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Impact of Social Determinants of Health on Preterm Births among Black Women

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Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral study by

TaShara B. Coakley

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2025

Abstract

Impact of Social Determinants of Health on Preterm Births among Black Women

by

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MPH, Walden University, 2009

B.S., Central Michigan University, 2005

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

February 2025

Abstract

Reducing preterm birth (PTB) in Black women is a public health priority. The purpose of this quantitative, cross-sectional study was to analyze the association between selected Social Determinants of Health (SDoH) and PTB types, both spontaneous and provider-initiated in Black women using the SDoH framework. A logistic regression analysis used secondary data from the 2018 Natality Public Use File. In the adjusted models, higher paternal education, college degree or higher (OR = .791, 95% CI [.637, .982]) was associated with reduced odds of provider-initiated PTB. Fewer prenatal visits, seven to eleven visits OR = 2.301 (95% CI [2.034, 2.601]) and six or fewer visits OR = 4.706 (95% CI [4.070, 5.443]) were associated with increased odds of provider-initiated PTB. Prepregnancy diabetes OR = 4.135 (95% CI [3.105, 5.506]) and prepregnancy hypertension OR = 3.758 (95% CI [3.103, 4.552]) were associated with increased odds of provider-initiated PTB. Higher maternal and paternal education were associated with decreased odds of spontaneous PTB with an OR = 0.810 (95% CI [.716, .917]) for mothers with a college degree or higher compared to those with less than a high school education. Similarly, in fathers with a college degree compared to those with less than a high school education there was a decreased odds of spontaneous PTB, OR = .800 (95% CI [.712, .899]). Fewer prenatal care visits six or fewer, OR = 9.273 (95% CI [8.565, 10.040]), prepregnancy diabetes, OR = 3.243 (95% CI [2.649, 3.970]), and prepregnancy hypertension, OR = 2.409 (95% CI [2.106, 2.756]), were associated with increased odds of spontaneous PTB. To promote positive social change, prioritize prenatal care, SDoH, and include fathers in prenatal care to support maternal and infant health.

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Dedication

I want to dedicate this doctoral study to my family: my mother (Lue), father (Jarrett Jr.), sister (Teisha), brother and sister in love (Jarrett III and Tarlise), mother and father in love (Janice and Keith), sister in love (Shalanda), and my nieces and nephews. Thank you for always supporting my dream of being a doctor. Thanks to my church family and friends for the continued prayers as I went through this journey. A special dedication to my husband, Jermaine, you are my biggest supporter; thank you for going on this journey with me. To my two sons, Jermaine Jr. and Jeremiah. I appreciate your support and calling me a doctor to keep me encouraged. I know the long nights and sometimes missing family time were challenging but thank you for sticking it out for your mother. Finally, I thank my Lord and Savior, Jesus Christ, who kept me throughout this process; this would not have been possible without GOD.

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Section 1: Foundation of the Study and Literature Review

Introduction

Preterm birth (PTB) is the leading cause of infant morbidity and mortality in the United States (Richter et al., 2019). PTB causes issues for infants such as respiratory problems, developmental delay, cerebral palsy, and other adverse child health outcomes (Chawanpaiboon et al., 2019). According to the Centers for Disease Control and Prevention (CDC), in 2019, one of every 10 infants born in the United States were preterm (n.d.). In 2019, the rate of PTB among Black women (14.4%) was slightly higher than the rate of PTB among white or Hispanic women (9.3% and 10% respectively). Black women have a disproportionately higher rate of PTB, and the reasons for the disparity are not fully understood.

The risk factors for PTB are multifactorial, including biological, psychosocial, behavioral, and medical factors that may lead to early delivery (Bublitz et al., 2019). The research on PTB is often examined as one type; however, PTB has two clinical subtypes, spontaneous PTB and provider-initiated PTB, initiated by clinicians who use obstetric interventions such as labor induction or cesarean delivery (Richter et al., 2019). Reducing PTB in the United States is a national public health priority. Research focusing on the PTB risks associated with the PTB clinical subtypes could reduce the rate of PTB. Also, there is a need to understand the PTB disparity among Black women better. An important aspect to examine is the social determinants of health and its association with PTB.

The social determinants of health (SDoH) are “the conditions in the places where people live, learn, work, and play” that can affect health outcomes (Center for Disease

Control and Prevention [CDC], n.d.). In this quantitative study, I examined the association of SDoH with PTB type in Black women using the following: SDoH, education level, utilization of care, and chronic conditions interrelated with SDoH, namely prepregnancy diabetes and hypertension. There was a comparison of the association of the SDoH with PTB type to Black women with full-term birth.

Other studies have researched the association between social factors and PTB. However, PTB has been analyzed as one outcome and has not been examined by its subtypes, spontaneous and provider-initiated PTB. Lorch and Enlow's (2016) review of the SDoH and perinatal outcomes explained numerous mechanisms by which adverse pregnancy outcomes may occur. Still, no studies examine whether specific social determinants may influence the risk of the clinical subtypes of PTB, spontaneous or provider-initiated. The findings from the study could be applied to create upstream interventions to address social determinants of health associated with PTB type.

Problem Statement

Premature birth, also known as preterm birth (PTB), occurs when an infant is born too early before the 37th week of pregnancy is completed (Centers for Disease Control and Prevention [CDC], n.d.). The result of PTB includes adverse health and neurodevelopment outcomes. PTB is the leading cause of infant mortality in the United States and is a risk factor for other chronic diseases, learning disabilities, and cognitive and motor delays in children (Walker et al., 2023).

A national public health priority is to reduce PTB (CDC, n.d.). Also, a key focus in the United States is to reduce the racial/ethnic disparities in PTB (Thoma et al., 2019).

In 2019, the PTB rate increased; one in 10 babies was born prematurely in the United States (CDC, n.d.), and the PTB rate is even higher among racial and ethnic groups. In 2019, the preterm birth rate among Black women was significantly higher than non-Hispanic white women (CDC, n.d.).

There are two clinical subtypes of PTB: spontaneous by preterm labor, including preterm premature rupture of membranes (pPROM), and provider-initiated, by cesarean or labor induction due to a maternal or fetal indication (Chawanpaiboon et al., 2019). While spontaneous preterm labor may be difficult to predict, provider-initiated preterm labor, in most cases, can be prevented when potential maternal and fetal issues are identified early and properly treated to reduce the chances of the doctor having to induce labor early. In the research, the risk factors of preterm birth include biological, psychosocial, behavioral, and medical risk factors (Bublitz et al., 2019). When reviewing research on PTB, one outcome is primarily identified, meaning the clinical subtypes are grouped, and the associated risk factors are grouped as one without distinguishing if the risk factors occur more or less based on spontaneous or provider-initiated PTB.

Previous research has examined preterm birth as a combination of both clinical subtypes, spontaneous and provider-initiated. However, Yang et al. (2023) stated that the clinical subtypes have separate pathophysiologic processes, and preventive strategies likely differ between the spontaneous and provider-initiated PTB. In the United States, provider-initiated preterm birth, including labor induction and cesarean delivery without labor, contributes to about 30–40% of all preterm births (Richter et al., 2019). There is a

need to examine if the risk factors predict the type of PTB to develop interventions that respond to each type and reduce the rate of PTB.

A group of risk factors to examine are the social determinants of health. Research on PTB and the social determinant of health is becoming more prevalent; areas such as air pollution, homelessness, housing quality, and access to quality healthcare are examined for their association with PTB (Gupta & Froeb, 2020). Carmichael et al. (2017) analyzed the association of social disadvantage markers, education level, and insurance payer type with PTB. The study results found that PTB increases for Black women with a higher social disadvantage. However, the research focused on spontaneous and early to moderate preterm deliveries, and future studies should include provider-initiated PTB.

Despite the previous findings, there is a lack of understanding regarding the association of the social determinants of health and the likelihood of the preterm birth type. In this study, Black women were studied regarding the association between selected social determinants of health and the PTB type. The comparison group was Black women who gave birth full term. Any confounding variables need to be considered to properly understand the relationship between the social determinants of health and PTB type. The control variable in this study was age because it may affect the outcome of the analysis.

This study addressed the gap in the literature on whether specific social determinants may influence the risk of a type of birth outcome (Lorch & Enlow, 2016), namely spontaneous or provider-initiated PTB. There have not been any other research studies that address this specific gap. Therefore, this study could contribute to further research on the association between the social determinants of health and the clinical

subtypes of PTB. This study used secondary data from the 2018 Natality Public Use file to examine the association of select social determinants of health and the influence of those selected determinants on the type of PTB, spontaneous or provider-initiated, in Black women.

This study examined a demographic SDoH factor, a health access-related SDoH factor, and SDoH interrelated with chronic conditions. The demographic SDoH was the education level of the mother and father. The social determinants of education and healthcare access are markers of social disadvantage. Social disadvantage markers include education level, income, insurance type, and access to care (Blakeney et al., 2019). In previous research on PTB, maternal education has frequently been used to analyze its relationship to PTB. Research on adverse birth outcomes has highlighted that a lower education level increases the risk of PTB (Janaki & Prabakar, 2024; Thoma et al., 2019).

Maternal education also plays a role in the disparity of PTB. DeSisto et al. (2018) found that maternal education was significantly associated with the PTB disparity among U.S.-born Black women versus U.S.-born White women. In contrast, de Sadovsky et al.'s (2018) systematic review of the literature on socioeconomic factors and adverse birth outcomes found that education did not play a significant role in PTB except for black women. While maternal education is a known variable associated with PTB, the literature does not examine whether the education level is significant in the type of outcome, spontaneous or provider-initiated.

In addition to the maternal education level, examining the paternal education level and its relationship with PTB type was essential. Researchers often omit paternal factors when researching adverse birth outcomes. However, paternal factors are as significant as the mother's factors. Paternal factors are associated with adverse birth outcomes, including preterm birth, fetal growth restriction, and preeclampsia (Hill et al., 2024). Identifying the association of the father's education level to PTB type could be essential to developing interventions that include the father to improve maternal and child health.

The social determinant of health, access to care, refers to prenatal care utilization. When discussing maternal and infant health, prenatal care is essential for a healthy pregnancy, healthy delivery, and introduction to infant care. This study used prenatal care as a proxy for healthcare access. Prenatal care visits are essential during pregnancy as they provide regular check-ups for the mother and baby to promote a healthy pregnancy and delivery.

The American College of Obstetrics and Gynecology (ACOG) recommends the following for women with an uncomplicated pregnancy. Women should have one visit every four weeks for the first 28 weeks of pregnancy, followed by bi-weekly visits up to 36 weeks. After 36 weeks, weekly visits are advised. There are a few indices used to determine the adequacy of prenatal care. Based on the ACOG recommendations, the Adequacy of Prenatal Care Utilizations (APNCU) Index is a reputable tool for identifying prenatal care utilization. The APNCU index measures prenatal care based on initiation and adequacy of received services. Since prenatal care is recommended to improve health

outcomes for the mother and baby, it is a frequently used variable that is analyzed for adverse birth outcomes such as PTB.

Prenatal care visits are influential in determining if interventions need to be implemented, such as inducing early labor due to maternal and infant complications. Provider-initiated PTB occurs when the physician induces labor due to a medical reason that will benefit the mother, infant, or both. Unlike spontaneous PTB, policies are in place to prevent provider-initiated PTB if a medical or obstetric indication is not warranted. The American College of Obstetricians and Gynecologists discourages nonindicated delivery before 39 weeks of gestation in part because of the neonatal risk of late preterm birth, such as neurological, respiratory, infectious complications and an increased risk of neonatal death (“Medically Indicated Late-Preterm and Early-Term Deliveries,” 2021). Reducing provider-initiated PTB is possible through interventions that avoid non-medical induced labor (White & Newnham, 2019) and that promote prenatal care utilization. This study examined the association of prenatal care utilization and PTB type among adult Black women to understand if the number of prenatal care visits has a significant association with the PTB types in comparison to women who give birth full term.

Last, the study examined prepregnancy chronic conditions diabetes and hypertension interrelated with SDoH. Both chronic conditions are associated with SDoH factors such as socioeconomic status (SES), including education level, income, and employment. In addition, these chronic conditions relate to access to care, social context,

and neighborhood and physical environment (Hill-Briggs et al., 2020; Nakagomi et al., 2022). Having these conditions prior to conception is a risk for adverse birth outcomes.

This study examined each social determinant of health listed and its influence on PTB type in Black women compared to Black women who gave birth full-term. Examining these variables addressed the gap in the research on whether there is an association between the social determinants of health and PTB type, spontaneous, and provider-initiated while controlling for age.

Purpose of the Study

The purpose of this study was to analyze whether there is an association between education level, utilization of prenatal care, and prepregnancy chronic conditions diabetes and hypertension with PTB type among U.S. Black women compared to Black women who gave birth at full term while controlling for age. The PTB rate is higher for black women than for other racial/ethnic groups. Therefore, the study population was Black women to understand the prevalence of PTB in this population. The research study employed binary and multinomial regression analyses to determine whether the independent variables education level, utilization of prenatal care, and prepregnancy chronic conditions diabetes and hypertension positively influence the type of PTB, spontaneous and provider-initiated in Black women with full-term birth as the comparison group. The study control was age, a modifiable risk factor for preterm birth.

The findings of this study could be used in national policies that address infant and child health. One of the Healthy People 2030 objectives is to reduce preterm births due to the resulting health issues it may cause infants. PTB is one of the leading causes of

infant morbidity and mortality in the United States (Mensah et al., 2023), and according to the World Health Organization (WHO), complications of PTB are the leading cause of death in children younger than five years old globally (Chawanpaiboon et al., 2019). Therefore, this research study can aid health professionals in developing and implementing perinatal interventions that address the social determinants of health associated with PTB.

This study will contribute to research focusing on early programs, such as prenatal and preconception health programs. Results from the study can be used to develop targeted PTB interventions based on the social determinants of health that are significantly associated with the PTB clinical subtypes. The focus on the Black population is beneficial to public health practitioners who are working to understand this population's disproportionate rate of PTB. Health professionals can use this research study to address the health inequities present in the birth outcomes of Black women.

Research Questions and Hypotheses

Research question 1: Is there an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H₀1: There is no association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

H_{a1}: There is an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Research question 2: Is there an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H₀₂: There is no association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

H_{a2}: There is an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

Research question 3: Is there an association between prepregnancy chronic conditions diabetes and hypertension preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women that give birth at full term while controlling for age?

H₀₃: There is no association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

H_{a3}: There is an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Theoretical Foundation for the Study

This study's theoretical framework was the social determinants of health (SDoH). This study examined selected social determinants of health and their association with the PTB types in Black women. Social determinants of health are non-medical factors that influence health outcomes; it is defined by the conditions under which people are born, live, learn, work, play, worship, and age (U.S. Department of Health and Human Services [USDHHS] & Office of Disease Prevention and Health Promotion [ODPHP], n.d.). The SDoH framework has five domains: economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context.

In this study, there is a relationship between two of the five SDoH domains: education access and quality and healthcare access and quality. Maternal and paternal education level correlates with education access and quality. The SDoH framework posits that a higher education level most likely contributes to a healthier life (U.S. Department of Health and Human Services [USDHHS] & Office of Disease Prevention and Health Promotion [ODPHP], n.d.). Janaki and Prabakar (2024) stated that maternal education plays a role in the mother's awareness, understanding, and adoption of essential maternal healthcare practices. Also, paternal education plays a significant role in birth outcomes like preterm birth. There is a relationship between a lower paternal education level and higher odds of preterm birth (Li et al., 2021; Ekeke et al., 2021)

There is a relation with the prepregnancy chronic condition variables, diabetes, and hypertension with the SDoH domain healthcare access and quality. In this study,

these chronic conditions were examined based on their interrelatedness to SDoH and the association with PTB type in Black women. Applying the SDoH framework can provide multiple options for interventions geared toward addressing these chronic conditions before, during, and after pregnancy. Access to care would provide the mother with the necessary monitoring and management of these chronic conditions, which may result in improved birth outcomes.

In relation to PTB in Black women, the SDoH domain, healthcare access, and quality relate to access to care (utilization of prenatal care). Prenatal care visits are essential during pregnancy as they provide regular check-ups for the mother and baby to promote a healthy pregnancy and delivery. An area identified within prenatal care utilization is limited or lack of healthcare resources. Pregnant women who live in an area where prenatal care resources are limited may be discouraged from making any appointments and receiving the care needed for themselves and the infant. The March of Dimes 2020 report, *Nowhere to Go: Maternity Care Deserts*, noted that more than 2.2 million women of childbearing age live in maternity care deserts. Maternity care deserts are any county without a hospital or birth center offering obstetric care and without obstetric providers (March of Dimes, 2020). Due to maternity care deserts, it limits women's access to prenatal care, which can lead to poor birth outcomes.

The benefit of applying the SDoH framework to this research study is that the relationship of the domains to the independent variables provided insight into the types of interventions, programs, and policies that need to be developed to address the preterm birth types in Black women. The SDoH framework addressed the social factors that

significantly affect health outcomes. This study provided results on the social factors that influence the preterm birth types. The results can be used to develop multifactorial interventions that address the social and clinical risk factors of preterm birth, with a particular focus on the Black population to help reduce the preterm birth rate disparity.

Nature of the Study

The nature of this study was a quantitative, cross-sectional research design using binary logistic and multinomial regression analyses to understand the association of the social determinants of health on PTB type in Black women compared to women who delivered full-term. A cross-sectional research design was selected to examine the numerous independent variables and their impact on PTB type in Black women. The dependent variable was the clinical subtypes of preterm birth, spontaneous and provider-initiated, and full-term birth. The independent variables were SDoH factors that are demographic, health access-related, and interrelated with chronic conditions. The logistic regression researched the gap on whether the specific SDoH was associated with PTB type in Black women.

The data for this study were from the 2018 Natality Public Use File, obtained from the CDC's National Center for Health Statistics (NCHS). The 2018 Natality Public Use file contains birth certification data from all 50 states of the United States, the District of Columbia, and New York City. The U.S. Standard Certificate of Live Birth, also known as the birth certificate, contains data directly from the mother, such as race, Hispanic origin, and educational attainment (National Center for Health Statistics, 2018).

The study population was limited to Black women aged 18–44, who delivered singleton first births and were preterm (< 37 weeks of completed gestation) spontaneously and provider-initiated. Since the father’s education level was included as an independent variable, the study population only included fathers acknowledged as yes on the mother’s worksheet. The comparison group was Black women who had vaginal full-term birth (> 37+ weeks of completed gestation). The exclusion criteria were women not having a first birth, women who gave birth to multiples, and father acknowledgment was recorded as no, unknown, or missing.

Literature Search Strategy

The literature review includes research on preterm birth, Black women, and SDoH. The period of the literature search was between the years 2018–2024. The literature was found through multiple search engines and databases, including Thoreau’s multi-database health sciences database, including CINAHL, MEDLINE, and PubMed. I also searched using Google Scholar. Several keywords and a combination of words and phrases were used in the investigation. The main keywords and phrases used in the search were *preterm birth, premature birth, prematurity, preterm labor, preterm delivery, spontaneous preterm birth, induction of labor, African American women and/or Black women, United States, preterm birth and risk factors, social determinants of health, low socioeconomic status, social factors, and education.*

Literature Review Based on Key Variables/Key Concepts

Preterm Birth

The rate of preterm birth (PTB) in the United States continues to be a public health issue of great concern. As one of the leading causes of infant mortality and morbidity (Kenner et al., 2018), PTB is a measure of overall health in the U.S. (Engelhardt et al., 2018). At its current rate of 10.02% (Martin et al., 2019), the rate puts the U.S. very close to the latest 2014 World Health Organization estimated preterm birth rate of 10.6% (Chawanpaiboon et al., 2019). These data on PTB explain the continued research to understand the issue and decrease its effects on infant health.

PTB is defined as an infant born too early. According to WHO, preterm birth is defined as babies born alive before 37 weeks of pregnancy are completed (World Health Organization [WHO], 2018). There are three categories of preterm birth based on gestational age at birth identified in the International Classification of Disease-Ninth Revision: extremely preterm, <24- to 28-wk gestation, moderately preterm, 29- to 32-wk gestation, and late preterm, 33- to 36-wk gestation (Engelhardt et al., 2018). Also, there are two clinical types of PTB. PTB occurs either by spontaneous birth by preterm premature rupture of membranes (pPROM) or provider-indicated by labor induction or cesarean section due to maternal or infant health conditions (Wang et al., 2022; Yang et al., 2023). Despite the category or the clinical type, PTB results in several infant morbidities.

PTB complications can occur in any three categories, risking a newborn infant's life. Some common complications of PTB for infants are respiratory distress syndrome,

necrotizing enterocolitis, cerebral palsy, and intraventricular hemorrhage

(Chawanpaiboon et al., 2019; Pinto et al., 2019). The complications of PTB may appear during extreme, moderate, and late PTB. Pinto et al. (2019) identified that infants born in the moderately PTB category have higher mortality and short-term morbidity. It is essential to understand the complications associated with each category of PTB in order to research further how to reduce PTB and lessen the risk of these complications.

Risk Factors of Preterm Birth by the Onset of Labor Type

The risk factors of PTB vary and can include social, behavioral, clinical, and biological. There is a complexity in the risk factors of PTB due to its two clinical types. The two kinds of PTB regularly appear in research as one, and the risk factors associated with PTB are grouped. Therefore, each type must be examined to understand and address the risk factors. For instance, in Yang et al.'s (2023) research on spontaneous and medically indicated PTB in Black women in Philadelphia, the results of the research study found that younger patients had spontaneous PTB. Older patients and patients with obesity had medically indicated PTB. Identifying the risk factors more regularly associated with each subtype provides insight into interventions to reduce either preterm birth type, resulting in an overall decrease in infant mortality and morbidity caused by preterm birth.

When examining provider-initiated PTB, the risk factors may seem predictable compared to spontaneous PTB. Provider-initiated PTB through premature labor induction or cesarean delivery is warranted if certain maternal or fetal conditions are present, such as preeclampsia or fetal growth restriction (Wang et al., 2022). Although this guideline is

in place, provider-initiated PTB occurs in elective/non-medical situations. Bouchet et al. (2018) examined provider-initiated preterm birth based on the Gyamfi-Banneman set of evidence-based indications, including maternal or fetal conditions recommended by the American College of Obstetricians and Gynecologists. Based on the research, Bouchet et al. found that provider-initiated PTB was used more frequently for non-medical indications like elected cesarean sections.

In an analysis of the relationship between obstetrical interventions and PTB, MacDorman et al. (2022) found an increase in PTB during 2014–2019 due to the healthcare provider's induction of labor and cesareans with no labor. It is necessary to elect provider-initiated PTB in response to maternal or fetal complications. However, overusing provider-initiated PTB may result in other adverse outcomes for the mother and infant. In other trend analysis research studies of spontaneous and provider-initiated PTB, the trend was an increase in provider-initiated PTB.

A research study by Ma et al. (2020) on the trends of PTB for births in Shenzhen, China, showed a decrease in spontaneous PTB and an increase in medically indicated PTB. The overall preterm birth rate and spontaneous and medically indicated PTB were associated with maternal age, education level, parity, multiple pregnancies, prenatal care utilization, and infant gender. Mensah et al. (2023) found similar results in their trend analysis study of preterm birth and the clinical subtypes between 2009 and 2020 in the United States by race and ethnicity. The results showed an overall decrease in PTB during the period, mainly due to a decrease in spontaneous PTB, primarily seen among non-Hispanic white women. There was no decrease in overall PTB in non-Hispanic

Black women. Mensah et al. (2023) found that there was a rise in iatrogenic PTB, defined as PTB, from indications of maternal and/or fetal complications. The increased rate of iatrogenic PTB rate was due to women with maternal chronic conditions. The trend analysis research reveals that the clinical subtypes of PTB can vary, mainly due to race and socioeconomic factors.

Racial Disparity in Preterm Birth

Black Women's Association with Preterm Birth

The racial disparity that exists in preterm birth is not fully understood. A recurring factor analyzed within the racial disparity is the socioeconomic disadvantage at the individual and neighborhood level (Carmichael et al., 2017; DeSisto et al., 2018). The racial disparity in PTB focuses on Black women compared to White women. Manuck (2017) identified in an extensive systematic review of 30 studies that black women have a 2-fold increased PTB risk compared to whites. The rate of PTB in 2015 was 13.4% of all Black births compared to 8.8% of non-Latino white births (Dorner et al., 2017). There is a disproportionate gap in the PTB rate for Black women, and social factors play a role in the disadvantage present in Black women.

Preterm Birth and the Social Determinants of Health

The mother's physical health and social and physical environment affect an unborn infant's health. The social and physical environment that can impact the mothers' and infants' health is called the Social Determinants of Health (SDoH). The SDoH is defined as "the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life

outcomes and risks” (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). As in the definition, SDoH can affect a wide range of health. In this case, PTB is a health issue that can be affected by the components of the SDoH.

The SDOH comprises different social and physical factors involved in everyday living. The five domains of the SDOH are economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). The poor quality or lack of the SDoH factors contributes to the many health disparities present in health status within countries (Centers for Disease Control and Prevention [CDC], n.d.; U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). The most frequent SDoH factors associated with PTB are socioeconomic status (e.g., education and income), stress, access, and healthcare quality (de Andrade et al., 2022).

A childbearing woman’s socioeconomic status (SES), whether high or low, contributes to birth outcomes. Socioeconomic status is determined by a family’s income level, education, or occupational status (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). Research on socioeconomic status and birth outcomes reveals some associations, which in most cases result in poor outcomes for women in a low socioeconomic position. For example, Farrant et al. (2019) found that women in Western Australia in the most disadvantaged socioeconomic status quintile had a significant risk factor for spontaneous and preterm pre-labor rupture of

membranes at extreme birth. Also, Amjad et al. (2019) found that adolescent mothers' in the lowest income quintiles were reported to have a higher incidence of obstetric complications.

Education level is one measure of socioeconomic status as it forms an individual's future career and earning potential. Concerning health, Healthy People 2030 informs that people with higher education are more likely to be healthier and live longer (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). Research on health and education has shown that less educated people "report worse general health, more chronic conditions, and more functional limitations and disabilities" (Zajacova & Lawrence, 2018, p. 275). Higher education allows access to health resources and a better understanding of following health recommendations.

Education level is frequently studied as a risk factor when reviewing birth outcomes like PTB. For the mother, research has shown that education level is a notable contributor to PTB, particularly in Black women (Thoma et al., 2019). In addition, the research has shown that Black women with an education level below the high school level are associated with increased odds of PTB (Su et al., 2021). In addition to the mother's education level, research has shown that the father's education level may also be associated with PTB. Meng and Groth (2018) state that less attention is spent on paternal factors contributing to adverse birth outcomes. Their research studied paternal aspects of age, race/ethnicity, and educational attainment with the association of high birth weight infants, PTB, low birth weight, and small for gestational age in primiparous women. Meng and Groth found that fathers with less than a high school education had a

significantly higher PTB risk. Shapiro et al. (2017) conducted similar research for fathers in Canada and found a dose-response relationship between paternal education and PTB. There was an elevated risk for PTB for fathers who had not graduated high school. Shapiro et al. (2017) stated that the dose-response of paternal education was more strongly related to early PTB, commonly spontaneous, than late PTB. Although paternal education and PTB association are present, there remains a gap in whether the SDoH of paternal education influences the type of PTB risk.

Another SDoH factor associated with PTB is access to healthcare. In maternal health, prenatal care measures access to healthcare. Prenatal care is vital to more favorable pregnancy outcomes. The regular visits associated with prenatal care monitor the pregnancy through routine tests and assist with early detection and timely treatment of risk factors that could result in complications for the mother and infant (Melo et al., 2015).

Prenatal care is essential; therefore, measurement is utilized to determine if pregnant women are receiving adequate visits. The Adequacy of Prenatal Care Utilization Index (APNCU) is a tool used to indicate prenatal care utilization based on the adequacy of prenatal care initiation and adequacy of received services (Kotelchuck, 1994). By utilizing the American College of Obstetricians and Gynecologists (ACOG) recommendations of one visit per month through 28 weeks gestation, one visit every two weeks through 36 weeks gestation, and one visit per week, the APNCU uses a ratio of observed to expected visits. APNCU is grouped into Inadequate (less than 50% of expected visits), Intermediate (50%-79%), Adequate (80%-109%), and Adequate Plus

(≥110%) (Kotelchuck, 1994). According to the March of Dimes (2020), evidence has shown that adequate prenatal care starting in the first trimester can decrease the presence of adverse birth outcomes. For Black women, the barriers of the SDoH, like SES, contribute to access to care, including vital prenatal care.

SDoH, Chronic Conditions, and PTB

It is not unlikely for pregnant women to have prepregnancy chronic conditions such as diabetes and hypertension, especially for Black women, as these conditions are more prevalent for them than for white women (Britton et al., 2018). Both of these chronic conditions increase the risk of adverse birth outcomes. Hypertension increases the risk for PTB, low birth weight, perinatal mortality, and pre-eclampsia. Diabetes before pregnancy has shown that elevated blood glucose increases the risk for congenital anomalies, pre-eclampsia, and other risks for obesity and type 2 diabetes for the infant later in life (Britton et al., 2018). Chronic conditions such as diabetes and hypertension have an association with the social factors of SDoH. These chronic conditions' prevention, diagnosis, and treatment are interrelated with an individual's social and physical environment.

Socioeconomic status (SES), including education, income, and employment status, strongly predicts disease onset and progression, including diabetes (Hill-Briggs et al., 2020). The SES constructs contribute to other social factors that result in disease progression. For example, limited access to affordable and quality healthcare results in poor management of diabetes or may even be the cause for the disease being undiagnosed. For individuals that do not have health insurance, they are more likely to

have undiagnosed diabetes than those with insurance. In addition, those without insurance have fewer doctor visits, less medication, and are prone to more emergency department visits (Hill-Briggs et al., 2020). The association of the SDoH with hypertension is very similar.

The SES constructs that contribute to the risk of diabetes also contribute to hypertension. In Nakagomi et al.'s (2022) literature review of the social determinants of hypertension in high-income countries, the research showed that lower educational attainment and lower income were associated with an increased prevalence of hypertension. Both chronic conditions are associated with PTB, but the present research does not identify whether the association is more significant for the PTB types.

PTB, Racial/Ethnic Disparity and SDoH

The SDoH is researched as an underlying cause of PTB for Black women disadvantaged in their social and physical environment. In most cases, the more disadvantaged the group, the more likely the risk of PTB increases. For example, Thoma et al. (2019) found that sociodemographic factors, maternal education, marital status, paternity acknowledgment, and source of delivery payment were the significant contributors to a higher rate of PTB among Black women compared to white women. On the contrary, de Sadovsky et al. (2018) found that income and education were not the most critical factors contributing to PTB. de Sadovsky et al. (2018) stated that being black was positively associated with poor neonatal outcomes, especially PTB. Knowing that being black contributes to PTB, it is vital to understand the SDOH contribution and racial disparity.

The disproportionate rate of PTB continues to exist even in instances when the SDoH is equal among races. Carmichael et al. (2017) conducted an impact analysis to determine how the PTB disparity would change if social factors were equal for blacks and whites. Carmichael found that when education, insurance type, and poverty level were “favorable,” there was a decrease in PTB for black women. However, the black-white disparity remained high compared to analyzing the values separately (Carmichael et al., 2017). Carmichael’s results were for spontaneous PTB, with no indication of if the higher rate of PTB would occur when PTB is medically indicated.

In most instances, spontaneous and medically indicated PTB are studied as one type; therefore, a gap exists in the literature on whether specific SDoH influences the outcome of PTB, spontaneous or provider-initiated. Some common medical causes of spontaneous PTB include infection, incompetent cervix, and inflammation (Richter et al., 2019). Some common medical causes of provider-initiated PTB include preeclampsia/eclampsia and severe intrauterine growth restriction (Richter et al., 2019), which are resolved through obstetric interventions such as labor induction or cesarean delivery (Richter et al., 2019). Although medically indicated PTB is justified in occurring due to maternal or fetal complications, the rise of PTB could be the result of the increase in obstetric interventions performed when it is non-medically indicated for the mother and infant.

Literature Review Summary

Based on the literature review, there is a gap between the association of SDoH and its influence on PTB type in Black women, compared to women who give birth full-

term. The literature presented research studies examining the clinical subtypes of PTB. Analyzing PTB as one type does not provide data on whether the SDoH influences the risk of spontaneous and provider-initiated PTB. In this study, I examined the gap in the literature, and the results may provide health professionals with data on the associations of SDoH with the PTB types. Based on the results from the study, health professionals can develop early maternal programs, interventions, and policies that address SDoH associated with the PTB types.

Most of the studies in the literature review indicated a black-white PTB disparity. In the United States, Black women have a disproportionately higher rate of PTB than other races/ethnicities. The social determinants of health could significantly influence the black-white disparity in PTB. Since the study population was Black women, the results could be helpful in interventions and programs developed to reduce the racial gap in PTB. Also, the results can shift the focus from downstream interventions for maternal and child health to upstream, addressing the SDoH before conception.

Definitions

Access to care: An individual's ability to obtain health insurance, local care options, and a usual source of care. Access to care allows individuals to find care easily, pay for care, and meet their health needs— (University of Wisconsin Population Health Institute, 2021).

Adequacy of Prenatal Care Utilization Index (APNCU): The index characterizes prenatal care utilization into two independent dimensions: adequacy of initiation of prenatal care and adequacy of received services (Kotelchuck, 1994).

Chronic condition: a long-lasting health condition or disease. Most chronic conditions need ongoing medical interventions and limit an individual's daily activities. (Campbell, 2023)

Education level: the number of years of school completed by an individual, commonly measured as less than a high school education level (i.e., less than 12 years of school) or high school degree and education beyond high school (i.e., some college, and/or college-level degree) (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion [ODPHP], n.d.).

Prenatal care: a series of check-ups between a healthcare provider and a pregnant woman at scheduled times between pregnancy confirmation and labor initiation (Rowe et al., 2020).

Preterm birth: Preterm is defined as babies born alive before 37 weeks of pregnancy are completed (World Health Organization [WHO], 2018).

Provider-initiated preterm birth: Induction of labor or pre-labor cesarean delivery occurring due to maternal and/or fetal indication (Wang et al., 2022)

Social determinants of health (SDOH): the conditions in the places where people live, learn, work, and play that affect a wide range of health risks and outcomes (Centers for Disease Control and Prevention [CDC], n.d.).

Socioeconomic Status: Socioeconomic status can be determined by several factors, including income level, occupational status, and education level (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.).

Spontaneous preterm birth (sPTB): Spontaneous after the onset of spontaneous preterm labor or preterm premature rupture of membranes (pPROM) (Richter et al., 2019; Wang et al., 2022).

Assumptions

It was assumed that the data collected on the birth certificate from each state was accurate, and each state's reporting data followed the standards developed by the NCHS. Also, it was assumed that the secondary data would provide the appropriate sample size to examine the variables of the research question.

Scope and Delimitations

The scope of this study was descriptive. A cross-sectional research design was selected for this study because it allows the data to make statistical inferences about the Black population and the relationship between SDoH and its influence on the type of PTB. The scope was limited to Black women to examine the higher rate of PTB in the Black population versus other races/ethnicities. Compared to full-term delivery, the SDoH and its association with PTB type were analyzed separately and collectively using binary and multinomial regression.

Since the natality file is a population-based database and the study was limited to Black women, the results can be generalizable to larger Black populations. The use of secondary data from the NCHS means there was no collection of primary data or contact with the participants in the study.

Significance of the Study

This study examined the association between the social determinants of health and PTB type in Black women, compared to Black women with full-term delivery, while controlling for age. The analysis was performed using the Natality Public Use file, the information collected on the birth certificate, and a worksheet reporting data on the birth mother and birth father. It is critical to identify PTB types as both types are preventable through early interventions.

This study contributes to positive social change by providing public health professionals with data to support the need to identify the SDoH that may influence the birth outcomes for the mother and infant. In addition, the results can be utilized to address the health inequities that exist in maternal and infant health among Black women compared to other races and ethnicities in the United States. A concentrated focus on the social factors that prevent Black women from carrying their infant to term could help alleviate the high rate of PTB.

The data from this study could aid health professionals with system and policy-level interventions centered on antenatal and perinatal health. Also, this study could help understand the importance of including the father in prenatal care. The data could be used in developing interventions that incorporate the father's support toward the mother and infants' health.

Summary

In this study section, I reviewed the literature on the SDoH and its association with PTB. Most researchers analyzed the clinical subtypes of PTB, spontaneous and

provider-initiated, as one variable. I identified a gap in the literature. There was a lack of research on whether specific social determinants may influence the type of PTB (Lorch & Enlow, 2016), spontaneous and provider-initiated, among Black women. The literature presents information on U.S.-born Black women. Black women have a disproportionately higher PTB rate than other races and ethnicities. I chose the SDoH as the theoretical framework, which includes the nonmedical factors that influence health and underlines how these factors need to be addressed to improve health outcomes. The SDoH in this study are being examined as influences on PTB type in Black women. Finally, I explained how secondary data from the Natality Public Use File, which reports live births in the United States, will address the study's research questions.

Section 2: Research Design and Data Collection

Introduction

In the first section, I provided a review of the literature on the clinical subtypes of PTB and the social determinants of health and how they play a role in PTB in Black women. In the literature review, I discussed that Black women have a disproportionately higher rate of PTB and are more likely to have poor SDoH than other races/ethnicities. There is no research on whether specific social determinants influence the risk of an adverse birth outcome, such as PTB type, spontaneous, or provider-initiated in Black women, while controlling for age. I used data from the NVSS, a compilation of data from the NCHS and the United States of statistical information from birth certificates to analyze pregnant Black women. This study section discusses the research design and rationale, including population, sampling and sampling procedures, instrumentation and operationalization of constructs, and data analysis plan. Also, this section discusses threats to validity and ethical procedures.

Research Design and Rationale

The research design was a quantitative, cross-sectional design to examine whether there is an association between SDoH and PTB type in black women. The SDoH independent variables were maternal and paternal education level, prenatal care utilization, prepregnancy chronic conditions, diabetes, and hypertension. The dependent variable was the clinical subtypes of preterm birth, spontaneous, provider-initiated, and full-term birth. The data source was secondary data from the U.S. birth data file compiled by the NCHS and the states to analyze the relationship between the SDoH and its

influence on PTB type in black women. The data file contains all the variables. The variable utilization of prenatal care was determined by the number of prenatal care visits collected on the data file. The prepregnancy chronic conditions were self-reported on the mother's worksheet as yes/no for having the conditions.

I used a cross-sectional design because the design is used to identify patterns and prevalence of an outcome within a population at a given time point (Cummings, 2017). The statistical methods used for analyzing the data were binary and multinomial logistic regression. The primary statistical method used was binary logistic regression. Binary logistic regression was selected because, first, previous research has utilized this statistical method in studies of PTB and its association with SDoH. Second, the dependent variable was dichotomous. The dependent variable was transformed into a dichotomous variable to compare the PTB types to full-term birth separately in the analysis with the independent variables. The dependent variables were provider-initiated PTB, full-term birth, and spontaneous PTB and full-term birth. Third, there was more than one independent variable, and the independent variables were nominal. Last, logistic regression tests associations or relationships between variables (Egerton, 2018). The statistical method selected was appropriate in determining whether the SDoH influences the type of PTB, spontaneous or provided-initiated, in black women compared to full-term births.

The research questions for this quantitative, cross-sectional design study were inferential. For the research questions, I used binary logistic regression analysis to determine the association between the SDoH and PTB type in Black women, compared to

full-term birth, while controlling for age. Since NCHS collected the data for statistical information from birth certificates, there was no time restriction regarding the design and data collection.

Methodology

Population

The population included births that were registered in the United States in 2018. The target population for this study comprised black women ages 18–44 years old in the United States who delivered singleton first births in 2018. It is also important to note that since the paternal education level was being analyzed, paternity acknowledged as “no” and “unknown” was extracted from the population. The population selection of mothers’ with singleton and first births was selected to isolate the analysis of SDoH and the PTB types, excluding known risk factors of PTB. Mothers with multiple births and parity may affect the current analysis. Other research on adverse birth outcomes has excluded mothers’ with parity and previous PTB because of the increased risk of adverse outcomes among these women (Su et al., 2021; Li et al., 2021).

The data were available through the CDC’s National Vital Statistics System (NVSS), which requires birth certificates to be completed for all births in the United States (Centers for Disease Control and Prevention [CDC], 2021). According to the codebook, there were 3,791,712 births registered in the United States in 2018. There were 552,029 births to Black women.

Sampling and Sampling Procedures

Sampling frame. The 2018 Natality file contained data on 3,791,712 births in the United States. The sampling frame includes women (a) ages 10 to 64 years old, (b) all races and Hispanic origin and reporting of five race categories either alone or in combination for each parent (Martin et al., 2019), (c) from the United States which includes the 50 states (including New York City) and the District of Columbia. The data for all births are collected in each state by law. Federal law requires national collection and publication of births and other vital statistics (Centers for Disease Control and Prevention [CDC], 2021). The sampling frame consisted of women giving birth in all 50 states, D.C., the independent registration area of New York City, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. In the 2018 Natality data file, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands are excluded from the data. The data file included births in the U.S. that occurred to U.S. residents and nonresidents (National Center for Health Statistics, 2018).

Data accessibility and permissions. The 2018 Natality file is a public-use file obtained from the CDC's website. Before the data were downloaded for public use, a data user agreement was read that reviewed the terms and conditions for utilizing the Natality file. The data included the information collected on the birth certificate and two worksheets, the Mother's Worksheet and the Facility Worksheet. The two worksheets were developed to improve data quality, collection, and transmission speed and enhance standardization (National Center for Health Statistics, 2018).

Power analysis. Based on the power analysis, the required sample size for the logistic regression was 4,386. The sample size calculation was conducted using the G*Power calculator for logistic regression analysis. The power level of 0.95 and alpha .05 were consistent with previous literature that utilized the U.S. Natality public-use data file (see Tabet et al., 2017). The power calculation (4,386) was below the actual sample size of 81,995; therefore, the sample size in the data set was sufficient for completing the logistic regression analysis with reduced Type I and Type II errors.

Instrumentation and Operationalization of Constructs

The data for this study were from the United States 2018 Natality Public Use data file published by the CDC's National Center for Health Statistics (NCHS). In the United States, state law requires birth certificates for all births, and Federal law requires national collection and publication (Centers for Disease Control and Prevention [CDC], 2021). The Natality Public Use data file contains data from the U.S. Standard Certificate of Live Birth, also known as the birth certificate. The birth certificate includes the Mother's Worksheet and the Facility Worksheet, ensuring the data file contains information for national use.

The Mother's Worksheet includes data directly from the mother, such as race, Hispanic origin, and educational attainment (National Center for Health Statistics, 2018). The mother worksheet also collects information on the father, including race, age, and education level. The facility worksheet contains the medical data of the mother and infant, such as the date of the first prenatal care visit, pregnancy risk factors, and delivery method (National Center for Health Statistics, 2018).

For this study, the variables used from the 2018 Natality Public Use data file included race, age, paternity acknowledgment, educational attainment of mother and father, live birth order, and parity. The live birth order indicates what number the present birth represents, and parity indicates how many live births the mother has had. Additional variables included the total number of prenatal visits, labor and delivery characteristics, and risk factors in pregnancy – diabetes and hypertension. The variables related to the infant included the period of gestation –the variable that identifies the infant as preterm or not, and plurality classifies single, twin, triplet, and higher-order births.

Operationalization of variables. In table 1, the variables in this analysis are listed. The dependent variable, delivery type, comprised spontaneous PTB, provider-initiated PTB, and full-term delivery. Full-term was included as the comparison group. PTB was identified using the induction of labor variable, a dichotomous (yes or no) measurement. A “yes” response to labor induction classifies the birth as provider-initiated PTB, and a “no” response classifies the birth as spontaneous PTB. The classification of spontaneous PTB and provider-initiated PTB is consistent with previous research (MacDorman et al., 2022) that similarly identified this variable. PTB is specified using the gestation variable, coded as a binomial measurement (0 = under 37 weeks, 1 = 37 weeks and over). Each variable was recoded correctly to create the nominal variable delivery type. The independent variables were nominal and ordinal.

Table 1*Operational Definitions of Variables*

Variable	Type of Measurement	Definition	Data Values/Units
Age (control)	Ordinal	Age of mother at the time of delivery	1=18-22 years 2=23-34 years 3=35-44 years
Delivery type (Dependent)	Nominal	Identifies the delivery, spontaneous preterm birth, provider-initiated preterm birth, or full-term birth	0= Spontaneous preterm birth 1= Provider-initiated preterm birth 2= Full term birth
Prepregnancy Diabetes (Independent)	Nominal	Diagnosis of diabetes before pregnancy	0= Yes 1= No
Prepregnancy Hypertension (Independent)	Nominal	Diagnosis of hypertension before pregnancy	0= Yes 1= No
Mother and Father Education Level (Independent)	Ordinal	The highest degree of level of school completed at the time of delivery	1= Less than high school education 2= High-school diploma or GED 3= Some college 4= College degree or higher
Prenatal visits (Independent)	Ordinal	Total number of prenatal visits	1= 12 or more visits 2= 7-11 visits 3= 6 or fewer visits
Induction of Labor (<i>spontaneous or provider-initiated</i>)	Binary	Identifies if labor was natural or induced by medical means	0= No (spontaneous) 1= Yes (provider-initiated)
Delivery method	Nominal	Identifies how the baby was delivered	1= Vaginal 2= C-section
Plurality	Nominal	Number of babies born in a single delivery	0= Single 1= More than 1
Gestation	Nominal	Number of weeks based on last regular menses	1= Under 37 weeks 2= 37 weeks and over
Live Birth Order	Interval	Indicates what number the present birth represents	1-7 Number of live birth order
Race/Ethnicity	Nominal	Race/ethnicity of mother	1=Black 2=Other

Data Analysis Plan

The 2018 Natality Public Use file data was uploaded to the Statistical Program for Social Sciences (SPSS) version 28 to analyze the hypotheses. I used descriptive statistics to describe the targeted population of this study. The primary statistical method was binary logistic regression, and the secondary method was multinomial logistic regression, which was used to analyze the association between the social determinants of health and the risk of the type of PTB.

Data Cleaning Procedures. For this study, the data came from the 2018 natality public-use data file containing birth data from the United States. The variables from the hypothesis were recoded using the SPSS software. The statistical test chosen to test the hypotheses includes descriptive statistics of the population utilizing frequency, binary, and multinomial logistic regression to test the association between the independent and dependent variables.

Research Questions and Hypotheses

Research question 1: Is there an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H01: There is no association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha1: There is an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Research question 2: Is there an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H02: There is no association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha2: There is an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

Research question 3: Is there an association between prepregnancy chronic conditions diabetes and hypertension preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women that give birth at full term while controlling for age?

H03: There is no association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha3: There is an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Statistical Analysis Plan

For the research questions, I conducted a binary and multinomial logistic regression analysis of the independent and dependent variables for the study population.

Binary Logistic Regression. Logistic regression is a statistical analysis that tests the association between variables. In research, logistic regression is used to predict whether the value of one variable or several combined variables can predict another variable's value. I used binary logistic regression in this study because I created a binominal dependent variable associated with more than one independent variable. The dependent variable in this study was nominal and had three categories: spontaneous PTB, provider-initiated PTB, and full-term birth. The dependent variable was transformed into two binomial variables: provider-initiated PTB and full-term birth and spontaneous PTB and full-term birth. The purpose of transforming the variable into binomial variables was to examine the PTB types with the independent variables compared to those with full-term birth. The independent variables were nominal and ordinal. I tested the association between maternal and paternal education level, utilization of prenatal care, prepregnancy chronic conditions, diabetes, and hypertension with PTB type in Black women. The control variable was age, and the comparison group was Black women who gave birth at full term.

I reported each research question's crude and adjusted odds ratio (OR). The odds ratio value shows how the changes in the independent variable affect the odds of the dependent variable occurring after controlling for other variables in the model. A 95%

confidence interval (CI) was reported with lower and upper bounds, providing estimated precision of the OR.

Rationale for Covariate Inclusion

The inclusion of age was because of the confounding factor with preterm birth. Confounding occurs when a third variable interferes with the causal relationship between the independent and dependent variables. Three criteria must be met for a variable to be a confounder:

1. The variable must be statistically associated with the risk factor.
2. The variable must be associated with the outcome.
3. The variable must not be on a causal pathway (Bovbjerg, 2020).

In this study, age met all three of the criteria for confounding. Age is a variable that is disproportionately distributed among the independent variables, such as education level, prenatal care utilization, and chronic conditions during prepregnancy. Next, previous research has shown that age has an association with preterm birth. Last, age is not an intermediary step in the causal pathway between the independent variables in this study and the association with the preterm birth clinical subtypes. The variables education level, prenatal care visits, and prepregnancy chronic conditions do not cause age, which would then lead to the preterm birth types, spontaneous or provider-initiated. By including this covariate, there was greater precision in estimates of the association between the dependent variable and independent variables (Ruppel, 2018).

Interpretation of Results

Logistic regression was used to predict the probability of spontaneous PTB or provider-initiated PTB, compared to full-term births, based on its association with the independent variables' maternal and paternal educational level, utilization of prenatal care, and prepregnancy chronic conditions diabetes, and hypertension. The odds ratio (OR), 95% confidence interval (CI), and significance were used to determine whether to reject the null hypothesis or fail to reject the null hypothesis. The p-value selected was $p < .05$ to signify the statistical significance of an odds ratio. The OR is the exponential of the β value, and the further away the β value is from 1.0, the stronger the association between the dependent and independent variables. The CI is a range of values that includes a population parameter. If the CI includes the number 1, it indicates that there is not a statistically significant difference in the odds of the dependent variable occurring.

Research question 1: Is there an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H01: There is no association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha1: There is an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Statistical plan: The independent variables were maternal and paternal education levels. The dependent variable was transformed into the PTB types separately with full-term birth, provider-initiated PTB, full-term birth, and spontaneous PTB and full-term birth. The statistical test was binary logistic regression. The control variable was age. The crude and adjusted odds ratios are reported for each PTB type. The null hypothesis was rejected if $p < .05$.

Research question 2: Is there an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H02: There is no association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha2: There is an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

Statistical plan: The independent variable was the number of prenatal care visits. The dependent variable was transformed into the PTB types separately with full-term birth, provider-initiated PTB, full-term birth, and spontaneous PTB and full-term birth. The statistical test was binary logistic regression. The control variable was age. Also, if any of the independent variables in Research Question 1 were significant, those variables were held constant in Research Question 2. The crude and adjusted odds ratios were reported for each PTB type. The null hypothesis was rejected if $p < .05$.

Research question 3: Is there an association between prepregnancy chronic conditions diabetes and hypertension preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women that give birth at full term while controlling for age?

H03: There is no association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha3: There is an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Statistical plan: The independent variables were prepregnancy diabetes and hypertension. The dependent variable was transformed into the PTB types separately with full-term birth, provider-initiated PTB, full-term birth, and spontaneous PTB and full-term birth. The statistical test was binary logistic regression. The control variable was age. Also, if any independent variables in research questions 1 and 2 were significant, those variables were held constant in research question 3. The crude and adjusted odds ratios were reported for each PTB type. The null hypothesis was rejected if $p < .05$.

Secondary Statistical Analysis

The secondary analysis in this study was multinomial logistic regression. The dependent variable did not have to be transformed in the multinomial. The dependent variable can have more than two categories in multinomial logistic regression. The dependent variable in this study was nominal and had three categories: spontaneous PTB,

provider-initiated PTB, and full-term birth. The independent variables were nominal and ordinal. The association between maternal and paternal education level, prenatal care utilization, and prepregnancy chronic conditions diabetes and hypertension with PTB type in Black women was tested. The control variable was age, and the comparison group was Black women who gave birth at full term. The adjusted odds ratio (OR) was reported for each research question. The null hypothesis was rejected if $p < .05$.

Threats to Validity

The data selected to analyze the research questions in this study were from the United States 2018 Natality Public Use data file published by the CDC's National Center for Health Statistics (NCHS). The data in this research were a secondary data source. However, there could be threats to the validity of the data source and the data analysis. Two types of threats to validity could occur in the research: an external and internal threat to validity. External validity is whether research findings can be generalized from one population to another (Mitchell, 2018; Ruel et al., 2018).

There is a potential threat to external validity. The population in this study is Black women from the United States. All other races were extracted from the data file. The findings from this study cannot be generalized to another population. The other threat to validity is internal validity. Internal validity refers to the claims that the measured data will show a cause-and-effect relationship between the independent and dependent variables (Daily, 2018; Ruel et al., 2018).

This study's threat to internal validity was minimal because of the data used in the analysis. The data in the birth file is from the U.S. birth certificates, which is required by

federal law to be completed for all births in the U.S. Since the data is collected on all births, there is a limited chance of selection bias in this research study because there was not a random assignment of the population to any groups, the groups were determined based on the data reported. Another threat of validity is statistical conclusion validity, which is the reliability of the statistical analysis conducted on the relationship between the two variables in the research. The two types of statistical conclusion validity are Type I and Type II errors. A Type I error occurs when the test concludes there is a relationship, the null hypothesis is rejected, but there is no relationship between the variables. A Type II error is failing to reject the null hypothesis when it is true. The following was considered to address the validity of the statistical conclusion in this research study: using adequate sample size, setting the statistical significance at a .05 level, and controlling for known variables associated with the dependent variable.

Ethical Procedures

This study used secondary data from the 2018 Natality Public Use File. The file contains data from birth certificates for every baby born in the U.S. The Natality Public Use file is publicly available for download through the CDC. A data user agreement on the National Center for Health Statistics web page requests that the data be used only for statistical reporting and analysis. The agreement explains that the identity of individuals cannot be disclosed, and all direct identifiers that could lead to identification are removed from the data set.

During the approval process of the proposal, I applied to Walden University Institutional Review Board (IRB) to receive approval for dataset access to conduct this study. I saved the data to a password-protected flash drive that I could access only.

Summary

In this section, I discussed the study's research design, methodology, and data analysis plan. The research design was a quantitative, cross-sectional design, using secondary data to analyze the association between the dependent variable (delivery type) and the independent variables (education level, utilization of prenatal care, and prepregnancy chronic conditions diabetes and hypertension). The study population was U.S. Black women ages 18 – 44 years old in the United States who delivered singleton first births. The secondary data source came from the 2018 Natality Public Use data file – which contains information collected on the birth certificate and worksheet of reporting data on the birth mother and birth father. A binary and multinomial logistic regression was used to analyze the association between the dependent and independent variables (education level, utilization of prenatal care visits, prepregnancy chronic conditions, diabetes, and hypertension). The control variable age was included in the inferential research questions. The following section presents the results and findings of the research questions and hypotheses.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative cross-sectional study was to examine whether education level, utilization of prenatal care, and prepregnancy chronic conditions diabetes and hypertension influenced preterm birth (PTB) types in Black women, compared to Black women with full-term birth while controlling for age. The 2018 Natality Public Use file, obtained from the CDC's National Center for Health Statistics (NCHS), was the data set used for the study. The research questions in this study were answered using binary logistic regression as the primary statistical analysis and multinomial logistic regression as the secondary analysis. This section presents the data analysis results for the research questions. I also discuss the statistical analysis results using logistic regression and summarize the results.

Data Collection of Secondary Data Set

The data for this quantitative, cross-sectional study were obtained from the 2018 Natality Public Use File from the CDC's NCHS. The law in the United States requires a birth certificate to be completed for all births. Also, federal law mandates the collection and publication of births and other vital statistics (CDC, 2021). The 2018 Natality Public Use file consisted of 3,791,712 births registered. The data set was filtered to the target population (Black women), resulting in 552,630 births.

Data and Variable Derivation

The sample population was limited to Black women aged 18–44 who delivered singleton first births because previous preterm births and multiple births are risk factors for preterm birth. Also, the population was narrowed by the presence of paternity

acknowledgment. The final sample size consisted of 81,995 individuals. The analysis was completed and presented using two separate models to compare full-term birth to the two types of PTB. The dependent variable was classified as provider-initiated PTB, full-term birth, and spontaneous PTB and full-term birth. The obstetric variable, coded as under 37 weeks and 37 weeks and over, was used to identify full-term and preterm births. Preterm births were those under 37 weeks, and full-term births were those at 37 weeks and over. PTB type was identified with the variable induction of labor, a dichotomous (yes or no) variable. A “yes” response to labor induction classified the birth as provider-initiated PTB, and a “no” response classified the birth as spontaneous PTB. The classification of spontaneous and provider-initiated PTB is consistent with previous research (MacDorman et al., 2022).

Tables 2 and 3 show the independent variables, maternal and paternal education level, prenatal care utilization, prepregnancy chronic conditions, diabetes, and hypertension. The education level variable was operationalized as an ordinal variable. The education variable measured the following levels: less than high school education, high school diploma or General Educational Development (GED), some college, or college degree or higher. The independent variable utilization of prenatal care was identified using the number of prenatal care visits. To categorize the number of prenatal care visits, I used the Adequacy of Prenatal Care Utilization Index (APNCU) tool as a reference. Based on the APNCU, the categories were 12 or more visits (adequate), 7–11 visits (intermediate), and six or fewer visits (inadequate). Prepregnancy chronic conditions diabetes and hypertension were operationalized as binomial variables of 0 =

yes (disease present) and 1 = no (disease not present). The control variable age was recoded into an ordinal variable, operationalized into three groups: 18–22, 23–34, and 35–44.

Descriptive Demographics of the Sample

Descriptive statistics were calculated for the sample population, Black women aged 18–44, who delivered singleton first births, and paternity acknowledged in the data file ($N = 81,995$). Table 2 presents the descriptive statistics of the sample population. Most of the population (51.5%) was from the age group 23–34 years, and the fewest participants (4.6%) were in the older age group 35–44. More than one-third of the mothers (39.1%) had a high school diploma or GED.

Table 2

Demographic Characteristics of Study Sample

Variable	Characteristic	Frequency	Percentage
Age group	1 = 18–22	35,999	43.9%
	2 = 23–34	42,232	51.5%
	3 = 35–44	3,764	4.6%
	Total	81,995	100.0%
Maternal Education level	1 = Less than high school education	6,092	7.4%
	2 = High school diploma or GED	32,064	39.1%
	3 = Some college	24,896	30.4%
	4 = College degree or higher	18,611	22.7%
	Total	81,663	99.6%
Paternal Education level	1 = Less than high school education	9,061	11.1%
	2 = High-school diploma or GED	38,778	47.3%
	3 = Some college	19,545	23.8%
	4 = College degree or higher	10,982	13.4%
	Total	78,366	95.6%

Note. a. 2018 Natality Public Use File, Black women, aged 18–44, singleton first birth ($N = 81,995$); b. Missing data was excluded from the analysis.

The dependent and independent variables data are presented in Table 3. The dependent variable was a delivery type; 7.4% of black women had spontaneous preterm

birth, and 2.0% had provider-initiated preterm birth. The independent variable number of prenatal visits showed that 44.9% of women received 12 or more prenatal care visits.

Table 3

Key Characteristics of Study Sample

Variable	Characteristic	Frequency	Percentage
Delivery type	0= Spontaneous preterm birth	6,064	7.4%
	1= Provider initiated preterm birth	1,673	2.0%
	2= Full term birth	70,780	86.3%
	Total	78,517	95.8%
Prenatal care visits	1 = 12 or more visits	36,826	44.9%
	2 = 7–11 visits	32,909	40.1%
	3 = 6 or fewer visits	9,681	12.0%
	Total	79,596	97.1%
Prepregnancy Diabetes	0 = Yes	833	1.0%
	1 = No	81,096	98.9%
	Total	81,929	99.9%
Prepregnancy Hypertension	0 = Yes	2,336	2.8%
	1 = No	79,593	97.1%
	Total	81,929	99.9%

Note. 2018 Natality Public Use File, Black women, aged 18–44, singleton first birth (N = 81,995)

Management of Missing Data

Some of the variables were missing in the data set. Missing data occurred because the questions were not answered on the corresponding worksheets for the birth certificate, or the data were unknown. The missing data were excluded from the study's data analyses. The variables that had missing data were delivery type (4.2%), prenatal visits (2.9%), mothers' education (0.4%), fathers' education (4.4%), prepregnancy diabetes (0.1%), and prepregnancy hypertension (0.1%).

Logistic Regression

A binary logistic regression analysis was performed to examine the association of delivery type with education level, utilization of prenatal care, prepregnancy conditions, diabetes, and hypertension. The following assumptions were considered for the binary logistic regression analyses:

1. The dependent variable was dichotomous: The delivery type variable, spontaneous PTB, provider-initiated PTB, and full-term birth were transformed into two separate dichotomous variables. The two dichotomous variables were spontaneous PTB and full-term birth and provider-initiated PTB and full-term birth. By transforming the delivery type variable, I conducted the binary logistic regression for the PTB types. When analyzing the association with the independent variables, I compared each to full-term birth.
2. There was more than one independent variable.
3. There was independence of observations, and the categories of the dependent and independent variables were mutually exclusive and exhaustive.
4. There was little or no multicollinearity among the independent variables. A multicollinearity test was conducted using the variance of inflation factor (VIF). The VIF was performed on each independent variable, and each independent variable had a value between 1 and 5, indicating a moderate correlation between an independent variable and another independent variable in the model.

Table 4

Binary logistic regression maternal and paternal education and provider-initiated PTB.

Delivery Type		Unadjusted				Adjusted			
		Sig.	Odds Ratio	95% Confidence Interval		Sig.	Odds Ratio	95% Confidence Interval	
				Lower Bound	Upper Bound			Lower Bound	Upper Bound
Mother's Education	Less than high school education	Reference							
	High school diploma or GED	.747	.968	.795	1.179	.738	.965	.783	1.189
	Some College	.873	.984	.805	1.203	.850	.979	.787	1.218
	College or more	.458	1.081	.880	1.327	.916	.987	.780	1.250
Father's Education	Less than high school education	Reference							
	High school diploma or GED	.356	.927	.789	1.089	.263	.910	.771	1.074
	Some College	.526	.945	.793	1.126	.254	.897	.744	1.081
	College or more	.336	.908	.745	1.106	.034	.791	.637	.982
Age Category	Age 18–22	Reference							
	Age 23–34					.006	1.174	1.047	1.317
	Age 35–44					<.001	2.079	1.675	2.580

Note. a. The reference category is Full-term birth.

Table 5

Binary logistic regression maternal and paternal education and spontaneous PTB

Delivery Type		Unadjusted				Adjusted			
		Sig.	Odds Ratio	95% Confidence Interval		Sig.	Odds Ratio	95% Confidence Interval	
				Lower Bound	Upper Bound			Lower Bound	Upper Bound
Mother's Education	Less than high school education	Reference							
	High school diploma or GED	.016	.883	.798	.977	.032	.889	.798	.990
	Some College	.002	.850	.766	.943	.016	.870	.777	.975
	College or more	.037	.892	.802	.993	<.001	.810	.716	.917
Father's Education	Less than high school education	Reference							
	High school diploma or GED	.111	.933	.857	1.016	.151	.937	.858	1.024
	Some College	<.001	.839	.764	.923	<.001	.832	.752	.920
	College or more	.006	.862	.775	.958	<.001	.800	.712	.899
Age Category	Age 18–22	Reference							
	Age 23–34					<.001	1.217	1.144	1.294
	Age 35–44					<.001	2.247	1.998	2.528

Note. a. The reference category is Full-term birth.

Binary Logistic Regression

The research questions were addressed by conducting binary and multinomial logistic regression using SPSS Version 28 to determine whether the dependent variable was significantly associated with the independent variables. The following results are from the binary logistic regression statistical analysis.

Research question 1: Is there an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H₀1: There is no association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Ha1: There is an association between maternal and paternal education level and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Table 4 shows the unadjusted and adjusted results for research question 1 for provider-initiated PTB. The binary logistic regression comparing provider-initiated PTB to full-term birth indicated no significant association between maternal education and provider-initiated PTB. However, there was an association with paternal education in the adjusted model. After adjusting for age and maternal education level, the adjusted odds ratio for fathers with a college degree or higher was OR = .791 (95% CI [.637, .982]), indicating that the odds of provider-initiated PTB were significantly less for partners of

fathers with a college degree than those without a college degree, even after accounting for the listed covariates.

Table 5 shows the unadjusted and adjusted results for spontaneous PTB. The unadjusted odds ratio for Black mothers with a high school diploma or GED was OR = .883 (95% CI [.798, .977]), indicating that the odds of spontaneous PTB for Black mothers with a high school diploma or GED were less likely than those with less than a high school education. The unadjusted odds ratio for Black mothers with some college was OR = .850 (95% CI [.766, .943]), indicating that the odds of spontaneous PTB for Black mothers with some college were less likely than those with less than a high school education. The unadjusted odds ratio for Black mothers with a college degree or higher was OR = .892 (95% CI [.802, .993]), indicating that the odds of spontaneous PTB for Black mothers with a college degree or higher were less likely than those with less than high school education. The unadjusted odds ratio for fathers with some college was OR = .839 (95% CI [.764, .923]), indicating that the odds of spontaneous PTB for partners of fathers with some college were less likely than those with less than a high school education. The unadjusted odds ratio for fathers with a college degree or higher was OR = .862 (95% CI [.775, .953]), indicating that the odds of spontaneous PTB for partners of fathers with a college degree or higher were less likely than those with less than a high school education. The paternal education level, high school diploma, or GED was not associated with spontaneous PTB.

After adjusting for age and paternal education, the adjusted odds ratio for Black mothers with a high school diploma or GED was OR = .889 (95% CI [.798, .990]),

indicating that the odds of spontaneous PTB for mothers with a high school diploma or GED was less likely to have spontaneous PTB than those with less than a high school education. The adjusted odds ratio for Black mothers with some college was $OR = .870$ (95% CI [.777, .975]), indicating that the odds of spontaneous PTB for mothers with some college were less likely than those with less than a high school education. The adjusted odds ratio for Black mothers with a college degree or higher was $OR = .810$ (95% CI [.716, .917]), indicating that the odds of spontaneous PTB for mothers with a college degree or higher were less likely than those with less than a high school education. The odds ratio for maternal education in the unadjusted and adjusted results was less than one, indicating that spontaneous PTB decreases as maternal education increases.

After adjusting for age and maternal education, the adjusted odds ratio for fathers with some college was $OR = .832$ (95% CI [.752, .920]), indicating that the odds of spontaneous PTB for partners of fathers with some college were less likely than those with less than a high school education. The adjusted odds ratio for fathers with a college degree or higher was $OR = .800$ (95% [.712, .899]), indicating that the odds of spontaneous PTB for partners of fathers with a college degree or higher were less likely to have spontaneous PTB than those with less than high school education, even after accounting for the other covariates. The adjusted odds ratio for spontaneous PTB in paternal education was slightly lower than the unadjusted odds ratio, suggesting that age and maternal education may play a role in the relationship between paternal education and spontaneous PTB. The odds ratio was less than 1, indicating that as paternal

education increases, it is associated with decreased odds of the mother having spontaneous PTB. For research question 1, I rejected the null hypothesis, since all variables, except maternal education, were associated with provider-initiated PTB.

Table 6*Binary Logistic Regression Prenatal Care Utilization and Provider-initiated PTB.*

Delivery Type		Sig.	Unadjusted			Sig.	Adjusted		
			Odds ratio	Lower Bound	Upper Bound		Odds Ratio	Lower Bound	Upper Bound
Prenatal care visits	12 or more visits	Reference				Reference			
	7 – 11 visits	<.001	2.284	2.026	2.574	<.001	2.301	2.034	2.601
	6 or fewer visits	<.001	4.637	4.032	5.333	<.001	4.706	4.070	5.443
Father's Education	Less than high school education					Reference			
	High school diploma or GED					.742	.972	.823	1.149
	Some College					.961	.995	.829	1.195
	College or more					.202	.872	.707	1.076
Age category	Age 18–22					Reference			
	Age 23–34					<.001	1.269	1.135	1.418
	Age 35–44					<.001	2.377	1.922	2.939

Note. a. The reference category is Full-term birth.

Table 7*Binary Logistic Regression Prenatal Care Utilization and Spontaneous PTB*

Delivery Type		Sig.	Unadjusted			Sig.	Adjusted		
			Odds ratio	95% Confidence Interval Lower Bound	Upper Bound		Odds Ratio	95% Confidence Interval Lower Bound	Upper Bound
Prenatal care visits	12 or more visits	Reference				Reference			
	7 – 11 visits	<.001	2.624	2.443	2.820	<.001	2.689	2.498	2.895
	6 or fewer visits	.000	8.951	8.292	9.663	.000	9.273	8.565	10.040
Mother's Education	Less than high school education					Reference			
	High school diploma or GED					.772	1.017	.907	1.141
	Some College College or more					.317 .564	1.064 1.040	.942 .911	1.201 1.187
Father's Education	Less than high school education					Reference			
	High school diploma or GED					.737	.984	.896	1.081
	Some College College or more					.019 .002	.880 .823	.790 .727	.979 .931
Age category	Age 18–22					Reference			
	Age 23–34					<.001	1.299	1.217	1.386
	Age 35–44					<.001	2.475	2.181	2.808

Note. a. The reference category is Full-term birth.

Research question 2: Is there an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H₀2: There is no association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

H_a2: There is an association between prenatal care utilization and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

A binary logistic regression was performed for research question 2. The binary logistic regression indicated that prenatal care utilization is associated with spontaneous and provider-initiated PTB while controlling for age, as shown in Tables 6 and 7. In Table 6, the unadjusted odds ratio for Black mothers with 7 – 11 prenatal care visits was OR = 2.284 (95% CI [2.026, 2.574]), indicating that the odds of provider-initiated PTB for Black mothers with 7 – 11 prenatal care visits was more significant than for Black mothers with 12 or more prenatal care visits. The unadjusted odds ratio for Black mothers with six or fewer prenatal care visits was OR = 4.637 (95% CI [4.032, 5.333]), indicating that the odds of provider-initiated PTB for Black mothers with six or fewer prenatal care visits was more significant than for Black mothers with 12 or more prenatal care visits.

After adjusting for age and paternal education, the adjusted odds ratio for Black mothers with 7 – 11 prenatal care visits were OR = 2.301 (95% CI [2.034, 2.601]). The adjusted odds ratio for Black mothers with six or fewer prenatal care visits was OR =

4.706 (95% CI [4.070, 5.443]), indicating no change in the adjusted model. The father's education level was no longer significant in the adjusted model. The odds ratios were greater than 1, indicating that fewer prenatal care visits were associated with an increase chance for provider-initiated PTB. The fewer prenatal care visits, the higher the odds ratio for the provider-initiated. The analysis showed an association between prenatal care utilization and provider-initiated PTB.

In Table 7, the unadjusted odds ratio for Black mothers with 7 – 11 prenatal care visits were OR = 2.624 (95% CI [2.443, 2.820]), indicating that the odds of spontaneous PTB for Black mothers with 7 – 11 prenatal care visits were more significant than for Black mothers with 12 or more prenatal care visits. The unadjusted odds ratio for Black mothers with six or fewer prenatal care visits was OR = 8.951 (95% CI [8.262, 9.663]), indicating that the odds of spontaneous PTB for Black mothers with six or fewer prenatal care visits were more significant than for Black mothers with 12 or more prenatal care visits.

After adjusting for age, maternal education, and paternal education, the adjusted odds ratio for Black mothers with 7 – 11 prenatal care visits were OR = 2.689 (95% CI [2.498, 2.895]). The adjusted odds ratio for Black mothers with six or fewer prenatal care visits was OR = 9.273 (95% CI [8.565, 10.040]). The adjusted model was unchanged; fewer prenatal care visits were associated with spontaneous PTB in Black women compared to women who gave birth full term. Maternal education was not significant in the adjusted model. However, paternal education levels, some college and college degree, were significant with an odds ratio less than 1, indicating that the odds of spontaneous

PTB were less likely for partners with fathers with some college or college degree. For research question 2, I rejected the null hypothesis because there was a significant association between utilization of prenatal care and preterm birth types, spontaneous and provider-initiated, compared to Black women who gave birth full term while controlling for age and accounting for the significant covariates.

Table 8*Binary Logistic Regression Prepregnancy Chronic Conditions and Provider-Initiated PTB*

Delivery Type		Sig.	Unadjusted			Sig.	Adjusted		
			Odds ratio	Lower Bound	Upper Bound		Odds Ratio	Lower Bound	Upper Bound
Pregpregnancy Diabetes	No	Reference				Reference			
	Yes	<.001	5.810	4.536	7.441	<.001	4.135	3.105	5.506
Pregpregnancy Hypertension	No	Reference				Reference			
	Yes	<.001	4.443	3.755	5.257	<.001	3.758	3.103	4.552
Father's Education	Less than high school education					Reference			
	High school diploma or GED					.888	.988	.835	1.169
	Some College					.737	1.032	.859	1.240
	College or more					.561	.939	.760	1.160
Prenatal care visits	12 or more visits					Reference			
	7 – 11 visits					<.001	2.378	2.102	2.691
	6 or fewer visits					<.001	4.853	4.191	5.619
Age category	Age 18–22					Reference			
	Age 23–34					.002	1.192	1.065	1.334
	Age 35–44					<.001	1.786	1.433	2.226

Note. a. The reference category is Full-term birth.

Table 9*Binary Logistic Regression Prepregnancy Chronic Conditions and Spontaneous PTB*

Delivery Type		Sig.	Unadjusted			Sig.	Adjusted		
			Odds ratio	Lower Bound	Upper Bound		Odds Ratio	Lower Bound	Upper Bound
Prepregnancy Diabetes	No	Reference				Reference			
	Yes	<.001	3.582	3.008	4.265	<.001	3.243	2.649	3.970
Prepregnancy Hypertension	No	Reference				Reference			
	Yes	<.001	2.668	2.376	2.995	<.001	2.409	2.106	2.756
Mother's Education	Less than high school education					Reference			
	High school diploma or GED					.710	1.022	.911	1.147
	Some College					.220	1.079	.955	1.219
Father's Education	College or more					.462	1.051	.920	1.201
	Less than high school education					Reference			
	High school diploma or GED					.842	.991	.902	1.088
	Some College					.041	.894	.803	.995
Prenatal care visits	College or more					.012	.852	.752	.965
	12 or more visits					Reference			
	7 – 11 visits					<.001	2.752	2.556	2.964
Age	6 or fewer visits					.000	9.526	8.793	10.321
	18–22					Reference			
	23–34					<.001	1.253	1.174	1.338
	35–44					<.001	2.115	1.859	2.407

Note. a. The reference category is Full-term birth.

Research question 3: Is there an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age?

H₀3: There is no association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

H_a3: There is an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

A binary logistic regression was performed for research question 3. In table 8, the unadjusted odds ratio for prepregnancy diabetes was OR = 5.810 (95% CI [4.535, 7.441]), indicating that the odds of provider-initiated PTB for Black mothers with prepregnancy diabetes was more significant than those that did not have prepregnancy diabetes. The unadjusted odds ratio for prepregnancy hypertension was OR = 4.443 (95% CI [3.755, 5.257]), indicating that the odds of provider-initiated PTB for Black mothers with prepregnancy hypertension was more significant than for those that did not have prepregnancy hypertension.

After adjusting for age, paternal education, and the number of prenatal care visits, the adjusted odds ratio for prepregnancy diabetes was OR = 4.135 (95% CI [3.105, 5.506]), and the adjusted odds ratio for prepregnancy hypertension was OR = 3.758 (95% CI [3.103, 4.552]). The adjusted model was unchanged; there were increased odds of

provider-initiated PTB for Black women with prepregnancy conditions, diabetes, and hypertension.

In Table 9, the unadjusted odds ratio for prepregnancy diabetes was $OR = 3.582$ (95% CI [3.008, 4.265]), indicating that the odds of spontaneous PTB for Black mothers with prepregnancy diabetes were more significant than for those who did not have prepregnancy diabetes. The unadjusted odds ratio for prepregnancy hypertension was $OR = 2.668$ (95% CI [2.376, 2.995]), indicating that the odds of spontaneous PTB for Black mothers with prepregnancy hypertension were more significant than for those who did not have prepregnancy hypertension.

After adjusting for age, maternal and paternal education, and number of prenatal care visits, the adjusted odds ratio for prepregnancy diabetes was $OR = 3.243$ (95% CI [2.649, 3.970]). After adjusting for age, maternal and paternal education, and number of prenatal care visits, the odds ratio for prepregnancy hypertension was $OR = 2.409$ (95% CI [2.106, 2.756]). The adjusted model was unchanged; there were increased odds of spontaneous PTB for Black women with prepregnancy conditions, diabetes, and hypertension.

For research question 3, I rejected the null hypothesis because there was an association between prepregnancy chronic conditions diabetes and hypertension and preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age.

Multinomial Logistic Regression

The multinomial logistic regression results at $p < .05$ were similar to the binary logistic regression results. The data results are in the Appendix: Multinomial logistic regression. There were significant associations between the dependent variable delivery type (provider-initiated PTB, spontaneous PTB, and full-term) with the independent variables maternal and paternal education, prenatal care visits, and prepregnancy conditions diabetes and hypertension.

Summary

The results of the binary logistic regression analysis at $p < .05$ indicated there were significant associations between maternal and paternal education level, prenatal care utilization, and prepregnancy chronic conditions diabetes and hypertension and PTB type, in Black women, compared to Black women that give birth at full term, while controlling for age. Although the null hypothesis was rejected for research question 1, the results showed that provider-initiated PTB was not associated with maternal education. The null hypotheses were rejected for research questions 2 and 3. In Section 4, I interpreted the findings, discussed the study limitations, explained the implications for social change, and made recommendations for future research.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to explore whether maternal and paternal education levels, prenatal care utilization, and prepregnancy chronic conditions diabetes and hypertension have an association with PTB type in Black women, compared to Black women who give birth at full term while controlling for age. Data were retrieved from the 2018 Natality Public Use file and analyzed using SPSS Version 28. Section 4 includes the interpretation of the study's findings, limitations of the study, recommendations, and implications for professional practice and social change.

Interpretation of Findings

My analyses of the association between maternal and paternal education level, prenatal care utilization, and prepregnancy chronic conditions diabetes and hypertension with PTB type in Black women compared to full-term birth were significant. After completing the analyses, I rejected the null hypotheses for research question 1. However, maternal education was not statistically associated with provider-initiated PTB. I rejected the null hypothesis for research question 2 because there was an association between prenatal care utilization, using the number of prenatal care visits and PTB type compared to full-term birth. Last, I rejected the null hypothesis for research question 3 because there was an association between prepregnancy diabetes and hypertension and PTB type when compared to full-term birth.

Research Question 1

In Research Question 1, I examined whether there was an association between maternal and paternal education level and PTB types, spontaneous and provider-initiated in Black women, compared to Black women who gave birth full term while controlling for age. The findings of research question 1 indicated that education level does have an association with PTB type in Black women. In this analysis, a maternal education level higher than a high school diploma/GED was associated with decreased odds of spontaneous PTB. The finding was consistent with other research, with results indicating an association between maternal education level and PTB. Su et al. (2021) and Thoma et al. (2019) studies on racial disparities and birth outcomes found that maternal education has a significant influence on the birth outcome of PTB and is a large contributor to the black-white disparity in PTB rates. Both of these studies analyzed PTB and not the PTB clinical subtypes. However, the results were similar, showing that a higher education level was associated with decreased odds of PTB.

The maternal and paternal education level was examined in my study's analysis. Paternal education level was included because it is studied less frequently. However, research has found that paternal factors may have a stronger influence on adverse birth outcomes than maternal ones (Li et al., 2021). Compared to full-term birth, the paternal education level was associated with spontaneous PTB and provider-initiated PTB. In this analysis, only the paternal education level – college degree or higher was associated with provider-initiated PTB. The paternal education level, some college and college degree or higher, was associated with spontaneous PTB after adjusting for age and maternal

education. The odds of provider-initiated PTB were decreased for the paternal education level - college degree or higher, which occurred in the adjusted model where maternal education was insignificant.

The results of the father's education level associated with the PTB types were inverted from Li et al.'s (2021) research on paternal factors and adverse birth outcomes. Li et al.'s (2021) study showed that lower paternal education was associated with a higher incidence of PTB. The significant difference between my study and Li's was that the study examined only PTB and not the clinical subtypes, spontaneous and provider-initiated.

An analysis of education level and PTB types was conducted in this study to understand better the association that education has with adverse birth outcomes. There is continued research on the relationship between education and health. In this study, education was selected as a social factor. Maternal education level is a frequently used variable, but my study highlighted paternal education's role in adverse birth outcomes.

In my study on the PTB types, the father's education level was significant for provider-initiated and spontaneous PTB. The father's education level differed between the two types. Fathers with a college degree lessened the odds of provider-initiated PTB. When reviewing the results for spontaneous PTB, fathers with some college and a college degree reduced the odds of spontaneous PTB. Also, all three levels (high school or GED, some college, and college degree) of the mother's education were associated with decreased odds of spontaneous PTB. Spontaneous PTB accounts for about 50–70% of all preterm births in the United States, and unlike provider-initiated PTB, it occurs due to a

premature rupture of the membranes (Waks et al., 2022; Wang et al., 2022). Some of the risk factors associated with spontaneous PTB are previous preterm birth, maternal age, African-American race, and low socioeconomic status (Waks et al., 2022). In my study, education level was the variable related to socioeconomic status, and its association with spontaneous PTB showed that education level plays a role in improved birth outcomes.

Based on my study's results, I propose that a higher level of education for the mother and father is beneficial in understanding the prescribed care recommended by a healthcare provider. A person with advanced education may have the skills and knowledge to help them grasp health information and be more receptive to following instructions. My study found that paternal education was more beneficial because a higher paternal education level was associated with decreased odds of spontaneous and provider-initiated PTB. Ekeke et al.'s (2021) study on acknowledged father's education level and its association with PTB rates among foreign-born Black women compared to US-born Black women had similar results to my study. Ekeke's study found that in both groups of women, the rates of PTB decreased as the paternal education level increased. In US-born Black women, Ekeke et al. (2021) suggested that higher paternal education had an association with reducing the mother's exposure to stress, which lowers their allostatic load and risk of PTB.

Research on education and health outcomes has shown that individuals with a higher education level have overall better health, are more likely to achieve healthier behaviors, and have reduced rates of premature death (J. Lee & Seon, 2019; U.S. Department of Health and Human Services & Office of Disease Prevention and Health

Promotion, n.d.). There is a relationship between education level and health in health outcomes like diabetes. Hill-Briggs et al. (2020) diabetes research reported that diabetes incidence was higher for adults with less than a high school education (10.4 per 1,000 persons). For adults with a higher education level, the incidence of diabetes was reduced. In the review of an impact analysis of income, education, and ethnicity on chronic diseases, Fernandes and Tirapani (2019) reported that education was strongly associated with preventing mortality for individuals with hypertension, diabetes, and chronic kidney disease. Fernandes and Tirapani's (2019) research showed that individuals with low education were more likely to have poor outcomes with chronic diseases. In contrast, those with a higher education reduced their risk of the disease or could better manage it.

The results of this doctoral study indicate that a maternal and paternal higher education level significantly reduces the odds of spontaneous and provider-initiated PTB. Higher education is significant for mothers' awareness, understanding, and adoption of essential maternal healthcare practices (Janaki & Prabakar, 2024). The father's higher education level is associated with financial and social support (Ekeke et al., 2021). Fathers with higher education may better understand health information and be able to assist the mother with understanding the health guidelines to adhere to for a healthy mother, delivery, and infant. There was not much difference between the education level of the mother and father, which was associated with a decrease in the odds of spontaneous PTB. Based on the results, the odds of spontaneous PTB are reduced if both parents have a high school education level and beyond.

Research Question 2

In research question 2, I examined whether there was an association between utilization of prenatal care and PTB types, spontaneous and provider-initiated in Black women, compared to Black women who gave birth full term while controlling for age. For research question 2, I rejected the null hypothesis. The results showed that utilization of prenatal care was associated with the PTB types in Black women compared to full-term births. The results showed that women with fewer prenatal care visits had increased odds of spontaneous PTB and provider-initiated PTB. There were increased odds of spontaneous and provider-initiated PTB for Black women with six or fewer prenatal care visits. As the number of prenatal care visits increased, the odds of each PTB type decreased. The results were aligned with findings that adequate prenatal care visits reduce the likelihood of adverse birth outcomes such as PTB (March of Dimes, 2020). Similar to Thurston et al. (2021), research found that early initiation of prenatal care in Black women significantly decreases the risk of PTB.

In the adjusted model, the father's education level was not significant for provider-initiated PTB, and the mother's education was not included because it was not significant with provider-initiated PTB. The utilization of prenatal care visits and association with provider-initiated PTB could be a result of the mother having more health complications, and additional visits are used to prevent adverse birth outcomes. Some medical factors that may require the healthcare provider to initiate labor prior to term, resulting in PTB, are maternal cardiovascular issues, chronic illnesses, or obstetric complications (Al Hussaini et al., 2024). One factor that is a leading cause of adverse

infant outcomes is hypertensive disorders (Avorgbedor et al., 2023). Hypertension, commonly known as high blood pressure, affects 17.6% of childbearing-aged women in the United States (Meyerovitz et al., 2023). Of those with hypertension, Black women are more likely than White women to have chronic hypertension and impacted by hypertensive diseases during pregnancy.

Managing hypertensive disorders like hypertension during pregnancy is essential to reducing the risk of adverse birth outcomes like PTB. Avorgbedor et al. (2023) examined the role of adequate prenatal care and race/ethnicity as moderators of hypertensive disorders of pregnancy on infant outcomes, and one of the outcomes was PTB. In Avorgbedor et al.'s (2023) study, adequate prenatal care was defined using the Kessner's Index, and women who initiated prenatal care in the first trimester and had at least nine visits were considered to have adequate prenatal care. The study results showed that women with hypertensive disorders with adequate prenatal care were associated with lower odds of PTB. Although this study did not review provider-initiated and spontaneous PTB, the results consistently showed that adequate prenatal care is associated with lower odds of PTB. In addition, this study reported that women with hypertensive disorders may have more prenatal care visits. Hence, women at risk must start prenatal care earlier to manage blood pressure during pregnancy better.

The significant unadjusted variables changed in the adjusted model for utilization of prenatal care and provider-initiated PTB. The father's education with provider-initiated PTB and prenatal care utilization was no longer significant. In the adjusted model for utilization of prenatal care and spontaneous PTB, fathers with some college

and college degree were significant in the model. Although the mother had fewer prenatal care visits, the odds of spontaneous PTB decreased when the father had a higher education. Also, in the adjusted model for spontaneous PTB, the mother's education level was no longer significant, and it supports the importance of including the father's educational level in examining the social factors associated with the PTB types. Based on these results, the support from the father to the mother and child is associated with positive outcomes for spontaneous PTB. The father's involvement and support during pregnancy can be a protective factor for PTB. Surkan et al. (2019) studied whether paternal involvement, paternal support, and support from family and friends were associated with PTB and small for gestational age. The study found that mothers without involvement from the baby's father were a significant predictor of PTB (Surkan et al., 2019). My study excluded participants if paternal acknowledgment was not present. Therefore, these results are solely based on whether the father was present with the mother.

Research Question 3

For research question 3, I examined whether there was an association between prepregnancy chronic conditions diabetes and hypertension preterm birth types, spontaneous and provider-initiated, in Black women, compared to Black women who give birth at full term while controlling for age. I rejected the null hypothesis because prepregnancy conditions diabetes and hypertension had an association with PTB type. In maternal health, women with comorbidities like diabetes and hypertension have an association with poor birth outcomes (Thoma et al., 2019). The association between the

prepregnancy conditions and provider-initiated PTB was stronger than with spontaneous PTB. DeSisto et al. (2018) found that Black women with gestational and chronic hypertension were responsible for a sizable portion of the disparity of PTB compared to foreign-born Black women and U.S.-born White women. Although my study did not compare based on race, the comparison to full-term birth found that Black women with prepregnancy diabetes and prepregnancy hypertension were associated with spontaneous and provider-initiated PTB.

My results were similar to Berger et al. (2020) study on the impact of prepregnancy diabetes, obesity, and chronic hypertension on PTB types for a population of women in Ontario, Canada. In Berger's study, the results showed that PTB complicated women with all three of the prepregnancy chronic conditions. In my study, prepregnancy diabetes and hypertension were analyzed together, and the odds of provider-initiated PTB were higher than spontaneous PTB. Berger analyzed the chronic conditions alone and in combined states, and the combined state of diabetes and hypertension was associated with an increased risk of PTB. Berger's study found that provider-initiated PTB was significantly higher than spontaneous PTB.

The results provide insights into the reasons why provider-initiated PTB is warranted because of maternal and fetal complications like preeclampsia. Preeclampsia is a complication of pregnancy that includes high blood pressure, high levels of protein in urine, and other signs of organ damage (*Preeclampsia - symptoms & causes*, n.d.). When preeclampsia is present, the recommendation is for early delivery of the infant, resulting

in PTB. Prepregnancy conditions like hypertension need to be appropriately managed before and during pregnancy to reduce the odds of provider-initiated PTB.

Prenatal care visits are a type of preventive measure for PTB. These visits are for effective screening, preventive education, and treatment interventions that are advised for better health outcomes for the mother and baby (Rowe et al., 2020). Prenatal care visits were a variable in this study, and when analyzed in the adjusted model for the association between prepregnancy conditions and provider-initiated PTB, the results showed that as prenatal care visits increased, the odds of provider-initiated PTB decreased for women with prepregnancy chronic conditions. My findings align with research that shows adequate prenatal care improves birth outcomes like PTB (Avorgbedor et al., 2023; Thurston et al., 2021). Avorgbedor's study on hypertensive disorders during pregnancy found that women with hypertensive disorders without adequate prenatal care were more likely to have severe pregnancy complications. For women with prepregnancy conditions, adequate prenatal care visits are essential for managing chronic conditions.

The other prepregnancy chronic condition in my study was diabetes. Diabetes affects pregnancy due to insulin resistance. There is an increase in insulin resistance because of a change in hormones, and with normal pregnancies, beta-cell adaptation occurs. However, in women with type 2 diabetes, the beta-cell function is impaired and can lead to severe hyperglycemia (Raets et al., 2023). When diabetes is not managed correctly, it can lead to other medical conditions like hypertension, preeclampsia, cesarean delivery, birth trauma, and preterm birth (Gojnic et al., 2022; Raets et al., 2023). In my study, prepregnancy diabetes was significantly associated with spontaneous and

provider-initiated PTB. There were increased odds of spontaneous and provider-initiated PTB for Black women with prepregnancy diabetes. My study examined diabetes that was present prior to pregnancy, identified from the data file as “yes” for prepregnancy diabetes. In Wei’s et al. (2019) study, the participants had preconception diabetes mellitus. Wei examined preconception diabetes and adverse pregnancy outcomes. The results found that Chinese women with diabetes mellitus were associated with an increases risk of spontaneous abortion, preterm birth, macrosomia, small for gestational age infant, and perinatal infant death. H. Lee et al. (2020) study on medical co-morbidities and PTB among women of different races/ethnicities also found that diabetes was associated with higher odds of preterm birth.

When examining the association between prepregnancy diabetes and spontaneous and provider-initiated PTB, there was increased odds of provider-initiated PTB occurring in Black women with prepregnancy diabetes. Provider-initiated PTB is used when maternal and fetal complications are present. For women with existing chronic conditions, the risk of complications for pregnancy and delivery increases. In Mensah et al.’s (2023) study on spontaneous and iatrogenic PTB trends, the study results show that the rates of iatrogenic PTB had increased during the 2009 - 2020 study period due mainly to chronic conditions in women. Women with chronic co-morbid conditions, the most prominent being chronic hypertension, diabetes, and asthma (Mensah et al., 2023), had increased rates of iatrogenic PTB. As was shown with prepregnancy hypertension, prenatal care visits, and prepregnancy diabetes association showed that as prenatal care visits increased, the odds of spontaneous and provider-initiated PTB decreased. Due to

these associations, it is vital to monitor and treat diabetes before, during, and after pregnancy.

Findings Summary

The findings in my study addressed the gap in the literature on whether specific social determinants of health may influence the risk of spontaneous or provider-initiated birth in Black women when compared to Black women who gave birth full-term. A significant difference in my study was including paternal data for the social determinant of health – education level. The results showed that a higher paternal education was important in decreasing the odds of provider-initiated PTB, whereas the maternal education level was not significant. The odds of spontaneous PTB were decreased with a higher maternal and paternal education level. The results contribute to the indirect effect that education has on health outcomes. A person with higher education is more likely to comprehend and utilize healthcare information and resources.

For prenatal care utilization, the results showed that as the number of visits increased, the odds of provider-initiated and spontaneous PTB decreased. When adjusting for education level in the utilization of the prenatal care model, higher paternal education was significant in decreasing the odds of spontaneous PTB. The result could be related to having support from the father, who can assist the mother with understanding the need for prenatal care visits and adhering to the prescribed care to prevent PTB.

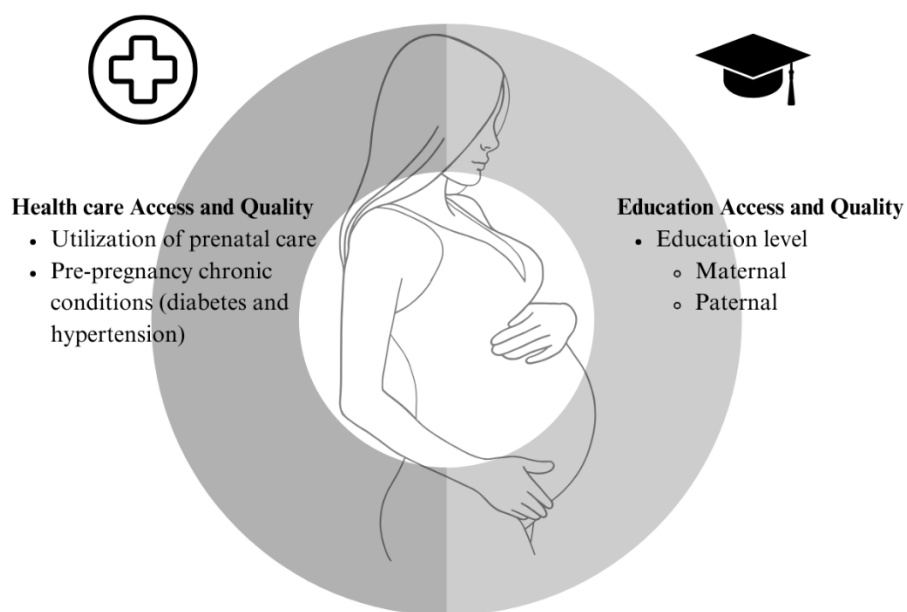
Last, prepregnancy chronic conditions were significantly associated with the PTB types. The difference was that the odds of provider-initiated and spontaneous PTB decreased when adjusting for education level and prenatal care utilization. Prepregnancy

chronic conditions, diabetes, and hypertension are interrelated with the social determinants of health. My study showed that the association with the selected social determinants of education level and utilization of prenatal care was significant. If the mother has these conditions, then to prevent the adverse birth outcome of either PTB type, then utilization of prenatal care would be essential and may involve achieving adequate prenatal care to assist with managing the chronic condition along with the care needed for the infant. The paternal education level was significant with spontaneous PTB, with the results showing that a higher education level decreases the odds of spontaneous PTB. Higher education levels may aid in managing chronic conditions because the father can assist the mother in understanding the health instructions for caring for herself and the infant. Also, the father's education being significant and the mother's education not being significant shows how the father's social determinants contribute to birth outcomes.

Theoretical Applications

Figure 1

Social Determinants of Health Framework on Preterm Birth



The social determinants of health (SDoH) framework guided this study in understanding how social factors influence health outcomes. The study analyzed selected SDoH factors and their association with PTB type in Black women. The social determinants of health are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect health, functioning, and quality of life outcomes and risks (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). The SDoH framework is grouped into five domains: economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context. Figure 1 shows

the two domains of healthcare access and quality and education access and quality, and the variables from the study that relate to each domain. Maternal and paternal educational levels are related to education access and quality. When the maternal and paternal education level was high school diploma or GED and higher, the odds of spontaneous PTB decreased. The association between education level and increased likelihood of PTB types is relative to the association of people with social disadvantages. People with less than a high school education are more likely to experience poorer health outcomes (Dave et al., 2021; DeHaven et al., 2020). In this case, there could be some association with a lower education level and knowledge about adverse birth outcomes such as preterm birth and what steps to take to prevent PTB.

Prenatal care utilization is related to healthcare access and quality. Access to prenatal care and achieving an adequate number of visits reduces the risk of adverse birth outcomes like PTB. My study showed that fewer visits were associated with increased odds of spontaneous and provider-initiated PTB. Prenatal care utilization is essential for preventing PTB, but the other aspect is quality of care. My study did not examine the quality of care, but the results can assist with identifying interventions that focus on the number of visits and quality of care. Research has shown that group prenatal care is effective in reducing PTB. Group prenatal care includes the visits and approaches of health education and social support for the mother (Braveman et al., 2021; Mohammadi et al., 2023; Thurston et al., 2021). The results of my study could contribute to the quality of care for developing new interventions that include the father in prenatal care. My study showed that a higher paternal education level was significantly associated with reduced

odds of spontaneous and provider-initiated PTB. Ekeke et al.'s (2021) study on the father's acknowledgment, education level, and rate of PTB suggested that the father's education level is linked to financial assistance and social support to the mother. The quality of care could improve by including the father in prenatal care.

Last, prepregnancy chronic conditions, diabetes, and hypertension are related to education access and quality and healthcare access and quality. When there are chronic conditions prior to pregnancy, the conditions must be managed and treated. Education access and quality play a role in the management of chronic conditions. When diagnosed with a chronic condition, there is a wealth of information to obtain, like medication adherence, change in diet, increase in physical activity, smoking cessation, and regular scheduled appointments with a primary care provider. A higher education level with chronic conditions is helpful because it is associated with better knowledge for adhering to the prescribed guidance for chronic conditions (M.-J. Lee et al., 2024). Also, a higher education level is associated with socioeconomic status, which can affect the quality and accessibility of healthcare (Janaki & Prabakar, 2024). Healthcare access and quality are important for screening for chronic conditions like diabetes and hypertension and receiving a care plan for management and treatment. Hill-Briggs et al. (2020) reviewed SDoH and diabetes. The study found that individuals with diabetes had poorer outcomes associated with having health insurance, geographic location of diabetes care, affordability of medications, and quality of care. The strongest predictor of poor outcomes was whether individuals had access to diabetes screenings and care and had health insurance. My study did not analyze whether the mothers had health insurance, but

there is a correlation between prenatal care utilization and access to healthcare. The results from my study could be used to expand all the aspects needed for prenatal care, which includes screening for chronic conditions and connecting the mother with the care needed to treat and manage the chronic condition, which could contribute to reducing the risk of PTB.

Limitations of the Study

Some limitations were identified in this study. The study was limited to Black women aged 18 - 44, having their first birth, and with fathers acknowledged on the mother's worksheet. Due to the study's limited population, the results cannot be generalized to other races/ethnicities or age groups. Next, the study had a quantitative, cross-sectional design, meaning that the study could predict an association but not a cause-and-effect relationship for the analyzed variables (Cummings, 2017). The study findings are limited to variables similar to those selected: prenatal care visits and education level.

Another limitation is how the data is obtained for the 2018 Natality Public Use file. The data is collected by hospital staff, who accurately report information from the medical records and self-reported information from the mother. Two worksheets were completed for the birth certificate: the facility worksheet and the mother's worksheet. The mother's worksheet collects demographic data, such as race and educational attainment, directly from the mother. The facility worksheet is completed by hospital staff and collects data directly from the medical records of the mother and infant. To assist with the facility worksheet, an instruction manual, and an eLearning training

session were created that went over best practices for collecting specific birth and health information on the birth certificate. Last, the data in the 2018 Natality Public Use file was collected for a purpose different from what was intended for this study.

Recommendations

The racial disparity present in PTB in the United States is a public health priority. Black women have a disproportionately higher rate of PTB than other races. This study's findings highlighted the importance of fathers in maternal and child health. Paternal education level was significantly associated with the clinical subtypes of PTB. Fathers with a higher education level were associated with decreased odds of spontaneous and provider-initiated PTB. Based on these findings, it is recommended that programs and interventions be developed that include the father in the care of the mother and infant. The inclusion of the father can assist the mother in prenatal care. The prescribed care shared with the mother and father could aid in adhering to the care to prevent PTB because the father can assist the mother with following the guidelines given by the healthcare provider.

Another recommendation is to screen mothers for social factors associated with PTB. Social screenings have been implemented in healthcare to better understand patients' social factors. The social screenings would be helpful in maternal and infant health. The social data collected from pregnant persons could help develop prevention and intervention strategies to improve the mothers' and infants' health (Girardi et al., 2023). In addition to understanding the social factors that may contribute to adverse birth outcomes, further research on the social determinants of health in understanding the

disparities in birth outcomes is recommended (Su et al., 2021). The social screening data can be used to understand the racial/ethnic disparity in PTB, where Black women have a disproportionately higher rate of PTB than white women.

For further research, it is recommended that the relationship between other social determinants of health and the PTB types be examined. Other social determinants of health may be associated with the type of PTB, such as stress, environmental exposures, social support, quality of healthcare, and experiences of discrimination and racism (Thoma et al., 2019). Also, a longitudinal study is recommended to examine how the social determinants of health play a role in a woman's life course and its relationship with the PTB types. The social determinants of health most likely do not begin during pregnancy but are social factors that may have begun in childhood into adulthood.

Implications for Professional Practice and Social Change

Preterm birth is a national public health priority in the U.S. Infants born before 37 weeks of gestation are at higher risk of infections, developmental delays, and death. The clinical subtypes of preterm birth are spontaneous preterm birth and provider-initiated preterm birth. Most research studies preterm birth as one outcome and does not examine the risk factors that may affect the clinical subtypes. This study addressed the gap in the literature on whether specific social determinants of health may influence the risk of a spontaneous and provider-initiated PTB. Based on the findings, there was an association between maternal and paternal education level, prenatal care utilization, and prepregnancy chronic conditions diabetes and hypertension with PTB type in Black women compared to full-term birth while controlling for age. There was no association

between provider-initiated preterm birth and maternal education. The results suggest that some social determinants of health significantly predict preterm birth types.

The results of prenatal care utilization showed that fewer prenatal care visits increased the odds of the PTB types. The prepregnancy chronic conditions of diabetes and hypertension were associated with the PTB types. Black women with these chronic conditions were more likely to have spontaneous and provider-initiated PTB when compared to Black women who gave birth full term. In addition, when the education and utilization of prenatal care were analyzed with the chronic conditions, the results showed the interrelationship that the chronic conditions have with social factors. When education level and utilization of prenatal care were favorable, it contributed to decreased odds of spontaneous and provider-initiated PTB.

Professional Practice

The findings from this study can be used in professional practice to understand the social factors that influence preterm birth types. Public health practitioners could use the social determinants of health framework to develop interventions that address the social factors associated with preterm birth types. For example, the education access and quality domain would address the importance of individuals having a high school education and higher. Individuals with a higher education are more likely to access prenatal care for pregnant women. Additionally, individuals with higher education are more likely to understand and adhere to the care prescribed by a healthcare provider. The healthcare access and quality domain would address access to care by achieving adequate

prenatal care. An intervention that has been researched that encompasses prenatal care visits and social support is group prenatal care.

Social Change

The purpose of my study was to understand the association between the social determinants of health and the preterm birth types, spontaneous and provider-initiated in Black women. Based on the study's results, there was a significant association between the social determinants in this study, maternal and paternal education, utilization of prenatal care, and prepregnancy chronic conditions of diabetes and hypertension with both PTB types in Black women. This study's implication for social change is beneficial to addressing the social determinants of health associated with PTB types in Black women. Health professionals can use the results in this study to create interventions that address multiple social determinants of health that may have a relation with PTB. Janaki and Prabakar's (2024) examination of socioeconomic factors influencing maternal health recommends multifaceted interventions beyond traditional healthcare. The recommendations included addressing multiple social determinants of health through policies and interventions such as educational programs targeted at women at a lower educational level by providing them with knowledge about proper prenatal care practices.

Other interventions recommended are community health centers or mobile clinics to increase access to prenatal care for underserved women and women unable to access prenatal care due to geographic and financial constraints. Another implication for social change is acknowledging the association between the father's involvement and the risk of adverse birth outcomes like PTB. In my study results, the father's education level was

associated with provider-initiated and spontaneous PTB. A higher education level for the father was associated with decreased odds of both PTB types. Health professionals can use these results to study further the association of the father's involvement and the relationship between the father's social determinants of health and the PTB types. In Matoba et al.'s (2024) review of the social determinants of premature birth, fathers were one of the factors discussed, and the studies reviewed indicated the need for more research on the father's role in birth outcomes. In addition, Matoba et al. (2024) recommended the integration of fathers into maternal and child health programs. My study can contribute to the social change implications of including the fathers in the development of interventions on PTB and addressing associated social determinants of health.

The study's implications for social change include the development of interventions for the Black population that will contribute to the efforts of reducing Black women's disproportionately higher rate of PTB. Also, interventions that address the social determinants of health that Black women may experience during pregnancy. Lessard et al. (2022) conducted community-based participatory research (CBPR) for the development, implementation, and feasibility of a Group Prenatal Care (GPNC) model for Black women in Fresno, CA, in response to the high PTB rates. The aim of the GPNC model was to address the social determinants of health for Black pregnant women. Using a community-based participatory research design allowed the participants to be included in what was needed for the GPNC model. Early in the development stages, social factors that needed to be addressed were prioritized and evolved as feedback was received from

participants and key stakeholders apart from the (CBPR). Based on the results from my study, health professionals can use the data to expand on Lessard et al.'s (2022) group prenatal care model that incorporates comprehensive health services that will address physical health like prepregnancy chronic health conditions that have a relation with the PTB types and social factors such as educational programs due to some having low educational attainment.

Last, the implications for social change support the need for screening for social determinants of health before pregnancy, during pregnancy, and after delivery. Most recently, there has been increased attention on addressing the social determinants of health to improve individuals' health outcomes. Now, there is a requirement from the Joint Commission for hospitals to assess patients' health-related social needs (HRSN) and provide community resources to support what the patient identified as a need (Trochez et al., 2023). The HRSNs are the individual social needs like access to healthy food and reliable transportation that leads to poor health outcomes (Richwine & Meklir, 2024; Trochez et al., 2023). HRSNs affect the individual, whereas SDoH is at the population level. However, the individuals' experiences with HRSNs are related to the surrounding SDoH. For example, an individual not receiving primary preventative care may result from a lack of healthcare facilities in their geographic location. Policies are needed to address SDoH that are above the individual level and are at the community and geographic level (Sheingold et al., 2023). In relation to my study, healthcare professionals can use this study's results to support policy developments in maternal health, such as the implementation of screening for HRSNs before, during, and after

pregnancy, particularly in underserved populations such as the Black population. In summary, this study's implications for social change focus on addressing the social determinants of health for Black women. The implications of social change are aligned with the social determinants of health framework by recommending interventions that address the social factors that hinder achieving healthy outcomes.

Conclusion

Preterm birth is the common cause of infant morbidity and mortality in the United States (Su et al., 2021; Vitner et al., 2020). The rate of PTB in 2021 was 10.5% in the United States (CDC, n.d.). The PTB rate for Black women is disproportionately higher at 14.8% than white women (9.5%) (CDC, n.d.), presenting a racial/ethnic disparity in maternal and child health. There are many risk factors for PTB, from socioeconomic to medical. In this study, the clinical subtypes of PTB were analyzed to understand the social determinants of health associated with spontaneous and provider-initiated preterm birth.

The results of the study found a significant association of preterm birth type with maternal and paternal education, utilization of prenatal care, and prepregnancy chronic conditions, diabetes, and hypertension. These findings suggest that social determinants of health influence the preterm birth types in Black women. Public health professionals can use this research study to develop further interventions that respond to social influences like education and utilization of prenatal care, which includes addressing access to prenatal care and the management and treatment of chronic diseases that are associated with preterm birth types. Although spontaneous PTB is challenging to predict and

provider-initiated birth is sometimes warranted for the safety of the mother and infant, responding to the social factors examined in this study it can make an impact on reducing the PTB rate among Black women, which can make an impact on maternal and infant health.

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Appendix: Multinomial Logistic Regression

Table A10*Multinomial Logistic Regression Maternal and Paternal Education and PTB Types*

Delivery Type ^a		Sig.	Odds ratio	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Provider-initiated PTB					
Mothers' education	Less than high education	.908	1.014	.801	1.283
	High school diploma or GED	.772	.978	.840	1.138
	Some College	.925	.993	.858	1.149
Fathers' education	College degree or higher	.	.	.	.
	Less than high education	.034	1.263	1.017	1.569
	High school diploma or GED	.103	1.149	.972	1.358
	Some College	.160	1.134	.952	1.350
Age	College degree or higher	.	.	.	.
	Age 18–22	<.001	.481	.388	.597
	Age 23–34	<.001	.565	.462	.691
	Age 35–44	.	.	.	.
Spontaneous PTB					
Mother's Education	Less than high education	<.001	1.234	1.090	1.397
	High school diploma or GED	.029	1.097	1.009	1.192
	Some College	.085	1.073	.990	1.164
	College degree or higher	.	.	.	.
Father's Education	Less than high education	<.001	1.248	1.111	1.403
	High school diploma or GED	<.001	1.170	1.069	1.281
	Some College	.439	1.039	.943	1.143
	College degree or higher	.	.	.	.
Age	18–22	<.001	.445	.396	.501
	23–34	<.001	.542	.485	.605
	35–44	.	.	.	.

Note. a. The reference category is: Full-term birth; b. This parameter is set to zero

because it is redundant

Table A11*Multinomial Logistic Regression Prenatal Care Utilization and PTB Types*

Delivery Type ^a		Sig.	Odds ratio	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Provider-initiated PTB					
Prenatal care visits	12 or more visits	<.001	.208	.181	.239
	7 – 11 visits	<.001	.485	.429	.549
	6 or fewer visits	.	.	.	.
Age	18–22	<.001	.438	.358	.534
	23–34	<.001	.549	.452	.667
	35–44	.	.	.	.
Spontaneous PTB					
Prenatal care visits	12 or more visits	.000	.107	.100	.116
	7 – 11 visits	.000	.289	.271	.308
	6 or fewer visits	.	.	.	.
Age	18–22	<.001	.424	.378	.476
	23–34	<.001	.539	.482	.603
	35–44	.	.	.	.

Table A12*Multinomial Logistic Regression Prepregnancy Chronic Conditions and PTB Types*

Delivery Type ^a		Sig.	Odds ratio	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Provider-Initiated PTB					
Prepregnancy Diabetes	Yes	<.001	3.841	2.960	4.984
	No	.	.	.	.
Prepregnancy Hypertension	Yes	<.001	3.574	2.992	4.268
	No	.	.	.	.
Age	18–22	<.001	.637	.521	.778
	23–34	<.001	.694	.571	.843
	35–44	.	.	.	.
Spontaneous PTB					
Prepregnancy Diabetes	Yes	<.001	2.749	2.295	3.293
	No	.	.	.	.
Prepregnancy Hypertension	Yes	<.001	2.222	1.971	2.505
	No	.	.	.	.
Age	18–22	<.001	.561	.503	.626
	23–34	<.001	.620	.558	.690
	35–44	.	.	.	.

Table A13*Multinomial Logistic Regression Education, Prenatal Care Utilization, Prepregnancy Chronic Conditions and PTB Types*

Delivery Type ^a		Sig.	Odds ratio	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Provider-initiated PTB					
Mothers' education	Less than high education	.200	.853	.668	1.088
	High school diploma or GED	.190	.900	.770	1.053
	Some College	.748	.976	.839	1.134
	College degree or higher	.	.	.	.
Fathers' education	Less than high education	.293	1.127	.902	1.410
	High school diploma or GED	.318	1.092	.919	1.296
	Some College	.249	1.111	.929	1.329
	College degree or higher	.	.	.	.
Prenatal care visits	12 or more visits	<.001	.201	.174	.233
	7 – 11 visits	<.001	.484	.425	.551
	6 or fewer visits	.	.	.	.
Prepregnancy Diabetes	Yes	<.001	4.359	3.291	5.775
	No	.	.	.	.
Prepregnancy Hypertension	Yes	<.001	3.845	3.180	4.649
	No	.	.	.	.
Age	Age 18–22	<.001	.572	.456	.718
	Age 23–34	<.001	.657	.533	.811
	Age 35–44	.	.	.	.
Spontaneous PTB					
Mother's Education	Less than high education	.442	.949	.831	1.084
	High school diploma or GED	.535	.972	.890	1.062
	Some College	.524	1.028	.944	1.120
	College degree or higher	.	.	.	.
Father's Education	Less than high education	.009	1.179	1.041	1.335
	High school diploma or GED	.002	1.166	1.059	1.284
	Some College	.316	1.054	.951	1.167
	College degree or higher	.	.	.	.
Prenatal care visits	12 or more visits	.000	.105	.097	.114
	7 – 11 visits	<.001	.289	.271	.309
	6 or fewer visits	.	.	.	.
Prepregnancy Diabetes	Yes	<.001	3.326	2.722	4.063
	No	.	.	.	.
Prepregnancy Hypertension	Yes	<.001	2.427	2.124	2.773
	No	.	.	.	.
Age	18–22	<.001	.468	.411	.532
	23–34	<.001	.585	.519	.660
	35–44	.	.	.	.