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Association Between Psychosocial, Obstetric, and Lifestyle Factors and Antenatal Depression

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This is to certify that the doctoral study by

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Abstract

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M.S., Saint Cloud State University, 2016

B.A., University of Minnesota, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the degree of

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Abstract

Antenatal depression, or depression during pregnancy, is a mental health concern in the United States that impacts mothers and their infants. This study examined the associations between psychosocial, obstetric, lifestyle factors, and antenatal depression. This study was guided by social cognitive theory, specifically the reciprocal determinism construct. Secondary data from the 2007–2018 National Health and Nutritional Examination Survey (NHANES) were used in this quantitative cross-sectional study. Every participant of the NHANES completed the Patient Health Questionnaire-9 depression screening form. The study sample consisted of 274 women who were pregnant at the time of participating in the NHANES, approximately 28.8% of whom responded to having depression during pregnancy. Logistic regression was used to analyze the data, and results indicated that psychosocial, obstetric, and lifestyle factors were statistically significantly associated with antenatal depression. The results also showed that never being married, having anxiety during pregnancy, having more than three previous pregnancies, having a previous cesarean delivery, not seeking a mental health provider, low-moderate physical activities, poor sleep health, and having poor nutrition were statistically associated with antenatal depression. The results of this study can be used to inform potential mothers and practitioners about antenatal depression and what factors may contribute to antenatal depression. Implications for positive social change include supporting programs and organizations that bring awareness of what antenatal depression is and to reduce its onset.

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Section 1: Foundation of the Study and Literature Review

Introduction

Depression is a preventable but common and serious illness that impacts women at a higher rate than men in the United States. It is estimated that women are twice as likely as men to have had a depressive episode (Brody et al., 2018). The general view of pregnancy is that it is often a time of bliss, happiness, and joy; however, depression during pregnancy is an overlooked public health disorder that has an extenuating health burden on the mother and the infant. Antenatal depression, or the presentation of depressive symptoms during pregnancy can lead to adverse health problems and increased postpartum depression (Ashley et al., 2016; Underwood et al., 2016). Suicidal ideation and suicide are the leading causes of maternal death during pregnancy and the first-year postpartum, with depression and other psychiatric disorders as underlying factors (Mangla et al., 2019; Orsolini et al., 2016; Underwood et al., 2016).

Antenatal depression is a problem that impacts the mother and the infant through worse neonatal outcomes, such as increased rates of preterm delivery and lower birth weight (Jarde et al., 2016; Smith et al., 2020). Antenatal depression prevalence in the United States is estimated to range from 6% to 17%, depending on the severity of the depressive symptom (American Psychiatric Association, 2020a; Ashley et al., 2016; Underwood et al., 2016). Mothers experiencing antenatal depression are more likely to have poorer health conditions and functional limitations along with adverse postnatal outcomes, such as preterm delivery, lower birth weight, miscarriage, and preeclampsia (Dadi et al., 2020; Hermon et al., 2019; Yedid Sion et al., 2016). The American College

of Obstetricians and Gynecologists (2018) recommended that all obstetricians and gynecologists screen at least once for anxiety and depressive symptoms during the perinatal period. The definition for the perinatal period is the time of during pregnancy until a year post pregnancy (Garcia & Yim, 2017). The American College of Obstetricians and Gynecologists recognized depression during pregnancy as a problem, but in their guidelines, they only recommended a minimum of one screening. The perinatal period encompasses a lengthy time frame, with the gestation period being 40 weeks; therefore, only one mental health screening may not be adequate to detect and help mothers who develop antenatal depression. Alhusen and Alvarez (2016) found that screening and counseling only occur one third of the time for health systems that claim to have universal screening for antenatal depression. The tendency to emphasize the physical health of the mother and infant can cause a lack of focus on the mental health side. An inherent stigma exists associated with mental health during pregnancy, so studying the disorder becomes more complicated when pregnancy is viewed as a time of bliss and happiness (Biaggi et al., 2016). Due to the potential harm to not just the mother but also the infant, antenatal depression should not be overlooked.

Problem Statement

In 2021, antenatal depression was an ongoing mental health condition in the United States with a significant negative impact on potential mothers and their postnatal conditions. The prevalence of antenatal depression in the United States has been estimated to be between 6% to 16.6%, varying from mild to severe depression, with psychosocial, obstetric, and lifestyle factors impacting important aspects of antenatal

depression (Ashley et al., 2016). Psychosocial factors, such as marital status, abuse, significant other's support, prior mental health history, and emotional support, are significantly associated with increased antenatal depression (Ayele et al., 2016; Dadi et al., 2020; Tsakiridis et al., 2019). Additionally, obstetric factors, defined as planned pregnancy and the number of prior pregnancies, are associated with an increased rate of antenatal depression (Ayele et al., 2016; Biratu & Haile, 2015; Dadi et al., 2020; Thompson & Ajayi, 2016; Tsakiridis et al., 2019). Antenatal depression is also associated with lifestyle factors, such as smoking status, alcohol use, and chronic medical conditions (Cao et al, 2020; Thompson & Ajayi, 2016; Tsakiridis et al., 2019). Various psychosocial, obstetric, and lifestyle factors have been shown to significantly impact antenatal depression and increase its risk; however, these factors need to be further assessed in the United States.

The current gap in the research is that psychosocial, obstetric, and lifestyle factors and their association with antenatal depression have not been previously examined in the United States. The psychosocial, obstetric, and lifestyle factors include seeking mental health care, marital status, anxiety, psychical activities, diabetes during pregnancy, pregnancy history, health care access, alcohol use, marijuana use, diet, and sleep behavior. I conducted this study to address this gap as well as add more information on what risk factors impact antenatal depression, find potential ways to lower the rates of antenatal depression, and influence positive social and behavioral change.

Purpose of the Study

The purpose of the study was to examine the association between psychosocial, obstetric, lifestyle factors, and antenatal depression in the United States. Antenatal depression can lead to adverse health outcomes in the postnatal periods of motherhood; therefore, identifying and addressing different associated factors of antenatal depression could decrease potential adverse health outcomes for the mother and infant.

Research Questions and Hypotheses

The following four research questions and their hypotheses guided this quantitative study to determine the association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

Research Question 1: What is the association between psychosocial factors and antenatal depression?

$H_0$1: There is no association between psychosocial factors and antenatal depression.

H_A1: There is an association between psychosocial factors and antenatal depression.

Statistical plan: The independent variables were marital status, anxiety, and activity limitations, and the dependent variable was depression. The statistical test used for this research question was multivariate logistic regression. The null hypothesis was rejected if the significance level was associated with the alpha level of $p < .05$.

Research Question 2: What is the association between obstetric factors and antenatal depression?

$H_0$2: There is no association between obstetric factors and antenatal depression.

H_A2: There is an association between obstetric factors and antenatal depression.

Statistical plan: The independent variables were diabetes, pregnancy history, and cesarean history, while the dependent variable was depression. The statistical test used for this research question was multivariate logistic regression. The null hypothesis was rejected if the significance level was associated with the alpha level of $p < .05$.

Research Question 3: What is the association between lifestyle factors and antenatal depression?

$H_0$3: There is no association between lifestyle factors and antenatal depression.

H_A3: There is an association between lifestyle factors and antenatal depression.

Statistical plan: The independent variables were seeking mental health care, access to health care, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. The dependent variable was depression. The statistical test used for this research question was multivariate logistic regression. The null hypothesis was rejected if the significance level was associated with the alpha level of $p < .05$.

Research Question 4: What is the association between psychosocial, obstetric, and lifestyle factors and antenatal depression?

$H_0$4: There is no association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

H_A4: There is an association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

Statistical plan: The independent variables were marital status, anxiety, activity limitations, diabetes, pregnancy history, cesarean history, seeking mental health care, access to health care, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. The dependent variable was depression. The statistical test used for this research question was multivariate logistic regression. The null hypothesis was rejected if the significance level was associated with the alpha level of $p < .05$.

Theoretical Foundation for the Study

I used the social cognitive theory (SCT) as the conceptual framework for this study. The SCT was constructed by Bandura (1986) to examine the interactions between different factors and how they influence an individual's behavior. In this study, I specifically focused on the SCT concept of reciprocal determinism. Reciprocal determinism is defined as three factors (behavioral, environmental, and personal factors) that interact on an equal level, with each factor exerting influence upon each other to determine the behavioral outcome of an individual (U.S. Department of Health and Human Services, 2005). The SCT comprises different interpersonal and intrapersonal components that can be key to assessing how and why different outcomes occur.

In this study, I applied the SCT and reciprocal determinism to examine psychosocial, obstetric, and lifestyle factors from behavioral, environmental, and

personal perspectives and determine how each factor influenced each other and their associations with antenatal depression. Additionally, I utilized the SCT framework to develop a better understanding of how the different factors influence antenatal depression. Figures 1 and 2 show the concept of reciprocal determinism and the application of SCT to the current study.

Figure 1

The Social Cognitive Theory

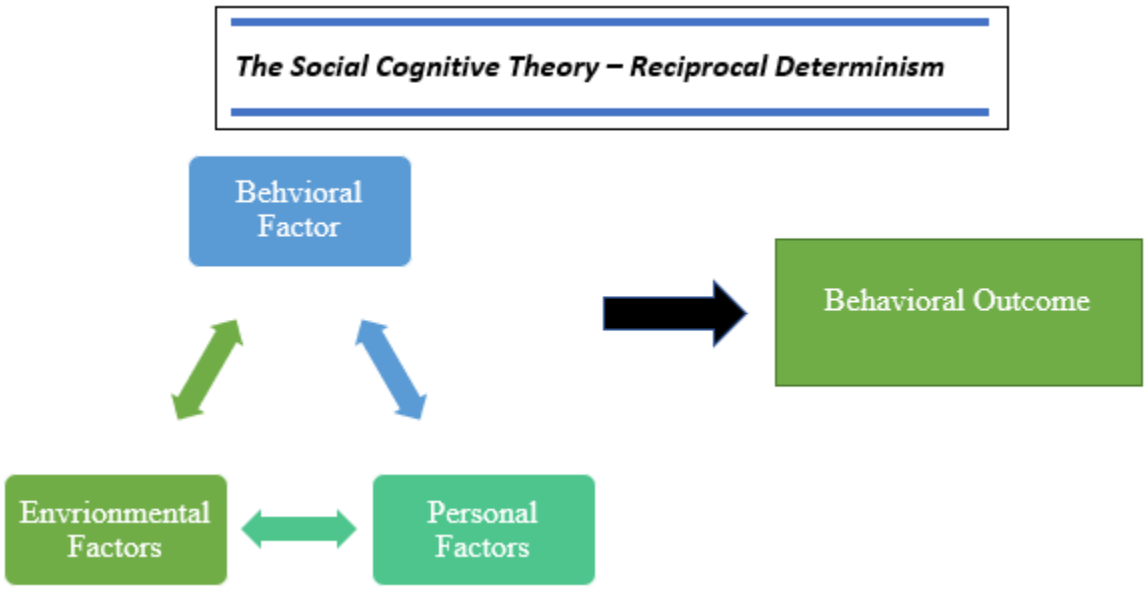
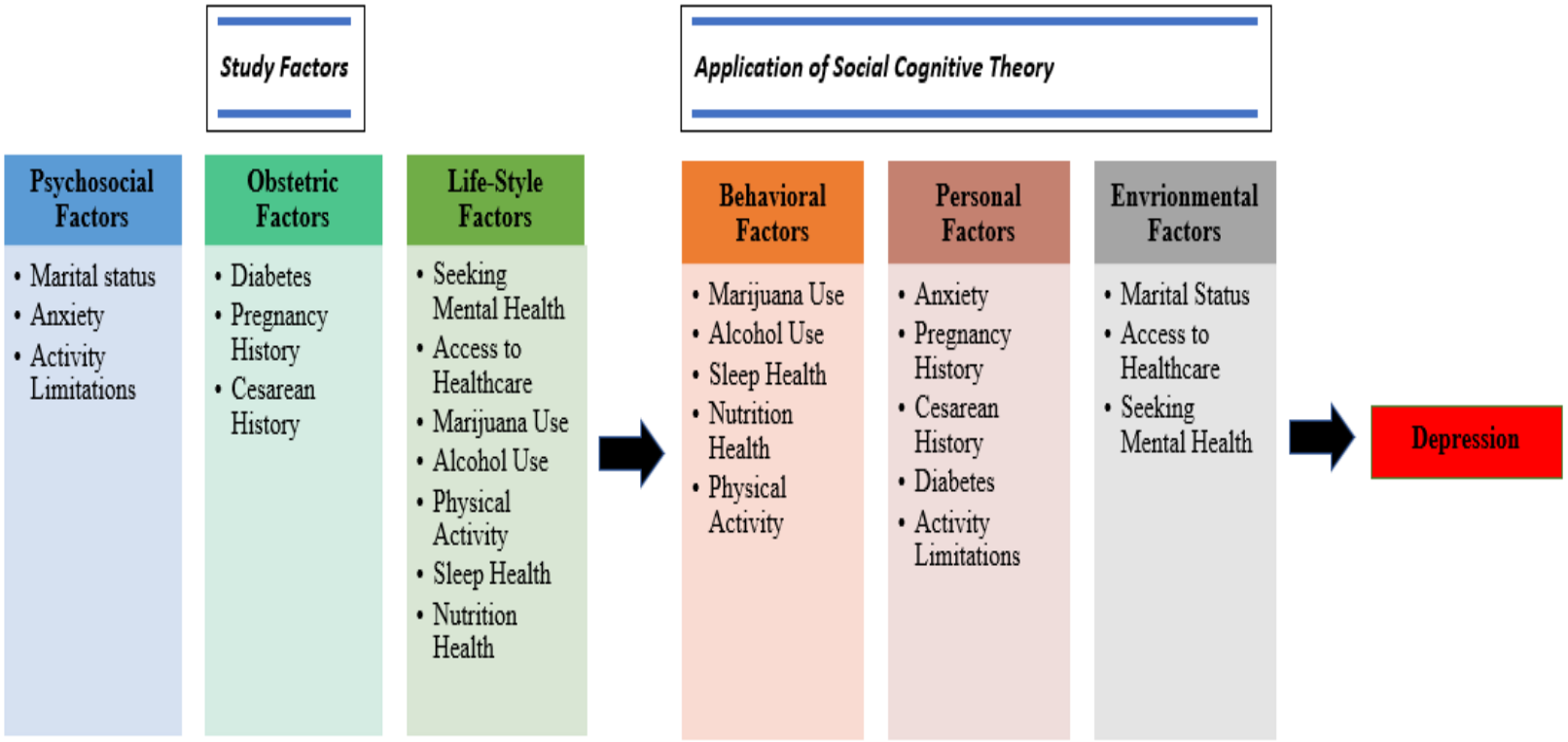


Figure 2

Application of the SCT



Nature of the Study

In this study, I used a quantitative cross-sectional design to examine the association between psychosocial, obstetric, and lifestyle factors and antenatal depression. Quantitative research is the collection and analysis of numerical data (Goertzen, 2017). The numerical data can quantify, show trends, and present evidence to answer questions of "what" and "how" of a given situation. Researchers use the cross-sectional design to look at a single point in time or a snapshot of an outcome of interest and observe the characteristics associated with the outcome of interest (Levin, 2006). The advantage of a cross-sectional study is that it can provide a snapshot of the current disease state and risk factors, disease etiology, the ability to study the association between variables, and is inexpensive to conduct (Levin, 2006; Setia, 2016). In this study, I analyzed secondary data from the 2007–2018 National Health and Nutrition Examination Survey (NHNES) data set assessing antenatal depression. The methodology will be discussed further in Section 2.

Literature Search Strategy

I conducted a comprehensive literature search to review the extant literature related to the association between antenatal depression and psychosocial, lifestyle, and obstetric factors. My initial broad search strategy included searching the websites of reputable organizations, such as the Centers for Disease Control and Prevention (CDC), the American College of Psychiatry, and the American College of Obstetricians and Gynecologists. I then made a comprehensive search of the literature accessible through the following databases and search engines: Cumulative Index to Nursing and Allied

Health Literature, MEDLINE, PubMed, Science Direct, ProQuest, Google Scholar, and Walden University EBSCO. The keyword search terms used individually and in combination were *antenatal depression*, *perinatal depression, prenatal depression, maternity depression, obstetric, lifestyle, psychosocial, prevalence, environment, behavior,* and *patient health questionnaire*. In all searches, I set publication date limits with a lower limit bound of 2016. Other limiters used in the literature searches were for only peer-reviewed articles and U.S. geography. The U.S. geography limiter was removed after the exhaustive search to examine any articles that may have provided relevant information that may have been omitted from my previous searches. For inclusion in this review, I selected the articles most applicable to this study and those that offered key valuable scientific data related to this research.

Literature Review Related to Key Variables

The literature review for this study is focused on antenatal depression in adult women in the United States. I placed special emphasis on literature with a U.S. sample group that analyzed depression during pregnancy and literature that contained data on the association between antenatal depression and psychosocial, obstetric, and lifestyle factors. I also examined the literature to determine how antenatal depression has been measured and examined the viability of the Patient Health Questionnaire.

The literature review is organized into four parts. In Part 1, I define what antenatal depression is, review the Patient Health Questionnaire-9 (PHQ-9) as a screening tool for depression as the dependent variable, and discuss the impact of antenatal depression in the United States. Part 2 contains an examination of the psychosocial factors, their

association with antenatal depression, and the variables that encompass psychosocial factors. In Part 3, I explore obstetric factors, their association with antenatal depression, and variables related to obstetric factors. Lastly, Part 4 includes a discussion of lifestyle factors, related variables, and their association with antenatal depression.

Antenatal Depression and the PHQ-9

The dependent variable for this study was depression in the antenatal period. Antenatal is the period between conception and birth, with antenatal depression being defined as the occurrence of depressive symptoms in women while pregnant before childbirth (Ashley et al., 2015). The American College of Obstetricians and Gynecologists (2018) identified seven different depression screening tools that have been validated for use during pregnancy and the postpartum period, with one of them being the PHQ-9.

The PHQ-9 is a depression screening instrument, comprised of a subset of questions from the full PHQ screening tool, created by Kurt Kroenke (Kroenke et al., 2001). It is. The PHQ-9 is a self-administered questionnaire consisting of nine questions, with each question having four responses denoting a score from 0 to 4. After the nine questions are answered, the scores of the responses are added together, and the total score from 0–27 will correlate to depression severity from minimal, mild, moderate, moderately severe, and severe (Kroenke et al., 2001; Savoy & O'Gurek, 2016). The PHQ-9 was designed in correlation to the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*) criteria, with the nine questions having a diagnostic criterion for the *DSM-IV*, allowing for reliable diagnostic practice (Spitzer et al., 2014). In addition, the

relative ease and quickness of taking the screening assessment with only nine questions make the PHQ-9 a fast and easily scorable tool.

A screening instrument's sensitivity and specificity are essential to assessing how good the screening instrument is in a clinical setting. Sensitivity refers to a test's ability to correctly identify all patients with the disease or disorder, also known as the true positive (Trevethan, 2017). For example, a sensitivity of 80% indicates that the screening test correctly identifies 80% of the patients who take the test as having the disorder, with 20% being undetected. Therefore, having a screening instrument with a sensitivity closer to 100% indicates that the screening instrument is good at detecting the disorder. Specificity refers to the test's ability to correctly identify patients who take the test without the disease or disorder, also referred to as the true negative (Trevethan, 2017). For example, if a screening instrument has a specificity of 70%, then the screening instrument can correctly identify that 70% of the patients taking the screening test do not have the disorder. Therefore, sensitivity and specificity closer to 100% imply that the screening instrument is suitable for accurately identifying those with the disorder with lower chances of misidentification.

As previously stated, the PHQ-9 is reliable in screening for depression in pregnant and postpartum females. The American College of Obstetricians and Gynecologists (2018) reported that the PHQ-9 has a sensitivity of 75% and a specificity of 90%. Wang et al. (2021) confirmed that the PHQ-9 has 84% sensitivity and 81% specificity in assessing antenatal and postpartum periods. However, other studies have indicated that the PHQ-9 may overestimate depression cases, reporting sensitivity from 61% to 88%,

and specificity from 62% to 66% (Do et al., 2021; Levis et al., 2020; Smith et al., 2020). Although studies have pointed out that the PHQ-9 may overestimate depressive symptoms, the benefits of using the PHQ-9, such as making a direct diagnosis to the *Diagnostic and Statistical Manual of Mental Disorders* and being recognized as a good screening instrument, made the PHQ-9 an appropriate screening instrument to use to measure this study's dependent variable.

Antenatal Depression in the United States

Depression is one of the most common disorders in the United States, leading to significant impairments and interference in individuals' daily lives. Depression is more prevalent in females than in males (8.7% versus 5.3%), with females reporting almost double the prevalence rate of major depression compared to males (National Institute of Mental Health, 2019). In the United States, antenatal depression prevalence in adults is estimated to be from 6% to 17%, depending on the severity of the depressive symptom (American Psychiatric Association, 2020a; Ashley et al., 2016; Underwood et al., 2016). Moderate to severe antenatal depression prevalence has been found in almost half of pregnant teenagers and adolescents (Buzi et al., 2016). The prevalence rates of antenatal depression confirm concerns for this mental health disorder, justifying the need for more research to develop ways to lower the prevalence rates.

Psychosocial Factors and Antenatal Depression

Psychosocial factors play an essential role in the mental health outcomes of individuals that have antenatal depression. Psychosocial refers to the influence of social structures on an individual's mind, behaviors, or health outcomes (Martikainen et al.,

2002; Oxford English Dictionary, 2012;). The American Psychological Association defined psychosocial factors as social, cultural, and environmental influences that affect an individual's mental health and behavior (VandenBos, 2007). Psychosocial factors and their relationship to antenatal depression are the influential social structures that impact pregnant mothers;' mental health, potentially leading to depression.

Research has shown that different psychosocial factors lead to a greater risk of depression during pregnancy. Choi et al. (2019) found that unintended pregnancy increases the risk of maternal health problems, such as depression, stress, and anxiety. Unintended pregnancy introduces new distress into the lives of the women, which can cause stress and depression. These results were confirmed by Benatar et al. (2020) and Polanksy et al. (2018) who discovered that women whose pregnancy was unplanned had greater rates of antenatal depression and felt more unhappy about their pregnancy compared to those with a planned pregnancy. Benatar et al., Biaggi et al. (2016), Choi et al., Kohlhoff et al. (2015), and Kalra et al. (2018) assessed different psychosocial factors, such as social support, abuse, and history of mental health, and confirmed that lack of social support from the husband, family, or peer plays a vital role in antenatal depression. A lack of social support can change the social structure of a potential mother because they may feel alone and as if they are embarking on the pregnancy journey with no help. Current or history of physical, sexual, and emotional abuse also impacts antenatal depression. Biaggi et al. explicitly stated that lack of support is a decisive risk factor, with abuse being a significant predictor of a pregnant women's mental health. Lastly, having a

history or family history of mental health problems increases the risk of antenatal depression (Dadi et al., 2020).

In the current study, I specifically examined the psychosocial factors of current marital status; frequency of anxiety; and activity limitations due to physical, mental, or emotional problems. These psychosocial factors impacting an individual's social structure and can potentially lead to depression.

Obstetric Factors and Antenatal Depression

Obstetrics is the area of medicine managing pregnancy and labor (Cambridge Dictionary, 2021). Obstetric factors are characteristics or events that impact the pregnancy and labor of mothers; therefore, a negative occurrence during pregnancy and labor could influence antenatal depression.

Women with high-risk pregnancies due to obstetric complications have higher prevalence rates of antenatal depression (up to 44%; Tsakiridis et al., 2019). Maternal age, gestational age, maternal education, abortion thoughts, diabetes, and the number of pregnancies are obstetric complications that contribute to antenatal depression. Kim and Dee (2018) confirmed maternal education and cesarean birth impacted depression during and post pregnancy in a study in rural California. Preeclampsia and gestational age are other obstetric complications related to developing depression during pregnancy. Sabir et al. (2019) and Sion et al. (2016) discovered that having a history of preeclampsia and preeclampsia during pregnancy increased the risk of antenatal depression. They also found that mothers in their third trimester have an increased risk of antenatal depression compared to those in the first and second trimesters. These studies showed that having an

obstetric complication or having a history of obstetric complications increases the risk and prevalence of antenatal depression. Obstetric complications could have a psychological and mental impact on the mother, potentially resulting in the development of depression.

In this study, I examined the obstetric factors of diabetes during pregnancy, the number of previous pregnancies, and the cesarean history. These variables could impact potential mothers and cause obstetric complications leading to depression.

Lifestyle Factors and Antenatal Depression

Lifestyle factors play a vital role in individuals' physical and mental health. Merriam-Webster (n.d.) defined lifestyle as a particular way of living for a person or group. Cheung and Yip (2016) referred to lifestyles as activities that an individual performs, such as exercise, adequate sleep, balanced nutrition, and meaningful social relationships, to maintain good physical and mental health. Regarding antenatal depression, lifestyle factors are modifiable behaviors that impact a pregnant woman's mental health.

Van Lee et al. (2020) studied modifiable lifestyles (i.e., substance abuse, smoking, nutrition, sleep, physical activity, vitamin D, and social support) and the risk of depression during pregnancy in Singapore and discovered that women with more than four lifestyle factors have a greater probability of depression during pregnancy. Khan et al. (2019) and Sattler et al. (2017) confirmed that dietary intake during pregnancy predicts depressive symptoms. Higher body mass index and pregnancy obesity showed depressive prevalence rates during pregnancy. Several authors also confirmed that

nutrition, adequate intake of micronutrients, and moderate physical activities help support overall maternal health and promote postpartum health as well (Ahmed et al., 2019; Mate et al., 2021). De Weerth (2018) suggested that lifestyle behaviors, such as maternal sleep, diet, and exercise during pregnancy, are potential mediators of depression during pregnancy and should be investigated further as well as have these factors integrated into the antenatal care of potential mothers. These authors emphasized how lifestyle factors impact antenatal depression and can contribute to developing depressive symptoms during pregnancy. By assessing the impact of lifestyle factors and how they influence antenatal depression, modifications to different lifestyle factors could affect depression outcomes.

In this study, I examined the lifestyle factors of seeking mental health help, access to health care, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. These variables are lifestyle factors because they are all activities that an individual can perform and can be a particular way of living.

Definitions

The terms below have been defined for the purpose of this study:

Activity limitations: A measure of if an individual is limited in any activity due to physical, mental, or emotional problem (CDC, 2019).

Alcohol use: A measure of how often an alcoholic beverage is consumed within the past year (CDC, 2019).

Antenatal depression: The presentation of depressive symptoms during pregnancy (Ashley et al., 2016).

Anxiety: An emotion characterized by feeling tense and worried followed by physical changes like increased blood pressure (American Psychological Association, n.d.).

Cesarean history: A count of how many times a woman has had a cesarean delivery (CDC, 2019).

Depression: A common and serious illness that negatively influences how an individual feels, thinks, and acts (American Psychiatric Association, 2020b).

Diabetes: A disease in which an individual's blood glucose or blood sugar levels are too high (MedlinePlus, 2021).

Lifestyle factor: Activities that an individual performs, such as exercise, adequate sleep, balanced nutrition, and meaningful social relationships, to keep in good physical and mental health (Cheung & Yip, 2016).

Marital status: Someone's current relationship status; if they are married, living with a partner, widowed, divorced, separated, or never married (CDC, 2019).

Marijuana use: A measure of if an individual has smoked marijuana or hashish at least once a month for more than a year (CDC, 2019).

Nutrition health: A balanced diet that provides good nutrition to promote healthier living and prevent chronic disease (DeSilva & Anderson-Villaluz, 2021).

Obstetric factor: Characteristics or events that impact a mother's pregnancy and labor.

Physical activity: Any bodily movement that requires energy expenditure from low to high (World Health Organization, 2020).

Pregnancy history: A count of how many times a woman has been pregnant (CDC, 2019).

Psychosocial factor: Social, cultural, and environmental influences that affect an individual's mental health and behavior (VandenBos, 2007).

Seeking mental health: A measure of if an individual has visited a mental health professional (CDC, 2019).

Sleep health: The quality of sleep that an individual gets. Adequate sleep improves overall health, wellness, quality of life, productivity, and safety on the roads. Conversely, short or poor sleep health can cause adverse effects of adequate sleep (HealthyPeople, 2021).

Assumptions

In this study, I used the NHANES survey data to examine the association between psychosocial, obstetric, and lifestyle factors and antenatal depression. I made three main assumptions in this study. The first assumption was that the survey participants understood the survey questions and answered them truthfully and accurately. The second assumption was that the NHANES survey was conducted according to the applicable federal and local laws. My last assumption was that the examiners of the NHANES would comply with those laws to protect the participants and prevent the identification of the participants.

Scope and Delimitations

This study was delimited by the examination of four associations between psychosocial, obstetric, and lifestyle factors and antenatal depression. I employed a cross-

sectional research design in this study to examine and evaluate a large amount of sample data and assess the outcomes of the identified dependent and independent variables; however, causality could not be determined or stated. I could only assess for potential associations between different independent variables and the dependent variable in this study.

Significance, Summary, and Conclusions

I conducted this study to determine the association between psychosocial, obstetric, and lifestyle factors and antenatal depression in a sample U.S. population. This study is significant because antenatal depression causes harm not just to the mother but also to the infant. In addition, antenatal depression causes an extra burden to the mother and the family as they deal with any potential stigmas that may occur with depression during pregnancy. The results of this study provide a better understanding and awareness of the different factors that impact antenatal depression and can be used to educate potential mothers and practitioners, resulting in positive social and behavioral changes. The findings of this study can also be used to aid advocacy groups and institutions supporting pregnant women, such as Planned Parenthood, to advocate for mental health wellness. The research design and data collection methodology are presented in detail in Section 2.

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to examine the association between psychosocial, obstetric, and lifestyle factors and antenatal depression in the United States. In this section, I describe the research design and rationale, methodology, target population, sample and sampling procedures, sample size and power calculation, instrumentation and operationalization of constructs, threats to validity, and ethical procedures.

Research Design and Rationale

In this study, I employed a quantitative cross-sectional approach. The quantitative method was selected over the qualitative method to assess the associations between the independent variables of interest and the dependent variable. A quantitative approach is used to examine the associations between and among numerical variables to answer the research questions and hypotheses (Creswell, 2008). The cross-sectional research design can be used to determine the prevalence of disease and provide a snapshot of an outcome of interest and the characteristics associated with the outcome (Levin, 2006). Cross-sectional studies provide advantages, such as evaluating different outcomes and risk factors, being inexpensive to conduct, and are helpful for understanding disease etiology, while the disadvantages of cross-sectional studies are difficulty making causal inferences and potential changes in the disease outcome depending on when the snapshot was observed (Levin, 2006). A cross-sectional study design is used to assess different factors and their association with the disease of interest (in the case of this study, antenatal depression); therefore, it was appropriate for determining how different factors are

associated with the disease of interest and answering the research questions. I used secondary data from the NHANES from 2007 to 2018 in the study. The NHANES is a program collecting data on health and nutritional statuses of adults and children, such as socioeconomic, dietary, and health-related questions as well as laboratory tests, from survey studies conducted via interviews and physical examinations (CDC, 2017). The surveys and exams are collected annually, and pooling the data was necessary to form a homogenous data set. It was imperative to confirm that all variables and data were collected similarly to avoid potential data gaps.

Methodology

I used secondary data from the NHANES in this quantitative cross-sectional study. Multivariate logistic regression was used to examine the association between antenatal depression and psychosocial, obstetric, and lifestyle factors. Logistic regression has been used in previous studies examining depression in the perinatal period. For example, Faisal-Cury et al. (2016) employed logistic regression of secondary data to examine the association between unplanned pregnancy, antenatal depression, and postnatal depression. In addition, previous studies have used logistic regression to find the association between perinatal depression and variables, such as socioeconomic factors, sociodemographic factors, hospital outcome, and infant birth weight (Cena et al., 2021; Hermon et al., 2018; Li et al., 2020).

Target Population

The study population for this research was adult females between the ages of 20 to 44 years old living in the United States who were pregnant and depressed when they

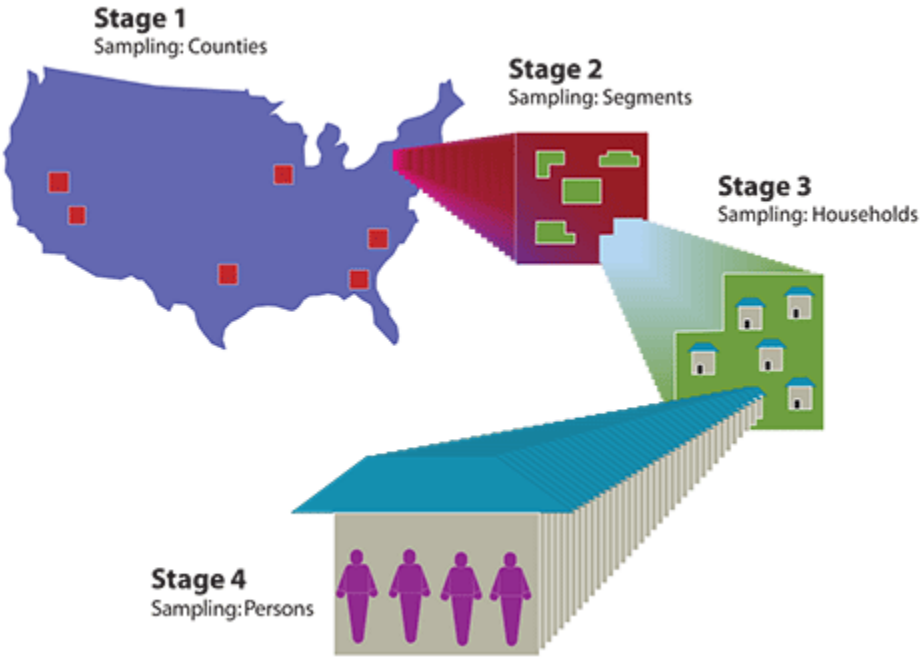
participated in the NHANES survey from 2007 to 2018. The NHANES has evolved from its initial inception to collecting data to determine the prevalence of major diseases and different risk factors (CDC, 2017). The NHANES attempts to collect data representing the U.S. population and oversamples individuals 60 years old and older, African Americans, and Hispanics to ensure reliable data (CDC, 2017).

Sample and Sampling Procedures

Sampling is a process of selecting individuals from the target population to participate in research that will represent the target population (Elfi & Negida, 2017). Due to the impracticality of studying every individual from the target population in research due to cost, time, and size of the target population, it is essential to sample the target population. There are typically two types of sampling: probability and nonprobability sampling (Elfi & Negida, 2017). A probability sampling method is a systematic method where all individuals in the target population can be selected to partake in the research; contrastingly, a nonprobability sampling method is a nonsystematic way of selecting individuals to participate in the research (Elfi & Negida, 2017). The NHANES does not use a simple, random sampling strategy but a complex, probability sampling method with four different sampling stages (CDC, 2018). In Stage 1, all the counties are divided into 15 groups that form the NHANES. In Stage 2, each of the 15 groups is then divided into smaller groups of between 20 to 24. In Stage 3, approximately 30 households from those small groups are selected, and lastly, in Stage 4, household members are randomly selected for sampling (CDC, 2018).

Figure 3

NHANES Sample Selection from Centers for Disease Control and Prevention (2018)



Sample Size and Power Calculation

The sample size is the required minimum size needed to test a research hypothesis and ensure the research results are correct to a chosen degree of error (Malone & Nicholl, 2016). Any hypothesis testing can have two types of errors: Type I and Type II (Sakpal, 2010). A Type I error occurs when the null hypothesis is falsely rejected in favor of the alternative hypothesis; contrastingly, a type II error occurs when the null hypothesis is accepted and the alternative hypothesis is correct (Sakpal, 2010). The sample size is typically determined based on four parameters: the significance level or "alpha," the power of the test, the effect size, and the standard deviation (Malone & Nicholl, 2016).

Power is the probability of avoiding a Type II error with conventional power set at 80%, yet many studies are now testing hypotheses with a power of at least 90% (Das et

al., 2016; Malone & Nicholl, 2016). Similar to sample size, the significance level, effect size, and standard deviation all impact the power of a test (Malone & Nicholl, 2016). The significance level is conventionally set at 5% and is the level at which a null hypothesis is false when it is true. The effect size is the minimum difference that the researchers want to detect. The standard deviation is the variability or variation associated with the null hypothesis, which can be from previous pilot studies, historical data, or literature with similar sample groups (Das et al., 2016; Malone & Nicholl, 2016). The power of a study greatly influences the sample size because the greater the power a study has, the sample size increases. There is a balance between power and sample size because a high power may not be feasible due to the sample size potentially being too large to detect the effect size. A large sample size faces challenges from cost and time.

In this study, I used the Cohen statistical power analysis to determine the minimum sample size. A power level of 99% and an alpha level of 0.05 were used. Lancaster et al. (2010) performed a systematic review of depressive symptoms during pregnancy, looking at bivariate and multivariate trends. Of the multivariate trends, three out of the five previous studies in the review had a medium to large effect size, while two had a small effect size. Therefore, based on the findings of their systematic review, I used a medium effect size of 0.5 in this study (see Lancaster et al., 2010). With a power level of 99%, an alpha level of 0.05, and an effect size of 0.5, the minimum total sample size required for a two-tailed hypothesis test was 299.

Instrumentation and Operationalization of Constructs

The NHANES is conducted by the National Center for Health Statistics and CDC, combining both survey interviews and physical examination (CDC 2018). The dependent variable for the current study was depression during pregnancy. The independent variables were comprised of psychosocial, obstetric, and lifestyle factors. The measures that operationalized the variables are detailed in the following subsections along with Table 1 that shows the variables and operational measures.

Depression

In NHANES, all participants are screened for their mental health status. NHANES utilizes the (PHQ-9 for their mental health interview. A participant responds to the nine questions, with each response to a question having an associated score. The final score is the sum of all the values of the nine questions, which is used to determine the severity of depression. The operation of depression was an ordinal variable in the current study.

Psychosocial Factors

The American Psychological Association (as cited in VandenBos, 2007) defined psychosocial factors as social, cultural, and environmental influences that affect an individual's mental health and behavior. Marital status, anxiety, and activity limitations were the psychosocial factor variables used in the current study. Marital status was obtained from a question asking adult participants at least 20 years of age if they were married. The operation of marital status was a nominal variable. Participants' anxiety was ascertained by asking, "How often do you feel worried, nervous, or anxious? Would you

say daily, weekly, monthly, a few times a year, or never?" (CDC, 2019). Anxiety was an ordinal variable. Finally, activity limitation was described by the participant having any activity limitations due to physical, mental, or emotional problems. Activity limitation was a binomial variable.

Obstetric Factors

Obstetric factors are variables that relate to the pregnancy and childbirth process. For example, obstetric factors can refer to an individual's age, prior pregnancy history, and health status that may impact current and future pregnancies. The obstetric factor variables in the current study were diabetes, pregnancy history, and cesarean history. Diabetes is measured in NHANES by whether the participants knew they had diabetes during pregnancy. Diabetes was an ordinal variable. Pregnancy history was obtained from asking participants how many times they have been pregnant. The operation for pregnancy history was an ordinal variable. Finally, cesarean history was obtained by asking participants how many cesarean deliveries had occurred. Cesarean history was a binomial variable.

Lifestyle Factors

Lifestyle factors are activities that an individual performs, such as exercise, adequate sleep, balanced nutrition, and meaningful social relationships, to maintain good physical and mental health (Cheung & Yip, 2016). Lifestyle factors are modifiable and nonmodifiable, with modifiable lifestyles being activities that an individual can proactively change. Lifestyle factors that are modifiable, such as substance use, diet, and sleep quality, have been shown to impact depression (Van Lee et al., 2020). Lifestyle factor variables in this study were mental health access, health care access, marijuana use, alcohol use, physical activity, sleep quality, and nutrition quality. The measurement and operationalization of lifestyle factors are specified in Table 1 along with the other factors.

Table 1

Description of Operational Measures for Key Dependent and Independent Variables

Variables	Description/Specific Measures	Response Category	Type of Variable
Dependent variable			
Depression	Depression level was assessed by using the Patient Health Questionnaire 9 question.	1 = No/minimal depression 2 = Mild depression 3 = Moderate depression 4 = Moderately severe depression 5 = Severe depression	Ordinal
Psychosocial factors			
Marital status	Current marital status.	1 = Married/living with partner 2 = Widowed/divorced/separated 3 = Never married	Nominal
Anxiety	How often do you feel worried, nervous, or anxious?	1 = A little 2 = A lot 3= Somewhere in between a little and a lot	Ordinal
Activity limitations	Are you limited in any activity because of physical, mental, or emotional problems?	1 = Yes 0 = No	Binomial
Obstetric factors			
Diabetes	Were you ever told by a doctor or other health professional that you had diabetes during pregnancy?	1= Yes 2 = No 3 = Borderline	Ordinal

Variables	Description/Specific Measures	Response Category	Type of Variable
Pregnancy history	How many times have you been pregnant?	1 = 0 to 2 prior pregnancies 2 = 3 to 5 prior pregnancies 3 = 6 to 10 prior pregnancies 4 = 11 or more prior pregnancies	Nominal
Cesarean history	How many cesarean deliveries have you had?	1 = 1 or more cesarean deliveries 0 = No prior cesarean deliveries	Binomial
Lifestyle factors			
Seeking mental health care	In the past 12 months, have you seen or talked to a mental health professional?	1 = Yes 0 = No	Binomial
Access to health care	Is there a place you usually go when you need advice about your health?	1 = Yes 0 = No	Binomial
Marijuana use	Have you smoked marijuana or hashish at least once a month for more than a year?	1 = Yes 0 = No	Binomial
Alcohol use	How often alcohol is consumed within the past 12 months?	1 = Never 2 = Every day 3 = Nearly every day 4 = 3-4 times a week 5 = 2 times a week 6 = Once a week 7 = 2 to 3 times a month 8 = Once a month 9 = 7 to 11 times in the last year 10 = 3 to 6 times in the last year 11 = 1 to 2 times in the last year	Ordinal
Physical activity	How many days do you perform moderate recreational activities?	1 = 0 days 2 = 1 day 3 = 2 days 4 = 3 days 5 = 4 days or greater	Ordinal
Sleep health	In the past month, how often did you feel excessively or overly sleepy during the day?	1 = Never 2 = Rarely – 1 time a month 3 = Sometimes – 2-4 times a month 4 = Often – 5-15 times a month 5 = Almost always – 16-30 times a month	Ordinal
Nutrition health	In general, how healthy is your overall diet?	1 = Excellent 2 = Very good 3 = Good 4 = Fair 5 = Poor	Ordinal

Data Analysis Plan

In this study, I used Statistical Package for the Social Sciences (SPSS) Version 27.0 software for Microsoft Windows to perform the statistical analysis in the form of multivariate logistic regression to answer the research questions. In addition, descriptive statistics were used to describe features of the data points in this study.

The following research questions and hypotheses guided this study:

Research Question 1: What is the association between psychosocial factors and antenatal depression?

$H_0$1: There is no association between psychosocial factors and antenatal depression.

H_A1: There is an association between psychosocial factors and antenatal depression.

Statistical plan: The independent variables = Marital status, anxiety, and activity limitations. Dependent variable = Depression. The statistical test is multivariate logistic regression. The null hypothesis will be rejected if the significance level is associated with the alpha level of $p < .05$.

Research Question 2: What is the association between obstetric factors and antenatal depression?

$H_0$2: There is no association between obstetric factors and antenatal depression.

H_A2: There is an association between obstetric factors and antenatal depression.

Statistical plan: The independent variables = diabetes, pregnancy history, and cesarean history. Dependent variable = Depression. The statistical test is multivariate logistic regression. The null hypothesis will be rejected if the significance level is associated with the alpha level of $p < .05$.

Research Question 3: What is the association between lifestyle factors and antenatal depression?

$H_0$3: There is no association between lifestyle factors and antenatal depression.

H_A3: There is an association between lifestyle factors and antenatal depression.

Statistical plan: The independent variables = Seeking mental health, access to healthcare, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. Dependent variable = Depression. The statistical test is multivariate logistic regression. The null hypothesis will be rejected if the significance level is associated with the alpha level of $p < .05$.

Research Question 4: What is the association between psychosocial, obstetric, and lifestyle factors and antenatal depression?

$H_0$4: There is no association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

H_A4: There is an association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

Statistical plan: The independent variables = Marital status, anxiety, activity limitations, diabetes, pregnancy history, cesarean history, seeking mental health, access to healthcare, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. Dependent variable = Depression. The statistical test is multivariate logistic regression. The null hypothesis will be rejected if the significance level is associated with the alpha level of $p < .05$.

Threats to Validity

Validity in a study is how choices made in study design will impact the quality of the research finding. The types of validity include content validity and construct validity. Content validity is the assessment of the instrument used to measure the targeted construct (Almanasreh, Moles, & Chen, 2019), and construct validity is the degree to which the study can make inferences. There are two threats to validity, internal threat, and external threat. Internal threats, typically relevant for a causal relationship, refer to the researcher's ability to make accurate inferences between treatment and outcome due to confounders or selection bias (Matthay & Glymour, 2020). Internal threats for this study are the probability of the datasets from multiple years. This can cause the exclusion of data points, biasing the overall results. External validity refers to the population of interest and if the study results can be generalizable. External validity impacts the interpretation of the results, and researchers have to judge the extent to which the findings are relevant (Matthay & Glymour, 2020). A threat to the external validity of this study is that the NAHANES yearly collection does not collect enough data on pregnant

women. Therefore, making those that are collected not be a representation of the U.S. pregnant women population.

Ethical Procedures

The NHANES is a study collecting data from the National Center for Health Statistics. This study used data from the NHANES from the years 2007 to 2018. Tripathy (2013) pointed out that concerns from using secondary data involve potential harm to individual subjects and their consent to their data being analyzed as secondary data, which may not be what they agreed to form their initial consent. A researcher should obtain permission to use secondary data for their analysis. If the secondary data has no identifying information, the ethical review board will need to confirm that the data is anonymous before performing any analysis. The researcher must be aware that the initial data was to answer different research questions and not the research questions that the researcher wanted to answer, performing secondary analysis. Due to this, the data obtained should be relevant and adequate to answer the researcher's research questions (Tripathy, 2013). The data were evaluated to understand the original data's methods and content so that results can be interpreted correctly during the analysis. NHANES follows federal law of section 308(d) of the Public Health Service Act and the Confidential Information Protection and Statistical Efficiency Act of 2002. To ensure that there was no data breach, NHANES is compliant with the Federal Cybersecurity Act of 2015, requiring the protection of federal computers, networks, and databases (CDC, n.d.). This study was approved by Walden University's Institutional Review Board on January 14th, 2022. Although NHANES is a public database, no data will be obtained, observed, or

were analyzed until Institutional Review Board approval was obtained with the approval number 01-14-22-0678217.

Summary

The purpose of the research design and methodology section was to provide a roadmap of the conduct of this study. This study examined the association between psychosocial factors, obstetric factors, lifestyle factors, and antenatal depression. This study's analysis used descriptive statistics and logistical regression to answer the research questions and study hypotheses. The study's research design was a quantitative cross-sectional approach using secondary data that was initially collected from the NHANES from years 2007 to 2018. Section 3, I will present the study results and findings from the analysis and the answers to the research questions.

Section 3: Presentation of Results and Findings

Introduction

In this study, I examined the association between antenatal depression and psychosocial, obstetric, and lifestyle factors in the United States. Each research question addressed how each factor is associated with antenatal depression. The dependent variable was depression as measured by the PHQ-9 assessment. The independent variables were marital status, anxiety, activity limitations, diabetes, pregnancy history, cesarean history, seeking mental health care, access to health care, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. I used multivariate logistic regression to test the hypotheses for all the research questions. Descriptive analyses were also used to help describe and summarize variables to show any potential patterns or outliers.

The data collection and data management processes and results of the statistical analyses are presented in this section. This section contains three parts. In the first part, I describe the data management process, data analysis plan, and the management of missing data. The second part contains a presentation of the descriptive analyses and the study sample's descriptive characteristics, including frequency table distributions. In the third part, I answer each of the research questions by testing their corresponding hypotheses and confirm whether the null hypothesis was accepted or rejected in favor of the alternative hypothesis.

Data Management

The secondary data used in this study were from the 2007–2018 NHANES. The NHANES data from 2007 to 2018 spanned a total of six different data sets; therefore, I pooled data from the six data sets from 2007 to 2018 to answer the research questions. The decision to pool the data across the different years of data collection was made to ensure that the sample size was large enough to perform the hypothesis testing on. In addition, the larger sample size from the pooled data set enabled investigating research questions that may not have been possible with a smaller sample cohort (see Zhou et al., 2018). The summary tables show data characteristics for each year from which the data were collected. Displaying the yearly data characteristics also shows each year's potential impact on the overall pool data. Table 2 provides a snapshot of how the six different data sets differ from one another. For example, the data set from NHANES 2011–2012 had the fewest responders identifying as pregnant, while the data set from NHANES 2015–2016 had the highest number of responders identifying as pregnant.

Table 2

NHANES 2007-2018 Combined Data Set

NHANES Data Set	NHANES Responders	# Of Pregnant Women	Proportion
2007–2008	10,149	47	4.6%
2009–2010	10,537	48	4.6%
2011–2012	9,756	38	3.9%
2013–2014	10,175	47	4.6%
2015–2016	9,971	51	5.1%
2017–2018	9,255	43	4.7%
Total	59,843	274	4.6%

In Section 2, I stated that the sample would maintain a power level of 99% by having a minimum sample size of 298. Table 2 shows that this study had a sample size of 274, with a power level of 98.4%. Although the study sample was below the requisite sample size to maintain a power level of 99%, this study continued forward with analysis because it still had a high power level of 98%. Depression severity was calculated as the sum of the scores for the PHQ-9 assessment. A PHQ-9 score of 5 or higher was considered to have depression at the time of assessment. NHANES only collects the score of the individual questions in the PHQ-9 assessment; therefore, I used the individual PHQ-9 scores as the dependent variable to answer the research questions.

Data Analysis Plan

The data analysis plan consists of three parts: (a) management of missing data, (b) descriptive analysis to describe the data, and (c) multivariate logistic regression analysis.

Management of Missing Data

Missing data in large-scale surveys, such as the NHANES, is not uncommon; however, an extensive survey combined with pooling data sets from multiple years of

NHANES can cause missing data to be more pronounced. Missing data in a survey can be due to individuals not wanting to answer questions or the incorrect handling of responses. As shown in Table 2, the total number of responders from NHANES 2007–2018 is 59,843, yielding a sample size of 274 pregnant women at the time of participation. Five variables were missing data across all data sets: sleep health, anxiety, marijuana use, activity limitations, and cesarean history. All the variables with missing data are categorical. The variable with the least missing data was marijuana use, with 25 (9.1%) data points missing. Both anxiety and activity limitations have the same amount of missing data, with 47 (17.2%) data points missing each. All the missing data for activity limitations came from the NHANES 2007–2008 data set for activity limitation. Participants were asked if they were limited in any activity because of physical, mental, or emotional problems, but all data points were missing. All the missing data for anxiety was from the NHANES 2013–2014 data set. The NHANES 2013–2014 data set did not include the frequency of feeling worried, nervous, or anxious question. Cesarean history (n = 144, 52.8%), and sleep health (n = 133, 48.5%) had more than 100 data points missing. The sleep health variable was missing data from the NHANES 2009–2010, 2011–2012, and 2013–2014 data sets. The NHANES collected sleep data for the 2009–2014 surveys but reduced the number of questions asked. The question concerning feeling sleepy during the daytime was put back in the NHANES starting in 2015.

Missing data can either be missing completely at random, missing at random, or missing not at random. Missing completely at random implies missing data points without systematic causes, missing at random can be considered missing data but related

to other observed values, and missing not at random implies that missing data are due to the variable itself (Finch, 2010; Stavseth et al., 2019). Because the variables were categorical in the current, missing completely at random was not suitable for the categorical variable assessments (see Li, 2013). Therefore, I used the multiple imputation method to create complete data sets and offset the missing data (see Van Buuren, 2018). The results of multiple imputations reduced the missing data for cesarean history from 52.6% to 8.8%, sleep health from 48.5% to 8.1%, activity limitations from 17.2% to 2.9%, anxiety from 17.2% to 2.9%, and marijuana use from 9.1% to 1.5%.

Descriptive Characteristics of Study Sample

I conducted a univariate analysis to describe the study sample. As previously noted, 4.6% of the responders were pregnant females. Of the responders, 74.1% were married or living with their partner; 4.7% were widowed, divorced, or separated; and 21.1% were not married. Of the responders, 71.2% answered the PHQ-9 as not having depression, while 28.8% reported having depression. Of those that had depression, 69.6% reported mild depression. Table 3 displays the characteristics of the study sample.

I conducted a bivariate analysis with depression (answered as yes/no) as the dependent variable to identify potential associations among the independent variables. Women who were married and/or living with their partner had a higher rate of depression than those who were widowed/divorced/separated or never married. Women with three to five prior pregnancies had the highest rate of depression for the variable. Women who did not participate in moderate physical activities throughout the week had the highest rate of

depression for this variable. Key findings from the bivariate analysis were statistically significant at $p < .05$, with their corresponding chi-square value shown in Table 4.

Table 3

Pooled Frequency Distribution of Study Sample

Characteristics	Frequency	Percent
Pregnant		
Yes	274	4.6%
No	59,843	95.4%
Depression		
Yes	79	28.8%
No	195	71.2%
Depression severity		
Mild	55	69.6%
Moderate	19	24.1%
Moderately severe	3	3.8%
Severe	2	2.5%
Marital status		
Married/living with partner	203	74.1%
Widowed/divorced/separated	13	4.7%
Never married	58	21.2%
Pregnancy history		
0 to 2 previous	123	44.9%
3 to 5 previous	128	46.7%
6 to 10 previous	22	8.0%
11 or more previous	1	0.4%
Alcohol consumption		
No	114	41.6%
Nearly everyday	1	.4%
3–4 times a week	5	1.8%
2 times a week	1	.4%
Once a week	4	1.5%
2 to 3 times a week	7	2.6%
Once a month	12	4.4%
7 to 11 times in the last year	19	6.9%

Characteristics	Frequency	Percent
3 to 6 times in the last year	42	15.3%
1 to 2 times in the last year	69	25.2%
Marijuana use		
Yes	37	14.9%
No	212	85.1%
Anxiety		
A little	99	43.6%
A lot	16	7.0%
Somewhere in between	38	16.7%
No	74	32.6%
Activity limitations		
Yes	3	1.3%
No	224	98.7%
Diabetes during pregnancy		
Yes	25	9.1%
No	246	89.8%
Borderline	3	1.1%
Cesarean delivery history		
1 or more	48	36.9%
No prior	82	63.1%
Diet		
Excellent	24	8.8%
Very good	65	23.7%
Good	117	42.7%
Fair	57	20.8%
Poor	11	4.0%
Physical activity		
0 days	170	62.0%
1 day	16	5.8%
2 days	33	12.0%
3 days	28	10.2%
4 days or greater	27	9.9%
Sleep health: Feeling excessively tired		
Never	25	17.7%
Rarely	15	10.6%
Sometimes	52	36.9%

Characteristics	Frequency	Percent
Often	31	22.0%
Almost always	18	12.8%
Access to health care		
Yes	240	87.6%
No	34	12.4%
Seeking mental health care		
Yes	17	6.2%
No	257	93.8%

Table 4

Demographic Characteristics by Depression

Characteristics	Have Depression	Chi-square	*p* value
Marital status		31.557	< .001
Married/living with partner	18.6%		
Widowed/divorced/separated	1.82%		
Never married	8.40%		
Pregnancy history		53.970	< .001
0 to 2 previous	9.50%		
3 to 5 previous	15.70%		
6 to 10 previous	3.28%		
11 or more previous	.365%		
Alcohol consumption		95.480	< .001
Never	10.95%		
Nearly everyday	.36%		
3–4 times a week	0%		
2 times a week	0%		
Once a week	.36%		
2 to 3 times a week	0%		
Once a month	.36%		
7 to 11 times in the last year	2.92%		
3 to 6 times in the last year	4.01%		
1 to 2 times in the last year	9.85%		
Marijuana use		1.925	.165
Yes	4.76%		
No	24.10%		
Anxiety		210.860	< .001
A little	12.67%		
A lot	5.39%		
Somewhere in between	7.13%		
No	3.26%		
Activity limitations		.038	.846
Yes	7.38%		
No	26.7%		

Characteristics	Have Depression	Chi-square	*p* value
Diabetes during pregnancy		23.508	< .001
Yes	3.65%		
No	24.45%		
Borderline	.73%		
Cesarean delivery history		13.757	< .001
1 or more	13.53%		
No prior	15.87%		
Diet		121.296	< .001
Excellent	1.46%		
Very good	3.28%		
Good	12.41%		
Fair	9.49%		
Poor	2.19%		
Physical activity		22.993	< .001
0 days	19.71%		
1 day	2.19%		
2 days	2.55%		
3 days	2.55%		
4 days or greater	1.82%		
Sleep health: Feeling excessively tired		44.306	< .001
Never	4.83%		
Rarely	3.11%		
Sometimes	8.07%		
Often	6.42%		
Almost Always	6.15%		
Access to health care		1.407	.236
Yes	24.82%		
No	4.01%		
Seeking mental health care		17.607	< .001
Yes	2.92%		
No	25.91%		

Multivariate Analysis Results

Research Question 1: What is the association between psychosocial factors and antenatal depression?

$H_0$1: There is no association between psychosocial factors and antenatal depression.

H_A1: There is an association between psychosocial factors and antenatal depression.

To answer Research Question 1 on the association between psychosocial factors and someone having antenatal depression, I conducted a logistic regression analysis between depression and the variables of: marital status, anxiety, and activity limitations. Table 5 shows the logistic model fitting.

Table 5

Logistics Regression Model of Psychosocial Factors and Antenatal Depression

Variable	Coefficient β	Std. Error	Wald	p value	OR	OR 95% CI
Marital status						
Widowed/ divorced/separated	.336	.279	1.455	.228	1.399	[.811, 2.416]
Never married	.763	.144	28.155	< 0.001*	2.144	[1.618, 2.842]
Anxiety						
A little	1.337	.173	59.727	< 0.001*	3.806	[2.712, 5.342]
A lot	2.849	.242	138.762	< 0.001*	17.270	[10.750, 27.743]
Somewhere in between	2.052	.198	109.930	< 0.001*	7.783	[5.275, 11.482]
Activity limitations						
Yes	.153	.231	.438	.508	1.165	[.741, 1.833]

**Statistically significant*

The logistic regression model indicated that marital status and anxiety are significantly associated with antenatal depression. The multivariate logistic regression

also showed that activity limitations due to a physical, mental, or emotional problems are not statistically significantly associated with antenatal depression. Additionally, an individual being widowed, divorced, or separated is not statistically significantly associated with antenatal depression. The logistic regression showed that having anxiety during pregnancy in this model had a high odds ratio or a higher risk of having antenatal depression.

The logistic regression analysis showed that being divorced, separated, or never married is statistically significantly associated with antenatal depression. This shows that a pregnant woman who is divorced, separated, or unmarried is more likely to have antenatal depression. This is significant in that they should be monitored to ensure that they don't have any symptoms of depression or is currently depressed. As stated by Kiecolt-Glaser (2019), stresses from a troubled relationship led to poor health outcomes, especially for those that are separated and divorced. This is because they have a poorer immune function and are more depressed than those in a married relationship.

A high level of anxiety also showed a 17 times higher chance of having antenatal depression. This is significant in that if a woman shows any signs of anxiety during pregnancy, this could lead to depression, especially those that may exhibit signs of high anxiety. Anxiety and depression are comorbid with each other (Kalin, 2020), therefore, even if an individual may not exhibit signs of depression during screening but shows some level of anxiety; this should not be something that should be ignored.

The logistic regression also performed a Wald test statistic. The Wald test is a statistical test to show if a variable is significant in a logistic regression model (Sommer

& Huggins, 1996). The larger the Wald statistics, the more significant the variable is but the test is also limited by sample size as well. When sample size is too small, making the standard error potentially large, the Wald statistics will typically yield a small number causing a variable to be non-significant when the sample size plays a role (Bewick, Cheek, & Ball, 2005). A Nagelkerke R^2 calculation yielded a value of .204, meaning that the dependent variable had a variation of 20.4% based on the logistic regression model. A Hosmer and Lemeshow goodness of fit test was also calculated, and found that this model's significance level is 0.338 with a Chi-square of 5.685. This means that the variables used to predict depression may not have been the best logistic regression model. In summary, the null hypothesis for Research Question 1 is rejected in favor of the alternative hypothesis.

Research Question 2: What is the association between obstetric factors and antenatal depression?

$H_0$2: There is no association between obstetric factors and antenatal depression.

H_A2: There is an association between obstetric factors and antenatal depression.

To answer Research Question 2 on the association between antenatal depression and obstetric factors, a model with depression as the dependent variable and the independent variables of diabetes, pregnancy history, and cesarean history was created. Table 6 shows the model interaction between the dependent and independent variables.

Table 6.

Logistics Regression Model of Obstetric Factors and Antenatal Depression

Variable	Coefficient	Std. Error	Wald	p-value	OR	OR 95% CI
Diabetes						
Yes	-1.023	.534	3.661	.056	.360	[.126, 1.025]
No	-1.592	.508	9.840	.002*	.203	[.075, .550]
Pregnancy History						
3 to 5 priors	.675	.126	28.491	<0.001*	1.964	[1.533, 2.517]
6 to 10 priors	1.013	.208	23.652	<0.001*	2.753	[1.830, 4.140]
11 or more priors	22.833	>100	.000	.999	>100	[.000, ---]
Cesarean History						
1 or more	.527	.119	19.624	.000*	1.694	[1.342, 2.139]

**Statistically significant*

The logistic regression results show that individuals that do not have diabetes during pregnancy, or more than one cesarean delivery, are statistically significantly associated with antenatal depression and between three to ten prior pregnancies. The pregnancy history of 11 or more prior had a very high standard error and odds ratio without it being statistically significant due to the low sample size of just one responder. This means that pregnancy history for this logistic model does statistically predict antenatal depression for those with three to ten prior pregnancies. The obstetric factor results are important for this study as these could be early indicators if a pregnant woman may develop antenatal depression and could be used as a tool to screen and monitor a woman. In addition, if a woman presents with multiple prior pregnancies and/or previous cesarean history, this could be a risk factor for developing antenatal depression.

The calculated Nagelkerke R^2 is .083, and Hosmer and Lemeshow goodness of fit test yielded a Chi-square value of 13.773, which is statistically significant at $p = .017$. In

summary, the null hypothesis for Research Question 2 is rejected in favor of the alternative hypothesis.

Research Question 3: What is the association between lifestyle factors and antenatal depression?

$H_0$3: There is no association between lifestyle factors and antenatal depression.

H_A3: There is an association between lifestyle factors and antenatal depression.

For Research Question 3, the independent variables of lifestyle factors for the logistic regression model consist of the variables: seeking mental health, access to healthcare, marijuana use, alcohol use, physical activity, sleep health, and nutrition health. Table 7 shows the logistic model output of the interaction of the dependent and independent variables.

Table 7.

Logistics Regression Model of Lifestyle Factors and Antenatal Depression

Variable	Coefficient	Std. Error	Wald	p-value	OR	OR 95% CI
Seeking MentalHth						
No	-0.562	0.282	3.986	0.046*	0.570	[.328, .990]
Access to Healthcare						
No	0.421	0.191	4.842	0.028*	1.524	[1.047, 2.218]
Marijuana Use						
Yes	-0.147	0.202	0.527	0.468	0.864	[.581, 1283]
Alcohol Use						
Nearly everyday	19.210	>100	0.000	0.999	>100	[.000, ---]
3-4 times a day	-20.515	>100	0.000	0.998	0.000	[.000, ---]
2 times a week	-19.254	>100	0.000	0.999	0.000	[.000, ---]
Once a week	-1.207	0.614	3.865	0.049*	0.299	[.090, .996]
2 to 3 times a month	-20.425	>100	0.000	0.997	0.000	[.000, ---]
Once a month/year	-1.757	0.492	12.766	<0.001*	0.173	[.066, .452]
7 to 11 times in the last year	0.231	0.258	0.799	0.371	1.260	[.759, 2.091]
3 to 6 times in the last year	-0.423	0.198	4.557	0.033*	0.655	[.445, .966]
1 to 2 times in the last year	0.463	0.158	8.544	0.003*	1.588	[1.165, 2.166]
Physical Activity						
0 Day	0.550	0.255	4.640	0.031*	1.733	[1.051, 2.858]
1 Day	0.700	0.348	4.033	0.045*	2.013	[1.017, 3.985]
2 Days	-0.248	0.328	0.572	0.449	0.780	[.411, 1.484]
3 Days	0.032	0.316	0.010	0.920	1.032	[.556, 1.916]
Sleep Health						
Rarely	-0.027	0.246	0.012	0.912	0.973	[.601, 1.576]
Sometimes	-0.327	0.188	3.018	0.082	0.721	[.498, 1.043]
Often	0.038	0.207	0.034	0.854	1.039	[.698, 1.560]
Almost always	1.014	0.230	19.503	<0.001*	2.756	[1.758, 4.322]
Nutrition Health						
Very good	0.007	0.298	0.001	0.981	1.007	[.561, 1.805]
Good	0.850	0.269	10.000	0.002*	2.340	[1.832, 3.964]
Fair	1.670	0.283	34.887	<0.001*	5.312	[3.052, 9.245]
Poor	2.177	0.396	30.210	<0.001*	8.822	[4.059, 19.176]

**Statistically significant*

The Hosmer and Lemeshow goodness of fit test yielded a Chi-square of 17.978, which was statistically significant at p=.021. The Nagelkerke R^2 was .251. The logistic regression model for lifestyle factors and depression shows that individuals that do not seek mental health and do not have access to a healthcare location are statistically significantly associated with antenatal depression. This is significant as both these variables potentially reflect if an individual can access an adequate healthcare system to treat their mental health. Studies have shown that countries, where individuals don't have access to a healthcare facility, had significant depressive symptoms (Tomita et al., 2018; and Bolstad et al., 2020). With that being said, Studies have also shown that women with perinatal depression have more medical expenditures than individuals without perinatal depression (Pollack et al., 2021), with a potential cost of care deterring depressed individuals from seeking help; this could impact if pregnant woman actively seek care. Nonetheless, this result shows that seeking healthcare is significantly associated with antenatal depression.

The logistic regression model also shows that low levels of moderate physical activity, poor sleep health, and poor nutritional health are statistically significantly associated with antenatal depression. This highlights the importance of being physically healthy. A previous study by Nakamura et al. (2019) showed that women who were physically active during pregnancy performing any kind of physical activities were more likely to reduce postpartum depression than those who were not physically active. Due to the gestational weight gain (Kominiarek & Peaceman, 2017), encouraging physical activity could help lessen pregnant women's burden and impact antenatal depression.

Similarly, poor nutritional health can impact gestational weight impacting perinatal outcomes, and poor nutritional health can impact gestational weight, perinatal outcomes, and short-term and long-term health (Kominiarek & Peaceman, 2017; and McDowell, Cain, & Brumley, 2018). The diet has been shown to be associated with depression risk, with having a poor diet, such as high sweets and -fat products, leading to an increased risk of depression (Li et al., 2017). Quality of sleep has been associated with depression, especially with depressive relapse and recurrence (Nutt, Wilson, & Paterson, 2022), impacting overall quality of life due to being unable to recharge and deal with the mental toll of depression. These results highlight the importance of having a balanced level of nutrition, sleep, and physical activity to potentially reduce the onset of antenatal depression, improving overall health outcomes.

Surprisingly, majority of the frequency of alcohol use response category was not statistically significantly associated with antenatal depression. This could be due to the number of different response categories in the alcohol use variable. Only four (Once a month per year, seven to 11 times in the last year, three to six times in the last year, and one to two times in the last year) of the possible responses for alcohol consumption contained more than 10 responders. Nonetheless, for those that did respond, pregnant women who consumed alcohol more than once a year per month, three to six times in the last year, and one to two times in the last year is statistically significant. Marijuana use is not statistically significantly associated with antenatal depression as well. Previous studies have shown that individuals who have depressive symptoms or increased mental health symptoms such as loneliness, have an increased risk of increasing alcohol use

frequency and marijuana use (Gutkind, Gorfinkel, & Hasin, 2022; Megan et al., 2022). Although marijuana use is nonsignificant and alcohol use is inconclusive, studies have shown that abuse of these drugs these impact the fetus in an adverse manner, such as fetal growth restrictions and lower neurodevelopment (Sebastiani et al., 2018; Thompson, DeJong, & Lo, 2019). The logistic regression and descriptive analysis showed that there is still alcohol use and marijuana use during pregnancy. Overall, the null hypothesis for Research Question 3 is rejected in favor of the null hypothesis.

Research Question 4: What is the association between psychosocial, obstetric, and lifestyle factors and antenatal depression?

$H_0$4: There is no association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

H_A4: There is an association between psychosocial, obstetric, and lifestyle factors and antenatal depression.

To answer Research Question 4, all the independent variables that were used in Research Question 1 to 3 is modeled with depression as the dependent variable. Table 8 shows the logistic regression model. The Nagelkerke R^2 for this logistic regression model was .414. The Hosmer and Lemeshow goodness of fit test yielded a Chi-square of 16.423, which is statistically significant at p=.037.

Table 8.

Logistics Regression Model of Psychosocial, Obstetric, Lifestyle Factors and Antenatal Depression

Variable	Coefficient	Std. Error	Wald	p-value	OR	OR 95% CI
Marital Status						
Widowed/ divorced/ Separated	-0.400	0.322	1.543	0.214	0.670	[.356, 1.260]
Never married	0.655	0.184	12.637	<0.001*	1.926	[1.342, 2.764]
Anxiety				<0.001*		
A little	1.630	0.209	60.908	<0.001*	5.103	[3.89, 7.685]
A lot	2.663	0.286	86.741	<0.001*	14.333	[8.185, 25.101]
Somewhere in between	2.059	0.251	67.556	<0.001*	7.841	[4.799, 12.813]
Activity Limitations						
Yes	0.138	0.277	0.247	0.619	1.148	[.667, 1.976]
Diabetes						
Yes	-0.500	0.649	0.592	0.442	0.607	[.170, 2.166]
No	-1.458	0.615	5.620	0.018*	0.233	[.070, .777]
Pregnancy History						
3 to 5 priors	0.396	0.162	5.983	0.014*	1.486	[1.082, 2.042]
6 to 10 priors	0.616	0.287	4.591	0.032*	1.851	[1.054, 3.250]
11 or more priors	22.115	16824.077	0.000	0.999	>100	[.000, ---]
Cesarean History						
1 or more	0.457	0.152	9.073	0.003*	1.579	[1.173, 2.125]
Seeking MentalHth						
No	-0.712	0.316	5.071	0.024*	0.491	[.264, .912]
Access to Healthcare						
No	0.606	0.223	7.375	0.007*	1.834	[1.184, 2.840]
Marijuana Use						
Yes	-0.055	0.238	0.054	0.816	0.946	[.594, 1.508]
Alcohol Use						
Nearly everyday	18.093	>100	0.000	0.999	>100	[.000, ---]
3-4 times a day	-20.692	>100	0.000	0.998	0.000	[.000, ---]
2 times a week	-19.257	>100	0.000	0.999	0.000	[.000, ---]
Once a week	-1.305	0.733	3.173	0.075	0.271	[.065, 1.140]
2 to 3 times a month	-20.279	>100	0.000	0.997	0.000	[.000, ---]
Once a month/year	-1.818	0.524	12.041	0.001*	0.162	[.058, .453]
7 to 11 times in the last year	0.010	0.291	0.001	0.974	1.010	[.570, 1.788]
3 to 6 times in the last year	-0.623	0.232	7.224	0.007*	0.536	[.340, .845]

Variable	Coefficient	Std. Error	Wald	p-value	OR	OR 95% CI
1 to 2 times in the last year	0.537	0.184	8.525	0.004*	1.712	[1.193, 2.455]
Physical Activity						
0 Day	1.065	0.300	12.623	<0.001*	2.902	[1.612, 5.223]
1 Day	0.841	0.405	4.323	0.038*	2.320	[1.049, 5.128]
2 Days	-0.039	0.393	0.010	0.920	0.961	[.445, 2.076]
3 Days	0.246	0.361	0.462	0.497	1.279	[.630, 2.596]
Sleep Health						
Rarely	-0.172	0.291	0.350	0.554	0.842	[.476, 1.489]
Sometimes	-0.424	0.228	3.453	0.063	0.655	[.419, 1.023]
Often	-0.214	0.251	0.726	0.394	0.807	[.493, 1.321
Almost always	0.644	0.270	5.696	0.017*	1.904	[1.122, 3.232]
Nutrition Health						
Very good	0.134	0.347	0.149	0.699	1.144	[.579, 2.258]
Good	0.818	0.318	6.601	0.010*	2.265	[1.214, 4.227]
Fair	1.511	0.328	21.205	<0.001*	4.531	[2.382, 8.619]
Poor	2.105	0.473	19.778	<0.001*	8.210	[3.246, 20.765]

**Statistically significant*

The logistic regression model shows that never being married, having any level of anxiety, having three to 10 prior pregnancies, having a prior cesarean delivery, not seeking a mental health provider, having no access to a health care location, low moderate physical activities, poor sleep health, and having a poor nutrition are statistically significantly associated with antenatal depression. A high frequency of alcohol use is not associated with antenatal depression. That said, alcohol consumption within the past year is significantly associated with antenatal depression. Having diabetes is not significantly associated with antenatal depression. Therefore, the null hypothesis for Research Question 4 is rejected in favor of the alternative hypothesis.

Summary of Results

This study aimed to examine the association between psychosocial, obstetric, and lifestyle factors, and antenatal depression. Results indicate an association between psychosocial, obstetric, and lifestyle factors and antenatal depression. The variables never

being married, having any level of anxiety, having prior pregnancies, having a prior cesarean delivery, not seeking a mental health provider, having no access to a health care location, low, moderate physical activities, poor sleep health, and having poor nutrition are all associated with antenatal depression. In the analysis, the null hypothesis for all four research questions was rejected in favor of the alternative hypothesis. The interpretations of the results of the study are presented in Section 4, including discussions on limitations, recommendations, implications for social changes, and the conclusion.

Section 4: Application of Professional Proactive and Implications for Social Change

Introduction

With this study, I examined the associations between antenatal depression and psychosocial, obstetric, and lifestyle factors. Data from the 2007–2018 NHANES were pooled together and analyzed to examine these associations. In this section, I present my interpretation of the findings, the limitations, recommendations of the study results, implications for social change, and conclusions.

Summary of Results and Interpretations of Findings

Research Question 1 was: What is the association between psychosocial factors and antenatal depression the association between psychosocial factors and antenatal depression? The findings showed that individuals who were never married and had any level of anxiety were associated with antenatal depression. Any limitations due to physical, mental, or emotional problems were not associated with antenatal depression. Any level of anxiety during pregnancy had high odds ratios, with “a lot” of anxiety yielding an odds ratio of 17.270. The odds ratio for anxiety increases as the level of anxiety increases. Having “a little” anxiety yielded an odds ratio of 3.806 that increased to 7.783 for “somewhere in between a lot and a little” anxiety. The odds ratios for anxiety imply that having any anxiety during pregnancy is a significant predictor for depression.

Research Question 2 was: What is the association between obstetric factors and antenatal depression? The logistic regression indicated that there was no association between having diabetes and more than 11 prior pregnancies. There is an association between those that have had a prior cesarean delivery and those that have had 10 or less

prior pregnancies. Those with between six to 10 prior pregnancies had a higher odds ratio than those between three to five prior pregnancies, 2.753 to 1.964, respectively. Although individuals that do not have diabetes during pregnancies had a statistically significant association with antenatal depression, the odds ratio is less than 1. This means that although having no diabetes during pregnancies is statistically significant, there is a lesser likelihood of having antenatal depression. Lastly, having a previous cesarean delivery increases the likelihood of having antenatal depression.

Research Question 3 was: What is the association between lifestyle factors and antenatal depression? The analysis indicates that there is an association between those that do not talk to a mental health provider; those that do not have access to routine health care; those that consume alcohol at least once a week, once a month per year, three to six times in the last year, and one to two times in the last year; less than 1 day of moderate physical activity, those that always feel tired, and individuals that have a good to poor diet. Although individuals that do not have access to a mental health provider and who consume alcohol at least once a week, once a month per year, and three to six times in the last year had a statistically significant association with antenatal depression, they all have an odds ratio of less than 1. This signals that there is a lesser likelihood of having antenatal depression due to these factors. It is also important to note that consuming alcohol once a week is borderline significant (p = .049) and only having one to two alcoholic drinks in the last year is statistically significant and had an odds ratio (1.588) greater than 1. Taking all of this into account, alcohol consumption may not be a good predictor of antenatal depression. This is also similar for individuals that do not seek a

mental health provider with a *p* value of .046 and an odds ratio of .570. The analysis shows that nutritional health is the variable that has the highest odds ratio for predicting antenatal depression. As the overall diet declines from good to poor, the odds ratio increases (from 2.340 to 8.822). This suggests that having a poor diet increases the likelihood of having antenatal depression. Individuals who almost always feel sleepy during the day had an odds ratio of 2.756, indicating that feeling sleepy during the day or poor sleep health increases the likelihood of having antenatal depression.

Research Question 4 was: What is the association between psychosocial, obstetric, and lifestyle factors and antenatal depression? Similar to the results of Research Questions 1, 2 and 3, the logistic regression analysis showed that never being married, having anxiety, no diabetes, three to 10 prior pregnancies, one or more cesarean history, not seeking a mental health provider, no access to a routine health care, a lower frequency of alcohol consumption, lower levels of moderate physical activity, almost always sleepy, and good to poor nutritional health are associated with an increased risk of antenatal depression. The results regarding this research question confirmed the previous research question results because this model produced similar results. Although statistically significant, those that do not have diabetes, do not seek mental health provider, and a lower frequency of alcohol consumption, the odds ratios are less than 1, which indicates that the likelihood of these factors impacting antenatal depression is lower, and they may not be a good predictor of antenatal depression. Having any level of anxiety still showed an association with antenatal depression. Having a lot of anxiety also yielded the highest odds ratio of any variable at 14.333. Nutritional health from good to

poor also had an association with antenatal depression. As diet goes from good to poor, the likelihood of having antenatal depression increases. Lower levels of moderate physical activities were associated with antenatal depression as well. Lastly, pregnancy history of having 10 and fewer prior pregnancies was associated with antenatal depression.

There is evidence from the study results that psychosocial, obstetric, and lifestyle factors are associated with antenatal depression. The findings showed that there is an association between anxiety and depression. Previous researchers stated that a high percentage of patients with depression also experience significant symptoms of anxiety, and vice versa, in that patient with anxiety experiences symptoms of depression (Möller et al., 2016). Higher levels of physical activity have been shown to help treat and reduce depression (Zhang et al., 2020), with moderate levels of activity yielding lower prevalence of depression (Currier et al., 2020). The results of the current study confirm those in the literature that anxiety and physical activity levels have an impact on depression. The findings of this study also confirm that a poor diet is associated with a higher likelihood of antenatal depression. This finding aligns with those of previous studies that provided evidence indicating that high-quality diets are associated with lower risk of depressive symptoms (Molendijk, et al., 2018), and a poor diet has an association with depression (Francsis et al., 2019).

Limitations of Study

I identified several limitations in this study. These limitations included the nature of cross-sectional studies and causality inferences, the use of self-reported data across

multiple years of data sets, the complexity of antenatal depression and what impacts it, and the power of the study. First and foremost, as previously stated, this study did not reach the set power level of 99%. Although this study still had a relatively high power level, by not meeting the set power level that the initial study design was intended for, this study may have missed out on smaller, but important, effects that may impact antenatal depression. By pooling data sets across multiple years, I was not able to account for variability in the patient population throughout the years in the study. The cross-sectional study design has inherent limitations in that it can only be used to assess the outcome at the time of data collection. It cannot be used to establish a true causal relationship between the dependent and independent variables. Lastly, self-reported data presents a level of response bias. Participants in the NHANES may not have understood questions, accurately remembered information, and may not have divulged all information during assessments. Because antenatal depression is a more sensitive outcome, participants may have been hesitant to respond accurately at the time they were assessed, leading to inaccurate information.

Recommendations

This study confirmed that psychosocial, obstetric, and lifestyle factors play an important role in antenatal depression. In this study, I attempted to assess the different factors together instead of as separate, independent variables. With that said, further studies are needed to examine the impact of psychosocial, obstetric, and lifestyle factors on antenatal depression as well as how these factors contribute throughout pregnancy. Future longitudinal studies are recommended and should be conducted to assess the

relationship between psychosocial, obstetric, and lifestyle factors and antenatal depression. Longitudinal studies are useful for evaluating the relationships between different risk factors and the development of a disease state. This type of study also allows for assessments of outcomes throughout the length of the study to determine potential causal relationships that a cross-sectional study may not be able to provide (Cauruana et al., 2015).

Implications for Professional Practice and Social Change

Depression remains an important and common disorder that needs to continually be addressed so that mental health disorders can be prevented. As previously stated, mental health screening for depression during pregnancy is minimal, yet there is an emphasis on making sure that the mother and infant are physically healthy. The results of this study show that psychosocial, obstetric, and lifestyle factors play an important role in antenatal depression. The results of this study suggest that an individual should be screened for depression more than once throughout their pregnancy if they exhibit poor psychosocial, obstetric and lifestyle factors. Professional practice should encourage activities that may prevent or decrease symptoms of depression, such as promoting a healthier and balance diet, getting an adequate amount of sleep, and performing moderate levels of physical activities at least twice a week. Practices should also monitor individuals that have any level of anxiety in their pregnancy because the results of the current study show that any level of anxiety increases the likelihood of antenatal depression. Incorporating programs and organizations, such as Planned Parenthood and March of Dimes, to help address the importance of a healthy lifestyle in terms of

psychosocial and obstetric factors to prevent antenatal depression will be key to improving social and behavioral changes because these organizations have the national reach that can help advocate for change. With legal changes such as the recent overturning of *Roe v. Wade*, it is imperative to show the importance of antenatal depression and preventing it.

Conclusion

In this study, I examined the association between psychosocial, obstetric, and lifestyle factors and antenatal depression. The results showed that for psychosocial factors, any levels of anxiety and never being married during pregnancy, were great indicators of antenatal depression. Concerning obstetric factors, having multiple prior pregnancies and a previous cesarean delivery increased the likelihood of developing antenatal depression. Related to lifestyle factors, having access to routine health care, low levels of physical activities, poor sleep, and poor nutrition leads to the increased likelihood of developing antenatal depression. The findings of this study also showed that approximately 28.8% of pregnant women at the time of NHANES assessment were depressed. This number is greater than the previously stated prevalence rate of antenatal depression in the United States, which was estimated to be between 6% to 16.6% (American Psychiatric Association, 2020a; Ashley et al., 2016; Underwood et al., 2016). The results of this study suggest that prevalence rates of depression may be underreported. I recommend that future researchers conduct a prospective, longitudinal study to accurately assess the impact of antenatal depression and determine potential causal relationships to antenatal depression.

The social change implications of this study may include promoting a healthier psychosocial and obstetric lifestyle to reduce depression symptoms or prevent antenatal depression. The findings of this study may also help support programs and organizations that provides mental health services to pregnant women.

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