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## Factors Contributing to Low Adequate Prenatal Care Rates in Orange County, Florida

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FACTORS CONTRIBUTING TO LOW ADEQUATE PRENATAL CARE RATES  
IN ORANGE COUNTY, FLORIDA

by

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B.S. University of Central Florida, 2017

A thesis submitted in partial fulfillment of the requirements  
for the degree of Master of Arts  
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## **ABSTRACT**

In 2017, only 56% of births in Orange County, Florida, received adequate prenatal care—care that has been shown to prevent maternal and infant death. The Florida Department of Health uses the Kotelchuck Index to determine care adequacy. This index rates care adequacy based on when the mother first receives care, and how many recommended appointments she attends. Prenatal care is rated “inadequate” if it starts after the fourth month of pregnancy, and/or if less than half of the recommended appointments are attended. Receiving earlier and consistent prenatal care has been shown to be an effective way to improve birth outcomes.

In Florida, counties that have low adequate prenatal care rates like Orange County’s tend to be less populous and rural. However, Orange County stands out with its large population of 1.3 million and more urban environment; other Florida counties similar in population and environment to Orange tend to have rates like that of the state’s, at approximately 70%.

The objective of this study is to determine which factors contribute most significantly to prenatal care inadequacy in Orange, Duval, Hillsborough, Miami-Dade, and Pinellas counties; determine the differences between the most significant factors in Orange County and those in the other four counties; and to determine if residing in Orange County in of itself a risk factor for inadequate prenatal care, using logistic regression. By identifying factors that may lead to low adequacy rates, interventions intended to increase care adequacy in Orange County can be better targeted towards populations in need.

## TABLE OF CONTENTS

LIST OF TABLES .....	v
LIST OF ABBREVIATIONS.....	vi
CHAPTER ONE: INTRODUCTION.....	1
CHAPTER TWO: LITERATURE REVIEW .....	4
What Is Prenatal Care?.....	4
Measuring the Adequacy of Prenatal Care .....	8
Andersen’s Behavioral Model of Health Services Use and Adequacy of Prenatal Care .....	10
Predisposing Factors .....	11
Enabling Factors .....	12
Need Factors .....	14
CHAPTER THREE: THEORETICAL ORIENTATION.....	15
CHAPTER FOUR: METHODOLOGY .....	17
Data.....	17
Variables .....	17
Dependent Variable .....	18
Independent Variables.....	18
Analytic Strategy .....	20
CHAPTER FIVE: FINDINGS.....	22
Univariate Analyses .....	22
Summary Statistics.....	22
Pregnancy and Birth Circumstances .....	25
Binary Logistic Regression Analyses .....	26
CHAPTER SIX: DISCUSSION .....	33
CHAPTER SEVEN: CONCLUSION .....	37
APPENDIX A: FDOH VITAL RECORDS DATA USE AGREEMENT .....	38
APPENDIX B: UCF IRB NON-HUMAN RESEARCH DETERMINATION .....	50
APPENDIX C: FDOH IRB EXEMPTION .....	52
LIST OF REFERENCES .....	54

## LIST OF TABLES

Table 1. Sample Size.....	23
Table 2. Mother's Age at Time of Birth.....	23
Table 3. Sample Demographics .....	24
Table 4. Other Hispanic Origin.....	25
Table 5. Pregnancy and Birth Circumstances .....	26
Table 6. Number of Previous Births Still Living.....	26
Table 7. Binary Logistic Regressions of Factors Affecting Prenatal Care Adequacy in Each County.....	29
Table 8. Binary Logistic Regressions of Factors Affecting Prenatal Care Adequacy in All Counties .....	32

## **LIST OF ABBREVIATIONS**

ACOG	American College of Obstetricians and Gynecologists
APNCU	Adequacy of Prenatal Care Utilization
CDC	Centers for Disease Control and Prevention
FDOH	Florida Department of Health
NICHD	Eunice Kennedy Shriver National Institute of Child Health and Human Development
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

## CHAPTER ONE: INTRODUCTION

In 2017, only 54.2% of births in Orange County, Florida, received adequate prenatal care (Florida Department of Health, 2017). Prenatal care is preventative medical care received during pregnancy that includes monitoring of vital measurements of the mother and fetus, monitoring of the mother's mental health, specialized genetic tests, nutrition and behavioral advice from a medical practitioner (Hetherington et. al, 2018; Magliarditi et. al, 2018; Oakley et. al, 2017). Adequate prenatal care has been shown to improve birth outcomes, including lowering rates of infant and maternal mortality (Feijen-de Jong et. al, 2011; Oakley et. al, 2017). Prenatal care adequacy is commonly measured using the Kotelchuck Index, which rates prenatal care adequacy using the month of initiation and amount of appointments attended. Prenatal care becomes inadequate when it is begun in the fourth month of pregnancy, and/or only half of the recommended amount of appointments are attended.

Certain factors make women more vulnerable to receiving inadequate prenatal care. Personal factors such as young age, low levels of education, and being unmarried at the time of birth have all been correlated with low adequacy of prenatal care (Baer et. al, 2013; Feijen-de Jong et. al, 2011; Hetherington et. al, 2018; Magliarditi et. al, 2018; Sidebottom et. al, 2017). Beyond individual characteristics, systemic issues such as lack of insurance coverage and unemployment rates are also associated with higher rates of inadequate prenatal care (Feijen-de Jong et. al, 2011; Sidebottom et. al, 2017). For many women in the United States, these factors intersect to create a perfect storm of health disparity which is defined as, "differences or gaps in care experienced by one population compared with another population" (Lu et. al, 2010, p. 199). Non-white and Hispanic women are more at risk of not receiving adequate prenatal care than



white non-Hispanic women (Green, 2018; Lu et. al, 2010), and low socioeconomic status may largely contribute to this (Green, 2018). Lack of adequate prenatal care in these groups leads to higher rates of morbidity and mortality in infants and mothers than in other groups, widening health disparities even further over the life span (Green, 2018; Tu et. al, 2012).

This study contributes to a body of literature that examines the cause of disparities in adequate prenatal care in different locations around the United States and the world. However, this study will focus on one county in one state, rendering its conclusions specifically relevant to this particular area. Orange County, FL, was chosen as the focus for this study because out of all counties classified as “large central metros” by the National Center for Health Statistics in Florida (Duval, Hillsborough, Miami-Dade, Orange, and Pinellas counties [CDC, 2014]), Orange County has the lowest adequate prenatal care rate. The other large Florida central metros have rates closer to, and above, the state’s average rate of 70.1%. Given that the literature shows that rural areas of the United States typically have worse rates of adequate prenatal care as opposed to urban areas, this is an unusual observation worthy of examination (Baer et. al, 2018).

This study seeks to answer four questions: which factors contribute most significantly to PNC inadequacy in Florida’s five large central metro counties—Duval, Hillsborough, Miami-Dade, Orange, and Pinellas; what difference is there, if any, between the most significant factors in Orange County and the factors in the other four counties; is residing in Orange County in of itself a risk factor for inadequate prenatal care; and according to the Andersen’s Behavioral Model of Health Services Use model, do predisposing, enabling, or need factors more significantly impact PNC adequacy in these counties?

Having information on which populations are most at risk for not having their prenatal care needs met in Orange County will allow future interventions to be tailored to their needs. Interventions that only address the health of the population as a whole do not necessarily improve health disparities and may actually increase them (Frohlich et. al, 2008; Tu et. al, 2012).

## **CHAPTER TWO: LITERATURE REVIEW**

### What Is Prenatal Care?

One of the most utilized forms of preventative care in the developed world (Sword et. al, 2012), prenatal care serves to both help prevent any medical issues that can occur during pregnancy as well as treat issues that arise. The World Health Organization (WHO) considers prenatal care to be part of women's "fundamental rights." (Zanconato et. al, 2006). Prenatal care may also address additional stressors in the mother's life, such as those stemming from a poor socioeconomic situation (Alexander et. al, 2001).

Prenatal care is obtained throughout the pregnancy over many appointments, with the frequency of appointments increasing as the woman's due date approaches. What happens in each visit will differ as time goes on. Along with tracking basic figures about the patient's health to ensure the pregnancy is progressing satisfactorily – blood pressure, weight, fetal heart rate and more – the health care provider should also inform the patient of the different risks she may face throughout her pregnancy. First, many foods and other ingested substances have different effects on the fetus; any pre-existing chronic illnesses she has, and other factors may create more risks for her pregnancy than average; and that infections must be treated as soon as possible to prevent harm to the fetus. (NICHD, 2017). Finally, based on genetic testing of the parents, determine if any specialized testing for genetic malformations is needed.

What a mother consumes during pregnancy is vitally important. Eating a nutritional diet has been shown to reduce pregnancy risk for both the mother and fetus, as well as promoting the fetus' development (National Institute of Child Health and Human Development, 2017). The

American College of Obstetricians and Gynecologists (ACOG) recommends eating a diet especially rich in folate, iron, calcium, and vitamin D. All are essential in ensuring healthy fetal development. The ACOG also recommends that pregnant women limit their consumption of fish and shellfish due to risk of mercury exposure, which may cause birth defects (ACOG, 2018). Raw, undercooked, or unpasteurized foods are not recommended during pregnancy (NICHD, 2017). Consumption of these may lead to food-borne illnesses, such as listeriosis, which can cause premature delivery and fetal death (ACOG, 2018). While the results of studies done on the effects of caffeine on a developing fetus are inconclusive, the ACOG recommend consuming no more than 200 milligrams of caffeine a day (ACOG, 2018).

Besides foods, other products can have undesirable effects on both the mother and fetus, such as alcohol, drugs, and tobacco, due to how easily they pass through the placenta. Use of these substances during pregnancy greatly increase risk for stillbirth, birth defects, premature birth, low birthweight, fetal withdrawal symptoms, and sudden infant death syndrome (SIDS) (National Institute on Drug Abuse, 2018). Mothers may be unwittingly exposing themselves to harmful substances and chemicals during pregnancy as well. Exposure to items such as radiation, pesticides, and lead have been shown to cause premature birth, birth defects, and miscarriage. Women whose places of employment use these substances, such as farms or salons, may need to temporarily stop certain job duties to avoid pregnancy complications (NICHD, 2017).

Taking prenatal vitamins is recommended due to their use as harm reduction agents. While it is best to obtain nutrients through food, prenatal vitamins ensure that these nutrients are reaching the fetus (Mayo Clinic, 2018). The U.S. Preventive Services Task Force states that if a pregnant woman takes 400 micrograms of folic acid a day, she may reduce her fetus' risk of

neural tube defects by 70%. Neural tube defects can lead to disabling birth defects, such as anencephaly and spina bifida, or even death. While some medications and supplements, like vitamins, may be helpful during a pregnancy, many are not. Most medications have not been studied as to their effects on a fetus, and some, like those for acne, are known to be dangerous (NICHD, 2017).

Beyond pregnancy-specific care, it is important for the mother to manage the rest of her health to continue risk reduction. A very common health problem many pregnant women encounter is excessive weight gain. A study recently done by NICHD showed that 73% of women gain more weight than is necessary during pregnancy (NICHD, 2017). Excess weight can cause many issues, such as high blood pressure and increased risk for C-section (Johnson et. al, 2013). Along with following a nutritional diet, weight gain during pregnancy can be kept in check using exercise as well. Most women are able to remain relatively physically active during pregnancy, although it is recommended that the patient should consult her doctor first (NICHD, 2017).

Also common in the United States is the presence of chronic illnesses (Raghupathi et. al, 2018), which can also affect pregnancy. For example, diabetes is cited as one of the most serious chronic conditions, due to its ability to cause serious congenital malformations if left uncontrolled throughout the pregnancy. High blood pressure has serious consequences as well; it can cause the growth of the fetus to slow down. Having pre-existing chronic conditions such as these can increase a woman's risk of developing pre-eclampsia (blood pressure disorders occurring during pregnancy) (Luo et. al, 2007). The mother's mental health, whether already affected by disorders or not, must be monitored as well. Affecting approximately 10% of births,

depressive symptoms are one of the most common side effects of pregnancy (Magliarditi et. al, 2018). It is also recommended that treatment for mental illnesses, such as depression and anxiety, be continued. Untreated depression has been associated with poor pregnancy and birth outcomes (Farahi, 2018).

The NICHD (2017) recommends that pregnant women act quickly in seeking treatment of bacterial and viral infections, such as sexually transmitted infections. Untreated, they can be passed to the fetus while in utero or during birth. They have been linked to serious birth defects and pregnancy complications (CDC, 2016). The CDC (2016) also recommends women receive certain vaccines before, during, and after pregnancies to defend against certain diseases. Finally, a pregnant woman's dental care must also not be neglected. Because of increased blood flow and changing hormones, inflammation and/or infection of the gums are possible (NICHD, 2016).

Another large component of prenatal care is a variety of tests done to further ensure complications are not present. The timing of these tests is important, as the mother may be put into a position of deciding whether to continue or end the pregnancy due to a known birth defect already present. If the decision to keep a child with a known chromosomal malformation is made, knowing ahead of the birth gives the family time to prepare for the necessary extra care the infant may need. (ACOG, 2017). Throughout the course of the pregnancy, basic tests to monitor the mother and fetus' health are done to look for signs of gestational diabetes, check iron levels, and signs of pre-eclampsia. There are also tests done for infections like STIs and hepatitis B and C being present in the mother, due to their ability to pass onto the infant. Additional tests are also done to check for chromosomal abnormalities that may lead to Down syndrome or other birth defects (NICHD, 2017). If there is a genetic risk factor for certain birth defects in either

parents' family, tests to check for these may be done. Some are not performed unless there is a large likelihood of the condition existing in the fetus, as some can cause loss of pregnancy (ACOG, 2017).

Certain groups of women have risk factors that make them more likely to develop health problems during pregnancy and could possibly develop a high-risk pregnancy. Women who experience high-risk pregnancies frequently need more care from more providers than women with average pregnancies (NICHD, 2017). Existing chronic health conditions, as previously discussed, may introduce complications into the pregnancy by adding excess stress on the body. Being overweight or obese during pregnancy also increases the likelihood of complications, as well as birth defects such as congenital heart defects. Women who are teenagers or over 35 are more likely to experience health problems during pregnancy. Teenage mothers are likelier to deliver early; infants of mothers over 35 experience a higher risk of neural tube defects and other complications. The risk of pre-eclampsia, preterm birth, and stillbirth are higher for women who have had problems in earlier pregnancies, as well as women pregnant with multiple fetuses (NICHD, 2017).

#### Measuring the Adequacy of Prenatal Care

Over time, measuring techniques used to determine if prenatal care received was adequate have evolved. In 1973, Kessner et. al introduced the Kessner Index, intended to measure the adequacy of prenatal care using how soon the care began and how many visits were attended. These measures were then combined and categorized as “Adequate,” “Intermediate,” and “Inadequate.” By this index, adequate care begins in the first trimester, and nine prenatal care appointments should be attended (Kotchelchuck, 1994). In “An Evaluation of the Kessner

Adequacy of Prenatal Care Index and a Proposed Adequacy of Prenatal Care Utilization Index,” (1994) Kotelchuck argues that the Kessner Index is “seriously flawed,” and expresses concern due to its wide use in public health research at the time; he contends that while the Kessner Index is only a measure of initial access to prenatal care, with no regard for the amount of care received after the initial appointment (Kotelchuck, 1994).

Kotelchuck states that much of the scale’s emphasis is on the timing of initiation of care and that the amount of appointments attended “rarely” affect the final statistic; it is not clear whether the inadequacy is coming from the time of initiation of care, or amount of appointments attended; defining an adequate number of visits as 9 appears to be because of outdated data; and finally, Kotelchuck posits that due to the initial lack of satisfactory documentation provided with the Kessner index, research done using it was not instructed as to how to treat records with missing data (such as missing initiation dates).

To address these points and create a more accurate measure of prenatal care utilization, Kotelchuck created the Adequacy of Prenatal Care Utilization (APNCU) Index. Measurements of utilization using this index involve two factors: “adequacy of initiation of prenatal care and adequacy of received services” (Kotelchuck, 1994). For the initiation variable, Kotelchuck chose to use months as the markers, instead of simply trimesters, for more accuracy. Adequacy of received services is “the ratio of the actual number of [prenatal care] visits to the expected number of visits,” deriving the expected number of visits from American College of Obstetrics and Gynecology (ACOG) standards. Both figures are then used to rate the utilization of prenatal care from Inadequate to Adequate Plus (Kotelchuck, 1994). Prenatal care is defined as



inadequate when prenatal care is initiated in the fourth month of pregnancy or later, and/or when less than 50% of the recommended number of prenatal care appointments have been attended.

Kotelchuck notes a few limitations of the APNCU Index. First, the “adequacy” is referring to the amount of prenatal care utilized by the woman—not the actual content of her visit. Second, women with longer pregnancies are less likely to be rated as having received adequate or adequate plus care, because they have more opportunities to miss appointments. He states that this “accurately reflect[s] the increasing difficulty that women have in meeting the demanding ACOG recommendations...” (Kotelchuck, 1994). Finally, the index does not adjust for mothers who have more risk factors than an average pregnancy. Because the ACOG recommendations are meant for women with uncomplicated pregnancies, the APNCU will produce a “slightly conservative” estimate of inadequate prenatal care usage, due to these women possibly requiring more requiring visits than others.

#### Andersen’s Behavioral Model of Health Services Use and Adequacy of Prenatal Care

Disparities in healthcare in the United States are common, and obtaining adequate prenatal care is no exception (Lu et. al, 2010). The literature shows that a wide array of factors affects a woman’s likelihood of receiving at least “adequate”-rated prenatal care. A framework frequently used to examine healthcare utilization is Andersen’s Behavioral Model of Health Services Use (2013). This framework organizes determinants of utilization into three main categories: predisposing factors, or characteristics of the individual and their community; enabling factors, or systemic characteristics; and need factors, or perceived need of healthcare from both the individual’s and practitioner’s perspectives. Using this framework, a more complete picture of healthcare utilization can be seen: why or why not an individual may seek

healthcare; the structural factors that enable or disable them from doing so; and their perceptions of when healthcare intervention is required versus a professional's. (Babitsch et. al, 2012; Feijen-de Jong et. al, 2011). This framework has been used by many studies to examine determinants of prenatal care utilization and adequacy (Feijen-de Jong et. al, 2011) and gives a more complete picture of the determinants of prenatal care adequacy.

### Predisposing Factors

The mother's age at birth has been shown to be associated with different levels of prenatal care. Older women are more likely to receive adequate or above prenatal care due to the increased risk of pregnancy complications (Green, 2018), and younger women (under 20 years old) more likely to receive inadequate care (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Hetherington et. al, 2018; Magliarditi et. al, 2018; Sidebottom et. al, 2017).

Women with higher levels of education are not only able to afford better quality health care but have also been shown to begin prenatal care sooner (Green, 2018). Women with low levels of education, especially less than high school, experience inadequate care more often (Baer et. al, 2013; Feijen-de Jong et. al, 2011; Hetherington et. al, 2018; Magliarditi et. al, 2018; Sidebottom et. al, 2017).

In a 2018 study, marital status was shown to be a statistically significant factor in explaining prenatal care adequacy disparities between white and non-white women (Green, 2018). The same has been found throughout the literature. Unmarried women begin prenatal care later and do not attend as many visits compared to their married counterparts. They also are more

likely to not receive care at all (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Sidebottom et. al, 2017).

Race and ethnicity are well-documented contributing factors to disparities in prenatal care adequacy. In the United States, non-Hispanic black women and Hispanic women are less likely to receive adequate prenatal care compared to non-Hispanic white women (Bengiamin, 2009; Green, 2018; Partridge, 2012). Women of color are more likely to enter prenatal care late and attend less appointments (Feijen-de Jong, 2011; Sidebottom et. al, 2017).

The overall socioeconomic status of the area in which mothers live has been shown in the literature to affect prenatal care adequacy as well. Women who live in areas with higher numbers of individuals with incomes under the poverty line and high rates of unemployment had higher rates of inadequate prenatal care (Feijen-de Jong, 2011; Sidebottom et. al, 2017).

In the United States, urban and rural areas often have differing levels of prenatal care adequacy (Green, 2018). A study in California showed that women in rural areas were more likely to enter prenatal care late as opposed to urban areas (Baer et. al, 2018), and access to OB/GYN care in rural areas like Georgia is worsening (Shoff et. al, 2011; Shoff et. al, 2014).

### Enabling Factors

In the United States in particular, perhaps the most significant barrier towards obtaining adequate prenatal care is cost. In the literature, women with private insurance obtain the most adequate prenatal care—they begin care earlier and attend more appointments compared to women who are uninsured or have Medicaid (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Green, 2018; Oakley et. al, 2017). Women with Medicaid—who are more likely to be women of

color—often face delays in beginning prenatal care on time, due to its logistical difficulties such as barriers to enrollment and being unable to find healthcare providers (Daw et. al, 2018; Green, 2018).

In 2018, Daw et. al found that dependent coverage provision in the Affordable Care Act, which allows young adults to use their parent’s health insurance until they are 26 years old, was associated with increased use of private insurance for birth, higher utilization and adequacy of prenatal care, and a decrease in preterm births in women 24—25 years old. The increase in private insurance was notably higher for unmarried women. Though private insurance has been shown to improve prenatal care adequacy, racial and ethnic disparities among women who are privately insured show that black and Hispanic women still do not obtain the quality of prenatal care that white women do (Green, 2018).

In a 2018 study, WIC participation was shown to be one of the most significant factors enabling women to overcome financial barriers to receive adequate prenatal care. This was especially true for black and Hispanic mothers; increasing WIC use in these groups may help to decrease health disparities caused by financial difficulties that disproportionately affect women of color’s access to adequate prenatal care (Baer et. al, 2018; Green, 2018).

Unsurprisingly, the amount of prenatal care health providers in a woman’s area influences her chances of receiving adequate prenatal care. Living in an area with few office-based primary care physicians has been shown to be associated with starting prenatal care late (Feijen-de Jong et. al, 2011; Shoff et. al, 2012). Shoff et. al (2012) determined that “with every

one Ob-Gyn doctor increase per 100,000 females ages 15—44, the percentage of mothers receiving late or no prenatal care decreases by 0.01 percent”.

### Need Factors

While women who have high-risk pregnancies (women with certain chronic diseases and/or who have had a previous poor birth outcome [FloridaCHARTS, 2018]) have been an interest in prenatal care adequacy research, findings are mixed as to whether the two are correlated. However, a woman’s parity—amount of pregnancies a woman has had that have reached 20 weeks gestation (ACOG, 2014)—seems to be. In a study of inadequate prenatal care in high-income countries, Feijen-de Jong et. al (2011) state that higher parity may lead to inadequate prenatal care. Women who have given birth 3 or more times are more likely to begin prenatal care late on subsequent births, as well as attending less appointments. Women who have not given birth at least once before start prenatal care much earlier and attend more appointments, increasing its adequacy (Sidebottom et. al, 2017).

The use of alcohol and tobacco during pregnancy—known to cause birth defects and complications (National Institute on Drug Abuse, 2018)—has also been found to be associated with inadequate prenatal care (Bernardes et. al, 2014; Debessai et. al, 2016; Feijen-de Jong et. al, 2011). Women who use one substance are likely to use another; it is hypothesized that substance use during pregnancy serves as a source of stress relief for the mother (Bernardes et. al, 2014; Passey et. al, 2014).

## **CHAPTER THREE: THEORETICAL ORIENTATION**

As studies that examine utilization of healthcare of any kind show, many social and structural variables play a role in an individual's decision to seek healthcare (Babitsch et. al, 2012). The literature shows that there are often patterns among groups—for example, men use outpatient services less than women do (Babitsch et. al, 2012). In order to better understand these factors and how they affect healthcare utilization, Ronald M. Andersen developed the Behavioral Model of Health Services Use (BM) in 1968 (Babitsch et. al, 2012). It has continued to be developed over the years, with the sixth iteration being published in 2013 (Andersen et. al, 2013). It organizes factors that affect seeking and utilizing healthcare into three main categories: predisposing, enabling, and need factors.

Items belonging in these groups are then broken down further, into “individual” and “contextual” categories. “Individual” factors refer to the person themselves—biological and social characteristics like age, marital status, and health issues they have. “Contextual” factors refer to their surroundings and include cultural and social norms in their communities, health policy, and infrastructure (Feijen-de Jong et. al, 2011).

Predisposing factors refer to a person's individual characteristics and characteristics of their community that have an influence on their predisposition towards seeking health care. These factors include “biological” ones, such as age and sex (Andersen et. al, 2001); social factors, like level of education, race, and occupation; and mental factors, which refers to their attitudes and beliefs towards seeking medical attention. Similarly, structural characteristics

follow the same pattern. Demographics of communities, their social compositions, and norms and values are all categorized as predisposing factors (Babitsch et. al, 2012).

An enabling factor is one that makes the individual able to actually seek medical care. Individually, enabling factors include the ability to pay for medical treatment and health insurance status. Contextual factors include availability of transportation to medical facilities, number of medical facilities available in the area, number of available health practitioners, and even policy that applies to healthcare (Babitsch et. al, 2012).

Need factors refer those factors that make healthcare seem necessary or unnecessary. On the individual level, these factors are the ways in which people perceive their own health. These perceptions include their own experience of “health” versus “ill health,” and what constitutes each for them personally. Contextually, “needs” for healthcare are those observed and defined by health professionals through the use of objective assessment. Andersen et. al (2001) further subdivide this category into “environmental need characteristics” and “population health indices.” Environmental needs refer to conditions of the environment that contribute to health (such as occupational injury and death rates). Population health indices include such examples as population morbidity and mortality rates (Babitsch et. al, 2012).

## CHAPTER FOUR: METHODOLOGY

### Data

The data set used in this study was 2017 birth data from Duval, Hillsborough, Miami-Dade, Orange, and Pinellas counties obtained from the Bureau of Vital Statistics at the Florida Department of Health. The data is entered into Florida's electronic birth record system after a birth occurs. A Data Use Agreement was completed and approved in conjunction with the Florida Department of Health (see Appendix A). As the study consists of secondary data analysis of unidentifiable data, exempt status was received from both University of Central Florida and Florida Department of Health Institutional Review Boards (see Appendix B and Appendix C respectively). Any published findings and conclusions are those of the author and do not necessarily represent the official position of the Florida Department of Health.

The original data set contained 86,588 individual cases, each representing a birth. Cases containing missing variables were removed (n=13,044). Cases also involving the births of two or more infants were removed (n=3,098), due to being high-risk pregnancies that almost always receive adequate plus prenatal care (Green, 2018). The final number of cases included was 70,446.

### Variables

Andersen et. al's method of organizing factors concerning health services use into "predisposing," "enabling," and "need" categories (2013) will be utilized in order to determine if the effects each category of variables has on obtaining adequate prenatal care differ, and if so,



how. Studies that have examined adequate prenatal care use in other areas have used a similar structure (Feijen-de Jong, 2011).

### Dependent Variable

The dependent variable in this study is the adequacy of the mother's prenatal care utilization as determined by the Kotelchuck Index. There are four levels of adequacy: "inadequate," "intermediate," "adequate," and "adequate plus." Prenatal care is "inadequate" if care was begun in months 7 to 9 and less than 50% of prenatal care visits were received. "Intermediate" care is begun in months 5 to 6, with 50-79% of visits completed. "Adequate" care begins in months 3 to 4, completing 80-109% of visits. Finally, "adequate plus" care—typically received by women with high-risk pregnancies—begins in months 1 to 2 and receives 110% or more of visits (Utah Department of Health). For the purposes of analysis, this variable was recoded dichotomously with "inadequate" and "intermediate" being coded as "0" and "adequate" and "adequate plus" being coded as 1.

### Independent Variables

#### *Predisposing Factors*

"Age" represents the mother's age at the time of birth, as entered into the electronic birth record system. It was recoded into five categories: "13-19"; "20-24"; "25-29"; "30-34"; and "35 and up".

Seven different variables were requested from the Bureau of Vital Statistics in order to gain a more specific picture of prenatal care adequacy among Florida's diverse Hispanic population. The first variable asks if the mother is of Hispanic or Haitian origin. The FDOH

defines Hispanic as “those people whose origins are from Spain, Mexico, or the Spanish-speaking countries of Central or South America.” Next, the FDOH utilizes four variables to record the ethnicity of larger Hispanic groups: those whose origins are in Mexico, Puerto Rico, Cuba, and Haiti. Each of these variables, alongside the general Hispanic and/or Haitian origin variables were originally recorded as “Y” for “Yes,” and “N” for “No.”

Finally, those from other countries were recorded as having “other Hispanic origins” and their origin being recorded as a separate string variable. Data entered here consisted of either the name of the country, or the name of the continent/geographical area (see Table 4: Other Hispanic Origins).

FDOH records eight different levels of education for the mother of the infant. “8<sup>th</sup> Grade or Less”; “9<sup>th</sup> Through 12<sup>th</sup>, No Diploma”, “High School Graduate or GED”, “Some College, No Degree”, “Associate Degree”, “Bachelor’s Degree”, “Master’s Degree”, and “Doctorate Degree”. Each level was assigned a value of 1-8 respectively. Because “8<sup>th</sup> Grade or Less” was such a small category, it was combined with “9<sup>th</sup> Through 12<sup>th</sup>, No Diploma” during recoding. The same was done with the “Master’s Degree” and “Doctorate Degree” categories.

To represent marital status, the values for the variable “Is the mother married?” were “Yes”, “No”, and “Widowed”. As only 5 cases in the sample were widowed, during the recoding of this variable the cases who were widowed were merged with “No” into a “0” value with “Yes” becoming the “1” value.

Race was determined by three variables. For “white” and “black” they were originally recorded as “Y” if the mother identified as white or black, and “N” if she did not. Mothers who

did not identify as either white or black were put into an “Other” race category. Each category was recoded into dummy variables in which a “1” represented cases in which the mother identified with that race and a “0” if she did not. The variable representing “White” is not included in the data analysis in order to serve as a reference category.

### *Enabling Factors*

Three types of payment are recorded by the FDOH: “Private Insurance”; “Medicaid”; and “Self-Pay”. The “Medicaid” category also encompasses “comparable State programs”. Dummy variables were created for “Medicaid” and “Self-Pay” utilizing “Private Insurance” as the reference category in data analysis.

FDOH records whether a mother has received WIC food, noting “WIC is the U.S. Department of Agriculture’s nutrition program for women, infant, and children. The data was recorded as “Y” for “Yes” and “N” for “No”. This variable was recoded for use as a dummy variable in data analysis, recoding “Y” as “1” and “N” as “0”.

### *Need Factors*

The number of previous children born to the mother that are still alive are recorded as a value into the electronic birth record system. These were recoded into four categories: “0”; “1”; “2”; and “3 or more”.

### Analytic Strategy

First, frequencies were run on each variable. Next, using SPSS, the data file was split and set to organize output by groups so that binary logistic regressions could be run for each county individually. Then, a set of binary logistic regression models were used to determine which

variables contribute most to adequate prenatal care rates in each large central metro Florida county, and how each county differs in the factors that positively and negatively impact its prenatal care adequacy rates. Next, the data file split was reset, and a binary logistic regression model containing all variables plus dummy variables for each county was run to determine if, controlling for other factors, simply living in Orange County was a significant risk to prenatal care adequacy.

## CHAPTER FIVE: FINDINGS

### Univariate Analyses

#### Summary Statistics

Of the total 70,446 cases, most were from Miami-Dade, with 27,168 cases; Pinellas contributed the least, at 6,136 (Table 1). Mean and median ages at the time of births for all counties was very similar, at approximately 29. Duval County had the lowest mean age at 28.28, and Miami-Dade with the highest, at 29.81 (Table 2). In each county, the highest percentage of education completed was a high school diploma or GED; most other cases completed some college without obtaining a degree or did obtain a bachelor's degree. In all counties but Orange, the largest race category is "White"; Orange County was 29.8% "Other" race, when all other counties were only 10.5-14.2%. Duval County had the largest percentage of cases identifying as "Black", with 36.8% (Table 3).

The amount of Hispanic-identifying cases in each county varied widely. Duval and Pinellas counties only had 12.4-13.9%, while Miami-Dade was 69.9% Hispanic. Hillsborough and Orange Counties were 33.8% and 39.5% Hispanic, respectively. The majority Hispanic groups in each county were also very different. In Hillsborough and Orange counties, Puerto Ricans were the largest group; Miami-Dade was 42.98% Cuban; and Pinellas was 29.49% Mexican. The largest Hispanic group in Duval County was "Other Hispanic"; within this group, the largest categories were Honduran (22.9%); Central American (14.4%); and Colombian (10.3%). In all counties, the most common "Other Hispanic Origin" categories were Venezuelan, Colombian, Honduran, and Dominican (Table 4). In each county, roughly half of cases were

married, and half unmarried. WIC participation varied slightly—from 34.2% in Pinellas County to 50% in Miami-Dade County (Table 3).

Table 1. Sample Size

Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
10,544	15,038	27,168	11,560	6,136	70,446

Table 2. Mother's Age at Time of Birth

	Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
Mean	28.38	28.73	29.81	29.32	29.1	29.22
Median	28	29	30	29	29	29
Range	13-49	13-52	13-61	14-56	14-49	13-61

Table 3. Sample Demographics

	Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
<b>Education Level</b>						%
8 <sup>th</sup> Grade or Less	2.4	2.8	3.1	1.8	1.1	2.5
9 <sup>th</sup> -12 <sup>th</sup> , No Diploma	8.9	9.2	5.9	8.3	7.9	7.6
High School Diploma/GED	27.7	32.7	35.2	27	26.1	31.4
Some College, No Degree	23.7	18.5	15.7	18.5	20.9	18.4
Associate Degree	9.3	9.1	9.7	10.2	9.5	9.6
Bachelor's Degree	18.7	17.7	19	22.4	22.6	19.6
Master's Degree	7.1	7.6	9	9.4	8.4	8.4
Doctorate Degree	2.2	2.4	2.4	2.3	3.5	2.4
<b>Race</b>						
Black	36.8	22.8	21.3	26.6	19.7	61.0
White	50.2	66.7	68.2	43.6	66.1	24.7
Other	13	10.5	10.5	29.8	14.2	14.3
<b>Ethnicity</b>						
Hispanic	12.4	33.8	69.9	39.5	13.9	43.7
<i>Cuban</i>	10.64	20.04	42.98	5.33	13.63	31.43
<i>Haitian</i>	5.97	3.09	8.29	16.16	2.12	8.33
<i>Mexican</i>	18.82	24.74	3.46	9.38	29.49	9.23
<i>Puerto Rican</i>	28.31	28.15	4.12	35.43	27.85	14.41
<i>Other Hispanic Origin</i>	36.27	23.98	41.14	33.7	26.91	36.6
Non-Hispanic	87.6	66.2	30.1	60.5	86.1	56.3
<b>Marital Status</b>						
Married	52.8	52.4	51.6	57.4	54.3	53.1
Unmarried	47.2	47.6	48.4	42.6	45.7	46.9
<b>WIC Participation Status</b>						
Yes	36.3	47.2	50	45.7	34.2	45.3
No	63.7	52.8	50	54.3	65.8	54.7

Table 4. Other Hispanic Origin

	Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
<b>Countries</b>						%
Argentina	0.9	0.7	3.1	1.4	2	2.5
Brazil	1.8	3.1	1.4	8.8	1	2.6
Colombia	10.3	13.7	15.3	17	8.4	15.1
Dominican Republic	9.4	20	9.9	18.7	10.9	12.2
Ecuador	1.8	3.4	3.9	4.3	3.5	3.8
El Salvador	4.8	4.6	4	2.8	1.5	3.9
Guatemala	9.8	7.6	5.3	6.7	1	5.9
Honduras	22.9	10.9	15.1	7.3	2	13.7
Nicaragua	2.1	1.9	12.7	1.4	2	9.4
Panama	3	1.4	0.7	1.4	1.5	1
Peru	4.1	2.8	4.2	3.4	4.5	4
Venezuela	3.2	7.1	17.8	22.2	5	16.4
<b>Continents/Geographical Areas</b>						
Caribbean	0	0.4	0	0.2	0	0.1
Central America	14.4	9.3	1.3	1.4	45	3.5
Europe	4.3	2.5	1.2	1.3	3	1.5
South America	7.1	10.5	3.9	1.8	8.9	4.6

### Pregnancy and Birth Circumstances

Duval County had the largest percentage of births with “Inadequate” care as rated by the Kotelchuck Index; Orange County had the largest percentage of births with “Intermediate” care; Hillsborough had the largest amount of births with “Adequate” care; and Miami-Dade had the largest amount with “Adequate Plus” care (Table 5).

Approximately 50% of cases in each county used Medicaid as a payment source for their birth, with most of the remaining cases paying with private insurance. Miami-Dade County had the highest amount of self-paying mothers, at 10.1%. Concerning the amount of previous births still living, each county was very similar with an average of 1 previous birth per case (Table 6).



Table 5. Pregnancy and Birth Circumstances

	Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
<b>Kotelchuck Index</b>						
Inadequate	26.3	13.1	9.6	16.7	12.9	14.3
Intermediate	14.4	10.4	11.9	27.1	11.8	14.5
Adequate	35.5	60.9	36.8	37.8	48.1	42.9
Adequate Plus	23.8	15.6	41.6	18.4	27.2	28.3
<b>Payment Source</b>						
Medicaid	53.4	52.8	48.5	45.8	49.5	49.8
Private Insurance	44.3	40.8	41.4	46.2	47.3	43
Self-Pay	2.3	6.5	10.1	8	3.1	7.2

Table 6. Number of Previous Births Still Living

	Duval	Hillsborough	Miami-Dade	Orange	Pinellas	Total
Mean	1.1	1.09	0.88	0.98	0.97	0.98
Median	1	1	1	1	1	1
Range	12	13	13	12	9	13

### Binary Logistic Regression Analyses

Each county differed in the factors that affected its prenatal care adequacy rates; all models were statistically significant at  $p < 0.01$  (see Table 7).

Consistent with the literature (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Hetherington et. al, 2018; Magliarditi et. al, 2018; Sidebottom et. al, 2017), being older and having more education increased the probability of having adequate care for cases in all counties with the exception of age in Pinellas county, which was not significant. Being of an older age had the highest positive effect in Miami-Dade county, with more education having the highest positive effect in Hillsborough county.

Concerning race, there were mixed effects. Being black somewhat negatively affected chances of adequate care in Duval, Orange, and Pinellas counties; it increased the chances of

obtaining adequate care in Hillsborough county by 1.233. Somewhat similarly, being of “other” race was only a positive aspect in Miami-Dade county, increasing chances of adequate care by 1.804. Comparing to black mothers, being of “other” race was more detrimental in most counties.

Each Hispanic ethnicity had much different outcomes in this analysis. Cuban mothers by far had the best chances for adequate care. In Miami-Dade and Pinellas counties, their chances were twice that of non-Cuban mothers; in Hillsborough, they are 2.641. It still had a positive effect in Orange County, just to a lower degree; being Cuban was not significant in Duval county. Similarly, being Puerto Rican as opposed to not was also a positive force on prenatal care adequacy. It helped the most in Duval county; a little less in Hillsborough, Miami-Dade, and Orange; and not significant in Pinellas. Being of Mexican ethnicity had a significant positive effect in Orange County only. In contrast, being Haitian was only significant in two counties (Hillsborough and Orange) in which it had a negative impact on the probability of obtaining adequate care.

Unsurprisingly, being married had a positive effect on getting adequate prenatal care in most counties, by a slightly higher amount in Orange in comparison to the other counties. The mother participating in WIC was not significant in any counties with the exception of Miami-Dade, in which it was slightly detrimental. Having had more than 0 previous live births was slightly detrimental in all counties, with the effect being felt most in Duval county.

Concerning payment sources, there was some variation. Paying with Medicaid was fairly detrimental to the adequacy of care in most counties; however, it increased the likelihood of

adequate care in Miami-Dade county by 1.255. Self-pay, however, was by far the most detrimental factor towards chances of obtaining adequate care in nearly every county; Duval, Hillsborough, and Miami-Dade counties fared the worst.

Table 7. Binary Logistic Regressions of Factors Affecting Prenatal Care Adequacy in Each County

Variables	Model 1			Model 2			Model 3			Model 4			Model 5		
	Duval			Hillsborough			Miami-Dade			Orange			Pinellas		
	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
<b>Age</b>	.075	(.024)	1.078*	.057	(.022)	1.059*	.144	(.016)	1.155*	.104	(.022)	1.109*	.038	(.034)	1.039
<b>Education</b>	.145	(.019)	1.156*	.175	(.018)	1.191*	.144	(.012)	1.155*	.035	(.016)	1.035*	.085	(.027)	1.088*
<b>Race</b>															
Black	-.258	(.050)	.772*	.209	(.054)	1.233*	-.016	(.047)	.984	-.177	(.055)	.837*	-.339	(.080)	.712*
Other	-.533	(.070)	.587*	-.508	(.064)	.602*	.590	(.057)	1.804*	-.385	(.048)	.681*	-.313	(.099)	.731*
<b>Ethnicity</b>															
Cuban	.321	(.187)	1.378	.971	(.101)	2.641*	.777	(.044)	2.174*	.296	(.137)	1.344*	.722	(.261)	2.059*
Haitian	.191	(.245)	1.210	-.564	(.180)	.569*	-.053	(.070)	.948	-.216	(.088)	.805*	.511	(.577)	1.667
Mexican	.177	(.144)	1.193	-.090	(.072)	.914	.182	(.098)	1.199	.312	(.106)	1.367*	.198	(.166)	1.219
Puerto Rican	.595	(.121)	1.813*	.324	(.073)	1.382*	.390	(.100)	1.477*	.372	(.062)	1.451*	.174	(.160)	1.190
<b>Marital Status</b>	.215	(.051)	1.239*	.003	(.049)	1.003	.196	(.037)	1.216*	.238	(.048)	1.269*	.219	(.077)	1.244*
<b>WIC Part.</b>	.060	(.050)	1.061	.045	(.054)	1.046	-.187	(.040)	.829*	-.036	(.048)	.965	.131	(.075)	1.140
<b>Previous Live Births</b>															
Previous Live Births	-.136	(.023)	.873*	-.060	(.022)	.942*	-.093	(.018)	.911*	-.050	(.022)	.951*	-.120	(.034)	.887*
<b>Payment</b>															
Medicaid	-.743	(.055)	.476*	-.641	(.065)	.527*	.227	(.042)	1.255*	.015	(.053)	1.015	-.536	(.089)	.585*
Self-Pay	-1.921	(.161)	.147*	-1.477	(.082)	.228*	-1.464	(.049)	.231*	-.683	(.077)	.505*	-.402	(.179)	.669*
<b>N</b>	10,544			15,038			27,168			11,560			6,136		
<b>Nagelkerke R<sup>2</sup></b>	.148			.111			.129			.042			.071		

Note: B = coefficient. SE = standard error. Exp(B) = exponentiated beta coefficient. \*p < 0.05.

In the final binary logistic regression model (see Table 8), all variables plus dummy variables for each county were included to determine if, controlling for other variables, simply living in a county was a risk factor for receiving inadequate prenatal care. Because Miami-Dade County has the highest percentages of cases that received adequate or adequate plus care (a combined 78.4%), it was used as the reference category.

In this significant model, nearly every variable was significant, most being significant at the  $p < .01$  level. Being of an older age and having more education increased the likelihood of obtaining adequate prenatal care by 1.110 and 1.101 respectively, which are consistent with the literature (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Hetherington et. al, 2018; Magliarditi et. al, 2018; Sidebottom et. al, 2017). Being married improved chances of adequate prenatal care as well, which is an effect also seen in the literature (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Sidebottom et. al, 2017). However, the two factors with the largest positive impact on the likelihood of obtaining adequate prenatal care were being of Cuban or Puerto Rican ethnicity. While the literature generally states that women of color have poorer prenatal care adequacy (Bengiamin, 2009; Green, 2018; Partridge, 2012), Puerto Rican women were 1.344 times likelier to obtain adequate care than non-Puerto Ricans. Cuban women were almost twice as likely than non-Cuban women to obtain adequate care.

More variables had a detrimental effect on the probability of obtaining adequate care. Significant factors that were detrimental included having more than 0 previous live births; being non-white; and using Medicaid as the birth payment option. These are unsurprising, and all seen in the literature on the topic (Bengiamin, 2009; Feijen-de Jong et. al, 2011; Green, 2018;

Partridge, 2012). Out of all the detrimental factors, however, using self-payment as the birth payment method was the most hurtful to the probability of obtaining adequate care.

In comparison with the adequate prenatal care rates in Miami-Dade county, residence in three other counties had statistically-significant worse probabilities of having obtained adequate prenatal care: Duval, Orange, and Pinellas. The likelihood in Pinellas was only slightly worse, but Duval and Orange were even more detrimental, respectively.

Table 8. Binary Logistic Regressions of Factors Affecting Prenatal Care Adequacy in All Counties

Variables	Model 1		
	B	SE	Exp(B)
<b>Age</b>	.104	(.010)	1.110*
<b>Education</b>	.097	(.007)	1.101*
<b>Race</b>			
Black	-.102	(.024)	.903*
Other	-.130	(.026)	.878*
<b>Ethnicity</b>			
Cuban	.657	(.035)	1.929*
Haitian	-.067	(.048)	.935
Mexican	-.008	(.044)	.992
Puerto Rican	.296	(.038)	1.344*
<b>Marital Status</b>	.174	(.021)	1.190*
<b>WIC Part.</b>	-.043	(.022)	.957
<b>Previous Live Births</b>	-.096	(.010)	.909*
<b>Payment</b>			
Medicaid	-.208	(.024)	.813*
Self-Pay	-1.387	(.034)	.250*
<b>County of Residence</b>			
Duval	-.862	(.027)	.422*
Hillsborough	-.012	(.026)	.988
Orange	-1.007	(.026)	.365*
Pinellas	-.154	(.035)	.857*
<b>N</b>	70,446		
<b>Nagelkerke R<sup>2</sup></b>	.138		

Note: B = coefficient. SE = standard error. Exp(B) = exponentiated beta coefficient. \*p<0.05.

## CHAPTER SIX: DISCUSSION

With the Nagelkerke  $R^2$  value for each model ranging from .042 to .148, it is clear that there is variability in what factors contribute to prenatal care adequacy in each county that is not explained by these current models. However, with such high statistical significance of each model, a clearer picture can begin to emerge of issues pertaining to women in each county being unable to obtain adequate prenatal care.

In examining the variables that most significantly impacted the probability of obtaining adequate prenatal care in each county, they were fairly similar. Paying for the birth without the help of Medicaid or private insurance was extremely detrimental in all counties, further confirming an already-observed phenomenon in the literature. Women with private insurance are more able than women without to begin care earlier and attend more appointments, the key components of the Kotelchuck Index (Baer et. al, 2018; Feijen-de Jong et. al, 2011; Green, 2018; Oakley et. al, 2017). While Medicaid did not have as strong of a negative impact on care adequacy in all counties, its effects could be seen in a few; women report many logistical difficulties in trying to obtain care using Medicaid (Daw et. al, 2018; Green, 2018).

The effects of race and ethnicity on care adequacy were interesting. While black women saw worse chances of adequate care in comparison to white women, women of “other” ethnicity’s chances were even less than theirs (with the exception of a few counties). In Hillsborough county, black women had increased chances of obtaining adequate care, while women of “other” race were much worse; in Miami-Dade, black women saw no significant effect due to their race, but women of “other” race had a significant positive effect.



The most protective factor in the entire model was being of Cuban ethnicity, which doubled women's chances of adequate care in three counties. Because women of color normally have worse prenatal care adequacy, these positive findings are unusual (Feijen-de Jong, 2011; Sidebottom et. al, 2017).

There were a few differences in the factors that significantly affected chances of adequate prenatal care in Orange county in comparison to the other four counties examined in the study. Interestingly, women of Mexican ethnicity had greater chances of obtaining adequate care in Orange county; Mexican ethnicity did not have a statistically significant effect in any other county. 65.2% of women who identified as Mexican paid with Medicaid. While Medicaid is not as much of a positive influence on prenatal care adequacy as paying with private insurance, Medicaid births in this study more often had adequate care (47.8%) in comparison to self-paid births (4.7%). 43.5% of Mexican women in Orange County were married, which may have acted as a protective factor, as well as 68.2% also having at least a high school diploma. 35.3% also had never had a previous live birth. WIC use in the literature is a protective factor concerning adequate prenatal care, especially for women of color (Baer et. al, 2018; Green, 2018). This may have been the case here, with 59.3% of Mexican women in Orange County participating in WIC.

Being of Cuban ethnicity had a positive effect on care adequacy for women in Orange county, just not to the extent it did in the other counties. Roughly half (49.4%) of Cuban women in Orange County paid for their birth with Medicaid, which is not as much of a positive factor towards prenatal care adequacy as is paying with private insurance.

Being married had a slightly more impactful positive effect in Orange county than the others. 64.3% of Orange County mothers used private insurance, which may be part of the explanation; 32.7% also had a bachelor's degree, which may be as well. 39.5% were also 30-34 when they gave birth, with 40.3% giving birth to a live infant for the first time.

As previously discussed, self-payment as the payment method for the birth had large negative effects on the mother's chances of obtaining adequate care. However, in Orange county, it was not as detrimental as the others. This may have been helped by 47% of women who self-paid also participating in WIC; they also tended to be older, with 41.3% having no previous live births. 65.2% were also married, with nearly 30% having a bachelor's degree.

While being of other Hispanic ethnicities seems to be beneficial, being Haitian was not in this model (Table 7). Orange was one of two counties in which Haitian women's ethnicities were detrimental to their probability of obtaining adequate care. 33.4% of Haitian women had previously given birth to one live infant, and 55.2% had not attended college. Only 32.3% were able to pay using private insurance; nearly 20% self-paid.

One of the goals of this study was to answer the question that, if controlling for all other variables within the study, was simply residing in Orange County a risk to obtaining adequate care? Unfortunately for Orange County mothers, the model in Table 8 shows that this may be the case. While self-payment for the birth had a higher negative impact, residence in Orange County was next in line as the most detrimental factor when controlling for the other variables in the model.

Concerning what types of variables according to the Andersen model's classifications were the most impactful, enabling factors, specifically payment, emerged as the overall most impactful. Women in these counties who are made to, or choose to, self-pay for their births are not receiving the adequate care they need; overall, 53.8% of women who self-paid received inadequate prenatal care. Where they lived played a part as well; living in Orange and Duval counties made chances of obtaining adequate care much worse than residence in the others. Race and ethnicity, predisposing factors, also made large positive and negative impacts.

## CHAPTER SEVEN: CONCLUSION

Because adequate prenatal care has been shown to be vitally important—lowering rates of both maternal and infant mortality—any factors that contribute to its detriment must be examined in detail. The models in this study demonstrated that non-white and Haitian women in Orange County are likelier to experience inadequate care in comparison to white and non-Haitian women, as well as women who self-paid for their birth. Since we know that the care obtained during pregnancy can influence health outcomes across the lifespan, disparities between groups concerning adequate care may contribute to health disparities between groups for generations (Adler et. al, 2010). Future research or intervention efforts focused on closing gaps in prenatal care adequacy in Orange County should focus on the experiences of non-white women, Haitian women, and women who self-paid for their births.

Though this study examined individual factors that affected the probability of obtaining adequate care, contextual ones are just as important (Feijen-de Jong et. al, 2011). Characteristics of the mother's area such as number of individuals below the poverty line, unemployment rates, and high numbers of single-parent families contribute negatively to adequate care rates. Availability of transportation and medical facilities are impactful as well. While the Kotelchuck Index provides a way to measure the adequacy of prenatal care quantitatively, a limitation of the index is its inability to measure the quality of the care received or the content of the visits. Studies like Sword et. al (2012) describe that women greatly value a meaningful, trusting relationship with her care provider. A woman's amount of social support, as well as attitudes towards healthcare, have also been found to have an impact (Green, 2018).

**APPENDIX A:**  
**FDOH VITAL RECORDS DATA USE AGREEMENT**



2019008

**Vital Records Data Use Agreement**

**Background and Purpose**

The Bureau of Vital Statistics at the Florida Department of Health (DOH) may release vital records data to entities with an approved Vital Records Data Use Agreement (Data Use Agreement) for purposes authorized by section 382.025, Florida Statutes. All persons with data access must sign the Data Use Agreement outlining the terms and conditions for using vital records data. A data use agreement is specific to the individual project and all projects require annual review.

The Bureau of Vital Statistics at the DOH conducts a detailed review of every application for access to vital records data and makes a determination on a case by case basis. Requests for confidential data will be granted only if the project meets the statutory criteria, the criteria above, and the project cannot be reasonably completed with de-identified information.

Approved applicants are held to the highest ethical standards and must agree to the stipulations detailed in the Data Use Agreement.

**Return application to:**  
Bureau of Vital Statistics  
Florida Department of Health  
Attn: Gary Sammet  
1217 N. Pearl Street  
Jacksonville, FL 32202

**RECEIVED**

FEB 04 2019

Public Health Statistics  
Bureau of Vital Statistics



**Vital Records Data Use Agreement**

**Date:** 1/9/2019

**I. Project Director Information**

**Name of Requestor:** Lauren Daniel

**Title:** Factors Contributing to Low Adequate Prenatal Care Rates in Orange County, Florida

**Requestor's Organization/Agency:** University of Central Florida, Department of Sociology

**Mailing Address:** 4297 Andromeda Loop N.  
Howard Phillips Hall, room 403  
Orlando, FL 32816-1360

**Telephone Number:** 407-823-1357 (office) 229-421-9511 (cell)

**Fax Number:**

**E-Mail Address:** laurenannedaniel@knights.ucf.edu

**Contact Person (if different from Project Director):**

**Contact Person's Telephone Number:**

**Contact Person's E-Mail Address:**

**Does this application update a previous Data Use Agreement?**  Yes  No

**If yes, provide Study Number of previous Data Use Agreement:**

**RECEIVED**

**FEB 04 2019**

Public Health Statistics  
Bureau of Vital Statistics

**II. Project Summary**

**Provide a brief title for your project or study:** Factors Contributing to Low Adequate Prenatal Care in Orange County, Florida

**Purpose of the Project:** (Provide detailed explanation)

Compared to other large central metro Florida counties, Orange County has a significantly ( $p < .001$ ) lower average percentage of births with adequate prenatal care from 2007-2017, at 57.85%. The other four counties in the same NCHS urban-rural classification (Duval, Hillsborough, Miami-Dade, and Pinellas) have an average of 72.45% over the same time period.

The purpose of my research is to use a series of linear regression models to determine what variables contribute most to Orange County's lower average percentage of births with adequate prenatal care out of the most common factors cited in similar studies in other locations (age; parity [amount of children previously had]; race; ethnicity; marital status; educational attainment; delivery payment source; WIC participation status).

As prenatal care has been shown to lower maternal and infant mortality, less women receiving adequate care is an important health issue. Obtaining data as to the causes of this low percentage may help

to inform future intervention efforts to increase the adequacy of prenatal care of women in Orange County.

**Intended Use of the Data:** (Provide detailed information)

The intended use of the data is to be statistically analyzed in order to complete my Applied Sociology Master's thesis from the University of Central Florida.

Please describe your plan for the release of results, including plans for public dissemination, if any: MA theses completed at UCF are electronically published into UCF's Theses and Dissertations repository (STARS, <https://stars.library.ucf.edu/thesedissertations/>)

**The publication must cite the DOH as the data source.** A disclaimer must also be included that "any published findings and conclusions are those of the authors and do not necessarily represent the official position of the Florida Department of Health."

**The Project Director is the Data Custodian for this project; however, there are some circumstances which may allow another person to be the Data Custodian.**

[The Data Custodian is responsible for observance of all conditions of use and for establishment and maintenance of physical and electronic security arrangements to prevent unauthorized use. This individual must have the legal authority to keep the information confidential and maintain confidentiality. If the custodian is changed, the organization must promptly notify the DOH Division of Public Health Statistics and Performance Management.

**Are you the Data Custodian for this project?**  Yes  No

**If no, please indicate the name of the Data Custodian and their relationship to the requestor's organization:**

**Is the requested data needed for work being performed under contract with the DOH?**  Yes  No

**If yes, then please provide the DOH contract manager's name:**

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**III. Data Requested and Specifications**

<u>Data Requested</u>	<u>Data Specifications</u>	<u>Data Format</u>
<input checked="" type="checkbox"/> Birth	<input checked="" type="checkbox"/> Years	<input type="checkbox"/> Photocopies
<input type="checkbox"/> Fetal Death	(Specify) 2017	<input checked="" type="checkbox"/> Electronic Transfer (Secure FTP)
<input type="checkbox"/> Death with cause-of-death	<input type="checkbox"/> Statewide Data	
<input type="checkbox"/> Death without cause-of-death	<input checked="" type="checkbox"/> County Only	
<input type="checkbox"/> Marriage	(Specify) Duval;	
<input type="checkbox"/> Dissolution of Marriage	Hillsborough; Miami-Dade;	
	Orange; Pinellas; Seminole	

**IV. Variables and/or Linking (Matching) of Data**

List the specific variable names being requested here or in an attachment to the data use agreement :

- MOTHER\_RES\_COUNTY
- MOTHER\_AGE
- LIVE\_BIRTHS\_LIVING
- MOTHER\_ETHNIC\_YES
- MOTHER\_RACE\_WHITE
- MOTHER\_MARRIED
- MOTHER\_EDCODE
- PRINCIPAL\_SRCPAY\_CODE
- MOTHER\_WIC\_YESNO
- Kotelchuck\_Index
- HOME\_BIRTH\_PLANNED
- FACILITY\_TYPE\_CODE
- PLURALITY\_CODE
- PRINCIPAL\_SOURCE\_PAY
- SCREEN\_CONSENT
- PROGRAM\_CONSENT
- MR\_PREV\_POOR\_OUTCOME
- ATTENDANT\_TITLE\_CODE
- TOBACCO\_USE\_YESNO
- ALCOHOL\_USE
- PRENATAL\_YESNO
- PRENATAL\_DATE\_BEGIN\_MONTH
- PRENAT\_TOT\_VISITS
- MOTHER\_MEXICAN
- MOTHER\_PR
- MOTHER\_CUBAN
- MOTHER\_ETHNIC\_OTHER
- MOTHER\_HAITIAN
- MOTHER\_ETHNIC
- MOTHER\_RACE\_BLACK

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Will the data requested be linked or matched with any other data sources ?  Yes  No

If yes, describe in detail any linking of requested vital statistics data with any other data sources. Specify the data sources, the variables which will be used for linking, (SSN, name, etc.), and which variables will be kept in the linked file.

If the applicant will be linking the data, provide a detailed description of the linking methodology to be used. If the requestor will need DOH to match or link records, describe how the data needing to be matched or linked will be provided.

#### V. Security and Confidentiality

The release of information that may lead to the identification of individuals or be traced back to an individual record is prohibited. However, statistical and research results based on the data provided by the Bureau of Vital Statistics pursuant to this Agreement may be released. Any person(s) who access, disclose or use personally identifiable information in a manner or for a purpose not authorized by this agreement may be subject to civil and criminal sanctions contained in applicable federal and state statutes.

Only the listed Data Custodian or authorized users listed on this agreement may access data. Describe where data will be stored and how data will be accessed by authorized users. The data will be stored and accessed on my University of Central Florida computer user account.

Do you agree to each of the following requirements?

- 1) The files will be used only to accomplish the research project described in this agreement.  Yes  No
- 2) These files, or any files extracted or derived from them, will not be released to other organizations or individuals who have not been named in this agreement.  Yes  No
- 3) No attempt will be made to link information from any other source to records for specific individuals for whom records are included in these files, unless authorized by this agreement.  Yes  No
- 4) No listing of information from individual records, with or without identifiers, will be published or otherwise released.  Yes  No
- 5) No statistical tabulations or research results will be released which reveal information about identifiable individuals.  Yes  No
- 6) Statistical and research results derived from these files may be published. However, no results may be copyrighted by the author without the permission of the Bureau of Vital Statistics.  
 Yes  No

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#### VI. Data Destruction Schedule

Consistent with Florida law, applicants must make provisions for the destruction of records at the conclusion of their project, or when the data is no longer required. Maintaining the privacy of the individuals whose personal information is included in vital records is required to preserve the integrity of the data sharing process.

Please detail the manner and timeline for destruction. If you are following a data destruction policy set by your organization or agency, please attach that policy to your application. Per IRB policy, data must be kept for five years. No identifying data will be used, and the file will be deleted after five years.

#### VII. Data Use by Others

Bureau of Vital Statistics 03/20/2017

- 5 -

Will any sub-contractors affiliated with this project use the data during the course of the project?

Yes  No

If yes, each sub-contractor or other individual will need to complete a separate Data Use Agreement. Please identify the individuals of the sub-contractor who will have access or be using the data and describe the work they will perform.

### VIII. Fees

Prior to generating the data, the DOH will provide an estimate of the costs incurred in its preparation. Once the request is approved and payment received, the data will be provided. A waiver or reduction of the fees authorized by section 382.0255(1), Florida Statutes, will be considered only if the intended use of the data will have a direct health-related benefit to Florida citizens. If a waiver or reduction of the fees is requested, describe how use of the data is a direct benefit to Florida citizens.

The purpose of this project is to determine factors that contribute to Orange County's low percentage of births with adequate prenatal care (56.4% received adequate prenatal care in 2017). As a type of preventative medicine, prenatal care monitors both the mother and infant's health throughout the pregnancy and has been shown to lower infant and maternal mortality. The less adequate a woman's prenatal care, the less care she receives, which may lead to negative birth outcomes for both her and the infant.

First, knowing more specifically why the percentage is so low will help in the possible development of health interventions to remedy the issue. Secondly, in 2017, 58.7% of births to white women received adequate prenatal care; only 52.2% of black and other mothers received adequate care. Since 1998, women of color have received less adequate care than white mothers each year. This lack of healthcare before birth contributes to health disparities between white people and people of color that last across the life span and continue through generations.

The first steps to increasing prenatal care adequacy is through research that shows where improvement is needed. This research will contribute to that process and will hopefully assist in future efforts to improve prenatal care adequacy for women in Orange County.

(Data on percentages of births with adequate prenatal care were obtained from the FLHealthCHARTS.com website.)

### IX. Contact with Human Subjects

No contacts of any kind can be made with any person named on a certificate or data file or related persons without the written permission of the Bureau of Vital Statistics and review by the DOH Institutional Review Board (IRB). If the project requires DOH IRB review, applicants must first submit a signed and notarized Data Use Agreement along with the protocol for review to the Bureau of Vital Statistics. A Data Use Agreement may be rejected if the research protocol involves intrusive follow-back of research subjects.

Will the project involve direct contact with individuals or establishments mentioned on the record?

Yes  No

If so, describe the need for such activity and the types of individuals or establishments who will be contacted.

### X. All Staff Accessing the Information

List name, title, affiliation and role in this project for each authorized user:

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Dr. Amy Donley, University of Central Florida Department of Sociology, Faculty Advisor

**XI. Use and Consent of the Data**

Vital records data may only be used for the specific purpose(s) described in this agreement. All persons with data access must maintain the confidentiality of the data and prevent release to unauthorized parties. All publications, tabular presentations, maps or depictions of cartographic information must aggregate results to protect the identity of individuals and comply with applicable state and federal laws. The Division of Public Health Statistics and Performance Management, Bureau of Community Health Assessment, Section of Public Health Reporting shall be notified immediately by phone (850-245-4037) after discovery of any use or disclosure of the data not provided for by this agreement.

As the signatory for this agreement as the Data Custodian, the Data Custodian bears full responsibility for adhering to all data confidentiality, security policies, and the terms of this agreement. The Data Custodian serves as the point of contact for receiving, maintaining, protecting, and ultimately destroying the data provided by DOH. Data may be used by the custodian only for the purpose stated in this agreement and may not be used for any other purpose. No entity with data access may link vital records data with any other source of information without the written authorization of the Bureau of Vital Statistics. Additionally, proper physical, computer and system security safeguards will be maintained by the signatory's requestor's organization/agency pursuant of the agreement.

**Physical Security**

The requestor's organization shall ensure that DOH data are used and stored in an area that is physically safe from access by unauthorized persons during working hours and non-working hours. The requestor's organization agrees to safeguard DOH data from loss, theft, or inadvertent disclosure and, therefore, agrees to:

1. Secure all areas of the organization's facilities where employees assist in the administration of the program's use or disclose DOH data. Ensure that authorized individuals only access these secure areas with properly coded key cards, authorized door keys or access authorization; and access to premises is by official identification.
2. Issue identification badges to workers who assist in the administration of the organization's programs and require the organization's workers to wear these badges at organization's facilities where DOH data are stored and used.
3. Store paper records with DOH data in locked spaces, such as locked file cabinets, locked file rooms, locked desks, or locked offices in facilities which are multi-use, meaning that where the requestor's organization and non-requestor's organization functions in one building in work areas that are not securely segregated from each other.
4. Use all reasonable measures to prevent non-authorized personnel and visitors from having access to, control of, or viewing DOH data.

**Computer Security Safeguards**

The requestor's organization agrees to comply with the general computer security safeguards, system security controls, and audit controls in this section.

**General Computer Security Safeguards:**

1. Encrypt portable computer devices, such as but not limited to, laptops and notebook computers, that process and/or store DOH data with an encryption solution that is full-disk utilizing a minimum algorithm of 256 bit AES or 3DES (Triple DES) if AES is unavailable.

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2. Encrypt workstations where DOH data are stored using an encryption product that utilizes a minimum algorithm of 256 bit AES, or 3DES (Triple DES) if AES is unavailable, and is recognized as an industry leader in meeting the needs for the intended solution.
3. Ensure that only the minimum necessary amount of DOH data is downloaded to a laptop or hard drive when absolutely necessary for current business purposes.
4. Encrypt all electronic files that contain DOH data when the file is stored on any removable media type device (i.e., USB thumb drives, floppies, CD/DVD, portable hard drives, etc.) using an encryption product that utilizes a minimum algorithm of 256 bit AES, or 3DES (Triple DES) if AES is unavailable, and is recognized as an industry leader in meeting the needs for the intended solution.
5. Ensure that all emails sent outside the requestor's organization's e-mail environment that include DOH data are sent via an encrypted method using an encryption product that is recognized as an industry leader in meeting the needs of the intended solution.
6. Ensure that all workstations, laptops and other systems that process and/or store DOH data have a commercial third-party anti-virus software solution and are automatically updated when a new anti-virus definition/software release is available.
7. Ensure that all workstations, laptops and other systems that process and/or store DOH data have current security patches applied and are up-to-date.
8. Ensure that all DOH data are wiped from all systems and backups when the data is no longer legally required. The requestor's organization shall ensure in writing that the wipe method conforms to the US Department of Defense standards for data destruction.
9. Ensure that any remote access to DOH data are established over an encrypted session protocol using an encryption product that is recognized as an industry leader in meeting the needs of the intended solution. The requestor's organization shall ensure all remote access is limited to the minimum necessary and maintains the principles of least privilege.

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**System Security Controls**

In order to comply with the following system security controls, requestor's organization agrees to: **Public Health Statistics Bureau of Vital Statistics**

1. Ensure that all systems containing DOH data provide an automatic timeout after no more than 15 minutes of inactivity.
2. Ensure that all systems containing DOH data display a warning banner stating that data is confidential, systems are logged, and system use is for business purposes only. Users shall be directed to log off the system if they do not agree with these requirements.
3. Ensure that all systems containing DOH data log successes and failures of user authentication and authorizations granted. The system shall log all data changes and system accesses conducted by all users (including all levels of users, system administrators, developers, and auditors). The system shall have the capability to record data access for specified users when requested by authorized management personnel. A log of all system changes shall be maintained and be available for review by authorized management personnel.
4. Ensure that all systems containing DOH data uses role-based access controls for all user authentications, enforcing the principle of least privileges.

5. Ensure that all data transmissions over networks outside of the requestor's organization's control are encrypted end-to-end using an encryption product that is recognized as an industry leader in meeting the needs for the intended solution when transmitting DOH data. Encrypt DOH data at the minimum of 256 bit AES or 3DES (Triple DES) if AES is unavailable.
6. Ensure that all systems that are accessible via the Internet or store DOH data interactively use a comprehensive third-party real-time host-based intrusion detection and prevention program or are protected at the perimeter by a network based IDS/IPS solution.

Any failure of persons listed in this agreement to abide by the terms of this agreement constitutes a breach and may result in legal action and/or the demand for immediate return of all data obtained hereunder and the destruction under the supervision of the DOH of all copies of the data in the requestor's, the organization's, employees, agents, assigns, or subcontractor's possession. All actions brought under this agreement will be in the State of Florida. In any action brought by the DOH under this agreement in which the DOH prevails, the DOH shall be entitled to its attorney's fees and court costs.

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\*\*\* All persons who come in direct contact with vital statistics data are required to sign this agreement. If additional signatures are required, please provide them on the last page of this agreement.

Project Director's Name (Please Print): Lauren Daniel

Project Director's Signature (Notarization Required):

Lauren Daniel Lauren Daniel

Attest (If applicant is a corporation): \_\_\_\_\_  
(As Corporate Secretary)

Subscribed and sworn before me LAUREN DANIEL this 9th day of JANUARY, 2019.

Notary Public, State of Donna Rio  
Notary Public Signature (Affiliated Notary Stamp) 01/16/2021  
Donna Rio  
NOTARY PUBLIC  
STATE OF FLORIDA  
Comm# GG151970

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Fees Waived: Yes  No  Fees Reduced: Yes  No   
DOH IRB Recommendation: Yes  No

Florida Department of Health Reviewers:

Danny... (Reviewer 1)  
Maria Bailey (Reviewer 2)

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Florida Department of Health Authorization:

Ken Jones  
State Registrar/Bureau Chief  
Bureau of Vital Statistics  
Date 2/12/19

This agreement shall expire one year from the date above. If the agreement is not renewed, all vital records data must be handled in accordance with the Data Destruction Plan .



**Vital Records Data Use Agreement**

Signatures below, by individuals who will access vital records data as authorized users, acknowledging agreement to the terms of this Data Use Agreement.

Name  
(Please Print) *Amy Donley*

Signature: *[Handwritten Signature]*

Name:  
(Please Print)

Signature: \_\_\_\_\_

Name:  
(Please Print)

Signature: \_\_\_\_\_

Name:  
(Please Print)

Signature: \_\_\_\_\_

Name:  
(Please Print)

Signature: \_\_\_\_\_

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## **APPENDIX B: UCF IRB NON-HUMAN RESEARCH DETERMINATION**



UNIVERSITY OF CENTRAL FLORIDA

**Institutional Review Board**

FWA00000351  
IRB00001138  
Office of Research  
12201 Research Parkway  
Orlando, FL 32826-3246

NOT HUMAN RESEARCH DETERMINATION

February 4, 2019

Dear [Lauren Daniel](#):

On 2/4/2019, the IRB reviewed the following protocol:

Type of Review:	Initial Study
Title of Study:	Factors Contributing to Low Adequate Prenatal Care Rates in Orange County, Florida
Investigator:	<a href="#">Lauren Daniel</a>
IRB ID:	STUDY00000076
Funding:	None
Grant ID:	None
Documents Reviewed:	• HRP-250-FORM- Request for NHSR v11.19.18.docx, Category: IRB Protocol;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving human in which the organization is engaged, please submit a new request to the IRB for a determination. You can create a modification by clicking **Create Modification / CR** within the study.

If you have any questions, please contact the UCF IRB at 407-823-2901 or [irb@ucf.edu](mailto:irb@ucf.edu). Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Renea Carver  
Designated Reviewer

## **APPENDIX C: FDOH IRB EXEMPTION**

**Mission:**  
To protect, promote & improve the health  
of all people in Florida through integrated  
state, county & community efforts.



**Ron DeSantis**  
Governor

**Vision:** To be the Healthiest State in the Nation

NOTIFICATION OF DEPARTMENT OF HEALTH DETERMINATION OF EXEMPTION

March 8, 2019

To: Lauren Daniel

Protocol Title: Factors Contributing to Low Adequate Prenatal Care Rates in Orange County, Florida

Review Type: Staff

The Ethics and Human Research Protection Program determined your study qualifies for one or more exemptions from federal regulations governing research involving human participants:

- **45 CFR 46.101(b)(4)** Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or the information is recorded by the Investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects

If there is a change in the activity, it may no longer qualify for exemption. Please contact the Ethics and Human Research Protection Program to determine if changes in your project require IRB review.

This determination of exemption is contingent upon continued ethical research practice and your agreement to obtain informed consent and authorization from your subjects, unless waived. Please make certain that confidentiality is maintained. You must abide by the policies and procedures of the Florida Department of Health with regard to the use of human subjects in research, and keep appropriate records concerning your subjects.

If you have questions, want to offer suggestions, or talk with someone about this or other projects, please contact Rotanya Bryan or Bonnie Gaughan-Bailey at the Department of Health IRB at (850) 245-4585 or toll-free in Florida (866)-433-2775.

Thank you for your cooperation with the IRB.



Sincerely,

Bonnie Gaughan-Bailey, MPA, ASQ-CQIA  
Administrator  
Biomedical Research Section  
Public Health Research

Federal Wide Assurance#: 00004682

**Florida Department of Health**  
**Division of Community Health Promotion**  
4052 Bald Cypress Way, Bin A-13 • Tallahassee, FL 32399  
PHONE: 850/245-4100 • FAX: 850/414-8091  
**FloridaHealth.gov**

**PHAB** Accredited Health Department  
Public Health Accreditation Board

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