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Prenatal Anxiety and Cesarean Delivery in a Clinic Population

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FINAL DNP CAPSTONE TECHNICAL REPORT

Prenatal Anxiety and Cesarean Delivery in a Clinic Population

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University of Kentucky

College of Nursing

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Executive Summary

Prenatal Anxiety and Cesarean Delivery in a Clinic Population

Prepared by: Carol A. Kirby, RN, CNM, MSN

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INTRODUCTION:

This document summarizes the results of a clinical study entitled *Prenatal Anxiety and Cesarean Delivery in a Clinic Population*. The project focused on prenatal anxiety drawn from clinical settings in Kentucky and Virginia. Prenatal anxiety was defined as Spielberger's state anxiety. The characteristics of participants who reported high anxiety were compared to those with low anxiety, and the association between high anxiety and cesarean deliveries was determined.

OBJECTIVE:

The primary purpose of the study was to perform a secondary analysis of an existing data set to assess if there was a relationship between prenatal state anxiety levels and mode of delivery. In addition, the pattern of state anxiety over the course of pregnancy was examined as well as associations between state anxiety and characteristics of the population.

SUMMARY OF FINDINGS:

The findings showed an association between high prenatal state anxiety levels and lack of education, low income, unemployment, multiple pregnancies and low Autonomy and Relatedness Inventory (ARI) scores. In the population studied there was no statistical or meaningful association found between state anxiety levels (during each of the trimesters of pregnancy and over the course of pregnancy) and delivery by cesarean. However, 41% of the respondents reported high state anxiety in one or more trimesters of pregnancy which speaks to the fact that anxiety was a problem for many of those studied and it needs to be addressed.

BACKGROUND:

In the Commonwealth of Kentucky, the 2013 cesarean delivery rate was 36.6% and Virginia's 2013 cesarean delivery rate was 33.8%, both of which were well above the 2013 national average of 32.7%.

Although the rate is no longer increasing, the current cesarean delivery rate of about one in three births far exceeds the upper limit of 15% advised by the World Health Organization. Delivery by cesarean is known to cause adverse outcomes for both neonates and their mothers.

Prenatal anxiety is an issue that nurses are interested in for several reasons: it is a patient condition which impacts the patient's quality of life and in some cases ability to function at full capacity, it may contribute to poor pregnancy outcomes and it is something that is amenable to change. Spielberger's State Trait Anxiety Inventory (STAI) has been determined to be a valid and reliable measure and is widely used globally in research with pregnant women. There is a possible score ranging from 20-80 on the state subsection of the STAI Form Y tool with higher scores indicating greater anxiety. Similar to other researchers, women participating in this study were categorized as having high state anxiety if they scored above 40 on the STAI state anxiety scale.

Although there is an abundance of literature on the topics of prenatal anxiety, stress, depression, etc. during pregnancy, very little research has been conducted on the impact of prenatal anxiety on cesarean delivery and the studies which have been conducted have resulted in conflicting results.

METHODS:

The data set utilized in the analysis was developed by Ashford et al. (2015) with grant funding and the project was IRB approved. A multi-racial/ethnic population of 440 pregnant women was recruited to participate over a period of almost 6 years (from January 2008 through November 2013). Inclusion criteria were: pregnant women greater than 16 years of age with a single gestation pregnancy. Participants were excluded from both studies if they had any of the following risk factors: history of diabetes (Type1 and Type 2; history of heart disease, current history of illegal or prescription drug abuse; second trimester diagnosis of bacterial vaginosis (BV) or sexually transmitted disease, multi-fetal pregnancies (participants that were pregnant with more than one fetus); and women with a previous normal pregnancy who delivered preterm/low birth weight during the current pregnancy. There were four prenatal data collection periods: 1) 5-13 weeks; 2) 14-26 weeks; 3) 27-36 week's gestation; and 6 weeks

postpartum. Statistical analyses were used to determine the association between state anxiety and selected demographic variables (age, race/ethnicity, education, annual household income, employment, and gravidity/parity) and the additional variables of interest, Autonomy and Relatedness Inventory [ARI] scores and the outcome variable, mode of delivery.

RESULTS:

Study Question #1: What is the pattern of state anxiety over the three trimesters of pregnancy?

There was no apparent pattern with regard to which trimester in which a greater proportion of women reported high state anxiety.

Study Question #2: What are the associations between characteristics of the population and state anxiety?

Trimester specific:

- Age and race were not associated with state anxiety scores in any trimester.
- Education was negatively associated ($p = .014$) with state anxiety during the second trimester of pregnancy.
- Income was negatively associated ($p = .035$) with state anxiety during the second trimester of pregnancy.
- Employment status was negatively associated ($p = .000$) with state anxiety during the third trimester of pregnancy.
- Gravida status (# of pregnancies) was positively associated with state anxiety scores during the first ($p = .021$) and third ($p = .024$) trimesters of pregnancy.
- Autonomy and Relatedness Inventory (ARI) was negatively associated ($p = .002$) with state anxiety scores in all three trimesters of pregnancy.

Over the Course of Pregnancy:

- Age, race, education, and gravida status (# of pregnancies) were not associated with state anxiety scores over the course of the pregnancy.

- Income ($p = .048$), employment ($p = .005$) and Autonomy and Relatedness Inventory (ARI) scores ($p = .002$) were found to be negatively associated with state anxiety scores over the course of the pregnancy.

Study Question #3: Is there an association between prenatal state anxiety levels and mode of delivery?

There was no statistical or meaningful association found between state anxiety levels (during each of the trimesters of pregnancy and over the course of pregnancy) and delivery by cesarean.

RECOMMENDATIONS FOR PRACTICE:

- The data in this study suggests that transient state anxiety might be a symptom of difficulties in everyday coping due to a lack of resources including social support.
- Health care practitioners should look at the holistic picture of the expectant mother when assessing anxiety and formulating a plan of care. These findings highlight the need for a multidisciplinary approach in which practitioners work in collaboration with other disciplines to find ways to see that the multiple economic, social, and psychological needs of pregnant women are met.
- Nurses should focus on interventions such as dealing with more tangible things such as education about pregnancy and what to expect in childbearing, how to cope with limited income and a growing family as well as available social support after pregnancy.

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Introduction

This project focuses on prenatal anxiety in a clinical population, the characteristics of participants with reported high anxiety, and its association with cesarean deliveries. During the time period from 1990 to 2012, the cesarean delivery rate in the United States was at its lowest in 1996 with a 20.7% cesarean delivery. The national cesarean delivery rate rose nearly 60% from 1996 to 2009. By 2009, the rate increased to 32.9%. The rate declined slightly from 2009 to 2010 (from 32.9% to 32.8%), and has been stable ever since at 32.7% (U.S. Department of Health and Human Services, 2013; Center for Disease Control [CDC], 2014). Although the rate is no longer increasing, the current cesarean delivery rate of about one in three births far exceeds the upper limit of 15% advised by the World Health Organization (U.S. Department of Health and Human Services, 2013). In the Commonwealth of Kentucky, the 2013 cesarean delivery rate was 36.6% and Virginia's 2013 cesarean delivery rate was 33.8%, both of which were well above the 2013 national average of 32.7% (CesareanRates.com, 2014).

Cesarean birth can be life-saving for the fetus, the mother, or both in certain cases. However, the high cesarean delivery rates in the United States without clear evidence of concomitant decreases in maternal or neonatal morbidity or mortality raises significant concern that cesarean delivery is overused. In addition to clinically indicated cesarean deliveries (failure to progress and non-reassuring fetal heart tones), other non-clinical factors may contribute to the increasing cesarean delivery rates in the United States. In a large, multicenter, retrospective study Haberman et al. (2014) found that among women delivering by primary cesarean (first delivery), non-clinical factors contributing to cesarean deliveries were: delivery during evening hours; a male provider; public health insurance; and nonwhite race. For example, a nonwhite multipara had a 2.4-fold increased risk for cesarean compared with a white multipara (6.9% versus 3.2%). Haberman et al. (2014) concluded that among hospitals which rarely allowed elective cesarean deliveries (patient demand), the cesarean rate was 36% lower as compared to hospitals which routinely allowed elective cesarean deliveries. Additionally, the researchers found that among hospitals which routinely utilized epidural analgesia for labor, they were 1.7 times more likely to perform a cesarean delivery.

Delivery by cesarean is known to cause adverse outcomes for both neonates and their mothers. Cesarean deliveries are linked to pulmonary disorders such as transient tachypnea of the newborn; infant and respiratory distress syndrome; and transfer to neonatal intensive care (Kolås, Saugstad, Daltveit, Nilsen, & Øian, 2006). Adverse sequelae for mothers may include an increased risk of uterine rupture and implantation difficulties in subsequent pregnancies (National Institute of Health [NIH], 2006). O'Neill et al. (2014) recently reported that women with a prior cesarean delivery had a 14% increased risk of subsequent stillbirth and a 9% rate of ectopic pregnancy compared with women who had a spontaneous vaginal delivery.

Prenatal anxiety has been associated with increased requests for elective cesarean deliveries (Nama & Wilcock, 2011; Nerum, Halvorson, Sorlie, & Oien, 2006). Tocophobia, an intense fear of childbirth which contributes to high prenatal anxiety, appears to be the most important reason for women requesting a caesarean delivery (Nama & Wilcock, 2011). Nerum et al. (2006) found that fear of childbirth was accompanied by extensive psychosocial problems in most women. The researchers reported that in their 2006 study, 90% of women requesting an elective cesarean delivery had experienced anxiety or depression; 43% had eating disturbances, and 63% had been subjected to abuse.

Physician preference may play a role in the greater prevalence of elective cesarean deliveries (Potter et al., 2001). Potter et al. (2001) discusses that in their study, there was a large difference in the rates of caesarean section between public and private patients and this difference was attributable to a greater prevalence of unwanted caesarean sections among private patients rather than to a difference in preferences regarding type of delivery. The researchers suggested that scheduled cesarean deliveries may be more convenient or the savings in time gained by cutting labor short may motivate obstetricians to choose a caesarean delivery for their private patients (Potter et al., 2001).

Nurses serve a vital role in maximizing the health and health care experiences of pregnant women and new mothers. Prenatal anxiety is an issue that nurses are interested in for several reasons: it is a patient condition which impacts the patient's quality of life and in some cases ability to function at full capacity (Atwood, 2013), it may contribute to poor pregnancy outcomes (Kolås et al., 2006), and it is

something that is amenable to change**.** Beyond this, women with high stress, anxiety, and depressive symptoms in pregnancy are more likely to be impaired during the postpartum period (Dunkel Schetter & Tanner, 2012).

Pregnancy is a time of stress and anxiety for many women. In a 2009 survey, 52% percent of women reported increased anxiety or depression while pregnant (Anxiety and Depression Association of America [ADDA], 2014). Spielberger (1989) defined anxiety as a non-observable subjective experience that is characterized by feeling of apprehension, tension and dread. Spielberger relates that anxiety can be viewed in the context of transient episodes of increased anxiety (state anxiety) or as a continuous anxious state (trait anxiety). Stressors such as body image changes, fluctuating hormonal levels, sleep alterations, family dynamics, unexpected life events, available social support, fear of childbirth and pregnancy complications all play a role in self-reported anxiety levels (Hall, Stoll, Hutton, & Brown, 2012); (Johnson & Slade, 2002); (Lobel, 1994).

Prenatal anxiety has been studied in conjunction with depression (Andersson, Sundstrom-Poromaa, Wulff, Astrom, & Bixo, 2004; Fatoye, Adeyemi, & Oladimeji, 2004) as a component of stress (Alderdice, Lynn, & Lobel, 2012; Saunders, Lobel, Veloso, & Meyer, 2006) with fear of childbirth (Hall et al., 2012; Johnson & Slade, 2002) with fatigue and lack of sleep (Hall et al., 2012) and with lack of social support (Aktan, 2012; Zhou & Li, 2011). An important area of research is prenatal anxiety during pregnancy and its effect on obstetrical outcomes. Prenatal anxiety has been found to produce negative effects on the maternal-fetal-placental systems (Dunkel Schetter & Tanner, 2012) which may impact labor initiation and contribute to an increased rate of labor inductions. Prenatal Maternal Stress (PNMS) has been reported to be associated with delivery analgesia (primarily epidural analgesia) and unplanned cesarean deliveries (Saunders et al., 2006). Additionally, prenatal anxiety may be associated with uterine dysfunction (Ryding, Wijma, B., Wijma, K., & Rydhstrom, 1998). It has been hypothesized that there is a positive relationship between adrenaline and anxiety at the pushing phase of delivery and lower uterine contractility which may contribute to dysfunctional labors (Lederman, Lederman, Work & McCann, 1978). Dysfunctional labors may lead to fetal distress which is an indication for an expedited assisted

vaginal delivery as well as an emergency cesarean delivery. Anxiety related to childbirth fear contributes to increased requests for elective cesarean deliveries (Sjogren & Thomassen, 1997). This is an especially pertinent area of inquiry in the United States, where birth by cesarean delivery accounted for 32.7% of all deliveries in 2013 (CDC, 2014).

Literature Review

The literature review was carried out by searching on Academic Search Premier, PubMed, CINAHL, Cochrane and PsychINFO databases (1994 – 2014) using various combinations of the search terms "prenatal anxiety," "anxiety during pregnancy," " fear of childbirth," "mode of delivery," "obstetrical outcomes," "cesarean section," "delivery," "pregnancy outcomes'" and "birth." The broad search initially yielded 346 results. To narrow the search, the following inclusion criteria were added: full text articles in the English language from 1994 – 2014, focus on prenatal anxiety, focus on articles that have assessed prenatal anxiety at one or more time points, studies that used a validated measure of anxiety and studies that included mode of delivery as a specific outcome measure. Studies older than 1994 were excluded. With the addition of the inclusion criteria, the search yielded 11 articles which met the search terms.

Of the 11 articles located, four were literature reviews related to prenatal anxiety, and three were meta-analyses. The literature reviews and meta-analyses were reviewed in detail and yielded four additional research studies which were manually retrieved. Ultimately, this search located eight full text articles that met the inclusion criteria. There were no studies located in the Cochrane library which assessed the relationship between prenatal anxiety and mode of delivery.

Although there is an abundance of literature on the topics of prenatal anxiety, stress, depression, etc. during pregnancy, very little research has been conducted on the impact of prenatal anxiety on cesarean delivery and the results are conflicting. The lack of a sufficient number of studies and inconsistencies in the methods and findings of the studies make conclusions problematic. Six out of eight of the studies reviewed seemed to suggest that there was some evidence for a positive association

between prenatal anxiety levels and cesarean delivery but in view of the limitations of some of the studies, much more work is needed. For details of the studies reviewed see Table A-1 in the Appendix.

Spielberger's State-Trait Anxiety Inventory (STAI) and its subset the State Anxiety Inventory (SAI) as well as the State Trait Personality Inventory (STPI) were the most frequently used measure of prenatal anxiety in the studies reviewed. Sample sizes varied from less than 200 participants to almost 2000 participants. The average sample for the smaller studies were approximately 300 participants. The studies located were from a variety of different countries including China, Canada, Spain, Sweden, the United Kingdom and the United States. Globally, there appears to be a growing interest in understanding the impact of prenatal anxiety on cesarean delivery rates.

Upon close review of the available literature, it is apparent that the studies reviewed had several limitations. Selection bias may be considered when participants include only low-risk women or women that are recruited by mailed questionnaires. For example, Johnson and Slade (2002) discussed that a limitation to their study included a 35% response rate which may have caused a response bias because women who chose to respond to the questionnaire made up the entire sample studied. The researchers related that the higher levels of fear in their sample might suggest that women with lower levels of fear or anxiety may have chosen to not respond to the questionnaire. Johnson and Slade (2002) indicated that "face-to-face, clinic-based recruitment may have reduced the likelihood of such a response bias" (p. 1219).

All of the studies reviewed utilized differing inclusion/exclusion criteria with some of the studies limiting participation to healthy low-risk pregnant women. A variety of instruments and measures were used to assess prenatal anxiety levels during pregnancy without a definitive consensus on which measure or instrument was best to use. For example, in regard to instrument use, Hall et al. (2012) mentioned that the W-DEQ instrument used to assess fear of childbirth was originally a Swedish instrument and by translating the questions into English, there may have been some variation to the questions.

There appears to be no consensus among the researchers as to which gestational time period would be most predictive of the effects of prenatal anxiety and its impact on mode of delivery. Saunders

et al. (2006) began their assessment of prenatal anxiety in the first trimester of pregnancy while Andersson et al. (2004) assessed anxiety in the second trimester. The majority of the researchers focused on the third trimester of pregnancy. One group of investigators (Saunders et al., 2006) assessed prenatal state and trait anxiety during all three trimesters of pregnancy but they did not assess or report anxiety as an independent variable but rather as the composite measure of Prenatal Maternal Stress. Hernandez-Martinez et al. (2011**)** assessed "prenatal" anxiety during the immediate postpartum time period. The investigators reported in their study, medium to high state as well as high trait anxiety was positively associated with cesarean delivery. However, recall bias may have occurred when women have a complicated or difficult birth experience which may lead them to recall their prenatal anxiety levels differently.

Spielberger's STAI instrument has been determined to be a valid and reliable measure and is widely used globally in research with pregnant women (Gunning et al., 2010; Meades & Ayers, 2011; Littleton, Radecki-Breitkopf, & Berenson, 2007). Littleton et al. (2006) related that the STAI is used routinely in pregnancy research and the STAI was by far the most frequently used measure of state and trait anxiety. Fatoye et al. (2004) reported that the STAI instrument has been validated and extensively used in Nigeria. In this literature review, the STAI instrument was used in prenatal anxiety research in The United Kingdom, Sweden, China and Spain. Little is known about the cumulative effects of state and/or trait anxiety during each of the trimesters of pregnancy on mode of delivery. Ideally, future researchers would obtain prenatal state and trait anxiety measurements over all three trimesters of pregnancy to ascertain whether there are any patterns or trends.

Methods

This study was based on a secondary analysis of an existing data set developed by Ashford et al. (2015). Their grant funded research project was designed to examine associations between variables which may lead to adverse birth outcomes; specifically preterm birth and low birth weight. Data were collected on substance use, social, medical (including biological markers), demographic and psychological variables to evaluate if they could provide some predictive value allowing for early intervention. Specifically,

Ashford et al (2015) investigated the general hypothesis that "women who deliver preterm will have higher levels of prenatal inflammatory markers in whole saliva, serum and cervico-vaginal fluid (CVF), which are displayed earlier in pregnancy compared to women who deliver at term" (Ashford, 2008 p.1). A unique feature of the dataset is that anxiety data were collected at three points throughout the pregnancy prior to delivery. Select variables from Ashford et. al's study, which was approved by the University of Kentucky's Institutional Review Board, were used in the current study to examine prenatal anxiety over the course of the pregnancy and more specifically on its potential effects on mode of delivery.

Settings in which data were collected

Recruitment sites included the following prenatal clinics: University of Kentucky – Good Samaritan and Polk Dalton; University of Virginia; and Baptist Health, Madisonville, Kentucky. Two cohorts of pregnant women were recruited over a period of almost 6 years (from January 2008 through November 2013). There were four prenatal data collection periods: 1) 5-13 weeks; 2) 14-26 weeks; 3) 27-36 week's gestation; and 6 weeks postpartum. A minimum of four weeks were allotted between collection periods. The research nurse reviewed the mother's prenatal record to assess eligibility. Eligible women were given a study flyer at their first trimester prenatal screening appointment at one of the three participating facilities. Women interested in participating were asked to contact the PI, research coordinator, or inform their prenatal nurse. After the initial screening appointment, a member of the recruitment team explained the study and obtained consent. The IRB-approved consent(s), flyer, questionnaire, and HIPPA were written in English and Spanish at the 6th grade level, and participants were informed that they could choose to withdraw from the study at any time.

Description of the population studied

The population identified for this study was originally recruited from prenatal clinics located at the University of Kentucky, (Good Samaritan and Polk Dalton) and prenatal clinics at the University of Virginia and Baptist Health in Madisonville, Kentucky from January 2008 – November 2013. A multi-racial/ethnic population of 440 pregnant women was ultimately recruited to participate. Inclusion criteria

for Ashford et. al's study and subsequently for this capstone project were: pregnant women greater than 16 years of age with a single gestation pregnancy. Participants were excluded from both studies if they had any of the following risk factors: history of diabetes (Type 1 and Type 2); history of heart disease; current history of illegal or prescription drug abuse; second trimester diagnosis of bacterial vaginosis (BV) or sexually transmitted disease; multi-fetal pregnancies (participants that discover they are pregnant with more fetus); and women with a previous normal pregnancy who delivered preterm/low birth weight during the current pregnancy.

The research coordinator or prenatal nurse administered questionnaires during the 1st, 2nd, and 3rd trimesters when the participants were attending their regular prenatal appointments. After delivery, birth outcome data were collected from the mother and infant's medical record by the research nurse. Delivery outcome data obtained from the mother's medical record were: gestational age at birth; mode of delivery; delivery complications; birth weight; sex; and infant complications. Participants were given a $20 gift card for participating in each data collection opportunity. If the participants completed all four scheduled assessments, they were given an additional $20 gift card (possible total = $100).

Aim/Purpose

The primary purpose of this study is to perform a secondary analysis of an existing data set to assess if there is a relationship between prenatal state anxiety levels and mode of delivery. In addition, the pattern of state anxiety over the course of pregnancy will be examined as well as associations between state anxiety and characteristics of the population.

Study Question #1: What is the pattern of state anxiety over the three trimesters of pregnancy?

Study Question #2: What are the associations between characteristics of the population and state anxiety?

Study Question #3: Is there an association between prenatal state anxiety levels and mode of delivery

Demographic data – Demographic variables considered in this analysis were: age, race/ethnicity, education, annual household income, employment, and gravidity/parity.

Anxiety Measure: Spielberger's State-Trait Anxiety Inventory (STAI) is a commonly used measure of state anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Form Y, its most popular version, has 20 items for assessing state anxiety. The STAI is appropriate for those who have at least a sixth-grade reading level. All items are rated on a 4-point scale (e.g., from "Almost Never" to "Almost Always"). Higher scores indicate greater anxiety. There is a possible score ranging from 20-80 on the state subsection of the STAI Form Y tool. Similar to other researchers (Hall et al., 2012; Meades & Ayers, 2011), women were categorized as having high state anxiety if they scored above 40 on the STAI state anxiety scale. Trait anxiety was not assessed as part of the original research study thus state anxiety is the independent measure for prenatal anxiety in this study.

Relationships/social support measure: The Autonomy and Relatedness Inventory (ARI) was designed by Schaeger and Edgerton (1982) to assess the quality of an individual's relationship with a "significant other" (including spouse, partner, other close relatives, or friends). The ARI is a short version of the Marital Autonomy and Relatedness Inventory [MARI]. It includes 32 items which loaded most heavily on the MARI "Autonomy" and "Relatedness" scales (National Data Archive on Child Abuse and Neglect, 2014). Possible scores range from 0 to 128 as reported on a 5 point Likert scale. Established cut off scores are as follows: Low as (0-32); Moderate (33-64); Moderately High (65-96); and High (97-128) (Hall & Kiernan, 1990).

Mode of delivery (vaginal or cesarean delivery).

Description of the Study Population

Enrollment data showing the distribution of the population by personal characteristics are presented in Table 1. The largest proportion of participants (66.5%) were between the ages of 20 – 29 with the mean age of 25.9 (SD 5.3). Caucasian women made up the largest proportion of respondents (68.5%). African American and Hispanic/Latina participants made up 15% and 14.2% respectively. Almost 60% of the participants had some college or earned degrees with an additional 18.6% of the participants reporting less than a high school education. Nearly half of the respondents (46%) reported an annual household income of less than $20,000 per year with almost one third (32.2%) reporting an annual household

income of more than $40,000 per year. Approximately 58% of the participants were employed either part-time or full-time. The greatest proportion of women in the study (58.2%) were experiencing their first pregnancy. Upon enrollment in the study, the majority of the participants reported high Autonomy and Relatedness Inventory (ARI) scores with a mean score of 110.7 (SD=16). The distribution among ARI scores was extremely skewed with the vast majority in the high category (84%) and another 14% in the moderately high category.

Table 1: Distribution of Study Population by Personal Characteristics

Characteristic	Categories	n=	%	Mean (SD)
Age:	16-19	39	9.9 %	
	20-29	262	66.5 %	Mean 25.9 (SD 5.3)
	30-39	89	22.6 %	
	40+	4	1 %	
	Subtotal	***n= 394***		
Race:	Caucasian	265	68.5 %	
	African American	58	15 %	
	Hispanic/Latina	55	14.2 %	
	Asian	9	2.3 %	
	Subtotal	***n= 387***		
Education:	< high school	61	18.6 %	
	High School/GED	75	22.9 %	
	Some college or above	192	58.5 %	
	Subtotal	***n= 328***		
Income:	< $20K	147	45.9 %	
	$20k – $39,999K	70	21.9 %	
	$40K and >	103	32.2 %	
	Subtotal	***n= 320***		
Employment:	Not employed	137	41.6 %	
	Employed	192	58.4 %	
	Subtotal	***n= 329***		
Gravida Status:	0	189	58.2 %	
	1	62	19.1 %	
	2	43	13.2 %	
	3+	31	9.5 %	
	Subtotal	***n= 325***		
ARI Scores:	Low (0-32)	1	0.3 %	
	Moderate (33 – 64)	5	1.5 %	
	Mod. High (65 – 96)	48	14.1%	
	High (97 – 128)	351	84.1%	Mean 110.7 (SD 16)
	Subtotal	***n= 387***		

Results

This study was performed as a secondary analysis of an existing data set utilizing data obtained over all three trimesters of pregnancy as well as birth outcomes. Data were analyzed with IBM SPSS Statistics (version 22). Frequency distributions were used to calculate overall percentages, means and standard deviations. Chi-square analyses were used to determine the association between state anxiety and selected demographic variables (age, race/ethnicity, education, annual household income, employment, and gravidity/parity) and the additional variables of interest, Autonomy and Relatedness Inventory [ARI] scores and the outcome variable, mode of delivery.

State Anxiety in the Study Population

Data showing the distribution of the population by state anxiety scores upon enrollment in the study (the first trimester of pregnancy) are presented in Table 2. Similar to other investigators (Hall et al., 2012; Rondo et al., 2003& Teixeria, Fisk, & Glover, 1999), women were labeled as having high anxiety if they scored above 40 on the state anxiety scale. As seen in Table 2, initially 73.1% of the participants reported low levels of state anxiety (0 – 40) with 26.9% reporting high levels of state anxiety (41-80). Upon enrollment in the study, the mean state anxiety score among the study participants was 27 (SD 0.44). Spielberger (1989) established normative values with a variety of populations such as high school students, college students, and working adults. The mean state anxiety score of 27, recorded at the beginning of the study, was lower than normative data established by Spielberger (1989) with female high school students (40.54), female college students (38.76), and female working adults (35.20).

Table 2: Distribution of Study Population State Anxiety Scores upon Enrollment in the Study

State Anxiety Inventory scores	Upon Enrollment n=297
Low Anxiety (0-40)	217 (73.1%)
High Anxiety (41-80)	80 (26.9%)
Mean (SD)	27 (0.44)

Prenatal State Anxiety during the Trimesters of Pregnancy

The relationships between state anxiety and characteristics of the population were examined in two ways. First, state anxiety scores and population characteristics were explored during each of the trimesters of pregnancy and secondly over the entire course of pregnancy.

Study Question #1: What is the pattern of state anxiety over the three trimesters of pregnancy?

In order to look at state anxiety over the course of the pregnancy only those on whom data were available at three points in time during the pregnancy were included. This resulted in a cohort of 142 respondents (see Table 3). The patterns of state anxiety (high/low) during each of the three trimesters of pregnancy are displayed in Table 3. The greatest number of respondents (59%) scored low state anxiety over the course of the pregnancy. Conversely, 8.5% of all respondents scored high state anxiety over the course of the pregnancy. Overall, 41% of the respondents did report high state anxiety in one or more trimesters of pregnancy. There was no apparent pattern as to which trimester a greater proportion of women scored high state anxiety.

Table 3: Patterns of High (H) and Low (L) State Anxiety Scores by Trimester of Pregnancy

1st Trimester	2nd Trimester	3rd Trimester	n=
H	**H**	**H**	**n= 12 (8.5%)**
H	H	L	n= 4 (2.8%)
H	L	H	n= 9 (6.3%)
H	L	L	n= 9 (6.3%)
L	**L**	**L**	**n= 84 (59%)**
L	L	H	n= 14 (9.9%)
L	H	L	n= 5 (3.5%)
L	H	H	n= 5 (3.5%)
			Total n =142

Study Question #2: What are the associations between characteristics of the population and state anxiety?

Table 4 shows the summary of the statistical associations between characteristics of the study population and state anxiety levels by the three trimesters of pregnancy. More detailed data are shown in Tables A-2 through A-8 in the Appendix.

Table 4: Summary of Association of State Anxiety Level by Trimester and Population Characteristics

Population Characteristics	1st Trimester State Anxiety	2nd Trimester State Anxiety	3rd Trimester State Anxiety
Age	n.s.	n.s.	n.s.
Race/Ethnicity	n.s.	n.s.	n.s.
Education	n.s.	p .014 (-)	n.s.
Income	n.s.	p .035 (-)	n.s.
Employment	n.s.	n.s.	p .000 (-)
Gravida status	p .021 (+)	n.s.	p .024 (+)
ARI scores	p .000 (-)	p .000 (-)	p .007 (-)

(-) denotes a negative association and (+) denotes a positive association

As seen in Table 4, age was not statistically associated with state anxiety scores although a greater proportion of women in the age group 30-39 (31.7%), as compared to the other age groups, reported high state anxiety scores in the first trimester of pregnancy (see Table A-2). A greater proportion of teenage mothers (ages 16-19), while the second smallest of the age categories, reported high levels of state anxiety in the second and third trimesters of pregnancy (26.1% and 31.8% respectively) as compared to the other age groups (see Table A-2).

As seen in Table 4, race was not statistically associated with state anxiety scores although among all ethnic groups there were higher proportions of elevated state anxiety among African American and Hispanic/Latina participants (see Table 4 and Table A-3). A higher proportion of African American women, as compared to the other ethnic groups, reported high state anxiety in the first and third trimesters of pregnancy (42.2% and 40% respectively) (see Table A-3). A greater proportion of Hispanic/Latina participants (38.5%) reported high state anxiety in the second trimester (see Table A-3).

As seen in Table 4, education was associated with state anxiety (p.014) during the second trimester of pregnancy. Table A-4 shows that education is inversely related with high state anxiety. Specifically, a higher proportion of women with less than high school education (35.4% - 42.9%) reported high state anxiety as compared to those with more education (see Table A-4). This pattern persisted over all three trimesters of pregnancy but was statistically significant only in the second trimester of pregnancy (see Table A-4).

As seen in Table 4, income was also associated with state anxiety (p.035) during the second trimester of pregnancy. Table A-5 reveals that income is also inversely related to high state anxiety. Specifically, among women with an annual household income of less than $20,000 per year, a higher proportion (32.6% - 33.8%) reported high state anxiety as compared to those with more income (see Table A-5). This pattern persisted over all three trimesters of pregnancy but was statistically significant only in the second trimester of pregnancy (see Table A-5). .

Table 4 shows that the relationship between unemployment status and state anxiety was statistically significant (p.000) in the third trimester of pregnancy. As seen in Table A-6, a greater proportion of

unemployed women as compared to employed women reported high state anxiety during each of the trimesters of pregnancy. While persistent across the three trimesters, this pattern was only significant in the third trimester of pregnancy (see Table A-6).

As seen in Table 4, gravida status was associated with high state anxiety scores during the first and third trimesters of pregnancy. Table A-7 shows that, in the first trimester of pregnancy, a greater proportion of multigravida women (35.2%) reported a high level of state anxiety than those having their first child and this association was statistically significant (p.021). In the second trimester, the proportions between primagravida and multigravida women reporting high state anxiety (22.4% and 24.5% respectively) were very similar. In the 3rd trimester, there was a statistically significant association (p.024) with 34.7% of multigravida women reported high state anxiety as compared to 19.5% of primagravida women (see Table A-7).

Table 4 and Table A-8 show that Autonomy and Relatedness Inventory (ARI) scores had an inverse and statistically significant association (p .<007) with state anxiety scores in all three trimesters of pregnancy.

Persistence of State Anxiety over the Entire Pregnancy

In order to evaluate the persistence of high state anxiety over the course of the pregnancy (more than 1 trimester), participants in the cohort on whom the relevant data were available at all three points in time were categorized as having low state anxiety if they had 0 or only 1 trimester state anxiety scores recorded as high. High state anxiety was defined by reporting high state anxiety scores in 2 or all 3 trimesters of pregnancy. Table 5 describes a summary of association between state anxiety levels over the course of the pregnancy and characteristics of the cohort. Income, employment and ARI scores show a pattern of negative association which is consistent with what was seen in the trimester analyses in Table 4. Specifically, Table 5 reveals that income (less than $20K per year) and unemployment are inversely associated (p .048 and p .005 respectively) with high state anxiety in the cohort on which data at three points was available. Conversely, high ARI scores (which suggests high social support) are significantly associated (p .002) with low state anxiety scores (see Table 5). Education was negatively associated and gravida status was positively associated in the trimester specific analyses (see Table 4) but neither were

associated over the course of the pregnancy (see Table 5). Table A-9 contains a detailed description of the summary of association of state anxiety levels over the course of the pregnancy and the cohort characteristics.

Table 5: Summary of Association of State Anxiety Levels over Pregnancy and Cohort Characteristics

Cohort Characteristics	State Anxiety Levels over Pregnancy (n=135)
Age	n.s.
Race/Ethnicity	n.s.
Education	n.s.
Income	p .048 (-)
Employment	p .005 (-)
Gravida status	n.s.
ARI scores	p .002 (-)

(-) denotes a negative association

Prenatal State Anxiety and Mode of Delivery

When performing an analysis of the cohort for which there was data over all three trimesters of pregnancy (n=142), it was noted that delivery outcome data was missing for seven of the respondents which resulted in an adjusted number of participants, (n= 135).

Study Question #3: Is there an association between prenatal state anxiety levels and mode of delivery?

Table 6 describes the results of the analysis between mode of delivery and high/low state anxiety levels over pregnancy. The data in Table 6 show that mode of delivery (vaginal as compared to cesarean) was not found to be statistically significantly associated with state anxiety scores for any of the three trimesters of pregnancy (p .940, p .809, and p .802 respectively). Additionally, at the bottom of Table 6 it can be seen that mode of delivery (vaginal as compared to cesarean) was not found to be statistically significantly associated (p .593) with state anxiety scores over the course of the pregnancy.

Table 6: Mode of Delivery for Cohort Categorized by State Anxiety Scores

Trimester of Pregnancy	State Anxiety Scores (n=135)	Vaginal Delivery n=89 (66%)	Cesarean Delivery n=46 (34%)	p value
1st Trimester	Low anxiety	69	35	p .940
	High anxiety	20	11	
2nd Trimester	Low anxiety	72	38	p .809
	High anxiety	17	8	
3rd Trimester	Low anxiety	62	33	p .802
	High anxiety	27	13	
Over the Course of Pregnancy	Low anxiety	68 (76.4%)	37 (80.4%)	p .593
	High anxiety	21 (23.6%)	9 (19.6%)	

Discussion

In this study, there was no statistical or meaningful association found between state anxiety levels (during each of the trimesters of pregnancy and over the course of pregnancy) and delivery by cesarean. This finding of non-association is consistent with two of the prior studies reviewed. Hall et al. (2012) and Johnson and Slade (2002) both utilized only the state portion of the STAI instrument and both reported similar findings of no association between prenatal state anxiety levels and cesarean delivery. Using only the state anxiety measure may have contributed to the lack of association. Three other studies showed positive associations between trait anxiety levels and cesarean delivery. Hernandez-Martinez et al. (2011) and Zhang et al. (2013) both utilized the state and trait anxiety measures of the STAI instrument while Ryding et al. (1998) used only the trait anxiety assessment portion. This indicates that trait anxiety along with state anxiety assessments may be a better measure for associations between prenatal anxiety and cesarean delivery. Another possibility for a lack of a relationship is that non-clinical factors such as those studied by Potter et al. (2001) including practice patterns of providers or practice protocols such as

routine epidural analgesia use in labor may have played a bigger role in who received a cesarean delivery. These factors were not included in this study.

This study revealed that income, employment and ARI scores showed a pattern of negative association in the trimester specific analyses and over the course of the pregnancy. Education was negatively associated and gravida status was positively associated in the trimester specific analyses but neither were associated over the course of the pregnancy. Upon enrollment in the study, nearly 27% of the participants reported high levels of state anxiety. Throughout the study, 41% of the respondents reported high state anxiety in one or more trimesters of pregnancy. The elevated levels of prenatal anxiety speak to the fact that anxiety is a problem that needs to be addressed. It is important to intervene to reduce prenatal anxiety when it is present despite the lack of association with cesarean delivery.

While not associated with cesarean delivery in this study, high prenatal anxiety has been associated with labor initiation and induction of labor (Dunkel Schetter & Tanner, 2012); with increased utilization of epidural analgesia which is associated with unplanned cesarean deliveries (Saunders et al., 2006) as well as uterine dysfunction (Ryding et al., 1998). Dysfunctional labors may lead to fetal distress which is an indication for an expedited assisted vaginal delivery as well as an emergency cesarean delivery. Anxiety related to childbirth fear contributes to increased requests for elective cesarean deliveries (Sjogren & Thomassen, 1997).

Overall, the cesarean delivery rate for this population was 34%. This is a higher overall cesarean section delivery rate than the 2013 U.S. cesarean rate of 32.7% and slightly exceeds the Virginia cesarean rate of 33.8%. This rate is slightly lower than the Kentucky cesarean rate of 36.6%. Further research is needed to understand the reasons for the high cesarean delivery rate in this population.

Strengths/Limitations

A major strength of this study was the ability to examine anxiety over all three trimesters of pregnancy and to be able to compare the results to the two modes of delivery considered in this study. However, there are limitations when performing a secondary analysis of an existing data set. The use of state anxiety scores without considering the effect of trait anxiety scores as a measure of prenatal anxiety is a

limitation of this study. Ashford et al. (2015) collected numerous substance use, social, medical, demographic and psychological variables as part of the original research project. Preterm birth and low birth weight, rather than anxiety, were the main focus of the study. Because so many variables were assessed, it was necessary to minimize the number and the length of the assessments. Thus, the State Anxiety Assessment, which consisted of 20 questions, was administered in place of the full State Trait Anxiety Inventory (STAI) which incorporates the Trait Anxiety Assessment as well. The study was also limited by not extending the analyses to include an examination of the association between state anxiety and mode of delivery in which the possible effect of other variables was considered. For example, this analyses was limited by the inability to account for the circumstances/reasons for delivery by cesarean section (scheduled, elective or emergent).

Recommendations for Practice

Prenatal anxiety is a psychosocial variable that is assessable and potentially modifiable. The findings in this study showed an association between high prenatal state anxiety levels and lack of education, low income, unemployment, multiple pregnancies and low ARI scores. Health care practitioners should look at the holistic picture of the expectant mother when assessing anxiety and formulating a plan of care. These findings highlight the need for a multidisciplinary approach in which practitioners work in collaboration with other disciplines to find ways to see that the multiple economic, social, and psychological needs of pregnant women are met. The data in this study suggest that transient state anxiety might actually be a symptom of difficulties in everyday coping due to a lack of resources including social support. Psychosocial stress theory identifies social support as a protective factor against anxiety (Aktan, 2012). An example of a group prenatal model to facilitate increased social support is the "CenteringPregnancy" model. CenteringPregnancy, a group prenatal care model, consisting of ten 2-hour visits beginning at 16 to 18 weeks of gestation and continuing until birth, following the recommended schedule for prenatal care. At each group, women obtain their weight and blood pressure measurements, have a short assessment visit with their provider in the group space, and then use the remaining time as a group to discuss their concerns, ask questions, and explore with other women the new roles of pregnancy,

parenting, and motherhood (Klima, Nor, Vonderheid & Handler, 2009). This model of prenatal care shows great promise in facilitating increased social support during pregnancy and may be beneficial to reducing prenatal anxiety levels. Future research is indicated in this area.

Additionally, nurses should focus on interventions such as dealing with tangible things such as education about pregnancy and what to expect in childbearing, how to cope with limited income and a growing family as well as available social support after pregnancy. Antenatal anxiety has been shown to predict postpartum anxiety and depression (Atwood, 2013). Therefore, it is critical for nurses to address these issues after childbirth as well. Finally, women presenting with excessive anxiety need to be assessed for abusive-stress which is an indicator of domestic violence (Morales & Records, 2013).

Appendix A: Tables

Table A-1: Primary Research Studies Exploring Prenatal Anxiety to Mode of Delivery

Authors, Year	Anxiety related variable researched	Mode of delivery outcome variable	n = Population; n = sample /Setting	Sample selection	Inclusion (I) Exclusion (E) criteria	Anxiety assessment instrument utilized	Study design	Gestational Period assessed/ (weeks)	Findings
Andersson et al. (2004)	1. Psychiatric diagnosis n=211 with 155 diagnosed anxiety disorders	A. Instrumental (assisted vaginal) delivery; B. Planned cesarean delivery; C. emergency cesarean delivery	N=1495 pregnant women with subset of n=211 women with a psychiatric diagnosis (of these, anxiety disorders in 92 women, anxiety not otherwise specified in 63 women) Setting: Sweden, Umea University Hospital and Sunderby Central Hospital	All pregnant women attending a second trimester ultrasound screening at one of the two hospitals were recruited.	E: detection of malformation or missed abortion on ultrasound; inability to read and understand the questions; not signing informed consent.	PCEMD Completed questionnaire just prior to 2nd trimester ultrasound, telephone follow up with structured interviews	Prospective	2nd trimester, 16-18 weeks	1A. No assoc. with instrumental delivery – (not statistically significant OR 0.66, 95% CI 0.32-1.37); 1B. + assoc. with planned cesarean delivery (statically significant OR 1.76, 95% CI 1.05-2.93); 1C. No assoc. with emergency cesarean delivery (not statistically significant OR 1.07, 95% CI 0.62-1.82).

Hall et al. (2012)	1. State anxiety 2. Fear of childbirth	A. Assisted vaginal delivery; B. Elective cesarean delivery	N=624 pregnant women Setting: Canada, this study built upon previous cross-sectional research study exploring fear, sleep, fatigue and anxiety. Current study matched previous work with delivery records.	Using posters in provider's offices and gathering places, media, and pregnancy fairs, recruited women from communities across British Columbia (BC) with 150 or more annual births	I: pregnant woman who reside in BC; read and speak English; 35-39 weeks gestation with no medical complications during pregnancy.	SAI, W-DEQ	Prospective	3rd trimester 35-39 weeks	1A. Anxiety not assoc. with assisted vaginal delivery (non-significant p .686); 1B. Anxiety not assoc. with elective cesarean (non-significant p .241) 2A. Fear of childbirth not assoc. with assisted vaginal delivery (non-significant p .785). 2B. Fear of childbirth not assoc. with elective cesarean delivery (non-significant p .421)

Hernandez-Martinez et al. (2011)	1. State anxiety 2. Trait anxiety	A. Forceps B. Cesarean delivery (total)	N=188 pregnant women recruited from San Joan University Hospital Setting: Reus, Spain Hospital-based study	Recruited by gynecologists of the hospital.	I: Initially, pregnant women; more than 18 years old; no more than 11 weeks gestation; Additional, healthy; singleton pregnancy; no chronic illness affecting nutritional state	Spanish version of the STAI; Completed self-report questionnaire	Prospective	Immediate Post delivery Day 1 - 2	1A. High state anxiety + assoc. with forceps delivery (31.0% as compared to 13.8% forceps rate for low-medium state anxiety p .005), 1B. Medium and high state anxiety + assoc. with cesarean delivery (24.6%, 24.1% respectively as compared to 10.8% low state anxiety). (significant p .005 comparing state anxiety to normal-forceps-cesarean); 2A. High trait anxiety + assoc. with forceps delivery (25.8 % as compared to 16.1 % forceps rate medium trait anxiety and 14.5% for low trait anxiety p .126); 2B. High trait anxiety + assoc. with cesarean delivery (25.8% as compared to 16.1% low and medium trait anxiety). (significant p .126 comparing trait anxiety to normal-forceps-cesarean)

Johnson & Slade (2002)	1. State anxiety, 2. Trait anxiety, 3. Fear of childbirth	A. Spontaneous – vertex vaginal delivery; B. Assisted vaginal (forceps); C. Elective cesarean delivery; D. Emergency cesarean delivery	N=424 pregnant women at 32 weeks gestation Setting: Sheffield, The United Kingdom (UK)	Questionnaire booklets sent through mail to all pregnant women over age 16 registered at one of the two local hospitals.	None	State portion of the STAI, W-DEQ, Questionnaire booklets sent through mail	Prospective design using between-group comparisons	3rd trimester 32 weeks	No differences in state or trait anxiety nor fear of childbirth between women who delivered by any of the modes of delivery. Findings of nonsignificance (state anxiety $p > 0.9$; trait anxiety $p > 0.8$; fear of delivery $p > 0.5$).
Ryding et al. (1998)	1.Trait anxiety, 2. Fear of childbirth 3. Stress coping	A. Emergency cesarean delivery	N=1981 pregnant women intending to give birth at Helsingborg Central Hospital Case group n= 97 Control group n= 194 Setting: Sweden, Helsingborg Central Hospital	Recruited pregnant women intending to give birth at Helsingborg Central Hospital;	I: Speak Swedish; giving birth at Helsingborg Central Hospital E: gave birth elsewhere; planned elective cesarean delivery	W-DEQ; Trait portion of the STAI; SCI Completed questionnaires at antenatal clinics	Case-control study Case group = 97 women delivered by emergency cesarean delivery; Control group = 194 women matched for age and parity	3rd trimester 32 weeks	1A.+ association between trait anxiety scores and emergency cesarean delivery (mean difference 2.7 CI 0.1-5.3 $p < 0.05$) 2A. + assoc. between fear of childbirth and emergency cesarean delivery (mean difference 10.3 CI 5.3-15.3 $p < 0.0001$) 3A. No association between lower stress tolerance and emergency cesarean delivery (mean difference 5.0 CI -0.3-10.3 p .05)

Saunders et al. (2006)	1. Prenatal maternal stress PNMS (single PNMS variable includes: pregnancy-specific distress + perceived stress+ state anxiety + prenatal life events)	A. Unplanned cesarean delivery	N=298 pregnant women Setting: Northeastern USA, public university clinic in a suburban area	Recruited from clinic,	I: English speaking; over 18 years old; between 10-25 weeks gestation; attempting a vaginal delivery	10 item State Anxiety subscale of the STPI; interviewed by trained research assistants using instruments	Prospective	1st, 2nd, 3rd At approx... 16, 26, 34 weeks	1A. No direct association between PNMS and unplanned cesarean delivery - 15% low stress and 19% high stress had an unplanned cesarean delivery (Chi-square =1.16, ns); However, + indirect association with high PNMS and epidural usage ($p < .05$) resulting in higher numbers of unplanned cesarean deliveries ($p < .001$).
Sjogren & Thomassen (1997)	1. Anxiety related to extreme fear of childbirth	A. Elective cesarean delivery	N=200 n=100 pregnant women referred to psychosomatic outpatient clinic compared to a matched reference group of n=100 pregnant women Setting: Stockholm, Sweden Outpatient clinic at the department of Obstetrics	100 pregnant anxious women referred to psychosomatic outpatient clinic (68% requesting elective cesarean delivery)	Women who wanted advice or assistance were referred.	Detailed OB and psychological history with psychotherapy sessions	Interventional study using a Case Control Model	2nd & 3rd trimester Interventions started during 20th to 30th gestational week till delivery.	1A. 68% of women with severe fear of childbirth (anxiety) requested cesarean delivery. Post intervention, 38% had a vaginal delivery and 30% had an elective cesarean delivery. Overall, interventions resulted in a 50% reduction in elective cesarean deliveries. (no p value reported).

Zhang et al. (2013)	1. State anxiety 2. Trait anxiety	A. Cesarean delivery without medical indication	N=433 pregnant women recruited from local hospital Setting: China, Hospital-based	Recruited from hospital maternity care	E: History of mental illness, non-uterine pregnancy, distance to hospital	STAI	Nested case-control study	3rd trimester: 1 week before delivery	The overall cesarean delivery rate was 62.1% of which 55.8% were by request. 1A. State anxiety was + assoc with cesarean by request (odds ratio 1.41 (95% CI: 1.06-1.87) 2A. Trait anxiety was + assoc with cesarean by request (odds ratio 1.23 (95% CI: 1.08-1.40)

Primary Care Evaluation of Mental Disorders (PCEMD); State Anxiety Inventory (SAI); State Trait Anxiety Inventory (STAI); State Trait Personality Inventory (STPI); Stress Coping Inventory (SCI); Wijma Delivery Expectancy/Experience Questionnaire-A (W-DEQ)

Table A-2: Age and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Age**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Age (years) (n=296) 1st Trimester			p .717
Age (16 -19) n=34	26 (76.5%)	8 (23.5%)	
Age (20-29) n=198	146 (73.7%)	52 (26.3%)	
Age (30-39) n=63	43 (68.3%)	**20 (31.7%)**	
Age (40-42) n=1	1 (100%)	0 (0.0%)	
Subtotal	***n=216***	***n=80***	
Age (years) (n= 213) 2nd Trimester	n=164	n=49	p .799
Age (16 -19) n=23	16 (73.9%)	**6 (26.1%)**	
Age (20-29) n=141	107 (75.9%)	34 (24.1%)	
Age (30-39) n=48	39 (81.3%)	9 (18.8%)	
Age (40-42) n=1	1 (100%)	0 (0.0%)	
Subtotal	***n=164***	***n=49***	
Age (years) (n=183) 3rd Trimester			p .690
Age (16 -19) n= 22	15 (68.2%)	**7 (31.8%)**	
Age (20-29) n=118	84 (71.2%)	34 (28.8%)	
Age (30-39) n=42	33 (78.6%)	9 (21.4%)	
Age (40-42) n=1	1 (100%)	0 (0.0%)	
Subtotal	***n=133***	***n=50***	

Table A-3: Ethnicity/Race and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Ethnicity/Race**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Ethnicity/Race (n=293) 1st Trimester			p .078
Caucasian n=202	154 (76.2%)	48 (23.8%)	
African-American n=45	26 (57.8%)	**19 (42.2%)**	
Hispanic or Latina n=40	30 (75%)	10 (25%)	
Asian n=6	5 (83.3%)	1 (16.7%)	
Subtotal	***n=215***	***n=78***	
Ethnicity/Race (n=211) 2nd Trimester			p .094
Caucasian n=147	120 (81.6%)	27 (18.4%)	
African-American n=35	26 (74.3%)	9 (25.7%)	
Hispanic or Latina n=26	16 (61.5%)	**10 (38.5%)**	
Asian n=3	3 (100%)	0 (0.0%)	
Subtotal	***n=165***	***n=46***	
Ethnicity/Race (n=182) 3rd Trimester			p .405
Caucasian n=128	97 (75.8%)	31 (24.2%)	
African-American n=25	15 (60%)	**10 (40%)**	
Hispanic or Latina n=26	20 (76.9%)	6 (33.3%)	
Asian n=3	2 (73.6%)	1 (26.4%)	
Subtotal	***n=134***	***n=48***	

Table A-4: Education and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Education**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Highest Grade Completed (n=295) 1st Trimester			p .333
Less than high school n=48	31 (64.6%)	**17 (35.4%)**	
High School n=69	50 (72.5%)	19 (27.5%)	
Some college & above n=178	134 (75.3%)	44 (24.7%)	
Subtotal	***n=215***	***n=80***	
Highest Grade Completed (n=213) 2nd Trimester			p .014
Less than high school n=34	20 (58.8%)	**14 (41.2%)**	
High School n=49	37 (75.5%)	12 (24.5%)	
Some college & above n=130	107 (82.3%)	23 (17.7%)	
Subtotal	***n=164***	***n=49***	
Highest Grade Completed (n=184) 3rd Trimester			p .085
Less than high school n=28	16 (57.1%)	**12 (42.9%)**	
High School n=44	31 (70.5%)	13 (29.5%)	
Some college & above n=112	87 (77.7%)	25 (22.3%)	
Subtotal	***n=134***	***n=50***	

Table A-5: Income and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Income**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Income (n=290) 1st Trimester			p .123
Less than $20K n=129	87 (67.4%)	**42 (32.6%)**	
$20K - $39.9K n=67	49 (73.1%)	18 (26.9%)	
$40K and above n=94	75 (79.8%)	19 (20.2%)	
Subtotal	***n=211***	***n=79***	
Income (n=212) 2nd Trimester			p .035
Less than $20K n=88	60 (68.2%)	**28 (31.8%)**	
$20K - $39.9K n=46	37 (80.4%)	9 (19.6%)	
$40K and above n=78	66 (84.6%)	12 (15.4%)	
Subtotal	***n=163***	***n=49***	
Income (n=180) 3rd Trimester			p .075
Less than $20K n=71	47 (66.2%)	**24 (33.8%)**	
$20K - $39.9K n=44	31 (70.5%)	13 (29.5%)	
$40K and above n=65	54 (83.1%)	11 (16.9%)	
Subtotal	***n=132***	***n=48***	

Table A-6: Employment and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Employment**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Employment 1st Trimester STAI scores (n=296)			
Employed n=170	128 (75.3%)	42 (24.7%)	p .298
Unemployed n=126	88 (69.8%)	38 (30.2%)	
Subtotal	***n= 216***	***n= 80***	
Employment 2nd Trimester STAI scores (n=214)			
Employed n=128	100 (78.1%)	28 (21.9%)	p .664
Unemployed n=86	65 (75.6%)	21 (24.4%)	
Subtotal	***n=165***	***n=49***	
Employment 3rd Trimester STAI scores (n=184)			
Employed n=110	90 (81.8%)	20 (18.2%)	**p .000**
Unemployed n=74	44 (59.5%)	**30 (40.5%)**	
Subtotal	***n=134***	***n=50***	

Table A-7: Gravida Status and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic **Gravida/Parity**	**Low State Anxiety (0 – 40)**	**High State Anxiety (41 – 80)**	**P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05**
Gravida/Parity (n=233) 1st Trimester			p .021
Primagravida n=125	98 (78.4%)	27 (21.6%)	
Multigravida n=108	70 (64.8%)	**38 (35.2%)**	
Subtotal	***n=168***	***n=65***	
Gravida/Parity (n=201) 2nd Trimester			p .733
Primagravida n=107	83 (77.6%)	24 (22.4%)	
Multigravida n=94	71 (75.5%)	23 (24.5%)	
Subtotal	***n=154***	***n=47***	
Gravida/Parity (n=177) 3rd Trimester	***n=128***	***n=49***	p .024
Primagravida n=82	66 (80.5%)	16 (19.5%)	
Multigravida n=95	62 (65.3%)	**33 (34.7%)**	
Subtotal	***n=128***	***n=49***	

Table A-8: Autonomy and Relatedness Inventory (ARI) Scores and State Anxiety Scores by Trimester of Pregnancy for Population

Characteristic ARI Scores	Low State Anxiety (0 – 40)	High State Anxiety (41 – 80)	P Value Significance by trimester of pregnancy (Pearson Chi-Square) *p < .05
ARI 1st Trimester (n=256)			p .000
Low (score 0-32) n=1	0 (0.0%)	1 (100%)	
Moderate (score 33-64) n=3	1 (33.3%)	2 (66.7%)	
Mod. high (score 65-96) n= 37	17 (45.9%)	20 (54.1%)	
High (score 97-128) n= 215	**170 (79.1%)**	45 (20.9%)	
Subtotal	***n=188***	***n=68***	
ARI 2nd Trimester (n=191)			p .000
Low (score 0-32) n=0	0	0	
Moderate (score 33-64) n=7	2 (28.6%)	5 (71.4%)	
Mod. high (score 65-96) n= 24	9 (37.5%)	15 (62.5%)	
High (score 97-128) n= 191	**137 (85.6%)**	23 (22.5%)	
Subtotal	***n=148***	***n=43***	
ARI 3rd Trimester (n=228)			p .007
Low (score 0-32) n=0	0	0	
Moderate (score 33-64) n=1	0	1 (100%)	
Mod. high (score 65-96) n= 19	9 (47.4%)	10 (52.6%)	
High (score 97-128) n= 149	**114 (76.5%)**	35 (23.5%)	
Subtotal	***n=123***	***n=46***	

Table A-9: Summary of Association of State Anxiety Levels over Pregnancy and Cohort Characteristics

Characteristics:		**Low Anxiety (High 0-1 Trimesters)**	**High Anxiety (High 2-3 Trimesters)**	**P Value Significance over Pregnancy (Pearson Chi-Square) *p < .05**
Age (years) (n=134)				p .264
Age (16 -19)	n=19	14 (73.7%)	5 (26.3%)	
Age (20-29)	n=82	61 (74.4%)	21(25.6%)	
Age (30-39)	n=33	**29 (87.9%)**	4 (12.1%)	
	Subtotal	***n=104***	***n=30***	
Ethnicity/Race (n=133)				p .325
Caucasian	n=99	80 (80.8%)	19 (19.2%)	
African-American	n=20	13 (65%)	**7 (35%)**	
Hispanic or Latina	n=11	8 (72.7%)	3 (27.3%)	
Asian	n=3	3 (100%)	0 (0.0%)	
	Subtotal	***n=104***	***n=29***	
Highest Grade Completed (n=134)				p .128
Less than high school	n=17	9 (52.9%)	**8 (47.1%)**	
High School	n=32	26 (81.3%)	6 (18.7)	
Some college and above	n=85	69 (81.2%)	16 (18.8%)	
	Subtotal	***n=104***	***n=30***	
Income (n=133)				p .048
Less than $20K	n=46	30 (65.2%)	**16 (34.8%)**	
$20K - $39.9K	n=35	29 (82.9%)	6 (17.1%)	
$40K and above	n=52	44 (84.6%)	8 (15.4%)	
	Subtotal	***n=103***	***n=30***	
Employment (n=134)				
Employed	n=79	68 (86.1%)	11 (13.9%)	p .005
Unemployed	n=55	36 (65.5%)	**19 (34.5%)**	
	Subtotal	***n= 104***	***n= 30***	
Gravida/Parity (n=135)				p .053
Primagravida	n=70	55 (78.6%)	15 (21.4%)	
Multigravida	n=65	50 (76.9%)	15 (23.1%)	
	Subtotal	***n= 105***	***n=30***	
ARI 1st (highest scores 2-3 trimesters) (n=36)				p .002
Mod. high (total scores 65-96)	n= 7	2 (28.6%)	5 (71.4%)	
High (total scores 97-128)	n=29	**25 (86.2%)**	4 (13.8%)	
	Subtotal	***n= 27***	***n= 9***	

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