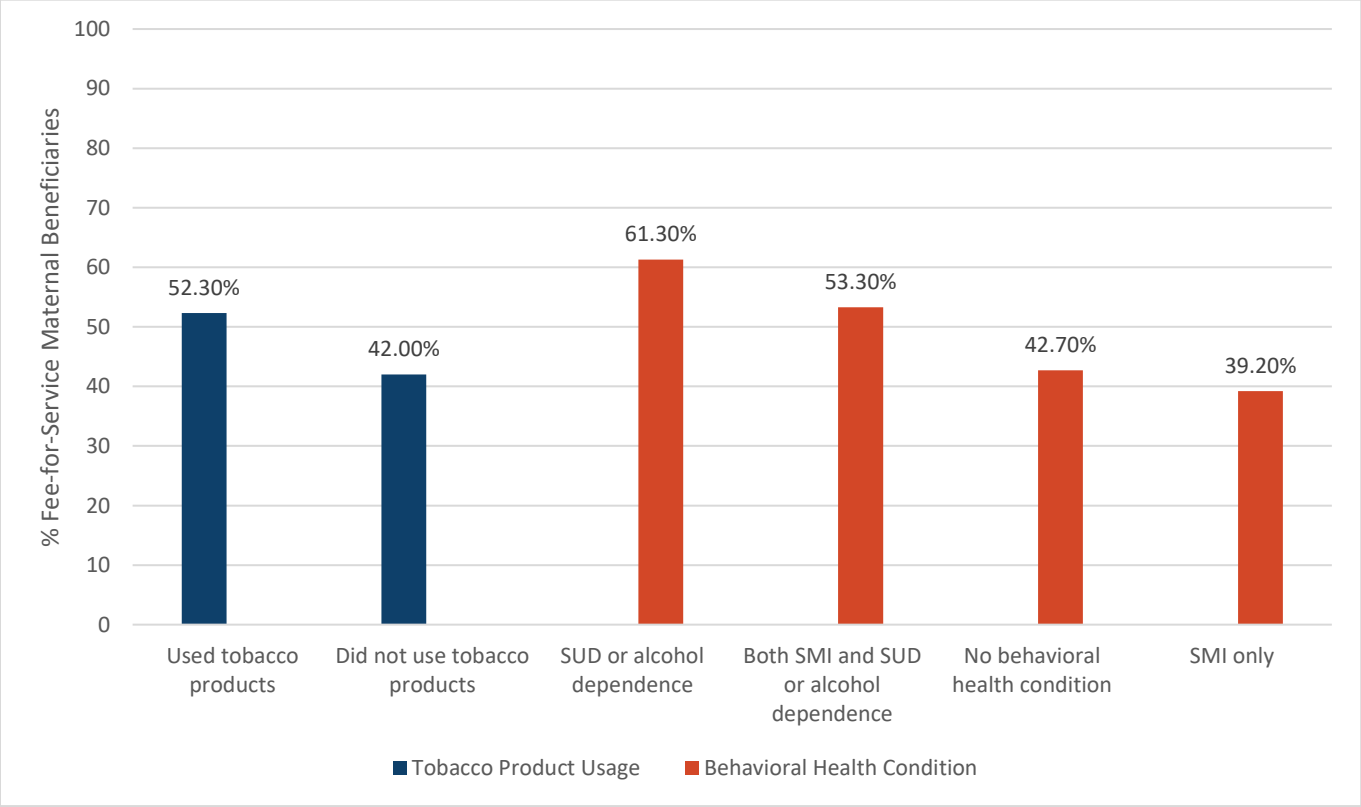
The other characteristics examined did not have a statistically significant association with the receipt of timely prenatal care. These included age, area of residence, overweight/obesity/excessive weight gain during pregnancy, high blood pressure, and diabetes.

Figure 2: Late Initiation of Prenatal Care by Race/Ethnicity among ND Medicaid Birthing People



Sample sizes are shown in **Table 1.** NH=Non-Hispanic, AAPI=Asian American & Pacific Islander

Figure 3: Late Initiation of Prenatal Care by Clinical Conditions



Sample sizes are shown in **Table 1.** SUD=substance use disorder; SMI=serious mental illness

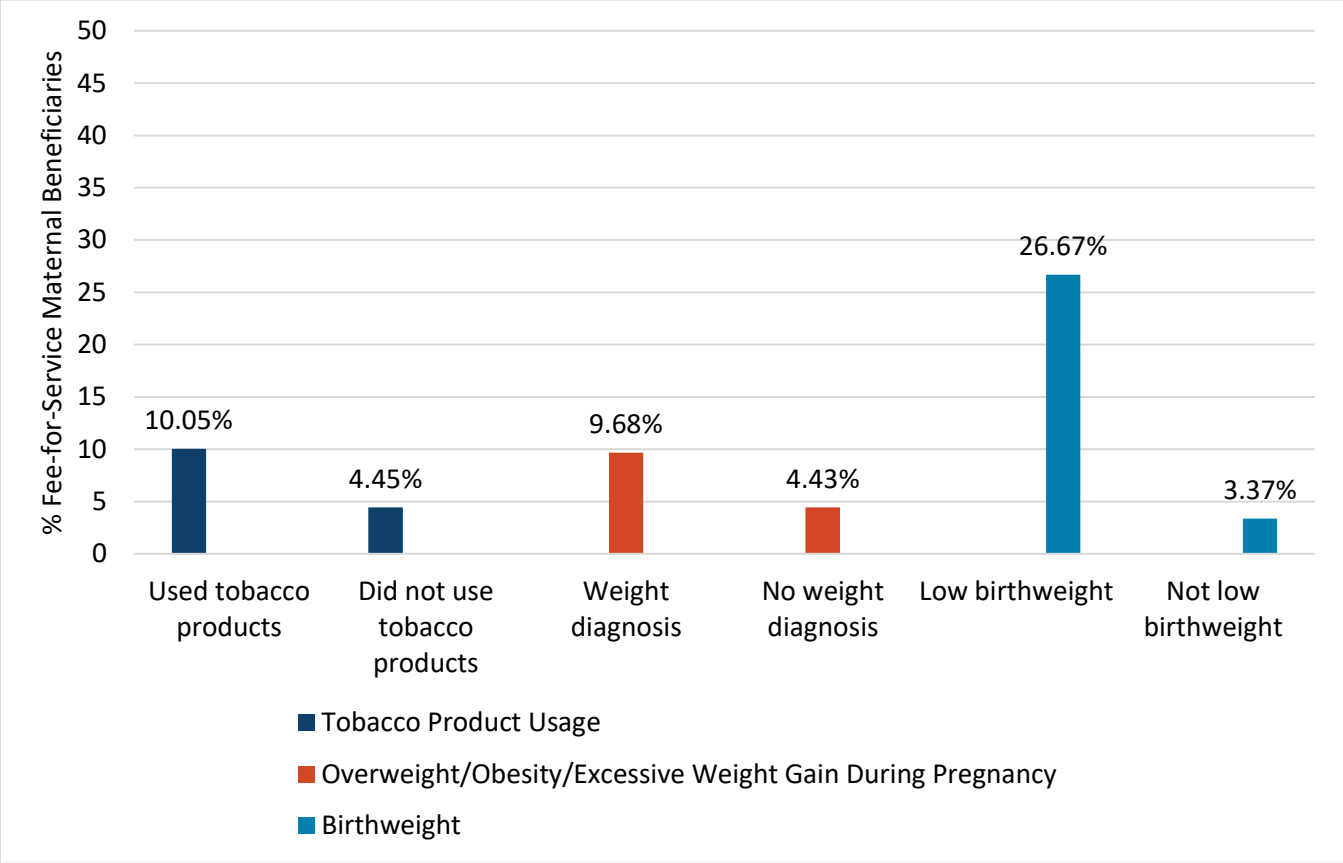
Characteristics Associated with Preterm Delivery

Three characteristics were associated with having a preterm delivery, as shown in **Figure 4**. These findings were statistically significant despite having a small sample size of less than 30 preterm births.

- Among birthing people who used **tobacco products,** 10.0% had a preterm birth, yet among birthing people who did not use tobacco products, 4.5% had a preterm birth.
- Nearly 10% (9.7%) of birthing people diagnosed with **overweight/obesity/excessive weight gain during pregnancy** had a preterm birth, whereas only 4.4% of birthing people without such a diagnosis delivered prematurely.
- A total of 26.7% of birthing people who delivered a baby that was **low birthweight** (less than 2,500 grams) had a preterm birth, while only 3.4% of birthing people who delivered a baby without low birthweight (2,500+ grams) had a preterm delivery.

The other characteristics examined did not have a statistically significant association with preterm delivery. These included age, race/ethnicity, area of residence, behavioral health condition, any high blood pressure, any diabetes, and timely prenatal care.

Figure 4: Tobacco Use, Weight Gain, and Birthweight Among Birthing People with Preterm Deliveries



Sample sizes are shown in **Table 1.**

Characteristics Associated with Low Birthweight

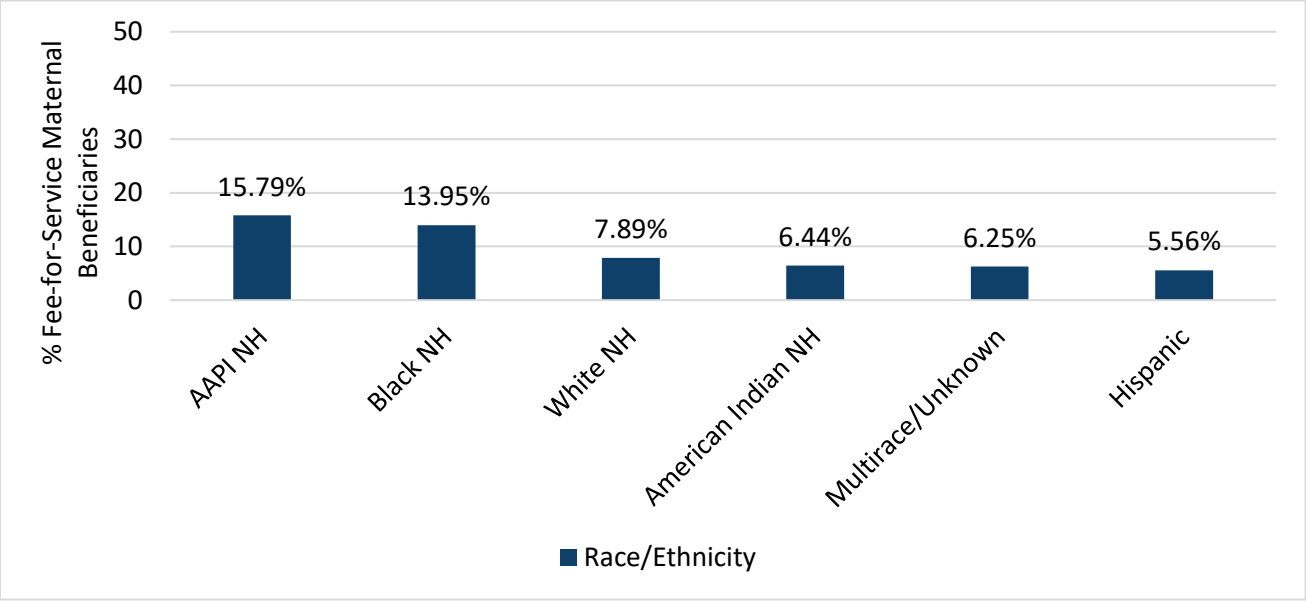
Five characteristics were associated with delivering a baby with low birthweight (less than 2,500 grams). These findings were statistically significant despite having a small sample size of less than 30 low birthweight deliveries.

- **Racial disparities** were observed. Nearly 16% of birthing people who identified as AAPI, non-Hispanic (15.8%) and 14.0% of Black, non-Hispanic delivered a baby with low birthweight **(Figure 5)** whereas only 5.6% of Hispanic birthing people delivered a low birthweight baby.
- Among birthing people who delivered a baby with low birthweight, 13.1% used **tobacco products**, while only 7.6% of birthing people who did not use tobacco products delivered a baby with low birthweight **(Figure 6)**.

- Among birthing people who delivered a baby with low birthweight, 18.4% lived with both **SUD or alcohol dependence and SMI**, and 5.3% had SMI only **(Figure 6)**.
- Among birthing people who delivered a baby with low birthweight, 42.4% had a **preterm delivery**, while only 6.6% who did not deliver prematurely had a low birthweight baby **(Figure 7)**.
- Among birthing people who delivered a baby with low birthweight, 12.6% did not have a **timely prenatal care** visit, while only 4.4% who had timely prenatal care delivered a baby with low birthweight **(Figure 7)**.

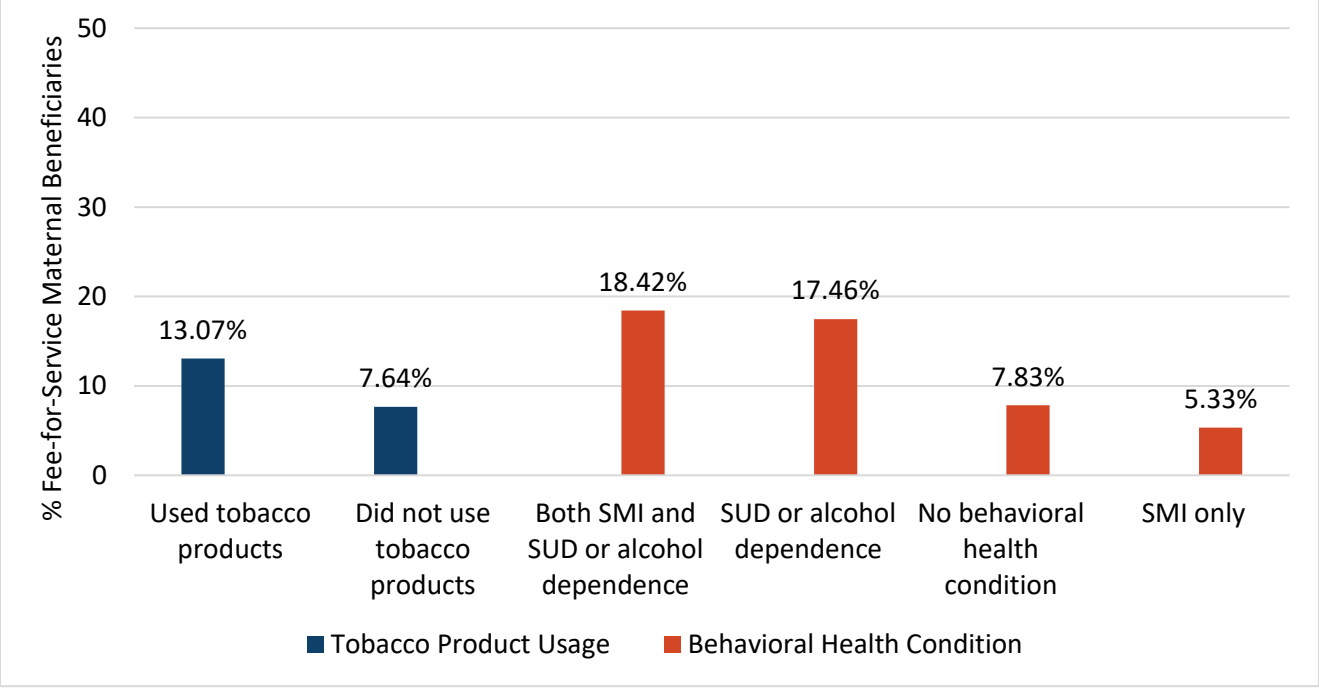
The other characteristics examined did not have a statistically significant association with low birthweight. These included age, area of residence, overweight/obesity/excessive weight gain during pregnancy, any high blood pressure, and any diabetes.

Figure 5: Low Birthweight by Race/Ethnicity



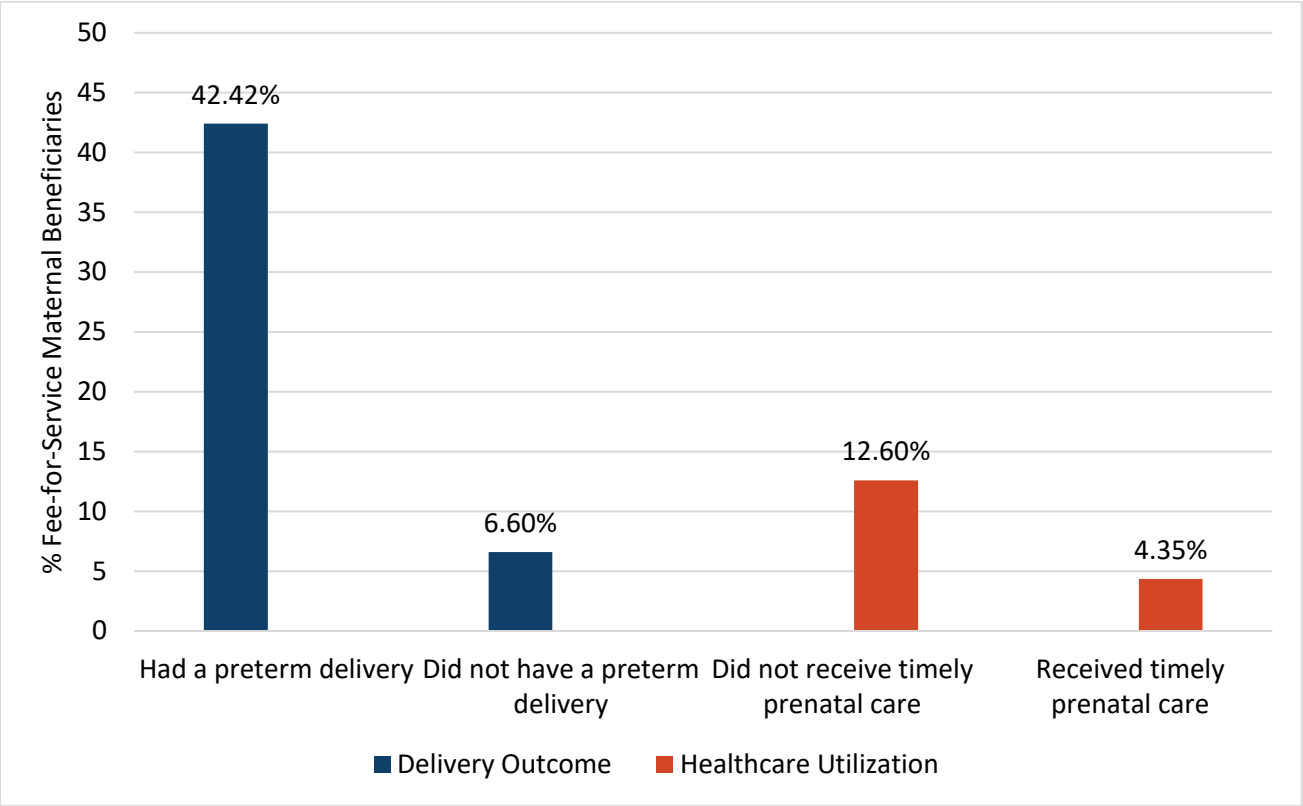
Sample sizes are shown in **Table 1.** NH=Non-Hispanic, AAPI=Asian American & Pacific Islander

Figure 6: Low Birthweight by Clinical Characteristics



Sample sizes are shown in **Table 1.** SMI=serious mental illness, SUD=substance use disorder

Figure 7: Low Birthweight by Delivery Outcomes and Healthcare Utilization



Sample sizes are shown in **Table 1.**

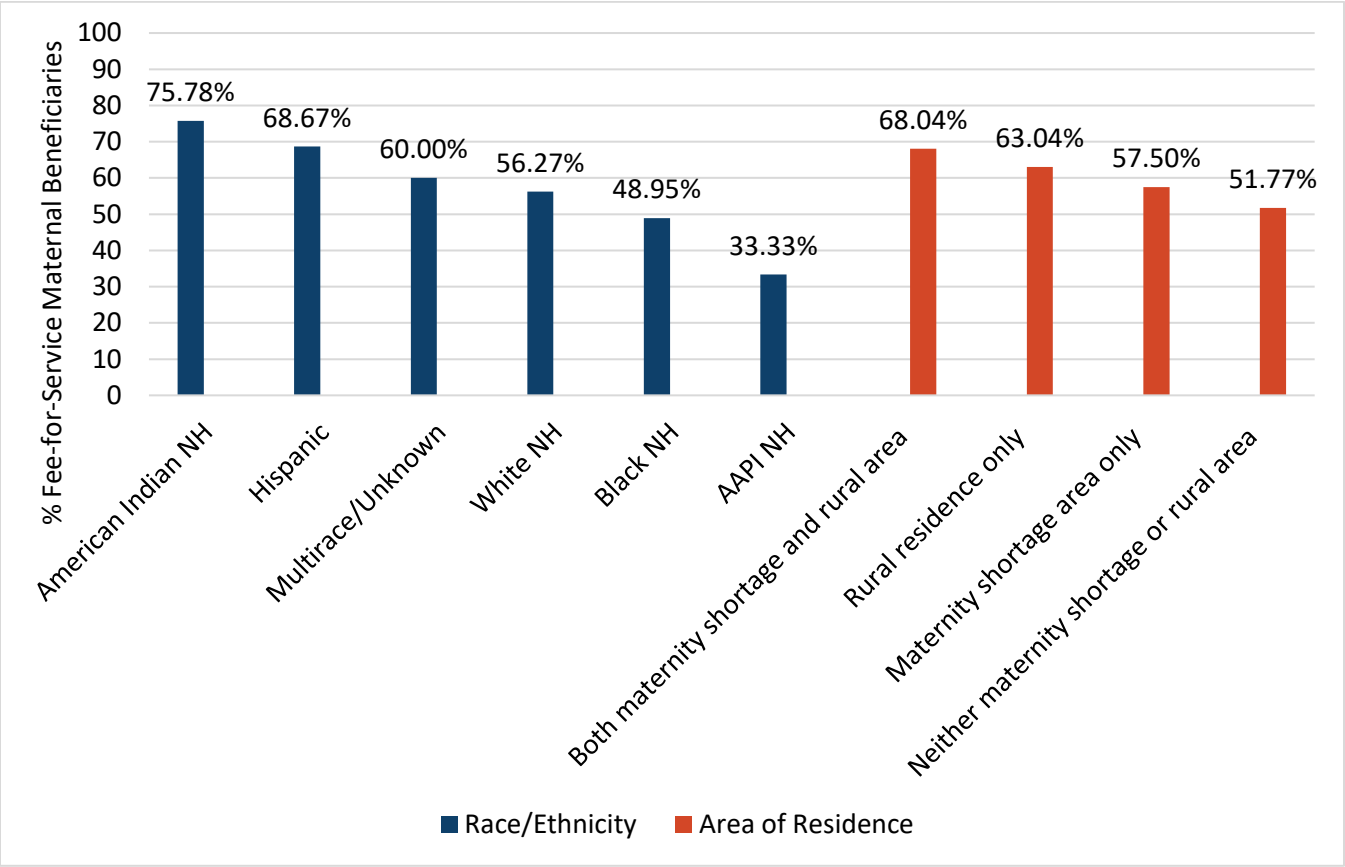
Characteristics Associated with Lack of Timely Postpartum Care

The American College of Obstetricians and Gynecologists (ACOG) recommends a postpartum evaluation within the first three weeks after delivery, in person or by phone, with a complete biopsychosocial assessment to be completed no later than 12 weeks after birth.[44] Six characteristics were significantly associated with a lack of timely postpartum care, defined as a visit on or between 7-84 days post-delivery.

- **Racial disparities** were observed. Among birthing people who identified as American Indian, non-Hispanic, over three-quarters (75.8%) did not receive timely postpartum care, whereas only 33.3% of AAPI birthing people lacked timely postpartum care **(Figure 8)**.
- Among birthing people, 68.0% who resided in **both a rural and maternity shortage area** did not receive timely postpartum care, whereas 51.8% who resided in neither a rural nor a maternity shortage area lacked timely postpartum care **(Figure 8)**.
- Among birthing people, 66.8% who used **tobacco products** did not receive timely postpartum care, while 58.0% of those who did not report using tobacco products lacked timely postpartum care **(Figure 9)**.
- Among birthing people, 75.8% living with **SUD or alcohol dependence** did not receive timely postpartum care, whereas 47.9% with SMI only lacked timely postpartum care **(Figure 9)**.
- Birthing people with **diabetes** (60.2%) had a lower rate of postpartum care use than did members without diabetes (45.5%) **(Figure 9)**.
- Among birthing people, 69.4% of those who did not receive **timely prenatal care** did not attend a timely postpartum care visit, while 51.8% who did receive timely prenatal care did not attend a timely postpartum care visit.

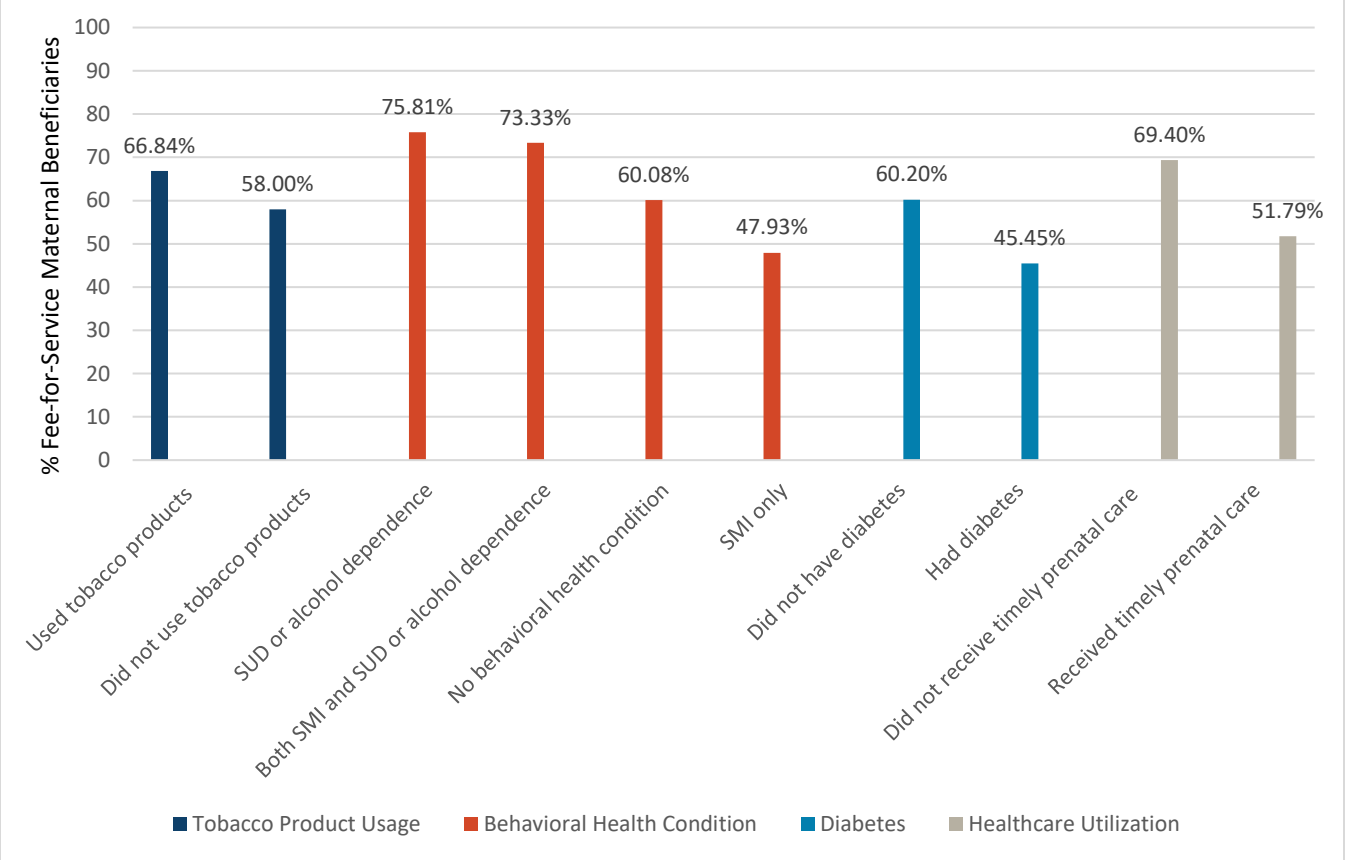
The other characteristics examined did not have a statistically significant association with a lack of timely postpartum care. These included age, overweight/obesity/excessive weight gain during pregnancy, any high blood pressure, preterm delivery, type of delivery, and birthweight.

Figure 8: Non-receipt of Timely Postpartum Care by Demographic Characteristics



Sample sizes are shown in **Table 1.** NH=Non-Hispanic, AAPI=Asian American & Pacific Islander

Figure 9: Timely Receipt of Postpartum Care by Clinical Characteristics and Healthcare Utilization



Sample sizes are shown in **Table 1.** SMI=serious mental illness, SUD=substance use disorder

Risk Factors for Lack of Timely Prenatal Care

Findings from the multiple logistic regression model analyzing the likelihood of not receiving timely prenatal care, while controlling for all other variables, are presented in **Table A2**. One statistically significant risk factor emerged. Birthing people living with SUD or alcohol dependence were 81.3% more likely to not receive timely prenatal care compared to birthing people without a behavioral health condition ($p < .05$). A second risk factor approached statistical significance. Birthing people who used tobacco products were 41.5% more likely to not receive timely prenatal care compared to birthing people who did not use tobacco products ($p = .05$).

One facilitator for receipt of timely prenatal care approached statistical significance. Birthing people living with an overweight/obesity/excessive weight gain during pregnancy diagnosis were 27.4% less likely to not receive timely prenatal care compared to birthing people without such a diagnosis ($p = .05$). In other words, birthing people living with an overweight/obesity/excessive weight gain during pregnancy diagnosis were more likely to receive timely prenatal care compared to birthing people who were not overweight/obese and/or did not gain excessive weight during pregnancy.

Risk Factors for Preterm Delivery

Table A3 presents results from the multiple logistic regression model analyzing the likelihood of a birthing person delivering prematurely, while controlling for all other variables. Three statistically significant risk factors emerged. Birthing people who used tobacco products were twice as likely to deliver prematurely compared to birthing people who did not use tobacco products (OR = 2.100; $p < 0.05$). Birthing people with a diagnosis of overweight/obesity/excessive weight gain during pregnancy were 124.1% more likely to deliver prematurely compared to birthing people who did not have such a diagnosis ($p < 0.05$). Birthing people who delivered a baby with low birthweight were 706.9% more likely to deliver prematurely compared to birthing people who delivered a baby without low birthweight ($p < .0001$). While statistically significant, these results are based on low sample sizes less than 30.

Risk Factors for Low Birthweight

Table A4 shows results from the multiple logistic regression model analyzing low birthweight (less than 2,500 grams), after controlling for all other variables. Six risk factors were found to be statistically significant.

- **Black, non-Hispanic** birthing people were nearly three times more likely to deliver a baby with low birthweight compared to white, non-Hispanic birthing people (OR = 2.838; $p < .01$).
- **Asian American/Pacific Islander, non-Hispanic** birthing people were 509.9% more likely to deliver a baby with low birthweight compared to white, non-Hispanic birthing people ($p < .01$).
- Birthing people who resided in both a **maternity shortage and rural** area were 97.9% more likely to deliver a baby with low birthweight compared to birthing people who did not reside in either a maternity shortage or rural area ($p < .05$).
- Birthing people with **SUD or alcohol dependence** were 234.8% more likely to deliver a baby with low birthweight compared to birthing people without a behavioral health condition ($p < .01$).
- Birthing people with **both SMI and SUD or alcohol abuse dependence** were 156.3% more likely to deliver a baby with low birthweight compared to birthing people without a behavioral health condition ($p < .05$).
- Birthing people who **delivered prematurely** were 735.4% more likely to deliver a baby with low birthweight compared to birthing people who did not deliver prematurely ($p < .0001$).

One risk factor approached statistical significance.

- Birthing people who resided in a **rural** area were 81.8% more likely to deliver a baby with low birthweight compared to birthing people who did not reside in either a maternity shortage or rural area ($p = .08$).

One significant facilitator for delivery of a baby weight 2,500+ grams emerged**.**

- Birthing people who received a **timely prenatal care visit** were 66.6% less likely to deliver a baby with low birthweight compared to birthing people who did not receive timely prenatal care ($p < .0001$). In other words,

birthing people who received timely prenatal care were more likely to deliver a baby weighing 2,500+ grams compared to birthing people who did not receive timely prenatal care.

One facilitator for delivery of a baby weight 2,500+ grams approached statistical significance.

- **American Indian/Alaska Native, non-Hispanic** birthing people were 45.2% less likely to deliver a baby with low birthweight compared to white, non-Hispanic birthing people (p = .08). In other words, birthing people who identify as American Indian/Alaska Native, non-Hispanic were more likely to deliver a baby weighing 2,500+ grams compared to birthing people who did not receive timely prenatal care.

Risk Factors for Lack of Timely Postpartum Care

Table A4 shows results from the multiple logistic regression model analyzing non-receipt of timely postpartum care (7–84 days after delivery), after controlling for all other variables. Four risk factors were found to be statistically significant.

- **American Indian/Alaska Native, non-Hispanic** birthing people were over twice as likely to not receive a timely postpartum care visit compared to white birthing people (OR = 2.065; p < .0001).
- **Hispanic** birthing people were 76.3% more likely to not receive a timely postpartum care visit compared to white birthing people (p < .05).
- Birthing people who resided in a **rural area** were 62.1% more likely to not receive a timely postpartum care visit compared to birthing people who resided in neither a maternity shortage or rural area (p < .01).
- Birthing people who resided in **both a maternity shortage and rural area** were 76.8% more likely to not receive a timely postpartum care visit compared to birthing people who resided in neither a maternity shortage or rural area (p < .0001).

One risk factor approached statistical significance.

- Birthing people who are **40 years of age and older** were 110.4% more likely to not receive a timely postpartum care visit compared to birthing people less than 25 years of age (p = .09).

Three significant facilitators for receipt of a timely postpartum visit emerged**.**

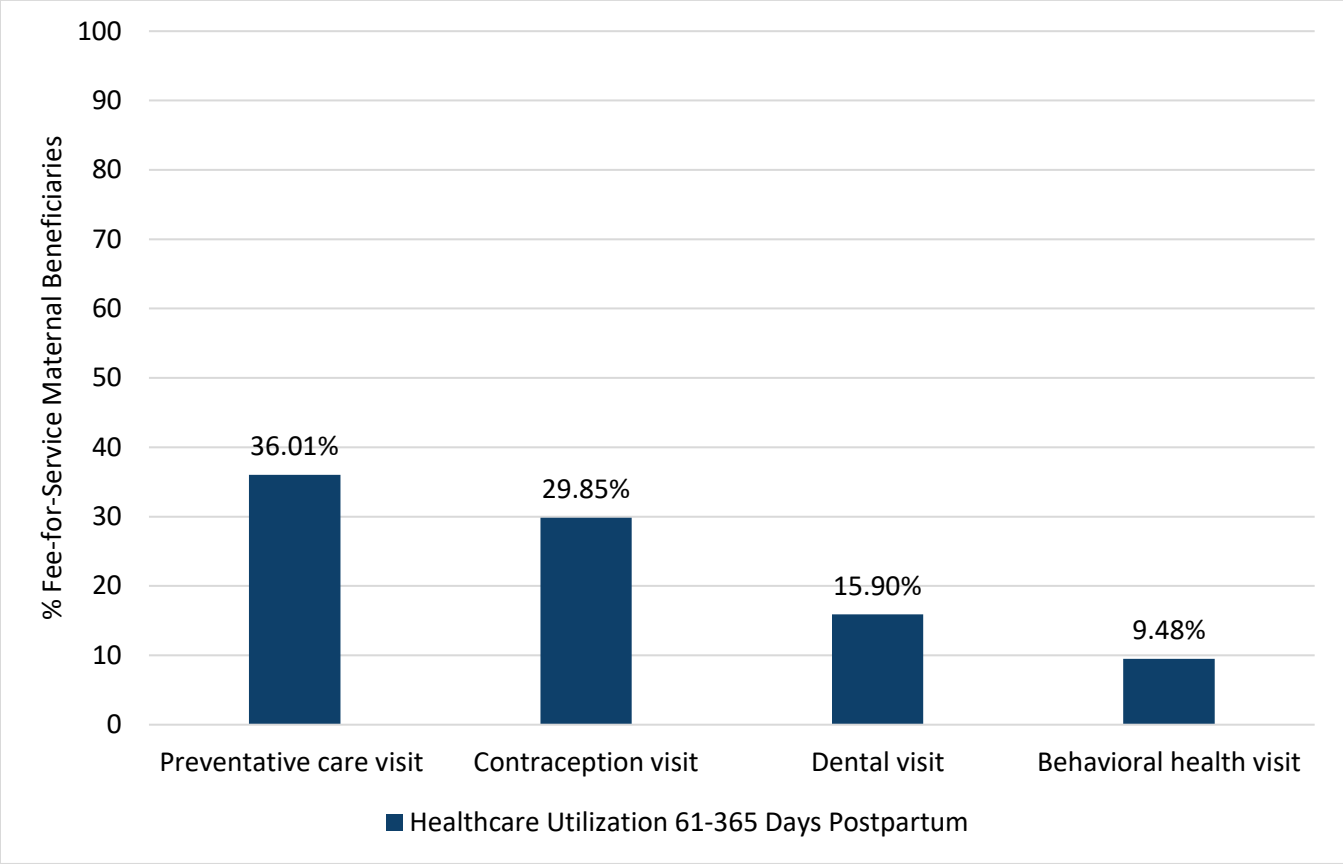
- Birthing people living with **serious mental illness** were 39.1% less likely to not receive a timely postpartum care visit compared to birthing people without a behavioral health condition (p < .01). In other words, birthing people living with serious mental illness were more likely to receive timely postpartum care compared to those without a behavioral health condition.
- Birthing people with **diabetes** were 48.9% less likely to not receive a timely postpartum care visit compared to birthing people without diabetes (p < .05). In other words, birthing people living with diabetes were more likely to receive timely postpartum care compared to those without diabetes.
- Birthing people who received **timely prenatal care** were 50.5% less likely to not receive a timely postpartum care visit compared to birthing people who did not receive timely prenatal care (p < .0001). In other words, birthing people who received timely prenatal care were more likely to receive timely postpartum care compared to those who did not receive timely prenatal care.

Extended Healthcare Coverage

Prior to COVID-19, individuals with pregnancy-related Medicaid coverage in North Dakota typically lost their Medicaid benefits 60 days after the end of pregnancy, unless they qualified for Medicaid based on other circumstances. North Dakota extended healthcare coverage from 60 days to 12 months postpartum in 2023. This is important for improving health outcomes. For example, one-third of pregnancy-related deaths occur between one week and one year postpartum.[45] This study relies on data from 2021-2022, which predates the eligibility change in January 2023. However, during the COVID-19 pandemic, most Medicaid enrollees retained continuous coverage, which allows for this study to analyze postpartum healthcare utilization.

Figure 10 shows the prevalence of healthcare utilization among ND Medicaid birthing people between 61 and 365 days postpartum. Percentages indicate the number of individuals who had a live birth who subsequently utilized the service. Nearly 10% of individuals received care for behavioral health needs. Over 35% of enrollees attended a preventive care visit (other than a timely postpartum care visit). About 30% of birthing people attended a contraception-related appointment. This included services for most or moderately effective contraceptive methods and long-acting reversible contraception methods. In addition, 15.9% had at least one dental visit for a check-up, cleaning, filling, root canal, or extraction.

Figure 10: Prevalence of Healthcare Utilization 61-365 Day Postpartum



Discussion

This study highlights barriers and facilitators related to maternal healthcare utilization among North Dakota Medicaid fee-for-service enrollees. Fewer than 60% of enrollees received a prenatal care visit in the first trimester (56.3%). This is less than the 83.0% that is reported for Medicaid beneficiaries nationally.[46] Comparatively across the state, 78.9% birthing people received prenatal care within the first three months of pregnancy in 2022.[47] Educating birthing people about the benefits of prenatal care, for both birthing person and baby, are recommended.

Pregnant birthing people who do not receive early prenatal care face an increased risk of complications that may either be undetected or treated too late in pregnancy, increasing the possibility of adverse outcomes for both the birthing person and baby. Several clinical risk factors identified in this study are associated with a decreased likelihood of a birthing person's receipt of timely healthcare and/or developing poor health outcomes. Birthing people with behavioral health conditions and those who used tobacco products were at significantly greater risk of not attending a timely prenatal care appointment.

Seeking to understand potential challenges to obtaining timely prenatal care are warranted. For example, healthcare professionals could consider utilizing community health workers or nurses to connect with patients following a positive

pregnancy test to facilitate the first prenatal appointment. A touchpoint connection could serve as an opportunity to address potential barriers and solutions, including transportation. The use of care coordination staff (e.g., care manager, care coordinator, community health worker, or patient navigator) can help to address clinical and health-related social needs and provide wrap around services. This will be particularly impactful for those birthing people living with behavioral health conditions who are at significant risk of not receiving timely prenatal care. For example, group prenatal care models can be implemented to provide prenatal care in group settings according to racial/ethnic identification, age, or due date. Another supportive, group-based prenatal care approach could focus on specific health conditions such as providing patients with diabetes self-management education. Providers should also consider customized and targeted interventions that address barriers specific to vulnerable subpopulations.

North Dakota could encourage providers to collaborate with their local emergency departments and utilize the North Dakota Health Information Network (NDHIN) to proactively outreach to patients with positive pregnancy results. Incentive programs for appointment adherence, such as baskets containing personal and newborn care items, are also suggested. It is also recommended that North Dakota continue to educate birthing people about telehealth coverage for maternity care services. Live video, remote patient monitoring, and audio services can address gaps in access to care.[48]

Preterm babies, born before 37 weeks of pregnancy, often have serious health problems. Just over 5% of beneficiaries in this study delivered prematurely (5.3%) compared to 10.3% of all births in North Dakota in 2022.[49] Among North Dakota Medicaid enrollees in this study, tobacco usage, living with an overweight/obesity/excessive weight gain during pregnancy diagnosis, and delivering a baby with low birthweight were significant risk factors related to preterm delivery. North Dakota Medicaid beneficiaries would benefit from targeted interventions to promote healthy eating, physical activity, and smoking cessation support.[50]

A total of 8.5% of newborns in this study were born with low birthweight compared to 7.1% of all live births in North Dakota.[51] Identifying as Black, non-Hispanic or Asian American/Pacific Islander, non-Hispanic increased a birthing person's likelihood of delivering a baby with low birthweight. Other risk factors included residing in a maternity shortage and rural area, living with a behavioral health condition, and delivering prematurely. Opportunities exist to reduce the prevalence of low birthweight. This can include expanding access to providers and hospitals that provide culturally and linguistically appropriate care and promoting timely prenatal care utilization.

The postpartum period for a birthing person and their newborn is very important for both short-term and long-term health and well-being. Only 40.5% of North Dakota birthing people received timely postpartum care compared to 77.0% of Medicaid birthing people nationally.[52] Significant racial disparities were observed. American Indian, non-Hispanic and Hispanic birthing people were significantly less likely to receive timely postpartum care compared to those who identify as white, non-Hispanic. Improving timely postpartum care access for American Indian/Alaska Native and Hispanic women will help address the significant and persistent racial and ethnic disparities in maternal and infant mortality and morbidity. Providers should be encouraged to consider ways to reduce maternal and infant racial/ethnic disparities, such as providing staff-wide education on implicit bias and incorporating a disparities dashboard that monitors process and outcome metrics stratified by race and ethnicity.[53] Healthcare professionals should also consider potential barriers to postpartum care, including childcare responsibilities. Scheduling well-baby checkup appointments during the same time as a postpartum visit can help birthing people overcome barriers to care.

Successes within the North Dakota Medicaid healthcare system are also noted. Birthing people with an overweight/obesity/excessive weight gain during pregnancy diagnosis were significantly more likely to receive timely prenatal care than those without such a diagnosis. Similarly, those with serious mental illness and diabetes were more likely to receive timely postpartum care compared to those without such a diagnosis. It is possible that these birthing people are already engaged with a specialist or other healthcare services that help guide care pathways. Receiving timely prenatal care was also significantly related to a lesser likelihood of delivering a baby with low birthweight and a

higher likelihood of attending a postpartum care appointment. Timely prenatal care visits provide the opportunity to monitor the health of birthing people, those living with chronic conditions, and their babies.

Results of this study also suggest that birthing people utilize the healthcare system with their Medicaid postpartum extended coverage. About 9.5% of beneficiaries accessed behavioral health services 61-365 days postpartum, including care for substance abuse, alcohol dependence, and mental health. Extended healthcare coverage improved access to postpartum services, including preventive care. Over 35% of birthing people in this study attended a preventive care visit during the postpartum period who had not otherwise received postpartum care on or between 7-84 days after delivery (36.0%).

Extended healthcare coverage increased access to contraception services which decreases the risk for short interval pregnancies, a known risk factor for poor health outcomes.[54] About 30% received contraception services between 61-365 days post-delivery (29.9%). Use of dental care was also noted with 15.9% having received some type of preventive or restorative care during this extended coverage period.

Study Strengths and Limitations

Due to the nature of claims data, there are some study limitations. We can only look at the relationship between variables, but it is beyond the information available to be able to assert a causal relationship between risk factors and outcomes. Small sample sizes might have precluded findings of statistical significance or should be interpreted with caution, when noted. Not all beneficiaries in the dataset may have had diagnosis claims data. For example, a beneficiary might use tobacco products or live with obesity, and it could have been omitted from claims. This could lead to underreporting and low sample sizes for some characteristics.

Conclusion

Improving the health of birthing people and infants is key for preventing unnecessary illness and death and advancing overall population health. Addressing social and economic factors that contribute to poorer health outcomes and disparities will be important. Significant risk factors for a lack of timely care included identifying as non-white, residing in a maternity shortage county and/or rural area, and living with behavioral conditions. Birthing people who used tobacco products and lived with diabetes were also at significant risk of not attending a timely prenatal care appointment. Clinical risk factors related to a higher likelihood of delivering prematurely included tobacco usage, living with an overweight/obesity/excessive weight gain during pregnancy diagnosis, and delivering a baby with low birthweight. Racial disparities, living with a behavioral health condition, and delivering prematurely were significantly associated with increased risk of having a baby with low birthweight. These present key opportunities for needed interventions to promote timely prenatal care, reduce risk of preterm birth and low birthweight, and increase postpartum service utilization. Although some complications are unavoidable, early identification and prompt management during prenatal and postpartum visits can reduce the chances of severe morbidity, mortality, and preterm birth. North Dakota is encouraged to continue working with its MMRC and NSDPQC to improve outcomes for maternal and infant health. To improve the health of birthing people and infants, prenatal and postpartum care should be viewed as an opportunity for providers to assist with the transition to ongoing preventive care to ensure continued access to healthcare services.

Recommendations

HHS may want to review existing policies and procedures to see if the following activities are in place and being utilized, or if they could be strengthened.

- Conduct outreach and education for members about the benefits of comprehensive care, from prenatal to postpartum.
- Increase access to a broader array of services and providers that support maternal and infant health, including perinatal home visitation.
- Promote use of midwives and doulas, which can reduce health disparities by providing support to birthing people before, during, and after labor and delivery.

- Collaborate with local emergency departments and utilize the North Dakota Health Information Network (NDHIN) to proactively outreach to patients with positive pregnancy test results.
- Consider group prenatal care models of delivery where small groups of patients of similar gestational age meet at scheduled intervals for both medical care and facilitated educational discussions.
- Utilize care coordination staff (e.g., care manager, care coordinator, community health worker, or patient navigator) to address clinical and health-related social needs, provide touchpoints prior to first prenatal appointment, and provide wrap around services.
- Provide resources for healthcare professionals on ways to reduce racial/ethnic disparities, such as with The Council on Patient Safety in Women's Health Care and the Alliance for Innovation in Maternal Health (AIM Program) "Reduction of Peripartum Racial/Ethnic Disparities Patient Safety Bundle."[55]
- Create customized and targeted interventions that address barriers specific to vulnerable subpopulations, including age and race/ethnicity disparity subpopulations.
- Obtain member feedback on knowledge about and barriers to prenatal and postpartum care.
- Target interventions that support healthy behaviors including smoking cessation, nutrition, and physical activity.[56]
- Consider applying to the new Centers for Medicare & Medicaid Services' (CMS) Transforming Maternal Health (TMaH) Model designed to focus exclusively on improving maternal healthcare. CMS will release a Notice of Funding Opportunity (NOFO) for state Medicaid agencies in Spring 2024. Applications will be due in Summer 2024.[57]

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Appendix

Table A1: Prevalence of Maternity Outcomes, North Dakota Medicaid Enrollees

Characteristics (n = 1,233)	Did Not Receive Timely Prenatal Care[1,2]	Preterm Delivery[1]	Low Birthweight[1]	Did Not Receive At Least One Timely Postpartum Care Visit[1,2,3]
Demographic characteristics				
Age group (Years)				
< 25	46.78% (167)	4.21% (16)	7.11% (27)	61.34% (219)
25–39	41.99% (317)	5.73% (47)	9.02% (74)	58.15% (439)
40+	51.61% (16)	9.09% (3)	12.12% (4)	70.97% (22)
Race/Ethnicity[4,6,7]				
White non-Hispanic	41.74% (273)	5.99% (41)	7.89% (54)	56.27% (368)
Black non-Hispanic	41.96% (60)	4.07% (7)	13.95% (24)	48.95% (70)
American Indian/Alaska Native non-Hispanic	51.12% (114)	5.15% (12)	6.44% (15)	75.78% (169)
Asian American/Pacific Islander non-Hispanic	26.67% (8)	2.63% (1)	15.79% (6)	33.33% (10)
Multiracial/unknown	50.00% (5)	6.25% (1)	6.25% (1)	60.00% (6)
Hispanic	48.19% (40)	4.44% (4)	5.56% (5)	68.67% (57)
Area of Residence[7]				
Neither in a maternity shortage or rural area	43.58% (197)	4.69% (23)	7.76% (38)	51.77% (234)
Maternity shortage area only	42.50% (51)	6.29% (9)	10.49% (15)	57.50% (69)
Rural residence only	40.87% (94)	5.74% (14)	9.84% (24)	63.04% (145)
Both a maternity shortage and rural area	46.33% (158)	5.62% (20)	7.87% (28)	68.04% (232)
Clinical characteristics				
Tobacco use[4,5,6,7]				
Yes	52.33% (101)	10.05% (20)	13.07% (26)	66.84% (129)
No	42.00% (399)	4.45% (46)	7.64% (79)	58.00% (551)
Behavioral health condition[4,6,7]				
None	42.71% (337)	4.95% (43)	7.83% (68)	60.08% (474)
Serious mental illness only	39.17% (85)	5.33% (12)	5.33% (12)	47.93% (104)
SUD or alcohol dependence	61.29% (38)	6.35% (4)	17.46% (11)	75.81% (47)
Both SMI and SUD or alcohol dependence	53.33% (40)	9.21% (7)	18.42% (14)	73.33% (55)
Overweight/obesity/excessive weight gain during pregnancy[5]				
Yes	39.32% (81)	9.68% (21)	8.29% (18)	55.83% (115)
No	44.72% (419)	4.43% (45)	8.56% (87)	60.30% (565)
Any high blood pressure (Yes)				
Yes	48.94% (46)	8.00% (8)	12.00% (12)	62.77% (59)
No	43.28% (454)	5.12% (58)	8.21% (93)	59.20% (621)
Any diabetes[7]				
Yes	47.27% (26)	8.20% (5)	9.84% (6)	45.45% (25)
No	43.57% (474)	5.20% (61)	8.45% (99)	60.20% (655)
Delivery outcomes				
Preterm delivery[6]				

Characteristics (n = 1,233)	Did Not Receive Timely Prenatal Care[1,2]	Preterm Delivery[1]	Low Birthweight[1]	Did Not Receive At Least One Timely Postpartum Care Visit[1,2,3]
Yes	-	-	42.42% (28)	61.40% (35)
No	-	-	6.60% (77)	59.39% (645)
Type of delivery	-	-		
Vaginal	-	-	-	59.55% (508)
Cesarean	-	-	-	59.31% (172)
Birthweight[5]				
Not low birthweight	-	3.37% (38)	-	59.32% (624)
Low birthweight (less than 2,500 grams)	-	26.67% (28)	-	61.54% (56)
Healthcare utilization				
Receive timely prenatal care[6,7]				
Yes	-	3.58% (23)	4.35% (28)	51.79% (333)
No	-	6.80% (34)	12.60% (63)	69.40% (347)

[1] % (Number of Enrollees).

[2] n = 1,143

[3] 7–84 days after delivery.

[4] This enrollee characteristic showed a statistically significant association with not receiving timely prenatal care; *chi*-squared $p < 0.05$.

[5] This enrollee characteristic approached a statistically significant association with preterm delivery; *chi*-squared $p < 0.05$.

[6] This enrollee characteristic showed a statistically significant association with low birthweight; *chi*-squared $p < 0.05$.

[7] This enrollee characteristic showed a statistically significant association with not receiving timely postpartum care visit; *chi*-squared $p < 0.05$.

n: sample size; %: percentage.

Table A2: Multiple Logistic Regression Results: Odds of Not Receiving Timely Prenatal Care

Characteristics	Odds Ratio	95% Confidence Interval	
Demographic characteristics			
Age group (Years) (Ref = < 25)	-	-	-
25–39	0.828	0.638	1.075
40+	1.241	0.587	2.625
Race (Ref = White)			
Black, non-Hispanic	1.077	0.723	1.604
American Indian/Alaska Native, non-Hispanic	1.265	0.918	1.743
Asian American/Pacific Islander, non-Hispanic	0.525	0.226	1.220
Multiracial/unknown	1.160	0.323	4.164
Hispanic	1.376	0.861	2.196
Area of residence (Ref = Neither in a maternity shortage or rural area)			
Maternity shortage area only	0.963	0.635	1.459
Rural residence only	0.848	0.605	1.188
Both a maternity shortage and rural area	1.085	0.799	1.474
Clinical characteristics			
Tobacco use (Ref = No)[2]	1.415	0.995	2.012
Behavioral health condition (Ref = None)			
Serious mental illness only	0.887	0.643	1.223
SUD or alcohol dependence[1]	1.813	1.031	3.188
Both SMI and SUD or alcohol dependence	1.310	0.782	2.196
Overweight/obesity/excessive weight gain during pregnancy (Ref = No)[2]	0.726	0.524	1.007
Any high blood pressure (Ref = No)	1.135	0.722	1.784
Any diabetes (Ref = No)	1.311	0.730	2.355

[1] This enrollee characteristic showed a statistically significant association with not receiving timely prenatal care; $p < 0.05$.

Ref: referent; %: percentage.

Table A3: Multiple Logistic Regression Results: Odds of Preterm Delivery

Characteristics	Odds Ratio	95% Confidence Interval	
Demographic characteristics			
Age group (Years) (Ref = < 25)			
25–39	1.224	0.645	2.326
40+	1.762	0.350	8.864
Race (Ref = White)			
Black, non-Hispanic	0.597	0.218	1.633
American Indian/Alaska Native, non-Hispanic	0.981	0.469	2.052
Hispanic	0.734	0.207	2.596
Area of residence (Ref = Neither in a maternity shortage or rural area)			
Maternity shortage area only	1.279	0.495	3.306
Rural residence only	0.946	0.420	2.129
Both a maternity shortage and rural area	1.098	0.529	2.280
Clinical characteristics			
Tobacco use (Ref = No)[2]	2.100	1.057	4.172
Behavioral health condition (Ref = None)			
Serious mental illness only	0.922	0.424	2.002
SUD or alcohol dependence	0.622	0.187	2.066
Both SMI and SUD or alcohol dependence	0.986	0.370	2.628
Overweight/obesity/excessive weight gain during pregnancy (Ref = No)[2]	2.241	1.167	4.302
Any high blood pressure (Ref = No)	0.904	0.343	2.388
Any diabetes (Ref = No)	0.970	0.253	3.715
Healthcare utilization and delivery outcomes			
Timely prenatal care (Ref = No)	0.651	0.361	1.175
Low birthweight (Ref = Not low birthweight)[3]	8.069	4.239	15.361

[1] Race was recategorized due to low sample size.

[2] This enrollee characteristic showed a statistically significant association with having a preterm delivery; $p < 0.05$.

[3] This enrollee characteristic showed a statistically significant association with having a preterm delivery; $p < 0.0001$.

Ref: referent; %: percentage.

Table A4: Multiple Logistic Regression Results: Odds of Low Birthweight

Characteristics	Odds Ratio	95% Confidence Interval	
Demographic characteristics			
Age group (Years) (Ref = < 25)			
25–39	0.984	0.587	1.651
40+	0.679	0.137	3.354
Race (Ref = White)			
Black, non-Hispanic[3]	2.838	1.388	5.804
American Indian/Alaska Native, non-Hispanic[5]	0.548	0.279	1.078
Asian American/Pacific Islander, non-Hispanic[3]	6.099	1.985	18.738
Hispanic	0.847	0.302	2.380
Area of residence (Ref = Neither in a maternity shortage or rural area)			
Maternity shortage area only	1.336	0.597	2.992
Rural residence only[5]	1.818	0.936	3.533
Both a maternity shortage and rural area[2]	2.563	1.167	5.627
Clinical characteristics			
Tobacco use (Ref = No)	1.339	0.716	2.505
Behavioral health condition (Ref = None)			
Serious mental illness only	0.753	0.367	1.546
SUD or alcohol dependence[3]	3.348	1.417	7.910
Both SMI and SUD or alcohol dependence[2]	2.563	1.167	5.627
Overweight/obesity/excessive weight gain during pregnancy (Ref = No)	0.736	0.381	1.422
Any high blood pressure (Ref = No)	1.226	0.552	2.723
Any diabetes (Ref = No)	0.766	0.233	2.517
Healthcare utilization and delivery outcomes			
Timely prenatal care (Ref = No)[4]	0.334	0.204	0.548
Preterm delivery (Ref = No)[4]	8.354	4.361	16.003

[1] Race was recategorized due to low sample size.

[2] This enrollee characteristic showed a statistically significant association with delivering a low birthweight baby; $p < 0.05$.

[3] This enrollee characteristic showed a statistically significant association with delivering a low birthweight baby; $p < 0.01$.

[4] This enrollee characteristic showed a statistically significant association with delivering a low birthweight baby; $p < 0.0001$.

[5] This enrollee characteristic approached a statistically significant association with delivering a low birthweight baby; $p < 0.1$.

Ref: referent; %: percentage.

Table A5: Multiple Logistic Regression Results: Odds of Not Receiving at Least One Early Postpartum Care Visit (7–84 Days After Delivery)

Characteristics	Odds Ratio	95% Confidence Interval	
Demographic characteristics			
Age group (Years) (Ref = < 25)			
25–39	0.987	0.749	1.302
40+[4]	2.104	0.897	4.936
Race (Ref = White)			
Black, non-Hispanic	0.886	0.592	1.326
American Indian/Alaska Native, non-Hispanic[3]	2.065	1.434	2.976
Asian American/Pacific Islander, non-Hispanic	0.582	0.257	1.321
Multiracial/unknown	0.956	0.252	3.632
Hispanic[1]	1.763	1.056	2.945
Area of residence (Ref = Neither in a maternity shortage or rural area)			
Maternity shortage area only	1.297	0.847	1.987
Rural residence only[2]	1.621	1.142	2.303
Both a maternity shortage and rural area[3]	1.768	1.277	2.448
Clinical characteristics			
Tobacco use (Ref = No)	1.218	0.830	1.785
Behavioral health condition (Ref = None)			
Serious mental illness only[2]	0.609	0.439	0.845
SUD or alcohol dependence	1.564	0.814	3.006
Both SMI and SUD or alcohol dependence	1.411	0.785	2.537
Overweight/obesity/excessive weight gain during pregnancy (Ref = No)			
Any high blood pressure (Ref = No)	1.170	0.713	1.921
Any diabetes (Ref = No)[1]	0.511	0.279	0.937
Healthcare utilization and delivery outcomes			
Timely prenatal care (Ref = No)[3]	0.495	0.382	0.642
Low birthweight (Ref = Not low birthweight)	0.834	0.510	1.363
Preterm delivery (Ref = Yes)	0.928	0.512	1.683
Cesarean birth (Ref = Vaginal birth)	0.964	0.722	1.288

[1] This enrollee characteristic showed a statistically significant association with not receiving at least one postpartum care visit; $p < 0.05$.

[2] This enrollee characteristic showed a statistically significant association with not receiving at least one postpartum care visit; $p < 0.01$.

[3] This enrollee characteristic showed a statistically significant association with not receiving at least one postpartum care visit; $p < 0.0001$.

[4] This enrollee characteristic approached a statistically significant association with not receiving at least one postpartum care visit; $p < 0.1$.

Ref: referent; %: percentage.