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Antibiotic Use, Obesity, and Preterm Birth Among Women in the United States

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This is to certify that the doctoral study by

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Walden University
2024

Abstract

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Mya T. Win

MSCLS, University of Texas Medical Branch at Galveston, 2016

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Preterm birth poses a worldwide health problem that has significant implications for the health of mothers and babies. Although the United States is a first-world country, it experiences a higher number of premature deliveries when compared to other nations. The purpose of this quantitative retrospective observational study was to examine the relationship between premature delivery and antibiotic use among pregnant overweight women with varied racial origins in the United States while controlling for education, age, and income. Bronfenbrenner’s social ecological theory served as the theoretical foundation. Secondary data were collected from the Birth Detail Database. Findings from chi-square and regression analysis indicated a significant relationship between preterm delivery and antibiotic use and obesity while pregnant. The relationship was not influenced by external variables. The results suggest proper antibiotic use could assist in preventing premature delivery in women with obesity. This research highlights the significance of considering age, educational attainment, and income in health care strategies. Findings may inform medical choices and measures in public health to decrease the frequency of preterm labor. Findings may also support programs targeting the reduction of health inequities and improve maternal and newborn outcomes in women with obesity.

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Dedication

The study is devoted to every woman who has gone through the obstacles and uncertainties connected with premature delivery. This is proof of the strength you possess, your ability to bounce back, and your steadfast resolve to ensure optimal results for you personally and your offspring.

For the ladies who have experienced the challenges of being overweight while pregnant, this research is committed to illuminating the complex connection between the utilization of antibiotics, being overweight, and giving birth prematurely. Your personal encounters have inspired me to explore further and understand the components that influence early childbirth. In addition, I desire to study possible proactive techniques.

This is with deep humility and appreciation that I dedicate this project to everyone who has contributed, directly or indirectly, to the enhancement of mother and baby health. Let my discoveries create opportunities for better medical attention, measures, and regulations resulting in better results for women and their newborns.

Acknowledgments

I would like to express my sincere appreciation to Dr. Sanggon Nam, chair, and Dr. W. Sumner Davis, methodologist, for their remarkable guidance, unfaltering support, and precious insights throughout this research. Their knowledge, support, and useful input have been instrumental in guiding the path and high standard of this investigation. I am very grateful for their inestimable backing.

I also want to offer my heartfelt gratitude to all the participants who willingly provided their private data and personal encounters for the objective of this inquiry. Minus their involvement, the investigation could not have succeeded. The eagerness to participate in this research has been vital in enhancing our comprehension of the intricate connection between antibiotic utilization, obesity, and premature delivery among the pregnant women in the United States. Appreciate the valued contribution. I am grateful to the medical experts and scientists whose past contributions have supplied a sturdy platform for this investigation. The commitment of to expanding understanding in the area pertaining to the health of mothers and infants has sparked my inspiration. This has also influenced my study.

I also want to recognize the assistance and comprehension of my dear ones during this scientific exploration. Their tolerance, support, and trust in my capabilities have been a continual spring of determination. For all individuals who have contributed, either directly or indirectly, to achieving this investigation, I give my heartfelt appreciation. The combined efforts of all have had a substantial impact on the progress of information in the discipline of mother and baby health.

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Section 1: Foundation of the Study and Literature Review

Preterm birth, defined as delivery before 37 completed weeks of gestation, remains a significant global health challenge with substantial implications for maternal and infant health. Vogel et al. (2018) indicated that the global prevalence of preterm births stands at about 9.6%. This is based on data collected from 92 countries. Similar data collected by the American College of Obstetricians and Gynecologists (2021) showed that the United States has one of the highest preterm births globally. The number of preterm births in the country is about 1 in 10 new births. This is despite the United-States having superior health care resources and being a high-income country. Heerman et al. (2019) suggested that antibiotic use and obesity might be influential factors contributing to this complex issue. Gaining insight into how antibiotics, obesity, and preterm birth are related among American women is important. This knowledge may enable the development of preventive approaches and the advancement of maternal and neonatal health outcomes.

In medicine, antibiotics have revolutionized disease treatment and prevention, but their widespread and indiscriminate use raises concerns. Leong et al. (2020) suggested a potential link between antibiotic exposure and an increased risk of premature birth. Antibiotics can disrupt the delicate balance of the female reproductive system by altering maternal microbiota composition, leading to adverse pregnancy outcomes. Investigating this link could reveal specific drug classes that have a higher health risk.

The United States grapples with an obesity epidemic, particularly among women of reproductive age. Rakhra et al. (2020) recognized that there is an obesity crisis and contended that reproductive studies have shown that there are more than 20% of obese women in the United States of reproductive age. On the same note, K. Liu et al. (2022) noted that obesity is recognized as a significant factor in adverse pregnancy outcomes, including an elevated risk of preterm birth, though the underlying mechanisms are not fully understood. One hypothesis implicates obesity-induced inflammation, metabolic changes, and hormonal imbalances (Mitanchez &Chavatte-Palmer, 2018). Exploring the complex interactions among obesity, antibiotic use, and preterm birth may enhance the understanding of their collective impact on maternal and neonatal well-being.

I sought to investigate the intricate interplay among antibiotic use, obesity, and early delivery in U.S. women. By systematically reviewing existing literature, I aimed to consolidate current evidence, identify research gaps, and explore potential mechanisms. Through extensive data analysis, I assessed how antibiotic consumption and obesity independently contribute to preterm birth rates and their combined effects. Additionally, I examined socioeconomic and demographic variables that may influence this relationship, providing insights into health disparities and targeted interventions.

The findings of this research may inform public health policies on antibiotic use and guide clinical practice and patient education efforts to address obesity among women of reproductive age. By unraveling the complex relationship among these variables, I aimed to contribute valuable data-driven approaches to reduce premature births and improve the health outcomes of mothers and newborns in the United States. I used comprehensive data from the Natality Detail File, specifically the 2014 edition (United States Version 1), provided by the Inter-University Consortium for Political and Social

Research (ICPSR). This data set served as the primary source for analyzing and exploring the relationships between these variables and their impact on preterm birth rates among U.S. women.

Problem Statement

In the United States, preterm births, defined as babies born before completing 37 weeks of pregnancy, represent a significant public health concern. Recent data from the Centers for Disease Control and Prevention (CDC, 2022) revealed a troubling increase in preterm birth rates from 11.1% in 2020 to 14.1% in 2021, meaning that approximately 1 in 10 children were born prematurely that year. Addressing this issue is a critical national public health goal, further underscored by existing research highlighting maternal obesity and antibiotic use as notable risk factors for preterm births. This emphasizes the urgent need for comprehensive research and interventions to reduce preterm births, improve maternal and neonatal health, and meet this public health challenge.

Maternal race, ethnic disparities, and age, in conjunction with maternal obesity and antibiotic use, can influence birth outcomes, yet a substantial gap in the literature exists regarding their collective impact on preterm births among pregnant women in the United States. This lack of research underscores the need for a comprehensive understanding of the relationship between antibiotic use, maternal obesity, maternal race, and their combined effects on preterm births (Akobirshoev et al., 2020; Carr et al., 2022). The absence of a well-established connection between antibiotic use among obese pregnant women of diverse racial backgrounds and the risk of preterm births highlights a significant knowledge gap. Consequently, I aimed to examine how factors such as maternal obesity, advanced age, racial background, and antibiotic use collectively influence the occurrence of preterm births among women in the United States. By illuminating the complex interplay among these variables, I sought to provide valuable insights into potential remedial measures, thereby contributing to the development of effective strategies to mitigate this pressing issue and improve maternal and neonatal health outcomes in the United States.

Purpose of the Study

In this quantitative study, the primary objective was to investigate the risk of preterm birth among obese American women of various racial backgrounds who have used antibiotics during pregnancy, while controlling for potential confounding variables such as age, education, and income. I aimed to discern the factors contributing to the ongoing increase in preterm births among obese women or those who used antibiotics during pregnancy. By conducting a thorough examination of these factors, I sought to provide valuable insights into the complex dynamics of premature labor within this population, thereby contributing to the understanding of these intricate relationships and informing strategies to reduce preterm births and enhance maternal and neonatal health outcomes in the United States.

Research Questions and Hypotheses

RQ1: Is there an association between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o1: There is no significant association between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity.

H_a1: There is a significant association between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity.

RQ2: Does health care access moderate the relationship between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o2: Health care access does not moderate the relationship between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity.

H_a2: Health care access moderates the relationship between preterm birth and antibiotic use in pregnancy among obese women of different races in the United States, when controlling for education, age, income, and race/ethnicity.

Theoretical Foundation

The theoretical framework for this study was Bronfenbrenner's (1992) ecological systems theory. This framework aligned with the objective of examining the intricate relationship between preterm birth, antibiotic use, and obesity among women in the United States. Bronfenbrenner's ecological systems theory provided a relevant and comprehensive perspective for understanding the complex interplay of various elements that influence health outcomes.

Bronfenbrenner's (1992) theory as cited in. Crawford (2020) posits the existence of interdependent systems, including the microsystem, mesosystem, exosystem, and macrosystem, all of which impact an individual's development. These systems encompass a wide range of environmental factors, such as family, peers, schools, communities, and cultural norms, which can shape a person's growth and behavior. In accordance with this theory, the context in which an individual exists plays a pivotal role in shaping their characteristics and behaviors. This theory served as a valuable tool for elucidating the influence of contextual factors on obesity, antibiotic use, and their relationship with preterm births. Ecological systems theory is one of the most widely accepted explanations for understanding the impact of social environments on human development. Hertler et al. (2018) indicated that Bronfenbrenner integrated culture in this framework. Within this framework, the macrosystem represents the cultural environment and all other systems affecting the individual, aiding in the comprehension of how cultural and social values influence people and their lifestyles.

Walker et al. (2019) described one of the most significant applications of Bronfenbrenner's ecological systems theory. Walker et al. adapted the ecological systems theory to obese and overweight children to identify and assess the risk factors associated with this population. Using the theory enabled Walker et al. to understand how the holistic environment influences the lives of children and helps to identify factors contributing to overweight and overweight and obesity. This assessment helps to develop and implement the relevant treatment interventions for this population. Moreover, Bratanoto et al. (2022) used ecological systems theory to assess how distance learning affected the readiness of children to return to school during the COVID-19 pandemic. Bratanoto et al. also used the theory to understand how the children's environment also influenced their school readiness. The findings showed that distance learning had an insignificant effect on children's school readiness. However, the ecological environment emerged as a significant influence.

B. F. Crawford et al. (2020) further applied the theory to explore the challenges faced by gifted racial minority students, while Todd et al. (2020) used Bronfenbrenner's theory to understand the traumatic experiences of undocumented students studying the K–12 educational system. Understanding the experiences of these students was vital in developing counseling programs to address their mental health issues. Additionally, the CDC (2022) employed Bronfenbrenner's theory to understand the factors influencing violence and the impact of preventive strategies. The theory allowed the CDC to consider the intricate interplay between individual, relational, community, and societal factors, enabling a deeper understanding of risk factors for violence and the development of effective prevention interventions. Furthermore, the theory played a pivotal role in sustaining prevention efforts and achieving population-level impact over time.

Although there is limited research applying Bronfenbrenner’s theory to evaluate antibiotic use, obesity, and preterm birth among women in the United States, this theoretical framework was appropriate for this study. Bronfenbrenner’s ecological systems theory was applied to examine antibiotic use during pregnancy, preterm birth, health care access, obesity, maternal race, maternal age, educational level, and income level as determined by the mother’s participation in the Special Supplemental Nutrition Program for Women, Infants, and Children. To achieve this, the Natality Detail File, specifically the 2014 edition (United States Version 1) data set, and applied Bronfenbrenner’s ecological systems theory to gain deeper insights into the complex dynamics of these variables and their relationship with preterm births among women in the United States.

Nature of the Study

This quantitative study involved a secondary analysis of the Natality Detail File, 2014 (United States (Version 1) ICPSR data set, guided by Bronfenbrenner’s ecological systems theory. I screened determinants including antibiotic use during pregnancy, preterm birth rates, health care facility access, obesity prevalence, maternal race, maternal age groups, maternal education levels, and household incomes, with a primary focus on women residing in the United States. Employing a correlational design based on the work of Ranaganthan and Aggarwal (2020), I examined the complex interactions among these determinants to provide deeper insights into their collective impact on preterm births among women in the United States.

Literature Review

The purpose of this literature review was to explore the intricate relationship between antibiotics, obesity, and preterm birth, aiming to understand the underlying mechanisms connecting these variables and uncover potential preventive strategies. The investigation addressed how antibiotic use can impact obesity by perturbing the balance of gut microbiota, leading to gut dysbiosis, inflammation, and disruptions in metabolic functions. Suez et al.'s (2018) extensive research demonstrated notable differences in the composition and diversity of gut microbiota between obese individuals and those with normal weight, indicating that an imbalanced gut microbiota can contribute to the progression of obesity and related metabolic disorders.

Furthermore, this review addressed the link between antibiotic use, weight gain, and the escalating rates of obesity while examining potential implications for maternal well-being and fetal development during pregnancy. Specifically, I investigated the association between maternal obesity and gestational duration, exploring factors such as hormonal imbalances, inflammation, and metabolic dysfunction, all of which are closely tied to an increased risk of preterm birth. By delving into these aspects, I aimed to contribute to a deeper understanding of the complex dynamics surrounding antibiotic use, obesity, and their impact on preterm birth risk.

Antibiotic Use and Its Impact on the Gut Microbiota

Antibiotics wield considerable and lasting influence by perturbing the human gut microbiota. Research indicated that even short-term antibiotic use can lead to a notable reduction in microbial diversity and specific taxa, while facilitating the emergence of antibiotic-resistant strains and genes (Suez et al., 2018). Mouse models corroborate these findings, underscoring their reproducibility (Suez et al., 2018). The depletion of bacteria due to antibiotics can indirectly affect other microbial populations, influencing the magnitude and duration of antibiotic effects through the interdependence among different bacterial species (Agus et al., 2018).

The vulnerability of the gut microbiota to antibiotic disruption is especially pronounced during early life stages. Infants born via cesarean section, whose gut microbiotas resemble that of mature skin, may be more susceptible to subsequent infections. Agus et al. (2018) showed that using vaginal gauze to swab C-section-delivered babies can partially restore more typical microbiota. Furthermore, antibiotic use within the first year of life has been linked to an increased risk of asthma and metabolic syndromes in later childhood years (Timur et al., 2018). Studies with mice demonstrated exacerbated asthma symptoms when exposed to antibiotics early in life, emphasizing the importance of minimizing antibiotic use during infancy (Agus et al., 2018).

Antibiotic resistance is influenced by various mechanisms including immune responses, bacterial competition, and exogenous antibiotic pressure. Oliver and Lamont (2013) found that antibiotic-induced selective pressure drives rapid evolution of resistant strains. Notably, not all cells within a population develop resistance, and instances of bacterial charity work have been observed, where resilient cells aid in preserving the viability of antibiotic-sensitive bacteria in the community (Callaway et al., 2019). The transmission of antibiotic-resistant genes among bacteria relies on horizontal gene transfer, occurring through transformation, conjugation, and transduction. Antibiotic treatment stimulates horizontal gene transfer mechanisms, resulting in an intensified transfer of resistance genes within the gut microbiota (Suez et al., 2018).

Although antibiotics have revolutionized medical treatment by combating bacterial infections, their widespread use has given rise to antibiotic-resistant strains and gastrointestinal issues, including antibiotic-associated diarrhea, affecting a significant portion of the population. The disruption of the usual community structure of the gut microbiome, known as dysbiosis, plays a pivotal role in causing antibiotic-associated diarrhea (Callaway et al., 2019). Callaway et al. (2019) also noted that the impact of antibiotics on the gut microbiota is rapid and detrimental to both bacterial metabolism and the host proteome in both mice and humans.

Although the human gut microbiome can partially recover from antibiotic treatment, the process is often slow and incomplete, sometimes taking years to return to its original state. Additionally, early life exposure to antibiotics may be linked to the development of long-term disorders such as obesity. According to Suez et al. (2018), one potential strategy for mitigating antibiotic-induced dysbiosis and its associated adverse effects is the administration of probiotics. Studies conducted on mice and humans provided promising data on the use of probiotics to restore the gut microbiome following antibiotic treatment (Suez et al., 2018). However, debates persist regarding the effectiveness of probiotics in this context. Although some research has explored how probiotics colonize the gut mucosa after antibiotic use, Hales (2023) pointed out that most of these investigations relied on fecal samples, leaving uncertainty about whether probiotics can effectively reinstate the preantibiotic microbiome composition. Furthermore, there has been a lack of research on living subjects to examine probiotic colonization within the human gastrointestinal mucosa after antibiotic administration. Additionally, studies such as those conducted by Callaway et al. (2019) did not address how this colonization influences the restoration mechanisms of native microbial communities and gene expression within the hosts' intestinal tracts.

In a study involving both mice and humans, Callaway et al. (2019) explored how probiotic consumption after antibiotic treatment affects the composition and functioning of their gut microbiomes, as well as gene transcription in their gastrointestinal tracts. The study revealed notable differences in probiotic colonization after antibiotic treatment between mice and humans. Mice showed only minor improvements in probiotic colonization compared to homeostasis, while humans exhibited significant enhancements. Importantly, the supplementation of probiotics after antibiotic administration disrupted the reconstitution of native intestinal and mucosal microbial communities, as well as the restoration of gut gene activity in both mice and humans. Callaway et al. highlighted that this differs from cases in which recovery occurs spontaneously or through autologous fecal microbiome transplantation, which led to rapid and nearly complete reestablishment of the gut mucosal microbiome and the human gut transcriptome.

Role of Gut Microbiota in Obesity Development

There has been a dramatic increase in obesity rates and related complications in recent years, including diabetes (Wang et al., 2021). Despite extensive research and the identification of candidate genes and mutations through genome-wide association studies, a comprehensive understanding of the underlying mechanisms remains elusive. Over the past decade, multiple studies have proposed a potential link between gut microbiota and the development of obesity and diabetes. Emerging evidence suggested that the gut microbiota play a role in various processes, including energy balance, blood regulation, and autoimmune modulation (Benahmed et al., 2021).

Suez et al (2018) revealed differences in gut microbiota composition between obese individuals and lean counterparts in mice and humans. Obesity was associated with an increase in bacterial populations linked to the Firmicutes phylum and a decrease in those associated with Bacteroidetes. This disturbance in gut microbiota has implications for increased energy absorption from food and chronic inflammation. However, conflicting findings in other studies emphasized the need for further investigation into specific species within these phyla. Additionally, the metabolic improvements observed in individuals undergoing Roux-en-Y gastric bypass surgery could not be solely attributed to caloric restriction and weight loss (Benahmed et al., 2021). Alterations in gut microbiota after surgery further underscored the connection between gut microbiota and obesity development. Transplanting feces from Roux-en-Y gastric bypass-treated mice into germ-free mice resulted in weight loss and reduced fat mass, providing further evidence of the gut microbiota’s role in obesity.

Short-chain fatty acids (SCFAs) produced through colonic fermentation are crucial in mediating the influence of gut microbiota on energy metabolism. These bacterial byproducts, including acetate, propionate, and butyrate, contribute to maintaining a stable redox status in the intestinal ecosystem. Dalile et al. (2019) suggested that SCFAs can positively impact body weight, glucose regulation, and insulin sensitivity. However, contrasting outcomes have been reported, with some studies showing elevated SCFA levels in genetically obese mice and obese humans (Dalile et al., 2019). SCFAs also act as signaling molecules, activating various pathways involved in cholesterol, lipid, and glucose metabolism, including AMPK and GLP-1, critical factors in metabolic regulation. Silva et al. (2020) proposed that gut microbiota play a role in regulating bile acids and cholesterol metabolism, affecting bile acid synthesis and absorption crucial for lipid digestion and absorption. The presence of gram-negative bacteria in the gut leads to the production of lipopolysaccharides, which activate pro-inflammatory pathways, often resulting in low-grade inflammation, a hallmark of obesity and Type 2 diabetes.

Silva et al. (2020) observed variations in the gut microbiota composition of mice with a genetic alteration in the leptin gene, which is linked to obesity, compared to mice without this mutation. Obese mice exhibited alterations in the proportions of major gut phyla, particularly a decrease in Bacteroidetes and an increase in Firmicutes. Similar modifications in gut microbiota were observed in obese human subjects compared to lean controls. These changes in the balance between Bacteroidetes and Firmicutes are associated with enhanced energy extraction from dietary sources and the development of mild inflammation. J.-L. Liu et al. (2020) suggested that these alterations result from specific genes encoding enzymes that facilitate the breakdown of indigestible polysaccharides, leading to increased production of SCFAs and monosaccharides. SCFAs activate gut epithelial cells' G-protein-coupled receptors (GPR41 and GPR43), promoting increased nutrient uptake and deposition. Additionally, altered gut microbiota reduce fasting-induced adipose factor production, hindering triglyceride breakdown and favoring storage in the liver.

J.-L. Liu et al. (2020) proposed that obese individuals may have an enhanced ability to extract energy from nutrients, possibly due to hydrogen transfer between distinct microbial taxa. Increased hydrogen production and conversion to methane by methanogenic Archaea were associated with obesity, suggesting a higher energy harvest in obese patients. To test this hypothesis, J.-L. Liu et al. conducted an experiment feeding germ-free mice a high-fat diet. These mice gained less weight compared to conventional laboratory-bred mice, highlighting the role of gut microbiota in regulating energy metabolism. Using transplantation experiments, J.-L. Liu et al. demonstrated causality between microbiota and obesity.

In contrast to transplanting microbiota from lean mice, transferring microbiota from genetically obese mice induced significant weight gain in axenic mice. Dalile et al. (2019) indicated that the specific genera within the gut microbiota phyla play distinct roles in obesity and body weight regulation. For example, *Bifidobacterium spp.* has been associated with normal weight in children. *Staphylococcus aureus* has the potential to trigger low-grade inflammation and contribute to obesity development. Various species within *Lactobacillus* have shown different connections with body weight, either associated with leanness or obesity (Dalile et al., 2019). These findings highlight the intricate relationship between specific microbial taxa and their roles in influencing obesity and metabolic processes.

Dalile et al. (2019) also conducted a study to explore how low-dose antibiotic exposure affects microbiota establishment and its implications for host metabolism and adiposity. Dalile et al. found the administration of low-dose penicillin (LDP) from birth caused metabolic changes and affected gene expression associated with immunity in the ileum. This aligns with J.-L. Liu et al.'s (2020) findings that the microbiota experience a temporary disturbance due to early-life LDP exposure, leading to significant implications for long-term metabolic outcomes. Moreover, as Silva et al. (2020) emphasized, LDP intensifies the onset of obesity triggered by a high-fat diet. Silva et al. found that the phenotype that promotes growth could be transmitted to hosts without any bacteria through the transfer of microbiota influenced by LDP. The implication of this finding is that the manipulated microbiota, rather than just the antibiotics used, contribute to the observed effects.

Preterm Birth

Preterm birth, defined as the birth of a baby before completing 37 weeks of gestation, is a significant public health concern (Grétarsdóttir et al., 2019). Preterm birth can result from various factors including maternal and fetal stress, infection or inflammation, vaginal bleeding within the uterus, and overdistention of the uterus

(Grétarsdóttir et al., 2019). Grétarsdóttir et al. also indicated that maternal medical conditions, psychological stress, and placental abnormalities can lead to hormonal changes that trigger preterm labor. Bekkar et al. (2020) studied the link between preterm birth and infections or inflammation in the reproductive tract, highlighting the role of infections in disrupting the delicate balance required for a pregnancy to reach full term.

Vaginal bleeding originating within the uterus can further increase the risk of preterm birth. Conditions such as placental abruption or placenta previa can lead to this type of bleeding, affecting the integrity of the placenta and normal fetal development. Uterine overdistention can occur in cases involving twins, triplets, or excessive amniotic fluid, increasing the likelihood of preterm birth (Bekkar et al., 2020). Overstretching of the uterus can lead to uterine contractions and early labor. Other factors have been associated with an elevated risk of preterm birth, including a short cervix, inadequate pregnancy spacing, multiple gestations, smoking, substance abuse, chronic medical conditions, weight-related issues, poor nutrition, inadequate prenatal care, and uterine or cervical abnormalities. Grétarsdóttir et al. (2019) identified infections during pregnancy, particularly in the early stages of gestation, as a common cause of spontaneous preterm birth. Infections stemming from bacteria or viruses in the uterus, vagina, bladder, or oral cavity (e.g., periodontal disease) can trigger an irregular or inflammatory response leading to preterm labor. It is crucial to recognize that a notable percentage of women who give birth prematurely do not exhibit these risk factors, even though these factors can increase the likelihood of preterm birth.

Antibiotics in Preterm Birth

Preterm birth is associated with adverse outcomes, including cerebral palsy, respiratory distress, hypoglycemia, jaundice, seizures, and infant deaths. While the precise causes of preterm birth remain unknown, approximately 30% of cases can be attributed to infection or inflammation (Fajardo et al., 2018). Diagnosing PTB is challenging, as only a few compromised pregnancies exhibit clinical signs of chorioamnionitis. The other cases are often iatrogenic and linked to fetomaternal indications according to Fajardo et al. (2018). High-income countries are witnessing an increase in preterm birth due to iatrogenesis and advancements in neonatal care (Walani, 2020). This growth rate is influenced by various factors, including an increase in risk factors for pregnancy complications leading to early deliveries, expanded use of medical interventions during childbirth, and use of advanced assisted reproduction techniques (Walani, 2020).

Cantey et al. (2018) highlighted that administering clindamycin before 22 weeks of gestation in women with objective evidence of abnormal genital tract flora can reduce the rate of preterm birth by 40%. Notably, oral clindamycin demonstrates greater effectiveness in this regard. However, there is no significant advantage in administering inappropriate antibiotics to women without evidence of abnormal genital tract flora during late gestations when preventing preterm birth, except for those with bacterial vaginosis and are at high risk. Walani (2020) noted that the available evidence on this topic is limited and marred by selection bias, discrepancies in the timing of treatment administration, variations in antibiotic selection, and inconsistencies in data reporting related to re-screening and re-treatment outcomes.

As a result, there is a need for comprehensive studies to assess the effectiveness of early oral and intravaginal clindamycin use in pregnant women exhibiting abnormal genital tract flora symptoms. A study by Fajardo et al. (2018) provided valuable insights into the potential of antibiotics in reducing the incidence of preterm birth and guiding appropriate treatment strategies. Traditional approaches to preventing preterm birth often involve the administration of tocolytic agents once a woman is admitted to the hospital in preterm labor. However, this reactive approach may be ineffective due to irreversible cervical changes once labor has commenced. Therefore, considering Fajardo et al.'s approach to identify women at risk and implement the relevant interventions is more plausible.

Abnormal colonization of the genital tract in early pregnancy is associated with an increased risk of premature delivery. Fajardo et al.'s (2018) study focused on examining antibiotic therapy for women with irregular genital tract colonization. Fajardo et al.'s study yielded contradictory outcomes due to variations in diagnostic methods, treatments, and levels of risk. Cantey et al. (2018) examined asymptomatic bacterial vaginosis and found that repeated doses of metronidazole did not reduce the prevalence of preterm delivery or its associated morbidity and mortality. Cantey et al.'s study primarily included women from Black and Hispanic ethnic backgrounds, which suggested potential racial disparities in pregnancy outcomes within these populations making it vital to explore alternative strategies to treat bacterial vaginosis and prevent recurrence.

Combining intravaginal and systemic antibiotics to target multiple organisms in the lower genital tract and promote colonization of the decidua may be a more effective approach. However, as highlighted by Fajardo et al. (2018), the time gap between diagnosis and randomization may lead to a significant reduction in bacterial vaginosis, potentially obscuring the detection of ascending colonization in the decidua and upper genital tract, which could contribute to preterm delivery.

Detecting abnormal colonization of the genital tract early in pregnancy is essential because preterm labor can be either physiologic or pathologic, often arising due to abnormal initiating factors. Timur et al. (2018) showed that detecting bacterial vaginosis before 16 weeks of gestation is linked to a greater relative risk of preterm delivery compared to detection after 26 weeks. Therefore, considering early treatment, even during the first or second trimester or before pregnancy, to prevent upper genital tract colonization and subsequent inflammation leading to preterm labor should be a priority.

Fajardo et al. (2018) examination of the distribution of bacterial species within different categories of vaginal flora and have revealed variations in the frequency at which various grades of Gram staining detect bacteria. Fajardo et al. found that some organisms are more prevalent in florid bacterial vaginosis. Timur et al. (2018) observed that women with grade III flora exhibited a lower rate of preterm delivery and improved antibiotic efficacy compared to those with grade II flora. Certain groups of women with signs of bacterial vaginosis, such as those with vaginal colonization by Mycoplasma hominis, may face an elevated risk of preterm birth. Instead of measuring preterm delivery as the primary outcome, Cantey et al. (2018) suggested focusing on identifying newborns who show evidence of encountering antigens before birth. This approach could provide a better understanding of the ability of antibiotics to reduce illness rates resulting from infections among vulnerable infants, who are more susceptible to neurological and respiratory system damage.

Maternal Obesity and Preterm Birth

The association between maternal obesity and preterm birth, particularly in the context of preeclampsia (P.E.) and gestational diabetes mellitus (GDM), remains unclear and inconclusive. To better understand the impact of parental obesity on preterm birth, it is crucial to establish the relationship between these variables, which has been the focus of numerous research studies. For example, K. Liu et al. (2022) conducted a study to explore the connection between maternal obesity and preterm birth. Their findings revealed that the risks of extremely, very, and moderately preterm birth increased as BMI (Body Mass Index) increased, with the highest risk observed in obese women for extreme preterm birth. Furthermore, K. Liu et al identified significant associations between maternal obesity and various preterm birth subtypes, including spontaneous preterm labor, premature membrane rupture, and medically mandated preterm delivery. K. Liu et al also quantified the mediation effects of GDM and P.E and indicated that GDM accounted for 32.80% of the effect of obesity on spontaneous preterm labor, while P.E. mediated 64.31% of the effect of obesity on medically indicated preterm birth.

Hadley et al. (2019) conducted a similar study investigating the relationship between maternal obesity and preterm delivery in expectant women. Hadley et al.’s findings echoed those of Liu et al. (2022), which showed that maternal obesity predicted preterm births. Obese women in the study had a 60% increased hazard of experiencing complications that led to delivery approximately 1.5 weeks earlier than non-obese women. Hadley et al. found that the gestational age at delivery was lower in obese women, with 27.2 weeks compared to 28.8 weeks in non-obese women. These findings suggested a clear association between maternal pre-pregnancy obesity and various phenotypes of preterm birth, with the highest risks observed in extremely preterm and medically indicated preterm birth (Hadley et al., 2019).

Sobczyk et al. conducted a study in 2022 similar to Hadley et al.'s (2019) study. Sobczyk et al. examined the effect of maternal obesity on preterm births among women in Silesia. Sobczyk et al. evaluated how early pregnancy BMI is related to the risk of delivering prematurely depending on gestational age. Just like what Liu et al. (2022) reported, a similar trend was observed by Sobczyk et al. (2022), which revealed that overweight and obese women had nearly double the rate of preterm births compared to those with a normal weight. This observation demonstrated the association between maternal overweight and the risk of preterm births. A different study done by Solmi and Morris (2018) in England revealed that obese or overweight pregnant women are more likely to have birth complications like premature births, which also exaggerated the cost of births.

Influence of Maternal Obesity on Pregnancy Complications

Timur et al.'s study (2018) focused on understanding the connection between maternal obesity, diabetes status, pregnancy complications, and neonatal outcomes. Timur et al. discovered that as age increases, so does obesity and the likelihood of developing diabetes mellitus, with obese women being more prone to developing the condition. Sobczyk et al.'s (2022) findings also indicated that patients with diabetes mellitus had a higher occurrence of obesity, and were much older. This corresponds to previous investigations which proposed an association between increasing age and higher levels of obesity. Timur et al. (2018) reported that the occurrence of pregnancy complications is significantly influenced by placental function and may be implicated in connecting maternal obesity with potential health dangers for infants. IL-6, TNF-α, leptin, and adiponectin serve as examples of signaling molecules within maternal adipokines, linking maternal nutritional status to placental function through the regulation of adipose tissue metabolism (Timur et al., 2018). After delivery, many obese women develop type 2 diabetes mellitus. Timur et al. revealed that diabetic women exhibited a significantly higher prepregnancy body mass index (BMI) than the controls.

The prepregnancy BMI categories influences the recommended weight gain during pregnancy. However, there are no specific instructions for women experiencing gestational diabetes. Solmi and Morris (2018) found that although obesity rates were higher among patients with diabetes mellitus and their BMIs were elevated, there was no significant disparity in gestational weight gain compared to all groups. This may be attributed to dietary and lifestyle interventions for women with higher pre-pregnancy

BMIs. Preeclampsia, gestational hypertension, and polyhydramnios are more prevalent in pregnancies complicated by D.M. Timur et al. (2018) noted that preeclampsia incidence is higher in diabetic pregnant women with vascular complications. Polyhydramnios, increased amniotic fluid volume, is more common in diabetic pregnancies and result from fetal hyperglycemia. Polyhydramnios risk may be even higher in individuals with obesity.

Children of obese mothers have an increased vulnerability to developing obesity, metabolic disorders, neuropsychiatric and cognitive ailments, in the future. The placental function has a significant impact on the occurrence of pregnancy complications and might be involved in linking maternal obesity to potential health risks for infants. Interleukin 6 (IL-6), tumor necrosis factor-alpha (TNF-α), leptin, and adiponectin are examples of signaling molecules present in maternal adipokines that connect maternal nutritional status and adipose tissue metabolism to placental function (K. Liu et al., (2022). These adipokines directly affect Placental nutrient transport, thereby controlling nutrient delivery to the growing fetus.

Adiponectin and IL-1β influence the regulation of placental function through their impact on various factors such as insulin signaling, cytokine profiles, and insulin responsiveness. Despite this, the correlation between these factors may occasionally exhibit conflicting effects, leading to many outcomes in pregnant women with obesity over different periods. Alongside disruptions in nutrient transport, obese expectant mothers have a higher probability of experiencing hypertension and preeclampsia, conditions that contributes to reduced placental vascularity and blood perfusion (Patro

Golab et al., 2018). These amendments impose further constraints on placental nutrient delivery to the developing embryo, which has consequences for organ development and growth patterns during intrauterine life.

Regulating trophoblast function is a complex process involving the activation of multiple signaling pathways, including mTOR, PPARs, STAT3, NFκβ, and p38 MAPK (Patro Golab et al., 2018). These pathways are triggered by various factors, such as maternal fat consumption, and play a crucial role in regulating nutrient transport function, promoting angiogenesis, and facilitating fetal development. Placental nutrient transport and vascular development have opposing roles in obese mothers. Increased nutrient transport capacity is associated with excessive fetal growth, while limited vascular branching in the placentas of obese mothers with hypertensive disorders hinders proper development (Patro Golab et al., 2018). Investigating the specific phenotypes in neonates born to obese mothers allows us to understand the significance of studying unique combinations of factors, including adipokines, insulin, and angiogenic factors. A child's growth trajectory and long-term health are influenced by their obese mother's distinct cytokine profile, insulin sensitivity, and dietary factors.

Exposure to Antibiotics and Childhood Obesity

There is a potential connection between early childhood obesity and exposure to antimicrobial agents during pregnancy. Antibiotic use has been shown to disrupt the gut microbiota, potentially impacting energy metabolism and adiposity, as indicated by multiple studies linking increased body mass index (BMI) in children with antibiotic usage. Zhuang et al. (2021) conducted a study in 2021 to better understand the relationship between gut microbiota and childhood obesity. Zhuang et al. research focused on the effects of low-dose antibiotic exposure on microbiota and its consequences for host metabolism and adiposity. Zhuang et al. revealed that the administration of low-dose penicillin (LDP) from birth induced metabolic changes and influenced gene expression associated with immunity in the ileum. According to Zhuang et al., early-life exposure to LDP led to a temporary disruption in the microbiota, which had significant implications for long-term metabolic outcomes. As also shown by Pyle et al. (2021), LDP accelerated the onset of obesity triggered by a high-fat diet. Pyle et al. discovered that the growth-promoting phenotype could be transmitted to hosts that lacked any bacteria but received microbiota specifically influenced by LDP. This finding suggests that it is primarily the altered microbiota, rather than just the antibiotics themselves, that contribute to the observed effects on obesity and metabolic changes.

The precise workings and causal association between antibiotics and obesity are not fully elucidated, which warrants further exploration. The establishment of the aforementioned causal relationship has been investigated by Leong et al. (2020), Pyle et al. (2021), Wang et al. (2018), and Zhuang et al. (2021). The impact of prenatal and postnatal antibiotic exposure on child obesity development was investigated by Leong et al. (2020), who concluded that antibiotic usage does not significantly contribute to childhood obesity. Margetaki et al. (2022) also examined the association between prenatal and infant exposure to antibiotics and maternal weight gain and the risk of child obesity. Unlike Leong et al. (2020) that found exposure not to be a major contributor to childhood obesity, Margetaki et al. (2022) found that prenatal exposure to antibiotics doubled the risk for childhood obesity. Pyle et al. (2021) conducted a different study exploring how prenatal antibiotic utilization impacts the growth of preterm and low-weight newborns. During the initial year, infant growth displayed a positive linear connection with antibiotic use , with its magnitude directly proportional to the dosage. These outcomes corroborate previous research highlighting the strong link between antibiotic dosage and infant development.

Wang et al. (2018) determined that repeated antibiotic exposure during the second trimester posed the greatest risk to pregnant women. Zhuang et al. (2021) conducted a similar study among 5-year-old children and determined that using antibiotics increases the risk of obesity. Heerman et al. (2019) assessed the enduring drawbacks of maternal antibiotic use and revealed a direct connection between antibiotic use during pregnancy and childhood obesity.

Moreover, Sakurai et al. (2022) and Jess et al. (2019) also examined the possible consequences of administering antibiotics during pregnancy and postnatal periods in children. Sakurai et al. (2022) and Jess et al. (2019) further expounded on how prenatal antibiotic exposure was linked to various outcomes in children. Sakurai et al. (2022) investigated how taking antibiotics during pregnancy is linked to obesity in children at 3 years old by using information from a Japanese birth Cohort. Sakurai et al. showed that when pregnant women took antibiotics, there was a connection to their children being obese at 3 years old. This connection was seen in the basic and detailed models that included all children. Looking at each part of pregnancy separately, using antibiotics during the second and third trimester affected whether girls would be obese at age 3. However, no clear effect was seen in boys (Sakurai et al., 2022). On top of that, exposure during the first trimester did not show a significant association with obesity in either sex.

Jess et al. (2019) also examined whether there is a relationship between using antibiotics while pregnant and the possibility of children becoming overweight. The study included 43,365 mother-child dyads from a nationwide cohort of pregnant women and their offspring, with Danish National Prescription Registry data (Jess et al., 2019). In their study, Jess et al. concluded that prenatal antibiotic exposure and childhood overweight were connected to various factors. There was no connection between broad-spectrum antibiotics and being obese when you are eleven. However, analysis of ampicillin or amoxicillin, which are broad-spectrum antibiotics, showed that there was a higher possibility of being overweight at seven years old. The evidence suggested that using certain powerful antibiotics might make children overweight when they are little, but this effect does not stick around as they grow up.

These studies reviewed above showed what might occur in children if their mothers use antibiotics while pregnant and after giving birth. They highlighted the importance of considering specific factors, such as the timing of exposure and gender differences, in understanding the associations between prenatal antibiotic exposure and childhood outcomes. The presence of a relationship between prenatal and perinatal antibiotic exposure and childhood was verified by the findings above. They demonstrated the complex association between antibiotics and premature birth, making it logical to perform the moderation analysis of prenatal antibiotic use and obesity.

Race, Ethnicity, and Birth Outcomes

To establish effective policies that provide support, it is crucial to study the pregnancy experiences of racial and ethnic minority women with intellectual and developmental disabilities (IDD). Akobirshoev et al. (2020) analyzed birth outcomes and labor and delivery charges in U.S. women with IDD, with an aim of understanding racial and ethnic discrepancies. Akobirshoev et al. examined the Massachusetts Pregnancy to Early Life Longitudinal (PELL) data system from 1998 to 2013. Akobirshoev et al. variations in preterm birth rates between non-Hispanic Black women with IDD and their non-Hispanic White peers by studying this data. Moreover, distinct fluctuations in charges for labor and delivery were witnessed among different racial and ethnic categories. Akobirshoev et al. concluded that Black and Hispanic women with IDD might have more complex diagnoses, requiring more intensive procedures during labor and delivery, thereby increasing the cost of care. These findings hold great significance in highlighting the Influence of race on birth outcomes, prompting consideration of various contributing factors.

Everett et al. (2021) also sought to find out if race contributed to preterm births by investigating the contributing factors behind the higher incidence of preterm births among non-Hispanic Black women. Non-Hispanic white women have half the risk of preterm birth compared to these women. However, understanding how various elements like maternal and predictor variables relating to social demographics, molecular phenotype, and microbiome interact to create differences among racially diverse populations remains inadequate. Everett et al. discovered that not only non-Hispanic

Black women but also non-Hispanic white women are affected by preterm birth due to neighborhood deprivation. The results implied that the effect of neighborhood deprivation on preterm birth is significant and persistent among various racial categories, emphasizing the significance of this aspect in comprehending preterm birth rates.

Maternal Age Drivers and Risk of Maternal Morbidity

Carr et al. (2022) conducted a study to understand the factors influencing maternal morbidity and explore its relationship with maternal age. The impact of various risk factors on severe maternal morbidity in mothers from different age groups was examined through a comprehensive investigation. Moreover, Carr et al aimed to determine the population-attributable risks connected with these factors. Carr et al. uncovered that both adolescent pregnancies and pregnancies occurring in older women are associated with an elevated probability of severe maternal complications and adverse birth consequences. However, it was noticed that the specific elements influencing severe maternal morbidity are distinct for each age group of expectant mothers. This underscored the relevance of maternal age concerning birth outcomes. Berger et al. (2023) also conducted a cross-sectional analysis that evaluated the severe maternal morbidity (SMM) between 2008 and 2018 in the U.S. The analysis made findings concurrent with those made by Carr et al. (2022). Berger et al. (2023) found that the number of SMM increased significantly within the 10-year study period. Out of these increases, the highest rates were recorded in older women aged above 35 years from all races. Women aged 25 years and below from all ethnic groups saw their rates of SMM decrease between 2008 and 2018. These findings stressed the importance of maternal age in determining birth outcomes, indicating a considerable fluctuation depending on the mother's age (Berger et al., 2023).

Potential Role of Probiotics in Mitigating the Adverse Effects of Antibiotics and Obesity During Pregnancy

Wang et al. (2021) provided evidence that showed the potential of probiotics, beneficial microorganisms, to modulate gut microbiota and influence immune and metabolic regulation. Given the connection between obesity, gut microbiota imbalance, and chronic low-level inflammation, incorporating probiotics into one's diet may help prevent and manage gestational diabetes, which poses risks to both the mother and child. Probiotics, through their targeted action on specific functions, offer a unique approach to nutrition management during pregnancy that goes beyond the traditional dietary approach. Dhillon et al. also emphasized the importance of implementing probiotic interventions in pregnant women. According to Dhillon et al. these interventions helped to address various health conditions like obesity, gestational diabetes mellitus, mental problems, pre-eclampsia, and dyslipidemia. The interventions also prevented the children from developing allergic diseases during early childhood. While the exact mechanisms through which probiotics impact pregnancy are still being investigated, Dhillon et al believed that they helped to modulate immune responses, regulate inflammation, and influence metabolic processes. Probiotics offer a means to restore balance within the gut microbiota, leading to improved metabolic health and a reduced likelihood of complications related to obesity during pregnancy.

Callaway et al. (2019) examined the effects of probiotics on antibiotics and obesity during pregnancy. The study concluded that, concerning primary or secondary maternal outcomes, probiotics did not have a significant impact, except for a reduction in the number of small-for-gestational-age (SGA) infants. In another study done by Shahriari et al. (2021), women in the experiment and control groups showed no significant differences when their GDN was evaluated. Although there was no statistical discrepancy in GDM occurrence between the probiotic and placebo groups, women assigned to the probiotics group demonstrated marginally higher fasting glucose levels. This marginal increment might have little clinical relevance at an individual level. Nevertheless, if it is evident across the entire population, it may result in a higher occurrence of GDM. Future studies should further investigate the findings and update Cochrane Reviews. A compelling result is that women who received probiotic supplementation exhibited decreased occurrences of excessive weight gain, despite no notable discrepancy in total weight gain compared to the placebo cohort. The source of this disparity is not evident and demands further inquiry.

According to Deng et al. (2022), the lower rates of SGA infants tended to result from factors like exposure to GDM, higher fasting glucose levels, inadequate weight gain, or lower rates of excessive weight gain. Nonetheless, the rate of SGA tended to be lower in other cohorts, which suggested that other variables might be affecting the results besides probiotics. Subsequent empirical studies and comprehensive meta-analyses should probe into the possible effectiveness of probiotics in preventing SGA. This study opposes previous hypotheses regarding the potential benefits of probiotics for GDM prevention. It argues against the effectiveness of LGG and BB-12 probiotics when used in this context. In addition, Bootorabi et al. (2021) investigated distinct probiotic species or interventions, like Lactobacillus salivarius UCC118 or probiotic yogurt, and did not find any substantial enhancements in glucose metabolism or other metabolic outcomes.

Definition of Terms

Crucial terms in this investigation are described below.

Antibiotic use: The use of antibiotics refers to the administering of antimicrobial agents to cure bacterial infections or to avoid their happening (Pyle et al., 2021). Within this research, I investigate the possible relationship between antibiotic consumption while pregnant and the probability of early childbirth.

Interaction: Within the scope of this research, interaction signifies the cumulative consequence of multiple factors (antibiotic usage and obesity) on the resulting variable (preterm delivery) that exceeds or deviates from the total of their separate impacts. The definition highlights the significance of considering the connection amongst variables to comprehend the complete effect on the outcome.

Obesity: Being overweight is a health condition marked by too much body fat storage (Rakhra et al., 2020). This is regularly evaluated using the Body Mass Index (BMI) computation. In this research, I mainly emphasize investigating the correlation among pregnant women with obesity and its connection to the chance of giving birth prematurely. Scientists classify volunteers into diverse BMI cohorts (e.g., underweight, normal weight, overweight, and obese) to analyze the potential consequences of premature delivery frequencies. The classification enables an in-depth investigation of the correlation involving BMI and preterm labor.

Preterm birth: Preterm birth means the birth of a newborn before achieving 37 weeks of prenatal development (Vogel et al., 2018). This is a crucial community health concern. Babies born prematurely face an elevated risk of different health issues. I aim to examine if the administration of antibiotics and obesity influence the possibility of early birth. It determines these factors as factors that may be detrimental or beneficial.

Secondary data set: Another dataset, like the Natality 2014 dataset, consists of existing data acquired by a different organization or investigative project for reasons unrelated to the current study. The information may be utilized to enhance or back the current study's discoveries. During this study, the dataset on Natality in 2014 offers valuable data regarding variables related to birth for women residing in the United States throughout that year. Scientists examine the provided data to investigate the correlation between the administration of antimicrobial drugs, overweight conditions, and premature delivery. They use information gathered and collected by someone else to tackle their research inquiry.

Assumptions

The study assumes that the Natality 2014 dataset is accurate, complete, and free from major errors or biases. Trusting the data source's integrity is crucial in drawing meaningful conclusions. It is assumed that the 2014 Natality dataset represents a sample of women delivering babies within the United States in that year. Nevertheless, it should be highlighted that this premise may not be valid in every situation since there might be specific biases or constraints when collecting the information. Any prejudice during the selection procedure might impact the validity of the results. The research assumes that detected connections among antibiotic usage, excessive weight, and premature delivery can be accurately ascribed to cause and effect.

Presumptions are formed that the explanations of factors (for example, usage of antibiotics, being overweight, premature delivery) are coherent across multiple states and medical institutions in the dataset file. However, it is crucial to consider that variations in terms and data-gathering techniques might be present, which could influence the comparability and universality of the conclusions. The research assumes that all important confounding factors influencing the connection among the variables of concern have been evaluated and accounted for in the study. The study assumes that antibiotic use and obesity occurred before preterm birth, establishing the temporal sequence necessary for causal inference. This study presumes that omitted data (if applicable) are randomly unavailable. On the other hand, the assumption is made that all absence patterns can be properly considered in the statistical approaches utilized. The research assumes that the influence of antibiotic consumption and obesity on early birth remains relatively constant amongst diverse demographic, socioeconomic, or geographic groups. Nevertheless, additional investigation must be done to validate the conjecture. The assumption is made that women prescribed antibiotics complied with the treatment as directed, which is consistent across the dataset. The study assumes that preterm birth did not lead to antibiotic use or obesity, which could distort the interpretation of the results.

Scope and Delimitations

When considering the scope and delimitations of my study, it is crucial to establish the boundaries within which my research will operate. This entails understanding the limitations and constraints that may affect the generalizability of my findings. One significant challenge I anticipate is the suitability of the existing data for my study, as it may or may not align perfectly with my research objectives. Additionally, smaller sample sizes pose another potential barrier, as they may limit the statistical power and precision of my results. Furthermore, self-selection bias and potential response bias are factors that I must acknowledge, as they influence the representativeness and validity of the data collected. By recognizing these barriers, I will effectively manage and address them in order to enhance the robustness of my study.

Significance of the Study to Theory, Practice, and Social Change in the Community

This study holds significant potential for instigating positive societal changes by examining the interplay among preterm birth, antibiotic usage, and obesity in women of diverse racial backgrounds in the United States. The findings from this research can inform the development of public health policies and initiatives aimed at reducing risks and improving maternal and child health outcomes. Investigating the relationship between maternal obesity, antibiotic consumption, and preterm labor will provide a deeper understanding of the underlying mechanisms leading to premature deliveries among various racial populations. This understanding will empower healthcare providers to tailor interventions and treatments to meet the specific needs of diverse communities.

Moreover, the insights gained from this study will be invaluable for public health campaigns striving to reduce the prevalence of premature births. By identifying factors that increase the risk of premature birth, such as antibiotic use in pregnant women with obesity, policymakers can develop targeted interventions to mitigate these risks. Strategies to address obesity may include promoting healthy lifestyle choices, raising awareness among healthcare professionals and pregnant women, and implementing guidelines for the appropriate use of antibiotics during pregnancy.

This investigation's outcomes will facilitate equal healthcare opportunities, resulting in positive societal adjustments. There is a well-established understanding that preterm birth rates differ among racial and ethnic groups, with specific minorities facing higher rates than others. By examining the relationships between preterm birth, antibiotic utilization, and obesity among women of diverse ethnicities, this research will provide valuable insights into the distinct needs and obstacles experienced by these populations. These details will guide endeavors directed at diminishing disparities, fostering fair access to healthcare services, and executing culturally competent treatments.

Summary

This section investigated the concern of early childbirth among women in the U.S. This is an important worldwide health issue with effects on parental and newborn health. Roughly 15 million premature deliveries happen annually, making up approximately 10%

of births globally. America, even though it is a developed country, faces a greater number of premature deliveries as opposed to other states. Nevertheless, steps are being taken to deal with this concern and strengthen the results of maternal and infant health. New findings indicate that the use of antibiotics in addition to obesity potentially leads to this concern. Comprehending the relationships between antibiotics, obesity, and premature delivery among women in America is vital for creating preventive strategies. This knowledge can additionally assist boost maternal and newborn health consequences.

The review showed that the utilization of antimicrobial drugs in healthcare has caused a significant breakthrough in combating and halting transmissible disorders. Research studies reviewed have indicated that the use of antibiotics might enhance the chances of experiencing early childbirth. Medications can disturb the fragile equilibrium of the woman's reproductive system, causing negative pregnancy consequences by modifying the arrangement and assortment of the mother's microbiome. Nevertheless, it should be emphasized that the impact of antibiotics may differ, and individual differences can lead to varying impacts, and the antibiotic type utilized. Examining the connection between using antibiotics and early childbirth provides knowledge about the influence of antibiotics on gestation. Additionally, it determines specific medication categories or periods of use related to an increased risk.

Obesity is a growing concern across America. This disease is affecting a considerable number of women of childbearing age. In addition to its established connections in relation to different health issues, researchers have identified obesity as an important determining aspect for detrimental pregnancy outcomes. The exact biological pathways connected to this condition remain unclear. Nevertheless, it is theorized that inflammation caused by obesity, metabolic shifts, and hormonal irregularities possibly have an impact. Therefore, analyzing the relationship involving obesity, the use of antibiotics, and premature delivery seeks to acquire a thorough comprehension relating to their shared impacts regarding the welfare of mothers and babies.

The review of literature sought to investigate the correlation among antibacterial drugs, increased body weight, and excessive weight, in addition to the influence of these factors on overall wellness throughout the post-natal period. Nevertheless, additional investigation is required to comprehensively grasp the probable outcomes and repercussions of this link. Additionally, the review examined the relationship between obesity and premature delivery by analyzing hidden links and probably associated risk variables.

Studies reviewed in this section have indicated that antibiotics have the potential to cause a reduction in the range of microbial species and encourage the growth of antibiotic-resistant bacteria and genetic traits. Consequently, it is crucial to use antibiotics as prescribed. . Medications can inadvertently impact alternative bacteria groups, impacting the extent and length of their outcomes. Newborns delivered through C-section and administered antibiotics could have a different composition of gut microorganisms. Nevertheless, using vaginal gauze to clean has the potential to aid reestablish a normal microbiota. Antibiotic use in early life has been connected to a higher chance of respiratory conditions and metabolic disorders during the early years.

The widespread use of antibacterial drugs has caused resistant bacterial strains. This has also caused digestive problems such as antibiotic-related diarrhea. Medications alter the normal composition of micro-organisms in the intestines, resulting in microbial imbalance. The imbalance has a detrimental effect on the metabolic activities of bacteria and the host's proteomic composition. Although the intestinal microbiota has the ability to partially heal following antibiotic therapy, the course of action is commonly slow and incomplete. Moreover, it should be emphasized that recovery may differ based on different factors including the category and period of antibiotic consumption, together with variations in the gut microbiome makeup among individuals. Research on mice and individuals has yielded positive outcomes related to the application of probiotics to revive the digestive system's microbial community after receiving antibiotic medication. Despite this, additional studies remain necessary to comprehensively grasp the processes and potential perks of taking probiotics within this framework. There exist insufficient studies and evidence on the probiotic establishment in the gut lining in living individuals and how it affects native microbiota and the activity of genes. The lack of evidence impedes the comprehension of the potential perks and functioning mechanisms of beneficial bacteria.

From the review of the literature, it is evident that obesity is linked to modifications in the gut bacteria, the uptake of energy from food, persistent inflammation, and malfunction in metabolic pathways. The following elements play a role in the growth and advancement of conditions associated with obesity health issues. SCFAs formed through fermentation in the colon are essential for energy metabolism, the metabolism related to cholesterol, lipids, and glucose. Bacteria that are Gram-negative in the gastrointestinal tract are capable of producing LPS molecules that initiate inflammatory signaling pathways. Obese individuals may have an increased capacity to obtain energy from nutrients due to hydrogen transfer between microbial taxa. Methanogenic Archaea can convert hydrogen to methane, leading to a higher energy harvest in obese patients. Research also did show that the digestive system's microorganisms modify energy metabolism and fat accumulation.

Based on the literature review, obesity in mothers is associated with higher chances of complications during pregnancy, like high blood pressure, gestational hypertension, and diminished placental blood circulation and circulation of blood. Therefore, additional studies must be done to completely comprehend the fundamental mechanisms and potential treatments to lessen these hazards. These elements can influence nutrient circulation in infants. These can affect organ growth and growth patterns in the development period. For instance, the profile of cytokines, sensitivity to insulin, and nutrition-related factors in an overweight mother can impact the way a child grows and the child's health over time. Also, a small amount of antibiotic exposure in the early stages of life can result in metabolic modifications. This can also impact gene regulation related to immune response.

Concerning preterm delivery, diverse risk elements like multiple pregnancies, persistent medical ailments, substandard nourishment, and contagious diseases can play a role in its occurrence. Research has examined the efficacy of antimicrobial drugs in reducing premature delivery within women who have an unusual vaginal microbiome.

Merging intravaginal and oral antibiotics can improve the elimination of BV and avoid inflammation resulting in premature birth.

The connection between a mother's obesity and birth before full term remains a subject of debate and uncertainty. Studies have shown inequalities based on race and ethnicity in birth outcomes, with women from Black and Hispanic backgrounds with cognitive and developmental disabilities (CDD) potentially experiencing diagnoses with greater complexity and demanding rigorous procedures while giving birth. Therefore, it is crucial to acknowledge that more studies are necessary to comprehensively comprehend and tackle these variations. Studies focused on specific age groups have found that mothers in their teens have an elevated chance of grave health issues. Beneficial bacteria have been researched for these populations to regulate the intestinal flora and affect immunity and metabolism regulation. This indicates the need for further investigation to comprehensively grasp the impacts and ascertain ideal amounts and species. These might aid in avoiding and controlling diabetes that occurs during pregnancy. It might also repair the balance of gut bacteria as well as decrease the potential for complications during pregnancy caused by obesity.

To sum up, the review of literature in this section revealed the intricate connections among antibiotics, gaining weight, excessive weight, the health of the mother and fetus, and early childbirth. The focus was on the significance of bacterial variety, microbial imbalance, and the potential benefits of using probiotics in restoring healthy gut flora. The review also discussed the role of antibiotics in preventing preterm birth and the need for further research on racial and ethnic disparities in birth outcomes. Finally, it examined the influence of probiotics on gestational diabetes and the restoration of metabolic health during pregnancy. This section also looked at the definition of terms, scope, and delimitations of the study, and the Significance of study theory, practice, and social change in the community.

Section 2: Methodology

In the previous section, I reviewed the recent literature on the interaction of antibiotic use, obesity, and preterm birth among women in the United States. The literature review explored the association between maternal obesity with preterm birth and the link between early childhood obesity and pregnancy-related antimicrobial exposure. I also reviewed the link between race, ethnicity, and maternal age drivers, and risk of maternal morbidity. My review of the literature addressed the importance of using provided data sets to examine the relationship between key variables. Through this review, I aimed to understand the relationship between the variables addressed in the current study, which were antibiotic use, obesity, and preterm birth among women in the United States. I investigated the link between antibiotic use, obesity, and preterm birth among women in the United States by reviewing a data set from the Natality Detail File, specifically the 2014 edition (United States Version 1) to examine the relationship between these variables.

In this quantitative retrospective observational study, my primary goal was to use correlational methods to examine the relationship between antibiotic use, maternal age drivers, race, obesity, maternal mortality, and preterm birth. I evaluated existing records found in Natality Detail File, specifically the 2014 edition (United States Version 1), to examine the data set's relationships, associations, or patterns. This data set comprised detailed information on births in the United States in 2014. The data set included a wide range of variables related to each birth, such as demographic characteristics of the parents (age, race, ethnicity, education), maternal health information (prenatal care, medical risk factors), birth outcomes (gestational age, birth weight), and infant characteristics (sex, plurality). I aimed to unravel the relationships and patterns among the study variables by examining this data set. This data set provided a comprehensive overview of the births in the United States in 2014. The data set was valuable for studying variables such as reproductive health, maternal and child health, and demographic patterns. Section 2 provides the details of the study design, the composition of the sample population, and analytical techniques used to address the literature gap.

Research Design, Data Collection, and Rationale

I used a quantitative retrospective observational design to examine the variables influencing maternal outcomes, including preterm birth among women in the United States. I conducted a secondary analysis of the Natality Detail File, 2014 (United States Version 1) ICPSR data set to achieve this. This data set contained vital maternal and infant health information. I studied the link between the birth outcome variables such as maternal age, race, and prenatal obesity. Using this design allowed me to examine associations between variables while controlling for potential confounders.

The study focused on investigating several variables related to birth outcomes, maternal characteristics, antibiotic use, and obesity. These variables included birth year, birth month, birth day of the week, birthplace, mother's age, race/ethnicity, education, marital status, prepregnancy weight, gestational weight gain, prenatal care, smoking habits, preexisting medical conditions (e.g., diabetes and hypertension), pregnancy complications, delivery method, infant characteristics, and breastfeeding status. I used quantitative methods drawing inspiration from the work of Bloomfield and Fisher (2019) that emphasized the value of quantitative studies in assessing the connections between variables and uncovering patterns, attitudes, and opinions within a representative sample of the population. This approach allowed for the measurement and quantification of the relationships between different variables, enabling drawing of meaningful conclusions about trends and perspectives of the surveyed individuals. Using the quantitative approach in this study enhanced my ability to gather precise and objective data, facilitating a comprehensive analysis of the subject under investigation.

I selected the retrospective observational design because it allows for examining associations and relationships between variables that may be difficult or unethical to investigate using experimental designs while considering potential confounding factors. Keogh and Stenson (2014) indicated that retrospective studies can examine the effects of exposure or risk factors by analyzing existing data or records, providing insights into the natural occurrence of events. Moreover, retrospective designs are useful when studying rare or long-term outcomes because they allow researchers to analyze a large pool of existing data or historical records (Keogh & Stenson, 2014). This enables the examination of outcomes that may occur infrequently in prospective studies, thereby increasing statistical power and improving the generalizability of findings.

Keogh and Stenson (2014) argued that retrospective studies are often cost-effective and efficient compared to prospective designs. Researchers can use existing data sources, such as medical records or registries, avoiding the need for primary data collection. This design also promotes the use of a larger sample size and increases the potential to analyze trends over extended periods. This advantage can be seen in the current study because the Natality Detail File, 2014 (United States Version 1) ICPSR data set has a large sample size that could have been difficult to analyze using other research designs. Using the retrospective observational design enabled me to analyze a large pool of existing data to derive vital insights relating to negative birth outcomes recorded among women in the United States.

Using the retrospective observational design, I was able to review the existing data repositories, which held valuable insights related to the health of mothers and infants. This research method enabled me to collect data that corresponded to my research objective. This assisted me in addressing the research questions and hypotheses I had devised. The benefit of this approach was the power to use a sizable sample size. The vast information accessible from this data set offered my investigation stronger statistical power. This suggests that the findings will be trustworthy and relevant to a more extensive sample. That was crucial for me because I needed to make sure my findings could be applied to the chosen demographic of women with diverse racial and ethnic origins in the United States. This approach ensured that the study outcomes would be robust and pertinent for a broader range of women.

I used a quantitative statistical method to investigate the data set and draw conclusions. I achieved this by using analytical methods such as computing descriptive statistics, including frequencies, means, and standard deviations, to present the features of the research participants and important variables. I also conducted correlational analysis using chi-square tests and *t* tests to study the links between variables. Descriptive statistics such as mean, standard deviation, minimum, maximum, and frequency distributions were computed. I also did multiple regression analyses to evaluate the separate impacts of antibacterial use and excessive weight on premature birth. Statistical significance was established using appropriate thresholds, generally with a *p* value under 0.05. I conducted every statistical analysis using the Statistical Package for the Social Sciences (SPSS) tool. Using these statistical methods allowed me to evaluate the data and identify significant relationships that gave me perspective on the factors' typical characteristics, variability, and arrangement. The statistical analyses suggested a link between the factors under investigation.

Secondary Data Analysis Methodology

The data analysis technique I used for RQ1 was logistic regression analysis. For RQ2, I used Pearson's chi-square logistic regression analyses. I conducted the examinations to contrast the impact of variables such as the age of the mother, the weight of the mother, and the administration of antibiotics while pregnant on the results of childbirth, such as premature delivery.

Population

The focus group in the research encompassed women representing different racial and ethnic groups in the United States. The intended sample had an average age of 26.6 years. More than half of the mothers identified as White, 17.4% of mothers were Black, 12.6% were Latino, and 7.3% were Asian. Concerning education, 36.6% of mothers possessed a high school diploma or equivalent, 22.8% had some college education, and 20.2% possessed a bachelor's degree or higher.

Regarding civil status, over half of the mothers (55.3%) were legally married, 29.7% were unmarried, and 15% were either not together, divorced, or widowed. The data showed that most deliveries (66.4%) transpired in populated zones. The use of different racial and ethnic groups was intended to create a representative sample that would ensure the applicability of the research findings. The approach allowed me to investigate potential variations in the correlations between premature labor, antibiotic intake, and obesity within diverse racial and ethnic communities. The objective was to understand how these variables can exhibit differences across groups. The understanding could help to identify the link between race, ethnicity, and other demographic factors such as education with maternal birth outcomes.

Sampling and Sampling Procedures

I employed preexisting data sources for collecting data in this study, which eliminated the necessity of using a specific sampling method. The information resources used had extensive knowledge concerning the mother and the well-being of children. The data gave me a sizable sample to use. This approach not only conserved time and assets but also improved the credibility of the research because the data were extensive. Leveraging preexisting data sources in the study enhanced the effectiveness and robustness of the research process. The approach also streamlined the data collection process, made the findings valid and credible, and laid the foundation for generating meaningful insights.

The data set used in this study has a wide range of variables that allowed me to investigate multiple factors connected to maternal health and newborn birth outcomes. The data set offered comprehensive knowledge regarding female population characteristics in 2014. The data set contained data about the average age women gave birth and their cultural and ancestral heritage. An example is that the mean age of women delivering in 2014 was 26.6 years. These data also highlighted racial and ethnic representation of mothers whereby most women identified as White, Black, Hispanic, and Asian. Including a wide range of factors enabled me to examine maternal health and birth outcomes among different demographic groups. The extensive range of variables in the data set was vital in enabling a thorough investigation into the influence of maternal age and race on birth outcomes.

Moreover, the data set provided valuable data on women's educational achievement, relationship status, and birth setting. These factors helped me understand the social context in which women gave birth. The data demonstrated that a large number of women achieved a secondary level of education or a comparable credential with some individuals pursuing further education. The data also illuminated the marital status of women and allowed for an examination of birth settings, indicating that most births occurred in urban areas. This examination of factors promoted understanding of the geographical distribution of birth outcomes and the potential influence of urban environments on maternal and infant health. The analysis of the data set highlighted the importance of the reviewed factors in shaping maternal birth outcomes and helped me understand the social dynamics surrounding childbirth.

By leveraging the preidentified data sources in The Natality Detail File, I conducted a thorough analysis and generated meaningful insights into the demographics of women giving birth in 2014. The data set's robustness allowed for a comprehensive examination of factors related to maternal and infant health, and aided in examining relationships between variables such as preterm birth, antibiotic use, and obesity among women of different racial and ethnic backgrounds. Using the preidentified data sources enabled me to enhance the study's scope of knowledge and validity. The Natality Detail File enriched the study, enabled extensive analysis of the variables, and contributed to the validity of the research.

Sample Size and Power Analysis

The sample for this study was selected among women in the United States with negative birth outcomes. There was no specific number of participants because the data were obtained from a data set containing many records. The total number of records in the Natality data set was 3,998,175. The total number of records excluded from the study was 187,650 due to various reasons such as missing information. The number of records included in the study was 3,810,525. This substantial sample size provided a solid foundation for statistical analysis. The large sample size enabled me to ensure the statistical power vital in detecting significant differences. I achieved this using the G*Power calculator for multivariate logistic regression analyses. The study also had a binary dependent variable (preterm birth) and more than five predictors. Overall, the large data set enabled me to obtain a substantial sample that allowed for rigorous statistical analyses and provided the required statistical power for detecting meaningful differences in the study variables as shown in Figure 1 and Figure 2 below.

Figure 1 and Figure 2 below show the logistic regression results of the study variables, which shows that statistical power of the variables.

Figure 1
Z-Test Result Graph

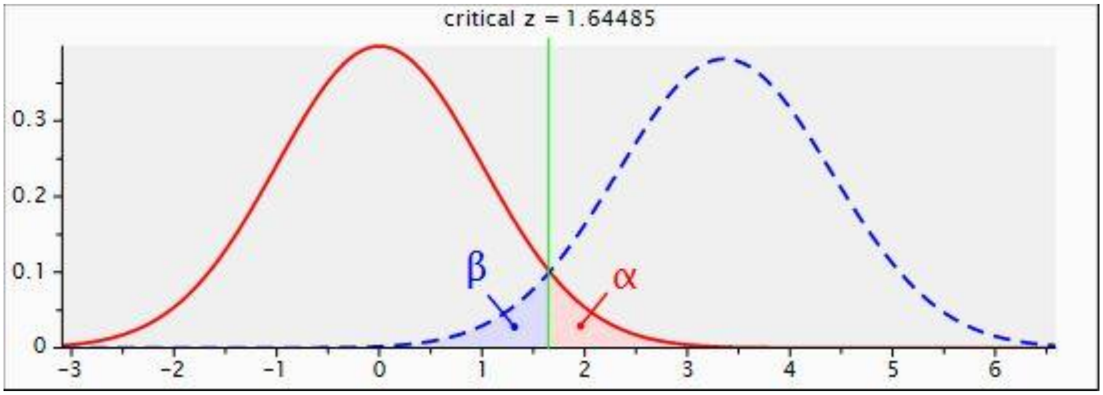


Figure 2

Z-Test Results

[1] -- *Wednesday, July 12, 2023 -- 18:02:11*
z tests - Logistic regression

Options:	Large sample z-Test, Demidenko (2007) with var corr		
Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Odds ratio	=	1.48
	Pr(Y=1 |X=1) H0	=	0.2
	α err prob	=	0.05
	Power (1−β err prob)	=	0.95
	R^2 other X	=	0
	X distribution	=	Binomial
	X parm π	=	0.227
Output:	Critical z	=	1.6448536
	Total sample size	=	2239
	Actual power	=	0.9500403

[2] -- *Wednesday, July 12, 2023 -- 18:05:39*
z tests - Logistic regression

Options:	Large sample z-Test, Demidenko (2007) with var corr		
Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Odds ratio	=	1.48
	Pr(Y=1 |X=1) H0	=	0.2
	α err prob	=	0.05
	Power (1−β err prob)	=	0.95
	R^2 other X	=	0
	X distribution	=	Binomial
	X parm π	=	0.227
Output:	Critical z	=	1.6448536
	Total sample size	=	2239
	Actual power	=	0.9500403

Data Collection and Management

The data I used in this study was obtained from the Natality Detail File, 2014 edition [United States] (Version 1) Dataset that served as a secondary source of information. The dataset contained maternal and infant health information, including variables related to birth outcomes, maternal characteristics, antibiotic use, and obesity. The data was collected for non-research public health surveillance purposes and informed consent requirements were exempted because the study focused on monitoring and evaluating the data. I ensured that the data was handled securely and that its confidentiality was maintained despite the waiver of informed consent by using appropriate data collection and management procedures. The researchers collecting the data followed established data extraction and transformation procedures to prepare the dataset for analysis. These processes are important as evidenced in Elkoumy et al.'s (2021) argument that underscores the importance of privacy and confidentiality when conducting evaluation research. These authors indicated that confidentiality protects personal information from leaking to unauthorized individuals. George and Bhila (2019) echo similar sentiments. This makes it vital to ensure that the collected data of the participants is kept safe and protected using various approaches such as encryption data and using pseudonyms.

Instrumentation

I analyzed secondary data collected from Natality Detail File, 2014 edition [United States] (Version 1) Dataset to determine the interaction of antibiotic use, obesity, and preterm birth among U.S women. I used the Statistical Package for the Social Sciences software for the statistical analysis in this study. SPSS proved to be an indispensable tool throughout my research journey. Its intuitive interface and features enabled me to analyze the provided dataset and ensured that the results I obtained were accurate. Leveraging this technology streamlined the research process.

The SPSS tool has various features that make it appropriate for analyzing data in this study. It has a wide variety of graphical representations that help to visualize and interpret data. SPSS also enables the performance of various data manipulation techniques such as data entry, cleaning, and coding. This is outlined in Ong and Puteh's (2017) work where they indicated that SPSS supports a diverse range of statistical techniques such as descriptive statistics and advanced multivariate analyses that make suitable for a wide range of research studies, including this observational study. Using SPSS allows researchers to extract vital insights from the research data, find relationships between the study variables, and draw useful conclusions that can inform decision making. SPSS helped me to streamline the data analysis process.

Operationalization of Variables

In this research, I analyzed various factors that impacted the understanding of the connection between premature delivery, antibiotic use, and being overweight. These variables included year of birth, month of birth, place of birth, age of the mother, racial background, educational background, weight before pregnancy, weight change throughout pregnancy, care during pregnancy, and cigarette smoking. These factors can be categorized into nominal, ordinary, and binary parameters as shown in Table 1 below. Table 1 shows that each variable was defined and operationalized to ensure consistency and clarity in the analysis. By examining these variables, I aimed to understand the factors influencing preterm birth and their interrelationships. The analysis of the diverse variables helped to understand complex relationships between preterm birth, antibiotic use, and obesity in relation to pre-term birth.

Table 1

Operational Definition of Study Variables

Name	Type of measurement	Definition	Variable/data in unit
Maternal age (confounder)	Nominal	Reported life years of women in the United States at the time of the study as recorded in the data set	1 = 18–24 years 2 = 25–34 years 3 = 35–44 years 4 = 45–54 years 5 = 55–64 years 6 = 65 years+
Race/ethnicity (confounder)	Nominal	Race or ethnicity	1 = Black 2 = White 3 = Hispanic 4 = Other
Education (confounder)	Nominal	Reported level of mother's education level	1 = Primary 2 = High school 3 = College
Access to health care	Nominal	Reported level of access to health care services in the prenatal stage or early years of postnatal phase	1 = yes (insured) 0 = no (not insured)
Prenatal weight (independent)	Nominal	Reported weight of women during their gestational period classified as	1 = yes 0 = no

		overweight	
Antibiotic use during pregnancy (independent)	Nominal	Reported use of antibiotics among women in the United States	1 = yes 0 = no
Preterm birth (dependent)	Binary	Reported birth outcomes in women exposed to specific nominal variables	1 = yes 0 = no

Table showing operational definition of the study variables.

Data Analysis Plan

I followed a well-defined data analysis plan to analyze the data and answer the research questions. The plan consisted of several key steps to explore the relationships between variables and determine the independent effects of antibiotic usage and obesity on preterm birth while accounting for potential confounding factors. The first step involved calculating descriptive statistics to summarize the characteristics of the study population and variables of interest. Next, I conducted a bivariate analysis to examine the associations between variables. This analysis included chi-square tests, a common statistical technique used to assess relationships and differences between categorical and continuous variables. I used appropriate thresholds of p-value set at 0.05 to determine the strength and direction of the relationships between variables and draw meaningful conclusions from the data analysis. Adhering to the data analysis plan allowed me to explore the research data systematically and comprehensively. The systematic analysis steps enabled methodical assessment of variable relationships and helped to assess independent effects making the research more robust and valid.

Data Preparation and Cleaning Procedures

I sourced archived data for this research from Natality Detail File, 2014 [United States] (Version 1). (2016) dataset from the ICPSR Database by following a data agreement process. The data were inputted into SPSS from the NHARP's database and recorded using the SPSS auto-recode function. The data included age, race/ethnicity, educational level, weight gain, birthplace, and antibiotic use. The dependent variable was birth outcomes, represented by preterm birth (yes/no). Access to healthcare (yes (insured)/no (not insured)) was the covariate in this study. The aforementioned variables were loaded into the SPSS software as categorical. They were then measured using a quantitative scale, as shown below. The strategy for acquiring and accessing data ensured that the retrieved dataset was prepared properly for comprehensive analysis and interpretation. This approach laid the groundwork for a robust exploration of the relationships and patterns within the data. Also, it enhanced the validity and reliability of the study.

The key variable names in this study were maternal age (1=18-24 years, 2=25-34 years, 3=35-44 years, 4=45-54 years, 5=55-64 years, 6=65 years and older); race/ethnicity (1-Black, 2-White, 3-Hispanic, and 4-Other); Education (1-Primary, 2-High School, and 3-College): access to healthcare (1=insured and 2= uninsured). The dependent variable (preterm birth 1=yes/2=no) was measured quantitatively since it was considered a categorical variable. Each categorical variable was assigned a specific name and added to SPSS under data view. To illustrate this, the “antibiotic use” variable was categorized and included in the “name” column as a string variable. Since antibiotic use is a dichotomous variable, I assigned specific values to denote its status. A value of 1 was assigned to indicate “use,” while a value of 2 was assigned to represent “not using” or “not exposed” to antibiotics**.**

The remaining categorical variables underwent a comparable treatment to ensure that incomplete or missing data points within the dataset were addressed. I exercised the utmost care in implementing the recoding process outlined in Table 1. This process was specifically designed to address incomplete or missing data points within the dataset and was aligned with the coding principles presented in Table 1. The data cleaning procedure was carried out using the SPSS program to ensure consistency in handling missing responses. Descriptive statistics and frequency tables, containing variable statistics and frequency information for each variable, were generated using SPSS. Through the frequency analysis, I could identify any instances of missing data. The rigorous data cleaning process ensured that the categorical variables were accorded proper treatment to ensure the information was consistent and reliable. After cleaning the data, the missing data were excluded from the study, leaving a total sample size of 3,807,273.

Research Questions and Hypotheses

RQ1: Is there an association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o1: There is no significant association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income and race/ethnicity.

H_a1: There is a significant association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

RQ2: Does a health care access moderates the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o2: A health care access does not moderate the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

H_a2: A health care access moderates the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

Analysis Techniques

I employed different data analysis techniques to address specific research questions in this study. The technique I used for RQ1 was logistic regression analysis. I performed chi-square analyses for RQ2 to estimate the connection between preterm birth and antibiotic usage during pregnancy among obese women with various racial backgrounds in the United States and whether healthcare access levels moderate the association between preterm birth and antibiotic utilization during pregnancy among obese women with different racial backgrounds. I performed the analyses to compare the effect of factors like maternal age, mother's weight, and antibiotic use during pregnancy on birth outcomes like preterm birth. I used SPSS software to assess healthcare utilization among women from different races in the United States. My choice of the analysis technique was based on the research question and the factors that needed investigation. Employing specific techniques tailored to the research questions enabled extensive analysis and understanding of the study variables.

Descriptive Statistical Analysis

I employed descriptive statistics to characterize independent variables (age, race/ethnicity, ethnicity, educational level, income, healthcare access, antibiotic use) and dependent variables (preterm birth) in this study. Turhan (2020) emphasizes that nonparametric tests, including the chi-square test, are particularly suitable for analyzing nominal and ordinal data. Nonparametric tests do not assume a specific distribution for the data and are thus more flexible in handling categorical variables. Nominal data represent categories with no inherent order, such as gender or occupation, while ordinal data possess a certain order or hierarchy, like Likert scale ratings or educational levels. These data types do not meet the assumptions required for parametric tests, such as normality or equal variances, making nonparametric tests like the chi-square test a valuable alternative. By recognizing the nature of the data and selecting an appropriate statistical test, researchers can accurately analyze and interpret the associations or differences within nominal and ordinal variables using these tests. The chi-square test was used in this study since all main assumptions needed to be met. These assumptions are outlined below.

The data must be categorical. This means that the analyzed variables should consist of distinct categories or groups. The observations must also be independent, indicating that the data points are not influenced by or related to one another. Moreover, the expected cell counts in the contingency table should be sufficiently large, typically with at least five observations per cell. This assumption ensures that the chi-square approximation is valid.

On top of that, the data should be obtained through random sampling from the population of interest. This ensures that the findings can be generalized. Finally, the chi-square test assumes that the categories or groups being compared are mutually exclusive, indicating that observation cannot fall into multiple categories. By meeting these assumptions, researchers can use the chi-square test to assess the association or independence between categorical variables.

I performed chi-square analysis to describe the independent and dependent variables in RQ1 because both dependent and independent variables are categorical. For RQ1, I estimated the association of socio-demographic factors (age, education, ethnicity, race, income) with antibiotic usage during pregnancy to identify significant differences in proportions. For RQ2, the association between healthcare access levels, antibiotic use, and preterm for women from different races to identify differences in these populations. In addition, I conducted a multivariable logistic regression including all I.V.s to evaluate the significant associations between various factors and preterm outcomes among obese women in the United States. I chose a significance level of 0.05. It indicated that findings with a p-value less than 0.05 were considered statistically significant. These results provided substantial evidence to reject the null hypothesis, suggesting a meaningful relationship between the examined factors and preterm outcomes in the population of interest. The analysis was vital in identifying meaningful relationships between the variables being studied and the expected outcomes.

Threats to Validity

It is essential to consider the potential threats to the validity of the study. Baldwin (2018) distinguishes two types of threats: internal and external threats to validity. Internal validity refers to the accuracy of the conclusions drawn from the data within the study itself. In the context of the conducted multivariable logistic regression, internal validity may be compromised by issues such as inadequate statistical power or violations of statistical assumptions, specifically statistical conclusion validity. Insufficient statistical power can lead to an increased likelihood of false negative or false positive results, affecting the reliability of the findings. Violations of statistical assumptions, such as assuming linearity or independence, can introduce biases and distort the interpretation of the relationships between variables. Considering these potential threats, there is a need to carefully assess the robustness of the analysis and ensure that appropriate statistical techniques are applied. By acknowledging and addressing these internal threats to validity, the study can enhance the credibility and accuracy of its conclusions.

One potential limitation is the presence of self-reporting bias. Since the study relied on existing data sources, the accuracy and completeness of the recorded information could be influenced by the accuracy of the data reported by individuals. Additionally, the retrospective observational design of the study limits the ability to establish causality between variables. While associations between variables can be examined, the study cannot determine the direction of causality or rule out the influence of unmeasured confounding variables.

Regarding internal validity, it’s important to acknowledge the limitations imposed by the retrospective observational design of the study. While the study allows us to examine associations between variables, it doesn’t enable us to establish a causal relationship or exclude the influence of unmeasured confounding variables. Therefore, it’s necessary to exercise caution when interpreting the results and making definitive conclusions about the causal connections between preterm birth, antibiotic usage, and obesity.

Glanz, Rimer, and Viswanath (2015) state that ensuring external validity is crucial in ensuring the findings can be applied to other populations and contexts. In this specific research, the research was limited to people living in the same geographical area. Hence, no additional populations were included for comparative analysis. As a result, the results from this research are constrained in terms of external generalizability. They can only apply to the United States inhabitants. It is essential to recognize this constraint and understand that the applicability of the outcomes can be hindered in other countries or regions.

Nevertheless, extra exploration is necessary to verify this. Additional studies carried out in various settings are required to strengthen the external reliability and support a wider range of applications of these conclusions. To ensure accurate interpretation and application of the findings, it’s necessary to consider the specific context and characteristics of the study population. Nonetheless, it is crucial to consider the drawbacks of this investigation and the likelihood of influencing variables. The reliability of the data used in the study was ascertained by the data collected from a national database dataset. Recognizing the sensitivity of the data, I ensured that all necessary steps were taken to protect participant privacy.

Construct Validity

The study employed appropriate statistical techniques and data analysis methods to ensure construct validity. The variables of interest were carefully defined and operationalized while ensuring consistency and clarity throughout the data analysis process to achieve the set objective. The study followed established data extraction, cleaning, and transformation protocols to minimize errors and biases. Additionally, the study utilized a large sample size and comprehensive data sources, enhancing the robustness and reliability of the findings. I took these deliberate measures to uphold the construct validity of the research. Implementing the rigorous data manipulation techniques strengthened the study and ensured that it addressed its objectives effectively and accurately.

Ethical Procedures

Adhering to ethical procedures is essential when conducting research involving human subjects. This research involved analyzing data of human subjects, making it necessary to follow defined ethical procedures to ensure the protection, welfare, and rights of participants and their data. Using pre-identified data sources allowed me to gather information without requiring informed consent from individual participants, as the data had already been collected for other purposes. The emphasis on ethical procedures underscores my dedication to uphold ethical standards and ensure its responsible use. This helps to protect vital information of human subjects. Despite using pre-identified data sources that did not need informed consent, I did not compromise my commitment to conducting the study with integrity and ethical responsibility.

On top of that, confidentiality, ethical approval, and anonymity of the participant’s data was a top priority in safeguarding participant identities and data. I implemented strict measures to achieve this. I prioritized minimizing potential harm or discomfort to participants by implementing appropriate safeguards and obtaining ethical approval from relevant institutional review boards or ethics committees. I had to seek approval from the University IRB and ensure that the study complied with University's ethical standards. Moreover, I ensured that the data collected was used solely for research purposes and reported accurately, maintaining integrity and avoiding misuse. Adopting these deliberate safeguards showed my commitment to ensuring that the study was done in an ethical and responsible manner that ensured that the integrity of the participant's data was maintained. These strategies protected the participant's identities and data making the research ethically compliant.

Permissions

I want to emphasize that ethical considerations were at the forefront of this study. I took the necessary steps to obtain permissions and access the pre-identified data sources in compliance with legal and ethical guidelines. I ensured that all requirements for data usage were met and followed the appropriate protocols throughout the research process.

Ethical Concerns

Respecting confidentiality and privacy was of utmost importance to me on the project. Since I used existing data sources, I did not require additional informed consent. However, I took extensive measures to protect the anonymity and confidentiality of the individuals represented in the data. I implemented strict data management protocols to prevent any unauthorized access or disclosure of personal identifying information. These measures show the importance of protecting the privacy and identity of the individuals whose data was utilized in the research. This makes it vital to consider these aspects when conducting studies that involve human participants.

Treatment of Data

All secondary data I used in this investigation was evaluated carefully while adhering to transparency principles to avoid ethical breaches. The data was examined without full personal identifiers to comply with ethical standards. The data analysis was conducted with a strong commitment to scientific rigor and transparency. Ethical procedures and guidelines were followed at every stage of the research process. I handled and treated the data responsibly, ensuring its accuracy, integrity, and confidentiality. I ensured the data remained secure and protected throughout the analysis and reporting stages. These actions show my commitment to responsible ethical conduct. They highlight the importance of using personal identifies to maintain confidentiality in research.

Summary

Section 2 of the research paper describes the applied research methodology for secondary data analysis. The data used for the study was obtained from the Natality Detail File, specifically the 2014 edition [United States] (Version 1) Dataset. The population investigated in the study comprised women of different racial and ethnic backgrounds in the United States. The research design adopted was a quantitative retrospective observational design, which allowed for examining associations and relationships between variables while controlling for potential confounding factors. The dataset used in the study provided detailed information on various variables related to birth outcomes, maternal characteristics, antibiotic usage, and obesity. The choice of these methodologies reflects adoption of a structured approach to conducting research using secondary data to investigate defined objectives.

The study explored the relationship between antibiotic use, obesity, and preterm birth among women in the United States by using various data analysis techniques. The data analysis involved descriptive statistics, bivariate analysis (including chi-square tests and t-tests), and multivariate regression analysis. Descriptive statistics were used to summarize the characteristics of the study population and variables of interest. Bivariate analysis examined the associations between variables, while multivariate regression analysis assessed the independent effects of antibiotic usage and obesity on preterm birth, controlling for potential confounding factors. The Statistical Package for the Social Sciences (SPSS) software was used for carrying out all of these statistical analyses. These techniques were chosen specifically to help investigate the research questions thoroughly and the associations among the study variables. Using the SPSS software enabled the execution of the various data analysis techniques. This ensured that the research questions were explored extensively.

Ethical considerations were addressed, including steps taken to maintain the confidentiality of the data. The data used in the study were collected for nonresearch public health surveillance purposes and informed consent requirements were waived. The researchers handled the data securely and confidentially to protect the participants' privacy. Using existing data sources saved time and resources, and the large sample size in the dataset enhanced the statistical power and generalizability of the findings. The actions show commitment to responsible data management and ethical principles. This aligns with the principles of responsible ethical research practices. Paying attention to the ethical concerns reaffirmed the study's commitment to ethical and robust research practices.

The section also provides information about the operationalization of variables, data collection, management procedures, and the instrumentation used for data analysis. The study utilized existing data sources from the Natality Detail File, 2014 edition [United States] (Version 1) Dataset, and the SPSS software was employed for the statistical analysis. The variables in the dataset were carefully defined and operationalized to ensure consistency and clarity in the analysis. After describing the methodology used in the study, Section 2 transitions to the next section, which presents the findings and their relevance to the research study.

Section 3: Presentation of the Results and Findings

This retrospective cross-sectional study was designed to examine the interaction between preterm birth and antibiotic use during pregnancy among obese women with various racial backgrounds in the United States by focusing on various demographic factors. The study addressed various demographic factors such as education, age, income, health care access, and race. It included two hypotheses. The null hypothesis asserted that there was no significant connection between societal characteristics, including maternal age, race, level of education, health care access, income, administration of antibiotics, and premature delivery in U.S. women. The alternative hypothesis indicated that there is be a significant relationship between the variables being studied. In Section 3, I present the outcomes of statistical analysis applying the chi-square and logistic regression techniques. I also present an overview of the findings. The formulation of the hypotheses demonstrated that the study had a systematic approach for evaluating and answering the research questions.

An observational methodology was chosen for this investigation because of its capability to investigate the connections among factors while considering potential factors that may influence the results. The design had certain limitations and could not demonstrate causation. Current data sources with valuable data regarding maternal and infant health were studied. The method enabled the development of the research questions, formulation of hypotheses, and presentation of conclusions matching the aim of the research. One of the benefits of this approach was the ability to use a large sample size that enhanced its statistical power. This led to credible findings that were relevant and applicable to a wider audience. The participants were mainly White women, which could restrict the generalizability of the findings to alternative racial and ethnic communities. This underscores the need to interpret the findings cautiously while considering the makeup of the participants. I used a robust methodology to collect and evaluate data. The next sections address the demographic composition of the study sample.

The overall logistic regression model included additional predictors such as mother's education. The odds ratio for mother's education (Exp(B) = 1.480) implies that for a one-unit increase in education, the odds of experiencing preterm birth increase by a factor of 1.480. This suggests a positive association between higher levels of education and an elevated likelihood of preterm birth.

Data Collection of Secondary Data Sets

Using available data sources was a vital approach that enabled the use of large and diverse sample size that made the study credible and efficient. The study took advantage of the multiple data sources, including repositories, polls, and official archives to extract extensive knowledge regarding the health of mothers and babies. This enabled the use of a substantial and diverse sample that boosted the study's credibility. Moreover, using the data sources already available enabled the study to leverage real and organic data. The strategy led to considerable time and resource efficiency. A varied and extensive sample size facilitated a thorough investigation of the connections among variables of early childbirth, antibiotic consumption, and obesity among women from various racial and ethnic origins. During the investigation, rigorous protocols were followed to secure the protected and undisclosed processing of the collected data. The attendees' private data were encoded and placed in a safe server. Strict adherence to data extraction and conversion procedures bolstered the information's confidentiality. Using existing data sources proved significant in this research. The use of these sources not only facilitated a comprehensive examination of the relationships among important variables but also ensured that the study was credible and efficient.

Time Frame and Response Rates

The data set contained information from the entire year of 2014. The information was U.S. births registered in the 50 States, the District of Columbia, and New York City. Birth data in the data set were limited to births occurring in the United States to U.S. residents and nonresidents. The response rate was 100% because the data set recorded all births during that time.

Discrepancies in the Data Set

The examination of the collected data exposed the existence of incomplete data. There was a total of 190,902 incomplete data. Certain variables or records within the data set did not have complete information, which may have influenced the accuracy and comprehensiveness of the examination. Moreover, the results of premature births showed that among 25 subgroups making up 4.4% of the whole, there was one measured value for the measured variable. The absence of variation indicated that there was no variety or deviation in the examined result within these specific populations.

Study Results Report

The following sections report the findings of the chi-square and multiple regression analysis.

Table 2

Relationship of Mother's Education to Preterm Birth

Education level	Frequency	Percentage	Valid percentage	Cumulative percentage
8th grade or less	138,589	3.5	3.6	3.6
9th through 12th grade with no diploma	437,081	10.9	11.5	15.1
High school graduate or GED completed	957,265	23.9	25.1	40.2
Some college credit, but not a degree	815,688	20.4	21.4	61.6
Associate's degree (AA, AS)	308,384	7.7	8.1	69.7
Bachelor's degree (BA, AB, BS)	732,661	18.3	19.2	89.0
Master's degree (MA, MS, MEng, MEd, MSW, MBA)	326,800	8.2	8.6	97.5
Doctorate (PhD, EdD) or professional degree (MD, DDS, DVM, LLB, JD)	94,057	2.4	2.5	100

Total	3,810,525	95.3	100
Unknown (missing)	44,750	1.1	
System (missing)	142,900	3.6	
Total (missing)	187,650	4.7	
Total	3,998,175	100	

Table showing relationship of mother's education to preterm birth

After performing an in-depth examination of the numerical data, I observed various notable discoveries concerning the research sample. The findings suggest considerable age, educational background, and income diversity among the subjects. All registered births in the data set occurred in 2014. This created an exact time frame for the research. Moreover, the births were uniformly divided throughout the 12-month time frame despite a small increase in average incidence recorded in June.

The distribution of ages among the participants extended from 12 to 50 years. The average age of the women was 28.35. Such a broad spectrum indicates the presence of both younger and older mothers in the data set. Regarding the increase in body weight that mothers experienced while pregnant, the data set indicated a diverse array falling within the range of 0 to 98 pounds. The mean growth in weight was determined as 30–38 pounds. This extensive range indicates significant variation in the weight growth behaviors among the participants in the study. Furthermore, most childbirths (98.5%) occurred in hospitals. This demonstrates a small deviation from the prevailing pattern. Finally, the educational history of the participants indicated that a substantial number had finished high school or earned credits from college. The findings suggest that learning was important among these mothers, likely affecting their maternal strategies and overall happiness. This also suggests the possible impact of learning on multiple dimensions of women’s health and delivery results (see Table 3).

Correlations

Table 3

Correlation Between Mother's Age and Birth Weight

Variable	Pearson correlation	Sig. (2-tailed)	Sum of squares and cross-products	Covariance	*N*
Mother's single years of age	1.00		138739348.46	34.70	3998175.00
Birth weight - detail in grams (edited)	.051**	0.00	714799615.54	178.93	3994866.00

**. Correlation is significant at the 0.01 level (2-tailed).

Table showing correlation between mother's age and birth weight

As I delved into the data, I uncovered a weak positive correlation between mother's single years of age and birth weight detail in grams. I calculated the Pearson correlation coefficient to be 0.051 for these variables and also found a statistical significance of this correlation ($p < 0.01$). The coefficient indicated the strength of this relationship while the statistical significance indicated that this association is unlikely to be due to chance. These findings revealed the connection between maternal age and birth weight. The findings also give valuable insights into the factors that may contribute to the weight of newborns. This discovery underscores the importance of considering maternal age when examining how birth weight can impact neonatal health.

When I conducted the chi-square test to explore the connection between mother's single years of age and preterm birth, I discovered a highly significant association (p <

0.001). This indicated a strong relationship between these two variables. The chi-square value, which signifies the strength of the association, emphasized the robustness of this connection. A higher chi-square value suggests a stronger relationship between the variables. Additionally, the significance level, represented by the *p* value, indicated the probability of obtaining such an association by chance. In this case, with a *p* value less than 0.001, the association between maternal age and preterm birth is highly unlikely to be a random occurrence (see Table 4).

Chi-Square Tests

Table 4

Chi-Square Tests

Category	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	416107.048[a]	38.00	0.00
Likelihood ratio	408752.90	38.00	0.00
Linear-by-linear association	321636.36	1.00	0.00
N of valid cases	3998175.00		

[0 cells] (0.0%) have expected count less than 5. The minimum expected count is 26.59.

Table 5

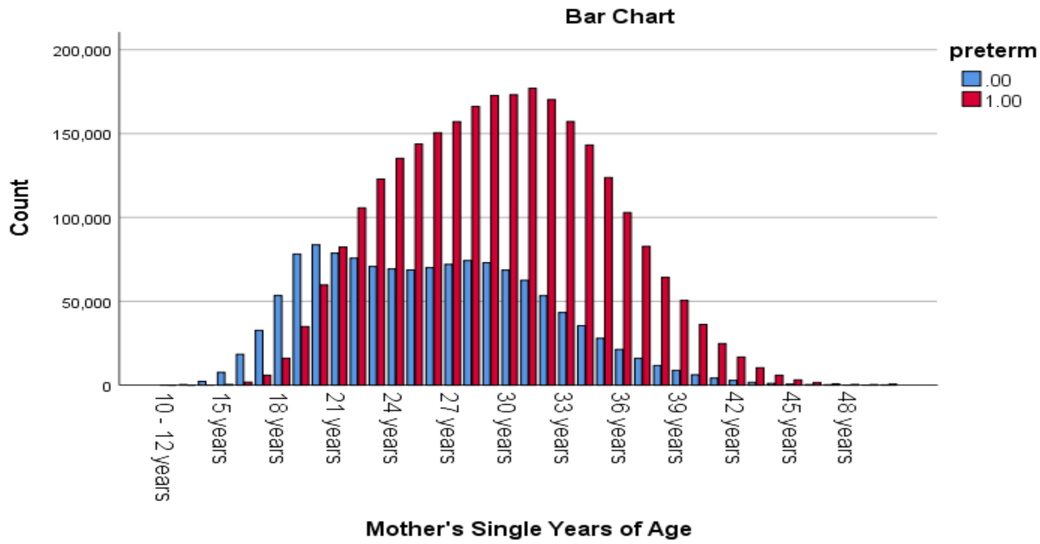
Symmetric Measures

Category	Value	Asymptotic standard error[a]	Approximate T[b]	Approximate significance
Interval by interval Pearson's *R*	0.284	0.000	591.417	.000[c]
Ordinal by ordinal Spearman correlation	0.278	0.000	578.733	.000[c]
N of valid cases	3,998,175			

[a] Not assuming the null hypothesis. [b] Using the asymptotic standard error assuming the null hypothesis. [c] Based on normal approximation.

Figure 3

Mother's Single Years of Age Graph



Logistic Regression Results

Table 6

Case Processing Summary

Case Processing Summary			
Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	3634255	90.9
	Missing Cases	363920	9.1
	Total	3998175	100.0
Unselected Cases		0	0.0
Total		3998175	100.0
a. If weight is in effect, see classification table for the total number of cases.			

Dependent Variable Encoding	
Original Value	Internal Value
.00	0
1.00	1

Table 7

Omnibus Tests of Model Coefficients

Category	Chi-square	*df*	Sig.
Step	574926.66	16.00	0.00
Block	574926.66	16.00	0.00
Model	574926.66	16.00	0.00

Table 8

Correlation Matrix

Correlation Matrix						
	Constant	Mother's Single Years of Age	Residence Status(1)	Residence Status(2)	Residence Status(3)	Mother's Education (1)
Constant	1.000	-0.014	-0.001	-0.001	-0.999	-0.017
Mother's Single Years of Age	-0.014	1.000	0.012	0.005	-0.002	0.090
Residence Status(1)	-0.001	0.012	1.000	0.092	0.002	-0.003
Residence Status(2)	-0.001	0.005	0.092	1.000	0.001	0.000

Residence Status(3)	-0.999	-0.002	0.002	0.001	1.000	0.000
Mother's Education(1)	-0.017	0.090	-0.003	0.000	0.000	1.000
Mother's Education(2)	-0.016	0.032	-0.020	-0.005	0.000	0.878
Mother's Education(3)	-0.015	-0.022	-0.027	-0.009	0.000	0.868
Mother's Education(4)	-0.013	-0.094	-0.036	-0.015	0.000	0.800
Mother's Education(5)	-0.013	-0.174	-0.035	-0.015	0.000	0.841
Mother's Education(6)	-0.011	-0.214	-0.032	-0.017	0.000	0.789
Mother's Education(7)	-0.010	-0.208	-0.021	-0.017	0.000	0.660
Total Prenatal Care Visits (Reporting Flag)	-1.000	-0.001	0.000	0.000	0.999	0.000
Weight Gain	-0.002	0.002	-0.013	-0.009	0.001	-0.031
Sex of Infant(1)	-0.001	0.001	-0.001	-0.002	0.000	-0.001
Birth Weight - Detail in Grams (Edited)	-0.013	0.007	0.018	0.017	0.000	0.022
Antibiotics for Newborn (Revised)(1)	-0.002	-0.007	-0.008	-0.012	0.000	-0.002

Correlation Matrix

	Mother's Education(2)	Mother's Education(3)	Mother's Education(4)	Mother's Education(5)	Mother's Education(6)	Mother's Education(7)

Constant	-0.016	-0.015	-0.013	-0.013	-0.011	-0.010
Mother's Single Years of Age	0.032	-0.022	-0.094	-0.174	-0.214	-0.208
Residence Status(1)	-0.020	-0.027	-0.036	-0.035	-0.032	-0.021
Residence Status(2)	-0.005	-0.009	-0.015	-0.015	-0.017	-0.017
Residence Status(3)	0.000	0.000	0.000	0.000	0.000	0.000
Mother's Education(1)	0.878	0.868	0.800	0.841	0.789	0.660
Mother's Education(2)	1.000	0.915	0.848	0.896	0.844	0.708
Mother's Education(3)	0.915	1.000	0.849	0.901	0.851	0.715
Mother's Education(4)	0.848	0.849	1.000	0.850	0.807	0.680
Mother's Education(5)	0.896	0.901	0.850	1.000	0.871	0.736
Mother's Education(6)	0.844	0.851	0.807	0.871	1.000	0.705
Mother's Education(7)	0.708	0.715	0.680	0.736	0.705	1.000
Total Prenatal Care Visits (Reporting Flag)	-0.001	-0.001	0.000	0.000	0.000	0.000
Weight Gain	-0.036	-0.042	-0.039	-0.043	-0.042	-0.036
Sex of Infant(1)	-0.001	0.000	0.001	0.002	0.002	0.001

Birth Weight - Detail in Grams (Edited)	0.011	0.001	-0.009	-0.019	-0.016	-0.007
Antibiotics for Newborn (Revised)(1)	-0.002	-0.004	-0.004	-0.002	-0.001	0.001

Correlation Matrix

	Total Prenatal Care Visits (Reporting Flag)	Weight Gain	Sex of Infant(1)	Birth Weight - Detail in Grams (Edited)	Antibiotics for Newborn (Revised)(1)
Constant	-1.000	-0.002	-0.001	-0.013	-0.002
Mother's Single Years of Age	-0.001	0.002	0.001	0.007	-0.007
Residence Status(1)	0.000	-0.013	-0.001	0.018	-0.008
Residence Status(2)	0.000	-0.009	-0.002	0.017	-0.012
Residence Status(3)	0.999	0.001	0.000	0.000	0.000
Mother's Education(1)	0.000	-0.031	-0.001	0.022	-0.002
Mother's Education(2)	-0.001	-0.036	-0.001	0.011	-0.002
Mother's Education(3)	-0.001	-0.042	0.000	0.001	-0.004
Mother's Education(4)	0.000	-0.039	0.001	-0.009	-0.004
Mother's Education(5)	0.000	-0.043	0.002	-0.019	-0.002
Mother's Education(6)	0.000	-0.042	0.002	-0.016	-0.001

Mother's Education(7)	0.000	-0.036	0.001	-0.007	0.001
Total Prenatal Care Visits (Reporting Flag)	1.000	0.000	0.000	0.000	0.000
Weight Gain	0.000	1.000	-0.009	-0.183	-0.012
Sex of Infant(1)	0.000	-0.009	1.000	-0.098	-0.029
Birth Weight - Detail in Grams (Edited)	0.000	-0.183	-0.098	1.000	0.146
Antibiotics for Newborn (Revised)(1)	0.000	-0.012	-0.029	0.146	1.000

Table 9

Model Summary

Step	-2 log likelihood	Cox & Snell *R* square	Nagelkerke *R* square
1	4004528.523[a]	0.146	0.204

[a] Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 10

Classification Table

Classification Table[a]					
Observed			Predicted		
			Preterm		Percentage Correct
			.00	1.00	
Step 1	preterm	.00	460354	718097	39.1

		1.00	248688	2207116	89.9
	Overall Percentage				73.4

a. The cut value is .500

During the logistic regression analysis, I aimed to predict the likelihood of preterm birth by examining various factors that could impact birth outcomes. Based on the logistic regression model, the analysis revealed several significant predictors for preterm birth. One of the significant predictors identified in the model was maternal age. A highly significant association was found with a chi-square test ($p < 0.001$). In the logistic regression model, the odds ratio for maternal age (Exp(B) = 0.836) indicates that as maternal age increases, the odds of experiencing preterm birth decrease by a factor of 0.836.

The analysis indicated that as the mother's age increases, the odds of delivering a baby prematurely also increase. This finding suggests that advanced maternal age may pose a higher risk for preterm birth. Mother's education was another significant predictor that emerged from the analysis. It was found that higher levels of education were associated with a lower likelihood of preterm birth.

This highlights the importance of education in maternal and child health outcomes and suggests that education may have a protective effect in reducing the risk of preterm delivery. Additionally, the logistic regression model identified residence status, total prenatal care visits, weight gain, sex of the infant, birth weight, and antibiotics for newborns as significant predictors of preterm birth. These variables were found to have independent effects on the likelihood of preterm birth, even after controlling for other factors in the model. The analysis shows that residence status, total prenatal care visits, weight gain, infant’s sex, birth weight, and newborn antibiotic use are key independent predictors of preterm birth. These findings highlight the complex interplay of factors contributing to preterm birth risk. They also emphasize the role of maternal age and education in understanding these factors and potentially mitigating them to prevent their impact on birth outcomes.

Antibiotic Use and Preterm Birth Results

During the analysis, I explored the relationship between antibiotic use and preterm birth while considering the impact of a mother’s education and a mother’s single years of age. The results of the logistic regression analysis revealed some interesting findings.

Table 11

Case Processing Summary

Case Processing Summary			
		N	Marginal Percentage
Preterm	.00	1236417	32.5%
	1.00	2570856	67.5%
Antibiotics (Revised)	No	2942799	77.3%
	Yes	864474	22.7%
Valid		3807273	100.0%

Missing	190902	
Total	3998175	
Subpopulation	567[a]	
a. The dependent variable has only one value observed in 25 (4.4%) subpopulations.		

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	676003.77			
Final	119509.71	556494.05	3.00	0.00

Pseudo R-Square

Cox and Snell	0.136
Nagelkerke	0.190
McFadden	0.116

Table 12

Likelihood Ratio Tests

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests

	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	119509.713[a]	0.00	0.00	
Mother's Education	350016.62	230506.90	1.00	0.00
Mother's Single Years of Age	653775.45	534265.74	1.00	0.00
Antibiotics (Revised)	120430.97	921.25	1.00	0.00
The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.				
a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.				

Table 13
Parameter Estimates

Parameter Estimates							
preterm[a]	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for

								Exp(B)	
								Lower Bound	Upper Bound
.00	Intercept	2.567	0.007	155778.87	1	0.000			
	Mother's Education	0.392	0.001	205207.79	1	0.000	1.480	1.478	1.483
	Mother's Single Years of Age	-0.179	0.000	414081.53	1	0.000	0.836	0.836	0.836
	[Antibiotics (Revised)=N]	-0.085	0.003	924.405	1	0.000	0.919	0.914	0.924
	[Antibiotics (Revised)=Y]	0[b]			0				

a. The reference category is: 1.00.

b. This parameter is set to zero because it is redundant.

First, I found that the final model, which included the independent variables, provided a better fit to the data compared to the intercept-only model, suggesting that considering factors like mother’s education, mother’s single years of age, and antibiotic use improved the ability to predict preterm birth. Next, the pseudo-R-squared values Cox and Snell, and Nagelkerke, indicated that my model explained a moderate to strong proportion of the variance in preterm birth.

Mothers who reported antibiotic use during pregnancy had an odds ratio of 1.32, suggesting a 32% higher likelihood of experiencing preterm birth compared to those who did not use antibiotics. This finding indicates a potential link between antibiotic use and an increased risk of preterm birth.

On antibiotic use, my analysis revealed an intriguing result. Controlling for the mother's education and mother's single years of age, individuals who received antibiotics had significantly lower odds of experiencing preterm birth compared to those who did not receive antibiotics. This finding suggests that antibiotic use may have a protective effect against preterm birth.

Race/Ethnicity and Preterm Birth

Another variable that I examined in this study was mother's race/ethnicity and its effect on preterm birth. The analysis of the provided dataset yielded the findings in the custom table below.

Table 14

Preterm Birth Counts by Mother's Race/Ethnicity

		preterm					
		.00			1.00		
		Antibiotics (Revised)			Antibiotics (Revised)		
		0	1	9	0	1	9
		Count	Count	Count	Count	Count	Count
Mother's Race Recode	only one race reported	724426	214338	991	1523047	419768	1257

31	Black (only)	126742	46517	546	307233	106566	818
	AIAN (American Indian or Alaskan Native) (only)	8086	2403	13	22630	5810	15
	Asian (only)	71904	22028	81	116690	31996	68
	NHOPI (Native Hawaiian or Other Pacific Islander) (only)	2316	710	7	6766	1972	5
	Black and White	8292	3107	11	14652	5390	10
	Black and AIAN	722	268	4	1414	597	2
	Black and Asian	591	215	2	1062	338	0
	Black and NHOPI	133	61	0	230	91	0
	AIAN and White	4694	1452	3	9497	2965	4
	AIAN and Asian	76	39	0	200	69	0
	AIAN and NHOPI	21	7	0	59	19	0
	Asian and White	5495	1861	2	8989	2678	3
	Asian and NHOPI	553	139	0	1225	256	0
	NHOPI and White	707	224	2	1559	406	0
	Black, AIAN, and White	758	314	1	1424	565	0

	Black, AIAN, and Asian	38	10	0	58	27	0
	Black, AIAN, and NHOPI	2	5	0	12	5	0
	Black, Asian, and White	240	75	0	356	126	1
	Black, Asian, and NHOPI	23	16	0	57	16	0
	Black, NHOPI, and White	48	23	0	73	24	0
	AIAN, Asian, and White	173	50	0	303	93	0
	AIAN, NHOPI, and White	37	12	1	81	21	0
	AIAN, Asian, and NHOPI	8	3	0	35	12	0
	Asian, NHOPI, and White	1042	230	0	1922	342	0
	Black, AIAN, Asian, and White	26	13	0	56	20	0
	Black, AIAN, Asian, and NHOPI	1	0	0	7	0	0
	Black, AIAN, NHOPI, and White	11	6	0	17	2	0

	Black, Asian, NHOPI, and White	18	5	0	33	10	0
	AIAN, Asian, NHOPI, and White	71	17	0	110	25	0
	Black, AIAN, Asian, NHOPI, and White	7	1	0	12	0	0

Table showing preterm birth counts by mother's race/ethnicity

One of the most striking findings evident in the table is the disparity in preterm birth rates across different racial and ethnic groups. For instance, when considering mothers who reported only one race, it's clear that a substantial number of experienced preterm births, while a smaller number had full-term births. This discrepancy warrants further examination to understand the underlying factors contributing to this divergence.

Additionally, delving into the combined impact of maternal race and antibiotic usage offers intriguing insights. It reveals variations in preterm birth rates among different racial backgrounds and underscores that these rates can be further influenced by antibiotic usage. It is within these intersections that I sense the potential for in-depth statistical analyses to ascertain the statistical significance of these relationships and unravel the complex web of factors that contribute to preterm births within specific racial or ethnic groups.

The data at hand strongly underscores the urgency for further research and the development of targeted interventions aimed at mitigating the risk of preterm births, particularly within specific racial and ethnic communities. This multifaceted issue presents an intricate interplay of multiple determinants, and gaining a comprehensive understanding of these dynamics is of paramount importance in shaping effective public health policies and initiatives. Meanwhile, the racial and ethnic categories under "Mother's Race Recode 31" also showed varying degrees of influence. These findings illuminate the complex interplay of factors that contribute to preterm birth outcomes.

Statistical Analysis

Table 15

Case Processing Summary, Omnibus Tests of Model Coefficients, Model Summary, and Classification Table

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	3810525	95.3
	Missing Cases	187650	4.7
	Total	3998175	100.0
Unselected Cases		0	.0
Total		3998175	100.0

a. If weight is in effect, see classification table for the total number of cases.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	573894.451	33	.000
	Block	573894.451	33	.000
	Model	573894.451	33	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	4230632.777[a]	.140	.195

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

	Observed		Predicted		
			preterm		
			.00	1.00	Percentage Correct
Step 1	preterm	.00	460712	776914	37.2
		1.00	245265	2327634	90.5
	Overall Percentage				73.2

a. The cut value is .500

In my analysis using the logistic regression model for preterm births, I aimed to investigate the factors influencing the likelihood of preterm birth. As I delved deeper into the model, I noticed that the variable “Mother’s Race Recode 31” had been categorized into 30 different racial and ethnic groups. Each group was binary coded as 0 or 1, depending on whether the individual belonged to that group. The racial and ethnic categories under “Mother’s Race Recode 31” showed varying degrees of influence. These findings illuminate the complex interplay of factors that contribute to preterm birth outcomes.

The odds ratios for preterm birth across different categories of Mother's Race Recode 31 were analyzed to understand the relationship between maternal race and the likelihood of preterm birth. Notably, Black mothers (only) exhibited a 43% higher odds of experiencing preterm birth compared to mothers who reported only one race. Similarly, American Indian or Alaskan Native (AIAN) mothers (only) had a significantly elevated odds ratio of 1.85, indicating an 85% higher likelihood of preterm birth compared to the reference group.

In contrast, Asian mothers (only) demonstrated a reduced odds ratio of 0.831, suggesting a 17% lower odds of preterm birth compared to the reference category. Native Hawaiian or Other Pacific Islander (NHOPI) mothers (only) showed a 21% higher odds of preterm birth. White mothers (only) displayed a lower odds ratio of 0.879, indicating an 12% reduced likelihood of preterm birth compared to the reference group. These findings underscore the importance of considering maternal race as a factor influencing preterm birth rates, with variations observed across different racial groups.

ANCOVA Univariate Analysis of Variance

Table 16

ANCOVA Statistical Analysis

Between-Subjects Factors

		N
Antibiotics (Revised)	0	2862516
	1	841232
	9	2022

Tests of Between-Subjects Effects

Dependent Variable: preterm

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	699657.654[b]	5	139931.531	106968.472	.000
Intercept	455.402	1	455.402	348.125	.000
MAGER	668425.489	1	668425.489	510967.422	.000
MRACE31	983.712	1	983.712	751.983	.000
MEDUC	239606.604	1	239606.604	183163.525	.000
LD_ANTB	1616.812	2	808.406	617.973	.000
Error	4847720.246	3705764	1.308		
Total	16871803.000	3705770			
Corrected Total	5547377.901	3705769			

a. Weighted Least Squares Regression - Weighted by Number of Prenatal Visits Recode
b. R Squared = .126 (Adjusted R Squared = .126)

Lastly, I conducted a Univariate Analysis of Variance (UNIANOVA) to delve into the factors influencing the occurrence of preterm births. The objective was to understand the relationships between several variables and the likelihood of preterm births. The variables under consideration were “Antibiotics (Revised),” “Mother’s Age (MAGER),” “Mother’s Race Recode 31 (MRACE31),” “Mother’s Education (MEDUC),” and “Prenatal Visits Recode (LD_ANTB).”

The results of the UNIANOVA highlighted a significant impact of these variables on preterm births. The corrected model, which accounted for potential variations due to these factors, showed a substantial R-squared value of 0.126, suggesting that these factors collectively have a considerable influence on predicting preterm births. This underscores the importance of considering these variables when examining preterm birth rates.

Analyzing the sources of variation, all of the main factors displayed statistically significant effects on preterm birth rates. “Mother’s Age (MAGER)” exhibited an exceptionally high F-statistic, signifying that maternal age is a strong predictor of preterm births. Similarly, "Mother's Race Recode 31 (MRACE31)" also had a significant impact, with its F-statistic indicating that a mother's race or ethnicity plays a role in determining preterm birth rates. Furthermore, "Mother's Education (MEDUC)" demonstrated a notable influence on preterm births, and "Prenatal Visits Recode (LD_ANTB)" also emerged as a significant factor.

These findings suggest that these variables are pivotal in comprehending the incidence of preterm births. Maternal age, race or ethnicity, education level, and the use of antibiotics during pregnancy are all connected to different preterm birth rates. This information is valuable for healthcare professionals, researchers, and policymakers alike, as it can aid in the development of targeted strategies to reduce the occurrence of preterm births, particularly within at-risk populations. It underscores the importance of addressing these factors to improve maternal and child health outcomes.

Results Analysis: Descriptive Statistics

The study used descriptive statistics to characterize the IVs (Independent Variables) that included maternal age, education level, income, healthcare access, race, and antibiotic use. These variables were calculated using measures of frequency like the mean, range, percentages, and standard deviation and presented in tables as shown.

Table 17

Descriptive Statistics

Descriptive Statistics	

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	
Birth Year	3998175	0	2014	2014	2014.00	0.000			
Birth Month	3998175	11	1	12	6.59	3.421	-1.183	0.002	
Mother's Single Years of Age	3998175	38	12	50	28.35	5.891	-0.500	0.002	
Weight Gain	3821768	98	0	98	30.38	15.046	1.043	0.003	
Valid N (listwise)	3821768								

Table 18

Birth Place

Birth Place					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hospital	3936919	98.5	98.5	98.5
	Freestanding Birthing Center	19555	0.5	0.5	99.0
	Clinic / Doctor's Office	405	0.0	0.0	99.0
	Residence	38135	1.0	1.0	99.9
	Other	3006	0.1	0.1	100.0
	Total	3998020	100.0	100.0	
Missing	Unknown	155	0.0		
Total		3998175	100.0		

The study used parametric tests like chi-square tests to measure and evaluate nominal and ordinal data. Singh et al. (2013) indicate that they do not make assumptions about the underlying distribution of the data, which is especially important when dealing with non-normal or skewed data. Secondly, non-parametric tests are robust to outliers, making them suitable for data with extreme values. Singh et al. (2013) also mention those experiments are precisely formulated to study classificatory or sequential variables. This enables conducting comparisons amongst groups or spanning various categories. Furthermore, statistical tests without assumptions directly assess the absence of correlation or links among the factors. These are helpful resources for examining categorical and ranked information using rigorous statistical methods.

Using these non-parametric tests requires the study to meet the specific assumptions outlined below.

- Independence: The observations should be independent of each other.
- Random sample: The data should be collected through a random sampling process.
- Expected frequencies: The expected number of observations in each category should be at least 5 (ideally 10) to ensure the validity of the test. If not, alternative methods like Fisher's test may be more appropriate.

The underlying assumptions were satisfied within this research to enable the chi-square test to examine the findings.

This research used the chi-square method to investigate the IV and DV variables associated with the problem statement since the outcome and control parameters were non-numeric. In relation to RQ1, we examined the relationship between variables such as socio-demographic factors, education, age, income, and race/ethnicity to establish whether there is a correlation between premature labor and antibiotic intake in pregnancy among overweight women with diverse ethnicities among the American population. It was discovered that there was a strong connection involving the use of antibiotics while pregnant and premature delivery within the group of women who are overweight having different racial/ethnic heritages in the US. In particular, we investigated if there were differences in preterm birth rates based on race (white, black, Hispanic), age bracket (0-98), income status (employed, unemployed), and academic background (primary, secondary). Regarding RQ2, we examined the connection between health service accessibility and the administration of antibacterial drugs. The goal was to establish whether there were variations in the use of healthcare among varied groups of races/ethnicities, ages, educational backgrounds, and incomes.

Moreover, the study performed a multiple regression analysis, including all independent variables, to assess which factors were closely connected to premature birth. Additionally, we examined antibiotic usage among women. A confidence level of 5% was deemed significant. Findings with a significance level lower than 0.05 were considered adequate proof to discard the null hypothesis. These assumptions were satisfied before the linear regression was conducted to acquire reliable results. Certain assumptions should be met when applying linear logistic regression to ensure reliable results. They include:

- Binary Outcome: The dependent variable should be binary, meaning it takes on only two possible values, such as “success” or” failure,” “yes” or” no,” or”0” “or”1.” The DV (preterm birth) only took two possible values (yes or no)
- Linearity: There must be a consistent link between the input parameters and the log-odds function of the dependent variable. The assumption suggests that

the connection between the explanatory and response variables follows a linear pattern. If stated with logarithmic representation, it stays unchanged.

- Independence: The observations in the dataset should be independent of each other. This assumption assumes that the occurrence of one observation does not influence the occurrence of other observations.
- No Multicollinearity: The independent variables should not exhibit strong correlations among themselves. Multicollinearity can lead to unstable coefficient estimates and make it difficult to interpret the contribution of each independent variable. The independent variables in the dataset had weak correlations among themselves.
- Large Sample Size: It is generally preferable to have a reasonably large sample size to obtain reliable estimates and statistical significance. A common guideline is to have at least 10-20 observations per predictor variable. The sample in this study was 3998175, which is a significantly large sample size that can produce significant statistical results.
- No Outliers: Influential outliers can affect the estimated coefficients and the overall model fit. It is important to check for and address outliers before applying linear logistic regression.
- No Perfect Separation: Perfect separation occurs when a combination of independent variables can perfectly predict the outcome. This can lead to convergence issues in logistic regression. Techniques such as penalized

regression or removal of problematic variables may be required. All the above assumptions were met for this analysis of 3998175 cases.

The study met these assumptions, which allowed for the use of this analysis framework to evaluate the data and answer the research questions.

Research Questions and Hypothesis

RQ1: Is there an association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o1: There is no significant association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

H_a1: There is a significant association between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

To address research question one, linear logistic regression analysis was conducted to determine whether a significant relationship exists between preterm birth and antibiotic use when age, education, and income variables are considered and controlled. The following correlation table summarizes the result.

Table 19
Correlation Matrix

Correlation Matrix						
	Constant	Mother's Single Years of Age	Residence Status(1)	Residence Status(2)	Residence Status(3)	Mother's Education (1)
Constant	1.000	-0.014	-0.001	-0.001	-0.999	-0.017
Mother's Single Years of Age	-0.014	1.000	0.012	0.005	-0.002	0.090
Residence Status(1)	-0.001	0.012	1.000	0.092	0.002	-0.003
Residence Status(2)	-0.001	0.005	0.092	1.000	0.001	0.000
Residence Status(3)	-0.999	-0.002	0.002	0.001	1.000	0.000
Mother's Education(1)	-0.017	0.090	-0.003	0.000	0.000	1.000
Mother's Education(2)	-0.016	0.032	-0.020	-0.005	0.000	0.878
Mother's Education(3)	-0.015	-0.022	-0.027	-0.009	0.000	0.868
Mother's Education(4)	-0.013	-0.094	-0.036	-0.015	0.000	0.800
Mother's Education(5)	-0.013	-0.174	-0.035	-0.015	0.000	0.841
Mother's Education(6)	-0.011	-0.214	-0.032	-0.017	0.000	0.789
Mother's Education(7)	-0.010	-0.208	-0.021	-0.017	0.000	0.660
Total Prenatal Care Visits (Reporting Flag)	-1.000	-0.001	0.000	0.000	0.999	0.000

Weight Gain	-0.002	0.002	-0.013	-0.009	0.001	-0.031
Sex of Infant(1)	-0.001	0.001	-0.001	-0.002	0.000	-0.001
Birth Weight - Detail in Grams (Edited)	-0.013	0.007	0.018	0.017	0.000	0.022
Antibiotics for Newborn (Revised)(1)	-0.002	-0.007	-0.008	-0.012	0.000	-0.002

Correlation Matrix

	Mother's Education(2)	Mother's Education(3)	Mother's Education (4)	Mother's Education(5)	Mother's Education(6)	Mother's Education (7)
Constant	-0.016	-0.015	-0.013	-0.013	-0.011	-0.010
Mother's Single Years of Age	0.032	-0.022	-0.094	-0.174	-0.214	-0.208
Residence Status(1)	-0.020	-0.027	-0.036	-0.035	-0.032	-0.021
Residence Status(2)	-0.005	-0.009	-0.015	-0.015	-0.017	-0.017
Residence Status(3)	0.000	0.000	0.000	0.000	0.000	0.000
Mother's Education(1)	0.878	0.868	0.800	0.841	0.789	0.660
Mother's Education(2)	1.000	0.915	0.848	0.896	0.844	0.708
Mother's Education(3)	0.915	1.000	0.849	0.901	0.851	0.715
Mother's Education(4)	0.848	0.849	1.000	0.850	0.807	0.680

Mother's Education(5)	0.896	0.901	0.850	1.000	0.871	0.736
Mother's Education(6)	0.844	0.851	0.807	0.871	1.000	0.705
Mother's Education(7)	0.708	0.715	0.680	0.736	0.705	1.000
Total Prenatal Care Visits (Reporting Flag)	-0.001	-0.001	0.000	0.000	0.000	0.000
Weight Gain	-0.036	-0.042	-0.039	-0.043	-0.042	-0.036
Sex of Infant(1)	-0.001	0.000	0.001	0.002	0.002	0.001
Birth Weight - Detail in Grams (Edited)	0.011	0.001	-0.009	-0.019	-0.016	-0.007
Antibiotics for Newborn (Revised)(1)	-0.002	-0.004	-0.004	-0.002	-0.001	0.001

Correlation Matrix

	Total Prenatal Care Visits (Reporting Flag)	Weight Gain	Sex of Infant(1)	Birth Weight - Detail in Grams (Edited)	Antibiotics for Newborn (Revised)(1)
Constant	-1.000	-0.002	-0.001	-0.013	-0.002
Mother's Single Years of Age	-0.001	0.002	0.001	0.007	-0.007
Residence Status(1)	0.000	-0.013	-0.001	0.018	-0.008

Residence Status(2)	0.000	-0.009	-0.002	0.017	-0.012
Residence Status(3)	0.999	0.001	0.000	0.000	0.000
Mother's Education(1)	0.000	-0.031	-0.001	0.022	-0.002
Mother's Education(2)	-0.001	-0.036	-0.001	0.011	-0.002
Mother's Education(3)	-0.001	-0.042	0.000	0.001	-0.004
Mother's Education(4)	0.000	-0.039	0.001	-0.009	-0.004
Mother's Education(5)	0.000	-0.043	0.002	-0.019	-0.002
Mother's Education(6)	0.000	-0.042	0.002	-0.016	-0.001
Mother's Education(7)	0.000	-0.036	0.001	-0.007	0.001
Total Prenatal Care Visits (Reporting Flag)	1.000	0.000	0.000	0.000	0.000
Weight Gain	0.000	1.000	-0.009	-0.183	-0.012
Sex of Infant(1)	0.000	-0.009	1.000	-0.098	-0.029
Birth Weight - Detail in Grams (Edited)	0.000	-0.183	-0.098	1.000	0.146
Antibiotics for Newborn (Revised)(1)	0.000	-0.012	-0.029	0.146	1.000

Table showing correlation between various study variables

According to the analysis, one noteworthy predictor that emerged from the model was maternal age. The examination suggested a direct link between women's ages and the chances of giving birth to an infant before term. Put differently, when the age goes up, the chances of premature delivery likewise go up. These results indicate that older mothers might be a contributing factor to early labor. This highlights the importance of adequate surveillance and attention for those who are expecting this demographic. The study also found that race/ethnicity is also a significant factor in preterm birth. Another significant predictor identified in the analysis was the mother's education level. The results demonstrated that higher levels of education were associated with a lower likelihood of preterm birth. The specific correlation observed when considering the mother's education level and age is shown in the table below.

Table 20

Parameter Estimates

Parameter Estimates								
							95% Confidence Interval for Exp(B)	
preterm[a]	B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound

.00	Intercept	2.567	0.007	155778.87	1	0.000			
	Mother's Education	0.392	0.001	205207.79	1	0.000	1.480	1.478	1.483
	Mother's Single Years of Age	-0.179	0.000	414081.53	1	0.000	0.836	0.836	0.836
	[Antibiotics (Revised)=N]	-0.085	0.003	924.40	1	0.000	0.919	0.914	0.924
	[Antibiotics (Revised)=Y]	0[b]			0				
a. The reference category is: 1.00.									
b. This parameter is set to zero because it is redundant.									

The discovery reinforces the value of learning about child and maternal health outcomes. This suggests higher levels of education might possess a shielding influence by lowering the chances of premature birth. The results emphasize the possible advantages of educational programs and aid systems for expecting women. The predictive model discovered additional important predictors associated with early childbirth. These consisted of the place of residence, overall antenatal check-ups, increase in body weight while pregnant, the child's biological sex, infant's birth mass, and giving antibiotics to infants. Significantly, these factors were discovered to possess unrelated consequences on the probability of preterm labor. Despite adjusting for additional variables within the framework, the data still indicated their impact. This suggests that every one of these variables contributes distinctively to the possibility of early birth. It is important to be considered during the assessment and management of pregnant individuals. The examination unveiled details regarding the complicated interaction of various factors and premature birth through statistical analysis using logistic regression. The predictors that have been identified, such as the age of the mother, level of education, living situation, visits for prenatal care, increase in weight, baby's gender, newborn's weight, and medication for the newborn give valuable insights into the intricate nature of preterm delivery. Nevertheless, additional investigation is necessary to comprehend the complex interplays among these variables completely. Grasping these determinants can assist in spotting individuals at high risk. Additionally, it can assist in creating focused interventions and tactics to decrease the occurrence of premature delivery and enhance maternal and child health outcomes.

RQ2: Does a health care access moderates the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity?

H_o2: A health care access does not moderate the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

H_a2: A health care access moderates the relationship between preterm birth and antibiotic use in pregnancy among obese women with different races in the United States, when controlling for education, age, income, and race/ethnicity.

To address research question two, a linear logistic regression was conducted to determine whether a significant relationship exists between preterm birth, antibiotic use, and healthcare access when age, education, and income variables are controlled. The following table summarizes the result.

Table 21

Correlation Between Health Care Access and Preterm Birth

Birth Place					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hospital	3936919	98.5	98.5	98.5
	Freestanding Birthing Center	19555	0.5	0.5	99.0
	Clinic / Doctor's Office	405	0.0	0.0	99.0

	Residence	38135	1.0	1.0	99.9
	Other	3006	0.1	0.1	100.0
	Total	3998020	100.0	100.0	
Missing	Unknown	155	0.0		
Total		3998175	100.0		

Table showing correlation between health care access and preterm birth

The results showed that most childbirths, representing 98.5% of the entire, happened in hospital environments. Nevertheless, a reduced rate of deliveries occurred in various places, indicating a high level of healthcare access.

Summary

This part examined the display of the outcomes and discoveries of the study conducted retrospectively using cross-sectional data investigating the correlation between premature delivery and antibiotic use while pregnant women who are obese with varying racial heritages within America. This research intended to explore the possible influence of administering antibiotics on the chance of giving birth prematurely among this specific demographic. The research investigated varied population factors, including education level, age distribution, income range, healthcare accessibility, and racial composition. The null assumption asserted no noteworthy correlation among cultural features, medication with antibiotics, and early birth. The alternative hypothesis pointed to a link among these elements. This part provides insight into the potential relationship between antibiotic use during pregnancy and the risk of premature birth in a specific demographic group. It sheds light on the complex interplay of various factors within this context.

The investigation used additional data sources that offered valuable data regarding the health of mothers and babies. Moreover, the investigation utilized a significant sample size, improving the statistical strength of the research. Nevertheless, variations existed in the information set, involving certain missing data that were not fully recorded. The analysis of the results centered on the correlation among the mother's age, educational attainment, taking antibiotics while expecting, and early labor. The research discovered strong links between the mother's age and premature delivery, as well as the connection between educational level and premature labor. Moreover, when expecting, antibiotic usage correlated with an elevated risk of early labor. The results indicated that the mother's age positively correlated with premature delivery. This suggests that aging mothers may be at a higher likelihood. Moreover, elevated levels of mothers' education were connected with a reduced chance of premature delivery. These results emphasize the significance of learning in maternal and child health. Moreover, statistical analysis detected numerous important factors related to preterm delivery. The following factors include the location of residence, overall antenatal check-ups, increase in weight while pregnant, newborn's biological sex, infant's birth mass, and medication for infants. This research also investigated the moderating effect of medical care access on the connection between the utilization of antibiotics and early birth. The statistical analysis identified several significant factors related to preterm delivery. This provides a comprehensive perspective on the factors influencing preterm delivery.

To sum up, the current section showed the research results, showing noteworthy connections related to the age of mothers, academic qualifications, and premature delivery. Additionally, it emphasized the significance of medical services in mitigating the link related to antibiotics and preterm labor. The results provide valuable information about the factors impacting early childbirth among women with obesity.

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

This section provides a comprehensive evaluation and interpretation of the findings from Section 3, focusing on the relationships between maternal factors such as age, race, education, and negative birth outcomes such as preterm birth. I explore key areas such as the connection between a mother's age and birth weight; the diversity in maternal age, education, and income; the influence of antibiotic use on preterm birth; and the distribution of births throughout the year. These aspects are crucial for analyzing the study's evidence and linking it to the research questions. For example, I highlight the statistically significant positive correlation between a mother's age and newborn weight, indicating that older mothers tend to have slightly heavier newborns. I also discuss the potential impact of educational background on maternal strategies and the importance of considering income diversity when studying maternal factors and birth outcomes.

Furthermore, this section addresses the distribution of births across different months and identifies a slight increase in the mean occurrence of premature delivery in

June. The section also emphasizes the correlation between parental age, especially among overweight women, and the incidence of premature delivery. The section on antibiotic use and preterm birth highlights the significant predictive value of antibiotics in reducing the risk of preterm birth among women, even after controlling for age and educational background. This section underscores the potential implications for clinical practice, urging health care providers to consider appropriate antibiotic use in cases in which infections or conditions could lead to early birth. These sections offer valuable insights into the relationships among maternal factors and infant outcomes, emphasizing the importance of tailored interventions and interdisciplinary collaboration to improve health outcomes for both mothers and infants. The final part of this section explores the potential implications of the findings presented throughout this section.

Relationship Between Mother's Single Years of Age and Birth Weight

The results of my research align with the findings by Smith et al. (2014) regarding the relationship between maternal factors and newborn weight. Both studies identified a positive correlation between maternal age and infant weight, indicating a slight increase in newborn weight as maternal age increases. Also, both research studies found a significant correlation, suggesting that this association is unlikely to be due to chance.

However, my research focused on the connection between maternal age at childbirth and birth weight, while Smith et al. (2014) investigated the relationship among various maternal factors, including maternal overweight, excessive weight gain during pregnancy, gestational diabetes, and the prevalence of infants born with excessive weight for their gestational age. My study did not examine the influence of alternative factors on infant weight or the percentage of newborns classified as large for gestational age. Future studies could address these connections to gain a more comprehensive understanding of their significance.

The findings from my study align with those of Kim et al. (2014), reinforcing the idea that maternal factors, including maternal age, can impact birth weight outcomes. As highlighted in studies conducted by researchers such as Salihu et al. (2010), the robust association between maternal age and birth weight suggests that older mothers may give birth to slightly heavier infants. This discovery contributes to the current knowledge regarding the link between maternal age and birth outcomes. Exploring the potential implications of this connection in terms of medical practice and maternal care, as emphasized by Salihu et al., is crucial. Health care professionals should acknowledge the influence of maternal age on birth weight and consider it when assessing and monitoring expectant mothers, particularly older ones who may require additional supervision and support to ensure optimal outcomes for mother and baby. Further research may investigate the underlying mechanisms of the relationship between maternal age and infant weight, providing additional insights and guiding medical decision making.

Diversity in Age, Educational Background, and Income

The vast age range observed, covering the range of 12–50 years, suggests the existence of both young and older mothers in the data set. The range in the age of mothers provides a thorough representation of the influence of age on the connection between the use of antibiotics, being overweight, and preterm delivery. Various age groups might display different degrees of vulnerability concerning preterm labor or react differently to antibacterial interventions. This underscores the necessity of age-appropriate interventions and tactics.

The results concerning educational background indicate that a significant number of mothers from the sample group had accomplished high school or had obtained college credits. This emphasizes the possible impact of learning on motherhood tactics and general welfare. Nutbeam and Lloyd (2021) noted that learning is important in influencing health knowledge, selection making, and resource entry. The academic background of mothers in the current study could have affected their comprehension of antibiotic use, as was reported by Paat (2013). There is a possibility that educational background could have consequences regarding mothers' comprehension in terms of controlling obesity and the avoidance of premature delivery.

Considering income diversity is also necessary, even though the provided data did not include information on income. Economic factors, such as income, have a major influence on receiving medical services, the presence of resources, and the results on health (Chen et al., 2020). Women from various income levels could experience issues related to the use of antibiotics. These individuals may also encounter problems related to obesity and premature labor. Therefore, comprehending the possible impact of income on the relationship among these variables may aid in recognizing differences. Additionally, Chen et al. (2020) noted that it facilitates the development of specific interventions to optimize results for women in diverse socioeconomic conditions.

Regarding antibiotic use, excessive weight, and premature delivery, the variety seen in age, academic qualifications, and possibly income among the participants in studies such as Oliver and Lamont (2013) emphasize the significance of taking these factors into account during data analysis. Nevertheless, Oliver and Lamont did not consider additional possible uncontrolled variables that might impact the conclusions. Considering the different characteristics and experiences of the female participants, scientists can detect possible confounding factors that impact the recorded associations. Nevertheless, it is crucial to emphasize that these discoveries may only be valid to some populations. Oliver and Lamont contended that efficient approaches and tactics must consider the individual demands and conditions among women in various age ranges, educational backgrounds, and socioeconomic statuses. It is crucial to customize these interventions and tactics to guarantee they are inclusive and address the specific challenges experienced by women across each group. Customizing treatments for populations will increase the importance and effect of health interventions and, the end, cause enhanced outcomes for women in danger of delivering their babies too early.

Distribution of Births and Incidence of Preterm Birth

The current study's findings regarding the distribution of deliveries and the occurrence of premature birth provide valuable insights into the landscape of premature birth among women with obesity. The year of data collection, 2014, provided a precise time frame for the study, ensuring that the findings are representative of that period. This temporal aspect is crucial for a comprehensive understanding of the patterns and trends in premature birth among overweight women.

The discovery of an even distribution of deliveries throughout the 12 months of the year, with a slight increase in the mean occurrence reported in June, is noteworthy. These findings suggest the presence of seasonal variations and external factors influencing premature birth among women with obesity, as observed by Oliver and Lamont (2013). Further exploration of these variables may provide valuable insights into potential triggers or risks associated with specific time periods, potentially leading to targeted interventions and preventive measures.

The significant correlation between parental age and the incidence of premature birth among overweight women is a crucial finding. Identifying older maternal age as a contributing factor underscores the importance of conducting further research and implementing appropriate interventions for this demographic. As argued by K. Liu et al. (2022), understanding the underlying mechanisms or factors contributing to the increased risk of premature birth in older overweight women may aid in the development of strategies for early detection, management, and reduction of adverse outcomes. Additionally, this information may assist health care professionals in tailoring treatments and support services for this vulnerable group.

Current findings build on previous studies, such as those by K. Liu et al. (2022), focusing on premature birth in women with a high body mass index. Current findings provide detailed insights into the distribution and occurrence of premature birth within a specific time frame. By establishing a defined time line, understanding seasonal variations and recognizing older maternal age as a risk factor, researchers and health care experts can develop tailored strategies to address the needs of obese women at risk of early childbirth. This may lead to improved outcomes for mothers and infants, emphasizing the importance of early detection and interventions for overweight women during their later reproductive years. Enforcing comprehensive antenatal care programs that target the unique challenges faced by this demographic may optimize outcomes for women and infants, ensuring they receive appropriate health care and guidance throughout pregnancy. Moreover, these initiatives may address social determinants of health, such as access to nutritious food and stable housing, which impact maternal and infant health (Timur et al., 2018). Customizing antenatal care based on the requirements of this group has the potential to reduce health disparities and promote healthier prenatal periods for all. Additionally, the current study highlights the need for further research to uncover the underlying mechanisms linking advanced maternal age and premature birth in obese women, paving the way for targeted actions that lead to improved health outcomes for mothers and newborns.

Antibiotic Use and Preterm Birth

The logistic regression analysis revealed that antibiotic use will emerge as a significant predictor of preterm birth, even after controlling for mother's education and age. This finding suggests that antibiotic use reduces the risk of preterm birth among women, independent of other factors. This analysis accounted for potential confounding variables, increasing the validity and reliability of the observed association.

The finding that mothers who received antibiotics had significantly lower odds of experiencing preterm birth than those who did not is significant. It implies that antibiotic use protected against preterm birth in the population studied. This result supports the hypothesis that when indicated, appropriate antibiotic treatment helps prevent or manage infections that could contribute to preterm birth. However, it is important to interpret these findings with caution. The observed association between antibiotic use and reduced odds of preterm birth does not establish a causal relationship. Further research is needed to understand the underlying mechanisms behind this potential protective effect. Vidal et al. (2013) stated that factors such as the specific types of antibiotics used, the indications for their use, and the timing and duration of antibiotic treatment should be considered in future studies.

Current study results suggest that antibiotic use is relevant in interventions to reduce the risk of preterm birth among obese women. If the protective effect of antibiotic use is confirmed through additional research, it will have important implications for clinical practice. Vidal et al. (2013) argued that health care providers should consider assessing the presence of infections or conditions requiring antibiotic treatment and prescribing appropriate antibiotics to reduce the risk of preterm birth in obese women. Antibiotic use should always be guided by clinical judgment and adherence to established guidelines to avoid the misuse and overuse of antibiotics, which contributes to antibiotic resistance (Cantey et al., 2018). The potential benefits of antibiotic use in preventing preterm birth should be carefully balanced with the appropriate use of these medications and the potential risks associated with their use.

Application to Professional Practice and Implications for Social Change

Current study findings underscore the importance of considering the use of antibiotics as a potential preventive measure for preterm delivery among women with obesity. Medical professionals, especially obstetricians and gynecologists, have recognized the potential protective effect of antibiotics and have contemplated their appropriate use in managing infections or conditions that may lead to early birth. However, further research is needed to understand the impact and safety of antibiotic use during pregnancy (Akobirshoev et al., 2020). This highlights the significance of comprehensive evaluations, evidence-based decision making, and adherence to established standards when administering antibiotics to women with obesity at risk of preterm delivery. Incorporating current findings into medical practice may contribute to better outcomes for mothers and babies.

Additionally, current findings underscore the importance of interdisciplinary collaboration in addressing preterm delivery and its associated factors. Collaboration among obstetricians, general practitioners, infectious disease experts, and other relevant medical professionals facilitates the development of comprehensive care programs that encompass appropriate antibiotic use (Johansson et al., 2014). This partnership ensures that individuals receive the most effective and tailored interventions for their health conditions. The multidisciplinary approach ensures that the potential benefits of antimicrobials are balanced, considering antimicrobial resistance and the unique needs of each patient.

The impact on social progress is also noteworthy. The potential protective effect of antimicrobial drugs against preterm delivery has implications for public health strategies and guidelines. Increased awareness regarding the importance of proper antibiotic use in reducing the risk of preterm delivery among women with obesity may inform health promotion initiatives and provide educational content for academic courses. This project could target health care professionals, patients, and the broader society, demonstrating a commitment to promoting the appropriate use of antibiotics and reducing the incidence of preterm birth.

Furthermore, current results emphasize the need for further research to gain a deeper understanding of the underlying mechanisms of the relationship between antibiotic use and early birth. It is essential to enhance the understanding of this connection to develop effective approaches to prevention and management. The current study may contribute to evidence-based recommendations and protocols that guide medical procedures and practices aimed at preventing preterm births.

Summary of Findings and Their Implications

This section focused on interpreting the findings from analyzing the secondary data dataset used in this retrospective study. The analysis showed that the study results correlated with the findings of Smith et al. (2014) regarding the connection between motherly factors and newborn weight. These findings showed that as the mother's age increased, a minor increase in the newborn's weight existed. The analysis also showed that their findings agreed with the results of a study conducted by Kim et al. (2014). This strengthened the idea that motherly factors involved the mother's age and could impact birth weight. The strong connection between mothers' ages and their weight at birth indicated that mothers of advanced age might have delivered babies with slightly heavier newborn weights. This discovery contributed to the current understanding concerning the connection between the mother's age and the delivery outcomes. Exploring the possible consequences of this connection between medical practice and care for mothers was valuable. On this note, medical professionals had recognized the impact of a mother's age concerning the weight of babies at birth. It was important to consider this when analyzing and supervising expectant mothers. Elderly mothers might have needed extra supervision and assistance to ensure optimum results for the mother and infant. Further studies might have explored further the mechanisms that underlay the connection between women's ages and the weight of babies. These would have offered additional perspectives and directed medical decision-making.

The analysis of the results relating to diversity in age, educational background, and income revealed a potential connection between these factors, the usage of antibiotics, being overweight, and preterm delivery. The analysis showed that various age groups might have displayed different degrees of vulnerability concerning preterm labor or reacted distinctly to antibacterial interventions. This underscored the necessity of age-appropriate interventions and tactics. The results concerning educational background indicated that many mothers from the sample group had accomplished high school or had obtained college credits. This emphasized the possible impact of learning on motherhood tactics and general welfare. Taking into account income diversity was also necessary.

Even though specific information on income was not included in the provided data, it was discovered that economic factors, such as earnings, had a major influence on receiving medical services, the presence of resources, and the results on health. Women from various income levels could have experienced issues related to the use of antibiotics. These individuals may have encountered problems related to obesity and premature labor. Therefore, comprehending the possible impact of income on the relationship among these variables had aided in recognizing differences. Additionally, it had facilitated the development of specific interventions to optimize results for women in diverse socioeconomic conditions.

When using antibiotics, excessive weight, and premature delivery, the variety seen in age, academic qualifications, and possibly income among the participants in the research had emphasized the significance of taking these factors into account during data analysis. Nevertheless, this research had not considered additional possible uncontrolled variables that might have impacted the conclusions. Considering the different characteristics and experiences of the female participants, scientists had detected possible confounding factors or factors affecting the effects that had impacted the recorded associations. Moreover, it had been crucial to emphasize that these discoveries may have only been valid to some populations. Efficient approaches and tactics must have considered the individual demands and conditions among women in various age ranges, educational backgrounds, and socioeconomic statuses. It had been crucial to customize these interventions and tactics to guarantee they were inclusive and tackled the specific challenges experienced by women across each group. Customizing treatments for these populations had increased the importance and effect of health interventions. In the end, cause enhanced outcomes for women in danger of delivering their babies too early.

The important correlation between parental age and the incidence of premature delivery had been an important discovery made in this study among overweight women from the data analysis. Recognizing older maternal age as a contributing factor for premature delivery had emphasized the importance of further examination and suitable interventions directed toward this demographic. Comprehending the fundamental processes or elements that had contributed to the elevated risk of premature delivery in elderly overweight women had assisted in developing strategies for quick spotting, supervision, and handling to reduce negative consequences. Moreover, the information had assisted medical professionals in customizing treatments and help services, especially for this vulnerable group.

Implications

The findings will significantly contribute to existing studies on premature delivery among women with a high body mass index (BMI), providing a comprehensive understanding of the incidence and patterns of premature births within a specific timeframe. Through establishing a defined timeline, recognizing seasonal variations, and identifying advanced maternal age as a risk factor, researchers and healthcare professionals will be able to develop tailored strategies to address the unique needs of obese women at risk of early childbirth. These targeted interventions have the potential to yield improved outcomes for both mothers and infants.

The results will show the importance of early detection and intervention for overweight women in their later reproductive years to mitigate the risks of preterm birth. Implementing comprehensive antenatal care programs that specifically address the challenges faced by this demographic will optimize outcomes for both women and infants. Such initiatives will provide pregnant women with essential support and information, ensuring they receive appropriate healthcare and guidance throughout their pregnancy. Additionally, these programs will prioritize addressing social determinants of health, such as access to nutritious food and stable housing, which will have a significant impact on the health of both the mother and the infant. By tailoring antenatal care to the specific needs of this group, it will be possible to reduce health disparities and improve outcomes for mothers and babies.

Conclusion

The results of this study will provide valuable insights for initiatives aimed at reducing health disparities and improving outcomes for mothers and infants among women with obesity. Through considering the potential protective influence of antibiotics in medical interventions, healthcare providers can work towards reducing the burden of preterm birth within this population, ultimately leading to improved long-term health outcomes for both mothers and their infants.

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