Theses and Dissertations   Graduate School

2020

Acute Stress Disorder in Neonatal Intensiver Care Unit Mothers: Modeling Risk Factors and Trauma Appraisals Modeling

Allison Baylor 5435882

Abstract

ACUTE STRESS DISORDER IN NEONATAL INTENSIVE CARE UNIT MOTHERS:
MODELING RISK FACTORS AND TRAUMA APPRAISALS

By: Allison Baylor Williams, M.S.

A dissertation submitted in partial fulfillment of requirements for the degree of Doctor of
Philosophy in Clinical Psychology at Virginia Commonwealth University

Virginia Commonwealth University, 2020

Director: Bruce Rybarczyk, Ph.D.
Professor
Department of Psychology

Postpartum mental health is a public health priority, particularly for mothers with infants in the Neonatal Intensive Care Unit (NICU), who may have experienced a precipitous birth, followed by a traumatic NICU hospitalization. However, little research has focused on NICU-related posttraumatic stress (PTSS), despite its presumed prevalence and ripple effects on infant development, family functioning, and provider burnout during the critical early bonding period. In particular, little research has evaluated: early posttraumatic stress (Acute Stress Disorder symptoms, ASD), index and sequential traumas related to NICU/birth, and relations among pre-existing risk factors, and trauma appraisals/ objective trauma characteristics (related to infant health and childbirth). Thus, the present study aimed to: (1) characterize ASD's prevalence, comorbidities, and index/compounding traumas; (2) evaluate relations between pre-existing risk factors, appraisals of infant health and control during childbirth, objective factors related to infant health or childbirth, and ASD, using descriptive statistics, correlation matrices, three infant health structural equation models (SEMs), and three birth related SEMs. English-speaking mothers were eligible between days 5-31 of their infants' hospitalizations for this cross-sectional

study. Of the 119 mothers (~72% Medicaid) who completed surveys, ~55% scored in the "at risk" range or higher for ASD symptoms. In the ~40% of mothers with diagnosed ASD, commodities of other mental health symptoms were high: ~81% endorsed significant postpartum anxiety and ~66% endorsed postpartum depression. Sequential trauma was pervasive: ~54% endorsed more than one trauma. NICU admission was the most common trauma (~81%), followed by childbirth (~50%), pregnancy (~24%), and a specific NICU incident (~15%). Pre-existing risk factors were examined, but only to adverse childhood experiences (ACEs) met criteria for testing in the SEMs. All the infant health SEMs had good fit, indicating that appraisals of infant health mediated the relationships between ACEs and ASD symptoms and between objective infant health and ASD respectively. Childbirth models had poor fit; only appraisals of control during childbirth and ACEs predicted ASD symptoms. The high prevalence of ASD symptoms, multiple traumas, and other mental health comorbidities highlight the unique psychosocial needs of NICU mothers. Additionally, these models suggest that a trauma-informed approach to research and clinical work is needed, which accounts for infant health and birth appraisals in addition to prior trauma.

Acute Stress Disorder (ASD) in Neonatal Intensive Care Unit Mothers:
Modeling Pre-existing Risk Factors and Trauma Appraisals

Introduction

Study Overview

Neonatal Intensive Care Unit (NICU) infant admissions are both common and

consequential for mothers, frequently causing a cascade of negative effects on maternal mental

and physical health (Hynan et al., 2015). Approximately one in eight newborns are admitted to

the NICU each year (National Perinatal Information Center [NPIC], 2011). Lower-income,

trauma exposed, and African American/Latinx mothers are at increased risk for having their

newborn admitted to a NICU (NPIC, 2011). These groups are more likely to have a NICU

admission due to vulnerabilities related to chronic stress as well as barriers to appropriate

prenatal care (Center for Disease Control [CDC], 2016; Holzman et al., 2009; Love, David,

Rankin, & Collins, 2010; Witt et al., 2014). Mothers of NICU infants are often recovering from a

traumatic birth while fearing for the lives of their infants, both of which can contribute to

maternal posttraumatic stress symptoms (PTSS), such as Acute Stress Disorder (ASD; Andersen,

Melvaer, Videbech, Lamont, & Joergensen, 2012; Roque, Lasiuk, Radunz, & Hegadoren, 2017).

Diagnosed in the first month following a traumatic event, ASD is characterized by symptoms of

distress, dissociation, re-experiencing, avoidance, and arousal (American Psychiatric

Association, 2013).

Maternal posttraumatic stress is associated with considerable negative consequences,

including higher substance use rates, comorbid mood disorders, and physical health concerns

such as chronic pain, insomnia, and cardiovascular disease (National Center for PTSD, 2016). In

addition to influencing the physical and mental health of the mother, mental health concerns like

3

posttraumatic stress are also associated with problematic outcomes for the infant including: insecure attachment, less frequent visitation of the infant in the NICU, worse infant sleep patterns, impaired infant cognitive development, and slower physical development (Davies, Slade, Wright, & Stewart, 2008; Focada-Guex, Borghini, Perrehumbert, Ansermet, & Muller-Nix, 2011; Maroney, 2003; Roque , Lasiuk, Radunz, & Hegadoren, 2017; Sanders & Hall, 2018). A focus on the factors that influence early posttraumatic stress in this population is critical to inform early screening/intervention practices and prevent long-term harms for both mother and baby.

Despite the high prevalence and the profound impact of maternal posttraumatic stress, research on risk factors and trauma characteristics that may predict ASD symptoms is limited, with only a handful of studies conducted to date (Binder, Zeltzer, Simmons, Mirocha, & Pandya, 2010; Gangi et al., 2013; Lefkowtiz, Baxt, & Evans, 2010; Misund, Nerdrum, & Diseth, 2014; Shaw et al., 2006; Shaw et al., 2009; Shaw, Bernard, Storfer-Isser, Rhine, & Horwitz, 2013). Available research generally does not focus exclusively on the first month post-admission or restricts samples to only premature infants or infants with lengthy hospitalizations (e.g., Gangi et al., 2013; Lefkowitz et al., 2010). Research is needed that evaluates: (1) pre-existing risk factors for ASD symptoms, (2) objective characteristics of the traumatic event (e.g., infant health factors, type of delivery), (3) subjective appraisals of the traumatic event (e.g., how sick parents perceive their infants to be), and (4) relationships between these factors and ASD symptoms. In particular, very little research has focused on pre-existing risk factors related to cumulative stress that may both contribute to the likelihood of NICU admission *and* predict worse posttraumatic stress outcomes as a result (Holzman et al., 2009; Love, et al., 2010). Specifically, further

research on the following pre-existing risk factors is needed: adverse childhood experiences, prior fetal loss, insomnia history, and history of experiencing racism.

Furthermore, when evaluating characteristics of the traumatic event, research has focused almost exclusively on infant health, without also assessing how objective and subjective characteristics of the birth experience may contribute to ASD symptoms (e.g., Aftyka et al., 2014; Misund et al., 2014; Yaman et al., 2015). Moreover, studies have primarily targeted objective risk factors (e.g., type of delivery), while neglecting to evaluate subjective perceptions that might also be important for ASD risk (e.g., how much control the mother felt during childbirth) (e.g., Chang et al., 2016; Yaman et al., 2015). Finally, to our knowledge, no studies have grounded their aims within a comprehensive theoretical model of medical traumatic stress, making findings scattered and difficult to interpret holistically.

To address these gaps, the present study will examine pre-existing risk factors for Acute Stress Disorder symptoms and objective/subjective characteristics of the traumatic event. The present study will focus specifically on ASD symptoms in NICU mothers, due to the scarcity of research on early posttraumatic stress in NICU mothers, as well as the potential ripple effects of PTSS on both mothers and their infants (Davies et al., 2008; Focada-Guex, et al., 2011; Maroney, 2003; Roque et al., 2017; Sanders & Hall, 2018). This study will be one of the first not to restrict our sample to exclusively premature infants or infants with a certain length of stay, thus allowing for broader inferences about the NICU population. The present study will be the first to apply the Pediatric Medical Traumatic Stress Model to NICU parents, which models relations between pre-existing risk factors, objective trauma characteristics, subjective appraisals of the traumatic event, and Acute Stress Disorder symptoms (Kazak et al., 2006). This model's emphasis on subjective appraisals of the traumatic event will also be a relatively novel

contribution to the NICU posttraumatic stress literature, as most of the research has only focused on objective trauma characteristics (e.g., Chang et al., 2016; Yaman et al., 2015). Additionally, our study's emphasis on potentially traumatic birth (rather than of simply focusing on infant health as the traumatic event) will also be a unique contribution to the literature and better reflect the sequential trauma that NICU mothers may experience.

Grounded in the Pediatric Medical Traumatic Stress Model, the present study broadly aims to evaluate key risk factors and objective/subjective trauma characteristics for Acute Stress Disorder in NICU mothers (Kazak et al., 2006). Specifically, we aim to first characterize the prevalence of Acute Stress Disorder and traumas in NICU mothers, without restricting our sample by infant diagnosis or length of stay. Additionally, we will evaluate correlations on key domains of interest, including: demographics, pre-existing risk factors, mental health concerns, infant health, and birth experience. We will apply Kazak's (2006) model to our population of NICU mothers, testing parallel models that focus first on infant health and subsequently childbirth experience. Specifically, we will investigate how subjective trauma appraisals (first for infant health, then childbirth) mediate the relations between pre-existing risk factors and ASD symptoms. Subsequently, we will also evaluate (1) how appraisals of infant health mediate the relations between objective infant health and ASD symptoms and (2) how appraisals of control during childbirth mediate the relations between type of delivery and ASD symptoms. Finally, we will evaluate comprehensive models of traumatic stress that include pre-existing risk factors, objective trauma characteristics, and subjective trauma appraisals, for infant health and childbirth respectively.

Background

Background on Neonatal Intensive Care Units

Approximately, 10 to 15% of newborns are hospitalized in the Neonatal Intensive Care Unit (NICU) each year (NPIC, 2011). Prematurity (defined as under 37 weeks gestation), very low birth weight (3.5 pounds or less), and respiratory distress syndrome are several of the most common reasons for NICU admission (Harrison & Goodman, 2015). NICU's differ from hospital nurseries in that they offer highly specialized care, including respiratory services, cardiac support, and complex surgeries (NPIC, 2011). Length of stay depends on medical severity, as some infants are hospitalized for less than a week while infants can stay up to a year (NPIC, 2011). Median length of stay is 13 days, ranging from approximately 5 days for infants between 39 and 41 weeks at birth to 46 days for infants born at less than 32 weeks (NPIC, 2011). Medical advances have drastically improved infant survival rates, particularly for premature infants (CDC, 2016). Accordingly, neonatal care efforts have expanded their focus from primarily infant survival also to support the psychosocial needs of the entire family in order to improve secondary infant health outcomes such as cognitive/physical development, pain reduction, bonding, and sleep (Hynan et al., 2015). This has led to increased initiatives for skin-to-skin care, breastfeeding, and parental involvement with daily infant care (Craig et al., 2015). Efforts to screen and address parental mental health needs have also been recommended and initiated in some medical centers (Sanders & Hall, 2018).

NICU parents may have unique characteristics that place them at greater risk for NICU admissions, making it important to consider sample characteristics. There are several maternal psychosocial characteristics associated with the increased likelihood of NICU admissions,

including: low-income status, African American or Hispanic/Latinx race/ethnicity, trauma history, and a history of mental health problems (CDC, 2016; Witt et al., 2014). One reason for the increased likelihood of preterm birth for these populations is through "weathering," wherein chronic toxic stress and cumulative disadvantages wear on a person's physical and mental health, contributing to worse reproductive outcomes (Witt et al., 2014; Holzman et al., 2009). Additionally, health disparities in the access and quality of prenatal care may also place these mothers at higher risk (Alexander, Kogan, & Nabukera, 2002). Mothers with complex reproductive histories (e.g., experiencing two or more miscarriages) are also more likely to have a baby in the NICU (Jivraj, Antsie, Cheong, Fairlie, & Laird, 2001). Finally, mothers with insomnia may be more likely to experience preterm birth (Felder, Baer, Rand, Jelliffe-Pawlowski, & Prather, 2017). In summary, NICU parents have pre-existing risk factors for NICU admission. It is vital to evaluate the ways in which these pre-existing risk factors may also contribute to posttraumatic stress post-admission.

In accordance with the increased recognition of the psychosocial needs of NICU families, research has focused on the unique stress that a NICU hospitalization places on parents, including subsequent harm to parental mental health. This literature has helped to delineate the key aspects of a NICU hospitalization that can be stressful for parents, such as worry about the infant's survival and adjustment to a parental role under adverse conditions (Miles, Funk, & Kasper, 1993). Consequently, studies have also documented how these NICU-related stressors can contribute to poorer mental health outcomes in parents (Roque et al., 2017). To date, the majority of studies has focused on general anxiety or postpartum depression, which are both considerably higher in NICU mothers than in well-baby mothers (Roque et al., 2017). It is critical to understand mental health in the NICU, as parental mental health problems can have

ripple effects on the infants that can affect bonding, heighten infant pain, and hamper physical and cognitive development (Hynan et al., 2015). Despite the advances in research on mental health in the NICU, only recently has research and clinical work employed a trauma-informed approach that conceptualizes NICU stress as a traumatic event, with a range of posttraumatic stress responses (Roque et al., 2017).

Posttraumatic Stress in NICU Parents

A NICU hospitalization can be a traumatic event for parents. NICU parents may experience sequential trauma, including (1) a potentially traumatic birth characterized by fear for the life of the mother and/or the infant and (2) fear for their infant's life or well-being during NICU hospitalization. Both events meet criteria for an "index trauma," an event that can elicit clinically significant posttraumatic stress responses (American Psychiatric Association [APA], 2013). "Compounding trauma" refers to traumas endorsed in addition to the index trauma. Traumatic birth and/or NICU hospitalization can result in posttraumatic stress symptoms (PTSS). PTSS is a broad term that encompasses both sub-clinical posttraumatic stress symptoms, as well as more formal diagnoses, such as Acute Stress Disorder (ASD) or Posttraumatic Stress Disorder (PTSD). We will use the term "PTSS" throughout this paper to include ASD or PTSD. Diagnosed within the first month following a traumatic event, ASD is characterized by clinically significant distress, accompanied by nine symptoms from any of the following five categories: dissociation (e.g., feeling like things are not real), intrusion (e.g., nightmares about their infant's illness), avoidance (e.g. avoiding visiting the hospital), negative mood, and hyper-arousal (e.g., anger at medical staff; APA, 2013). PTSD is diagnosed when ASD symptoms persist and cause clinically significant impairment for greater than one month post-trauma (APA, 2013). Research indicates that ASD significantly predicts PTSD in NICU parents (e.g., Kim, Lee, Kim,

Namkoong, Park & Rha, 2015; Shaw et al., 2009). The present study will focus exclusively on ASD in NICU mothers.

A small but growing field of research estimates ASD symptom prevalence rates ranging from 18% to 54%, for NICU mothers (Binder et al., 2010; Gangi et al., 2013; Lefkowtiz et al., 2010; Misund et al., 2014; Shaw et al., 2006; Shaw et al., 2009; Shaw et al., 2013). With the exception of a few studies (e.g., Shaw et al., 2006, Shaw et al., 2009), study inclusion criteria generally dictated that infants either be premature or have a significant length of stay, so less is known about ASD symptoms prevalence rates in the broader NICU population (e.g., Gangi et al., 2013; Lefkowitz et al., 2010). As a result of the low natural remittance rates of ASD symptoms, an estimated 13% to 60% of mothers have PTSD symptoms between one month and one year after delivery (Aftyka et al., 2014; Aftyka, Rybojad, Rosa, Wróbel, & Karakuła-Juchnowicz, 2017; Barr, 2010; Chang et al., 2016; Feeley et al., 2011; Gangi et al., 2013; Greene et al., 2015; Kim et al., 2015; Koliouli, Gaudron, & Raynaud, 2016; Leftkowitz, Baxt, & Evans, 2010; Misund et al., 2014; Sharp, 2016; Shaw et al., 2009; Shaw et al., 2013; Yaman et al., 2015). The rates of PTSS in NICU parents are higher than in comparable medical populations, underscoring the cumulative trauma that NICU parents may experience. For example, in the literature on birth-related posttraumatic stress, 1-6% of mothers overall meet PTSD criteria after childbirth, and 17% of mothers with unexpected birth complications (but without a NICU hospitalization) experienced birth-specific PTSD (Andersen et al., 2012; Dekel, Stube, & Dishy, 2017; Lasiuk, Comeau & Newburn-Cook, 2013). Systematic reviews on parents with critically ill children (e.g., cancer, burn/trauma units, pediatric intensive care) report slightly lower rates of parental PTSD than in the NICU, ranging from 10-45% (Bruce, 2006; Nelson & Gold, 2012). Research in pediatric intensive care indicates that the younger children are at the time of their illness or

injury, the more severe the parental posttraumatic stress reactions are (Rennick, Johnston, Dougherty, Platt, & Ritchie, 2002). The young age of NICU infants, coupled with the cumulative trauma experiences of birth and NICU hospitalization, may contribute to the relatively high rates of PTSS in NICU mothers.

Acute Stress Disorder and Mental Health

Acute Stress Disorder symptoms in NICU parents predict the future development of Posttraumatic Stress Disorder (PTSD; Binder et al., 2011; Kim et al., 2015; Lefkowitz et al., 2010; Shaw et al., 2009; Vanderbilt, Traute, Young, & Frank, 2009). This trajectory from ASD symptoms to PTSD symptoms is particularly relevant for mothers. NICU mothers are more likely than fathers to endorse posttraumatic stress symptoms within the first month and for those symptoms to develop into PTSD, compared to fathers who often appear to fare well the first month of hospitalization but later develop PTSD (Kim et al., 2015). Addressing maternal posttraumatic stress symptoms in the first month of hospitalization is important because PTSD is less likely to remit over time than other postpartum mental health concerns, such as postpartum anxiety or depression, and is associated with considerable consequences (Greene et al., 2015).

The presence of comorbid postpartum mental health concerns (e.g., depression and anxiety symptoms) is associated with postpartum Acute Stress Disorder symptoms in NICU mothers (Lefkowitz et al., 2010; Vanderbilt et al., 2009). This is especially noteworthy, due to the high prevalence of both postpartum depression and anxiety in this population (Roque et al., 2007). According to a systematic review on postpartum depression, NICU mothers experienced more frequent postpartum depression (PPD) compared to well-baby mothers (Vigod, Villegas, Dennis, & Ross, 2009). PPD symptoms' prevalence rates range from 8-40% in the first month

postpartum and are highest in the first four weeks after delivery, according to a systematic review (Vigod et al., 2009). Postpartum anxiety symptoms are highly comorbid with postpartum depression and have a prevalence rate ranging from 18% to 43% (Carter, Mulder, Bartram, & Darlow, 2005; Rogers, Kidokoro, Wallendorf, & Inder, 2013; Segre, McCabe, Chufflo-Siewert, & O'haram, 2014). Although postpartum anxiety and depression symptoms are prevalent and predictive of ASD symptoms, little research has evaluated the comorbidity rates of these conditions with ASD symptoms in NICU mothers.

In addition to formal comorbid mental health diagnoses, there is also considerable research evaluating the ways in which general stress in the NICU relates to ASD symptoms. Studies that evaluate general NICU stress typically use the Parental Stress Scale (PSS), which includes domains that may evoke distress such as "Sights and Sounds" (e.g., noises of monitoring equipment/alarms), "Role Alteration" (e.g., not being allowed to hold or care for the baby), and "Infant Appearance and Behavior" (e.g., the baby's fragile appearance/size) (Miles & Brunssen, 2003). Research consistently shows that the NICU is a stressful environment and that general stress predicts the development of posttraumatic stress (e.g., Aftyka, et al., 2017; Gangi et al., 2013; Greene et al., 2015; Koliouli et al., 2016; Parker, 2016; Sharp, 2016). For mothers, role alteration was found to be a particularly strong predictor of Acute Stress Disorder symptoms (e.g., Gangi et al., 2013). The robust relationship between general NICU stress and future ASD symptoms has significant clinical implications, suggesting that early intervention for stressed parents may be warranted in order to prevent its progression to ASD or PTSD symptoms.

Theoretical Perspective

Kazak et al.'s (2006) Pediatric Medical Traumatic Stress Model provides a broad framework for posttraumatic stress in injured or ill children and their parents. This model was

developed based on the existing literature on pediatric medical trauma, including various illnesses (e.g., cancer) and injuries (e.g., burns, motor vehicle collisions). The model provides a useful lens to examine the NICU experience, even though NICU parents were not originally incorporated in the model. The Pediatric Medical Traumatic Stress Model is divided into three primary phases, which depict how risk and resilience factors interact with characteristics of the traumatic event to influence PTSS. The first phase, *peritrauma*, includes pre-existing risk factors and the traumatic event. This model emphasizes the importance of both the objective trauma (e.g., the infant's diagnoses, birth weight,) as well as the parents' subjective appraisals (e.g., how worried the parents are that their infant might die). The second phase, *early, ongoing, and evolving*, includes acute stress reactions, as well as ongoing risk and resilience factors. For NICU parents, the ongoing phase encompasses the period in which the infant is hospitalized, including Acute Stress Disorder reactions within the first month of hospitalization. Kazak et al.'s (2006) model also describes ways in which ongoing risk factors influence ASD symptoms, such as coping style or social support. Finally, Kazak's model also describes the third phase of the model, *longer term*, which includes stress responses that occur more than a month after initial hospitalization, such as PTSD symptoms.

To our knowledge, the present study is the first study to apply this model to NICU parents and one of few to conceptualize the traumatic event as sequential, encompassing both birth and NICU admission (e.g., Chang et al., 2016; Kim et al., 2015). This study is limited to the first two phases of this model, i.e., the first month post-trauma, including: pre-existing risk factors (e.g., adverse childhood events, insomnia history, fetal loss, experiences with racism), objective characteristics and subjective appraisals of the traumatic event (birth, infant health), and Acute Stress Disorder symptoms. It is outside of the scope of the present study's focus on

pre-existing risk factors and trauma event characteristics to include ongoing risk factors or longer

term posttraumatic stress, such as PTSD. See Figure 1 for our adaptation of Kazak et al.'s (2006)

model for NICU parents.

Figure 1. Adaptation of Kazak's (2006) Model of Pediatric Medical Traumatic Stress for NICU Parents.
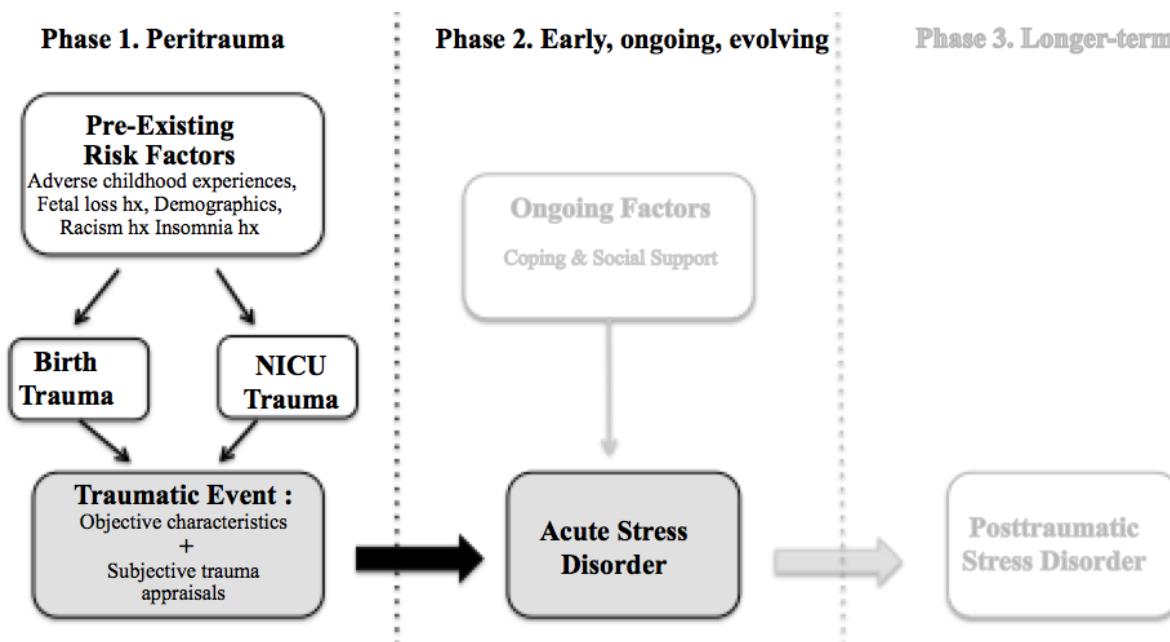
Note. Components of the model indicated in black ink are the focus of the present study. Components in grey are included in Kazak et al.'s model but outside the present scope. Hx=history

Current Literature on Risk Factors for ASD

Selection of Pre-existing Risk Factors

In addition to contextualizing these findings within Kazak et al.'s (2006) framework, we

selected our pre-existing risk factors based on whether they were both indicative of cumulative

stress exposure and currently understudied. Mothers with a history of exposure to chronic

stressors may be at increased risk for a NICU admission and subsequent posttraumatic stress, through a mechanism known as "weathering" (Holzman et al., 2009; Witt et al., 2014). Weathering describes the process through which stress creates multisystemic chronic inflammation and/or elevations in neuroendocrine responses that significantly increase allostatic load (i.e., "wear and tear on the body"; Geronimus, Hicken, Keene, & Bound, 2006). Increased allostatic load can heighten future stress responses, increase vulnerability for mental health issues, and contribute to worse physical health outcomes through accelerated aging processes (Beckie, 2012; Juster, McEwen, & Lupien, 2010). Research has demonstrated that chronic exposure to a range of stressors (e.g., discrimination experiences, childhood adverse events) can contribute to a greater likelihood of preterm birth and NICU hospitalization (Holzman et al., 2009; Love, et al., 2010). Despite the strong evidence for prior cumulative stress and socioeconomic disadvantage predicting preterm birth, the literature is scarce on ways in which prior chronic stress exposure can influence posttraumatic stress after NICU hospitalization (Blumenshine, Egerter, Barclay, Cubbin, & Braveman, 2010). Literature across other medical domains suggests that a history of chronic stress exposure increases the risk of PTSS following a traumatic event (e.g., Bruce, 2006). Additional research is needed on pre-existing risk factors related to cumulative stress exposure and subsequent ASD symptoms after NICU hospitalization. Specifically, more research is needed on the following pre-existing risk factors: adverse childhood experiences, fetal loss history, experiences with racism, and insomnia history.

Adverse Childhood Experiences

To date, no studies have specifically evaluated adverse childhood experiences' (ACEs) influence on ASD symptoms in NICU mothers. This is an important area for future investigation for several reasons. First, adverse childhood events are thought to create weathering during a

vulnerable developmental period that can contribute to a host of negative health outcomes (Felitti & Anda, 2009). In particular, adverse childhood events increase the likelihood of preterm labor and very low birth weight, both of which can lead to NICU admissions (Dunkel Schetter, 2011; Smith, Gotman & Yonkers, 2017). Thus, it is possible that NICU mothers have higher exposures to childhood adverse events than well-baby mothers. Moreover, exposure to childhood traumatic or adverse events has been demonstrated to predict perinatal mental health concerns (specifically anxiety/depression) over other sociodemographic, psychiatric, and psychosocial risk factors, according to a systematic review (Choi & Sikkema, 2016). As the literature has not yet evaluated the ways in which childhood adverse events contribute to perinatal posttraumatic stress, extrapolation from the broader trauma literature is needed. The general trauma literature suggests that childhood trauma exposure increases posttraumatic stress responses to traumatic events in adulthood, suggesting that NICU parents with childhood adverse experiences may be more likely to exhibit ASD symptoms following a NICU admission (Ehlert, 2013). Research in the NICU demonstrates that adult trauma predicts NICU-specific PTSS, across a range of high and low-income samples (Barr, 2011; Greene et al., 2015; Sharp, 2016; Vanderbilt, Bushley, Young, & Frank, 2009). As childhood trauma is thought to be a more potent predictor of future PTSS than adult trauma exposure, this effect may be even stronger for childhood adverse events (Dunn, Nishimi, Powers, & Bradley, 2017). Finally, clinical recommendations outline the recognition of prior trauma exposure as a key component of trauma-informed care, making research on childhood adverse events in NICU parents imperative (Sanders & Hall, 2018).

Fetal Loss History

Fetal loss history has been inconsistently related to posttraumatic stress throughout the literature, which may be attributable to several methodological considerations (Aftyka, 2017;

Chang et al., 2016; Greene et al., 2015). Fetal loss refers to miscarriages (defined as embryo or fetal death between 4-19 weeks pregnancy), stillbirths (defined as fetal death between twenty weeks and birth), and abortions (National Center for Health Statistics, 2018). Mothers with histories of multiple miscarriages are at a higher risk of future NICU admissions, highlighting that fetal loss history may be an important consideration for NICU mothers specifically (Jivraj et al., 2001). Additionally, fetal loss is a well-established stressful event with long-term mental health sequelae (e.g., Brier, 2004 Toffol, Koponen, & Partonen, 2013). Despite this rationale, research on fetal loss history and subsequent PTSS in NICU mothers is scarce, with inconsistent results. Small sample sizes may have limited the studies' power to detect a relationship between miscarriage history and PTSS (Aftyka et al., 2014; Barr, 2011). For example, Aftyka et al. had only nine mothers with miscarriage history, and Barr (2011) did not report the number of women with miscarriage history, making it difficult to evaluate power. Lending credence to the potential problem of being underpowered, when Aftyka et al.'s (2014) sample size was increased in their 2017 study, miscarriage history was significantly associated with increased PTSD symptoms. In addition to the studies evaluating miscarriage, Chang et al. (2016) reported that multiple abortions were associated with increased PTSS. The present study aims to garner enough participants to detect whether fetal loss (conceptualized broadly to increase statistical power) predicts ASD symptoms.

Demographics, Race, and Racism

Demographics have not consistently been demonstrated to influence ASD symptoms in NICU parents. Throughout the broader trauma literature, demographic characteristics, such as low education level or minority race, are commonly associated with PTSS, partially due to the weathering effects of chronic toxic stress (e.g., financial stressors, experiences with racism)

(Alim, Graves, & Mellman, 2006; Gillespie et al., 2009; Turner & Avison, 2003). In contrast, the

NICU parent literature has typically found no effect of demographics on PTSS, including null

findings for parental age, education, race/ethnicity, and relationship status (Aftyka et al., 2014;

Barr, 2011; Gangi et al., 2013; Greene et al., 2013; Kim et al., 2015; Lefkowitz et al., 2010;

Misund et al., 2014; Shaw et al., 2013; Yaman et al., 2015). On one hand, insignificant findings

may reflect that demographics truly do not influence PTSS for NICU parents. For example, the

lack of effects could be attributed to strengths related to minority status (e.g., higher religiosity,

familial support) or risks associated with white race and/or higher educational attainment (e.g.,

rigid expectations for maternal role) (Chatters, Taylor, Jackson, & Lincoln, 2018; Tichenor,

McQuillan, Greil, Bedrous, Clark, & Shreffler, 2017). However, there are also several

methodological limitations in the current literature that may also explain the null results. For

instance, relationship status was typically assessed in terms of marital status, rather than

evaluating other important relationship designations, such as "in a relationship with the co-

parent." A broader conceptualization of relationship status that extends beyond martial status

might better reflect social support from a partner, which has been shown to be protective against

ASD symptoms (Shaw et al., 2006). Moreover, the studies did not assess key subjective

experiences related to demographics (e.g., experiences with racism in addition to assessing race).

Research with more nuanced measurement that accounts for subjective experiences and allows

for a wider range of responses is needed to evaluate the relationship between demographics and

ASD symptoms in NICU mothers.

Subjective experiences related to minority race/ethnicity, particularly experiencing

racism, may be a critical component to understanding the influence of race/ethnicity on ASD

symptoms after NICU hospitalization. The literature that documents the multisystemic effects of

chronic exposure to racism and subsequent increase in allostatic load is extensive (e.g., Das, 2013; Geronimus et al., 1992; Geronimus, et al., 2006). The resulting increased allostatic load can heighten future stress responses, create vulnerabilities for future mental health concerns, and contribute to poorer physical health outcomes (Beckie, 2012; Juster, McEwen, & Lupien, 2010). In particular, the cumulative stress of experiences with racism increases the likelihood of NICU admission (after controlling for socioeconomic status and access to prenatal care), highlighting the importance of understanding experiences with racism in this population (Dominguez, 2008). Despite the well-established relationship between experiences with racism and chronic stress, there is limited research on how historical experiences with racism relate to posttraumatic stress responses to a non-racial trauma (Franklin, Franklin, & Kelly, 2006). Moreover, virtually no studies have evaluated ways in which experiences with racism relates to posttraumatic stress in NICU mothers. A cogent understanding of the ways in which experiences with racism may contribute to posttraumatic stress would elucidate the subjective experiences of racial/ethnic minorities in the NICU and flesh out our understanding of pathways to posttraumatic stress.

Insomnia History

Although the influence of insomnia on ASD symptoms in NICU mothers has not yet been studied, broader research suggests that insomnia may be an important risk factor for posttraumatic stress. One study on insomnia and preterm birth demonstrated that mothers with insomnia during pregnancy were more likely to experience preterm birth, using a dataset of approximately three million mothers (Felder et al., 2017). A review corroborated these findings, stipulating that a history of chronic sleep loss contributes to increased allostatic load, which in turn contributes to adverse pregnancy outcomes (Palagini, Gemignani, Banti, Manconi, Mauri, & Riemann, 2014). These initial findings suggest that mothers in the NICU are more likely to have

a history of insomnia, highlighting the unique vulnerabilities of NICU parent samples. Research on the influence of insomnia history on posttraumatic stress in NICU parents specifically is unavailable. However, insomnia history is a well-established risk factor for subsequent posttraumatic stress throughout the broader trauma literature (e.g., Bryant, Creamer, O'Donnell, Silove, & McFarlane, 2010; Wright, Britt, Bliese, Adler, Picchioni, & Moore, 2011). Insomnia history may contribute to subsequent PTSS through several mechanisms, including psychosocial factors, such as increasing overall stress or decreasing buffering daytime activities and/or social support (Bryant, et al., 2011). Insomnia is also associated with physiologic changes, including increased activation of hypothalamic pituitary adrenal (HPA) axis and increased hyperarousal (Pigeon et al., 2010; Bryant, et al., 2011). Similar to the neurobiological effects of weathering, these biological changes associated with insomnia contribute to increased allostatic load over time (Chen, Redline, Shields, Williams & Williams, 2014). Moreover, following trauma exposure, insomnia has been considered the "hallmark feature" of PTSS, underscoring the importance of understanding insomnia history both as a symptom of PTSD and as a mechanism that influences the severity and development of posttraumatic stress (Dolsen, Asarnow, & Harvey, 2014; Germain, 2013). In summary, there is a close relationship between insomnia and posttraumatic stress in general trauma populations, and NICU mothers may have higher rates of insomnia. However, to date, no studies have evaluated insomnia history on PTSS in NICU mothers.

Characteristics of the Potentially Traumatic Event

In addition to evaluating several key pre-existing risk factors for ASD symptoms, it is also critical to understand the objective characteristics and subjective appraisals of the traumatic event to predict posttraumatic stress responses. As outlined in our study's adaptation of Kazak et

al.'s (2006) Pediatric Medical Traumatic Stress model, NICU mothers may experience

multifactorial trauma within a small timeframe. NICU biological mothers undergo a potentially

traumatic birth, coupled with the hospitalization of their infant, which can cause fear for their

lives or for their infants' lives. To understand the effect of the birth/infant health on maternal

posttraumatic stress responses, it is important to evaluate both objective characteristics (e.g., the

infant's birth weight, length of hospitalization, type of delivery) as well as their subjective

appraisals (e.g., how much control did the mother feel she had during childbirth). The next

sections will briefly review several objective event characteristics and appraisals, with a focus on

childbirth and infant health.

Infant Health as a Traumatic Event

The effect of objective infant health characteristics on maternal posttraumatic stress is

one of the most extensively studied contributors to PTSS in NICU parents, yet it is also one of

the least conclusive. Objective infant health severity is a defining characteristic of the traumatic

event (Kazak et al., 2006). To our knowledge, none of the studies that used validated infant

mortality risk measures (e.g., the SNAPPE-II, Perinatal Risk Inventory, Revised Nursery

Neurobiological Score, and Neonatal Therapeutic Intervention Scoring System) detected

significant effects on PTSS (Barr, 2011; Binder et al., 2010; Chang, et al., 2016; Feeley et al.,

2011; Lefkowitz et al., 2010). However, the lack of an effect may be due to measurement

considerations. For example, many of these scales measure both congenital conditions and

prematurity indicators in their total score of mortality risk, yet congenital conditions may

actually be protective for PTSS, as they provide families with advance notice to prepare for

NICU admissions (Feeley et al., 2011). The null findings could also be due to the homogeneity

of the samples in the available studies. Most of these studies (with the exception of Leftowitz et

al.) included only premature infants, so there may not have been enough variability in infant health severity to detect an effect. Another possibility is that subjective appraisals of infant health outweigh objective parameters, which were not assessed in the majority of these studies. In summary, broadband measures of infant health have not detected an effect of objective infant health severity on PTSS. Given these methodological considerations, research is warranted that assesses the relationship between these "gold standard" scales of infant mortality (e.g., SNAPPE II) and ASD symptoms in a sample unrestricted by length of stay (Harsha, 2015). Moreover, this research should also evaluate potentially confounding variables (e.g., genetic conditions) and subjective appraisals of infant health.

Research using single-item measures of objective infant health is similarly inconclusive to broadband measures of infant health severity. Single-item measures of infant health severity were largely not correlated with posttraumatic stress across the majority of studies (Aftyka et al., 2014; Aftyka et al., 2017; Binder et al., 2010; Chang et al., 2016; Greene et al., 2015; Kim et al., 2015; Misund et al., 2014; Parker, 2016; Shaw et al., 2006; Shaw et al., 2009; Yaman et al., 2015). However, five studies found that one variable of the array assessed was related to worse PTSS, including: gestational age (Gangi et al., 2013), very low birth weight (Chang et al., 2016; Feeley et al., 2011; Greene et al., 2015; Gangi et al., 2013), length of hospitalization (Feeley et al., 2011), Apgar scores at birth (Aftyka et al., 2017), prematurity level (Koliouli, Gaudron, & Raynaud, 2016; Chang et al., 2016) and duration of time on a ventilator (Chang et al., 2016). Most of the studies with significant findings were conducted internationally, so differences in available treatment options and survival rates for these conditions might explain higher distress related to infant health variables (Patel, 2016). It is also notable that many of the significant infant health risk factors were related specifically to prematurity. To clarify the relations between

objective infant health and posttraumatic stress, domestic research is needed that does not restrict samples to exclusively premature infants and that evaluates the relations between these objective infant health factors and subjective appraisals of infant health.

Finally, few studies have assessed appraisals of infant health severity on ASD, despite the emphasis that Kazak's Model of Pediatric Medical Traumatic Stress (2006) places on subjective interpretations of trauma. Only one study to our knowledge has examined parents' individual appraisals of the threat to their children's lives (Lefkowitz, Baxt, & Evans, 2007). Lefkowitz et al. reported that maternal worry that their infant might die was a predictor of PTSS but that maternal perception of illness severity was not significant. The medical trauma literature on more widely researched populations suggests that parental appraisals of their children's health are potent predictors of PTSS (e.g., Bruce, 2006). Indeed, their research demonstrates that parents' perceptions of their children's health are stronger predictors than objective measures of health. Despite support for the importance of perceptions of infant health on PTSS in the broader literature, very few studies have evaluated whether infant health appraisals mediate the relations between objective health and posttraumatic stress outcomes for NICU parents. Further research is necessary to evaluate: (1) the potency of appraisals of infant health in predicting posttraumatic stress, (2) how subjective appraisals of infant health mediate relations between pre-existing risk factors and ASD, and (3) how subjective appraisals of infant health mediate the relations between objective health and posttraumatic stress in NICU parents.

Childbirth as a Traumatic Event

In contrast to the experiences of parents of children with other medical conditions, NICU biological mothers are in the unusual position of having personally experienced a potentially traumatic birth immediately prior to NICU hospitalization. Objective characteristics of the birth,

such as type of delivery, may influence subsequent Acute Stress Disorder symptoms (Misund et al., 2013; Sharp, 2016). However, detecting an effect of delivery mode on ASD may be dependent on the level of nuance in the measurement, specifically separating out planned from unplanned/emergent cesarean sections. In the studies that parsed out the mode of delivery into vaginal birth, unplanned/emergent cesarean, and planned cesarean, the mode of delivery was associated with PTSS. For example, Misund et al. (2013) reported that *planned* cesarean sections were protective against PTSS, which may be attributable to a number of factors, such as time to mentally prepare for the birth experience, increased autonomy, and adherence to a birth plan. Corroboratively, Sharp (2016)'s dissertation study found that unplanned/emergent cesarean sections were associated with worse PTSS. In contrast, the studies that did not separate out planned from unplanned/emergent cesareans in their analyses were unable to detect an effect of the mode of delivery on PTSS (Chang et al., 2016; Yaman & Atlay, 2015). Finally, mode of delivery is an important consideration for NICU mothers in particular, as other research suggests that they are likely to remain distressed by cesarean sections, compared to mothers of term infants (Brandon et al., 2014).

In addition to the type of delivery, Kazak et al.'s (2006) model emphasizes the impact of subjective appraisals of traumatic events on PTSS, highlighting the importance of evaluating maternal appraisals of birth. For well-baby mothers, subjective appraisals of birth were the strongest predictors of PTSD symptoms, over and above delivery type and complications, according to a systematic review on childbirth-specific PTSD (Dekel, Stuebe, & Dishy, 2017). Estimates on birth trauma appraisals for NICU mothers are far more limited, although it is likely that NICU mothers perceive their NICU infants' births to be more traumatic than well-baby mothers (Brandon et al., 2014). One of the few studies estimating perceptions of birth in NICU

parents reported that childbirth was perceived to be traumatic by a majority (69%) of the sample (Sharp, 2016). In particular, loss of control/powerlessness during birth has been associated with worse PTSS across well-baby samples (Beck, 2004; Dekel, Stuebe, & Dishy, 2017). In addition to loss of control, type of delivery may contribute to trauma appraisals of the birth experience. For example, Sharp (2016) reported that 83% of NICU mothers with emergent cesareans perceived their childbirth as traumatic compared to 19% with non-emergent cesareans or vaginal births, suggesting a relationship between type of delivery and perceptions of trauma. While these studies collectively suggest that subjective appraisals of childbirth—particularly related to loss of control--are important predictors of PTSS, research on NICU mothers specifically is scarce. Research is needed that investigates how loss of control during childbirth relates to PTSS for NICU mothers, as well as how perceptions of control in childbirth relate to objective birth characteristics, such as delivery type.

Current Study

Rationale

Currently, research on the risk factors for early posttraumatic stress in NICU mothers is limited to a handful of studies, despite the pernicious effects of posttraumatic stress on maternal and infant health (Davies et al., 2008; Focada-Guex, et al., 2011; Maroney, 2003; Roque et al., 2017; Sanders & Hall, 2018). A focus on early posttraumatic stress can help inform early screening and intervention efforts, particularly since ASD symptoms often progress into PTSD symptoms (e.g., Binder et al., 2011; Kim et al., 2015; Shaw et al., 2009).

First, research is needed on ASD symptom prevalence rates for NICU mothers, given the scarcity of studies and that samples are typically restricted to mothers of premature infants (e.g.,

Binder et al., 2010; Gangi et al., 2013; Misund et al., 2014). Our research will contextualize ASD

symptoms by also reporting comorbidities with postpartum depression and anxiety symptoms.

Additionally, prior studies have not specifically assessed index and compounding traumas in

NICU mothers, making it difficult to characterize sequential trauma or evaluate the extent to

which specific traumas are driving posttraumatic stress. Moreover, studies have not grounded

their risk factors within a theoretical model, contributing to difficulty contextualizing findings. A

model of pediatric traumatic stress is needed that includes pre-existing risk factors and the

influence of both objective trauma characteristics (e.g., infant health and delivery type) and

subjective appraisals of birth and infant health (Kazak et al., 2006). In particular, a focus on the

subjective appraisals of infant health/birth is needed, given that most studies have focused

exclusively on objective infant health (e.g., Aftyka et al., 2014; Binder et al., 2010; Chang et al.,

2016). In addition to evaluating these components individually, analyses examining Kazak's

(2006) Model of Pediatric Medical Traumatic Stress holistically would allow us to present a

more comprehensive depiction of ASD symptoms in NICU mothers.

Aims and Hypotheses

<u>Aim One</u>: Characterize mental health in NICU mothers.

(1) Establish overall maternal ASD symptom prevalence rates, reporting prevalence rates
for both meeting criteria and at risk for ASD symptoms.

We hypothesized that approximately one-third of mothers will meet criteria for ASD

symptoms. This estimation is on the lower end of the symptom prevalence ranges in the previous

literature, due to our NICU's psychosocial practices (e.g., emphasis on skin-to-

skin/breastfeeding, private rooms, and access to mental health providers) and the study's broad

inclusion criteria that does not restrict our sample to only premature or very ill infants (e.g., Binder et al., 2010; Holditch-Davis, et al., 2014).

(2) Characterize the index and compounding traumas.

We hypothesized that most parents will select the first few days of NICU hospitalization as their primary index trauma but that parents will commonly select several sequential traumas.

(3) Characterize comorbidities.

We hypothesize that approximately one-third of mothers will meet criteria for depression and anxiety symptoms respectively, commensurate with conservative estimates of these mood disorders in the NICU literature (e.g., Carter, Mulder, Bartram, & Darlow, 2005; Vigod et al., 2009).

Aim Two: Conduct correlation matrices related to (1) demographics, (2) pre-existing risk factors, (3) mental health, (4) infant health, and (5) childbirth.

We have the following hypotheses:

(1) Demographics: Demographics (race/ethnicity, relationship status, education level, insurance status) will not be correlated with ASD symptoms, as we anticipate that the relationship between demographic factors is primarily due to experiences with racism (or classism) rather than solely demographics.

(2) Pre-existing risk factor correlation: Pre-existing risk factors' (insomnia, racism, ACEs, fetal loss) will all be correlated with ASD symptoms.

(3) Mental health correlation: Concurrent mental health concerns, including depression and anxiety symptoms, will be significantly correlated with ASD symptoms (e.g., Lefkowitz et al., 2010; Vanderbilt et al., 2009). We anticipate that NICU-related stress will be associated with ASD symptoms, with the strongest association related to the Role Alteration domain (e.g.,

27

Aftyka et al., 2017; Gangi et al., 2013; Greene et al., 2015; Koliouli et al., 2016; Parker, 2016; Sharp, 2016).

4) Infant health correlation: ASD symptoms will be correlated with worse objective health severity on variables that typically are correlated with prematurity, such as birth weight, gestational age, and length of stay (e.g., Chang et al., 2016; Feeley et al., 2011; Greene et al., 2015; Gangi et al., 2013), as well as on infant mortality measures (i.e., the SNAPPE score) (Harsha, 2015). We do not expect between group differences on Apgar scores, due to limited support in the literature (e.g., Kim et al., 2015; Shaw et al., 2006; Shaw et al., 2009).

(5) Birth correlation: Type of delivery (vaginal, planned cesarean, emergency cesarean) will not be correlated with ASD symptoms; however when dichotomized into emergent vs. non-emergent delivery, we do anticipate a correlation with ASD symptoms. We hypothesize that perceptions of control during childbirth (subjective childbirth) will be correlated with both ASD symptoms and type of delivery.

Infant Health Models

<u>**Aim Three**</u>**:** ***Infant health model 1.*** **Model how infant health appraisals mediate the relations between pre-existing risk factors and ASD symptoms.**

We hypothesize that there will be a significant direct effect of pre-existing risk factors (i.e., adverse childhood experiences, fetal loss history, experiences with racism, and insomnia history) on ASD symptoms. We expect that there will be a significant indirect effect from pre-existing risk factors on ASD through subjective appraisals of infant health. We hypothesize that model fit will be at least adequate.

<u>**Aim Four**</u>**:** ***Infant health model 2.*** **Model how infant health appraisals mediate the relations between objective infant health and ASD symptoms.**

We hypothesize that there will be a significant direct effect of objective infant health (i.e., SNAPPE score) on ASD symptoms. We also hypothesize that there will be a significant indirect effect from objective infant health on ASD symptoms through subjective appraisals of infant health (i.e., worry about infant death, perceptions of illness severity). We hypothesize that model fit will be at least adequate.

Aim Five: *Infant health model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), objective infant health characteristics, infant health appraisals, and ASD symptoms.**

Consistent with our hypotheses for Aims Three and Four, we hypothesize that subjective infant health appraisals will significantly mediate the relations between: (1) pre-existing risk factors and Acute Stress Disorder symptoms and (2) objective infant health factors and Acute Stress Disorder symptoms. We anticipate significant direct effects of pre-existing risk factor(s) and objective infant health factors to ASD symptoms. We also hypothesize that pre-existing risk factor(s) and objective infant health will be significantly correlated. We hypothesize that model fit will be good.

Childbirth Experience Models

Aim Six: *Childbirth model 1.* **Model how appraisals of control during childbirth mediate the relations between pre-existing risk factor(s) and ASD symptoms.**

We hypothesize that there will be a significant direct effect of pre-existing risk factors (i.e., adverse childhood experiences, fetal loss history, experiences with racism, and insomnia history) on ASD symptoms. We expect that there will be a significant indirect effect from pre-existing risk factors on ASD symptoms through subjective appraisals of control during childbirth. We hypothesize that model fit will be good.

Aim Seven: *Childbirth Model 2.* **Model how appraisals of control during childbirth mediate the relations between type of delivery and ASD symptoms.**

We hypothesize that there will be a significant direct effect of type of delivery on ASD, as well as a significant indirect effect from type of delivery on ASD symptoms through subjective appraisals of control during childbirth. We hypothesize that model fit will be good.

Aim Eight: *Childbirth model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), type of delivery, appraisals of control during childbirth, and ASD symptoms.**

Consistent with our hypotheses for Aims Six and Seven, we hypothesize that subjective birth appraisals will significantly mediate the relations between: (1) pre-existing risk factor(s) and Acute Stress Disorder symptoms and (2) objective birth factors and Acute Stress Disorder symptoms. We anticipate significant direct effects of pre-existing risk factors and objective birth factors on ASD. We also hypothesize that pre-existing risk factors and type of delivery will be significantly correlated. We hypothesize that model fit will be at least adequate.

METHODS

Design

This study is a cross-sectional survey with self-report measures.

Participants

Participants included 119 mothers with infants in the NICU. English-speaking, biological mothers with an infant currently hospitalized in the NICU were eligible for inclusion between days 5 and 31 of their infants' hospitalizations. After conducting chart review for eligibility, 129 mothers were approached on the unit. Of the mothers approached, four mothers unexpectedly did not meet eligibility requirements (one due to age, three due being to non-English speaking). Of the eligible mothers, 96% (n=119) provided informed consent. The five who declined informed consent were due to discomfort with research (n=1) or due to having competing time priorities (n=4), such as having visitors in the room or tending to siblings. Participants' demographics, for both mothers and their infants, are presented respectively in Tables 1 and 2.

Table 1. *Maternal demographics*

Variable	Percent (Frequency)
Race/ethnicity	
White/Caucasian	39.5% (n=47)
Black/African American	48.7% (n=58)
Hispanic	7.6% (n=9)
Asian	2.5% (n=3)
Other	1.7 (n=2)
Insurance Type	
Private insurance	28.18% (n=31)
Medicaid	71.81% (n=79)
Education	
Did not complete high school	5% (n=6)
General Education Diploma (GED)	7.6% (n=9)
High school	37.8% (n=45)
Some college	15.1% (n=18)
College degree	21% (n=25)
Masters or higher	12.6% (n=15)
Relationship Status	
Single	18.5% (n=22)
Relationship with someone other than co-parent	2.5% (n=3)
Relationship with co-parent	36.1% (n=43)
Married	42% (n=50)

Table 2. *Infant health descriptives*

Variable	Percent (Frequency)	Means +/ SD
Infant health severity (SNAPPE II score)		25.42 ± 26.84
Mild infant health severity	51.3% (n=61)	
Moderate infant health severity	14.3% (n=17)	
Severe infant health severity	26.9% (n=32)	
Gestational age (weeks)		33.2 ± 4.66
Extremely preterm	13.4% (n=16)	
Very preterm	16% (n=19)	
Moderate to late preterm	47.1% (n=56)	
Term	20.2% (n=24)	
Birth weight (grams)		2278.43 ± 1037
Extremely low birth weight	12.6% (n=15)	
Very low birth weight	14.3% (n=17)	
Low birth weight	29.4% (n=35)	
Normal birth weight	42.9% (n=51)	
Health Factors		
Apgar at 1 minute		5.2 ± 2.86
Apgar at 5 minutes		7.26 ± 2.13
Length of stay (days)		44.82 ± 51.37
Survival	94.9% (n=113)	
Neurological condition or treatment	21.8% (n=26)	
Genetic condition	11.8% (n=14)	

Note. Infant health severity was "moderate" on average.

Setting

Virginia Commonwealth University (VCU) is an urban, academic medical center in Richmond, VA. This NICU contains 40 beds and treats over 450 infants annually, with an average length of stay of 14 days. It is designated as a Level IV NICU, which indicates that the unit provides the highest level of care (American Academy of Pediatrics, 2004). VCU's NICU encourages breastfeeding and skin-to-skin contact, has private rooms with the option for a parent

to spend the night, and provides access to a mental healthcare provider (the study lead author, supervised by a licensed psychologist, Dr. Alyssa Ward).

Procedure

Clinical psychology doctoral research assistants were present at the NICU 20-24 hours per week, over the course of several days, to identify potential participants. Data collection took place primarily from July 2018 to January 2019. Potential participants were approached in their infants' private NICU rooms and asked if they were willing to participate in a clinical research interview to assess their psychosocial needs, particularly to evaluate posttraumatic stress and related risk factors. Parents could choose if they would like to complete the assessment for clinical purposes only or if they were willing to have their responses included for research. If parents did not elect to have their answers used for research but did indicate an interest in a clinical assessment/intervention, they were administered the survey assessment solely for clinical purposes. In these cases, their responses were not included as data for research purposes. For parents who were interested in research participation, a graduate student conducted informed consent (see Appendix A for consent forms). After informed consent for research was obtained, the graduate research assistants administered the assessment battery verbally and offered support throughout. The assessment battery was designed to be a therapeutic experience for mothers and took between 40-100 minutes to administer, depending on the mothers' needs (see Appendix B for study instruments).

This assessment battery was used to directly inform clinical care and was administered to mothers regardless of whether their survey data was used for research. At the end of the survey, the graduate assistants provided the mothers with feedback and education on areas of clinical concern, reinforced mothers' strengths and adaptive coping strategies, offered the opportunity for

follow-up psychological support throughout their infants' hospitalizations, and provided

outpatient postpartum mental health referrals in the community. An integrative report including

the results from this survey and clinical recommendations were included in the infants' medical

records and shared with the NICU medical team during weekly interdisciplinary rounds (see

Appendix C for sample note). All of the graduate research assistants were clinically trained in

trauma-informed therapy in integrated care settings and were supervised by a licensed clinical

psychologist with a specialty in postpartum mental health, Dr. Alyssa Ward. For consistency

between administrations, all graduate students completed shadow sessions, attended a training

session, used the same protocol, and were provided with sample scripts included directly on the

survey (see Appendix D for protocol). If participants endorsed any suicidal ideation, a suicide

risk assessment protocol was followed (see Appendix E for suicide risk assessment protocol).

This study has been approved by Virginia Commonwealth University's International Review

Board (Protocol #: HM20011668).

Measures

Study measures included assessments of demographic information, pre-existing risk

factors (i.e., adverse childhood events, insomnia history, fetal loss history, experiences with

racism), characteristics and perceptions of the traumatic event (i.e., birth, infant health), Acute

Stress Disorder, and mental health concerns (e.g., comorbid postpartum depression and anxiety).

These measures were collected during a single time point assessment and are described in detail

below.

Acute Stress Disorder symptoms were assessed using *the Impact of Event-Revised*

(IES-R), a 22-item scale measuring posttraumatic stress (Weiss & Marmar, 1997). Mothers self-

reported their primary index trauma (options were pregnancy, birth, transition to NICU, or a

NICU scare), which was used to anchor ASD symptom questions throughout. Participants were asked to rate how distressed they had been by a particular item in the previous seven days. Response options range from *0=Not at all* to *4=Extremely*. The scale contains three subscales, which assess Intrusion, Avoidance, and Hypervigilance. Scores range from 0 to 88, with higher scores reflecting worse severity. Scores of 24 to 32 represent "at risk," where PTSS is a potential clinical concern, and scores of 33 and above represent a cutoff for "probable PTSS diagnosis." The scale is widely used throughout the medical and non-medical PTSS literature and has high internal consistency (alpha = 0.96) (Creamer, Bell, Failla, 2003). This scale was selected instead of a measure of posttraumatic stress specific to postpartum, such as the Perinatal PTSD Questionnaire to allow for comparison in ASD symptom rates across medical trauma populations (Callahan, Borja, Hynan, 2006). The IES-R has been used to evaluate PTSS in NICU parents (e.g., Aftyka et al., 2014; Aftyka et al., 2017; Binder et al., 2010; Chang et al., 2016; Misund et al., 2016; Yaman et al., 2015). ASD symptom scores were treated continuously in the analyses and reported dichotomously for descriptive prevalence rates.

Adverse Childhood Experiences (ACEs) were assessed using the 10-item *ACE Questionnaire* (Felitti et al., 1999). The measure was designed to assess the presence of ten ACE categories of childhood trauma; five are personal (e.g., survivor of physical or sexual abuse) and five are associated with family members (e.g., living with a family member who is an alcoholic, having a family member go to prison). Response options included *0=No, 1=Yes*. The summed number of adverse childhood experiences will be used to create an "ACE score," ranging from zero to ten. Scores of four or greater are considered at risk for physical and mental health sequelae. This measure has been widely used across hundreds of studies to evaluate the relationships between ACEs and physical/mental health outcomes in adulthood (Centers for

Disease Control and Prevention, 2016). A mean score was presented for prevalence rates, and scores were treated continuously for analyses.

Childbirth Experience (Subjective Appraisal) was measured by *the Perceived Control During Childbirth Scale*, which contains 12 items and a single subscale (Stevens, Wallston, & Hamilton, 2012). The scale assessed perception of control over procedures/the birth environment and communication with the medical team (e.g., advance discussion of procedures, flexibility given to question providers' decisions). Response options ranged from *1=Strongly disagree* to *6=Strongly agree*. Higher scores represented greater perceived control during childbirth. The scale has good psychometric properties, including α = 0.91, and predictive validity for posttraumatic stress after birth. Scores were treated continuously for analyses, and means were reported.

Childbirth Experience (Type of Delivery) was assessed using a self- report, single item measure of type of delivery developed for this study. Response options included planned cesarean, emergent cesarean, or vaginal deliveries. For structural equation models (SEMs), type of delivery was dichotomized into emergency delivery vs. non-emergent delivery (i.e., vaginal, planned cesarean) due to SEM data requirements.

Demographics were assessed using self-reported items of maternal age, race, highest level of education, income level, and relationship status. Items were pulled from the *Psychological Assessment Tool,* excluding insurance status, relationship status, and race/ethnicity (Pai et al., 2007). The relationship status item was created for this study to assess relationship status in a more inclusive manner than marital status alone. Options for relationship status were thus expanded from "marital status" to also evaluate "in a relationship with the co-parent" or "in a relationship with a non co-parent." Income level was assessed via a proxy measure of insurance

status. Insurance status included the following options: Medicaid or private insurance. Pregnant mothers qualify for Medicaid in Virginia if they make less than 143% of the federal poverty level (e.g., $21,892 for a household of two) (Medicaid, 2017). Race/ethnicity was assessed via "check all that apply" with the following listed options: White, Black/African American, Hispanic/Latinx, Asian/Asian American/Pacific Islander, and/or Other (list). Maternal age was pulled from the medical charts. Consent rates were also reported.

Fetal Loss History was assessed with self-report measures drawn from an unpublished adaptation of *Psychological Assessment Tool* (PAT) for NICU parents (Pai et al., 2007). Mothers reported if they had been pregnant prior to the pregnancy of their infant(s) currently in the NICU. If they had been pregnant before, single-item measures assessed: number of prior births that did not require NICU hospitalization, number of prior births that did require care in the NICU, number of miscarriages, number of terminated pregnancies, and number of prior stillbirth/early infant deaths. Fetal loss history was evaluated using a total score of prior fetal losses, including abortion, stillbirth, and miscarriages, in order to bolster power for SEMs. The PAT is undergoing psychometric validation in NICU studies. Available psychometrics in pediatric oncology samples includes $\alpha = 0.91$.

Infant Health (Objective Factors) was assessed using items pulled from chart review. Items include gestational age (in weeks), length of NICU hospitalization (in days), Apgar scores (1 minute, 5 minutes), and birth weight (grams). Apgar scores provide a brief snapshot of infant health at birth but are not intended to predict mortality or neurobiological outcomes (American College of Obstetricians and Gynecologists, 2015). Apgar total scores range from 0-10 and assess color, heart rate, reflexes, muscle tone, and respiration, with score options of 0-2 for each area (American College of Obstetricians and Gynecologists, 2015). When treated categorically,

gestational age was divided according to the World Health Organization's guidelines: Extremely Preterm (Less than 28 weeks), Very preterm (28-31 weeks), Moderately preterm (32-37 weeks), and Term (greater than 37 weeks) (Cutland et al., 2017). For categorical analyses, birth weight was divided into: Extremely Low Birth Weight (ELBW, <1000 grams), Very Low Birth Weight (VLBW, 1000-1499), Low Birth Weight (LBW, 1500-2499 grams), and Normal Birth Weight (2500 grams and greater), per the World Health Organization's guidelines (Cutland et al., 2017). Other items assessed via chart review included: length of stay (days), survival at the time of chart review (yes/no), genetic condition or treatment (yes/no), and neurological condition or treatment (yes/no).

Infant health was additionally measured using the *Score for Neonatal Acute Physiology-Perinatal Extension II* (SNAPPE II) scale, which assesses risk of infant mortality. This measure calculates a risk score based on weighted vitals and laboratory reports taken in the first 48 hours of the infant's life, including blood pressure, $P0_2/FiO_2$, lowest temperature, serum pH, presence of multiple seizures, urine output, birth weight, Apgar score, and small for gestational age ($\leq 3^{rd}$ percentile) (Harsha, 2015). Mild scores range from 0-20, Moderate scores range from 20-40, and Severe scores were 40 or greater.

Infant Health (Subjective Appraisals) was assessed using two items from an unpublished adaptation of the *Psychological Assessment Tool* (PAT) for NICU parents (Pai et al., 2007). Items include "how sick is your baby" and "how worried are you that your infant might die." Response items range from *0=Not at all* to *4=Very much*. The PAT is undergoing psychometric validation in NICU studies. Available psychometrics from pediatric oncology samples include *α = 0.91.*

Insomnia History was assessed using a two-item short form of *the Sleep Condition Indicator*, an eight-item scale designed to evaluate insomnia disorder (Espie, Kyle, Hames, Gardani, Fleming, & Cape, 2014). The short-scale assesses how many nights per week the participant endorsed problems with sleep (options ranged from *4=0-1 nights* to *0=5-7 nights*) and to what extent they were bothered by poor sleep (options ranged from *4=Not at all to 0=Very much*). Scores of 0-2 on each item represent the threshold for insomnia disorder symptoms, and higher scores represent better sleep. To capture insomnia history (rather than current insomnia symptoms), we added "prior to your pregnancy" as a time period anchor for this study. The full scale has good internal consistency, *α = 0.86* as well as convergent validity with two other widely used scales, The Pittsburg Sleep Quality Index and the Insomnia Severity Index (Bastien, Vallieres, & Morin, 2001; Buyssee, Reynolds, Monk, Berman & Kupfer, 1989). The two-item short form used in this study is correlated with the SCI total score (r=.90). Scores will be treated continuously for these analyses.

NICU Stressors was assessed with *the NICU Parental Stressor Scale (PSS),* a 46 item scale, with three subscales measuring perceived stress related to various domains of NICU hospitalization (Miles, Funk &Carlson, 1993). Domains included: "Sights and Sounds" (e.g., noises of monitoring equipment/alarms), "Role Alteration" (e.g., not being allowed to hold or care for the baby), and "Infant Appearance and Behavior" (e.g., the baby's fragile appearance/size). Response options ranged from *0=Not applicable* to *5=Extremely stressful*, so higher scores represent greater distress. The scale has α>.7 for all domain scales and α=.9 for the entire instrument. Scores were broken into subscales and treated continuously for analyses; means by subscale were also presented.

Postpartum Anxiety symptoms were assessed with the *Generalized Anxiety Disorder 2-item* (GAD-2; Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007). Items included: feeling nervous, anxious or on edge or uncontrollable worry, anchored over a two-week period. Response items range from *0=Not at all* to *3=Nearly every day*. A cutoff score of greater than or equal to three has good sensitivity (86%) and specificity (83%) for Generalized Anxiety Disorder (GAD). Scores were treated continuously for analyses, but percentages of participants meeting GAD cutoff scores were reported.

Postpartum Depression symptoms were assessed using the *Patient Health Questionnaire-2* (PHQ-2) item version (Kroenke, Spitzer, & Williams, 2003). Items assessed included anhedonia and feeling down, depressed or hopeless, anchored over a two-week period. Response items ranged *0=Not at all* to *3=Nearly every day*. A cutoff score of greater than or equal to three has good sensitivity (83%) and specificity (90%) for Major Depressive Disorder (MDD). This measure is a recommended screening tool for postpartum depression symptoms in NICU parents (Hyan et al., 2013). Scores were treated continuously for analyses, but percentages of participants meeting GAD cutoff scores were also reported.

Racism Experiences were assessed with the three-item subscale "Harassment/Rejection subscale" from *the Racism and Life Experiences Scale* (RaLes; Seaton, Yip, & Sellers, 2009). Items evaluated experiences with being insulted, treated rudely, or taunted due to race. Participants indicated the frequency of their exposure to these experiences with racism, with options ranging from *0=Never* to *5=Once a week*. The full scale has good psychometrics, including α = .91 and .82 split-half reliability. Scores were treated continuously for these analyses.

Traumatic Events (Index and compounding) were specified by having mothers "star" the single most distressing aspect of their infant's progression to NICU (index trauma) and also check-off any other traumatic components (compounding traumas). Options for index and compounding trauma included: pregnancy, birth, transition to NICU (first few days of hospitalization), or a NICU health incident. Endorsed index trauma items were used to anchor ASD symptom questions. Prevalence rates for both index traumas and compounding traumas were both reported.

Data Analyses

Data Preparation

Prior to analysis, means, standard deviations, and 95% confidence intervals (or medians and inter-quartile ranges) were estimated for continuous variables. Frequencies, proportions, and 95% confidence intervals were computed for categorical variables. Data were checked for univariate and multivariate outliers, and skewness and kurtosis were evaluated for the primary study variables. If skewness was found to be within the range of 2 to -2, data were considered to be normally skewed. Matrices of scatterplots between variables assessed linearity. Finally, bivariate correlations between all study variables were examined to assess multicollinearity, with .80 as a cutoff (Tabachnick &Fiddell, 2007).

Missing data were addressed using the expectation maximization algorithm in SPSS 24 (IBM Corp., 2016). Percentages of missing data were reported. To ensure that data was missing completely at random, Little's missing completely at random (MCAR) test was conducted and any variables with significance levels (at $p>.05$) were reported.

Primary Analyses

Aim One: Characterize mental health in NICU mothers.

(1) Establish overall maternal ASD symptom prevalence rates, reporting prevalence rates for both meeting criteria and at risk for ASD symptoms.

 Frequency statistics were used to obtain prevalence rates of mothers meeting criteria for ASD (with total ASD scores of greater than or equal to 33) as well as those at risk for ASD (with total ASD scores of 24 to 32).

(2) Characterize the index and compounding traumas.

Frequency statistics were used to describe the prevalence of the following traumas: pregnancy, birth, NICU admission and first few days of hospitalization, or a specific NICU-related health scare. Frequency statistics were also used to provide the percentages of mothers characterizing these events as traumatic, either as their index trauma or as a compounding traumatic event.

(3) Characterize mental health symptom comorbidities.

Frequency statistics were used to describe postpartum depression symptoms, postpartum anxiety symptoms, NICU distress by domain, and comorbidity rates of these conditions with ASD symptoms.

Aim Two: Conduct correlations related to (1) demographics, (2) pre-existing risk factors, (3) mental health, (4) infant health, and (5) childbirth.

The following Pearson correlations were conducted, including: **(1) Demographics correlation** that assessed ASD's correlations with race/ethnicity, education level, relationship status, and insurance level; **(2) Pre-existing risk factor correlation** that assessed pre-existing risk factors' (insomnia, racism, ACEs, fetal loss) correlations with ASD; **(3) Mental health correlation** that

assessed correlations between concurrent mental health concerns (e.g., NICU stressors, anxiety, and depression) and ASD; **(4) Infant health correlation** that assessed correlations among objective infant health indicators, subjective infant health, and ASD; **(5) Birth correlation** that assessed correlations among type of objective childbirth (e.g., vaginal delivery), perceived control during childbirth, and ASD.

Infant Health Models

Aim Three: *Infant health model 1.* **Model how infant health appraisals mediate the relations between pre-existing risk factors and ASD.**

For all infant health models, the following Structural Equation Models (SEM's) procedures were conducted:

Structural equation models (SEMs) with 2,000 bootstrap samples were conducted. Significance for indirect effects was assessed by calculating *p*-values via bootstrap approximation obtained by constructing two-sided bias-corrected confidence intervals. Goodness of fit was assessed with: comparative fit index (CFI) values >.95, goodness of fit (GFI) values of >.90, adjusted goodness of fit (AGFI) indices of >.90, a root mean square error of approximation (RMSEA) value of <..08 (Byrne, 1994; Hu & Bentler, 1999) and a standardized root mean square residual (SRMR) value of <.10 (Kline, 2016). The CFI analyzes the fit of the model by assessing the discrepancy between the hypothesized model and the data, while also adjusting for issues relating to sample size that are seen in the χ^2 statistic. The RMSEA assesses the discrepancy between the hypothesized model and the covariance matrix with optimally selected parameter estimates; RMSEA values included 90% confidence intervals. The GFI measures fit between the predicted model and the observed covariance matrix; the AGFI corrects the GFI by

taking into account the number of indicators for each latent variable. AMOS software was used for SEMs (Arbuckle, 2014).

Model how subjective infant health appraisals mediate the relations between pre-existing risk factors and ASD.

First, adjustments were made based on results of correlation matrices in Aim Two. We used both the correlation matrices and theoretical rationale to determine if one or all weathering pre-existing risk factors should be used. A mediational structural equation model was conducted that examined the direct effect of pre-existing risk factors on ASD and the indirect effect from pre-existing risk factors on ASD through appraisals of infant health. Pending correlation matrices and theoretical rationale, pre-existing risk factors would ideally have been assessed as a latent variable including adverse childhood events, fetal loss (total number of losses), insomnia, and experiences with racism (Espie et al., 2014; Felitti et al., 1999; Seaton, Yip, & Sellers, 2009). Subjective appraisals of infant health were assessed as a latent variable that included maternal worry that her infant might die and maternal overall infant health quality rating (Pai et al., 2007). ASD was assessed as a manifest variable of the total score on the Impact of Event-Revised Scale (Weiss & Marmar, 1997).

<u>**Aim Four:**</u> *Infant health model 2.* **Model how infant health appraisals mediate the relations between objective infant health and ASD.**

A mediational structural equation model was conducted that examined the direct effect of objective infant health on ASD and the indirect effect from objective infant health on ASD through subjective infant health appraisals. Objective infant health was assessed using a latent variable that included gestational age, birth weight, length of infant hospitalization, and Apgar score. Subjective infant health was assessed as a latent variable that included maternal worry that

45

her infant might die and maternal infant health quality rating (Pai et al., 2007). ASD was assessed as a manifest variable of the total score on the Impact of Event-Revised Scale (Weiss & Marmar, 1997).

Aim Five: *Infant health model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), objective infant health characteristics, infant health appraisals, and ASD.**

In the final infant health model, Aims Three and Four were investigated simultaneously in a comprehensive model designed to assess Kazak's Pediatric Model of Traumatic Stress (2006) in NICU mothers. This model examined the direct effects of pre-existing risk factors and infant health characteristics on ASD, as well as the indirect effects of infant health appraisals on ASD. This model correlated the pre-existing risk factor(s) and infant health. This model assessed latent and manifest variables for pre-existing risk factors, objective infant health, subjective appraisals of infant health and ASD.

Childbirth Experience Models

For all childbirth experience models, the following Structure Equation Modeling (SEM) procedures were conducted:

Structural equation models (SEMs) with 2,000 bootstrap samples were conducted. Significance for indirect effects was assessed by calculating *p*-values via bootstrap approximation obtained by constructing two-sided bias-corrected confidence intervals. Goodness of fit was assessed with: comparative fit index (CFI) values >.95, goodness of fit (GFI) values of >.90, adjusted goodness of fit (AGFI) indices of >.90, a root mean square error of approximation (RMSEA) value of <..08 (Byrne, 1994; Hu & Bentler, 1999) and a standardized root mean square residual (SRMR) value of <.10 (Kline, 2016). The CFI analyzes the fit of the model by

assessing the discrepancy between the hypothesized model and the data, while also adjusting for issues relating to sample size that are seen in the χ^2 statistic. The RMSEA assesses the discrepancy between the hypothesized model and the covariance matrix with optimally selected parameter estimates; RMSEA values included 90% confidence intervals. The GFI measures fit between the predicted model and the observed covariance matrix; the AGFI corrects the GFI by taking into account the number of indicators for each latent variable. AMOS software was used for SEMs (Arbuckle, 2014).

Aim Six: *Childbirth model 1.* **Model how appraisals of control during childbirth mediate the relations between pre-existing risk factor(s) and ASD.**

   First, adjustments were made based on results of correlation matrices in Aim Two. We used both the correlation matrices and theoretical rationale to determine if one or all weathering pre-existing risk factors should used. Subsequently, mediational structural equation model was conducted examining the direct effect of pre-existing risk factors on ASD and the indirect effect from pre-existing risk factors on ASD through appraisals of perceived control during childbirth. Pending correlation matrices and theoretical rationale, pre-existing risk factors would ideally have been assessed as a latent variable including adverse childhood events (total ACE score), fetal loss (total number of losses), insomnia (total score on the Sleep Condition Indicator subscale) and experiences with racism (subscale score on the Racism and Life Experiences Scale; Espie et al., 2014; Felitti et al., 1999; Seaton, Yip, & Sellers, 2009). Subjective appraisals of control during childbirth were evaluated based as a manifest variable of the Perceived Control During Childbirth scale total score (Stevens, Wallston, & Hamilton, 2012). ASD was assessed as a manifest variable of the total score on the Impact of Event-Revised Scale (Weiss & Marmar, 1997).

Aim Seven: *Childbirth Model 2.* **Model how appraisals of control during childbirth mediate the relations between type of delivery and ASD.**

A mediational structural equation model was conducted examining the direct effect of type of childbirth on ASD and the indirect effect from type of delivery on ASD through subjective appraisals of control during childbirth. Type of delivery was assessed using a manifest variable that dichotomized type of childbirth into emergent cesarean section vs. non-emergent delivery (i.e., vaginal birth, planned cesarean). Subjective appraisals of perceived control during childbirth were evaluated based as a manifest variable of the Perceived Control During Childbirth scale total score (Stevens, Wallston, & Hamilton, 2012). ASD was assessed as a manifest variable of the total score on the Impact of Event-Revised Scale. (Weiss & Marmar, 1997).

Aim Eight: *Childbirth model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), type of delivery, appraisals of control during childbirth, and ASD.**

In the final infant health model, Aims Six and Seven were investigated simultaneously in a comprehensive model designed to assess Kazak's Pediatric Model of Traumatic Stress (2006) in NICU mothers. This model examined the direct effects of pre-existing risk factor(s) and type of delivery on ASD, as well as the indirect effects of subjective appraisals of control during childbirth on ASD. This model correlated the pre-existing risk factors(s) and type of delivery. This model assessed latent and manifest variables for pre-existing risk factors, type of delivery, subjective appraisals of perceived control during childbirth, and ASD.

Results

Missing Data

Between <1% and 10% of variables had missing data; adverse childhood experiences was the only variable to have higher than 3% missing. To ensure that data were missing completely at random (MCAR), Little's MCAR tests were used. Each test was non-significant ($p<.05$), suggesting that the data were MCAR.

Primary Analyses

Aim One: Characterize mental health h in NICU mothers.

Descriptive statistics for variables related to maternal posttraumatic stress and maternal mental health are presented in Tables 3 and 4.

Table 3. *Posttraumatic Stress in NICU Mothers*

Variable	Percent (Frequency)	Means ± SD
Acute Stress Disorder		27.08 ± 20.02
Subscales		
Intrusion		12.27 ± 8.66
Hypervigilence		6.65 ± 5.86
Avoidance		8.16 ± 7.85
Clinical severity		
Not at risk for ASD	45.4% (n=54)	
At risk for ASD	15.1% (n=18)	
Probable ASD	39.5% (n=47)	
Index trauma		
Pregnancy	9.2% (n=11)	
Birth	18.5% (n=22)	
NICU hospitalization	61.3% (n=73)	
Medical scare in the NICU	9.2% (n=11)	
Multiple traumas	53.8% (n=64)	
Trauma (Index or Compounding)		
Pregnancy	24.4% (n=29)	
Birth	50.4% (n=60)	
NICU hospitalization	80.7% (n=96)	
Specific NICU scare	15.1% (n=18)	

Note. On average, ASD scores were "At risk for ASD" overall, Intrusion was endorsed "Quite a bit", Hypervigilance was endorsed "Moderately," and Avoidance was endorsed "Moderately."

Table 4. *Mental Health in NICU Mothers*

Variable	Percent (Frequency)	Means ± SD
Anxiety		3.00 ± 2.19
Subclinical or no anxiety	48.7% (n=58)	
Anxiety	51.3% (n=61)	
Depression		1.86 ± 2.08
Subclinical or no depression	64.7% (n=77)	
Depression	34.5% (n=41)	
Comorbidities		
ASD and Depression	66% (n=31)	
ASD and Anxiety	80.9% (n=38)	
Overall NICU Distress		
Sights and Sounds		9.82 ± 4.18
Infant Behavior and Procedures		34.56 ± 14.13
Role Alteration		23.58 ± 8.27

Note. SD= standard deviation. On average, Sights and Sounds and Infant behaviors and Procedures were rated as "Moderately stressful," Role Alteration was rated as "Very stressful." On average, anxiety was classified as "Clinical anxiety;" depression was endorsed at "Subclinical or no depression."

Aim Two: Evaluate the following correlations and provide descriptive statistics:

(1) Demographics correlation

Relationship status was significantly correlated with ASD (r=-.213, p<.05). Race/ethnicity,

education level, and insurance status were not significantly correlated with ASD.

(2) Pre-existing risk factor correlation

Descriptive statistics for pre-existing risk factors are provided in Table 5.

Table 5. *Pre-existing risk factors*

Variable	Percent (Frequency)	Means ± SD
ACE's		2.82 ± 2.58
≥ 4 ACE's	32.8% (n=39)	
<4 ACE's	57.1% (n=68)	
Reproductive loss		
Prior abortion(s)	10.7% (n=13)	
Prior infant death(s)	7.6% (n=9)	
Prior miscarriage(s)	26.9% (n=32)	
Insomnia		5.43 ± 2.77
Insomnia sx	15.1% (n=18)	
No insomnia sx	80.7% (n=96)	
Experience with Racism		1.99 ± 3.16

Note. ACE=Adverse Childhood Experiences; Sx=symptoms; SD= standard deviation. Experiences with racism were endorsed "Never" on average.

Total ACE score was significantly correlated with ASD (r=.431, p<.01), as was insomnia history (r=-.399, p<.01). Neither prior reproductive loss (abortion, prior infant death, miscarriage) nor experiences with racism were significantly correlated with ASD.

(3) Mental health correlation

A correlation matrix of mental health correlations is presented in Table 6.

Table 6. *Mental Health Correlations*

Variable	1	2	3	4	5	6
1. ASD	---	.629**	.629**	.440**	.648**	.619**
2. Anxiety	.629**	---	.691**	.238*	.472**	.550**
3. Depression	.629**	.691**	---	0.154	.400**	.494**
4. Sights and sounds	.440*	0.238*	0.154	---	.615**	.433**
5. Infant behavior	.648**	.472**	0.400**	.615**	---	.644**
6. Role alteration	.619**	.550**	.494**	.433**	.644**	---

Note. *= p<.05, **=p<.01. ASD=Acute Stress Disorder. Sights and Sounds, Infant behavior, and Role Alteration are subscales of the Parental Stress Scale, a broadband measure of NICU distress.

(4) Infant Health Correlation

Genetic diagnosis, neurological diagnosis or cooling procedure, infant death, length of stay,

gestational age, birth weight, and transfer status were not significantly correlated with either

ASD or subjective infant health. Significant correlations are presented in Table 7.

Table 7. *Significant infant health correlations*

	Subjective infant health	SNAPPE II	Apgar 1 Min.	Apgar 5 Min.	Infant Death
ASD	.594**	.354**	-.200*	-.249**	.168
Subjective infant health	---	.345**	-.263*	-.254*	.192*

Note. Min=Minutes, *= p<.05, **=p<.01

Finally, exploratory analyses examining both ends of birth weight spectrum (extremely low birth

weight [ELBW] and normal birth weight) indicated that ELBW was correlated with ASD,

(r=.255, p=.036) and with subjective health (r=.235, p=.040); however normal birth weight

(excluding ELBW babies) was not correlated with ASD or subjective infant health.

(5) Birth Correlation

Descriptive statistics related to childbirth are presented in Table 8. Greater perceived control

during childbirth was significantly correlated with less ASD severity (r=-.371, p<.01). Type of

delivery was not significantly associated with ASD or with perceived control during childbirth.

(B) Emergency cesarean section (vs. vaginal/ planned cesarean section) was not associated with

either perceived control during childbirth (r=-.174) or acute stress disorder (r=-.017).

Table 8. *Childbirth descriptives*

Variable	Percent (Frequency)	Means ± SD
Birth type		
Vaginal	44.5% (n=53)	
Planned cesarean	11.8% (n=14)	
Emergency cesarean	43.7% (n=52)	
Transfers from outside		
hospital	26.9% (n=32)	
Control during childbirth		50.22 ± 13.50

Note. SD= standard deviation. Control during childbirth items were endorsed "Slightly agree" on average.

Infant Health Models

Aim Three: *Infant health model 1.* **Investigate how subjective infant health appraisals mediate the relations between pre-existing risk factors and ASD.**

Figure 2 shows a visual representation of the model. Prior to running this SEM, racism and prior fetal loss were dropped from the model, due to low-frequency rates and insignificant correlations with one another and with ASD. Although insomnia was correlated with ASD, there was limited theoretical rationale to include only insomnia and adverse childhood experiences as a latent construct; therefore ACEs were included as a manifest variable over insomnia. In all subsequent models (for both infant health and childbirth models), ACEs were evaluated as a manifest variable.

After the SEM was adjusted to include exclusively adverse childhood experiences as our pre-existing risk factor, the χ^2 value was not statistically significant, suggesting good model fit, $\chi^2 = (1, N = 119) = 1.657$, $p = 0.198$. Other fit indices also supported the goodness of fit of the model: CFI $= 0.996$, GFI$=.993$, AGFI$=.931$, and RMSEA $= 0.075$ (CI, 0.000, 0.270).

There were significant direct effects from ACEs to subjective perceptions of infant health, with higher ACE levels predicting worse perceptions of infant health

($\beta = 0.346$, $p < 0.001$) and from subjective perceptions of infant health to ASD, with worse

perceptions of infant health predicting greater ASD symptoms ($\beta = 0.566$, $p < 0.001$). The direct

effect between ACEs and ASD was significant, with higher levels of ACE predicting higher

ASD symptoms ($\beta = 0.269$, $p < .01$), and there was a significant indirect effect from ACE to ASD

through subjective perceptions of infant health ($\beta = 0.196$, $p < 0.001$), indicating a partial

mediation. This model explained 49.7% of the variance in ASD.

Figure 2. Infant health model 1: Infant health appraisals as a mediator of ACEs and ASD.
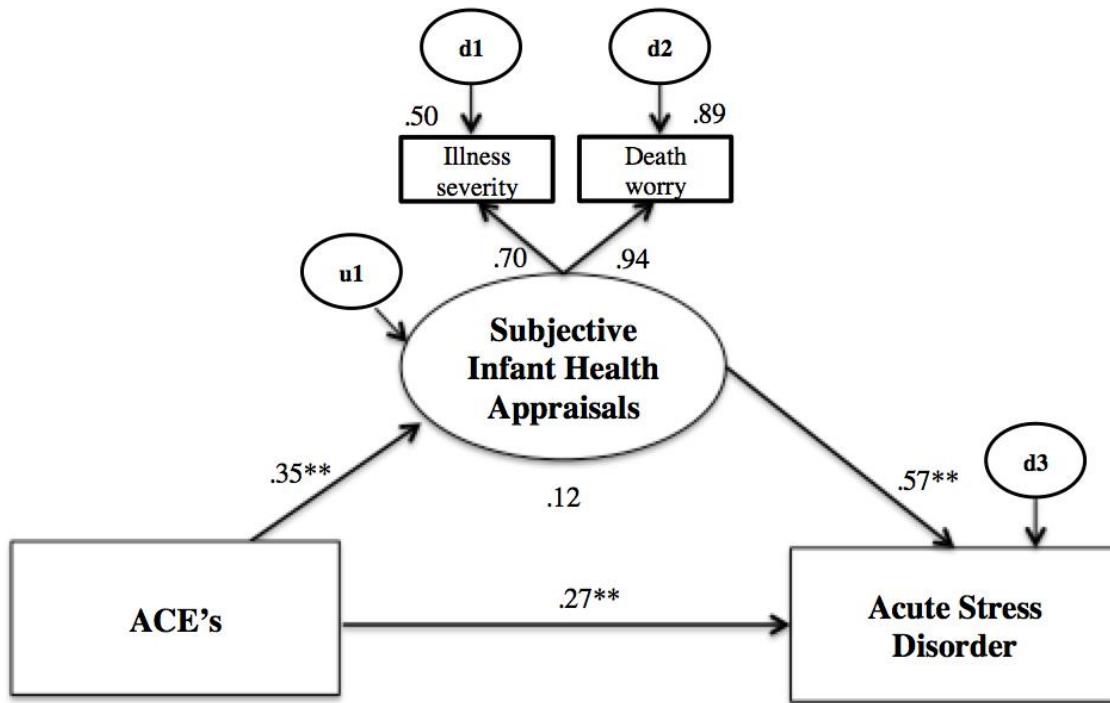
Note. **=$p<.01$.

Aim Four: *Infant health model 2.* **Model how subjective infant health appraisals mediate**

the relations between objective infant health characteristics and ASD.

Figure 3 shows a visual representation of the model. The χ^2 value was not statistically

significant, suggesting good model fit, $\chi^2 = (1, N = 119) = .839$, $p = 0.360$. Other fit indices also

supported the goodness of fit of the model: CFI = 1.000, GFI=.996, AGFI=.965, and

RMSEA = 0.000 (CI, 0.000, 0.236).

There were significant direct effects from objective infant health to subjective

perceptions of infant health, wherein more severe infant health predicted more catastrophic

appraisals of infant health (β = 0.395, p < 0.001) and from subjective appraisals of infant health

to ASD, wherein more catastrophic appraisals of infant health predicted greater ASD symptoms

(β = 0.630, p < 0.001). The direct effect between objective infant health and ASD was not

significant (β = 0.100, p = 0.230), yet there was a significant indirect effect from objective infant

health to ASD through subjective perceptions of health (β = 0.249, p < 0.001), indicating a full

mediation. This model explained 45.7% of the variance in ASD.

Figure 3. Infant health model 2: Infant health appraisals as a mediator of objective infant health
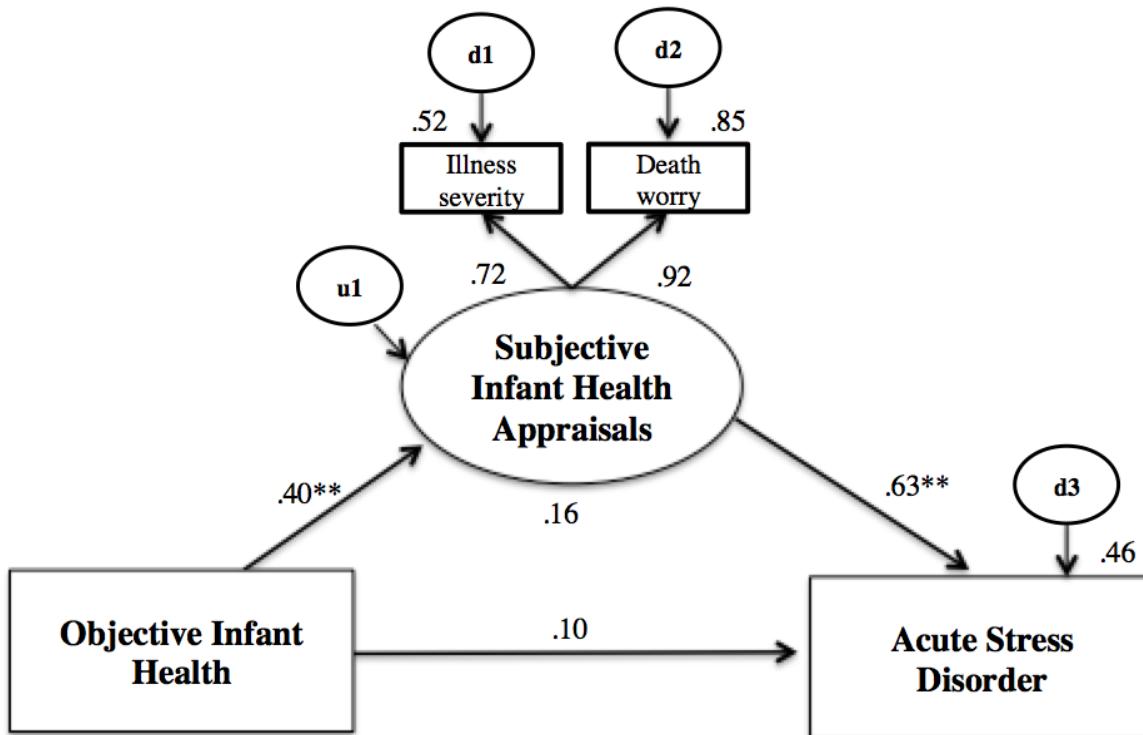
and ASD.

Note. **=*p*<.01.

Aim Five: *Infant health model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), objective infant health characteristics, subjective infant health appraisals, and ASD.**

Figure 4 shows a visual representation of the model. The χ^2 value was not statistically significant, suggesting good model fit, $\chi^2 = (2, N = 119) = 2.289$, $p = 0.318$. Other fit indices also supported the goodness of fit of the model: CFI = .998, GFI=.992, AGFI=.943, and RMSEA = 0.035 (CI, 0.000, 0.190).

There were significant direct effects from objective infant health to subjective perceptions of infant health ($\beta = 0.372$, $p < 0.001$), but there was not a significant direct effect from objective infant health to ASD ($\beta = 0.128$, $p=.125$). There were significant direct effects from ACEs to subjective perceptions of infant health ($\beta = 0.324$, $p < 0.001$), and from ACEs to ASD ($\beta = 0.276$, $p < 0.001$). There were also significant direct effects from subjective health to ASD ($\beta = 0.520$, $p < 0.001$).

There were significant indirect effects from objective infant health to ASD through subjective perceptions of infant health ($\beta = 0.194$, $p < 0.001$), which represented a full mediation. There was a significant indirect effect from ACEs to ASD through subjective perceptions of infant health ($\beta = 0.169$, $p < 0.001$), which represented a partial mediation. This model explained 52.0% of the variance in ASD.

Figure 4. Infant health model 3: Medical traumatic stress in NICU mothers
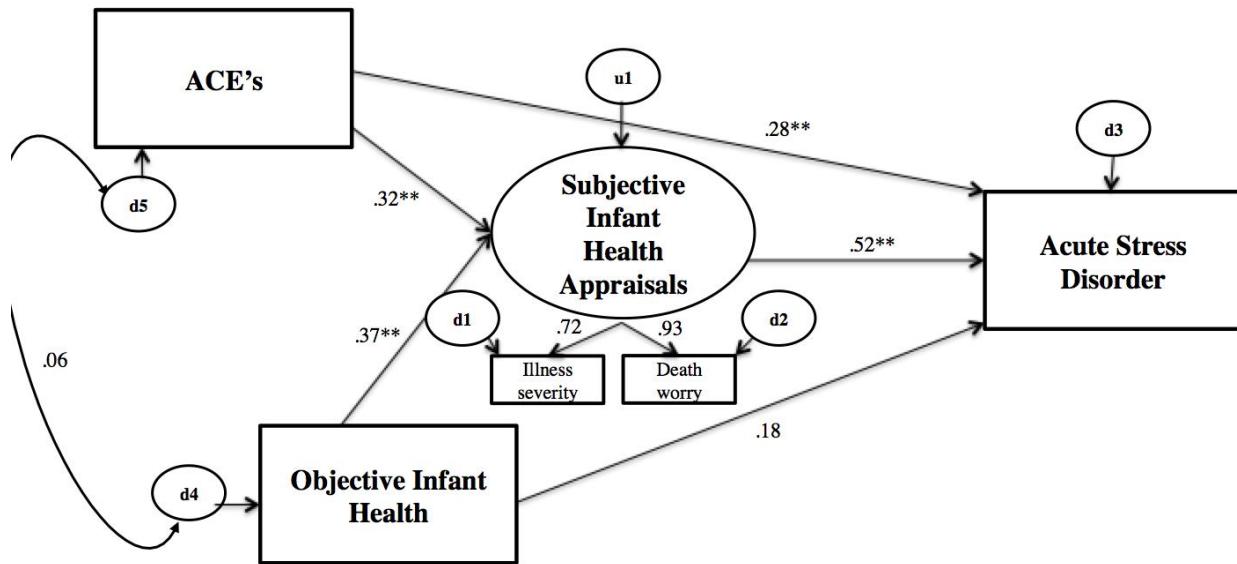
Note. ACE=Adverse Childhood Experiences, *=$p<.05$, **=$p<.01$.

Birth Models

Aim Six: *Childbirth model one.* **Model how subjective appraisals of control during childbirth mediate the relations between pre-existing risk factor(s) and ASD.**

The SEM was adjusted to include exclusively adverse childhood experiences as our pre-existing risk factor, per Aim Three. Figure Five shows a visual representation of the model. The χ^2 value was statistically significant, suggesting poor model fit, $\chi^2 = (1, N = 119) = 11.200, p = 0.001$. Other fit indices also reflected poor model fit: CFI $= 0.764$, GFI$=.943$, AGFI$=.658$, and RMSEA $= 0.294$ (CI, 0.157, 0.460).

There was a significant direct effect from ACEs to subjective perceptions of control during childbirth ($\beta = -.242, p < 0.01$), and a significant direct effect from ACE to ASD ($\beta = .129$

p < 0.01). There was a significant direct effect from subjective perceptions of control during childbirth to ASD (β = -.343, *p* < 0.01). Finally, there was a significant indirect effect of ACEs on ASD through subjective perceptions of control during childbirth (β = .083, *p* < 0.01), indicating a partial mediation. This model explained 15.6% of the variance in ASD.

Figure 5. Childbirth Model 1: Birth appraisals as a mediator of ACEs and ASD.
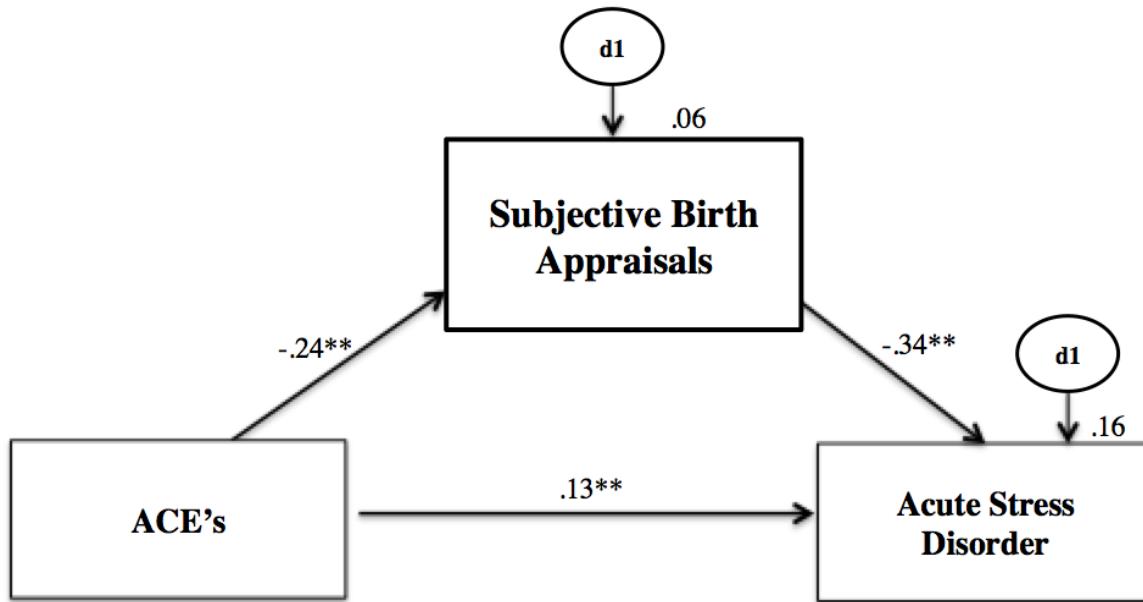
Note. **= *p*<.01

Aim Seven: *Childbirth Model 2.* Model how subjective appraisals of control during childbirth the relations between type of delivery and ASD.

Figure Six shows a visual representation of the model. The χ^2 value was statistically significant, suggesting poor model fit, χ^2 = (1, *N* = 119) = 89.331, *p* = 0.000. Other fit indices also reflected poor model fit: CFI = 0.00, GFI=.739, AGFI=.965, and RMSEA = 0.865 (CI, 0.791, 1.000).

There was a significant direct effect from subjective perceptions of control during childbirth to ASD (β = 0.421, *p* < 0.001). There were not significant direct effects from objective

type of delivery to perceptions of control during childbirth ($\beta = -.161$, $p = .093$) or from type of delivery to ASD ($\beta = -.056$, $p = .099$). Finally, there were not significant indirect effects from objective type of delivery to ASD through perceptions of control during childbirth ($\beta = -.068$, $p = .099$), indicating no mediation. This model explained 17.2% of the variance in ASD.

Figure 6. Childbirth model 2: Birth appraisals as a mediator of delivery type and ASD.
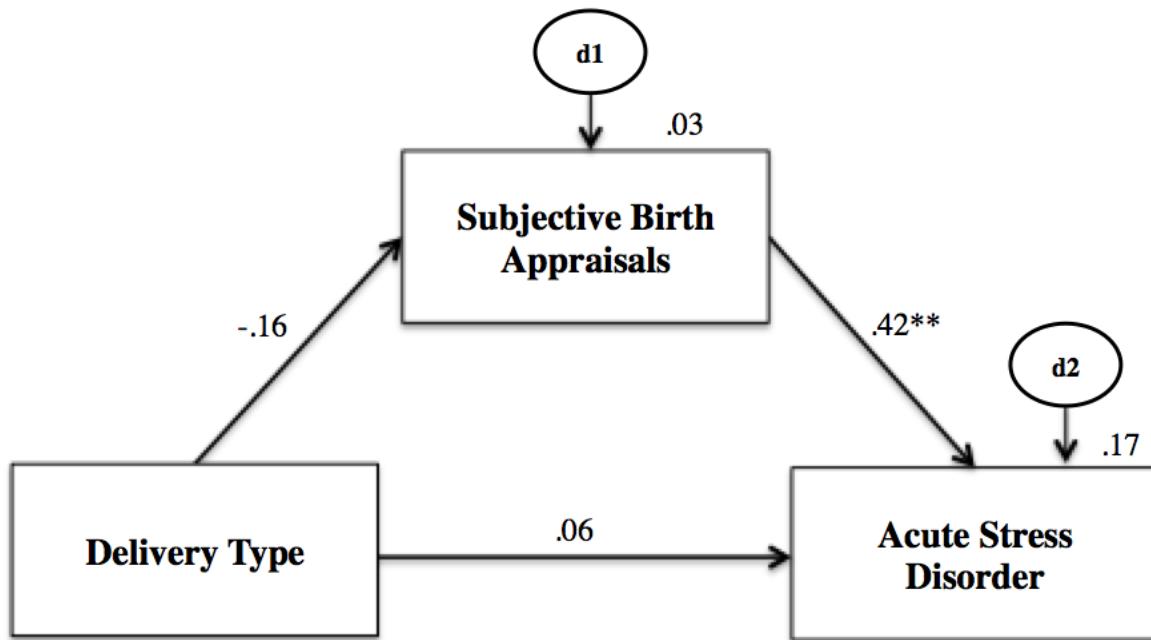
Aim Eight: *Childbirth model 3.* **Evaluate comprehensive models of traumatic stress that include pre-existing risk factor(s), type of delivery, subjective appraisals of control during childbirth, and ASD.**

Figure Seven shows a visual representation of the model. The χ^2 value was statistically significant, suggesting poor model fit, $\chi^2 = (1, N = 119) = 85.474$, $p = 0.001$. Other fit indices also reflected poor model fit: CFI $= 0.017$, GFI$=.795$, AGFI$=-1.049$, and RMSEA $= 0.846$ (CI, 0.700, 1.003).

There was a significant direct effects from ACE to subjective appraisals of control during childbirth ($\beta = -.232$, $p < 0.01$), and a significant direct effect from ACEs to ASD ($\beta = .429$

$p < 0.01$). There were not significant direct effects from objective type of delivery to appraisals of control during childbirth ($\beta = -.145$, $p = .125$) or from type of delivery to ASD ($\beta = -.029$, $p = .718$). There was a significant indirect effect from ACEs to ASD through subjective perceptions of childbirth ($\beta = -.102$, $p < 01$), indicating a partial mediation. There was no direct effect of type of delivery to ASD through subjective perceptions of childbirth ($\beta = -.064$, $p = .135$). This model explained 15.6% of the variance in ASD.

Figure Seven. Childbirth Model 3: Medical traumatic stress in NICU mothers
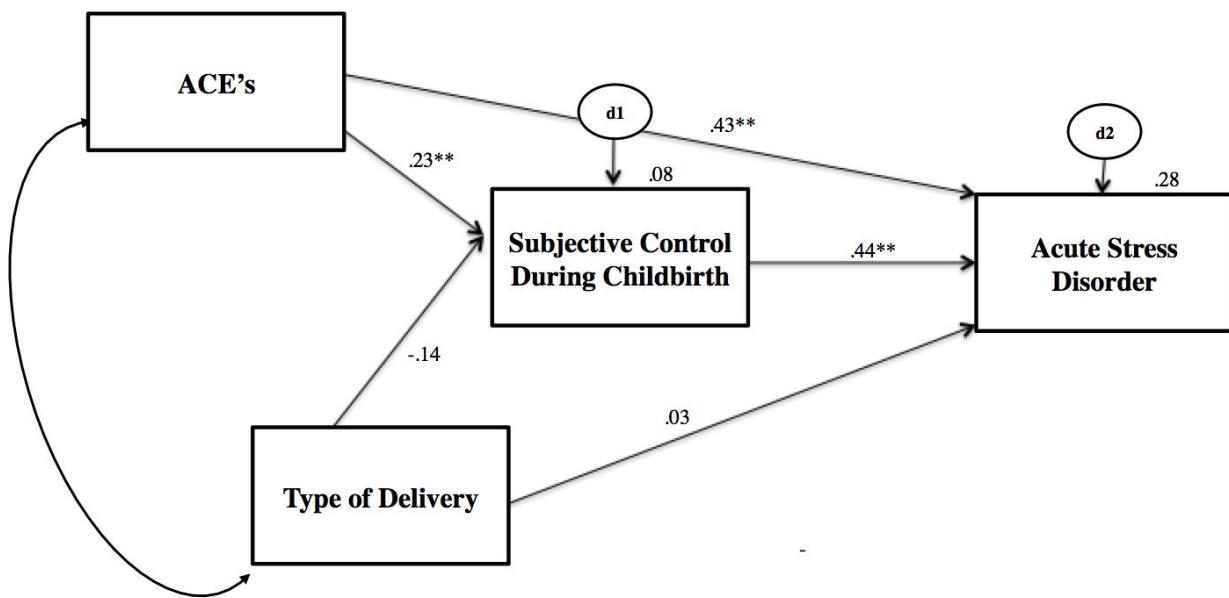
Note. ACE=Adverse Childhood Experiences, *=p<.05, **=p<.01.

<div align="center">**Discussion**</div>

Summary

Acute Stress Disorder (ASD) was highly prevalent in NICU mothers, as ~65% of mothers either met criteria for or were identified as at risk for ASD. Moreover, ASD was comorbid with higher levels of other critical indicators of mental health, including postpartum depression, postpartum anxiety, and overall NICU stress. The high rates of mental distress underscore the unique challenges faced by NICU mothers, as a majority (~54%) endorsed sequential traumas related to pregnancy, birth, and/or NICU hospitalization. In our sample (that included heterogeneous infant health severity), single item measures of prematurity/morbidity were not correlated with ASD, but a broadband infant health severity scale was associated with ASD (Harsha, 2015).

After adjusting our models to include only adverse childhood experiences (ACEs) as a "weathering factor," our three infant health models were significant with good fit indices. Subjective appraisals of infant health partially mediated the relationship between ACEs and posttraumatic stress (Infant health model 1), as well as the relationship between objective infant health and posttraumatic stress (Infant health model 2). Our third infant health model highlighted the importance of ACEs, infant health appraisals, and objective infant health as predictors of ASD during the *peritrauma* phase, using Kazak's (2006) Pediatric Model of Posttraumatic Stress. In contrast, the three childbirth models had poor model fit. The first childbirth model indicated that perceptions of control during childhood significantly mediated the relationship between prior childhood trauma and ASD. Our other models indicated that only subjective appraisals of childbirth experience predicted ASD, while type of delivery had no significant impact.

Posttraumatic Stress in NICU Mothers

A majority of mothers experience sequential traumas, underscoring the unique position of NICU mothers, who have recently undergone a potentially traumatic pregnancy and/or birth, followed by NICU hospitalization. The present study is the first to evaluate which aspects of the birth/NICU were perceived as traumatic. Sequential traumas were endorsed by ~54% of the overall sample, with a greater portion (66%) of mothers with Acute Stress Disorder endorsing multiple traumas. Parents most commonly identified the NICU admission as traumatic (~81%), followed by childbirth (~50%), pregnancy (~24%), and a specific medical scare in the NICU (~15%). The prevalence of sequential trauma provides a richer understanding of maternal posttraumatic stress for several reasons. First, the endorsement of one trauma may have a ripple effect on other trauma appraisals. For example, only 1-6% of well-baby mothers endorsed childbirth-related posttraumatic stress, according to Andersen et al.'s (2012) literature review. The higher rates of posttraumatic stress and trauma related to childbirth in this NICU sample could reflect either a more precipitous delivery or that the experience of NICU hospitalization colors trauma appraisals related to childbirth. Additionally, the high rates of sequential trauma might contribute to the overall higher rates of posttraumatic stress in NICU parents compared to other medical populations, such as parents in the pediatric intensive care or oncology units (Bruce, 2006; Nelson & Gold, 2012). Finally, the prevalence of sequential trauma has implications for more targeted clinical intervention and trauma-informed care.

Acute Stress Disorder (ASD) was prevalent, with ~40% of mothers meeting criteria for ASD and another ~15% endorsing symptoms that classified them as "at risk" for posttraumatic stress. While these rates are commensurate with previous studies (which estimate ASD rates of 18-54%), several setting and sample considerations should be enumerated to provide context

(Binder et al., 2010; Gangi et al., 2013; Lefkowtiz et al., 2010; Misund et al., 2014; Shaw et al., 2006; Shaw et al., 2009; Shaw et al., 2013). First, this is one of few studies with broad infant health inclusion criteria, reinforcing the high risk for ASD among all NICU mothers, not only those with the highest risk infants. Additionally, setting-specific factors related to Virginia Commonwealth University's (VCU) NICU may have influenced PTSS rates. For example, VCU engages in family-centered care practices that may buffer PTSS, including an emphasis on patient-provider communication (e.g., daily bedside rounds, interdisciplinary team meetings), promotion of breastfeeding and skin-to-skin contact, psychosocial support for families, and private rooms to allow parents to "room in." Conversely, VCU's setting and patient population may confer some unique PTSS risks. As one of the region's only Level IV NICUs, the unit provides care to infants with the highest medical needs. Additionally, the sample had a high portion of low-income mothers (~72% Medicaid), had high rates of prior trauma exposure, and serves in a federally-designated mental health shortage area, which underscores the importance of early and low-cost intervention for families (Health Resources and Service Administration, 2020).

In addition to evaluating total prevalence rates of ASD in NICU mothers, parsing out symptom clusters can elucidate how ASD symptoms present on the unit. In mothers meeting criteria for ASD, symptoms of intrusion were endorsed "quite a bit" on average, and avoidance and hypervigilance symptoms both were endorsed "moderately." Intrusion may include flashbacks or nightmares related to the birth or NICU (Beck & Woynar, 2017). Hypervigilence may manifest as heightened focus on the medical equipment, which could result in excessive paging of the medical team for example. Finally, avoidance may represent one of the most pernicious symptom clusters in terms of medical recovery, as traumatized parents may avoid

visiting the hospital or holding their baby, because these are "triggering" activities (Beck & Woynar, 2017; Greene et al., 2015). Lack of visitation or limited knowledge of caring for medically complex infants is a major barrier to parental engagement and timely discharge (Kjellsdotter, Lantx, & Ottosson, 2018; Raffray, Seminic, Galeano, & Marin, 2014). Future research should evaluate ways in which these symptom clusters contribute to poorer infant health outcomes, specific parental behaviors (e.g. visitation, breastfeeding etc.), medical provider burnout, and decreased bonding.

Posttraumatic Stress and Mental Health

Postpartum depression and anxiety symptoms were highly comorbid with posttraumatic stress. Of mothers meeting criteria for ASD, ~81% endorsed anxiety and ~66% endorsed depression, demonstrating high co-occurrence rates. In the overall sample, anxiety (~51%) and depression (~35%) rates were commensurate with the existing literature, which has established that both depression and anxiety symptoms are higher for NICU mothers than well-baby mothers (Roque et al., 2007; Vigod et al., 2009). Although the present study's prevalence rates for postpartum depression and anxiety are not novel, our findings on their high comorbidity rates with PTSS offer a contribution to a relatively understudied area. The high co-occurrence of these disorders underscores both the considerable global distress of mothers with PTSS and the opportunity for transdiagnostic treatment approaches that target broad symptom constellations. More research is needed on the transdiagnostic pathways underlying these mental health diagnoses, as well as longitudinal research on symptom trajectories.

Finally, general NICU distress was common in this sample and correlated with specific mental health conditions. Decades of research has established that the NICU is distressing for parents, commonly using the Parental Stress Scale-NICU, which evaluates "Sights and Sounds"

(e.g., medical alarms), "Infant Behavior and Procedures" (e.g., baby's fragile appearance or reliance on respiratory support), and "Role Alteration" (e.g., not being able to feed baby herself) (Miles, Funk, & Carlson, 1993). In this sample, mothers experienced moderate distress or higher across all domains, with Role Alteration as the highest distress level, followed by Infant Behavior and Procedures, and Sights and Sounds, which was consistent with previous findings using the Parental Stressor Scale-NICU (e.g., Gangi et al., 2013). Moreover, distress in all three domains was correlated with mental health outcomes, including ASD, anxiety, and depression, which is consistent with prior literature establishing a strong relationship between NICU-related distress and mental health sequelae (e.g., Aftyka, et al., 2017; Gangi et al., 2013; Greene et al., 2015; Koliouli et al., 2016; Parker, 2016; Sharp, 2016). The assessment of specific NICU stressors may be beneficial in order to inform case conceptualizations and targeted interventions. Overall, further research is needed to: evaluate which domains are associated with specific symptom clusters of ASD (e.g., distress related to infant appearance could be related to intrusive images), examine the impact of family-centered care practices on specific domains (e.g., skin to skin contact on maternal role), and incorporate specific domains into our models of posttraumatic stress in NICU mothers.

Infant Health

Prior to evaluating the relationship between infant health and posttraumatic stress, we sought first to characterize this sample in terms of infant health. The present sample consists primarily of moderate to late preterm infants (~67%) with moderate severity ratings on average on the SNAPPE-II (Harsha, 2015). However, there was considerable variability in health severity and a sizable minority infants experienced critical illness (Harsha, 2015). For example, ~22% of infants were diagnosed or treated for potential neurologic insult, ~27% of infants were

considered to be "severely" ill on the SNAPPE II, and ~5% of infants did not survive at the time of chart review. The length of stay was 40 days on average, (approximately triple the national average), as the present unit is a Level IV NICU that provides care to the region's most complex and critically ill infants (NPIC, 2011). Overall, the present sample offers a heterogeneous study in terms of health severity, as one of the first studies on PTSS in NICU mothers with broad infant health inclusion criteria.

Given the inconsistent findings throughout the medical literature on the relationship between objective infant health measures (including both single item and broadband scales) and posttraumatic stress (PTSS), we conducted correlations between infant health indicators and posttraumatic stress/infant health appraisals. Conditions or procedures associated with morbidity (i.e., genetic diagnoses, neurological condition or treatment, and infant death) were not significantly correlated with posttraumatic stress or infant health appraisals. Second, there were no significant correlations between markers of prematurity (i.e., gestational age, birth weight) and PTSS/subjective appraisals of infant health, which is consistent with previous literature (Aftyka et al., 2014; Binder et al., 2010). However, our study's null findings could be attributable to the same methodological limitations inherent to the existing literature, such as the use of dichotomous variables and limited power. Alternatively, the results may reflect the paramount importance of infant health appraisals. Our broadband health severity measure was correlated with posttraumatic stress. This finding stands in contrast to prior literature, which may reflect our sample's greater variety of infant health severity (Barr, 2011; Binder et al., 2010; Chang, et al., 2016; Feeley et al., 2011; Lefkowitz et al., 2010).

Infant Health Models

The weathering risk factors initially selected for inclusion in this study's structural

equation models—Adverse Childhood Events (ACEs), prior reproductive loss, insomnia, and

experiences with racism—were reduced to included only ACEs, due to limited conceptual and

statistical evidence. These four constructs were initially selected to evaluate ways in which the

"weathering effects" of chronic stressors influenced posttraumatic stress responses to the NICU.

Based on prior literature, we had anticipated that these risk factors would be elevated in NICU

mothers and contribute to higher posttraumatic stress (Holzman et al., 2009; Love, et al., 2010).

However, in this study neither experiences with racism nor prior reproductive losses were

correlated with ASD. These null findings may be attributable to measurement error (e.g.,

selecting an instrument that focused on overt racism instead of one focusing on microaggressions),

appraisals of the experience (e.g., prior loss could enhance gratitude for a live birth thereby

reducing distress), or limited power (e.g., Das, 2013; Greene et al., 2015). Insomnia during prior

to pregnancy was correlated with ASD, which was a novel finding for NICU parents (Pigeon et

al., 2010; Bryant, et al., 2011). However, because the other weathering risk factors were not

included, there was limited theoretical rationale to include both ACEs and insomnia alone as

"weathering risk factors." Thus, we dropped insomnia from all subsequent structural equation

models and focused on a single variable that had the most theoretical interest, childhood trauma

experiences. This rationale was also predicated on the fact that a large number of mothers, nearly

one-third, endorsed four or more ACEs, which is the common threshold for adverse mental and

physical health sequelae (Felitti & Anda, 2009). In contrast, only 15% reported prior insomnia.

Subjective appraisals of infant health partially mediated the relationship between adverse

childhood experiences (ACEs) and posttraumatic stress (Figure 2). Approximately one-third of

mothers endorsed four or more ACEs, which is the common threshold for adverse mental and physical health sequelae (Felitti & Anda, 2009). Moreover, ACEs had a significant direct effect on infant health appraisals, wherein higher ACEs contributed to worse infant health appraisals, which in turn predicted greater ASD. ACEs also directly predicted ASD; the overall model fit indices were good. This is the first study to evaluate the relationship between ACEs and posttraumatic stress in NICU mothers. Our sample of NICU mothers have also experienced considerable childhood trauma, which may have colored their perceptions of their babies' health and compounded their risk for posttraumatic stress. Prior literature has indicated that adult trauma can lead to more parental PTSS following NICU admission, though no specific mechanism has been posited (Barr, 2011; Dunkel Schetter, 2011). This model provides one pathway through which prior trauma can lead to PTSS, emphasizing the importance of infant health appraisals. Further research is needed that explores the relationship between ACEs and infant health appraisals, specifically evaluating ways in which specific cognitions, coping strategies, or external factors may influence this pathway.

Subjective infant health appraisals fully mediated the relationship between objective infant health and ASD, as demonstrated in the good fit of Infant Health Model 2 (Figure 3). This model has several clinical and research implications. First, although both objective infant health and subjective infant health appraisals had a significant path, they were not perfectly correlated. Clinically, this finding is relevant to the medical team, as parental understanding of infant health severity informs joint medical decision making, and clarification of health severity may be a point of therapeutic intervention. From a research perspective, it would be useful to examine if specific conditions, diagnoses, or procedures were more highly correlated with subjective appraisals of infant health (e.g., "cooling procedure" for neurological insult), using samples with

more narrow inclusion criteria. Additional future research should evaluate other variables that may influence the relationship between objective infant health and infant health appraisals (e.g., mental health history, religiosity, reproductive history), using larger samples. These findings also emphasize the importance of subjective appraisals on posttraumatic stress. For example, throughout much of the infant health and posttraumatic stress literature, studies have found inconsistent links between objective infant health and posttraumatic stress (e.g., Aftyka et al., 2014; Chang et al., 2016; Koliouli, Gaudron, & Raynaud, 2016). This model offers a potential explanation of these mixed findings, as the path between objective infant health and ASD became insignificant when subjective infant health appraisals were added to the model. This model suggests that parental appraisals of infant health are at the crux of the relationship between infant health indicators and posttraumatic stress.

Finally, the present study evaluated a model of ACEs, objective infant health, subjective infant health appraisals, and ASD, rooted in Kazak's 2006 Model of Pediatric Medical Traumatic Stress (Figure 4). The good fit of this structural equation model provided the first statistical support to Kazak's theoretical model within NICU parents. Specifically, these findings are consistent Kazak's diathesis-stress conceptualization, wherein prior trauma predicted appraisals of subsequent trauma and responses. In the peritrauma phase (Phase 1), prior childhood trauma predicted both infant health appraisals and ASD, highlighting the importance of evaluating prior trauma exposure to understand how a person perceives a current potentially traumatic event. Kazak's (2006) model suggests that it is important to consider the objective illness severity of the infant, subjective infant health, and prior trauma, in order to evaluate the development of PTSS. Future research should expand this model to include Phases 2 (Early trauma) and Phase 3 (Long term trauma) of Kazak's model, by evaluating coping factors that influence ASD and

70

exploring the eventual development of posttraumatic stress disorder, using larger, representative samples and longitudinal design.

Childbirth

In the present sample, emergency cesarean sections were common but not significantly correlated with adverse mental health sequelae. Roughly equivalent portions of mothers had emergency cesarean sections compared to vaginal deliveries (44% vs. 45%) and another ~12% had planned cesarean sections. In this sample, approximately one-fifth of mothers identified childbirth as their index trauma, while roughly half of mothers indicated that childbirth was traumatic (either as index or compounding traumas). For mothers who indicated that childbirth was their index trauma, posttraumatic stress symptoms were high: ~46% had "probable ASD" and another ~14% were classified as "at risk for ASD." These rates were significantly higher than the 1-6% of well baby mothers with posttraumatic stress related to childbirth, which may be attributable to a more dangerous birth or to the cumulative impact of the sequential traumas of labor and NICU admission (Andersen et al., 2012; Dekel, Stube, & Dishy, 2017; Lasiuk, Comeau & Newburn-Cook, 2013). Despite that this sample had both high rates of emergent cesarean sections and high rates of childbirth-related PTSS, type of delivery was not correlated with posttraumatic stress in this sample. These null findings may reflect the importance of sequential trauma and perceptions of control during childbirth. Alternatively, these results could be attributable to the specific population in this study or limited sample size, as a literature review noted that emergency cesarean sections were a risk factor for PTSS in well-baby mothers (Andersen et al., 2002).

Perceptions of control during childbirth partially mediated the relationship between ACE and ASD; however the model had poor overall fit (Figure 5). Poor model fit has several indications: first, our sample size may have limited our power to detect small effects; second it could indicate that the model is missing key constructs that would provide a more cohesive presentation. Despite the limited inferences that can be drawn from the model as a whole, the partial mediation and respective direct effects may be informative. First, prior trauma history predicted feeling less in control during childbirth, which in turn predicted greater ASD. While this is the first study to evaluate the relationship between ACEs and perceptions of control during childbirth in NICU parents, this finding maps onto previous literature in well-baby mothers. Specifically, well-baby mother literature has established that prior trauma was linked to increased likelihood of posttraumatic stress following childbirth, as well as to an external locus of control during labor and delivery (Andersen et al., 2012). This study's findings demonstrate similar effects in NICU mothers, a population at greater risk for multifactorial trauma. Moreover these findings highlight the importance of increasing subjective control during childbirth, particularly for mothers with trauma histories.

In the second childbirth model, only appraisals of control during childbirth predicted ASD, with no other significant pathways and poor overall model fit (Figure 6). These findings may reflect the importance of appraisals of control during childbirth in predicting posttraumatic stress. For example, a literature review for well-baby mothers established that perceptions of trauma during childbirth predicted posttraumatic stress, while type of delivery had no significant impact (Andersen et al., 2012). The research for NICU mothers has been conflicting, as some studies noted that emergency cesarean sections (but not planned) were associated with PTSS in NICU mothers (e.g., Misund et al., 2013). Conversely, it is also possible that methodological

limitations contributed to these null findings. For example, we did not assess other objective components of childbirth that may have influenced posttraumatic stress, such as induction, length of labor, discrepancies between birth plan and resulting birth experience, or pain medication (Andersen et al., 2012). While more research on these considerations is needed, the current study's finding of the significance of control during childbirth is encouraging as a potentially modifiable risk factor.

As anticipated, given the poor fit of our other childbirth models, our final childbirth model yielded poor fit (Figure 7). Consistent with the prior childbirth models, appraisals of control during childbirth partially mediated the relationship between ACE's and ASD. No other pathways were significant. The poor fit of the model suggests that the model provides an incomplete picture of factors related to childbirth. Future research should include components of this model (prior trauma exposure, subjective appraisals of childbirth), while incorporating other key constructs, such as more nuanced measurement of objective birth factors (e.g., birth plan, labor length), NICU admission circumstances (e.g., skin to skin contact in minutes after delivery), the presence of social support during delivery, and reproductive factors during pregnancy (e.g., extended hospitalized bedrest prior to delivery).

Limitations

Despite the potential for contributing to a growing area of research on a critical topic, the present study is limited by several methodological concerns, including study design. First, the present study is cross-sectional, with a one-month time period of eligibility for mothers on the unit. Ideally, the present study would have reduced retrospective reporting biases by implementing multiple time-point design with narrower windows for data collection, first evaluating pre-existing risk factors during pregnancy, followed by evaluation of birth and NICU

stress after approximately one week post-admission, and finally assessing ASD at approximately three weeks post-admission.

The present study is also limited by a number of measurement considerations. The study would have benefited from several changes to our measurement battery, including: a more sensitive assessment of experiences with racism (e.g., micro-aggressions instead of overt racism), a more extensive measure of factors related to childbirth (e.g., delivery duration), and the inclusion of adult traumatic experiences. It is also notable that the present study's scope is limited to risk factors, despite the innumerable strengths of NICU mothers that would have likely had buffering effects and provided a more balanced clinical picture. Finally, our "weathering" factors should have been selected as a more cohesive grouping, such as experiences with microaggressions related to both racism and classism, adult trauma history, and history of mental health concerns. Similarly, the examination of other social determinants of health, such as food insecurity or access to prenatal care, may have shed further light on the impact of broader contextual factors impacting health.

Sample and setting related limitations should also be considered. We excluded mothers in their few days of hospitalization, which limits our study to mothers with more than four days of NICU hospitalization. The exclusion of Non-English speaking mothers failed to capture the experiences of an important and understudied population. This criterion was particularly detrimental to understanding the experiences of Hispanic/Latinx mothers, who were grossly underrepresented in this sample and may experience greater stress in navigating a NICU stay due to language barriers (Lilo, Shaw, Corcoran, Storfer-Isser, & Horwitz, 2016; Obregon et al., 2019). Additionally, key caregivers were excluded, including fathers, adoptive mothers, and extended family. NICU fathers experience considerable posttraumatic stress, and kinship

networks are key to providing care to many families, especially those from diverse backgrounds (Binder et al., 2011; Mollborn, Fomby, & Dennis, 2010). Moreover, while our decision to include broad infant health criteria made our results more generalizable, we were insufficiently powered to examine the relationship between specific health conditions/procedures and posttraumatic stress, such as end of life care, cooling for neurological insult, or life-limiting genetic diagnoses. Finally, this study takes place in a NICU that offers the highest level of care (Level IV) and that supports the psychosocial well-being of parents through a variety of best practices (e.g., encouraging breastfeeding, offering private rooms, etc.). The majority of NICUs do not offer this level of care, so the rates reported in this study may not be fully generalizable.

Clinical Implications

This study's finding that trauma was ubiquitous, with high rates of posttraumatic stress, postpartum depression, and postpartum anxiety highlights the critical importance of early, trauma-informed psychological interventions (Sanders & Hall, 2018; Serlachius et al., 2018). Our findings suggest that all NICU mothers—and extrapolating from the broader literature, all family members—should be evaluated for mental health concerns, regardless of the severity of their infants' illnesses or their types of delivery. Psychological assessment should include aspects of the NICU that are stressful, given the correlation between NICU stressors and mental health sequelae in this study (e.g., Greene et al., 2015). Additionally, this study emphasized the compounding effect of multiple traumas, which can color both trauma appraisals and contribute to higher rates of overall posttraumatic stress. Thus, clinical intervention could begin by allowing families to process their experiences, starting with discussion of stressors during pregnancy. Additionally, the high comorbidity rates of depression, anxiety. and posttraumatic stress suggest that transdiagnostic treatment approaches may be useful (e.g., Cognitive Behavioral Therapy,

Acceptance and Commitment Therapy, Behavioral Activation). Posttraumatic stress treatment could include both acute coping (e.g., decreasing avoidance, psychoeducation, etc.) as well as evidence-based long-term treatments (e.g., Cognitive Processing Therapy) (e.g., Shaw et al., 2013). The psychologist should work closely with the medical team to relay mental health concerns and trauma history, barriers/facilitators of parental engagement, and perceptions of infant health. Finally, addressing psychological concerns while the family is on the unit is critical, given that NICU babies are disproportionately from low-income families with diminished access to mental health services and that posttraumatic stress is associated with considerable consequences during a critical bonding period, including detriments to parental mental and physical health, decreased bonding, and increased demands on the medical team (e.g., Davies et al., 2008; Focada-Guex et al., 2011; Maroney, 2003; Roque, et al., 2017; Sanders & Hall, 2018; NPIC, 2011).

In addition to extrapolating these findings to inform psychological practices, this study can help to guide trauma-informed care practices for the medical team. Many of the family-centered care guidelines already in place may help prevent or mitigate posttraumatic stress in parents (Sabnis et al., 2019). For example, NICUs have developed programs that increase parental engagement in care (e.g.. encouraging breastfeeding) and promote bonding (e.g., skin to skin contact), as well as designed NICU environments to encourage visitation (e.g., private rooms) (Gooding et al., 2011; Sabnis et al., 2019). These efforts map onto the NICU stress domains noted in this study, which were correlated with mental health (Miles, Funk, &Carlson, 1993). Similarly, existing Ob/Gyn trauma-informed care recommendations emphasize increasing maternal autonomy during labor and delivery, which mirrors this study's findings on the importance of perceived control during childbirth (Gerber, 2019). It is also critical that providers

have an understanding of posttraumatic stress, including its prevalence, risk factors, and clinical presentation (Sanders & Hall, 2018). For example, some of the more challenging behaviors from families on the unit may be indicative of posttraumatic symptoms, such as avoiding visiting their infants, seeming detached or disinterested in their infants, and/or becoming easily angered with the staff (Greene et al., 2015). Understanding of the etiology of these behaviors may help medical providers to recognize parents in need of further psychosocial intervention and decrease medical provider burnout. Additionally, this study may help providers to identify families for psychosocial assessment. For example, if a medical provider recognizes symptoms of depression, referral for other mental health comorbidities should also occur. While many of the psychological and medical implications described should help minimize mental health sequelae, more research is needed that empirically evaluates the efficacy of these treatments on targeted mental health outcomes (Sabnis et al., 2019).

Research Implications

More research is needed to better understand posttraumatic stress in NICU parents. First, future research should conduct studies using different samples, by both creating more inclusive samples (e.g., including fathers, extended family members, and non-English speaking families), as well as narrowing infant health criteria to focus on specific populations of interest (e.g., infants with suspected HIE, genetic conditions, or who did not survive). Future research should also address measurement limitations from this study, such as more nuanced measurement of racism/classism, adult trauma, and factors related to childbirth (e.g., induction, pain medication). In order to better understand some of the pathways modeled in this study, future research should evaluate variables that influence the relationship between constructs like objective infant health and infant health appraisal (e.g., mental health history, social support). Additionally research

should expand our measures to evaluate strengths, such as parental coping strategies, social support, or religiosity. To better understand trauma trajectories, future research would benefit from longitudinal design, beginning during pregnancy and following posttraumatic stress (and associated risk/resilience factors) across time points for a year (Kazak, 2006). Finally, our present paper has focused primarily on risk factors for posttraumatic stress, rather than on ways in which posttraumatic stress influences parental behaviors and outcomes. Future research should evaluate ways in which posttraumatic stress affects bonding, parental behaviors (e.g., visitation frequency, post-discharge treatment adherence), infant health/development, and staff burden/burnout.

Conclusions

Given both the dearth of research on posttraumatic stress (PTSS) in NICU mothers and the considerable consequences of maternal PTSS for families, infant health/development, and medical providers, it is critical to understand factors contributing to early posttraumatic stress during the first month of admission (e.g., Davies et al., 2008; Focada-Guex et al., 2011; Maroney, 2003; Roque, et al., 2017; Sanders & Hall, 2018). Findings from the present study underscored the prevalence of posttraumatic stress (irrespective of infant health severity) and high comorbidity rates with other mental health disorders, emphasizing that NICU mothers are at high risk for postpartum mental health concerns. Additionally, this study provided the first evaluation of sequential trauma in NICU mothers, finding that a majority of NICU mothers experience multiple traumas in quick succession and that one trauma can have a cascading effect on subsequent potentially traumatic experiences. Additionally, the present study offers several models through which providers can better understand the development of posttraumatic stress, emphasizing the relations between trauma history, objective factors related to infant health and

birth, and parental appraisals of these events. In particular, this is the first study to evaluate the influence of ACEs on posttraumatic stress in NICU parents, despite calls for ACE screening across medical settings to provide trauma-informed care (Sanders & Hall, 2018). Additionally, our findings note the critical importance of how parents perceive trauma (for both childbirth and infant health) in understanding their posttraumatic stress responses, which has implications on the allocation of psychosocial resources. In sum, these findings underscore the high psychosocial needs of NICU parents as well as the importance of trauma-informed screening and intervention for NICU mothers (Sanders & Hall, 2018).

References

American College of Obstetricians and Gynecologists. *The Apgar Score*. Retrieved September

    2019 from https://www.acog.org/Clinical-Guidance-and-Publications/Committee-

    Opinions/Committee-on-Obstetric-Practice/The-Apgar-Score.

Aftyka, A., Rybojad, B., Rosa, W., Wróbel, A., & Karakuła-Juchnowicz, H. (2017). Risk factors

    for the development of post-traumatic stress disorder and coping strategies in mothers and

    fathers following infant hospitalisation in the neonatal intensive care unit. *Journal of*

    Clinical Nursing, 26(23-24): 4436-4445. doi:10.1111/jocn.13773.

Aftyka, A., Rybojad, B., Rozalska-Walaszek, I., Rzoñca, P., & Humeniuk, E. (2014). Post-

    traumatic stress disorder in parents of children hospitalized in the neonatal intensive care

    unit (NICU): Medical and demographic risk factors. *Psychiatr Danubina, 26(4)* :347-352.

    Retrieved from

    http://www.hdbp.org/psychiatria_danubina/pdf/dnb_vol26_no4/dnb_vol26_no4_347.pdf.

Alexander, G. R., Kogan, M. D., & Nabukera, S. (2002). Racial differences in prenatal care use

    in the United States: Are disparities decreasing?. *American Journal of Public*

    Health, *92*(12), 1970-1975. Retrieved from

    https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447361/.

Alim, T., Graves, E., & Mellman, T. (2006). Trauma exposure, posttraumatic stress disorder and

    depression in an African-American primary care population. *Journal of the National*

    Medical Association, 89(10)*, 1630-1636. Retrieved from

    https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2569763/.

American Academy of Pediatrics. (2004). *Levels of Neonatal Care. Pediatrics, 114*(5).

Arbuckle, J. L. (2014). Amos 23.0. User's Guide. Chicago: IBM SPSS.

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*.

    American Psychiatric Association; 2013.

Andersen, L.B., Melvaer, L.B., Videbech, P., Lamont, R.F., & Joergensen, J.S. (2012) Risk

    factors for developing post-traumatic stress disorder following childbirth: a systematic

    review. *Acta Obstetrica et Gynecologica Scandinavica, 91(11):* 1261-1272.

    doi:10.1111/j.1600-0412.2012.01476.x.

Barr, P. (2010). Acute Traumatic Stress in Neonatal Intensive Care Unit Parents: Relation to

    existential emotion-based personality predispositions. *Journal of Loss and Trauma*, *15(2):*

    106-122. doi:10.1080/15325020903373128.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index

    as an outcome measure for insomnia research. *Sleep medicine*, *2*(4), 297-307. Retrieved

    from https://linkinghub.elsevier.com/retrieve/pii/S1389945700000654.

Beck, C.T. & Woynar, J. (2017). Posttraumatic stress in mothers while their preterm infants are

    in the Newborn Intensive Care Unit: A mixed research synthesis. *Advances in Nursing*

    Science, *40*(4), 337-355.

Beck, C. T. (2004). Birth trauma: In the eye of the beholder. *Nursing Research, 53*, 28-35.

    Retrieved from https://insights.ovid.com/pubmed?pmid=14726774.

Beckie, T. M. (2012). A systematic review of allostatic load, health, and health

    disparities. *Biological research for nursing*, *14*(4), 311-346.

Binder, W.S., Zeltzer, L.K., Simmons, C.F., Mirocha, J., & Pandya, A. (2011). The father in the

    hallway: Posttraumatic stress reactions in fathers of NICU babies. *Psychiatric Annals*,

    41(8): 396-402. doi:10.3928/00485713-20110727-05.

Blumenshine, P., Egerter, S., Barclay, C. J., Cubbin, C., & Braveman, P. A. (2010).

Socioeconomic disparities in adverse birth outcomes: a systematic review. *American Journal of Preventive Medicine*, *39*(3), 263-272. doi: 10.1016/j.amepre.2010.05.012.

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193-213. doi: 10.1016/0165-1781(89)90047-4

Brandon, D. H., Tully, K. P., Silva, S. G., Malcolm, W. F., Murtha, A. P., Turner, B. S., & Holditch-Davis, D. (2011). Emotional responses of mothers of late-preterm and term infants. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 40*, 719-731. doi: 10.1111/j.1552-6909.2011.01290.x.

Brier, N. (2004). Anxiety after miscarriage: a review of the empirical literature and implications for clinical practice. *Birth*, *31*(2), 138-142. doi: 10.1111/j.0730-7659.2004.00292.

Bryant, R. A., Creamer, M., O'Donnell, M., Silove, D., & McFarlane, A. C. (2010). Sleep disturbance immediately prior to trauma predicts subsequent psychiatric disorder. *Sleep*, *33*(1), 69-74. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2802249/.

Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows*. Thousand Oaks, CA: Sage Publications.

Bruce, M. (2006). A systematic and conceptual review of posttraumatic stress in childhood cancer survivors and their parents. *Clinical Psychology Review*, 26(3): 233-256. doi:10.1016/j.cpr.2005.10.002.

Callahan, J.L., Borja, S.E., & Hynan, M.T. (2006). Modification of the Perinatal PTSD Questionnaire to enhance clinical utility. *Journal of Perinatology, 26*(9): 533-539.

Carter JD, Mulder RT, Bartram AF, & Darlow BA. Infants in a neonatal intensive care unit:

Parental response. *Archives of Disease in Childhood, 90:* F109–F113. doi:
10.1136/adc.2003.031641.

Centers for Disease Control and Prevention. (2016). *ACE Study.* Retrieved August 2018
from https://www.cdc.gov/violenceprevention/acestudy/index.html

Centers for Disease Control and Prevention. (2016). *Infant Mortality in the US: Where We Stand*.
Retrieved March 2018 from https://www.cdc.gov/cdcgrandrounds/pdfpdf.

Centers for Disease Control and Prevention. (2016). *Premature Birth.* Retrieved March 2018
from https://www.cdc.gov/features/prematurebirth/index.html.

Chang, H.P., Chen, J.Y., Huang, Y-Yeh, C.J., Huang, J.Y., Su, P.H., Chen, V.C. (2016). Factors
Associated with Post-Traumatic Symptoms in Mothers of Preterm Infants. *Archives of
Psychiatric Nursing, 30(1):* 96-101. doi:10.1016/j.apnu.2015.08.019.

Chatters, L.M., Taylor, R.J., Jackson, J.S., Lincoln, K.D. (2008). Religious coping among
African Americans, Caribbean Blacks and Non-Hispanic Whites. *Journal of Community
Psychol*ogy, *36(3):* 371-386. doi:10.1002/jcop.20202.

Chen, X., Redline, S., Shields, A. E., Williams, D. R., & Williams, M. A. (2014). Associations of
allostatic load with sleep apnea, insomnia, short sleep duration, and other sleep
disturbances: findings from the National Health and Nutrition Examination Survey 2005
to 2008. *Annals of Epidemiology*, *24*(8), 612-619. doi: 10.1016/j.annepidem.2014.05.014

Choi, Karmel W., and Kathleen J. Sikkema. (2016). Childhood maltreatment and perinatal mood
and anxiety disorders: A systematic review. *Trauma, Violence, & Abuse, 17.5*: 427-453.
doi: 10.1177/1524838015584369

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences, 2ⁿᵈ edition.*

Craig, J. W., Glick, C., Phillips, R., Hall, S. L., Smith, J., & Browne, J. (2015).

Recommendations for involving the family in developmental care of the NICU

baby. *Journal of Perinatology*, *35*(S1), S5. doi: 10.1038/jp.2015.142

Creamer, M., Bell, R., & Failla, S. (2003). Psychometric properties of the impact of

event scale—revised. *Behaviour, Research and Therapy*, *41*(12), 1489-1496. doi:

10.1016/j.brat.2003.07.010

Cutland CL, Lackritz EM, Mallett-Moore T, et al. Low birth weight: Case definition &

guidelines for data collection, analysis, and presentation of maternal immunization safety

data. *Vaccine*. 2017;35(48 Pt A):6492–6500. doi:10.1016/j.vaccine.2017.01.049

Das, A. (2013). How does race get "under the skin"?: Inflammation, weathering, and metabolic

problems in late life. *Social Science & Medicine*, *77*, 75-83. doi:

10.1016/j.socsimed.2012.11.007

Davies, J., Slade, P., Wright, I., & Stewart, P. (2008). Posttraumatic stress symptoms following

childbirth and mothers' perceptions of their infants. *Infant Mental Health Journal*,

29(6),537-554. doi: 10.1002/imhj.20197

Dekel, S., Stuebe, C., & Dishy, G. (2017). Childbirth induced posttraumatic stress syndrome: a

systematic review of prevalence and risk factors. *Frontiers in Psychology*, *8*, 560. doi:

10.3389/fpsyg.2017.00560

Dominguez, T. P. (2008). Race, racism, and racial disparities in adverse birth outcomes. *Clinical

Obstetrics and Gynecology*, *51*(2), 360-370. doi: 10.1097/GRF.0b013e31816f28de

Dolsen, M. R., Asarnow, L. D., & Harvey, A. G. (2014). Insomnia as a transdiagnostic

process in psychiatric disorders. *Current Psychiatry Reports*, *16*(9), 471-782. doi:

10.1007/s11920-014-0471-y

D⊘ rheim, S. K., Bjorvatn, B. R., & Eberhard-Gran, M. (2012). Insomnia and depressive

symptoms in late pregnancy: a population-based study. *Behavioral Sleep Medicine*, *10*(3), 152-166. doi: 10.1080/15402002.2012.660588.

Dunkel Schetter, C. (2011). Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. *Annual Review of Psychology*, *62*, 531-558. doi: 10.1146/annurev.psych.031809.130727.

Dunn, E. C., Nishimi, K., Powers, A., & Bradley, B. (2017). Is developmental timing of trauma exposure associated with depressive and post-traumatic stress disorder symptoms in adulthood?. *Journal of Psychiatric Research*, *84*, 119-127. doi: 10.1016/j.jpsychires.2016.09.004

Ehlert, U. (2013). Enduring psychobiological effects of childhood adversity. *Psychoenuroendrocinology*, 38(9), 1850-1857. doi: 10.1016/j.psyneuen.2013.06.007

Espie, C. A., Kyle, S. D., Hames, P., Gardani, M., Fleming, L., & Cape, J. (2014). The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. *BMJ Open*, *4*(3), e004183. doi: 10.1136/bmjopen-2013-004183.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175-191.

Feeley, N., Zelkowitz, P., Cormier, C., Charbonneau, L., Lacroix, A., & Papageorgiou, A. (2011). Posttraumatic stress among mothers of very low birthweight infants at 6 months after discharge from the neonatal intensive care unit. *Applied Nursing Research*, *24(2):*114-117. doi:10.1016/j.apnr.2009.04.004.

Felder, J. N., Baer, R. J., Rand, L., Jelliffe-Pawlowski, L. L., & Prather, A. A. (2017). Sleep disorder diagnosis during pregnancy and risk of preterm birth. *Obstetrics &*

Gynecology, *130*(3), 573-581. doi: 10.1097/AOG.0000000000002132.

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., &

Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many

of the leading causes of death in adults: The Adverse Childhood Experiences (ACE)

Study. *American Journal of Preventive Medicine*, *14*(4), 245-258. Retrieved from

https://www.ajpmonline.org/article/S0749-3797(98)00017-8/fulltext.

Felitti, V. J., & Anda, R. F. (2010). The relationship of adverse childhood experiences to adult

medical disease, psychiatric disorders, and sexual behavior: Implications for

healthcare. *The Impact of Early Life Trauma on Health and Disease: The Hidden

Epidemic*, 77-87.

Forcada-Guex, M., Borghini, A., Pierrehumbert, B., Ansermet, F., & Muller-Nix, C. (2011).

Prematurity, maternal posttraumatic stress and consequences on the mother–infant

relationship. *Early Human Development*, *87*(1), 21-26. doi:

10.1016/j.earlhumdev.2010.09.006.

Franklin, A. J., Boyd-Franklin, N., & Kelly, S. (2006). Racism and invisibility: Race-related

stress, emotional abuse and psychological trauma for people of color. *Journal of

Emotional Abuse*, *6*(2-3), 9-30. doi: 10.1300/J135v06n02_02.

Gangi, S., Dente, D., Bacchio, E., Giampietro, S., Terrin, G., & De Curtis, M. (2013).

Posttraumatic Stress disorder in parents of premature birth neonates. *Social and

Behavioral Sciences, 82*: 882-885. doi:10.1016/J.SBSPRO.2013.06.365.

Gerber M.R. (2019) Trauma-Informed Maternity Care. In: Gerber M. (eds) Trauma-Informed

Healthcare Approaches. Springer, Cham

Germain, A. (2013). Sleep disturbances as the hallmark of PTSD: where are we now?. *American*

Journal of Psychiatry, *170*(4), 372-382. doi: 10.1176 / appi.ajp.2012.12040432

Geronimus, A. T. (1992). The weathering hypothesis and the health of African-American women
and infants: evidence and speculations. *Ethnicity & disease*, *2*(3), 207-221. Retrieved
from https://europepmc.org/abstract/med/1467758/reload=0.

Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and age patterns of allostatic load
scores among blacks and whites in the United States. (2006). *American Journal of Public
Health, 96*(5): 826–833. doi: 10.2105/AJPH.2004.060749

Gillespie, C. F., Bradley, B., Mercer, K., Smith, A. K., Conneely, K., Gapen, M., … Ressler, K.
J. (2009). Trauma exposure and stress-related disorders in inner city primary care
patients. *General Hospital Psychiatry*, *31*(6), 50514.
doi: 10.1016/j.genhosppsych.2009.05.003

Gooding, J. S., Cooper, L. G., Blaine, A. I., Franck, L. S., Howse, J. L., & Berns, S. D. (2011).
Family support and family-centered care in the neonatal intensive care unit: origins,
advances, impact. *Seminars in Perinatology*, *35*(1), 20-28. doi:
10.1053/j.semperi.2010.10.004.

Greene, M.M., Rossman, B., Patra, K., Kratovil, A.L, Janes, J.E., & Meier, P.P. (2015).
Depression, anxiety, and Perinatal-Specific Posttraumatic Distress in mothers of very low
birth weight infants in the Neonatal Intensive Care Unit. *Journal of Developmental and
Behavioral Pediatrics*, *36(5)*: 362-370. doi:10.1097/DBP.0000000000000174.

Greene, M.M., Rossman, B., Patra, K., Kratovil, A.L,Khan, S.. & Meier, P.P. (2015).Maternal
psychological distress and visitation to the neonatal intensive care unit*Acta Pediatrics,
104*(7):306-313. doi:10.1111/apa.12975.

Health Resources and Services Administration. (2020). Health Resource Area. Retrieved from:

https://data.hrsa.gov/tools/shortage-area/hpsa-find

Holditch-Davis, D., White-Traut, R. C., Levy, J. A., O'Shea, T. M., Geraldo, V., & David, R. J. (2014). Maternally administered interventions for preterm infants in the NICU: Effects on maternal psychological distress and mother–infant relationship. *Infant Behavior and Development*, *37*(4), 695-710.

Holzman, C., Eyster, J., Kleyn, M., Messer, L. C., Kaufman, J. S., Laraia, B. A., ... & Elo, I. T. (2009). Maternal weathering and risk of preterm delivery. *American Journal of Public Health*, *99*(10), 1864-1871. doi: 10.2105/AJPH.2008.151589

Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 76-99). Thousand Oaks, CA: Sage.

Hynan, M. T., Mounts, K. O., & Vanderbilt, D. L. (2013). Screening parents of high-risk infants for emotional distress: rationale and recommendations. *Journal of Perinatology*, *33*(10), 748. doi: 10.1038/jp.2015.144

IBM Corp. (2016). *IBM SPSS Statistics for Windows, Version 24.0*. Armonk, NY: IBM Corp.

Jivraj, S., Anstie, B., Cheong, Y. C., Fairlie, F. M., Laird, S. M., & Li, T. C. (2001). Obstetric and neonatal outcome in women with a history of recurrent miscarriage: a cohort study. *Human Reproduction*, *16*(1), 102-106. doi: 10.1093/humrep/16.1.102.

Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience & Biobehavioral Reviews*, *35*(1), 2-16. doi: 10.1016/j.neubiorev.2009.10.002

Kazak, A.E., Kassam-Adams, N., Schneider, S., Zelikovsky, N., Alderfer, M.A., & Rourke, M. (2006). An Integrative model of pediatric medical traumatic stress. *Journal of Pediatric*

Psychology, 31(4): 343-355. doi:10.1093/jpepsy/jsj054.

Kim, W.J., Lee, E., Kim, K.R., Namkoong, K., Park, E.S., & Rha, D. (2015). Progress of PTSD
symptoms following birth: a prospective study in mothers of high-risk infants. *Journal of Perinatology*, 35(8): 575-579. doi:10.1038/jp.2015.9.

Kjellsdotter, A., Lantz, B., & Ottosson, C, (2018), Healthcare professional's view on parental
participation in the neonatal intensive care units. *Journal of Pediatric Nursing, 41,* 3-8.

Kline, R.B. (2016). *Principles and practice of structural equation modeling*. New York, NY:
Guilford Publications.

Koliouli, F., Gaudron, C.Z., & Raynaud, J.P. (2016). Stress, coping, and Post-traumatic Stress
Disorder of French fathers of premature Infants. *Newborn Infant Nursing Review, 16(3)*:
110-114. doi:10.1053/j.nainr.2016.08.003.

Kroenke K, Spitzer RL, & Williams JB. (2003). The Patient Health Questionnaire 2: Validity of
a two-item depression screener. *Medical Care, 41,* 1284-1294. Retrieved from
https://www.jstor.org/stable/3768417.

Kroenke, K., Spitzer, R.L., Williams, J.B., Monahan, P.O., & Löwe, B. (2007). Anxiety
disorders in primary care: prevalence, impairment, comorbidity, and detection. *Annals of Internal Medicine, 146*:317-25. doi: 10.7326/0003-4819-146-5-200703060-00004.

Lefkowitz, D.S., Baxt, C., Evans, J.R. (2010). Prevalence and correlates of posttraumatic stress
and postpartum depression in parents of infants in the Neonatal Intensive Care Unit
(NICU). *Journal of Clinical Psychology in Medical Settings*, *17(3)*: 230-237.
doi:10.1007/s10880-010-9202-7.

Lefkowitz, D.S., Baxt, C., & Evans, J.R. (2010). Prevalence and correlates of Posttraumatic
Stress and Postpartum Depression in Parents of Infants in the Neonatal Intensive Care

Unit (NICU). *Journal of Clinical Psychology in Medical Settings*, *17(3):* 230-237.

    doi:10.1007/s10880-010-9202-7.

Lee, C., & Slade, P. (1996). Miscarriage as a traumatic event: a review of the literature and new

    implications for intervention. *Journal of Psychosomatic Research*, *40*(3), 235-244. doi:

    10.1016/0022-3999(95)00579-X

Lilo, E.A., Shaw, R.J., Corcoran, J., Storfer-Isser, A., & Horwitz, S.M. Does she think she's

    supported? Maternal perceptions of their experiences in the neonatal intensive care unit.

    Patient Experience Journal, 3(1), 15-24.

Love, C., David, R. J., Rankin, K. M., & Collins Jr, J. W. (2010). Exploring weathering: effects

    of lifelong economic environment and maternal age on low birth weight, small for

    gestational age, and preterm birth in African-American and white women. *American*

    Journal of Epidemiology, *172*(2), 127-134. doi: 10.1093/aje/kwq109.

Maroney, D. (2003). Recognizing the potential effects of stress and trauma on premature infants

    in the NICU: How are outcomes affected? *Journal of Perinatology, 23*, 699-683.

Medicaid. (2017). Medicaid Eligibility in Virginia. Accessed in August 2018.

    https://eligibility.com/medicaid/virginia-va.

Miles, M. S., Funk, S. G., & Carlson, J. (1993). Parental Stressor Scale: neonatal intensive care

    unit. *Nursing Research*, *42*(3), 148-152. doi: 10.1097/00006199-199305000-00005.

Misund, A.R., Nerdrum, P., & Diseth, T.H. (2014). Mental health in women experiencing

    preterm birth. *BMC Pregnancy Childbirth*, *14(1):* 263-271. doi:10.1186/1471-2393-14-

    263.

Mollborn, S., Fomby, P., & Dennis, J. A. (2011). Who matters for children's early development?

    race/ethnicity and extended household structures in the United States. *Child Indicators*

Research, *4*(3), 389-411. doi:10.1007/s12187-010-9090-2.

Myers, H.F., Wyatt, G.E., Ullman, J.B., Loeb, T.B., Chin, D., Prause, N., Zhang, M., Williams, J.K., Slavich, G.M., & Liu, H. (2015). Cumulative burden of lifetime adversities: Trauma and mental health in low-SES African Americans and Latino/as. *Psychological Trauma: Theory, Research, Practice, and Policy, 7*(3):243-251. doi: 10.1037/a0039077

National Center for Posttraumatic Stress Disorder (2016). PTSD and Physical Health. Retrieved from: https://www.ptsd.va.gov/professional/co-occurring/ptsd-physical-health.asp.

National Center for Health Statistics. *Fetal Deaths.* Retrieved September 2018 from https://www.cdc.gov/nchs/nvss/fetal_death.htm.

National Perinatal Information Center. (2011). *Special care nursery admissions background*. Retrieved on February 2018 from https://www.marchofdimes.org/peristats/pdfdocs/nicu_summary_final.pdf.

Nelson, L., & Gold, J. (2012) Posttraumatic stress disorder in children and their parents following admission to the pediatric intensive care unit: A review. *Pediatric Critical Care Medicine*, *13(3)*: 338-347. doi:10.1097/PCC.0b013e3182196a8f.

Obregon, E., Martin, C. R., Frantz III, I. D., Patel, P., & Smith, V. C. (2019). Neonatal Intensive Care Unit discharge preparedness among families with limited English proficiency. *Journal of Perinatology*, *39*(1), 135-142.

Pai, A. L., Patiño-Fernández, A. M., McSherry, M., Beele, D., Alderfer, M. A., Reilly, A. T., ... & Kazak, A. E. (2007). The Psychosocial Assessment Tool (PAT2. 0): Psychometric properties of a screener for psychosocial distress in families of children newly diagnosed with cancer. *Journal of Pediatric Psychology*, *33*(1), 50-62. doi: 10.1093/jpepsy/jsm053

Palagini, L., Gemignani, A., Banti, S., Manconi, M., Mauri, M., & Riemann, D. (2014). Chronic

sleep loss during pregnancy as a determinant of stress: impact on pregnancy outcome. *Sleep Medicine*, *15*(8), 853-859. doi: 10.1016/j.sleep.2014.02.013.

Parker, M. (2016). NICU *Parental mental health and infant outcomes: Effects of psychological well-being and psychopathology*. (Doctoral dissertation). Loma Linda University, Loma Linda, CA. doi:10.1016/j.jpeds.2012.04.062.

Patel, R. M., & Rysavy, M. A. (2016). Global variation in neonatal intensive care: Does it matter?. *The Journal of Pediatrics*, *177*, 6-7.

Pigeon, W. R. (2010). Diagnosis, prevalence, pathways, consequences & treatment of insomnia. *The Indian journal of medical research*, *131*, 321. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4324320/.

Rennick, J., Johnston, C., Dougherty, G., Platt, R., & Ritchie, J. (2002). Children's psychological responses to illness and exposure to invasive technology. *Developmental and Behavioral Pediatrics, 23*, 133–144.

Rogers CE, Kidokoro H, Wallendorf M, Inder TE. (2013) Identifying mothers of very preterm infants at-risk for postpartum depression and anxiety before discharge. *Journal of Perinatology, 33*:171–176. doi: 10.1038/jp.2012.75.

Roque, A. T. F., Lasiuk, G. C., Radünz, V., & Hegadoren, K. (2017). Scoping review of the mental health of parents of infants in the NICU. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, *46*(4), 576-587. doi:10.1016/j.jogn.2017.02.005.

Sabnis, A., Fojo, S., Nayak, S. S., Lopez, E., Tarn, D. M., & Zeltzer, L. (2019). Reducing parental trauma and stress in neonatal intensive care: systematic review and meta-analysis of hospital interventions. *Journal of Perinatology*, *39*(3), 375-386. . doi: 10.1038/s41372-018-0310-9.

Sanders, M.R., & Hall, S.L. (2018). Trauma-informed care in the newborn intensive care unit: promoting safety, security and connectedness. *Journal of Perinatology*, *38*: 3-10. doi:10.1038/jp.2017.124.

Seaton, E. K., Yip, T., & Sellers, R. M. (2009). A longitudinal examination of racial identity and racial discrimination among African American adolescents. *Child Development*, *80*(2), 406-417. doi: 10.1111/j.1467-8624.2009.01268.x.

Segre, L. S., McCabe, J. E., Chuffo-Siewert, R., & O'Hara, M. W. (2014). Depression and anxiety symptoms in mothers of newborns hospitalized on the neonatal intensive care unit. *Nursing Research*, *63*(5), 320.

Serlachius, A., Hames, J., Juth, V., Garton, D., Rowley, S., & Petrie, K. J. (2018). Parental experiences of family-centred care from admission to discharge in the neonatal intensive care unit. *Journal of Paediatrics and Child Health*, *54*(11), 1227-1233. doi: 10.1111/jpc.14063.

Shaw RJ, Deblois T, Ikuta L, Ginzburg K, Fleisher B, Koopman C. (2006). Acute Stress Disorder among parents of infants in the Neonatal Intensive Care Nursery. *Journal of Consult Liaison Psychiatry*, *47(3):* 206-212. doi:10.1176/appi.psy.47.3.206.

Shaw, R.J., Bernard, R.S., DeBlois, T., Ikuta, L.M., Ginzburg, K., & Koopman, C. (2009), The relationship between Acute Stress Disorder and Posttraumatic Stress Disorder in the Neonatal Intensive Care Unit. *Psychosomatics*, *50(2)*: 131-137. doi:10.1176/appi.psy.50.2

Shaw, R.J., Bernard, R.S, Storfer-Isser, A., Rhine, W., & Horwitz, S.M. (2013). Parental coping in the neonatal intensive care unit. *Journal of Clinical Psychology in Medical Settings*, *20(2)*: 135-142. doi:10.1007/s10880-012-9328-x.

Shaw, R. J., St John, N., Lilo, E. A., Jo, B., Benitz, W., Stevenson, D. K., & Horwitz, S. M.

(2013). Prevention of traumatic stress in mothers with preterm infants: a randomized controlled trial. *Pediatrics*, *132*(4), e886-e894. doi: 10.1542/peds.2013-1331.

Sharp, M. (2016). *Testing a model of the development of PTSD following childbirth resulting in admission to the Neonatal Intensive Care Unit (NICU)*. (Thesis). East Carolina University, Greenville, NC. http://thescholarship.ecu.edu/handle/10342/5378.

Smith, M. V., Gotman, N., & Yonkers, K. A. (2016). Early childhood adversity and pregnancy outcomes. *Maternal and Child Health Journal*, *20*(4), 790-798. doi: 10.1007/s10995-015-1909-5.

Stevens, N. R., Wallston, K. A., & Hamilton, N. A. (2012). Perceived control and maternal satisfaction with childbirth: a measure development study. *Journal of Psychosomatic Obstetrics & Gynecology*, *33*(1), 15-24. doi: 10.3109/0167482X.2011.652996

Tabachnick, B.G. & Fidell, L.S. (2007). Using Multivariate Statistics (5th ed.). Boston, MA: Allyn & Bacon.

Tichenor Collins, J.W., David, R.J., Handler, A., Wall, S., & Andes, S. (2004). Very low birthweight in African American infants: the role of maternal exposure to interpersonal racial discrimination. *Am Journal of Public Health*, *94(12):* 2132-2138. doi:10.2105/AJPH.94.12.2132.

Toffol, E., Koponen, P., & Partonen, T. (2013). Miscarriage and mental health: results of two population-based studies. *Psychiatry Research*, *205*(1-2), 151-158. doi: 10.1016/j.psychres.2012.08.029

Turner, R. J., & Avison, W. R. (2003). Status variations in stress exposure: Implications for the interpretation of research on race, socioeconomic status, and gender. *Journal of Health and Social Behavior*, *44*(4), 488-505. doi: 10.2307/1519795

Vanderbilt, D., Bushley, T., Young, R., & Frank, D. A. (2009). Acute posttraumatic stress

symptoms among urban mothers with newborns in the neonatal intensive care unit: a

preliminary study. *Journal of Developmental & Behavioral Pediatrics*, *30*(1), 50-56.doi:

10.1097/DBP.0b013e318196b0de.

Vigod, S. N., Villegas, L., Dennis, C. L., & Ross, L. E. (2010). Prevalence and risk factors for

postpartum depression among women with preterm and low-birth-weight infants: a

systematic review. *BJOG: An International Journal of Obstetrics &*

Gynaecology, *117*(5), 540-550. doi: 10.1111/j.1471-0528.2009.02493.x.

Weiss, D. S. (2007). The impact of event scale: revised. In *Cross-cultural assessment of*

psychological trauma and PTSD (pp. 219-238). Springer, Boston, MA.

Witt, W. P., Cheng, E. R., Wisk, L. E., Litzelman, K., Chatterjee, D., Mandell, K., & Wakeel, F.

(2014). Preterm birth in the United States: the impact of stressful life events prior to

conception and maternal age. *American Journal of Public Health*, *104*(S1), S73-S80.

Wright, K.M., Britt, T.W., Bliese, P.D., Adler, A.B., Picchioni, D., & Moore, D. Insomnia as

predictor versus outcome of PTSD and depression among Iraq combat veterans. *Journal*

of Clinical Psychology, 67(12):1240–58.

Yaman, S., & Altay, N. (2015). Posttraumatic stress and experiences of parents with a newborn

in the neonatal intensive care unit. *Journal of Reproductive and Infant Psychology, 33(2):*

140-152. doi:10.1080/02646838.2014.990872.

RESEARCH SUBJECT INFORMATION AND CONSENT FORM

TITLE: Risk and Protective Factors for Post-traumatic Stress in NICU Mothers

VCU IRB NO.: HM20011668

INVESTIGATOR: Dr. Karen Hendricks-Munoz

If any information contained in this consent form is not clear, please ask the study staff to explain any information that you do not fully understand. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

PURPOSE OF THE STUDY
The purpose of this research study is to find out about parents' post-traumatic stress reactions while their infants are in the Neonatal Intensive Care Unit (NICU). Research has shown that NICU parents may experience traumatic birth, in addition to stress related to their infants' stay in the NICU. Additionally, parents may have experienced prior stressors, such as childhood trauma or experiences with racism, which may also influence their stress related to NICU hospitalization. However, research is limited on how risk factors can affect the experiences of traumatic stress in the NICU. The present study will look at both risk factors and protective factors that relate to parents' stress reactions.

You are being asked to participate in this study because you are the parent of an infant in VCU's Neonatal Intensive Care Unit.

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT
If you decide to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to you.

In this study, you will be asked to participate in a survey. This survey will be administered by a clinically-trained, graduate research assistant. The survey should take between 30 minutes and an hour. Throughout the survey, your responses will be recorded on a paper form. Later, your answers will be entered onto REDCap, a secure web application for managing online surveys. The survey will *not* be tape-recorded.

RISKS AND DISCOMFORTS
Sometimes talking about the subjects in this survey can cause participants to be upset. Several questions will ask about your current stress related to your infant or birth experience, your mental health history, reproductive health, about any other children you may have, experiences with childhood trauma, and experiences with racism. You do not have to talk about any subjects

that you do not want to talk about, and you may ask to skip a question at any time. If you become upset, the study staff will give you names of counselors to contact so you can get help in dealing with these issues.

USE AND DISCLOSURE OF PROTECTED HEALTH INFORMATION
Authority to Request Protected Health Information
The following people and/or groups may request my Protected Health Information:
- Principal Investigator and Research Staff
- Research Collaborators
- Data Safety Monitoring Boards
- Institutional Review Boards
- Government/Health Agencies
- Others as Required by Law

Authority to Release Protected Health Information
The VCU Health System (VCUHS) may release the information identified in this authorization from my medical records and provide this information to:
- Health Care Providers at the VCUHS
- Government/Health Agencies
- Data Coordinators
- Data Safety Monitoring Boards
- Principal Investigator and Research Staff
- Research Collaborators
- Institutional Review Boards
- Others as Required by Law

Once your health information has been disclosed to anyone outside of this study, the information may no longer be protected under this authorization.

Type of Information that may be Released
The following types of information may be used for the conduct of this research:

☒ Complete health record ☐ Diagnosis & treatment codes ☐ Discharge summary

☐ History and physical exam ☐ Consultation reports ☐ Progress notes
☐ Laboratory test results ☐ X-ray reports ☐ X-ray films / images
☐ Photographs, videotapes ☐ Complete billing record ☐ Itemized bill
☐ Information about drug or alcohol abuse ☐ Information about Hepatitis B or C tests
☐ Information about psychiatric care ☐ Information about sexually transmitted diseases

☐ Other (specify):

Expiration of This Authorization

☒ This authorization will expire when the research study is closed, or there is no need to review, analyze and consider the data generated by the research project, whichever is later.
☐ This research study involves the use of a Data or Tissue Repository (bank) and will never expire.
☐ Other (specify):

Right to Revoke Authorization and Re-disclosure
You may change your mind and revoke (take back) the right to use your protected health information at any time. Even if you revoke this Authorization, the researchers may still use or disclose health information they have already collected about you for this study. If you revoke this Authorization you may no longer be allowed to participate in the research study. To revoke this Authorization, you must write to the Principal Investigator.

BENEFITS TO YOU AND OTHERS
You may not get any direct benefit from this study, but the information we learn from people in this study may help us to better understand the important experiences of NICU parents. This research may help inform clinical interventions to better screen for traumatic stress and design clinical interventions to better support NICU parents, with the ultimate goal of promoting better infant and parental health.

COSTS
There are no costs for participating in this study other than the time you will spend in discussing the questionnaire with a study research assistant.

ALTERNATIVES
You are not at all obligated to participate in this study. The clinical care of your infant will not be affected by choosing not to participate.

CONFIDENTIALITY
Potentially identifiable information about you will consist of your survey responses and data extracted about your infant's health from your infant's medical record, including infant medical record number (MRN), your name, infant name, and information about your infant's health. Data is being collected only for research purposes.

All personal identifying information will be kept in password protected files on VCU secure drives and or on REDCap, a HIPPA-compliant, secure data acquisition and storage system. The paper copy of your PAT will be kept in a locked file cabinet for two years after the study ends and will be destroyed at that time. Access to all data will be limited to study personnel. A data and safety-monitoring plan has been established.

We will not tell anyone the answers you give us; however, information from the study and the consent form signed by you may be looked at or copied for research, or by Virginia Commonwealth University. Personal information about you might be shared with or copied by authorized officials of the Department of Health and Human Services or other federal regulatory bodies.

If, as part of this research, we learn about real or suspected child or elder abuse, the law says that we have to let people in authority know so they can protect the person(s) at risk. Additionally, if something we learn through this research indicates that you may intend to harm yourself or others, we are obligated to report that to the appropriate authorities.

What we find from this study may be presented at meetings or published in papers, but your name will not ever be used in these presentations or papers.

VOLUNTARY PARTICIPATION AND WITHDRAWAL
Your participation in this study is voluntary. You may decide to not participate in this study. Your decision not to take part will involve no penalty or loss of benefits to which you are otherwise entitled. If you do participate, you may freely withdraw from the study at any time. Your decision to with draw will involve no penalty or loss of benefits to which you are otherwise entitled.

Your participation in this study may be stopped at any time by the study staff without your consent. The reasons might include:
- the study staff thinks it necessary for your health or safety;
- you have not followed study instructions;
- or administrative reasons require your withdrawal.

QUESTIONS
If you have any questions, complaints, or concerns about your participation in this research, contact:

> **Allison Baylor Williams, M.S.**
> **Graduate Research Assistant**
> **abaylor@vcu.edu**
> **804-543-5882**

The researcher/study staff named above is the best person(s) to call for questions about your participation in this study.

If you have any general questions about your rights as a participant in this or any other research, you may contact:

> Office of Research
> Virginia Commonwealth University
> 800 East Leigh Street, Suite 3000
> Box 980568
> Richmond, VA 23298
> Telephone: (804) 827-2157

Contact this number to ask general questions, to obtain information or offer input, and to express concerns or complaints about research. You may also call this number if you cannot reach the research team or if you wish to talk with someone else. General information about participation in research studies can also be found at
http://www.research.vcu.edu/human_research/volunteers.htm.

CONSENT

I have been given the chance to read this consent form. I understand the information about this study. Questions that I wanted to ask about the study have been answered.

_____
Legal Name of Participant
(Printed)

_____   _____
Legal Name of Participant   Date
Signature

_____
Name of Person Conducting Informed Consent Discussion
(Printed)

_____
Signature of Person Conducting Informed Consent Discussion   Date

_____
Principal Investigator Signature (if different from above)   Date

Pulled from Cerner:

ID number: (Baby MRN)

Your name:

Age of mother:

Insurance Type:

About the baby/babies:
Singleton or multiple?:

Date of birth:

Gestational age at birth:

Birth weight:

Apgar (1 min, 5 min):

Today's date:

Admission date: Discharge date:

Transfer from outside hospital:
☐ Yes   ☐ No

Infant treated for any substance use exposure? (Check all that apply)
☐ Alcohol   ☐ None   ☐ Drug use

Neurological treatment or condition
☐ Yes   ☐ No

Genetic condition
☐ Yes   ☐ No

ECMO treatment
☐ Yes   ☐ No

Infant death (chart review)
☐ Yes   ☐ No

SNAPPE II severity scale
(Extracted from charts; data is from first 48 hours of life)

Mean blood pressure
- ≥ 30 mmHG (0 pts)
- 20-29 mmHg (9 pts)
- < 20 mmHg (19 pts)

Lowest temperature
- > 35.6 degrees C (0 pts)
- 35-35.6 degrees C (8 pts)
- < 35 degrees C (15 pts)

Po2 (mmHg)/FIO2
- > 2.49 (0 pts)
- 1.0=2.49 (5 pts)
- 0.3- 0.99 (16 pts)
- < .03 (28 pts)

Lowest serum pH
- ≥ 7.20
- 7.20 – 7.19 (7 pts)
- < 7.10 (16 pts)

Multiple seizures
- No (0 pts)
- Yes (19 pts)

Urine output (mL/kg.h)
- ≥ 1
- - 0.9 (5 pts)
- < 0.1 (18 pts)

Apgar score
- ≥ 7
- < 7 (18 pts)

Birth weight
- ≥ 1000 g

- 750-999 g (10 pts)
- < 750 g (17 pts)

Small for gestational age

- >3rd %
- <=3rd % (12 pts)

MEASURES

Overall: We want for this to be a therapeutic experience for the parents first and foremost. At the same time, we are working to balance time constraints, precision in responding, and reliability in survey administration. As such, we have included some sample scripting for introducing each section. However, please do reflections throughout and offer support throughout the interview. Additionally, introduce the sections in a way that feels warm and genuine to you and that fits with the patient. These scripts are just suggestions.

A. BACKGROUND INFORMATION
Provide a little background information about study questions:
E.g. "Thank you again for being willing to chat with us. We hope that this interview will give you a chance to talk about some of your experiences in having your baby in the NICU, and that it might help to give us a sense of areas that we can talk about more or help you with.

First off, we are hoping to run through some quick background information about you and your baby."

Your relationship status:
- [ ] Single
- [ ] In relationship with non-co parent
- [ ] In relationship with co-parent
- [ ] Married
- [ ] Separated/divorced
- [ ] Other (list)

Your race (check all that apply)
- [ ] White
- [ ] Black/African American
- [ ] Hispanic/Latinx
- [ ] Asian/ Asian American/ Pacific Islander
- [ ] Other (list)

How will you primarily get to the hospital/clinic for visitation?
- [ ] Own car
- [ ] Rides from others
- [ ] Public transport
- [ ] Not sure/ don't know

What is your highest level of COMPLETED education?
- [ ] Less than high school
- [ ] GED
- [ ] High school
- [ ] 2-year/technical degree
- [ ] 4-year college degree
- [ ] Masters degree or higher

B. PREGNANCY/REPRODUCTIVE HISTORY

Introduce why asking about pregnancy history:
E.g. "It can also help us to understand a bit more about your pregnancy history."
[The idea here is that we keep connecting this these questions to them and that they understand why everything is being asked]

IF you have been pregnant before, list the number of times you have had (not including THIS baby in the NICU):

NICU PAT
1. Births that did NOT require care in the NICU:

2. Births that DID require care in the NICU:

3. Miscarriages:

4. Terminated pregnancies:

5. A still birth or child who died before 1 year old:
(If this overlaps with the infant in the NICU, that is okay)

Anchor that we are focusing on THIS pregnancy now
And with your current pregnancy…

NICU PAT

During THIS pregnancy, did your baby have any medical problems?
☐ Yes
☐ No

Was your baby's admission to the NICU unexpected (e.g., did you know at least a few days in advance)?
☐ Yes
☐ No

C. BIRTH
Introduce birth questions
E.g. It can also be helpful to understand a bit more about your experience with the birth of your baby (currently in the NICU), particularly how you feel about how things went.

What type of birth did you have (check one):
☐ Vaginal birth
☐ Planned caesarian
☐ Unplanned or emergent caesarian

How old was your baby when you first got to see him/her?

We are hoping to ask you a bit more about how you feel about your baby's birth.

Perceived Control in Childbirth Scale

1. I was able to participate in making decisions about how to manage my labor and birth.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

2. I was given choices before procedures were decided upon.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

3. I did <u>not</u> feel that I was in control of my birth environment.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

During my labor and birth, when I was told about the procedures, I felt…

4. I felt that I could <u>not</u> question my medical care provider's decisions.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

5. That I did <u>not</u> have much influence over what procedures were done.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

6. That I was in control of the situation.

Strongly disagree	*Moderately disagree*	*Slightly Disagree*
Slightly agree	*Moderately agree*	*Strongly agree*

7. That I could get all my questions answered.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

8. That what I said or did made no difference in what occurred.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

From the time I arrived at the hospital or birth center, I felt...

9. At a loss to know what I would be experiencing.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

10. If I wanted to, I could change the procedures I was receiving.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

11. I knew what the purpose and effects of the procedures were.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

12. If I asked my medical care providers to do something   differently during labor and delivery, they usually did it.

Strongly disagree   *Moderately disagree*   *Slightly Disagree*
Slightly agree   *Moderately agree*   *Strongly agree*

D. NICU STRESS

Introduce that we are focusing on current stressors and how they are responding to it (mental health). E.g., We'd also like to talk a bit about how you are feeling about your infant's NICU hospitalization. We have some questions here that include things that many parents with NICU babies find stressful, like all the alarms/machines in the rooms. Many parents find it helpful to identify areas that they find stressful.

Parental Stress Scale

Below is a list of the various **SIGHTS AND SOUNDS** commonly experienced in an NICU. We are interested in knowing about your view of how stressful these **SIGHTS AND SOUNDS** are for you.

**1.	The presence of monitors and equipment**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**2.	The constant noises of monitors and equipment**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**3.	The sudden noises of monitor alarms**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**4.	The other sick babies in the room**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**5.	The large number of people working in the unit**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

Below is a list of items that might describe the way your **BABY LOOKS AND BEHAVES** while you are visiting in the NICU as well as some of the **TREATMENTS** that you have seen done to the baby.

**6.	Tubes and equipment on or near my baby**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**7.	Bruises, cuts or incisions on my baby**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**8.	The unusual color of my baby (for example looking pale or yellow jaundiced)**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

**9.	My baby's unusual or abnormal breathing patterns**
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

10.   The small size of my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

11.   The wrinkled appearance of my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

12.Having a machine (respirator) breathe for my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

13.   Seeing needles and tubes put in my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

14.   My baby being fed by an intravenous line or tube
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

15.   When my baby seemed to be in pain
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

16.   When my baby looked sad
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

17.   The limp and weak appearance of my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

18.   Jerky or restless movements of my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

19.   My baby not being able to cry like other babies
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

The last area we want to ask you about is how you feel about your own **RELATIONSHIP** with the baby and your **PARENTAL ROLE**.

20.   Being separated from my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

21.   Not feeding my baby myself
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

22.   Not being able to care for my baby myself (for example, diapering, bathing)
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

23.   Not being able to hold my baby when I want
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

24.   Feeling helpless and unable to protect my baby from pain and painful procedures
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

25.   Feeling helpless about how to help my baby during this time
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

26.   Not having time alone with my baby
Not applicable   *Not at all stressful*   *A little stressful*
Moderately stressful   *Very stressful*   *Extremely stressful*

E. NICU Mental Health

Reflect what they mentioned was stressful. Introduce that we will be asking for mental health & provide support for stressors identified.

E.g., It can be so hard to have your infant in the NICU—especially trying to bond with your baby while being so worried about her (or whatever primary stressors they cited). Given how stressful it has been, we also wanted to ask a bit about how you've been feeling. Specifically, we'll cover some of the most common ways that parents feel while their infant is hospitalized—like anxious, down, or trying to block out what happened.

Which of the following has been the most difficult for you over the past few week(s):
☐ Pregnancy
☐ Birth
☐ NICU hospitalization – first few days and transition to care
☐ A Medical "scare" during NICU hospitalization

Please star the main one but check any others!
Okay, we are going to ask you a few questions related to [index trauma].

How much have you been distressed by the following:
[Impact of Event Scale-Revised]
Please make sure that you tie the index trauma (OR NICU stay) to your questions throughout (e.g., "repeated, unwanted or disturbing memories of your baby in the NICU or birth experience." We want to always give NICU hospitalization as an anchor, even if they identify pregnancy as the primary stressor

1. Any reminder brought back feelings about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

2. I had trouble staying asleep
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

3. Other things keep making me think about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

4. I felt irritable and angry
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

5. I avoided letting myself get upset when I thought about it or was reminded about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

6. I thought about it when I didn't mean to

Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

7. I felt as if it hadn't happened or wasn't real
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

8. I stayed away from reminders of it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

9. Pictures about it popped into my mind
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

10. I was jumpy or easily startled
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

11. I tried not to think about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

12. I was aware that I still had a lot of feelings about it, but I didn't want to deal with it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

13. My feelings about it were kind of numb
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

14. I found myself acting or feeling like I was back at that time
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

15. I had trouble falling asleep
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

16. I had waves of strong feelings about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

17. I tried to remove it from my memory
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

18. I had trouble concentrating
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

19. Reminders of it caused me to have physical reactions
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

20. I had dreams about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

21. I felt watchful and on-guard
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

22. I tried not to talk about it
Not at all (0)   A little bit (1)   Moderately (2)   Quite a bit (3)   Extremely (4)

Scoring:
Total score:
Total score greater than 24= clinical concern; 33 and above=probable PTSD score

Generalized Anxiety Disorder Scale-2
Over the past two weeks, how often have you been bothered by the following problems:

1. Feeling nervous anxious or on edge
☐ Not at all (0)
☐ Several days (1)
☐ More than half the days (2)
☐ Nearly Every day (3)

2. Not being able to stop or control worrying
☐ Not at all (0)
☐ Several days (1)
☐ More than half the days (2)
☐ Nearly Every day (3)

Total score:
[Score of 3= clinically significant]

Patient Health Questionnaire-2
Over the past two weeks, how often have you been bothered by the following problems:

1. Little interest or pleasure in doing things
☐ Not at all (0)
☐ Several days (1)
☐ More than half the days (2)
☐ Nearly Every day (3)

2. Feeling down, depressed or hopeless
☐ Not at all (0)

☐ Several days (1)
☐ More than half the days (2)
☐ Nearly Every day (3)

Total score:
[Score of 3= clinically significant]

NICU PAT
How sick is your baby?
☐ Not at all
☐ A little
☐ A lot
☐ Very much

How worried are you that your baby might die?
☐ Not at all
☐ A little
☐ A lot
☐ Very much

F. Previous Life Events
Introduce that we will be asking about previous life events
E.g., We've talked a good deal about how you've been feeling about your baby's hospitalization in the NICU. We haven't touched much on your background before this birth. If you are comfortable, we'd like to ask a bit more about your experiences before your baby's hospitalization.

It would be helpful to us to know a bit more about any traumatic experiences that you may have had in childhood, so that we can provide you with better care that is sensitive to your life experiences. We won't ask for you to go in any detail other than a yes/no, and you can always choose not to respond. We ask these questions because 1) you are becoming a mother to a new baby, and that can stir up old feelings about your OWN childhood, and 2) our bodies process trauma very similarly regardless of the type. If you have been through childhood trauma, you might be more likely to react strongly to NICU hospitalization or it again might stir up old memories. We want to know that info so that we can support you.
Have them fill this out themselves if anyone else is in the room!

While you were growing up, during your first 18 years of life:
1. Did a parent or other adult in the household often or very often… Swear
at you, insult you, put you down, or humiliate you? Or Act in a way that made you afraid that you might be physically hurt?
☐ *Yes (1)*
☐ *No (0)*

2. Did a parent or other adult in the household often or very often… Push, grab, slap, or throw something at you or Ever hit you so hard that you had marks or were injured?
☐ *Yes (1)*
☐ *No (0)*

3. Did an adult or person at least 5 years older than you ever…

Touch or fondle you or have you touch their body in a sexual way? Or Attempt or actually have oral, anal, or vaginal intercourse with you?
☐ *Yes (1)*
☐ *No (0)*

4. Did you often or very often feel that …No one in your family loved you or thought you were important or special? Or Your family didn't look out for each other, feel close to each other, or support each other?
☐ *Yes (1)*
☐ *No (0)*

5. Did you often or very often feel that …You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
☐ *Yes (1)*
☐ *No (0)*

6. Were your parents ever separated or divorced?
☐ *Yes (1)*
☐ *No (0)*

7. Was your mother or stepmother: Often or very often pushed, grabbed, slapped, or had something thrown at her? or Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? or Ever repeatedly hit at least a few minutes or threatened with a gun or knife?
☐ *Yes (1)*
☐ *No (0)*

8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
☐ *Yes (1)*
☐ *No (0)*

9. Was a household member depressed or mentally ill, or did a household member attempt suicide?
☐ *Yes (1)*
☐ *No (0)*

10. Did a household member go to prison?
☐ *Yes (1)*
☐ *No (0)*

Total score=
Scoring information: 4 or more is high risk for worse mental/physical health outcomes

Provide support as needed. It is considered best clinical practice for trauma-informed care to ask these questions of any patient, but we do not want to be probing or encouraging them to go into detail.

In addition to your childhood experiences, patients have sometimes experienced different treatment due to their race. We want to make sure that we are sensitive to those experiences as well.

RACISIM
Daily Life Experiences with Racism Questionnaire (Harassment/Rejection subscale

115

How often have you…

1. Been treated rudely or disrespectfully because of your race?

a. Never   *b. Less than once a year*   *c. A few times a year*
d. About once a month   *e. A few times a month*   *f. Once a week or more*

2. Been insulted, called a name, or harassed because of your race?

a. Never   *b. Less than once a year*   *c. A few times a year*
d. About once a month   *e. A few times a month*   *f. Once a week or more*

3. Been laughed at, made fun of, or taunted because of your race?

a. Never   *b. Less than once a year*   *c. A few times a year*
d. About once a month   *e. A few times a month*   *f. Once a week or more*

4. Have you experienced racism while on the NICU
Yes
No

SLEEP
Prior to your pregnancy, how many nights a week did you have a problem with your sleep?
0-1   *2*   *3*   *4*   *5-7*

Prior to your pregnancy, to what extent has poor sleep bothered you in general?
Not at all   *A little*   *Somewhat*   *Much*   *Very much*

MENTAL HEALTH HX
Have you ever taken medication for or been given a mental health diagnosis?
☐ Yes (1)
☐ No (0)

If so, what?

Do you currently have a mental health provider?
☐ Yes (1)
☐ No (0)

To wrap up:

-Thank them for being open with you
-Provide support
-Highlight their strengths!
-Review ways that they are coping with NICU hospitalization and help provide education on additional strategies (e.g., grounding techniques, self-care, increasing social support, problem solving)
-Reinforce how well they are doing and review how much it helps the baby that they are visiting (education on co-regulation, attachment, etc.)
-Offer support groups and offer individual follow-ups with a resident from our team (Mondays + Wednesdays).
--> Record if they want follow up with NICU Psych

Appendix C: Sample Clinical Note

PARENT INFORMATION
NAME is a XX year old RACE female, currently living in CITY, VA. Husband's NAME was present and supportive. Affect was mostly flat, although she was occasionally tearful or smiled as appropriate to content. Speech within normal limits. Forthcoming with information. Denied suicidal or homicidal ideation.

BABY's NAME is her fourth child. She has had 2 prior miscarriages at X weeks and X weeks respectively. She is a stay at home mother to her three girls. Her husband is employed as a cashier at Wal-Mart.

Introduced the role of psychology support in NICU service, including trainee status, team-based approach, and limits to confidentiality. Introduced the research and clinical purposes of the NICU mental health screening. NAME expressed interest in participation and provided informed consent for this data to be used for research and clinical purposes.

MENTAL HEALTH
-**Acute Stress Disorder:** 48 score on the Impact of Event Revised Scale (scores of 33 indicate clinically significant Acute Stress Disorder).
-**Depression:** 3 score on the Patient Health Questionnaire-2 (score of three or greater is clinically significant). She reported that she has had untreated depressive symptoms since age 15 but that she has only recently been formally diagnosed by her OB following BABY's birth two weeks ago. She began Prozac two weeks ago but does not yet have a mental health provider for therapy.
-**Anxiety:** 4 score on the Patient Health Questionnaire-2 (score of three or greater is clinically significant).

SOURCES OF STRESS
-**Stress related to pregnancy**: Mother reported feeling "on pins and needles" since learning that her baby might have medical problems at her 19 week ultrasound. She has coped with this uncertainty with prayer. She largely has not discussed these concerns with others.
-**Stress related to childbirth:** Mother characterized childbirth as "sudden and scary." She disclosed her birth story in this interview with limited detail and has avoided thinking or talking to anyone about the birth prior to this session.
-**Infant's fragile appearance and procedures:** Mother was distressed by any perception that her infant was in pain. She did note that nursing has been very helpful in providing education on infant pain, normal crying, and ways to comfort her baby. She reports trying "not to think about" her baby when she can help it.
- **Sights and sounds**: Noted feeling alarmed and startled by the monitors. NAME may benefit from further explanation of purposes of equipment and alarms.

RISK FACTORS:
-Current depression and depression history (see above)
-Trauma history
-Coping style: Mother has coped with the stress of an unexpected NICU hospitalization by avoiding thoughts of her infant's prognosis and birth.

-Sleep disturbances: Endorsed sleep difficulties prior to birth but that she engaged with a Cognitive Behavioral Therapy for Insomnia app ("Shut-i"), which has resolved sleep issues.

RESILIENCY FACTORS
-Family support: Cited family, friends, and partner as social support. Reinforced seeking social support and discussing fears/anxiety with family.
-Confidence in medical team
-Active role in infant care, well bonded. Encouraged continued skin to skin.

INTERVENTION:

Reviewed current stressors and provided support. MOTHER'S NAME reports high distress related to various elements of NICU hospitalization. She endorsed symptoms of posttraumatic stress, including: intrusive thoughts related to the NICU hospitalization, hypervigilance, sleep difficulties, hyperarousal, and avoidance. She has demonstrated some avoidance of thinking about her birth experience and BABY'S NAME's health. Gently provided education on ways in which avoidance (though a natural strategy) can increase posttraumatic stress. She was receptive. Discussed alternative ways that she can manage this distress, such as reaching out to social support and discussing her worries. Reinforced her maternal role and her strength in managing the stress of hospitalization. Reinforced time with her infant, breastfeeding, and skin-to-skin holding when medically feasible. Mother has been taking breaks in the evening but expressed guilt regarding leaving her baby. Normalized guilt and provided education on self-care, with emphasis on ways in which self-care can be a way of helping her baby. Generated list of self-care activities and set goals. Patient was receptive and requested continued follow up. Plan to continue discussion of self-care, reinforce non-avoidant coping, introduce cognitive restructuring, and continue to monitor posttraumatic stress. Additionally plan to provide outpatient mental health provider referral.

Time with family: 60 minutes

Allison Baylor Williams, M.S.
5th year Clinical Psychology Doctoral Student
Virginia Commonwealth University

NICU Mental Health Screening Protocol

Before approaching parents
- **Identify eligible patients**
  - Open Cerner
  - Click on "Patient List"
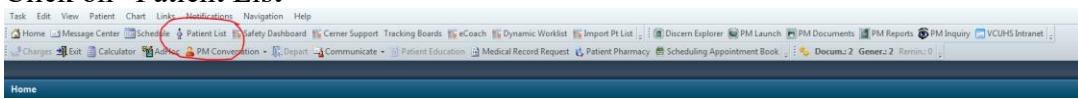
  - Sort by date by clicking on "Admitted" column header so that you can see the most recent NICU admissions
  - Print out this list (front desk printer is XXXXXX)
  - Highlight any patients *on days 2-31 of their admission* on your print-out.
- **See which parents are on the unit**
  - Take a lap around the NICU to see if any of the parents you have identified are on the unit at the moment.
  - Mark which ones are present on your printout.
- **Cross-check to see if parent that are both eligible and on the unit have already been approached.**
  - Pull up your electronic tracking sheet and check the paper version (in secure lockbox).
  - This will provide information on status of patients (i.e., approached and declined, administered survey, not yet approached, requested to be approached later, etc.).
  - Cross-check this sheet with Patient List to check for new NICU admissions that have not been added to the tracking sheet.
- **Complete a chart review of eligible and available parents.**
  - Complete first page of survey.
  - Admission H & P's and social work notes are the most helpful.
- **Gather Materials**
  - Consent forms and surveys will be located in a locked box in cabinet behind reception
    - You can keep your belongings in the team room. Code is XXXXX.
- **Check with nursing prior to entering**
  - The picture and name of each patient's nurse should be located somewhere on the patient's door.
  - This is a team-based project, so we want to make sure nursing knows that we are going in for a visit and that we always say hi/introduce yourself to any staff!
  - Ask nursing if it is an okay time to approach and introduce yourself.

Approaching parents
  - Check for signs on door (i.e. breast pumping, procedure ongoing)
  - Always knock on door first
- **Introducing the study**

- These screenings are our new practice for improving parental health and providing support in the NICU. Example script is below:
  - *"Hello! My name is __ and I work with our mental health support team here on the NICU. We try to meet with all the parents on the NICU in their first month on the unit because we know it can be really stressful to have your baby in the NICU.*
  - *Spend some time (5-10 minutes) building rapport and checking in with them about how they have been coping and what's been tough.*
  - *Introduce that we have a formal assessment that we ask all new NICU mothers. (e.g., We have a set of questions that we ask all new NICU mothers. These questions can help us to identify families who may benefit from the follow up support of our team as well as what areas we might be able to help you with). It usually takes between 30 minutes to an hour, really depending on how much you want to chat!*
  - *Are you free to talk today?*
    - *If no: Determine if another time is better and let them know about our availability.*
    - *If yes: Great, we hope that it will be helpful for you today. We have this set of questions here that we ask all parents. Would you be willing to have us use your responses as part of a research study?*
      - *If yes, great! Launch into informed consent and explain specifically what types of questions we will be asking (see consent form).*
      - *If no, that is fine! Explain types of questions we will be asking. Administer survey and include note for clinical purposes.*
- **Informed Consent**
  - Review the document and specific questions we will be covering.
  - Address questions.
  - Emphasize clinical importance of the interview.
  - Provide them a blank copy to keep if requested.

Survey administration
- Although this is a survey, it is also a space for parents to be able to talk about their experiences and for you to provide support!
- Provide lots of reflections throughout, while also being cognizant of time and redirecting to the interview questions for accuracy.
- Let them see the scale/answer anchors to make it easier for them to remember what the options are.

After survey administration
- Determine if participants would like follow-up from NICU psychology
  - Provide information on hours Mondays (9-5) and Wednesdays (9-5)
  - Can also arrange phone consult
  - Provide information on local referrals

- Review participants' survey
  - Objectively note any Acute Stress Disorder scores greater than 33, PHQ-2 score greater than or equal to 3, and GAD-2 score greater than or equal to 3.
  - Subjectively report on any key areas of stress or risk
  - Subjectively report on strengths and existing coping strategies
  - Document any risk assessment
- Write a brief note in Cerner
  - Use template under ".zz_NICU_Psych"
  - This will be a brief form that includes the integrated report discussed above.
- Fill out tracking information
  - Complete paper version
  - Complete and save electronic copy on password protected file.
- Put away and lock documents.
- ***Thank you!***

Appendix E: Suicide Risk Assessment Protocol

NICU Protocol/Guide for Assessing for Suicidality
- Discuss limits to confidentiality:
  - Substantial likelihood that they will harm themselves or others (will have to tell someone)
  - Confirmed or suspected abuse of a vulnerable population (e.g., child, elderly person, person with disability)
- Assess for:
  - Ideation (in last 48hrs, past month, worst ever)
    - Last occurred
    - Frequency
    - Duration
    - Content
    - Active vs. passive
  - Key Symptoms (e.g., hopelessness, psychological pain, self-hatred/loathing, agitation, impulsivity, anxiety/panic, hallucinations, insomnia)
    - Frequency
    - Duration
  - Behaviors (e.g., preparation, rehearsing, self-mutilation)
    - Frequency
    - Duration
  - History of suicide attempts
    - How many
    - When
    - Method
    - Severity
    - Outcome
  - Other risk factors:
    - Current and past psychiatric disorders, Precipitants, Stress, Interpersonal duress, Change in treatment
  - Plan
    - When
    - Where
    - How
    - e.g., ***"Have you considered how you might end your life?"***
  - Intent
    - e.g., ***"How likely are you to end your life right now?"***
    - Ask them to quantify their intent on a 0-5 scale (0 = never, 5 = absolutely)
    - Active vs. passive
    - Extent to which the patient (1) expects to carry out the plan and (2) believes the plan/act to be lethal vs. self-injurious.
  - Intensity
    - e.g., ***"How intense are your thoughts/feelings of ending your life right now?"***
    - Ask them to quantify their intensity on a 0-5 scale (0 = never, 5 = absolutely)

123

- o Access
  - ▪ Means to end their life, how available?
  - ▪ e.g., ***"Do you own a firearm?"*** or ***"How close are you to a bridge or tall building?"*** or ***"Do you have narcotics in your home?"***
- o Impulsivity
  - ▪ ***Do you believe you can keep yourself safe?***
- Protective Factors (*Even if present, may not counteract severe SI*)
  - o Access proximity of help resources
  - o Internal (coping, religious beliefs)
  - o External (responsibility to children, positive therapeutic relationships, other natural supports)

Risk Level/Intervention

- ACTIVE SI: If individual has a plan, intent, access, and active suicidal ideation:
  - o If on NICU Unit:
    - ▪ Move individual to private room (away from babies, kids etc.)
    - ▪ Step out and alert physician team or nursing staff
    - ▪ Page for psychiatric consult:
  - o If on NICU Follow Up:
    - ▪ Step out and alert physician team or nursing staff (discuss with team)
    - ▪ Call emergency contact to come and watch children
    - ▪ Call Security to escort to ED or walk with them to the ED (depending on your clinical judgment)
  - o If anywhere else:
    - ▪ Move individual to private room (away from babies, kids etc.)
    - ▪ Alert attending physician/
    - ▪ Page for psychiatric consult
  - o If you are able, try to stay with individual through consult process to provide support
- PASSIVE SI: If individual has PASSIVE ideation (i.e. no plan, no access or low intent)
  - o Develop safety plan
  - o Plan to call in next 48hrs to follow up (with parent or parents mental health care)
  - o Give emergency numbers: 1-800-273-8255
  - o Provide with mental health resources
  - o If needed, complete a referral to CSB or local area clinic

ALLISON BAYLOR WILLIAMS, M.S.
Curriculum Vitae
Doctoral Candidate
Clinical Psychology

CONTACT

Address: 4605 Bromley Lane, Richmond, Virginia 23226
Phone: (804) 543-5882
Email: abaylor@vcu.edu

EDUCATION

Virginia Commonwealth University   **2014- Present**
Doctoral Candidate, Clinical Psychology, Behavioral Medicine Track
Cumulative GPA: 4.0
Dissertation: *Acute stress disorder in Neonatal Intensive Care Unit mothers: Modeling pre-existing risk factors and trauma appraisals*

Virginia Commonwealth University   **2016**
M.S. in Clinical Psychology
Cumulative GPA: 4.0
Master's Thesis: *Behaviorally induced insufficient sleep syndrome and insomnia's relationship to depression in college students*

University of Virginia   **2012**
B.A. in Psychology, with Excellence in Research Distinction

AWARDS & HONORS

Deborah Braffman Schroeder Research Award, Virginia Commonwealth University, 2020
Outstanding Clinical Student in the Behavioral Medical Concentration, Virginia Commonwealth University, 2019
Behavioral Medicine Departmental Nominee for Psi Chi, Virginia Commonwealth University, 2019
Emerging Leaders in Integrated Care Award Recipient and Panelist, Virginia Commonwealth University Medical Center, 2018
Student Poster Award Finalist, International Society for Traumatic Stress Studies, 2018
Graduate School Travel Grant, Virginia Commonwealth University, 2017
Phi Kappa Phi Honors Society Member, Virginia Commonwealth University, 2017
Graduate School Travel Grant, Virginia Commonwealth University, 2015
Excellence in Research Distinction, University of Virginia, 2012
Dean's List, University of Virginia, 2008-2012

PEER REVIEW PUBLICATIONS

1. Griffin, S.C., Tan, J., Perrin, P.B., **Williams, A.B.,** Smith, E.R., Rybarczyk, B.D. (*In press*). Psychosocial underpinnings of pain and sleep disturbance in safety-net primary care patients. *Pain Research and Management.*

2. **Williams, A.B.,** Dzierzewski, J.M., Griffin, S.C., Lind, M.J., Kendler, K., Rybarczyk, B. Insomnia disorder and Behaviorally Induced Insufficient Sleep Syndrome: Prevalence and relationship to depression in college students. *Behavioral Sleep Medicine, 21: 1-12.* doi: 10.1080/15402002.2019.1578772.

3. **Williams, A.B.**, Smith, E., Griffin, S., Trujillo, M., Perrin, P., & Rybarczyk, B. (2019) Presenting problems in primary care: the role of mental health and trauma history. *Journal of Clinical Psychology, 75(1)*, 146-164. doi: 10.1002/jclp.22694.

4. Griffin, S., Mezuk, B., **Williams, A.B.,** Perrin, P., & Rybarczyk, B**.** (2018). Isolation, not loneliness or cynical hostility, predicts cognitive decline in older Americans. *Journal of Aging and Health.* [epub ahead of print]. doi: 10.1177/0898264318800587.

5. Griffin, S.C., Tan, J., Perrin, P.B., **Williams, A.B.,** Smith, E.R., Rybarczyk, B.D. (*accepted*). Psychosocial underpinnings of pain and sleep disturbance in safety-net primary care patients. *Pain Research and Management.*

6. Lind, M., **Baylor, A.,** Hawn, S., Overstreet, C., Rybarczyk, B., Kendler, K., Dick, D., & Amstadter, A (2017). Relationships between trauma, sleep disturbances, PTSD, and symptoms of alcohol use disorder in a young adult sample. *Sleep Medicine, 34,* 141-147. doi: 10.1016/j.sleep.2017.02.024

7. Radcliffe, Z., **Baylor, A**., & Rybarczyk, B. (2016). Adopted youth and sleep difficulties. *Pediatric Health, Medicine, and Therapeutics, 17,* 165-175. doi:10.2147/PHMT.S119958

8. Lewin, D., Wang, G., Yao, C., Skora, E., Hoehn, J., **Baylor, A.,** & Wang, J. School start time change policies: Benefits for young teens and variable impact on demographic groups. *Health Affairs.* (In press)

9. Lewin, D., Wang, G., Yao, C., Skora, E., Hoehn, J., **Baylor, A.,** & Wang, J. (2017). Impact of variable school starttimes on middle students' sleep and academic performance. *Journal of Adolescent Health*, *61*(2), 205-2011. doi: 10.1016/j.jadohealth.2017.02.017.

10. Owens, J., Wang, G., Lewin, D., Skora, E., & **Baylor, A.**. (2017). Association between short sleep duration and risk behavior factors in middle school students. *Sleep*, *40*(1), 1-10. doi: 10.1093/sleep/zsw004.

11. Jacobs, S., Mowbray, C., Cates, L., **Baylor, A.,** Gable, C., Skora, E., Yao Cheng, Y., Wang,

J., Lewin. D., & Hinds, (2016). P. Pilot study of massage to improve sleep and fatigue in hospitalized adolescents with cancer. *Pediatric Blood and Cancer, 63*(5), 880-886*.* doi: 10.1002/pbc.25902.

12. Wang, G., Liu, Z., Xu, G., Jiang, F., Lu, N., **Baylor, A.W.,** Xu, G., Owens, J.A. (2015). Sleep disturbances in Chinese children with Autism Spectrum Disorders: A retrospective and cross-sectional study. *Child Psychiatry & Human Development, 47*(2). 248-258. doi: 10.1007/s10578-015-0561-z.

13. Owens, J.A., Mindell, J.A., & **Baylor, A.W.** (2014). Drivers of energy product use by children and adolescents. *Nutrition Reviews*, 72 (S1); 65-71.

14. Owens, J., Drobnich, D., **Baylor, A.** & Lewin, D. (2014), School start time change: An in-depth examination of school districts in the United States. *Mind, Brain, and Education, 8*(4): 182–213.

MANUSCRIPTS UNDER REVIEW

1. Griffin, S., **Williams, A.B.** Ravyts, S., & Rybarczyk, B. (*under review*). Loneliness and sleep: A systematic review and meta-analysis. *Health Psychology.*

2. Griffin, S., Mladen, S.N., **Williams, A.B.,** Dautovich, N.D., Lageman, S.K., Dzierzewski, J.M., Perrin, P.B., & Rybarczyk, B.D. (*revise and resubmit*). Reciprocal Effects between Loneliness and Sleep Disturbance in Older Americans. *Journal of Aging and Health*.

3. Models of Trauma, Depression, and Suicidality in Safety-Net Primary Care. (*under review*). Mladen, S.N., Williams, A.B., Griffin, S., Perrin, P., Rybarczyk, B.R. *Archives of Suicide Research.*

4. Trujillo, M., Smith, E., Griffin, S., Trujillo, M. **Williams, A.B.**, Perrin, P., & Rybarczyk, B. Classism and alcohol use: Racial differences of religiosity as a mediator. (*revise & resubmit*)

CHAPTERS

1. Thompson, E., **Williams, A.** Robinson, E., Radcliff, Z., & Maher, K. (In press) Chapter 9: Screening and Assessment of Anxiety. In M. Maruish (Ed.), *Pediatric Primary Care Psychology Assessment*.

2. Robinson, Thompson, E., **Williams, A**., Thompson, E., Hailu, S., & Radcliffe, Z. & Maher, K., (In press). Chapter 10: Screening and Assessment of Obsessive-Compulsive Disorder. In M. Maruish (Ed.), *Pediatric Primary Care Psychology Assessment*.

3. **Baylor, A.,** Griffin, S., & Rybarcyck, B. (2016) Cognitive Behavioral Therapy for Insomnia. *Encyclopedia of Neuropsychology.*

4. Ochsner Margolies, S., Rybarczyk, B., **Baylor, A.,** & Griffin, S. (2016) Assessment of Sleep Disorders. In M. E. Maruish, (Editor) *Handbook of Psychological Assessment in*

Primary Care Settings, Second Edition. Taylor and Francis: New York.

ACADEMIC PRESENTATIONS

1. **Williams, A.** (2019, November). *Posttraumatic stress in NICU parents*. Talk presented at the Neonatal brain rehabilitation conference. University of Virginia. Charlottesville, VA.

2. **Williams, A.,B.** Smith, E., Griffin, S., Trujillo, M., Perrin, P., Rybarczyk, B, & Jones, H. (April, 2019). *The relationships among interpersonal Trauma, mental health, pain, and sleep in a safety-net primary care clinic*. Poster session presented at the 22nd Annual Virginia Commonwealth University Graduate Research Symposium, Richmond, VA.

3. **Williams, A.B.,** Ward, A., Griffin, S, Mladen, S., & Hendricks-Munoz, K. (November, 2018) *Posttraumatic stress responses in Neonatal Intensive Care Unit (NICU) parents: A systematic review*. Poster session presented at the 33rd Annual International Society for Traumatic Stress Studies. Washington, D.C.

4. Mladen, S., **Williams, A.B.,** Griffin, S., Smith, E., Trujillo, M., Rybarczyk, B., & Perrin, P. (November, 2018). *Trauma exposure strengthens the relationship between depression and suicidal ideation in a safety-net primary care sample*. Poster session presented at the 33rd Annual International Society for Traumatic Stress Studies. Washington, D.C.

5. Griffin, S., **Williams, A.B.,** Rybarczyk, B., Dzierzewski, J (November, 2018). *Lonely nights: The relationship between loneliness and restless sleep in older Americans*. Poster session presented at the Gerontological Society of America. Boston, MA.

6. Griffin, S.C., **Williams, A.B.,** Mladen, S., Braun, S., & Rybarczyk, B. (April, 2018). *Trauma-informed primary care psychology: Prevalence of self-reported trauma and its relationship to anxiety and depression.* Paper presentation at the 2018 Society for Behavioral Medicine 39th Annual Meeting & Scientific Sessions in New Orleans, LA.

7. Trujillo, M.A., Smith, E.R., Griffin, S., **Williams, A.B**., Perrin, P.B., & Rybarczyk, B. (April, 2018). *Classism and alcohol use: Racial differences in the moderating effect of attitudes toward God.* Poster session will be presented at the 38th Society for Behavioral Medicine. New Orleans, LA.

8. **Williams, A.,B.** Smith, E., Griffin, S., Trujillo, M., Perrin, P., & Rybarczyk, B. (November 2017). *The Relationships among Interpersonal Trauma, Mental Health, Pain, and Sleep in a Safety Net Primary Care Clinic*. Poster session presented at the 33rd Annual International Society for Traumatic Stress Studies. Chicago, IL.

9. **Baylor, A.**, Smith, E., Griffin, S., Trujillo, M., Perrin, P., & Rybarczyk, B. (2017, April). *Gender Differences in Adult and Childhood Trauma Exposure in an At-Risk Community Sample.* Poster session presented at the 13th Annual VCU's Institute for Women's Health Convention, Richmond, VA.

10. Radcliff, Z., **Baylor, A.,** Braun, S., & Rybarczyk, B. (2017, March). *Behavioral health needs assessment of an underserved urban family medicine clinic.* Poster session

presented at the 38th Annual Convention of the Society of Behavioral Medicine, San Diego, CA.

11. Lind, M. J., **Baylor, A.,** Hawn, S. E., Overstreet, C. M., Rybarczyk, B. D., Kendler, K.S., Dick, D. M., and Amstadter, A. B. (November 2016). *Exploring associations between potentially traumatic events, sleep disturbance, and symptoms of PTSD and alcohol use disorder in college students.* Poster session presented at the 8th annual Virginia Academy of Sleep Medicine Conference, Richmond, VA.

12. Lind, M. J., **Baylor, A.,** Hawn, S., Overstreet, C., Rybarczyk, B., Kendler, K.S., Dick, D. M., and Amstadter, A. B. (2016, November). *Exploring associations between potentially traumatic events, sleep disturbance, and symptoms of PTSD and Alcohol Use Disorder in college students.* Symposium presented at the 32nd annual meeting of the International Society of Traumatic Stress Studies, Dallas, TX.

13. **Baylor, A.,** Thompson, E, Griffin, S., & Rybarczyk, B. (2016 ,June). *Insomnia and Behaviorally Induced Insufficient Sleep's relationship to mood disorders in college students.* Poster session presented at 30th Annual Sleep Conference, Denver, CO.

14. Griffin, S., Mezuk, B., **Baylor, A.,** Rybarczyk, B., & Perrin, P. (2016, November). *Cynical hostility and loneliness as predictors of cognitive decline in older Americans.* Poster session presented at Gerontological Society of America. New Orleans, LA.

15. **Baylor, A.,** Thompson, E, Griffin, S., & Rybarczyk, B. (2016, April) *Insomnia and Behaviorally Induced Insufficient Sleep: Prevalence and relationship to depression in college students.* Poster session presented at 19th Annual Virginia Commonwealth University Graduate Research Symposium, Richmond, VA.

16. Bustamante, D., Smith, E., **Baylor, A.,** Trujillo, M., Griffin, S., Rybarczyk, B., & Perrin, P. (2016, March). *Associations between childhood trauma, mental health and tobacco use in a low-income, urban, primary care clinic.* Poster session presented at 19th Annual Virginia Commonwealth University Graduate Research Symposium, Richmond, VA.

17. **Williams, A.B.** (2016). *Cognitive Behavioral Therapy for Insomnia: Role in primary care.* Presented at Ambulatory Care Clinic, Virginia Commonwealth University Medical Center, Richmond, VA.

18. Owens, J.A, Wang, G., **Baylor, A.,** Skora, E., & Lewin, D. (2015, June). *Multilevel analysis of sleep time and risk behaviors among middle school students.* Poster session presented at 29th Annual Sleep Conference, Seattle, WA.

19. Hoehn , J., Wang, G., **Baylor, A.,** Skora, E., Yao, C., Owens, J., & Lewin, D. (2015, June) . *The impact of variable middle school start times on sleep duration.* Poster session presented at 29th Annual Sleep Conference, Seattle, WA.

20. **Baylor, A.W.,** Lewin, D., & Owens, J.A. (2014, June). *Delaying high school start times: Attitudes and barriers to change from national and local surveys.* Poster session presented at 28th Annual Sleep Conference, Minnesota, MN.

21. **Baylor, A.W.,** Mindell, J.A., & Owens, J.A. (2013, March). *A review of caffeine use in children and adolescents: Relationship to sleep.* Poster session presented at the 14th Annual Research Symposium at Children's National Health System, Washington, D.C.

INTERHEALTH PRESENTATIONS

1. **Williams, A.** (2019). *The role of psychology in the NICU.* Nursing rounds, Children's Hospital of Richmond. Virginia Commonwealth University Medical Center, Richmond VA.

2. **Williams, A.** , Parlier, A.B., & Wallace, R. (2019). *Posttraumatic stress in NICU parents.* Neonatal Brain Rehabilitation Conference. University of Virginia. Charlottesville, VA.

3. Ward, A., **Williams, A.,** & Hill, A. (2018). *Trauma-informed care in the NICU.* Pediatric Grand Rounds. Children's Hospital of Richmond, Virginia Commonwealth University, Richmond VA.

4. **Williams, A**., & Islam, L. (2017). *Motivational Interviewing in medical settings.* Nursing student service leaning course. School of Nursing, Virginia Commonwealth University Medical Center, Richmond VA.

5. **Williams, A.** (2018**).** *Emerging Leaders in Integrated Care Panelist.* 7th Annual Emswiller Interprofessional Symposium. Center for Interprofessional Excellence and Collaborative Care, Virginia Commonwealth University, Richmond VA .
6. **Williams, A.** (2018). *Sleep in teens: What's normal, what's not, and what to do.* Health Enrichment Program. St. Christopher's School, Richmond, VA.

7. **Williams, A.,** (2016). *Insomnia in primary care.* Resident rounds. Ambulatory Care Center, Virginia Commonwealth University Medical Center, Richmond VA.

8. **Williams, A**. (2016). *Managing anxiety workshop.* Health Enrichment Program. St. Catherine's School, Richmond, VA.

RESEARCH EXPERIENCE

<u>**Neonatal Intensive Care Unit**</u>   **June 2018 – Present**
PI: Alyssa Ward, PhD
Virginia Commonwealth University
- *Study Description:* Dissertation study aims to evaluate risk factors for posttraumatic stress in NICU mothers, including: prevalence of posttraumatic stress and other common mental health concerns, perceptions of the traumatic event (both objective/subjective birth and infant health), and structure equation modeling of pre-existing risk factors, traumatic event, and posttraumatic stress outcomes.
- Designed study research aims, assessment, and protocol, including designing and implementing formal mental health screening for 125 NICU mothers.

- Completed IRB protocol, submitted grants, and collaborated with nurses, physicians, physical therapists, and social work to implement study.
- Conduct 1-2 hour assessments and complete integrative reports, on the unit for 18 hours/week.
- Supervise other graduate student assessments, including: peer supervision support, on-site trainings, and development of administration protocol for consistency in administration.
- Conducted presentations and will complete data entry, data analysis, and manuscript preparation.

Primary Research in Medical Environments (PRIME) Lab   **Aug. 2014 – Present**
PI: Bruce Rybarczyk, PhD
Virginia Commonwealth University
- *Lab Description:* Collaborative lab with a broad focus on intersection of physical/mental health in primary care.
- Provided project development, data entry, data analysis, as well as writing/editing for ongoing projects across ten primary care sites.
- Collaborated with various other PI's and departments for related research projects.

Health Behaviors in a Safety-net Clinic   **Nov. 2014 – Nov. 2015**
PIs: Paul Perrin, PhD & Bruce Rybarczyk, PhD
Virginia Commonwealth University
- *Study Description:* Studies aim to model the pathways by which cumulative stressors affect the physical and mental health of low-income individuals in an urban safety net clinic.
- Collaborated with research team to design surveys and study protocol.
- Assisted with data collection, analysis, and manuscript preparation.

Behavioral Sleep Medicine   **June 2012- July 2014**
PIs: Danny Lewin, PhD & Judy Owens MD
Children's National Health System
- *Lab description:* Research projects included the mental and physical health correlates of changing school start times in Fairfax County, qualitative study with narcolepsy patients, and randomized control trial of massage in teens with cancer.
- Provided assistance with literature reviews and creation of website and social media pages.
- Recruited participants and drafted IRB protocols for ongoing studies.
- Provided data entry/analysis and co-authored publications.

Center for Children, Families, and the Law   **Aug. 2011 – May 2012**
PI: Robert Emery, PhD
University of Virginia
- *Lab description:* Research lab on marriage and family functioning.
- Contributed to the background research and data analysis for a graduate project on depressive symptomology and marital quality.

- Provided more general assistance for the entire lab with input/revision of their manuscripts and assistance with study recruitment.

Clark-Hill Institute   **May 2011 – Aug. 2011**
PI: Albert Farrell, PhD
Virginia Commonwealth University
- *Lab description:* One of six national Academic Centers of Excellence (ACE) for Youth Violence Prevention that designs, implements, and evaluates violence prevention programs for youth in at-risk communities.
- Administered surveys to ~40 middle school students in at-risk community.
- Coded qualitative interview data from first wave of interviews using N-Vivo 7.

CLINICAL EXPERIENCE

Neonatal Intensive Care Unit (NICU)   **June 2018 – Dec. 2019**
Student Clinician, NICU inpatient unit and follow-up clinic, VCU Children's Hospital of Richmond
- *Clinic Description:* Inpatient is a Level IV NICU with an average length of stay of 2 weeks; outpatient follow-up clinic includes developmental assessments for high-risk infants at 3, 6, 12, and 24 months.
- Developed a formal assessment program for mothers while infants are inpatient.
- Provided 1-2 hour psychodiagnostic assessment of maternal mental health during first 30 days of infant hospitalization. Assess for presenting mental health concerns (acute stress disorder, depression, anxiety), reproductive history (e.g., prior fetal loss, infertility issues), NICU-related stressors, birth experience, and coping with hospitalization.
- For inpatient families: provide support and strengths-based interventions adapted from Cognitive Behavioral Therapy, Acceptance and Commitment Therapy, and Motivational Interviewing, including: non-avoidant coping strategies, behavioral activation, self-care, grounding or relaxation techniques, education on development and bonding, sleep hygiene, cognitive restructuring, and problem-solving.
- Developed and conducted trauma-informed care trainings for staff.
- Assisted with weekly staff support groups.
- Participate in weekly interdisciplinary rounds, report on cases and coordinate care.
- For outpatient, provide psychosocial assessment for families in coordination with physical/occupational therapy, nutrition, and physicians.
  Supervisor: Alyssa Ward, PhD, LCP

Complex Care Team   **June 2018 – Present**
Student Clinician, Complex Care Team, VCU Medical Center
- *Clinic Description:* Clinic follows low-income "super-utilizers" of the medical system, with at least seven medical conditions. Patients are seen monthly by the medical team and care coordination.
- Address behavioral health concerns for high-needs patients, with a focus on diabetes management, substance use, pain management, sleep, dementia, mood disorders, and treatment adherence.

- Common interventions draw from Acceptance and Commitment Therapy, Cognitive Behavioral Therapy, Motivational Interviewing, medical coping interventions, and meaning-making therapies.
- Provide assessment and tracking of behavioral and mental health outcomes; conduct brief neurocognitive assessments to inform treatment, including MoCA, MMSE, RBANS.
- Work closely with interdisciplinary team of social workers, care coordinators, nursing, and physicians.
- Co-led sessions with pharmacy for diabetes management.
  Supervisor: Bruce Rybarczyk, PhD, LCP & Leila Islam, PhD, LCP

Inpatient Trauma Surgical Unit and Burn Unit   **July 2017 – July 2018**
Student Clinician and Peer Supervisor, Trauma and Burn Inpatient Units, Consultation and Liaison, VCU Medical Center
- *Clinic Description:* Consultation and Liaison service for adult and pediatric Burn and Trauma Surgical Services; most prevalent injury mechanisms include: car accidents, gunshot/stabbing wounds, house fires, assaults, and attempted suicide.
- Conducted assessments including: brief cognitive status exams, substance use evaluations, PTSD/depression risk assessments, domestic violence and suicide risk assessments, and comprehensive psychosocial history.
- Provided evidence based treatment for acute management of traumatic stress in the hospital (e.g., ACT grounding exercises, CBT-I, IRT for nightmares).
- Adapted behavioral health interventions to fit medical setting, including: Motivational interviewing for substance use, Behavioral activation, Acceptance and Commitment values-based exercises, and Cognitive Behavioral Therapy.
- Interdisciplinary approach to patients; created behavioral contracts with nursing/medical providers.
- Participate in daily interdisciplinary rounds, report on cases, and coordinate care
  Supervisor: Katy Maher, PhD, LCP

Residents' Primary Care Clinic   **Aug. 2015 – July 2018**
Student Clinician and Peer Supervisor, Ambulatory Care Center, VCU Medical Center
- *Clinic Description:* Integrated behavioral health clinic in a primary care resident clinic for low-income, predominately African American patients.
- Provided Motivational Interviewing, Dialectical Behavior Therapy, Cognitive Behavioral Therapy interventions targeting a range of behavioral health (e.g., insomnia, medication compliance, weight loss, substance use) and mental health (e.g., depression, anxiety, trauma) issues.
- Conducted homicide and suicide risk assessments, as well as assessment and treatment tracking for mental and behavioral health concerns.
- Conducted brief neurocognitive exams, including MoCA, MMSE, RBANS
- Worked with integrated care team including physicians, pharmacists, social workers, and nurses to plan treatment strategies and referrals.
  Supervisor: Leila Islam, PhD & Bruce Rybarczyk, PhD, LCP

Crossover Safety Net Clinic   **Nov. 2017 – July 2018**
Student Clinician and Peer Supervisor, Crossover Ministries

- *Clinic Description:* Non-profit, primary care and specialty services clinic; patient population includes predominately recent immigrants and refugees with high levels of trauma exposure.
- Provided brief interventions for behavioral health and mental health concerns, using Motivational Interviewing, Cognitive Behavioral Therapy, and Acceptance and Commitment Therapy.
- Developed referral stream for postpartum mood disorder assessment and treatment.
- Conducted brief assessments and outcome tracking for mental health concerns.
- Used translator services to conduct sessions in Arabic and Spanish; focus on cultural competency.
  Supervisor: Paul Perrin, PhD, LCP

Teens + Weight Loss Clinic   **Jan. 2017 – Aug. 2017**
Student Clinician, Center for Endocrinology, VCU Children's Hospital of Richmond
- *Clinic Description:* A research trial for parents and teenagers with obesity.
- Co-led two 12-week group weight loss groups along with a registered dietitian.
- Implemented Motivational Interviewing-based treatment protocol.
- Conducted assessment for eating disorders, health behaviors, and psychopathology to determine study eligibility.
- Received weekly supervision with MI treatment fidelity assessed via independent raters and written feedback.
- Provided individualized feedback for parents based on weight loss and daily food diaries.
  Supervisors: Melanie Bean, PhD, LCP & Jessica LaRose, PhD, LCP

Community Service Boards   **May 2016 – Sept. 2016**
Graduate Assessor, Chesterfield & Henrico Counties, Virginia
- Administered tests of cognitive and adaptive functioning (e.g., WISC-IV, WAIS-IV, TONI-4, ABAS-II) to children and adults to determine whether they met clinical criteria for intellectual disability, thereby determining their eligibility for county services.
- Conducted unstructured clinical interviews with caregivers; collaborated with caseworkers.
- Wrote clinical reports integrating testing results with background information and providing relevant recommendation.
- *Supervisor: Mary Beth Heller, PhD, LCP*

Anxiety Clinic   **May 2016 – May 2017**
Student Therapist, Center for Psychological Services and Development, Virginia Commonwealth University
- *Clinic Description:* Clinic for anxiety disorders, including phobias, panic disorder, generalized anxiety, posttraumatic stress disorder, obsessive compulsive disorder, and eating disorders.
- Trained in evidence based treatment and assessment approaches for anxiety. Monitored progress in treatment using idiographic and standardized measures.
- Provided Systemic Exposure and Cognitive Behavioral Therapy for anxiety and phobias.

- Delivered educational presentations about anxiety and stress management to local elementary and middle schools.
Supervisors: Scott Vrana, PhD, LCP & Michael Southam-Gerow, PhD, LCP

Virginia Women's Center   **Aug. 2016 – Nov. 2016**
Student Clinician, Obstetrics and Gynecology, Private Practice
- *Clinic Description:* An Obstetrics and Gynecology private practice clinic with several psychologists on staff.
- Co-led a chronic pain management group for women with Interstitial Cystitis.
- Co-developed the pain management treatment protocol, rooted in Acceptance and Commitment Therapy, psychoeducation, and relaxation techniques.
Supervisor: Lisa Cuseo-Ott, PhD, LCP

Hayes E. Willis Family Medicine Clinic   **Aug. 2015 –Aug. 2016**
Behavioral Health Coach, Hayes E. Willis Clinic, VCU Medical Center
- *Clinic Description:* Integrated behavioral health clinic in a family medicine practice.
- Sessions focused on behavioral health concerns and substance use; common issues included diabetes, weight loss, smoking cessation, substance use, and management of complex medical issues.
- Conducted brief, targeted interventions delivered in 30 minute sessions, drawing from Cognitive Behavioral Therapy, Parent Behavior Training, Acceptance and Commitment Therapy, and tracked treatment progress.
- Conducted brief neurocognitive exams, including MoCA, MMSE, RBANS.
- Work with integrated care team including physicians, pharmacists, social workers, and nurses to plan treatment strategies and referrals.
Supervisor: Carla Shaffer, PhD, LCP

Chronic Depression Clinic   **Aug. 2015 – Aug. 2016**
Student Therapist, Center for Psychological Services and Development, Virginia Commonwealth University
- *Clinic Description:* A specialty clinic targeting chronic depression within an urban, community-based clinic
- Implemented Cognitive Behavioral Analysis System of Psychotherapy (CBASP) techniques to treat patients with chronic depression and comorbidities such as borderline personality disorder, posttraumatic stress disorder, and social phobias.
Supervisor: Jim McCullough, PhD, LCP

CLINICAL LEADERSHIP EXPERIENCE

Clinical Coordinator Primary Care Psychology   **May 2017 – Present**
Psychology Department, VCU Medical Center
- Student leader for 25 students, across 9 safety-net adult clinics.
- Restructured and led group supervision for all sites: implemented new case study format and scheduled and secured bi-monthly guest speakers.
- Responsible for orientation and on-boarding of new students across all adult clinic sites.

Peer Supervisor   **May 2016 – Present**
Ambulatory Care Center, VCU Medical Center
- Onsite peer supervisor in a safety-net primary care clinic.
- Provided assistance with treatment planning, note-writing feedback, in-session supervision, and co-led risk assessments.

Peer Supervisor   **May 2016 – Present**
Hayes E. Willis Health, VCU Medical Center
- Onsite peer supervisor for a family medicine practice for predominately low-income patients.
- Provided assistance with treatment planning, note-writing feedback, in-session supervision, and co-led risk assessments.

Student Site Coordinator   **May 2016 – May 2018**
Ambulatory Care Center, VCU Medical Center
- Liaison with medical team; coordinated shadowing of residents, interns and nursing students.
- Managed schedule for three shifts and address administrative issues.
- Represented site-specific concerns at group supervision.
- Provided dashboard data entry of patient demographics, presenting problems, and session length.

Peer Mentor   **June 2017 – June 2018**
Virginia Commonwealth University
- Director-selected peer mentor for first year clinical doctoral student.
- Provided support and guidance on adjusting to graduate school, clinical training, and research.

ADDITIONAL CLINCIAL TRAININGS

Transcending Self Therapy for Substance Use Disorder   **2019**
VCU Medical Center & Hunter Holmes McGuire VA Medical Center
- Instructor: Jarrod Reisweber, PsyD
- Six- hour workshop on a manualized, 4 session treatment for substance use disorder; currently being piloted at VAMC's nationally.

Dialectical Behavior Therapy (DBT) in Primary Care Workshop   **Fall 2018**
VCU Medical Center
- Instructor: Jarod Keeley, PhD LCP
- Four-hour training on adaptation of DBT in primary care settings, with a focus on interpersonal communication and distress tolerance.

Motivational Interviewing Graduate Workshop   **Fall 2016**
VCU Medical Center
- Instructor: Dace Svikis, PhD, LCP
- Four-day intensive Motivational Interviewing training; conducted video-taped practice sessions with extensive feedback provided.

Diversity dialogues   **Spring 2017**
Virginia Commonwealth University
- Facilitators: Heather Jones, PhD, LCP & Paul Perrin, PhD, LCP
- Iterdepartmental programming series designed to facilitate discussion around cultural issues in research and clinical work.

Suicide/Homicide Risk Assessment in Primary Care   **Fall 2015**
VCU Medical Center
- Instructor: Paul Perrin, PhD LCP
- Annual 2-hour training on homicide/suicide risk assessment in primary care settings.

Safe Zone workshop   **Summer 2015**
Virginia Commonwealth University
- Instructor: Safe Zone facilitators
- One-day workshop to support LGBTQIA+ community, with focus on therapy considerations.

TEACHING EXPERIENCE

Instructor   **Aug. 2015 – May 2016**
Developmental Psychology Service Learning Course
- Two undergraduate-level service learning courses focusing on human development and theory applications to student volunteer experiences in the community.
- Led two 20 student classes, prepared lectures, designed assignments, graded assignments, and coordinated student placements at service learning sites.
  Supervisor: Geri Lotze, PhD

Research Project Advisor   **May 2013 – June 2014**
Independent Research Course, River Hill High School
- High school student's year-long, independent study project on sleep and ADHD.
- Met with student in person monthly and provided feedback and assistance throughout project, including: background research, study design, data collection/analysis, and final presentation/paper.

Psychology Tudor   **Aug. 2010 – May 2011**
Psychology Department, University of Virginia
- Recommended tutor by UVA's Psychology Department for "Introduction to Cognition" and "Introduction to Psychology" courses.

- Provided weekly tutoring on an hourly basis for students as well as more intensive assistance before examinations.