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Abstract

Objective: To explore the relationships between social and environmental factors and parenting self-efficacy (PSE) among mothers of preterm infants hospitalized in neonatal intensive care units (NICUs) using a social determinants of health (SDoH) framework. ***Method:*** We analyzed data from a prospective cohort study that included 187 mother-infant dyads admitted to four NICUs in the Mountain West region between June 2017 and December 2019. We used multivariable linear regression models to assess the independent associations between maternal and infant characteristics and PSE. ***Results:*** Our final multiple linear regression model predicting the efficacy score including maternal race/ethnicity, age, insurance, employment status before giving birth, gestational age, depression, and having other children was significant ($F(12,160) = 3.17$, $p = .0004$, adjusted $R^{-}2 = .131$). Significant predictors of PSE were race/ethnicity ($\beta = 3.3$, $p = .022$), having another child/children ($\beta = 4.2$, $p = .005$), and depression ($\beta = -4.2$, $p = .004$). ***Conclusions:*** Findings suggest that social workers and medical practitioners should consider SDoH, such as insurance type, household income, and employment, along with traditional clinical indicators when assessing families' infant care needs. Social workers, medical practitioners, and researchers should be mindful of how implicit bias may influence the allocation of care and parental supports.

Keywords: NICU, Social Determinants of Health, Implicit Bias, Parenting Self-Efficacy

Introduction

Parents of infants who are hospitalized in neonatal intensive care units (NICUs) experience a complicated and often distressing introduction to parenting their preterm infant. Research has found increased risk among parents of NICU-hospitalized infants for emotional distress and mental health conditions such as depression, anxiety, and posttraumatic stress disorder (PTSD) compared to parents whose infants do not require NICU care (Aftyka et al., 2017; Lefkowitz et al., 2010; Rogers et al., 2013; Schecter et al., 2020; Soghier et al., 2020; Tahirkheli et al., 2014; Wyatt et al., 2019). The complex stressors that accompany NICU hospitalization may also disrupt parents' perceptions of parenting self-efficacy (PSE), an important factor influencing parent-child attachment, parent well-being, and child health and development (Barnes & Adamson-Macedo, 2007; Hsiao et al., 2016).

Parenting self-efficacy refers to "beliefs or judgments about one's competency or ability to be successful in the parenting role" (Hess et al., 2004). Emerging from Bandura's theory of self-efficacy (Bandura, 1997), PSE evolves over time through practical experience with parenting-related tasks such as feeding, holding, and soothing one's infant. NICU hospitalization may compromise the development of PSE as it interrupts the natural patterns of early parent-infant interaction (Barnes & Adamson-Macedo, 2007; Hsiao et al., 2016). For example, in a NICU setting, parents may not be able to breast or bottle feed their baby for weeks or months, or hold their child during acute illness. Studies of PSE among parents of high-risk infants have provided empirical support for Bandura's theory that self-efficacy develops and increases over time as parents have more opportunities to practice and successfully complete parenting tasks (Troutman et al., 2012; Vance et al., 2020).

Parenting self-efficacy is an important element in parenting quality because it drives parenting initiative and guides parent-child interactions. Higher levels of PSE are associated with greater parenting competency, more positive parent-infant interactions, successful breastfeeding initiation, fewer hospitalizations during childhood, and better child neurological and behavioral outcomes (Botha et al., 2020; Holland et al., 2011; Hsiao et al., 2016; Jones & Prinz, 2005; Leerkes & Burney, 2007; Melnyk et al., 2001). Research also demonstrates a relationship between PSE and maternal depression, though the causal direction of this relationship is unclear. Higher levels of PSE are associated with fewer symptoms of postpartum depression, as well as strong social support and better overall parent psychological well-being (Brazeau et al., 2018; Fathi et al., 2018; Haslam et al., 2006; Holland et al., 2011; Leahy-Warren et al., 2012; Vance et al., 2020).

The relationships between PSE, depression, and other mental health conditions such as anxiety and PTSD among NICU parents are important to explore given the increased risk of adverse mental health among NICU parents. Adverse mental health is associated with maternal suicide and substance use (Centers for Disease Control and Prevention, 2017; Davis et al., 2019), impaired maternal-child attachment, and negative cognitive, behavioral, and emotional child developmental outcomes (Rogers et al., 2013; Schecter et al., 2020). Maternal mental health conditions are also linked to less use of preventive and routine infant healthcare (e.g., well-baby check-ups), more use of emergency departments or urgent care for infant healthcare, and higher rates of child hospitalization (Holland et al., 2011; Minkovitz et al., 2005).

Given its importance to maternal and child outcomes, research should examine factors associated with PSE. Extant research has mostly investigated PSE's relationship to individual factors such as social and emotional support, depression, trauma exposure, infant health acuity,

and family dynamics (Brazeau et al., 2018; Haslam et al., 2006; Vance et al., 2020). Studies have not fully examined the influence of upstream structural factors such as race/ethnicity and socioeconomic position. This is a particularly critical area of study in the NICU population, which is known to reflect racial/ethnic and socioeconomic disparities (Almeida et al., 2018; Sigurdson et al., 2019). Race/ethnicity and socioeconomic position may be conceptualized as social determinants of health (SDoH), which refers to nonmedical factors such as social, cultural, political, economic, and environmental elements that influence health (World Health Organization, 2021). Numerous studies suggest structural oppression enacted through racism and discrimination affect maternal and child health outcomes, including increased risk for low birth weight, preterm birth, and pregnancy complications (Braveman & Gottlieb, 2014).

In light of evidence pointing to the association between SDoH and maternal and infant outcomes, the importance of PSE to maternal and infant outcomes, and the lack of existing research examining SDoH and PSE, we used a SDoH framework to investigate the relationships between social and environmental factors and PSE among mothers of preterm infants hospitalized in NICUs. This study reflects a sub-analysis of a larger study of maternal engagement designed to investigate the relationships between maternal time spent in the NICU, maternal psychosocial factors, and infant health outcomes. We included depression and acute stress disorder as exploratory outcomes due to prior literature pointing to relationships between SDoH and maternal mental health outcomes (Guintivano et al., 2018). We also included infant healthcare utilization as an exploratory outcome given research demonstrating a relationship between PSE and infant healthcare utilization (Holland et al., 2011).

Methods

Participant Description

This prospective cohort study included 187 mother-infant dyads admitted to four NICUs in the Mountain West region between June 2017 and December 2019. Three of the NICUs are located in an urban, metropolitan area, and one is located in a smaller urban area in the same geographical region. Of the four, three are Level III NICUs with 25-50 beds, and one is a Level IV NICU with 84 beds. Our multidisciplinary study team included social workers, neonatologists, nurses, and public health professionals. This study was approved by the study sites' institutional review boards. All participants completed informed consent forms and were assured that study participation was voluntary and that participation in no way affected the care they or their infant(s) received in the NICU.

Eligibility criteria included: dyads with mothers who primarily spoke English or Spanish, were ≥18 years old, and had no reported history of illicit substance abuse with infants born at ≤32 weeks gestational age.

Measures

Perceived Maternal Parenting Self-Efficacy Scale (PMP-SE). The PMP-SE is a 20-item self-report questionnaire used to assess mothers' confidence in providing care for their preterm infants (Barnes & Adamson-Macedo, 2007). The PMP-SE contains 4 subscales: caretaking procedures, evoking behaviors, reading behaviors or signaling, and situational beliefs. Each item is answered on a 4-point Likert scale. Scores range from 20-80, with higher scores indicating greater parenting self-efficacy. Administered within the first 4 weeks of NICU admission, the PMP S-E takes approximately 10 minutes to complete (Barnes & Adamson-Macedo, 2007). Originally developed in the United Kingdom, the PMP S-E has strong reliability and validity psychometric properties with a Cronbach's alpha of 0.91 (Barnes & Adamson-Macedo, 2007), and it has been validated in a number of cultures and languages, including in the

United States and in Spanish (Hsiao et al., 2016; Vargas-Porras et al., 2020). It has been used with both primiparous and multiparous mothers, as well as married/partnered mothers and single mothers. While most studies include maternal samples with indicators of mid-to-high socioeconomic position (e.g., college education), Vargas et al. (2020)'s sample of Spanish-speaking mothers included about half with low socioeconomic position and half with high socioeconomic position. This study used the PMP-SE as an indicator of our primary outcome, parenting self-efficacy, and scored it as a continuous variable.

Edinburgh Postnatal Depression Scale (EDPS). The EPDS is a 10-item, self-report questionnaire initially developed to assess for postnatal depression symptoms experienced within the last 7 days (Alkozei et al., 2014). It usually takes respondents less than 5 minutes to complete and may be administered in a variety of contexts (Cox et al., 1987). The EPDS has acceptable reliability and validity across a variety of cultures and languages, including Spanish (Alkozei et al., 2014). The EPDS has been used for research and clinical purposes with widely varying sociodemographic samples including racialized minorities and those with low-to-high socioeconomic position (Alkozei et al., 2014; Flom et al., 2018; Levinson et al., 2020). The EPDS has a maximum score of 30, with higher scores indicating more symptoms of parental distress, depression, and/or anxiety. Initially, the EPDS was scored using ≥ 10 as a cut-off to indicate potential postnatal depression (Cox et al., 1987). Interpretation of cut-off scores have evolved over time, with recent evidence suggesting the EPDS may be considered an indicator of Perinatal Mood and Anxiety Disorder (PMAD), which would include depression, anxiety, and anhedonia (Flom et al., 2018; Long et al., 2020). For our study, we used the EPDS as an indicator of depressive symptoms as an exploratory outcome and used a cut-off score of ≥ 10

based on 1) prior research using this approach in NICU contexts (Alkozei et al., 2014), and 2) the clinical use of this criterion in our study sites.

Acute Stress Disorder Scale (ASDS). The ASDS assesses Acute Stress Disorder in adults and has been shown to be predictive of future development of PTSD (Bryant et al., 2000). The ASDS is a 19-item, self-report questionnaire that has been used in prior research in a NICU context (Lefkowitz et al., 2010). It has demonstrated good sensitivity (95%), specificity (93%), and test-retest reliability (r = .94). Based on DSM IV Acute Stress Disorder criteria and consistent with DSM V criteria, the ASDS asks questions about dissociative, re-experiencing, avoidance, and arousal symptoms related to the experience of a traumatic event. The ASDS may be scored as a continuous variable, with higher scores indicating greater distress. For this study, we used the ASDS as an indicator of acute stress as an exploratory outcome and used a cutoff score of $\geq$ 56 in line with recommendations from its initial validation (Bryant et al., 2010). It may be used within 2-30 days of experiencing a traumatic event and has strong internal consistency, test-retest reliability, and convergent validity with related measures (Bryant et al., 2000). The ASDS has not been validated in Spanish; consequently, we used a forward-backward translation process (Maneesriwongul & Dixon, 2004) to translate the instrument for use with our Spanish-speaking participants.

Surveys

Initial Survey. Mothers completed the initial survey when their infants were between 32-34 weeks gestational age. Surveys were housed in REDCap, a HIPAA-compliant server (Harris et al., 2009), and mothers were provided an option of paper or electronic forms to complete the survey while in the NICU. The survey collected self-reported information about sociodemographic predictors and the primary outcome measure, parenting self-efficacy. The

survey also collected self-reported information about the exploratory outcomes of depression and acute stress.

Six Week Survey. Six weeks after infant discharge from the NICU, mothers completed a survey administered via phone or a HIPAA-compliant electronic link sent via email. This survey collected information about secondary outcomes including infant health status, utilization of infant health services, new infant diagnoses, and infant supplemental oxygen use. These variables were binary (Y/N) or categorical and were analyzed as such.

Data Analysis

Inclusion in analysis required non-missing responses to each of the items in the Perceived Maternal Parenting Self-Efficacy (PMP-SE) (Barnes & Adamson-Macedo, 2007) tool with the exception of the item 'I am good at feeding my baby,' as not all mothers in the sample were able to feed their infant at the time of survey completion due to severity of illness and other complicating factors. Maternal sociodemographic predictors for PMP-SE were transformed to categorical variables for analysis. Variables included maternal race/ethnicity, age, marital status, insurance at delivery, estimated annual household income, highest education attained, typical mode and travel time to the NICU, employment status pre-NICU admission, and having other children. We used maternal household income, insurance type, and employment as proxies for socioeconomic position given evidence that suggests multiple ways of capturing socioeconomic position, particularly in health research (Galobardes et al., 2007). We additionally assessed postnatal depression and acute stress as binary variables based on screening cutoffs.

Infant predictors of PMP-SE included gestational age at birth and length-of-stay, reported by hospital staff at time of discharge, and a composite infant health score calculated as the sum of presence (1) or not (0) of bronchopulmonary dysplasia (BPD), necrotizing enterocolitis

(NEC), intraventricular hemorrhage (IVH), and retinopathy of prematurity (ROP). For analysis, infants were dichotomized as either having none of these diagnoses or having one or more. These medical comorbidities are inversely related to birth weight and prematurity and are associated with neonatal mortality and long-term morbidity.(Schmidt et al., 2003) We conducted a sensitivity analysis for those missing the item of the PMP-SE inquiring about ability to feed the infant, imputing a value of 0, 1, or 2, corresponding to responses of missing, "Strongly Disagree", and "Disagree". We investigated this sub-population and found that these infants were not able to receive oral feeding at the time of PMP-SE completion, indicating a likely lower level of confidence in performing this activity. The sensitivity analysis showed no significant differences in findings with each imputation and we ultimately used the median value of 1 ("Strongly Disagree") for these values.

We assessed efficacy scores for normality and determined they were non-parametric and thus calculated medians and interquartile ranges for each independent predictor. Bivariate relationships were assessed using the Wilcoxon Rank Sum Test, Kruskal-Wallis Test, or Correlation depending on the structure of the data. If non-parametric testing was significant at alpha < .05 we used the Dwass-Steel-Critchlow-Flinger (DCSF) test for multiple comparisons of difference between medians as a post-hoc analysis to determine the levels of each category that differed significantly.

To assess the independent association between maternal and infant characteristics and PSE, multivariable linear regression models were used. All assumptions of multiple regression were assessed and met (Jobson, 1991). Maternal race/ethnicity, age, household income, insurance, and employment prior to birth were included in the model to represent SDoH. To control for the effect of infant health, we also included gestational age and composite infant

score. All other independent variables were then tested to determine if they improved the fit of the model, as were interaction terms. Models were compared using adjusted R^2 values, with a higher R^2 indicating better explanatory value.

As a post-hoc analysis, we assessed the relationship between variables that were significant in the final multiple regression model and the PMP-SE subscale scores using Wilcoxon rank-sum tests.

Results

Cohort Description

Our sample included 187 mother-infant dyads. A description of the study sample along with an assessment of the bivariate relationships of the sample characteristics with the primary outcome variable are presented in Table 1. The bivariate relationships between 6-week post-discharge infant health and healthcare utilization with the primary outcome are show in Table 2. The majority (57%) were non-Hispanic white and 67% were 25-35 years of age. The median and IQR of PMP S-E score for the cohort was 68 (IQR = 58,72). The Cronbach's alpha for the PMP-SE was 0.95 indicating excellent internal validity.

Bivariate Results

We found significant differences in median efficacy score by race/ethnicity ($p < .01$), with those of races/ethnicities other than non-Hispanic white scoring higher. Mothers with an estimated annual household income <$25,000 had significantly higher efficacy scores than those with household income ≥$75,000 ($p < .01$). Mothers with a high school degree or less ($p < .01$) and those with some college or associate degree ($p < .01$) had significantly higher efficacy scores than mothers with a master's degree or greater. Mothers who did not have private insurance had significantly higher efficacy scores than those with private insurance ($p < .01$). Mothers who

were not working full-time prior to their infant's NICU admission had significantly higher scores (p = .01) as did mothers with other children (p < .01). Mothers who screened positive for postnatal depression had significantly lower efficacy scores than those who did not (p = .04). We found a small but significant negative association between efficacy score and infant length-of-stay (p = .02). We found that mothers with lower efficacy scores were more likely to have utilized urgent care/emergency department services for their infant at 6 weeks post-discharge (p = .03). Finally, there were significant differences in the PMP-SE score by NICU, with the highest acuity Level IV NICU having significantly lower scores than each of the other three NICUs.

Multivariable Results

Our final multiple linear regression model to predict efficacy score including maternal race/ethnicity, age, insurance, employment status before giving birth, gestational age, presence of depression, and having other children is presented in Table 3. None of the interaction terms of independent variables considered for the model significantly improved the fit of the model to the data and were therefore excluded. The final model was significant ($F_{(12,160)}$ = 3.17, p = .0004, adjusted R^2 = .13). When controlled for all other covariates in the multiple regression model, an EPDS >10 was associated with a 4.2 point decrease in PSE score (β= -4.2, p < .01), while maternal race/ethnicity other than non-Hispanic white was associated with a 3.3 point higher score (β= 3.3, p = .02) and having any other children (β= 4.2, p < .01) was associated with a 4.2 point higher score. While these relationships were strongly significant, the effect on PMP-SE score, which can range from 20-80 points, was relatively small. Maternal age <25 years (p = 0.08) or >35 years (p = 0.83), annual estimated household income >$25,000 ($24-$49,000 p = 0.65, $50-$74,999 p = 0.94, >$75,000 p = 0.43), not working full-time prior to NICU admission

(p = 0.71), a composite infant health score >1 (p = 0.26) and infant gestational age (0.93) were not significantly associated with differences in PMP-SE scores when controlled for all other covariates in the multiple regression model.

Post-Hoc Analysis Results

In our post-hoc analysis of median score for the PMP-SE subscales measuring caretaking, evoking, reading, and situational efficacy we found that maternal race/ethnicity other than Non-Hispanic white was significantly associated with a higher score on each subscale ($p<0.01$, $p<0.01$, $p<0.01$, $p = 0.2$). Having any other children was significantly associated with higher caretaking ($p<0.01$), evoking ($p = 0.02$), and reading ($p = 0.01$) scores. An EPDS score of >10 was associated with significantly lower reading ($p = 0.01$) and situational ($p = 0.03$) scores.

Discussion

This paper reports findings from a sub-analysis of PSE, maternal mental health outcomes, infant health status, and post-NICU infant health status and healthcare utilization among mothers of preterm infants hospitalized in NICUs using a SDoH framework. The current study found maternal household income, insurance, and employment all were independently significantly related to the primary outcome of parenting self-efficacy. Our findings confirm existing literature that shows higher rates of depressive symptoms among NICU mothers compared to postpartum mothers without children hospitalized in NICUs (Stotts et al., 2019). Our findings also align with studies that show maternal depressive symptoms are associated with decreased PSE (Brazeau et al., 2018). We did not find racial/ethnic or socioeconomic disparities in maternal depression rates in our sample. This contradicts studies that show higher rates of depressive symptoms among parents who are racialized minorities and/or have lower socioeconomic position compared to their white and/or more affluent counterparts (Hall et al., 2020; Mounts, 2009).

To our knowledge, this is the first study of PSE and its relationship to maternal SDoH, including race/ethnicity, insurance type, household income, and employment. Based on a SDoH framework and prior literature, we considered insurance type, household income, and employment as proxies for socioeconomic position. We added education to our multivariable analysis to see if it improved model fit but it did not, suggesting the need for alternative measures of maternal socioeconomic position including employment status. Our findings show that non-Hispanic white mothers and mothers with higher socioeconomic position (e.g., private insurance, higher household income, higher education attainment) reported lower perceived PSE compared to mothers of other racial/ethnic identities and mothers with lower socioeconomic position.

Our findings that non-Hispanic white mothers and those with higher socioeconomic position experience lower PSE are curious and initially surprised the research team as we assumed these mothers may have access to more material resources and experience less distress overall. We recognize how our implicit bias as researchers influenced our interpretation of the findings and hypothesize that cultural factors and experiences of social support may influence PSE. Non-Hispanic white mothers with higher socioeconomic position may be more likely to have material resources, but they may also adhere to more individualistic cultural values of rigid self-sufficiency and independence that shape their access to and mobilization of support networks (Braveman et al., 2001; Braveman et al., 2005). They may also have less extended family and intergenerational experiences, potentially leading to less exposure to infants prior to giving birth to their own children. Mothers of other racial/ethnic identities and with lower socioeconomic position may have more experiences with intergenerational households, including infants and young children, and may adhere to more collectivist cultural values of

interdependence and mutual support (Bhawuk, 2017; Vargas & Kemmelmeier, 2012). These factors may serve as buffers to distress and threats to PSE to which NICU parents may be particularly susceptible. This hypothesis aligns with literature showing that NICU parents with more social support also experience more efficacy and that support improves depressive symptoms through raising PSE. (Brazeau et al., 2018; Haslam et al., 2006; Leahy-Warren et al., 2012). Our hypothesis also fits with our study's median PMP-SE score of 68, which is slightly higher than other studies of PSE that used the PMP-SE with majority white, non-Hispanic mothers in NICU contexts (Barnes & Adamson-Macedo, 2007; Hsiao et al., 2016). Our findings point to the necessity of more comprehensive understandings of social and environmental factors that may influence NICU mothers' PSE and overall psychological well-being, including those that may involve social and emotional support. Using a SDoH framework in our analysis allowed us to consider ways that SDoH may build upon and contextualize our understanding of risk and protective factors, which in turn may allow us to optimize interventions for this unique population.

Among our sample, mothers with lower PSE were more likely to have infants with longer lengths of stay in the NICU and to use urgent care and emergency department services for their infants after NICU discharge. They were also more likely to have infants hospitalized in the Level IV NICU that provides care for infants requiring the most intensive levels of medical care. These findings align with studies that show an inverse relationship between PSE and infant health acuity. Mothers with lower PSE may engage less with their infants in the NICU because of beliefs about their inability to meet their infants' needs, potentially impacting their infants' health trajectory and time spent in the NICU. Additionally, lower PSE may increase urgent care and emergency department utilization after NICU discharge as these mothers may experience

greater distress and feelings of unpreparedness after discharge. They may also have fewer informal social supports (e.g., family and friend networks) to help them discern and navigate their infants' health needs.

Strengths and Limitations

A key strength of our study is the application of a SDoH framework to understand social and environmental factors that may shape PSE. Given the limited understanding of what factors influence PSE among parents of hospitalized preterm infants, the present study advances knowledge about the relationship between racial/ethnic identity, socioeconomic position, and perceived PSE. An additional strength of our study is the prospective design, which allowed us to examine the relationship between PSE and infant health outcomes six weeks post-discharge.

However, our study is not without limitations. Due to our sample size and characteristics, maternal racial/ethnic identity was classified in binary categories for meaningful statistical analysis, resulting in non-Hispanic white and Other Race/Ethnicity. This is a key limitation in our conceptualization of SDoH given the importance of racial/ethnic identity within a SDoH framework. This prevented us from analyzing the data for each racial/ethnic identity represented in our sample, thus limiting our ability to adequately describe the relationship between racial/ethnic identity and PSE. The binary categorization of racial/ethnic identity may have also posed a limitation to our interpretation of the relationship between racial/ethnic identity and maternal depressive symptoms in our sample, which did not align with repeated findings in the literature of racial/ethnic disparities in maternal depression. Further, non-white mothers are not monolithic and any cultural assumptions we make trying to understand our findings are limited by the fact that many different cultures and family experiences may be represented in this category within our sample. In addition, our study only examined maternal experiences in the

NICU, which limits our understanding of the experiences and contributions of fathers and other extended family members who are certainly affected by the NICU experience and play an important role in shaping maternal and infant health outcomes.

Implications

Our findings suggest several practice and research implications that acknowledge the importance of social, economic, and cultural conditions in shaping PSE among mothers of preterm infants hospitalized in NICUs. First, social workers, medical practitioners, and researchers should be mindful about how implicit biases may manifest in the assessment of parenting competence in the NICU. Our initial surprise that non-Hispanic white mothers and mothers with higher socioeconomic position had significantly lower perceived PSE than mothers of other racial/ethnic identities and with lower socioeconomic position attests to this. Without concern for the ways in which racism and classism present in our unconscious assumptions about parenting competence, we run the risk of reinforcing harmful racial and class-based stereotypes. We also risk overlooking opportunities to build resilience and strengthen PSE among mothers who we assume already feel competent.

In addition, targeting parenting self-efficacy in NICU-based interventions may be a promising strategy to increase parental engagement, reduce infant length of stay, and decrease urgent care and emergency department visits post-discharge. These reflect potentially fruitful topics for continued research and intervention. Perhaps efforts to improve PSE should be tailored to match the unique SDoH profiles of NICU parents, taking into account the possibility of strengths and risks present in the social environment. Identifying parents with low parenting self-efficacy may also indicate a need to provide screening and support for PMAD. Social workers and medical practitioners have an opportunity to partner in the development and evaluation of

such interventions. Strengths-based approaches that draw upon parents' existing resiliencies and social and cultural ecologies, and that recognize the developmental trajectory of parenting self-efficacy in the NICU context offer the potential to meaningfully support parents in their parenting role. Research designed to document and evaluate these efforts will provide valuable contributions to the field.

Finally, additional research should further explore social determinants of PSE and how SDoH may influence NICU families' experiences more broadly. Potential lines of inquiry include examining the relationship between perceived social support and PSE and exploring parental cultural orientation (e.g., collectivistic, individualistic) and PSE among parents of hospitalized infants. The recruitment of larger, more racially and ethnically representative study samples will both enhance generalizability of findings and support analyses that adequately describe the relationship between racial/ethnic identity, SDoH, and PSE. The inclusion of fathers and extended family members in this research is also sorely needed to expand our understanding of how to best support NICU families and their infants (Prouhet et al., 2018). Finally, using a SDoH framework in NICU research and practice may create opportunities to more holistically understand and address the ways in which social and environmental factors shape NICU parent and child health trajectories (Parker et al., 2020).

Conclusion

Parenting self-efficacy plays an important role in parent-infant interactions, infant health and developmental outcomes, and parental well-being. In the NICU context, the development of PSE may be affected by the alteration of the parenting role and disruptions in early parent-infant interactions. Understanding the social determinants of PSE may lead to improved NICU practices that strengthen parental confidence and engage existing parental strengths. Our findings

suggest that social workers and medical practitioners should consider SDoH, such as insurance type, household income, and employment, along with the traditional clinical indicators when assessing a family's infant care needs. Critically, social workers, medical practitioners, and researchers should be mindful of the role of implicit racial and socioeconomic bias in the allocation of care and parental supports especially in regards to PSE.

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Table 1

Summary *of the Bivariate Relationships of Cohort Characteristics and Perceived Maternal Parental Self- Efficacy Score (N=187)*

	N (%)	Median IQR[a.]	*p*
Socio-Demographic Characteristics			
Maternal Age			0.12[b.]
<25 years	33 (18%)	71 [60-73]	
25-35 years	126 (67%)	64 [58-72]	
>35 years	28 (15%)	62 [58-71]	
Maternal Race/Ethnicity**			<0.01[c.]
Non-Hispanic White	107 (57%)	62 [57-71]	
Other Race/Ethnicity	80 (43%)	69 [60-75]	
Maternal Insurance at Birth**			<0.01[c.]
Private	102 (55%)	62 [57-70]	
Public, Other, None	84 (45%)	67.5 [60-75]	
Estimated Annual Household Income**			<0.01[b.]
<$25,000	44 (24%)	71 [60-76]	
$25,000 - $49,999	40 (22%)	62.5 [60-72]	
$50,000 - $74,999	23 (13%)	67 [59-74]	
>$75,000	75 (42%)	62 [57-69]	
Marital Status			0.14[c.]
Married/ Living with Partner	156 (83%)	64 [58-72]	
Other Status	31 (17%)	71 [59-75]	
Maternal Highest Education**			<0.01[b.]
< High School Degree	55 (30%)	67 [60-74]	
Some College/Associate Degree	51 (27%)	68 [60-73]	
Bachelor's Degree	52 (28%)	62 [57-71]	
> Master's Degree	28 (15%)	58 [54-68]	
Maternal Pre-NICU Employment*			0.01[c.]
Working full-time	113 (61%)	63 [57-71]	
Other	72 (39%)	67 [60-75]	
Other Children**			<0.01[c.]
Yes	108 (60%)	68.5 [60-74]	
No	73 (40%)	62 [57-69]	
Maternal Mental Health			
Maternal Postnatal Depression*			0.04[c.]
EPDS < 10	124 (66%)	65.6 [59-73]	
EPDS > 10	63 (34%)	62 [57-71]	
Maternal Acute Stress			0.29[c.]
ASDS < 56	170 (91%)	64.5 [59-52]	
ASDS > 56	17 (9%)	60 [57-71]	
Infant Characteristics			
Composite Infant Health Score			0.22[c.]
0	128 (68%)	65 [59-73]	
< 1	59 (32%)	64 [58-71]	
Gestational Age	0.06[d.]	29 [27-31]	0.43[e.]
Infant Length of Stay (days)	-0.18[d.]	65.5 [46, 89]	0.02[e.]

Note. a. Interquartile range. b. p-value for Kruskal-Wallis. d. p-value for correlation if continuous. c. p-value for Wilcoxon Rank sum d. Correlation coefficient. e. p-value for the correlation. *p<.05. **p<.01.

Table 2

Summary *of the Bivariate Relationships Between Six-week Infant Health Outcomes and Perceived Maternal Parental Self-Efficacy Score (N=109)*

	***n* (%)**	**Median IQR[a.]**	**Wilcoxon rank sum (*p*)**
Maternal Reported Infant Health			0.18
Excellent	48 (44%)	65 [58-72]	
Very Good	45 (41%)	54 [57-72]	
Good	8 (7%)	60 [56-68]	
Fair	6 (6%)	65 [54-71]	
Poor	2 (2%)	47 [46-47]	
Physician Check-up			
Yes	109 (100%)	64 [57-71]	
Specialist Visit			0.21
Yes	63 (58%)	63 [55-71]	
No	46 (42%)	65 [59-71]	
Urgent Care Center/Emergency* *Department Visit			0.03
Yes	21 (19%)	58 [54-65]	
No	88 (81%)	65 [58-71]	
Hospital Admission			0.3
Yes	7 (6%)	57 [47-70]	
No	102 (94%)	65 [57-71]	
New Infant Diagnosis			0.68
Yes	12 (11%)	63 [54-74]	
No	97 (89%)	64 [58-71]	
Supplemental Oxygen Usage			0.7
Yes, 24 hours/day	47 (43%)	60 [57-71]	
Yes, at night only	10 (9%)	65 [60-69]	
No	52 (58%)	64 [57-71]	

Note. *p<.05. **p<.01.

Table 3

Parameter *Estimate of Final Multiple Linear Regression Estimating the Effect of Child and Parent Characteristics on Perceived Maternal Parental Self- Efficacy (N=187)*

	β	Standard Error	95% Confidence Interval	*p*
Intercept	61.7***	10.9	40.2, 83.1	<0.001
Age <25 years	3.3	1.9	-0.5, 7.1	0.08
Age ≥35 years	0.4	1.9	-3.4, 4.3	0.83
Other Race/Ethnicity [a.]	3.3*	1.4	0.5, 6.2	0.02
$25-$49,999/year [b.]	-0.9	2.1	-5.0, 3.1	0.65
$50-$74,999/year	-0.2	2.6	-5.3, 4.9	0.94
≥$75,000/year	-1.9	2.4	-6.6, 2.9	0.43
Public, Other or No Insurance	0.7	2.0	-3.1, 4.6	0.71
Not working full-time pre-NICU	0.6	1.5	-2.5, 3.6	0.71
Other child(ren)	4.2**	1.4	1.3, 7.0	<0.01
Postnatal Depression	-4.2**	1.4	-7.0, -1.3	<0.01
Composite Infant Health Score ≥1	-2.1	1.9	-5.8, 1.6	0.26
Gestational Age	0.03	0.4	-0.7, 0.7	0.93

Note. a. Reference group = Non-Hispanic White; b. Reference group = <$25,000; Model R^2 = 0.191. *p<.05. **p<.01. ***p<.001.