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Preterm Birth Among Opioid-Using Women Vs. High Risk Controls: The Potential Moderating Role of Borderline Features

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To the Graduate Council:

I am submitting herewith a thesis written by Andrea Maria Gorrondona entitled "Preterm Birth Among Opioid-Using Women Vs. High Risk Controls: The Potential Moderating Role of Borderline Features." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Jenny Macfie, Major Professor

We have read this thesis and recommend its acceptance:

Lowell Gaertner, Greg Stuart

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

**Preterm Birth Among Opioid-Using Women and High-Risk
Controls: The Potential Moderating Role of Borderline
Features**

A Thesis Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Andrea M. Gorrondona
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ABSTRACT

While previous research supports an association between opioid use in pregnancy and preterm birth (Nørgaard, Nielsson, & Heide-Jørgensen, 2015), no research has evaluated the role mental health diagnoses aside from anxiety and depression (Benningfield et al., 2010) play in conjunction with opioid use in exacerbating the risk of preterm birth. In the current study, the focus is on borderline personality disorder (BPD). Given that research suggests borderline features are associated with opioid use (Kurdziel-Adams et al., 2019), the current study evaluated how borderline features may relate to the relationship between opioid use and preterm birth and may serve to exacerbate the biological risks presented by opioid use. Results found that scoring above a cutoff score of total borderline features (which has high convergent validity with a BPD diagnosis, Kurtz & Morey, 2001) was associated with preterm birth. However, BPD did not serve as a moderator between opioid use and preterm birth.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION AND GENERAL INFORMATION	1
Opioid Use	1
CHAPTER TWO: LITERATURE REVIEW.....	3
Opioid Use in Pregnancy and Preterm Birth	3
BPD and Opioid Use	5
BPD and Preterm Birth.....	5
Opioid Use, BPD, & Preterm Birth	6
Purpose and Hypotheses	7
CHAPTER THREE: METHOD	9
Participants	9
Procedure	9
Measures	9
Demographics.	9
Borderline Features.....	10
Opioid Use.	10
Preterm Birth.....	11
CHAPTER FOUR: RESULTS	12
CHAPTER FIVE: DISCUSSION	14
Strengths and Limitations	15
Future Research	16
REFERENCES	18
APPENDIX	22
VITA.....	31

CHAPTER ONE: INTRODUCTION AND GENERAL INFORMATION

Opioid Use

There is a significant need for research regarding opioid use during pregnancy as this represents a growing problem the U.S. (Stuart et al., 2018). Estimates range from a 127% increase between 1998 to 2011 (Maeda, Bateman, Clancy, Creanga, & Leffert, 2014) to an increase of 373% between 2000 and 2009 (Patrick et al., 2012). One implication is an increased incidence of preterm birth, defined as birth before 37 weeks gestation. This poses a serious threat to infant well-being and represents the number one cause of perinatal death (de Bernabe et al., 2004). Indeed, while only between 7 and 12% of all births are considered preterm, preterm birth accounts for 85% of perinatal deaths (Kramer et al., 2000; Norwitz & Robinson, 2001).

Previous research supports an association between opioid use and preterm birth (Nørgaard, Nielsson, & Heide-Jørgensen, 2015). While research suggests that psychosocial variables may serve as risk factors (Moutquin, 2003), no research has evaluated the role of mental health diagnoses aside from anxiety and depression (Benningfield et al., 2010) play in conjunction with opioid use in exacerbating the risk of preterm birth. In the current study, the focus is on borderline personality disorder (BPD). BPD is a severe and chronic disorder characterized by affective instability, identity disturbance, presence of negative relationships, and/or self-harm/impulsivity tendencies (Morey, 1991). While research suggests that borderline features are associated with opioid use (Kurdziel-Adams et al., 2019), no research has evaluated how borderline features may relate to the relationship between opioid use and preterm birth and may serve to exacerbate the biological risks presented by opioid use. The current study addresses this gap and evaluates whether BPD, operationalized as above a cutoff of self-reported borderline features (Morey, 1991), moderates the relationship between opioid use and preterm birth in order

to inform interventions to help prevent premature delivery in women who misuse opioids in pregnancy.

CHAPTER TWO: LITERATURE REVIEW

Opioid Use in Pregnancy and Preterm Birth

There is considerable research that finds an association between opioid use during pregnancy and an increased incidence of preterm birth (reviewed below). This research has been consistent across different populations and different study methodologies. Given the possible implications of preterm birth, this represents a significant risk factor for infants.

Research that has evaluated preterm birth in conjunction with opioid use operationalized broadly (e.g. use of any opioid whether prescribed opioid use for the management of opioid abuse or illicit use) has found higher rates of preterm birth among this group. Nørgaard et al. (2015), in a Danish population-based study, compared opioid users (sample included women using methadone, buprenorphine, heroin, or combination of these substances) to the rest of the general population who had given birth within that time, with drug use being determined from medical records. Data found an association between opioid use and preterm birth, with 5.7% of unexposed infants and 17.1% of exposed infants being born preterm. Moreover, Baer et al. (2019), found that 13.3% of women using opioids during pregnancy gave birth between 32 and 36 weeks, as compared with 5.8% of women not using substances, in a population-based sample in California.

This increased prevalence of preterm birth among opioid-using women holds true when the effects of specific individual opioids are evaluated. Kelly et al. (2011) evaluated oxycodone use and found that infants exposed in utero were significantly more likely to be born preterm than those who had not been exposed, as identified through use of medical records. Furthermore, Maghsoudlou et al. (2017) found, in a study conducted in rural Iran, that self-reported opium users had a significantly higher risk of preterm birth than self-reported non-users.

This relationship is also found with opioids typically prescribed for the management of opioid misuse (e.g. by providing doses small enough to avoid euphoria but large enough to reduce cravings, namely methadone and buprenorphine). Almario et al. (2009) found that women who were maintained on methadone during pregnancy (who were either stabilized on this drug after conception or maintained on it prior to conception) were more likely to give birth preterm than women not using any opioids. Furthermore, Cleary et al. (2011) found that women who were using methadone at delivery were 4.32 times more likely to give birth preterm and 3.75 times more likely to give birth very preterm than controls.

There similarly seems to be a relationship between buprenorphine use and preterm birth, with most studies evaluating the effects of buprenorphine in relation to methadone. A meta-analysis conducted by Brogly et al. (2014) evaluating 298 published articles reported similar rates of preterm birth in women maintained on buprenorphine versus methadone. A separate meta-analysis evaluating three randomized control trials and 15 cohort studies which directly compared methadone and buprenorphine found that buprenorphine is associated with a lower risk of preterm birth than methadone (Zedler et al., 2016). While there appears to be some discrepancy in reported level of risk associated with these particular opioids, the research in this area indicates a clear association between use of either of these maintenance drugs and an increased incidence of preterm birth.

Given this research, it is clear that opioid use is related to an increased occurrence of preterm birth. In current study we aimed to expand our understanding of the relative risks of opioid use in pregnancy by evaluating the prevalence of preterm birth among a group of women using opioids during pregnancy and among a comparison group comprised of women with high-risk pregnancies for medical issues not related to substance use. All previous studies evaluating

opioid use in pregnancy to our knowledge have used a normative control group, which does not control for the high-risk nature of a pregnancy.

BPD and Opioid Use

Symptoms of BPD include impulsivity in at least two areas that are potentially self-damaging (e.g. spending, sex, substance abuse, reckless driving, binge eating). In addition to substance misuse being one potential symptom of BPD, there is comorbidity between BPD and substance misuse above and beyond this shared symptomatology (Trull, Sher, Minks-Brown, Durbin, & Burr, 2000). These high levels of substance use among individuals with BPD appear to hold true in pregnancy, as women with BPD are more likely to use substances than individuals without this disorder (Blankley, Galbally, Snellen, Power, & Lewis, 2015). Moreover, borderline features (affective instability, identity disturbance, negative relationships, and self-harm/impulsivity; Morey, 1991) were all significantly correlated with opioid use severity in the current sample (Kurdziel-Adams et al., 2019), and women categorized as above the clinical cutoff range for BPD (≥ 38) in terms of borderline features (Morey, 1991) were 2.83 times more likely to be opioid users than women who were below this threshold (Kurdziel-Adams et al., 2019).

BPD and Preterm Birth

Research regarding BPD and preterm birth is limited, though some research suggests women with BPD may be more susceptible to giving birth preterm. In a study conducted by Blankley et al. (2015), women with BPD were compared with typical controls regarding birth outcomes. Information from 42 women with a previous clinical diagnosis of BPD was compared with data from 14,313 other women who gave birth at the same hospital during the same time period. Women with BPD gave birth preterm (21%) more frequently than controls (10%).

Another study conducted by Pare-Miron, Czuzoj-Shulman, Oddy, Spence, and Abenhaim (2016) shows a similar trend. This retrospective population-based cohort study on all births from 2003 to 2012 from a pre-existing research project included women from across the country from a variety of different backgrounds. The sample consisted of 8,487,892 women overall, with 989 women classified as having BPD (based on previous diagnosis included in medical record). Women with BPD were more likely to give birth preterm, with calculated rates of 7.48% in the general population and 16.78% among individuals diagnosed with BPD.

Despite this apparent risk, no studies to date have evaluated BPD and preterm birth in the context of opioid use. Given the high rates of comorbidity previously discussed, it is important to understand the relative risk women using opioids who have BPD may have. Furthermore, no research to date has evaluated this relationship using self-report data (as an approximation of BPD). Given that many women may meet criteria for this disorder but may not have received a diagnosis due to lack of access to or unwillingness to seek psychological care, evaluating borderline features in this manner may provide a better estimate of how these variables interact in the general population. In the current study we expected to find that women above the cut-off for borderline features that approximates a diagnosis of BPD (Trull, 1995) would be more likely to give birth preterm than would high-risk medical comparisons.

Opioid Use, BPD, & Preterm Birth

Borderline features may moderate the relationship between opioid misuse and preterm birth. For example, the borderline feature of affective instability may increase the likelihood that a woman experience anxiety, depression, and stress, factors known to exacerbate the incidence of preterm birth (Glynn, Schetter, Hobel, & Sandman, 2008; Grote, Bridge, Gavin, Melville, Iyengar, & Katon, 2010), compounding any risks presented by opioid use alone. Furthermore, the

borderline feature of identity disturbance may make it more difficult for a woman to prepare for the role of a motherhood. This might lead to less engagement in prenatal care, which is related to increased incidence of preterm birth (Vintzileos, Ananth, Smulian, Scorza, Knuppel, 2002) or increase her perceived levels of stress throughout pregnancy, which is also associated with increased frequency of preterm birth (Latendresse, 2009). The borderline feature of negative interpersonal relationships may be associated with less social support, which in turn is associated with higher rates of preterm birth (Nkansah-Amankra, Dhawain, Hussey, & Luchok, 2009). Finally, the borderline feature of impulsivity/self-harm may predispose women to engage in risky behavior beyond opioid use, which is also related to preterm birth (Erickson et al., 2001). As such, in the current study we expected to find that borderline features (above the cutoff that approximates a diagnosis of BPD) would moderate the relationship between opioid use and preterm birth such that higher borderline features would be associated with a stronger relationship between opioid use in pregnancy and preterm birth.

Purpose and Hypotheses

In this study we sampled women who use opioids in pregnancy and women at high-risk for medical issues other than drug use. BPD was assessed as a cut-off reflecting likelihood of a BPD diagnosis (Trull, 1995) from self-reported borderline features. Preterm birth was assessed as a categorical variable (above or at/below 37 weeks gestation at birth). We began by evaluating the likelihood of preterm birth among women using opioids compared with women who had high-risk pregnancies for reasons not including substance use. We then hypothesized that: 1) women above the cut-off for borderline features that approximates a diagnosis of BPD would be more likely to give birth preterm than would women below the cut-off; and 2) the cut-off for a BPD diagnosis would moderate the relationship between opioid use (yes/no) and preterm birth, such

that the relationship between opioid use and likelihood of preterm birth will be stronger for women above the cut-off.

CHAPTER THREE: METHOD

Participants

The sample ($N = 88$) was comprised women in their second or third trimester of pregnancy who were being seen at a high-risk obstetrics clinic at a large medical center in the state of Tennessee. Of that sample, 52 participants were referred for opioid misuse, and 36 were referred for medical issues other than substance misuse including obesity, multiple gestation, high blood pressure, and heart disease.

Procedure

Researchers recruited participants through flyers placed in the clinic waiting room and word of mouth from the clinic physicians working. If a woman expressed an interest in participating in the study, she was brought to a separate room before or after her appointment with her obstetrician/gynecologist (OBGYN) where a research assistant greeted her. The research assistant provided information regarding the nature of the study and obtained her consent to participate. The woman was then given a questionnaire packet to complete and was compensated with a gift-card for her time. After delivery, a research assistant obtained information from the participant's medical chart, including demographic information, opioid use history, and gestational age of infant at birth.

Measures

Demographics.

Information was gathered regarding women's race, employment status, and relationship status, and gestational age at study participation from the participant's medical chart and is summarized in Table 1. Medicaid enrollment was used as a proxy for (low) socioeconomic status. All women in the sample received TennCare, the local version of Medicaid.

Borderline Features.

Borderline features were assessed during pregnancy using The Personality Inventory-Borderline Features Scale (PAI-BOR; Morey, 1991). There are 32 items to which the women rated her agreement on a scale of 1 to 4. This self-report measure provides scores in four key domains: affective instability, identity problems, negative relationships, and self-harm. Items included statements such as, “My mood can shift quite suddenly” (affective instability), “My attitude about myself changes a lot” (identity problems), “ My relationships have been stormy” (negative relationships), “When I’m upset, I typically do something to hurt myself” (self-harm). Potential raw scores range from 0-72 with higher overall scores indicating higher levels of borderline features. High levels of borderline features are convergent with a diagnoses of BPD (Kurtz & Morey, 1991); furthermore, the PAI-BOR has good test-retest reliability as demonstrated in a study evaluating borderline features among adolescents with a BPD diagnosis (Trull, 1995). The current study made use of a clinical cutoff score of ≥ 38 for total borderline features as Trull (1995) found this to be approximately equivalent to a BPD diagnosis. As determined using Cronbach’s alpha, this scale had a high level of internal consistency: affective instability $\alpha=.80$, identity problems $\alpha=.75$, negative relationships $\alpha=.79$, self-harm/ impulsivity $\alpha=.80$, and total borderline features $\alpha=.79$.

Opioid Use.

Participants were classified as either opioid-users (referred to the clinic for opioid misuse in pregnancy) or non-users (high-risk medical comparisons) through the use of urine screens and prescription information accessed in their medical records. In order to be placed in the opioid group, a participant had to meet the following criteria: have a prescription for opioids used to

manage withdrawal symptoms (e.g. buprenorphine) at some point during pregnancy and/or have had a positive opioid urine screen (prescribed and/or non-prescribed) within the 30 days prior to participation. Women were included in the comparison group if they were referred to the clinic for reasons not including substance use and did not produce any positive drug screens throughout their pregnancy.

Among the opioid-user group, women took one of three different paths throughout their pregnancy: traditional medication- assisted treatment (MAT) where they received the same doses of prescription opioids throughout their pregnancy after becoming stable; MAT with a taper, where they received prescription opioids throughout their pregnancy but the doses were reduced past the initial dosage; or MAT with detox, where the participant tapered completely off of the prescribed opioid before giving birth.

Preterm Birth.

Number of weeks gestation at time of birth was obtained from medical records. This variable was conceptualized as a categorical variable (preterm versus full-term), with preterm birth being defined as birth before 37 weeks gestation.

CHAPTER FOUR: RESULTS

Before evaluating our hypotheses, we tested for differences between the opioid-use and the non-opioid-use group on demographic variables such as maternal age, gestational age at study participation, minority group status, employment status, and relationship status. Group differences were evaluated using *t*-tests for continuous variables (maternal age and gestational age at study participation) and chi-square tests for categorical variables (minority group status, employment status, and relationship status). Significant differences were found between the groups in terms of maternal age, but no differences were found in terms of gestational age at study participation, minority group status, employment status, or relationship status. See Table 1. Furthermore, women who met the cutoff for a BPD diagnosis were compared with those who did not in terms of these demographic variables. No group differences were found.

To begin, we looked at the descriptive differences between the opioid group and high medical-risk comparison group in terms of prevalence of preterm birth. Overall, women in the comparison group were more likely to give birth preterm (21.05% vs 16.36%) than were women in the opioid group. See Table 2 and Graph 1. However, when a binomial logistic regression was used with opioid use (yes/no) entered as an independent variable and preterm birth entered as a dependent variable (yes/no birth before 37 weeks) this difference was found not to be statistically significant, $\chi^2(2) = 4.590, p = .101$. See Table 3.

Using descriptive statistics, we also observed rates of preterm birth among the different treatment groups among the opioid use group. For women who adhered to traditional MAT, 13.04% gave birth preterm; women who used MAT throughout their pregnancy but tapered their dosage, 30.77% gave birth preterm; of women who detoxed off of MAT completely by the end

of their pregnancy, 10.53% gave birth preterm. Due to very small sample size within these groups, inferential statistical analyses were not preformed. See Table 2 and Graph 2.

Hypothesis 1

To evaluate hypothesis 1, we first looked at descriptive differences between the BPD groups (yes/no based on cutoff score of total borderline features) regarding preterm birth (yes/ no birth before 37 weeks). Among participants above the cutoff for BPD, the prevalence of preterm birth was 31.25%. The prevalence of preterm birth was 11.48% among those below this cutoff. See Table 4.

To test whether the relationship between BPD (yes/no based on cutoff score of total borderline features) and preterm birth (yes/ no birth before 37 weeks) was statistically significant, a binomial logistic regression was used. BPD (yes/ no based on cutoff score) was entered as an independent variable and preterm birth (yes/no) was entered as a dependent variable. No variables were controlled for as there were no significant differences between groups (yes/ no BPD) in terms of demographic variables. As hypothesized, results demonstrated that BPD significantly predicted preterm birth, $\chi^2(1) = 4.933, p < .05$. The model explained 8.7% (Nagelkerke R^2) of the variance in preterm birth and correctly classified 80.7% of cases. See Table 5.

Hypothesis 2

Lastly, binomial linear regression was used to evaluate Hypothesis 2: whether the relationship between opioid use (yes/no) and preterm birth (yes/no) was moderated by BPD (determined using cutoff scores). Opioid use, BPD, and the interaction term opioid use*BPD were entered as independent variables, with preterm birth as the dependent variable. Contrary to our hypothesis, BPD was not found to significantly moderate the relationship. See Table 6.

CHAPTER FIVE: DISCUSSION

The current study found, as hypothesized, that women above the cutoff of borderline features associated with a diagnosis of BPD were significantly more likely to give birth preterm than women without BPD (below the cutoff). This is in line with previous research which reported that women with a previous diagnosis of BPD were more likely to give birth preterm than typical controls (Blankely et al., 2015; Pare-Miron et al., 2016) However, no support was found to support the hypothesis that borderline features served as a moderator between opioid use and preterm birth.

Furthermore, the current study looked at the rates of preterm birth among women using opioids in pregnancy (traditional MAT, taper, and detox groups) and women who had high-risk pregnancies for reasons not including substance use. Overall, we found that women in the comparison group had a higher prevalence of preterm birth (21.05%) than the women in the opioid use group (16.36%). Among the opioid use group, women who tapered their MAT doses but did not detox had the highest rate of preterm birth (30.77%), followed by women who maintained the same MAT dose throughout pregnancy (13.64%), followed by women who detoxed off of MAT completely (10.53 %). It is important to note to sample sizes within these groups was very small so inferential statistics were not conducted.

Interpretation and Meaning of Findings

Overall, these results suggest that opioid use does not impose a risk of preterm birth over and above what is expected for a different kind of high-risk pregnancy—medical high risk. While previous research has evaluated preterm birth among women using opioids with a normative control group, this is the first study to use a high-risk medical comparison group.

Furthermore, results found that BPD predicts preterm birth, replicating research by Blankely et al. (2015) and Pare-Miron (2016). However, these previous studies operationalized BPD as clinical diagnoses based off the DSM-IV and ICD-9-CM, respectively. Our research extends these findings by conceptualizing BPD as self-reported borderline features above the cutoff score used to approximate a clinical diagnosis (Morey, 1992; Trull, 1995). This suggests that administering this scale may be useful in evaluating potential risk for preterm birth. This is important as administration and scoring a self-report measure is more time effective and requires less training than conducting interviews to determine a clinical diagnosis. While many women may meet criteria for BPD and not have a diagnosis due to lack of ability or unwillingness to seek psychological services, administration of a self-report measure may provide the ability for more women to be screened for features this disorder above the cutoff score.

Strengths and Limitations

The current study has a number of strengths. First, our sample consisted of women using opioids during pregnancy, which is a sample that is often difficult to recruit due to societal stigma around such use and previous laws within the state criminalizing such use (Fetal Assault Law; Nadkarni, 2015). Furthermore, our study utilized a high-risk comparison group, consisting of women who had high risk pregnancies for medical reasons such as obesity, multiple gestation, and high blood pressure, allowing for the risks of opioid use to be evaluated above those simply imposed due to having a high-risk pregnancy. Additionally, this study utilized the use of self-report measures in order to conceptualize borderline personality symptoms which likely allowed us to get a better understanding of this disorder in the general population.

There were also several limitations present in the current study. First, the participants in our sample were relatively homogenous in terms of demographic variables, as participants were almost exclusively white, and they all received Medicaid (which reflects low socio-economic status). While there were no differences between groups in terms of these variables (women using opioids versus those with high-risk pregnancies for other reasons and women above the cutoff for BPD and those below it), this likely limited the generalizability of our findings. Second, our study had a low sample size, which contributed to low power to detect group differences and suggests that future replication of findings is necessary. This is a particularly significant limitation when looking at the frequencies of preterm birth among the different opioid use groups (no-taper MAT, taper, and detox) as these groups were especially small. Third, we did not assess medical risk factors in the opioid use group so do not know how prevalent they were or what effect they might have had.

Future Research

Research in the future might extend our findings by evaluating how other mental health diagnoses might relate to opioid use and preterm birth. Research in the past has been limited to anxiety and depression (Benningfield et al., 2010), and the focus in the current study was on BPD. As such, more research is needed on a variety of different mental health concerns in understanding these processes.

Future research might also better evaluate the relative risks of BPD and preterm birth among specific contexts of opioid use (e.g. illicit use, those detoxing during pregnancy, etc.) as the current study was limited by small sample size. While our study demonstrates that there may possibly be differences in prevalence rates of preterm among various opioid use conditions

(traditional MAT, taper, detox), it was not possible to make inferences with the current data due to the limited number of participants in each group.

Furthermore, future research should be conducted with a more diverse sample. As our research was conducted with predominately white participants who were all of low socioeconomic status, as discussed previously, our results might not generalize to all groups of women impacted by substance use. Research sampling different populations will help better understand how these variables interact in the population as a whole.

In the future it may also be beneficial to evaluate the optimal time to screen for borderline features. In our study, women were able to participate at any point in their second or third trimester of pregnancy. As such, they were screened for borderline features at various points during their pregnancy. While we found no group differences between women who were above the cutoff of borderline features and those who were not, future research might evaluate whether there are differences in how women self-report borderline symptoms throughout their pregnancy. This would allow for better screening practices going forward.

Lastly, future research might benefit from a focus on understanding ways in which women with BPD may be supported in their pregnancies with the goal of reducing instances of preterm birth. As such, studies evaluating the mechanism by which BPD and preterm birth are associated would be helpful. Furthermore, research should also evaluate potential interventions that may be used to reduce the rate of preterm birth, given the risk for infant death (de Bernabe et al., 2004).

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APPENDIX

Table 1. *Demographic Information*

Variable	Opioid-use group <i>n</i> = 52 M(<i>SD</i>)	Control group <i>n</i> = 36 M(<i>SD</i>)	Opioid Use vs. Control Group <i>t</i>
Participant age	28.22 (4.37)	25.43(4.19)	-3.108**
Gest. age (study)	27.56 (7.89)	25.68 (7.89)	-1.081
	%	%	χ^2
Race/Ethnicity			10.78
<i>White</i>	94.2%	69.4%	
<i>Racial Minority</i>	5.8%	16.7%	
<i>Hispanic/ Latina</i>	1.9%	2.8%	
<i>Not Hispanic/Latina</i>	98.1%	97.2 %	
<i>Not specified</i>	--	8.3%	
Unemployed	90.4%	69.4%	8.91
Medicaid	100% (52)	100%	0
Rel. Status			.843
<i>Single</i>	65.4 %	63.9 %	
<i>Dating</i>	17.3 %	16.7 %	
<i>Married</i>	21.2 %	25%	
<i>Divorced</i>	1.9% (1)	0% (0)	

***p* < .01

Table 2. *Frequency of Gestational Outcome Per Opioid Use Group*

	Preterm	Full-term	Missing Data
Comparison Group	8 (21.05%)	28 (73.68%)	2 (5.26%)
Opioid Group (Total)	9 (16.36%)	43 (78.18%)	3 (5.45%)
Traditional MAT	3 (13.04%)	18 (78.26%)	2 (8.70%)
Taper	4 (30.77%)	9 (69.23%)	0 (0%)
Detox	2 (10.53%)	16 (84.21%)	1 (5.26%)

Note: The comparison group is women who had high-risk pregnancies for reasons not including substance use.

Graph 1. Prevalence of Preterm Birth in Opioid versus Comparison Group

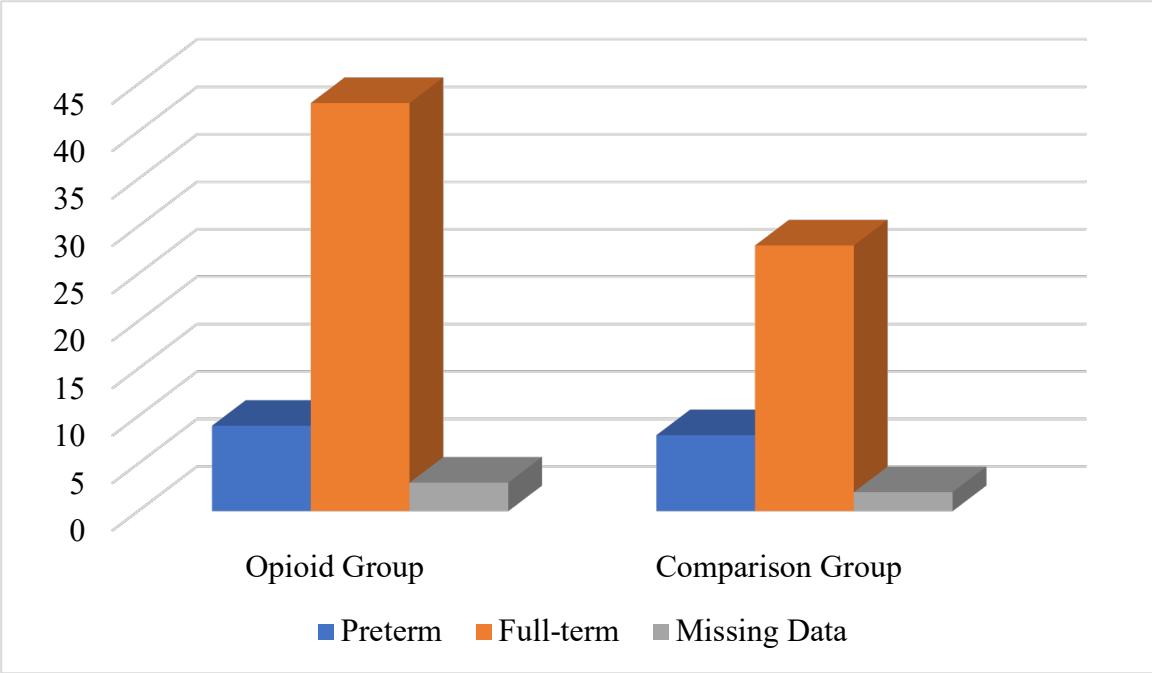


Table 3. *Logistic Regression Predicting Likelihood of Preterm Birth based on Opioid Use with Controls for Maternal Age, n = 88*

	<i>B</i>	SE	Wald χ	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
			2				Lower	Upper
Opioid User	.78	.61	1.63	1	.201	2.17	.661	7.146
Constant	-5.67	2.17	6.81	1	.009	.00		

Note: Opioid user group and preterm birth are yes/no variables

Graph 2. *Prevalence of Preterm Birth by Opioid Group*

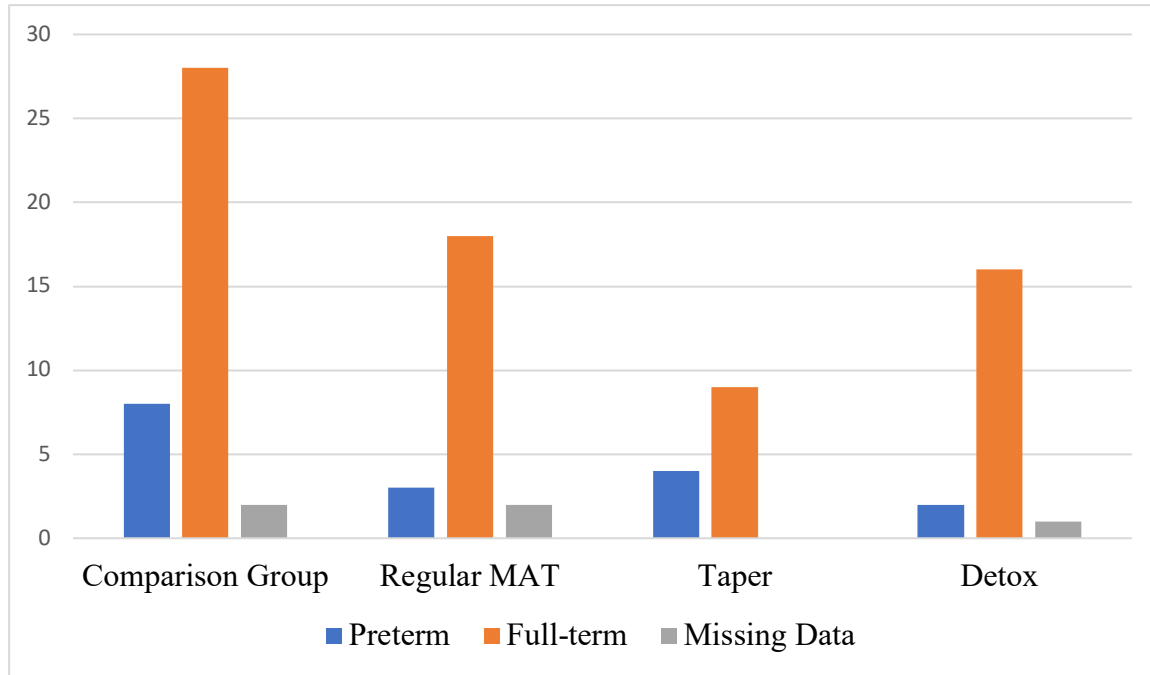


Table 4. *Frequency of Gestational Outcome Per BPD Status*

	Preterm	Full-term	Missing Data
BPD	10 (31.25%)	21 (65.63%)	1 (3.13%)
Comparison	7 (11.48%)	50 (81.97%)	4 (6.56%)

Note: BPD status was determined using an approximation of BPD determined using a cutoff score on a self-report measure of borderline features. Comparison group denotes all participants who scored below that cutoff and BPD group denotes participants who scored above that cutoff.

Table 5. *Logistic Regression Predicting Likelihood of Preterm Birth based on Borderline Features Cutoff, n=88*

	<i>B</i>	SE	Wald χ^2	df	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
BPD	-1.22	.56	4.83	1	.028	.30	.10	.88
Constant	-.74	.38	3.72	1	.009	.003		

Note: Opioid user group is yes/no variable. Borderline features cutoff is determined based on scores greater than 38 on the PAI-BOR.

Table 6. *Logistic Regression Predicting Likelihood of Preterm Birth based on Borderline Features Cutoff *Opioid Use Interaction Term, n=88*

	<i>B</i>	SE	Wald χ	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds	
							Ratio	Upper
			2				Lower	Upper
Opioid User	.79	.86	.83	1	.361	2.20	.41	11.95
Borderline Features Cutoff	-1.16	.88	1.71	1	.190	.31	.06	1.78
Borderline Features Cutoff *Opioid User	1.09	1.22	8.94	1	.373	2.97	.27	32.51

Note: Opioid user group is yes/no variable. Borderline features cutoff is determined based on scores greater than 38 on the PAI-BOR.

VITA

Andrea Gorrondona received her Bachelor of Arts degree in Psychology from the University of Tennessee, Knoxville in 2017 and continues her studies here in the clinical psychology doctoral program. She anticipates earning her Master of Arts degree in August 2020 and her doctoral degree in 2023. Her research interests include substance use, personality disorders, and the effects of trauma.