

Effect of Socioeconomic Adversity on Mother-Infant Interaction

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THESIS

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To the Lord and my husband, Dongjin

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LIST OF ABBREVIATIONS

BSI-18	Brief Symptom Inventory-18
CFI	Comparative Fit Index
CI	Confidence Interval
FLP	Family Life Project
HOME	Home Observation for Measurement of the Environment
MI	Mother-Infant
NES	Neighborhood Environment Scale
QSS	Questionnaire of Social Support
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
SES	Socioeconomic Status

SUMMARY

As of 2018, approximately 10.5 million children lived in poverty in the United States (U.S. Census Bureau, 2019). Poverty in early childhood can hinder a child's development and thus can negatively influence adult attainment (e.g., earnings and working hours), behavior, and health (Duncan et al., 2010). One reason underlying these negative influences may be the impact of socioeconomic adversity on mothers. Women facing socioeconomic adversity, including a combination of low income, limited education, single parenthood, and living in poor neighborhood environments, may show suboptimal quality of mother-infant (MI) interaction (Lugo-Gil & Tamis-LeMonda, 2008), a vital factor influencing child development (Bernier et al., 2016; Raby et al., 2015), and potentially leading to child development problems and delays (Goyal et al., 2010; Madigan et al., 2007). For this reason, socioeconomic adversity is considered a crucial factor negatively influencing parenting behavior (Sturge-Apple et al., 2017).

Socioeconomic adversity consists of multiple socioeconomic status (SES) indicators, such as limited education, single parenthood, financial instability, resource scarcity, and living in unsafe neighborhoods (Sturge-Apple et al., 2017), combining financial, educational, and interpersonal components. Due to the complexity of the socioeconomic adversity construct, little is known about how SES measures that reflect socioeconomic adversity influence MI interaction. Moreover, many studies of the impact of SES on parenting behavior have used either single composite scores or a limited number of SES indicators, such as parental education and/or family income (Evans et al., 2012), that do not allow comprehensive evaluation of the association between socioeconomic adversity and parenting behavior. Therefore, an improved understanding of the relationship between them is required to support development of effective interventions for improving MI interaction in families facing socioeconomic adversity.

One possible pathway between socioeconomic adversity and MI interaction is through the effect of maternal psychological well-being, which is a key influencing factor among the determinants of parenting behavior (Belsky, 1984; Porreca et al., 2017). However, about 85% of postnatal mothers experience mood disturbances (The MGH Center for Women’s Mental Health, 2016); among them, about 10% to 20% annually are affected by postnatal depression (Centers for Disease Control and Prevention, 2020), and up to 15% experience postnatal anxiety symptoms (Dennis et al., 2017). Mothers affected by postnatal depression or anxiety have been found to show suboptimal MI interaction (Beebe et al., 2011; Binda et al., 2019; Feldman et al., 2009; Reck et al., 2018). More specifically, depressed mothers had less sensitive, engaged, and responsive interaction with their infants (Binda et al., 2019; Stanley et al., 2004), and mothers with anxiety disorders displayed less sensitive, more intrusive, or even fearful interaction with their infants (Beebe et al., 2011; Feldman et al., 2009; Nicol-Harper et al., 2007). Infants experiencing such suboptimal MI interaction can in turn display distress and avoid social engagement (termed avoidance behaviors) (Feldman et al., 2009; Warren et al., 2003). Moreover, suboptimal MI interaction may be negatively associated with child cognitive development and other long-term developmental outcomes (Moehler et al., 2006; Murray et al., 2010).

On the other hand, social support, defined as “support accessible to an individual through social ties to other individuals, groups, and the larger community” (Lin et al., 1979), may play a protective role with respect to parenting behaviors in families experiencing socioeconomic adversity (Lee et al., 2009). For example, Lee et al. (2009) showed that family income was associated with both self-reported parenting and parental depression and that social support mediated both relationships; furthermore, parents with low family income displayed a high level of depressive symptoms when they had low social support, but this was not the case for those with more social support, indicating the moderating effect of social support.

McConnell et al. (2011), however, found no association between economic hardship and perceived social support, but they did suggest that a high level of social support might alleviate negative effects of parenting stress on parent-child interaction in the presence of economic hardship.

Prior research has produced only a limited understanding of these pathways. First, studies that evaluated the mediating effects of maternal depression and anxiety on the association between SES and MI interaction (Burchinal et al., 2008; Ettekal et al., 2020; Gurko, 2018; Newland et al., 2013) have shown inconsistent results. For instance, while Newland et al. (2013) found that economic hardship indirectly influenced MI interaction through the effects of maternal depression and anxiety, Gurko (2018) found no significant associations among SES measures (maternal education and family income), maternal parenting stress, and MI interaction. In addition, little information is available on the role of social support in the associations between SES measures and MI interaction (Lee et al., 2009). Furthermore, although SES consists of various measures, each having unique aspects (Evans et al., 2012), previous studies have either used composite SES scores or considered limited aspects of SES.

Belsky's process model of the determinants of parenting (1984), a classic theory widely accepted and frequently cited by parenting and family researchers, provides a conceptual framework for examining these complex relationships. The process model indicates that parent-child relations are influenced by three determinants of parenting: (1) parental psychological resources, including parent developmental history, psychological well-being, and personal maturity (age); (2) contextual sources of stress and support, including marital relations, social network, and employment; and (3) child characteristics (temperament). Through parenting, the determinants ultimately influence child development (Figure 1).

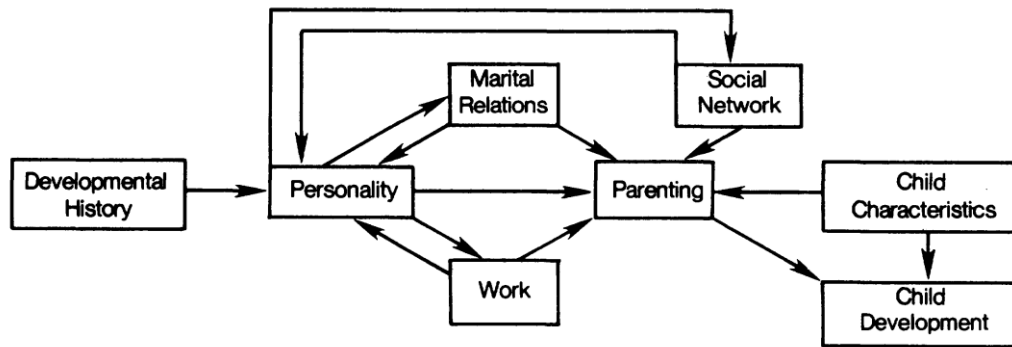


Figure 1. The Process Model of the Determinants of Parenting. Adapted from “The determinants of parenting: A process model,” by J. Belsky, 1984, *Child Development*, 55, p. 83-96. Copyright 1984 by the Society for Research in Child Development, Inc.

This dissertation project applied a modified version of Belsky’s model limited to the associations among three model concepts: contextual sources of stress and support (social network, marital relations, and work in Figure 1), maternal psychological well-being, and parenting. In the study, contextual sources of stress and support were defined as SES measures and social support, maternal psychological well-being as maternal depressive and/or anxiety symptoms, and parenting as MI interaction.

The purpose of this dissertation project was (a) to investigate how different SES measures (income-to-needs ratio, education, marital status, and neighborhood environment) variously influence MI interaction and the potential mediating roles of maternal depressive and/or anxiety symptoms and social support in the pathways by which the SES measures affect MI interaction (Chapter 1) and (b) to explore the moderating roles of various kinds of social support in the relationships among SES measures, maternal psychological well-being and MI interaction (Chapter 2).

Cross-sectional correlational studies were conducted using data from the Family Life Project (FLP), and the sample consisted of 1,198 MI dyads (infant mean age: 7.72 months with a range of 5 to 15 months). In both Chapters 1 and 2, maternal SES was assessed using four

measures, including income-to-needs ratio, education level, marital status, and neighborhood environment. Neighborhood environment was measured by the FLP home visitors in terms of (a) the safety of the area outside the home building, (b) the noise level in the neighborhood, and (c) the safety of the neighborhood. Maternal psychological well-being was measured as maternal depressive and anxiety symptoms, and social support was measured as mothers' satisfaction with social support from community involvement, friendship, family, and intimate relationships (spouse or partner). MI interaction was assessed in terms of maternal behavior (maternal sensitivity and positive engagement) and infant behavior (infant positive and negative mood) during an observed episode of free-play interaction. In Chapter 1, to assess maternal parenting behavior, the Home Observation for Measurement of the Environment (HOME) inventory (Caldwell & Bradley, 1984) was additionally used; the inventory was completed based on a semi-structured interview and observation of MI interaction during the FLP home visit.

In Chapter 1, to evaluate the direct and indirect effects of SES measures on MI interaction, structural equation modeling was employed to test hypothesized mediation models. In Chapter 2, to evaluate the moderating roles of social support in the relationships among SES measures, maternal psychological well-being and MI interaction, PROCESS analyses were conducted. In addition, the Johnson-Neyman technique was applied to identify the transition point defining particular regions within the range of the moderator variable (social support) in which the effect of SES measures on MI interaction or maternal psychological well-being was or was not statistically significant.

As discussed in Chapter 1, the results showed that three of the four SES measures—maternal education level, marital status, and neighborhood environment—directly influenced maternal parenting behavior during MI interaction. On the other hand, no SES measures showed significant direct effects on infant behavior during MI interaction. With respect to the indirect

effects of SES measures, only neighborhood environment and graduate degree attainment showed significant indirect effects on infant negative mood through maternal depressive symptoms and combined depressive and anxiety symptoms. In addition, neighborhood environment showed a significant indirect effect on infant negative mood through social support. In the sequential mediation pathways, social support and maternal psychological well-being showed no mediation effects on the relationships between SES measures and MI interaction.

In Chapter 2, the results indicated that among all the subscales of social support (community involvement, friendship, family, and intimate relationships), only social support from intimate relationships moderated the associations among SES measures, maternal psychological well-being, and MI interaction. Specifically, social support from intimate relationships moderated the effect of single parenthood on maternal positive engagement as well as the effect of neighborhood environment on maternal anxiety symptoms.

From an intervention perspective, these two studies highlighted the importance of interpersonal (social support from intimate relationships) and contextual (neighborhood environment) factors beyond the individual in improving MI interaction for families facing socioeconomic adversity. Study findings suggest that advocating for public policies targeted at improving neighborhood conditions could be beneficial from enhancing MI interaction in such families. In developing such policies, the possibility should be considered that not only neighborhood environment, but also social support, may play an important role in MI interaction. Given that factors influencing MI interaction may differ depending on the type and level of social support present, the contemporary assumption that all mothers would respond to interventions in the same way may need to be revisited and reconsidered.

Future research replicating the study is needed to further support the findings regarding the effects of social support and neighborhood environment on MI interaction. In addition, in

future research should examine mothers' self-reported perceptions of neighborhood environment in order to more fully determine the effects of neighborhood conditions on MI interaction. Also, given that no study has reported the validity of the FLP's MI interaction measures, their validity should be evaluated to confirm the rigor of study results. Moreover, as one subscale of social support (support from community involvement) showed low internal consistency reliability, future studies should use a social support instrument known to have better internal consistency. Lastly, longitudinal studies should be conducted to explore (a) the long-term effects of socioeconomic adversity on MI interaction and (b) the long-term buffering effects of social support on the negative effects of socioeconomic adversity on maternal psychological well-being and MI interaction.

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I. EFFECT OF SOCIOECONOMIC ADVERSITY ON MOTHER-INFANT INTERACTION: MEDIATING ROLES OF MATERNAL PSYCHOLOGICAL WELL-BEING AND SOCIAL SUPPORT

Background

The quality of mother-infant (MI) interaction, a combination of reciprocal maternal caregiving behaviors and infant behaviors that induce and respond to mothers' care (Sumner & Spietz, 1995), is one of the vital factors affecting child development (Bernier et al., 2016; Raby et al., 2015). Because MI interaction creates a basis for infants' psychological growth and development by providing an initial social learning environment and an opportunity to promote brain plasticity (Csibra & Gergely, 2009; Feldman, 2007), optimal early interaction is crucial for infants. The quality of MI interaction is influenced by multiple determinants (Belsky, 1984), and among them, socioeconomic adversity may be a crucial factor negatively influencing interaction quality (Sturge-Apple et al., 2017).

While there appears to be evidence of an association between socioeconomic adversity and MI interaction (Ettekal et al., 2020; Heng et al., 2018), socioeconomic adversity is a complex construct consisting of multiple socioeconomic status (SES) measures (Sturge-Apple et al., 2017). In a systematic review, SES measures such as economic hardship, low education level, and low income made a major contribution to explaining differences in the quality of maternal sensitivity [a key element of MI interaction (Crittenden & Bonvillian, 1984) between families in various race/ethnic groups (Mesman et al., 2012). However, little is yet known about the pathways connecting socioeconomic adversity with MI interaction (Mesman et al., 2012) due to the complexity of the association (Roubinov & Boyce, 2017).

The literature suggests potential pathways between socioeconomic adversity and MI interaction. One such pathway is through the effect of maternal psychological well-being. For

example, mothers facing socioeconomic adversity experience higher levels of stress than mothers not experiencing such adversity (Evans, G. W., 2004; Goodman et al., 2005). The chronic and daily stressors associated with socioeconomic adversity can produce maternal psychological disturbances such as depressive or anxiety symptoms (Kim & Bianco, 2014). Mothers affected by depression and/or anxiety clearly show suboptimal MI interaction (Beebe et al., 2011; Binda et al., 2019; Feldman et al., 2009; Reck et al., 2018). Another pathway linking socioeconomic adversity and MI interaction may be social support playing a protective role (Lee et al., 2009). For example, Lee et al. (2009) showed that low family income was associated with increased parental depressive symptoms, which in turn were related to disruptive parenting. In these relationships, family income was positively correlated with social support, while social support was negatively correlated with parental depression.

The limited understanding of the pathways connecting socioeconomic adversity with MI interaction may be due to investigators underestimating SES as a multidimensional construct. Although each SES measure has unique aspects and individual SES measures may influence MI interaction in different ways, previous studies have employed composite SES scores (Evans, W. et al., 2012). In addition, in relying on a limited number of SES measures, researchers have neglected the broader range of SES measures available (Evans et al., 2012). For instance, while exploring socioeconomic effects on parenting behavior, researchers have mainly focused on narrow SES measures such as parental education and/or family income (Roubinov & Boyce, 2017). Another explanation for our limited understanding of how SES affects MI interaction are the inconsistent findings demonstrating the mediating effects of maternal depression or anxiety (Burchinal et al., 2008; Ettekal et al., 2020; Gurko, 2018; Newland et al., 2013). For instance, in a longitudinal study, Newland et al. (2013) found that income-to-needs ratio at infant age 6 months indirectly influenced sensitive and supportive parenting behavior at child age 36 months through the effects of maternal depression and

anxiety at 24 months. On the other hand, Ettekal et al. (2020) reported that socioeconomic adversity (a composite of low education level, single parenthood, low family income, and meal and money unpredictability) at infant age 1 month directly and prospectively influenced maternal sensitivity at child age 24 months but that it was not associated with maternal depression. Lastly, scarce data is available on the role of social support in the associations between SES measures and MI interaction, and those study results have been inconsistent (Lee et al., 2009; McConnell et al., 2011).

Given these gaps in our understanding, a primary aim of this study was to evaluate the potential relationship between four SES measures (income-to-needs ratio, maternal education level, marital status, and neighborhood environment) and MI interaction. A secondary aim was to identify the SES measures' influences on MI interaction through the effects of maternal depressive and/or anxiety symptoms and social support. Understanding of these relationships is crucial to develop effective interventions for improving MI interaction in families facing socioeconomic adversity.

This study applied a modified version of Belsky's process model of the determinants of parenting (1984) to determine the pathway by which socioeconomic adversity influences MI interaction while accounting for the potential effects of maternal depressive and anxiety symptoms and social support. The process model indicates that parent-child relations are influenced by three determinants of parenting: (1) parental psychological resources, including parent developmental history, psychological well-being, and personal maturity (age); (2) contextual sources of stress and support, including marital relations, social networks, and employment; and (3) child characteristics (temperament). Through parenting, the determinants ultimately influence child development. In particular, the model posits that parental psychological resources are the determinants having the greatest influence on parenting. Also, compared to their direct effects on parenting, the indirect effects of the contextual sources of

stress on parenting through parental psychological resources are stronger. The focus of this study was limited to the associations among three concepts of Belsky's model: contextual sources of stress and support, maternal psychological well-being, and parenting. In the study, contextual sources of stress and support were defined as SES measures and social support, maternal psychological well-being as maternal depressive and/or anxiety symptoms, and parenting as MI interaction. Figures 2 shows the hypothesized pathways examined in this study.

The study hypotheses were as follows:

1. SES measures have a direct, positive relationship with MI interaction (path a).
2. SES measures negatively influence MI interaction through the effects of elevated symptoms of maternal depression and/or anxiety (path b).
3. SES measures positively influence MI interaction through the effect of social support (path c).
4. SES measures positively influence symptoms of depression and/or anxiety through the effect of social support (path d).

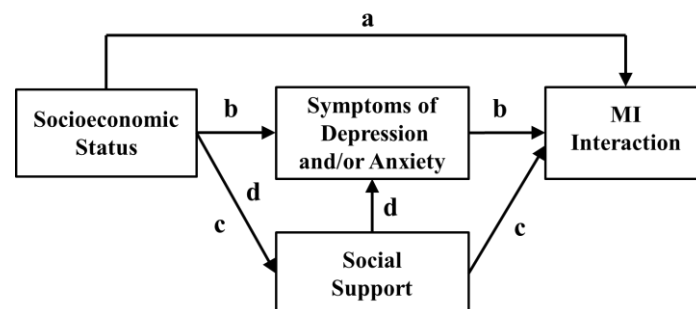


Figure 2. Conceptual model of hypothesized pathways among SES, depressive and/or anxiety symptoms, social support, and MI interaction (modified from Belsky, 1984).

Methods

A cross-sectional correlational study was conducted using data from the Family Life Project (FLP). The FLP was a longitudinal investigation (2003-2008) of families living in rural areas in eastern North Carolina and central Pennsylvania with high poverty rates. In three selected counties of each of those states, 1,292 families were recruited. The FLP applied two

stages of sampling. In the first stage, all seven hospitals in the three Pennsylvania counties were identified, and three hospitals were randomly selected; only three hospitals were present in the three North Carolina counties, and all three of those hospitals were selected. In the second stage, mothers who had given birth in the six selected hospitals were sampled. To achieve oversampling of low-income families, the project included families whose (a) household income was below 200% of the national poverty line value in 2002, (b) mothers received economic social services (e.g., via the Supplemental Nutrition Assistance Program, Women Infant Children program, or Medicaid), and (c) mothers or heads of household had less than a high school education. Among eligible families who had a child born in the hospitals between September 15, 2003, and September 14, 2004, and who were willing to participate in the study, 58% were randomly selected and invited to participate. Of the invited families, 82% (1,292) were enrolled and received initial home visits by FLP researchers. The home visits included completion of self-report questionnaires and interviews in addition to videotaped observations of MI interaction. During the project period, home visits were conducted for data collection at infant ages of 2, 6, 15, 24, and 36 months (Burchinal et al., 2008).

Sample

A total of 1,198 mother and infant dyads who participated in the FLP's 6-month home visit were included in the present study. Under the inclusion criteria of this study, each maternal participant was (1) the biological mother in a dyad who participated in the FLP's 6-month home visit, (2) the primary respondent during the home visit, and (3) also the primary respondent during the 2-month home visit. Of 1,292 families initially recruited, 1,212 families participated in the 6-month home visit; of these, 14 families were excluded because another primary caregiver (father, foster parent, grandparent, or other adult relative) was the primary respondent during the home visit or because the primary respondent was different from that of the 2-month visit. Thus, for this study's analysis, data for 1,198 participants were used.

Measures

Detailed information on the measures discussed below is provided in [Appendix A](#).

Maternal Socioeconomic Status

Maternal SES was assessed using the following four measures: income-to-needs ratio, education level, marital status, and neighborhood environment.

Income-to-Needs Ratio, Education Level, and Marital Status. Data on income-to-needs ratio, education level, and marital status were collected in the interview with each maternal participant during the 6-month home visit. Income-to-needs ratio was calculated by dividing the annual total household income by the 2004 federal poverty threshold with adjustment for the size and composition of the family (Vernon-Feagans et al., 2008). An income-to-needs ratio of ≤ 1 indicates that household income is at or below the poverty level. Education level was coded in 15 categories ranging from “less than 7th grade” to “professional degree”; for the purposes of this study, four categories reflecting the highest diploma or college degree completed were employed, ranging from 1=no high school diploma to 4=graduate degree. Marital status was coded in six categories, but for this study, two categories (single and married) were employed. Mothers who described themselves as being not married, divorced, separated, or widowed were coded as being single.

Neighborhood Environment. Neighborhood environment was assessed using the 3-item Neighborhood Environment Scale (NES) of the FLP’s Windshield Survey (Burchinal et al., 2008). The Windshield Survey had 12 items drawn from the Post-Visit Reaction Inventory of the FAST Track project (Conduct Problems Prevention Research Group, 1992). Using the survey, home visitors assessed maternal participants’ receptiveness to and preparedness for the home visit and household and neighborhood characteristics at the end of the visit. The NES consisted of the following three items scored on 4-point scales: (a) the safety of the area outside

this building (b) the noise level in the neighborhood, and (c) the safety of the neighborhood. In this study, the mean score for the three items was used for analysis, and higher scores indicated better neighborhood environment. The Cronbach's α value for the NES was 0.76, but the FLP did not provide evidence of the NES's validity. One dissertation study (Hall, 2017) evaluated the validity of the FLP's Windshield Survey and reported that a four-item subscale including the three NES items had acceptable validity; however, no study has specifically reported on the validity of the three-item NES.

Maternal Psychological Well-Being

Maternal psychological well-being was measured as maternal depressive and anxiety symptoms using the Brief Symptom Inventory-18 (BSI-18; Derogatis & Savitz, 2000). The BSI-18 is a self-reported instrument used to assess elevated psychological distress symptoms. The instrument consists of three six-item subscales: somatization, depression, and anxiety, but this study used the subscales for depression and anxiety only. Specifically, the mean scores for each 6-item subscale and for the combined 12 items of the two subscales were used, with higher scores indicating more elevated symptoms. The Cronbach's α values for the depression and anxiety subscales and the combined subscales were 0.81, 0.78, and 0.87, respectively. The subscales showed strong convergent validity versus the 4-item version of the Patient Health Questionnaire (PHQ; Kroenke et al., 2009). The depression subscale showed strong correlations with the PHQ depression scale ($r = 0.72$) and anxiety scale ($r = 0.71$); the anxiety subscale also showed strong correlations with the PHQ depression scale ($r = 0.64$) and anxiety scale ($r = 0.72$) (Franke et al., 2017).

Social Support

Social support was measured using the short form of the Questionnaire of Social Support (QSS; Crnic & Booth, 1991). The short form is a self-report instrument having 16 items and is used to evaluate satisfaction with social support. The instrument has 15 items in

four subscales—community involvement, friendship, family, and intimate relationships (spouse or partner). The 16th item assesses parental attitude with respect to general life satisfaction. In this study, the mean score for the first 15 items was used as the QSS composite score, with higher scores indicating greater social support; the 16th item was excluded. The Cronbach's α value for the mean QSS score was 0.86 in this study; no previous study has reported on the validity of this measure.

Mother-Infant Interaction

MI interaction was assessed by maternal behavior (maternal sensitivity and positive engagement) and infant behavior during an observed episode of free-play interaction. MI interaction was videotaped for 10 minutes, and during the interaction, mothers were asked to play with their children using toys as they typically would during the day (Cox & Crnic, 2002; National Inst of Child Health & Human Development, 1999). The videotaped interaction was coded by two trained coders using a 5-point scale. To assess the quality of maternal behavior during the interaction, seven subscales were used: (a) sensitivity/responsiveness, (b) detachment/disengagement, (c) positive regard, (d) animation, (e) stimulation of development, (f) intrusiveness, and (g) negative regard. To assess the quality of infant behavior during the interaction, two subscales were used: (a) positive mood and (b) negative mood. Inter-rater reliability, which was calculated using the intraclass correlation for composites and each behavior subscale, was maintained at $r = .80$ or greater.

Maternal Sensitivity and Positive Engagement. Maternal sensitivity and maternal positive engagement were assessed using two composite scores. The composite score for maternal sensitivity was composed of the mean scores for three subscales: sensitivity/responsiveness, intrusiveness (reverse-scored), and negative regard (reverse-scored) (Vernon-Feagans et al., 2008). The composite score for maternal positive engagement was composed of the mean scores for four subscales: detachment/disengagement (reverse-scored),

positive regard, animation, and stimulation of development. In this study, the Cronbach's α values for maternal sensitivity and maternal positive engagement were 0.69 and 0.87, respectively. No previous study has reported on the validity of the composite scores.

Infant Behavior. Infant behavior was assessed using the mean scores for the two subscales addressing infant (a) positive mood (degree of satisfaction, contentment, and pleasure expressed with the situation overall) and (b) negative mood (degree of discontentment expressed). Because each subscale was composed of a single item, internal consistency was not calculated.

Maternal Parenting Behavior. Maternal parenting behavior was assessed using the Home Observation for Measurement of the Environment (HOME) inventory (Caldwell & Bradley, 1984). During the home visit, the inventory was completed based on the semi-structured interview and observation of MI interaction. In the FLP, 28 items in three HOME subscales were used (versus the 45 items in the six subscales of the original HOME inventory): (a) parental responsiveness, (b) acceptance of child, and (c) learning materials. Employing binary scoring (*Yes*=1 and *No*=0), these three subscales were used to assess the quality of maternal parenting, degree of responsiveness and sensitivity observed in a mother's interactions with her infant, and use of age-appropriate objects that would stimulate the infant's cognitive skills. In this study, the summed scores for the three subscales were calculated, and then a standardized sum score (z-score) was used for analysis. Higher z-scores indicated higher quality of maternal parenting behavior. The Cronbach's α value for the three subscales was 0.81 (Hereafter, "HOME parenting" refers to the maternal parenting behavior measured using the HOME inventory).

Covariates

Covariates controlled for in the data analysis included maternal sociodemographic characteristics. Specifically, these characteristics consisted of maternal age, race, ethnicity, and number of children under 18 years of age living in the household.

Data Analysis

Data were cleaned and prepared for analysis using Stata/IC 15.1. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to analyze maternal characteristics. Pearson *r* correlation coefficients and Spearman's Rho were used to examine associations between the SES measures (income-to-needs ratio, education level, marital status, and neighborhood environment) and MI interaction.

To test the hypothesized mediation models, Mplus 8 was used to conduct structural equation modeling (SEM). Maternal symptoms of depression and/or anxiety and social support were modeled as mediators of the relationship between the SES measures and MI interaction. In specifying the mediation models, all possible combinations of variables were considered based on the study hypotheses. For instance, to examine maternal psychological well-being as a mediator, 15 models were specified in combinations of the three subscales of maternal psychological well-being and the five MI interaction variables (maternal sensitivity, positive engagement, HOME parenting, and infant positive and negative moods). Other models were specified in a similar way, resulting in 5 social support mediation models (social support \times 5 MI interaction variables) and 15 models for the sequential mediation paths of social support and maternal psychological well-being (social support \times 3 subscales of maternal psychological well-being \times 5 MI interaction variables). Overall, 35 models were specified to test the mediating effects of maternal psychological well-being and social support.

To assess for indirect (mediated) effects in the mediation models, bias-corrected bootstrap confidence intervals based on 5,000 estimations were employed. In the models, a 95%

confidence interval (CI) that does not include 0 indicates that the indirect effect is significant (MacKinnon, 2008). Because Mplus does not produce p-values corresponding to the bias-corrected method used for the bootstrap CIs in this study, contradictions between CIs and p-values can be observed in drawing significance conclusions. In such cases, the significance conclusion was based on the CI according to the recommendation of Asparouhov and Muthén (2021). The fit of each SEM model was assessed using chi-square, the root mean square error of approximation (RMSEA), and the comparative fit index (CFI) (Hu & Bentler, 1999).

Results

Maternal Characteristics

Among the maternal participants, 53.4% were under 26 years old ([Table 1](#)). Most maternal participants were non-Hispanic (98.5%) and White (59.5%). Most mothers had a high school diploma (60.5%) as their highest educational level, and about half were single (50.7%). Slightly more than half the mothers were employed (52.4%), and the annual household income of 65% of mothers was less than \$40,000. The mean income-to-needs ratio was 1.82. The mean age of the infants was 7.72 months and the average number of children under 18 years of age in the participants' households was 2.21. The mean scores, standard deviations, and ranges for neighborhood environment, maternal psychological well-being, social support, and MI interaction are reported in [Table 1](#). Because of missing data, the total number of participants reported for individual maternal characteristics varied.

Relationships Among Variables

The relationships among the SES measures, MI interaction, maternal psychological well-being, and social support are discussed below and are presented in [Table 2](#).

SES Measures and MI Interaction

All the SES measures were significantly correlated with each other. For example, income-to-needs ratio showed moderate positive correlations (ranging from 0.35 to 0.57, $p < 0.01$) with maternal education level, marital status, and neighborhood environment.

All the SES measures were also significantly correlated with maternal parenting behaviors—maternal sensitivity, maternal positive engagement, and HOME parenting—during MI interaction. For instance, maternal sensitivity showed moderate positive correlations with most SES measures ($r=0.33$ for income-to-needs ratio, $r=0.32$ for education level, $r=0.35$ for marital status, and $r=0.19$ for neighborhood environment; $p < 0.01$).

Infant behavior during MI interaction showed significant but weak correlations with the SES measures. Infant positive mood was positively correlated with income-to-needs ratio ($r=0.08$, $p < 0.01$), education level ($r=0.13$, $p < 0.01$), marital status ($r=0.11$, $p < 0.01$), and neighborhood environment ($r=0.09$, $p < 0.01$). Infant negative mood showed a significant negative correlation with marital status only ($r=-0.07$, $p < 0.05$); that is, single status was correlated with increased level of infant negative mood.

SES Measures, Psychological Well-Being, and Social Support

Maternal depressive symptoms and combined depressive and anxiety symptoms showed significant negative correlations with all the SES measures. For instance, maternal depressive symptoms were negatively correlated with income-to-needs ratio ($r=-0.15$, $p < 0.01$), education level ($r=-0.14$, $p < 0.01$), marital status ($r=-0.13$, $p < 0.01$), and neighborhood environment ($r=-0.14$, $p < 0.01$). On the other hand, maternal anxiety symptoms showed a weak negative correlation only with neighborhood environment ($r=-0.08$, $p < 0.01$).

Social support was positively correlated with all the SES measures ($r=0.10$ for income-to-needs ratio, $r=0.06$ for education, $r=0.08$ for marital status, and $r=0.11$ for neighborhood environment; $p < 0.05$). Correlations between social support and the three maternal

psychological well-being subscales were also significant. Social support showed moderate negative correlations with maternal depressive symptoms ($r=-0.45$, $p < 0.01$), maternal anxiety symptoms ($r=-0.37$, $p < 0.01$), and combined depressive and anxiety symptoms ($r=-0.45$, $p < 0.01$).

MI Interaction, Psychological Well-Being, and Social Support

Among the MI interaction variables, only maternal sensitivity and infant negative mood showed significant correlations with maternal psychological well-being. Maternal sensitivity showed weak negative correlations with maternal depressive symptoms ($r=-0.10$, $p < 0.01$) and combined depressive and anxiety symptoms ($r=-0.07$, $p < 0.05$). Infant negative mood showed weak positive correlations (ranging from $r=0.08$ to $r=0.14$, $p < 0.01$) with all three maternal psychological well-being subscales. Finally, among the MI interaction variables, only maternal sensitivity and infant negative mood showed significant correlations with social support ($r=0.08$ and $r=-0.10$, respectively; $p < 0.05$).

Mediation Model Testing

All 35 mediation models were tested (Tables 3 through 9), and model testing yielded direct and indirect effects of SES measures on MI interaction. [Table 4](#) reports indirect effects in terms of SES measures' influence on MI interaction variables through maternal psychological well-being and/or social support and indicates whether the indirect effects were significant or not. The model fit indices are presented in [Table 5](#).

For mediation model testing, employment status was initially considered as a fifth SES measure. However, during preliminary analyses, collinearity was found between employment status and income-to-needs ratio that resulted in errors in estimating employment status coefficients in the SEM models. For this reason, employment status was not included as an independent variable in subsequent analyses.

Direct Effects of SES Measures on MI Interaction

Maternal education level, marital status, and neighborhood environment showed significant direct effects on MI interaction. Maternal education level was significantly correlated with maternal sensitivity, positive engagement, and HOME parenting. For instance, model 1 showed significant differences in level of maternal sensitivity between mothers with and without a high school diploma (coefficient=0.12, $p=0.02$), between mothers with an associate/bachelor's degree and those without a high school diploma (coefficient=0.25, $p < 0.01$), and between mothers with a graduate degree and those without a high school diploma (coefficient=0.29, $p=0.01$) ([Table 3](#)). In addition, models 2 and 5 showed moderate to strong significant effects of education level on maternal positive engagement and HOME parenting (coefficients ranging from 0.35 to 0.71, $p < 0.001$; see [Table 3](#)).

Marital status showed a significant negative correlation only with maternal sensitivity. For example, model 1 showed a significant difference in level of maternal sensitivity between single and married mothers (coefficient=-0.20, $p < 0.001$; see [Table 3](#)). Neighborhood environment showed a significant positive direct effect on HOME parenting (coefficient=0.29, $p < 0.001$)

No significant direct effects were found between any SES measure and infant behavior. Also, income-to-needs ratio showed no significant direct effect on any MI interaction variable.

Mediating Effects of Maternal Psychological Well-Being

Models 1 through 15 accounted for hypothesized path b in [Figure 2](#). Among the 15 models, models 4 and 14 showed significant mediation effects of maternal psychological well-being on the relationships of neighborhood environment and education level to infant negative mood. In model 4 ([Table 3](#)), a change in maternal depressive symptoms mediated the effects of neighborhood environment on infant negative mood while controlling for maternal race, ethnicity, and age and number of children under 18 in the household. For example, a decrease

in the level of neighborhood environment was correlated with a higher level of infant negative mood, and this effect occurred through the mediating role of increased maternal depressive symptoms (coefficient=-0.02, CI=[-0.04, -0.01], bootstrapped p=0.06; see [Table 4](#)). In addition, compared to mothers' lack of a high school diploma, mothers' graduate degree attainment was correlated with a lower level of infant negative mood through the effect of decreased maternal depressive symptoms (coefficient=-0.04, CI=[-0.09, -0.01], bootstrapped p=0.05; see [Table 4](#)). However, model 4 was not significant ([Table 5](#)).

In model 14 ([Table 3](#) and [Figure 3](#)), a change in combined maternal depressive and anxiety symptoms mediated the effect of neighborhood environment on infant negative mood. The effect of neighborhood environment on infant negative mood through maternal depressive and anxiety symptoms was -0.02 and significant (CI=[-0.04, -0.01], boot-strapped p=0.07; see [Table 4](#)). Thus, similar to model 4, neighborhood environment showed a significant negative correlation with infant negative mood, and this effect was mediated by increased maternal depressive and anxiety symptoms. Moreover, maternal depressive and anxiety symptoms showed significant mediating effects on the negative relationship between graduate degree attainment and infant negative mood (coefficient=-0.04, CI=[-0.09, -0.01], bootstrapped p=0.05; see [Table 4](#)) as compared to lack of a high school diploma. The model fit indices for model 14 were $\chi^2_{(df=6)}=14.47$, p=0.04; CFI=0.82; and RMSEA=0.03 ([Table 5](#)), and this was chosen as the final model.

The subscales of maternal psychological well-being were significantly associated with maternal positive engagement and HOME parenting. However, the subscales showed no significant mediation effects on the relationships between any SES measures and these MI interaction variables.

Mediating Effects of Social Support

Models 16 through 20 accounted for hypothesized path c in [Figure 2](#), wherein social support was hypothesized to mediate the effects of SES measures on MI interaction. In model 19 ([Table 3](#)), a change in social support mediated the effect of neighborhood environment on infant negative mood. A decrease in neighborhood environment was correlated with a higher level of infant negative mood, and this effect was mediated by a decreased level of social support (coefficient=-0.01, CI=[-0.03, -0.001], bootstrapped $p=0.08$; see [Table 4](#)). The model fit indices for model 19 were $\chi^2_{(df=7)}=14.69$, $p=0.04$; CFI=0.74; and RMSEA=0.03 ([Table 5](#)). On the other hand, social support did not mediate the relationships between other SES measures and other MI interaction variables.

Mediating Effects of Social Support and Maternal Psychological Well-Being

Models 21 through 35 accounted for the sequential process represented in hypothesized path d in [Figure 2](#), wherein the effects of SES measures on MI interaction were hypothesized to be mediated by social support and maternal psychological well-being in turn. Contrary to the hypothesis, no models showed significant sequential paths by which SES measures influenced MI interaction through social support and maternal psychological well-being ([Table 4](#)). In some models, significant relationships were found between social support and the subscales of maternal psychological well-being and between those subscales and maternal positive engagement, infant negative mood, and HOME parenting. However, the overall sequential mediating effects of social support and maternal psychological well-being were not significant. For example, in model 22 ([Table 3](#)), neighborhood environment was positively correlated with social support (coefficient=0.07, $p=0.04$), and social support showed a moderate negative correlation with maternal depressive symptoms (coefficient=-0.48, $p<0.001$); in addition, maternal depressive symptoms were positively correlated with infant negative mood (coefficient=0.08, $p=0.04$). However, the indirect effect of neighborhood

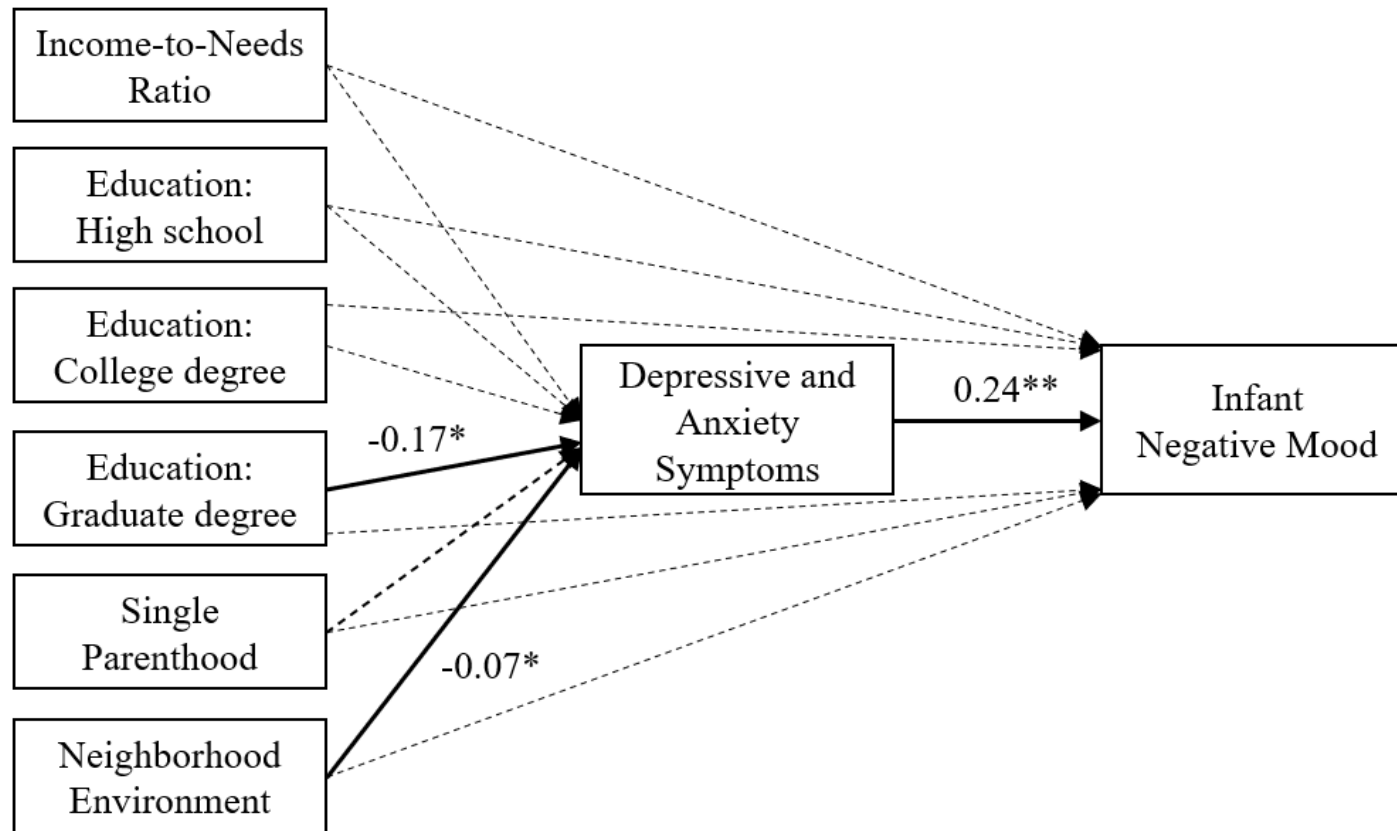


Figure 3. Path diagram for the final model (Model 14: $\chi^2_{(df=6)}=14.47$, $p=0.04$; CFI=0.82; and RMSEA=0.03). Non-standardized estimates are reported for the statistically significant effects shown as solid lines. Dashed lines represent paths that were estimated but not statistically significant. Covariates (maternal age, race and ethnicity, and number of children under 18 years old in the household) were controlled for in the model but are not included in this figure for clarity. The indirect effects of education (graduate degree attainment) and neighborhood environment through maternal depressive and anxiety symptoms were significant (coefficient=-0.04, CI=[-0.09, -0.01] and coefficient=-0.02, CI=[-0.04, -0.01], respectively). * $p<.05$; ** $p<.01$.

environment on infant negative mood through social support and maternal depressive symptoms was not significant ([Table 4](#)).

Discussion

This study investigated how four SES measures (income-to-needs ratio, education, marital status, and neighborhood environment) variously influenced MI interaction and the potential mediating roles of maternal depression, anxiety, and social support in the pathways by which those measures affected MI interaction. The study results indicated that three of the four SES measures—maternal education level, marital status, and neighborhood environment—directly influenced maternal parenting behavior during MI interaction. Although the subscales of maternal psychological well-being were significantly correlated with maternal parenting behavior, they did not mediate the relationships between SES measures and maternal parenting behavior. In the sequential mediation pathways, social support and maternal psychological well-being showed no mediation effects on the relationships between SES measures and MI interaction. Moreover, SES measures showed no significant direct effects on infant behavior during MI interaction. With respect to the indirect effects of SES measures, only neighborhood environment and graduate degree attainment showed significant indirect effects on infant negative mood through maternal depressive symptoms and combined depressive and anxiety symptoms. In addition, neighborhood environment showed a significant indirect effect on infant negative mood through social support. The main study findings are summarized in [Table 6](#).

The study results partially support the hypothesis that SES measures have a direct, positive relationship with MI interaction. For instance, maternal education level showed significant positive correlations with maternal parenting behavior. When mothers obtained a graduate degree, the positive direct effect on maternal sensitivity became greater compared to mothers who had no high school diploma. In addition, the positive effect of education level on

maternal positive engagement was stronger than that observed for maternal sensitivity. These results were consistent with the finding of a meta-analytic review that maternal education showed a positive correlation with maternal sensitivity with a small to moderate effect size (Booth et al., 2018). Booth et al. (2018) suggested that the effect of maternal education on maternal parenting behavior might be explained by the association between education level and attentional capacity. When mothers attain a higher education level, they are more likely to have improved attentional capacity (Gómez-Pérez & Ostrosky-Solís, 2006) and mothers need adequate attentional capacity to respond to their infant's cues promptly and appropriately (Pederson & Bento, 2015).

In addition, in the final model (14) that tested the hypothesis that the effects of SES measures on MI interaction are mediated by maternal psychological well-being, mothers having a graduate degree showed fewer depressive and anxiety symptoms and in turn lower infant negative mood compared to those with no high school diploma. However, this result indicating that maternal education influences infant negative mood through maternal depressive and anxiety symptoms should be interpreted with caution because only one education dummy variable showed a significant indirect effect. Consequently, further examination of the indirect effects of education level is called for.

Marital status showed a direct effect on maternal sensitivity, with single mothers showing lower maternal sensitivity compared to married women. This result is similar to Newland et al.'s (2013) finding that being married was positively correlated with sensitive parenting of children at 36 months of age. Having a supportive partner may be helpful for family functioning (Royce & Balk, 1996; Stapleton et al., 2012), whereas without a partner's assistance, single mothers may have to juggle parenting and domestic duties, resulting in lower maternal sensitivity (Booth et al., 2018). It should be noted that although all unmarried mothers were combined into one category in this study, some may have been in supportive, committed

nonmarital relationships. Different types of nonmarital relationships may have varying effects on maternal sensitivity, and thus further examination is needed of the association between maternal sensitivity and a wider range of partnerships than simple binary categories.

A third SES measure, neighborhood environment, also had a positive direct effect on maternal parenting behavior. This finding suggested that mothers living in a safer neighborhood are likely to show more positive parenting behavior. This result is similar to the findings of Hill and Herman-Stahl (2002) that neighborhood safety measured by study interviewers was negatively correlated with hostile control parenting behavior. Moreover, the final model (14) indicated that living in an unsafe neighborhood environment increases maternal depressive and anxiety symptoms, which in turn increase infant negative mood. Although Barajas-Gonzalez and Brooks-Gunn's (2014) study generated similar findings, their outcome variable was harsh parenting rather than infant behavior; in fact, little research was available to support this specific relationship.

The study results partially supported the hypothesis that the effects of SES measures on MI interaction are mediated by social support. Specifically, the results suggested that better neighborhood conditions are positively related to a higher level of social support and in turn are likely to decrease the level of infant negative mood. Little research evidence is available for the mediating role of social support in this specific relationship, and the literature reports inconsistent findings for the role of social support in various relationships. For example, while McConnell et al. (2011) found no association between financial hardship and social support, Giurgescu et al. (2015) found that the effects of perceived neighborhood environment on maternal depressive symptoms in pregnant women were mediated by social support. These inconsistent findings may be due to differing means of measuring social support in the two studies. For example, in McConnell et al.'s (2011) study, no sources or types of social support were specified, but Giurgescu et al. (2015) stated that they measured social support of different

specific types: emotional/informational, tangible, affectionate support, and support from positive social interaction.

On the other hand, income-to-needs ratio showed no significant direct effects on MI interaction, nor did it have any significant indirect effects through maternal psychological well-being and/or social support. These results were in line with Barajas-Gonzalez and Brooks-Gunn's findings (2014) that income-to-needs ratio had no direct effect on harsh parenting behavior and did not influence such parenting behavior through maternal depressive symptoms. However, other researchers have had results conflicting with our study. For example, Boothe et al. (2018) reported that higher family income was significantly correlated with higher maternal sensitivity. In addition, Newland et al. (2013) found that a change in maternal depression and anxiety mediated the effects of income-to-needs ratio on sensitive and supportive parenting behavior. Although no significant effects of income-to-needs ratio on MI interaction were found in the present study, given that income-to-needs ratio showed significant positive correlations with maternal parenting behavior, income-to-needs ratio may indirectly influence maternal parenting behavior through other pathways not examined in this study. For example, Barajas-Gonzalez and Brooks-Gunn (2014) showed that the effect of income-to-needs ratio on harsh parenting was mediated by family conflict or neighborhood disorder in families with children aged 5 to 16 years.

Contrary to expectations, maternal psychological well-being did not mediate the relationships between SES measures and any maternal parenting behavior in this study. This finding is inconsistent with that of Hill and Herman-Stahl (2002), who reported that mothers exposed to an unsafe neighborhood showed increased depressive symptoms and were in turn more likely to show inconsistent disciplinary parenting. On the other hand, this study's finding is supported by Ettekal et al. (2020), who found that the effect of socioeconomic adversity (a composite of low education level, single parenthood, low family income, and meal and money

unpredictability) on maternal sensitivity was not mediated by maternal depression. In their longitudinal study, Ettekal et al. showed that maternal depression and maternal sensitivity influenced children's conduct problems in separate pathways rather than through the same mediating pathway. Given the contradictory findings to date, additional research is needed to investigate the mediating role of maternal depressive and anxiety symptoms.

Lastly, the study results did not support the hypothesis positing the sequential mediation effects of social support and maternal psychological well-being. However, social support showed moderate correlations with maternal psychological well-being as well as weak but significant correlations with maternal sensitivity and infant negative mood. These findings imply that social support moderates the relationship between SES measures and maternal psychological well-being (Lee et al., 2009) in the sequential mediation pathways. Consequently, further investigations of the mediating and/or moderating roles of social support are called for.

Implications for Intervention

The study findings support the potential impact of interventions for improving neighborhood environment on the quality of MI interaction. Given that mothers living in unsafe neighborhoods are more likely to have increased depressive and anxiety symptoms that in turn influence increased infant negative mood, individual-level interventions to improve mothers' mental health may enhance the quality of MI interaction in families facing socioeconomic adversity. However, previous interventions to promote MI interaction for mothers with postnatal depression or anxiety have shown only a moderate improvement of MI interaction, although they have been effective in enhancing maternal mood (Huang et al., 2020; Tsivos et al., 2015). Moderate or mixed effectiveness in improving the quality of parenting was also found in interpersonal-level interventions emphasizing the importance of social support to parenting (Olds et al., 1997). Given these considerations, our findings indicate that contextual factors beyond the individual should be addressed as part of holistic approaches to improving

MI interaction. Therefore, in addition to individual- and interpersonal-level interventions, a systems approach should be considered to improve MI interaction in families experiencing socioeconomic adversity.

As an example of policies to improve families' neighborhood environment, cities across the United States have implemented a policy that helps families living in public housing in high-poverty areas to relocate to less disadvantaged neighborhoods by demolishing the public housing and providing housing vouchers (US Government Accountability Office, 2007). Chyn (2018) found that this policy showed the positive long-term effects of moving to a better neighborhood on children. Although Chyn's study did not focus on parenting behavior specifically, the results imply the potential positive impact of policies to improve neighborhood environment on MI interaction. Therefore, advocating for public policies targeted at improving neighborhood conditions, including decreasing social and physical violence and enhancing social interactions among neighbors (Wandersman & Nation, 1998), could be beneficial in improving MI interaction in families facing socioeconomic adversity.

From a research perspective, qualitative and quantitative self-reported perceptions of neighborhood safety should be examined to determine appropriate safety measures for particular communities. For example, in some communities, the noise level around dwellings (one of the subscales used in the NES instrument) may be of little consequence in terms of safety, whereas the presence of police may signal lack of safety, particularly for Black Americans who are disproportionately harmed by law enforcement systems (Richardson, A. S. et al., 2021).

Strengths and Limitations

This study thoroughly investigated multiple mediation models employing various combinations of four SES measures, maternal depressive and/or anxiety symptoms, and social

support. In particular, the inclusion of four individual SES measures as opposed to the traditional SES indicators of income and education alone is a study strength in that it expands understanding of the complex effects of socioeconomic adversity on MI interaction. By doing so, we found that although three of the four SES measures had direct effects on maternal behavior, neighborhood environment stood out as also having indirect effects on infant behavior through maternal psychological well-being or social support. This finding is significant because it reveals the importance of contextual factors beyond the scope of mother-blaming narratives of maternal behavior.

As to study limitations, because of its cross-sectional design, the long-term effects of the SES measures on MI interaction remain to be evaluated. In addition, as this study was conducted using FLP data, measurement of study variables had some limitations. First, measurement of neighborhood environment was limited to the NES instrument of the FLP Windshield Survey used by FLP home visit staff, and thus the effects of neighborhood environment may not have been fully captured. Moreover, FLP home visit staff did not employ the full version of the HOME Inventory in measuring maternal parenting behavior; use of the partial instrument may have contributed to the unexpected direction of the effect of maternal depressive and/or anxiety symptoms on HOME parenting. Investigation of the reversed direction of this effect was beyond the scope of this study, but further investigation is needed of the relationships between maternal depressive and/or anxiety symptoms and HOME parenting. Furthermore, use of the full version of the HOME inventory should be considered in future studies. Lastly, although the subscales of the FLP's MI interaction measure showed adequate internal consistency, the validity of the measure has not been reported. This is a particular issue with regard to measurement of infant behavior; because each infant mood subscale used only a single item, the measure may not fully reflect infant behavior during MI

interaction. Thus, the validity of the MI interaction measure should be evaluated in future studies to confirm the rigor of study results.

This study's employment of a large sample resulted in statistically strong evidence of the relationships between SES measures and MI interaction and the mediating effects of maternal psychological well-being and social support on those relationships. Given that the sample mainly consisted of White and Black maternal participants and included few Hispanic/Latinx mothers, the study results may not be generalizable to other racial/ethnic groups. Notably, although the effects of race and ethnicity were controlled for as covariates, the study results implied that significant differences in quality of MI interaction might exist among racial and ethnic groups. Therefore, in future, direct examination of relationships and pathways between race/ethnicity and MI interaction may uncover important differences among groups. Such findings would be consistent with a large body of research showing persistent disparities between Black and White people in a wide range of health outcomes when SES measures are controlled for. Lastly, as the FLP data were collected from 2003 through 2008, they may not be fully reflective of family life in 2021.

Conclusion

We found that neighborhood environment influences infant behavior reflecting negative mood during MI interaction through the effect of maternal depressive and anxiety symptoms or social support. Also, our results revealed potentially significant effects of maternal education level on infant negative mood mediated by maternal depressive and anxiety symptoms. Therefore, although individual and interpersonal level interventions are needed to enhance the quality of MI interaction and to potentially improve child health, public policies should also be implemented to improve neighborhood conditions for mothers and infants facing socioeconomic adversity.

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TABLE I
DESCRIPTIVE STATISTICS FOR MATERNAL CHARACTERISTICS

Variable	N (%)	Mean (SD)	Range
Maternal age (years) (n=1,198)			
Under 15	5 (0.4)		
15-25	635 (53.0)		
26-35	485 (40.5)		
36-45	73 (6.1)		
Infant age (months) (n=1,190)		7.72 (1.47)	5.03-15.38
Race (N=1,190)			
White	708 (59.50)		
Black	477 (40.08)		
Other	5 (0.42)		
Ethnicity (n=1,190)			
Hispanic	18 (1.51)		
Non-Hispanic	1,172 (98.49)		
Education (N=1,190)			
Less than high school	231 (19.41)		
Graduated high school	720 (60.50)		
Associate/Bachelor's degree	201 (16.89)		
Graduate degree	38 (3.19)		
Marital status (n=1,182)			
Single	599 (50.68)		
Married	583 (49.32)		
Employment (n=1,182)			
Yes	619 (52.37)		
No	563 (47.63)		
Annual household income (n=1,198)			
≤ \$19,999	448 (37.40)		
\$20,000–39,999	331 (27.63)		
≥ \$40,000	419 (34.97)		
Income-to-needs ratio (n=1,198)		1.82 (1.68)	0-16.49
Number of children under 18 years of age in the household (n=1,190)		2.21 (1.12)	1-7
Neighborhood environment (n=1,174)		2.99 (0.58)	1-4
Maternal psychological well-being (n=1,188)			
Depressive symptoms		0.38 (0.55)	0-3.33
Anxiety symptoms		0.37 (0.52)	0-3.83
Depressive and anxiety symptoms		0.38 (0.49)	0-3.58
Social support (n=1,029)		3.30 (0.51)	1.2-4
MI interaction			
Maternal sensitivity (n=1,138)		3.29 (0.69)	1-5
Maternal positive engagement		2.95 (0.84)	1-5
Infant positive mood (n=1,129)		2.60 (0.78)	1-5
Infant negative mood		1.68 (1.00)	1-5
Maternal parenting behavior (HOME inventory) (n=1,179)		0.63 (0.13)	0.07-1

TABLE II

RELATIONSHIPS AMONG SES MEASURES, MATERNAL PSYCHOLOGICAL WELL-BEING, SOCIAL SUPPORT,
AND MI INTERACTION

Pearson's correlation

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Income-to-Needs Ratio												
2. Education	0.56**											
3. Marital Status	0.48**	0.45**										
4. Neighborhood Environment	0.35**	0.30**	0.33**									
5. Depressive Symptoms	-0.15**	-0.14**	-0.13**	-0.14**								
6. Anxiety Symptoms	-0.04	-0.06	-0.01	-0.08**	0.69**							
7. Depressive and Anxiety Symptoms	-0.10**	-0.11**	-0.08**	-0.12**	0.92**	0.91**						
8. Social Support	0.10**	0.06*	0.08*	0.11**	-0.45**	-0.37**	-0.45**					
9. Maternal Sensitivity	0.33**	0.32**	0.35**	0.19**	-0.10**	-0.03	-0.07*	0.08*				
10. Maternal Positive Engagement	0.32**	0.39**	0.31**	0.21**	-0.02	0.04	0.01	0.03	0.34**			
11. Infant Positive Mood	0.08**	0.13**	0.11**	0.09**	-0.04	0.01	-0.02	-0.02	0.06*	0.27**		
12. Infant Negative Mood	-0.04	-0.02	-0.07*	-0.05	0.14**	0.08**	0.12**	-0.10*	-0.26**	-0.06	-0.10**	
13. Maternal Parenting Behavior (HOME Inventory)	0.37**	0.37**	0.35**	0.32**	-0.03	0.06*	0.02	0.05	0.29**	0.45**	0.12**	-0.04

* $p < 0.05$, ** $p < 0.01$

TABLE III
MEDIATION MODEL TESTING (n=1,158)

Model	Independent variable	Dependent variable					
		Maternal depressive symptoms			Maternal sensitivity		
		Estimate	SE	p ^a	Estimate	SE	p ^a
1	Income-to-needs ratio	-0.02	0.11	0.11 [-0.04, 0.00]	0.03	0.01	0.06 [0.00, 0.05]
	Education						
	High school diploma	-0.03	0.05	0.49 [-0.13, 0.06]	0.12	0.05	0.02* [0.02, 0.22]
	Associate/Bachelor's degree	-0.09	0.06	0.17 [-0.22, 0.03]	0.25	0.07	0.001* [0.10, 0.39]
	Graduate degree	-0.18	0.07	0.02* [-0.32, -0.03]	0.29	0.10	0.01** [0.09, 0.49]
	Marital status						
	Single	0.05	0.04	0.20 [-0.03, 0.13]	-0.20	0.05	<.001**[-0.29, -0.11]
	Neighborhood environment	-0.08	0.03	0.02* [-0.15, -0.01]	0.01	0.04	0.79 [-0.06, 0.08]
	Maternal depressive symptoms	-	-	-	-0.05	0.04	0.18 [-0.12, 0.02]
	Race						
	Black	-	-	-	-0.40	0.04	<.001** [-0.48, -0.31]
	Others	-	-	-	-0.10	0.36	0.77 [-0.58, 0.87]
	Ethnicity						
	Hispanic	-	-	-	-0.18	0.21	0.40 [-0.62, 0.21]
	Maternal age (years)						
	16-25	-	-	-	-0.03	0.15	0.85 [-0.29, 0.30]
	26-35	-	-	-	0.02	0.16	0.88 [-0.25, 0.36]
	36-45	-	-	-	-0.11	0.17	0.95 [-0.33, 0.36]
	Number of children under 18	-	-	-	-0.02	0.02	0.24 [-0.06, 0.01]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III
MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable					
		Maternal depressive symptoms			Maternal positive engagement		
		Estimate	SE	p ^a	Estimate	SE	p ^a
2	Income-to-needs ratio	-0.02	0.11	0.11 [-0.04, 0.00]	0.03	0.02	0.12 [0.00, 0.07]
	Education						
	High school diploma	-0.03	0.05	0.49 [-0.13, 0.06]	0.35	0.07	<.001** [0.23, 0.48]
	Associate/Bachelor's degree	-0.09	0.06	0.17 [-0.22, 0.03]	0.61	0.09	<.001** [0.43, 0.79]
	Graduate degree	-0.18	0.07	0.02* [-0.32, -0.03]	0.71	0.15	<.001** [0.41, 0.99]
	Marital status						
	Single	0.05	0.04	0.20 [-0.03, 0.13]	-0.11	0.06	0.05[-0.23, 0.00]
	Neighborhood environment	-0.08	0.03	0.02* [-0.15, -0.02]	0.07	0.04	0.10 [-0.02, 0.16]
	Maternal depressive symptoms	-	-	-	0.08	0.04	0.04* [0.004, 0.16]
	Race						
	Black	-	-	-	-0.37	0.05	<.001** [-0.47, -0.27]
	Others	-	-	-	0.05	0.45	0.92 [-0.99, 0.96]
	Ethnicity						
	Hispanic	-	-	-	0.29	0.16	0.08 [-0.05, 0.59]
	Maternal age (years)						
	16-25	-	-	-	0.45	0.37	0.22 [-0.35, 1.14]
	26-35	-	-	-	0.52	0.37	0.16 [-0.28, 1.22]
	36-45	-	-	-	0.55	0.38	0.15 [-0.26, 1.26]
	Number of children under 18	-	-	-	0.00	0.02	0.98 [-0.04, 0.04]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III
MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable					
		Maternal depressive symptoms			Infant negative mood		
		Estimate	SE	p ^a	Estimate	SE	p ^a
4	Income-to-needs ratio	-0.02	0.11	0.11 [-0.04, 0.00]	0.00	0.03	0.92 [-0.05, 0.05]
	Education						
	High school diploma	-0.03	0.05	0.49 [-0.13, 0.06]	0.04	0.08	0.67 [-0.13, 0.20]
	Associate/Bachelor's degree	-0.09	0.06	0.17 [-0.22, 0.03]	0.16	0.12	0.19 [-0.08, 0.40]
	Graduate degree	-0.18	0.07	0.02* [-0.32, -0.03]	0.03	0.19	0.88 [-0.33, 0.40]
	Marital status						
	Single	0.05	0.04	0.20 [-0.03, 0.13]	0.11	0.08	0.17 [-0.04, 0.25]
	Neighborhood environment	-0.08	0.03	0.02* [-0.15, -0.02]	-0.04	0.06	0.47 [-0.16, 0.08]
	Maternal depressive symptoms	-	-	-	0.23	0.06	<.001** [0.11, 0.36]
	Race						
	Black	-	-	-	0.11	0.07	0.14 [-0.04, 0.24]
	Others	-	-	-	-0.30	0.26	0.25 [-0.70, 0.33]
	Ethnicity						
	Hispanic	-	-	-	-0.23	0.19	0.21 [-0.57, 0.16]
	Maternal age (years)						
	16-25	-	-	-	0.53	0.16	0.001** [0.18, 0.79]
	26-35	-	-	-	0.50	0.17	0.003** [0.15, 0.80]
	36-45	-	-	-	0.62	0.20	0.002** [0.19, 0.99]
	Number of children under 18	-	-	-	-0.02	0.03	0.60 [-0.07, 0.04]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III
MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable					
		Maternal depressive symptoms			HOME parenting		
		Estimate	SE	p ^a	Estimate	SE	p ^a
5	Income-to-needs ratio	-0.02	0.11	0.11 [-0.04, 0.00]	0.03	0.02	0.10 [0.00, 0.07]
	Education						
	High school diploma	-0.03	0.05	0.49 [-0.13, 0.06]	0.39	0.08	<.001** [0.23, 0.54]
	Associate/Bachelor's degree	-0.09	0.06	0.17 [-0.22, 0.03]	0.62	0.10	<.001** [0.43, 0.81]
	Graduate degree	-0.18	0.07	0.02* [-0.32, -0.03]	0.35	0.13	0.01** [0.08, 0.60]
	Marital status						
	Single	0.05	0.04	0.20 [-0.03, 0.13]	-0.12	0.06	0.06 [-0.24, 0.00]
	Neighborhood environment	-0.08	0.03	0.02* [-0.15, -0.02]	0.29	0.05	<.001** [0.19, 0.38]
	Maternal depressive symptoms	-	-	-	0.08	0.05	0.09 [-0.01, 0.17]
	Race						
	Black	-	-	-	-0.66	0.06	<.001** [-0.78, -0.55]
	Others	-	-	-	-0.39	0.35	0.26 [-1.10, 0.33]
	Ethnicity						
	Hispanic	-	-	-	-0.36	0.28	0.20 [-0.94, 0.15]
	Maternal age (years)						
	16-25	-	-	-	-0.70	0.69	0.31 [-1.98, 0.77]
	26-35	-	-	-	-0.61	0.70	0.38 [-1.88, 0.83]
	36-45	-	-	-	-0.63	0.70	0.37 [-1.91, 0.86]
	Number of children under 18	-	-	-	-0.08	0.02	0.001** [-0.13, -0.03]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III
MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable					
		Maternal depressive and anxiety symptoms			Infant negative mood		
		Estimate	SE	p ^a	Estimate	SE	p ^a
14	Income-to-needs ratio	-0.01	0.01	0.40 [-0.03, 0.01]	0.00	0.03	0.95 [-0.05, 0.05]
	Education						
	High school diploma	-0.03	0.04	0.54 [-0.11, 0.06]	0.04	0.08	0.68 [-0.14, 0.20]
	Associate/Bachelor's degree	-0.07	0.06	0.21 [-0.18, 0.04]	0.16	0.12	0.19 [-0.08, 0.40]
	Graduate degree	-0.17	0.07	0.01* [-0.30, -0.03]	0.03	0.19	0.88 [-0.33, 0.40]
	Marital status						
	Single	0.01	0.04	0.87 [-0.07, 0.08]	0.11	0.08	0.14 [-0.04, 0.26]
	Neighborhood environment	-0.07	0.03	0.02* [-0.13, -0.01]	-0.05	0.06	0.44 [-0.16, 0.07]
	Maternal depressive and anxiety symptoms	-	-	-	0.24	0.07	<.001** [0.11, 0.36]
	Race						
	Black	-	-	-	0.12	0.07	0.10 [-0.03, 0.25]
	Others	-	-	-	-0.30	0.25	0.23 [-0.68, 0.31]
	Ethnicity						
	Hispanic	-	-	-	-0.23	0.19	0.21 [-0.57, 0.16]
	Maternal age (years)						
	16-25	-	-	-	0.51	0.18	0.01** [0.10, 0.80]
	26-35	-	-	-	0.48	0.19	0.01* [0.07, 0.80]
	36-45	-	-	-	0.61	0.22	0.01** [0.13, 1.00]
	Number of children under 18	-	-	-	0.01	0.03	0.61 [-0.07, 0.04]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III
MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable					
		Social support			Infant negative mood		
		Estimate	SE	p ^a	Estimate	SE	p ^a
19	Income-to-needs ratio	0.02	0.01	0.08 [0.00, 0.04]	0.00	0.03	0.97 [-0.05, 0.05]
	Education						
	High school diploma	-0.02	0.05	0.64 [-0.11, 0.07]	0.03	0.08	0.76 [-0.14, 0.19]
	Associate/Bachelor's degree	-0.06	0.06	0.36 [-0.18, 0.07]	0.13	0.12	0.28 [-0.11, 0.38]
	Graduate degree	0.03	0.10	0.80 [-0.18, 0.21]	-0.01	0.18	0.98 [-0.36, 0.37]
	Marital status						
	Single	-0.04	0.04	0.32 [-0.11, 0.04]	0.11	0.08	0.14 [-0.04, 0.27]
	Neighborhood environment	0.07	0.03	0.02* [0.01, 0.13]	-0.05	0.06	0.40 [-0.17, 0.07]
	Social support	-	-	-	-0.18	0.07	0.01** [-0.32, -0.05]
	Race						
	Black	-	-	-	0.10	0.07	0.17 [-0.04, 0.23]
	Others	-	-	-	-0.31	0.27	0.26 [-0.72, 0.37]
	Ethnicity						
	Hispanic	-	-	-	-0.27	0.19	0.16 [-0.62, 0.14]
	Maternal age (years)						
	16-25	-	-	-	0.51	0.20	0.01* [0.05, 0.83]
	26-35	-	-	-	0.48	0.21	0.02* [0.01, 0.83]
	36-45	-	-	-	0.60	0.25	0.02** [0.06, 1.04]
	Number of children under 18	-	-	-	-0.02	0.03	0.54 [-0.07, 0.04]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE III

MEDIATION MODEL TESTING (continued) (n=1,158)

Model	Independent variable	Dependent variable								
		Social support			Maternal depressive symptoms			Maternal positive engagement		
		Coef.	SE	p ^a	Coef.	SE	p ^a	Coef.	SE	p ^a
22	Income-to-needs ratio	0.02	0.01	0.08 [0.00, 0.04]	-0.01	0.01	0.36 [-0.03, 0.01]	0.03	0.02	0.12 [0.00, 0.07]
	Education									
	High school diploma	-0.03	0.04	0.58 [-0.12, 0.07]	-0.05	0.04	0.30 [-0.13, 0.04]	0.35	0.07	<.001** [0.23, 0.48]
	Associate/Bachelor degree	-0.06	0.06	0.36 [-0.18, 0.06]	-0.12	0.06	0.04* [-0.23, -0.01]	0.61	0.09	<.001** [0.43, 0.79]
	Graduate degree	0.03	0.10	0.79 [-0.18, 0.21]	-0.16	0.08	0.03* [-0.31, -0.01]	0.71	0.15	<.001** [0.41, 0.99]
	Marital status									
	Single	-0.03	0.04	0.45 [-0.10, 0.05]	0.04	0.04	0.29 [-0.03, 0.11]	-0.11	0.06	0.05 [-0.23, 0.00]
	Neighborhood environment	0.07	0.03	0.04* [0.004, 0.13]	-0.05	0.03	0.14 [-0.11, 0.02]	0.07	0.04	0.10 [-0.02, 0.16]
	Social support	-	-	-	-0.48	0.04	<.001** [-0.57, -0.40]	-	-	-
	Maternal depressive symptoms	-	-	-	-	-	-	0.08	0.04	0.04* [0.004, 0.16]
	Race									
	Black	-	-	-	-	-	-	-0.37	0.05	<.001** [-0.47, -0.27]
	Others	-	-	-	-	-	-	0.05	0.45	0.92 [-0.99, 0.96]
	Ethnicity									
	Hispanic	-	-	-	-	-	-	0.29	0.16	0.08 [-0.05, 0.59]
	Maternal age (years)									
	16-25	-	-	-	-	-	-	0.45	0.37	0.22 [-0.35, 1.14]
	26-35	-	-	-	-	-	-	0.52	0.37	0.16 [-0.28, 1.22]
	36-45	-	-	-	-	-	-	0.55	0.38	0.15 [-0.26, 1.26]
	Number of children under 18	-	-	-	-	-	-	0.00	0.02	0.98 [-0.04, 0.04]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval].

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE IV
INDIRECT EFFECTS OF SES MEASURES ON MI INTERACTION

Path	Independent variable	Dependent variable				
		Maternal sensitivity	Maternal positive engagement	Infant positive mood	Infant negative mood	Maternal parenting behavior
		Est. ^a [C.I.] ^b	Est. [C.I.]	Est. [C.I.]	Est. [C.I.]	Est. [C.I.]
SES ↓ Depression ↓ MI interaction	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, -0.00]	0.00 [0.00, 0.00]
	Education ^c	0.00 [0.00, 0.01]	0.00 [-0.02, 0.01]	0.00 [-0.01, 0.01]	-0.01 [-0.03, 0.02]	0.00 [-0.02, 0.01]
	Education ^d	0.00 [0.00, 0.02]	-0.01 [-0.03, 0.00]	0.00 [-0.01, 0.01]	-0.02 [-0.06, 0.01]	-0.01 [-0.03, 0.00]
	Education ^e	0.01 [0.00, 0.03]	-0.02 [-0.04, 0.00]	0.00 [-0.01, 0.02]	-0.04 [-0.09, -0.01]	-0.01 [-0.04, 0.00]
	Marital status ^f	0.00 [0.00, 0.00]	0.00 [0.00, 0.02]	0.00 [-0.01, 0.01]	0.01 [-0.01, 0.03]	0.00 [0.00, 0.02]
	Neighborhood environment	0.00 [0.00, 0.01]	-0.01 [-0.02, 0.00]	0.00 [-0.01, 0.01]	-0.02 [-0.04, -0.01]	-0.01 [-0.02, 0.00]
SES ↓ Anxiety ↓ MI interaction	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]
	Education ^c	0.00 [0.00, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.00]	0.00 [-0.02, 0.01]	0.00 [-0.02, 0.01]
	Education ^d	0.01 [0.00, 0.01]	0.00 [-0.02, 0.01]	0.00 [-0.01, 0.01]	-0.01 [-0.03, 0.01]	-0.01 [-0.03, 0.01]
	Education ^e	0.01 [0.00, 0.03]	-0.01 [-0.04, 0.00]	0.00 [-0.02, 0.01]	-0.03 [-0.06, 0.00]	-0.02 [-0.05, 0.00]
	Marital status ^f	0.00 [0.00, 0.01]	0.00 [-0.01, 0.00]	0.00 [-0.01, 0.01]	-0.01 [-0.02, 0.01]	-0.01 [-0.02, 0.00]
	Neighborhood environment	0.00 [0.00, 0.01]	-0.01 [-0.01, 0.00]	0.00 [-0.01, 0.01]	-0.01 [-0.03, 0.00]	-0.01 [-0.02, 0.00]
SES ↓ Depression and Anxiety ↓ MI interaction	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]
	Education ^c	0.00 [0.00, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	-0.01 [-0.03, 0.01]	0.00 [-0.02, 0.01]
	Education ^d	0.00 [0.00, 0.02]	-0.01 [-0.02, 0.00]	0.00 [-0.01, 0.01]	-0.02 [-0.05, 0.01]	-0.01 [-0.03, 0.00]
	Education ^e	0.01 [0.00, 0.03]	-0.02 [-0.04, 0.00]	0.00 [-0.02, 0.02]	-0.04* [-0.09, -0.01]	-0.02 [-0.05, 0.00]
	Marital status ^f	0.00 [-0.01, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]	0.00 [-0.02, 0.02]	0.00 [-0.01, 0.01]
	Neighborhood environment	0.00 [0.00, 0.01]	-0.01 [-0.02, 0.00]	0.00 [-0.01, 0.01]	-0.02 [-0.04, -0.01]	-0.01 [-0.02, 0.00]
SES ↓ Social Support ↓ MI interaction	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.00]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]
	Education ^c	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.02]	0.00 [-0.01, 0.01]
	Education ^d	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.02]	0.01 [-0.01, 0.04]	0.00 [-0.01, 0.01]
	Education ^e	0.00 [-0.01, 0.02]	0.00 [-0.01, 0.01]	0.00 [-0.02, 0.01]	0.00 [-0.04, 0.03]	0.00 [-0.01, 0.01]
	Marital status ^f	0.00 [-0.01, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.01]	0.01 [-0.01, 0.03]	0.00 [-0.01, 0.01]
	Neighborhood environment	0.00 [0.00, -0.01]	0.00 [-0.01, 0.01]	-0.01 [-0.02, 0.00]	-0.01 [-0.03, -0.001]	0.00 [-0.01, 0.01]
SES ↓ Social Support	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]
	Education ^c	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
	Education ^d	0.00 [-0.01, 0.00]	0.00 [0.00, 0.01]	0.00 [-0.01, 0.00]	0.01 [-0.01, 0.02]	0.00 [0.00, 0.01]

↓	Education ^e	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]	0.00 [-0.03, 0.02]	0.00 [-0.01, 0.01]
Depression	Marital status ^f	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
↓						
MI interaction	Neighborhood environment	0.00 [0.00, 0.01]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]	-0.01 [-0.02, 0.00]	0.00 [-0.01, 0.00]
SES	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]
↓	Education ^c	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
Social Support	Education ^d	0.00 [-0.01, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
↓	Education ^e	0.00 [0.00, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.00]	0.00 [-0.02, 0.01]	0.00 [-0.01, 0.01]
Anxiety	Marital status ^f	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.01]
↓						
MI interaction	Neighborhood environment	0.00 [0.00, 0.00]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.00]	0.00 [-0.01, 0.00]
SES	Income-to-needs ratio	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]
↓	Education ^c	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
Social Support	Education ^d	0.00 [-0.01, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.01 [-0.01, 0.02]	0.00 [0.00, 0.01]
↓	Education ^e	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.01, 0.01]	0.00 [-0.03, 0.02]	0.00 [-0.01, 0.01]
Depression and Anxiety	Marital status ^f	0.00 [0.00, 0.00]	0.00 [0.00, 0.01]	0.00 [0.00, 0.00]	0.00 [-0.01, 0.01]	0.00 [0.00, 0.01]
↓						
MI interaction	Neighborhood environment	0.00 [0.00, 0.01]	0.00 [-0.01, 0.00]	0.00 [0.00, 0.00]	-0.01 [-0.02, 0.00]	0.00 [-0.01, 0.00]

Note. ^a Unstandardized path estimate; ^b 95 percent bias-corrected confidence intervals reported as: [Lower Limit Confidence Interval, Upper Limit Confidence Interval]; ^c High school diploma; ^d Associate/Bachelor degree; ^e Graduate degree; ^f Single.

Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE V
MODEL FIT INDICES

Mediator	Model	X ²	df	p	CFI	RMSEA
Maternal Depressive Symptoms	1	6.31	7	0.50	1.000	0.000
	2	6.31	7	0.50	1.000	0.000
	3	6.31	7	0.50	1.000	0.000
	4	6.31	7	0.50	1.000	0.000
	5	6.31	7	0.50	1.000	0.000
Maternal Anxiety Symptoms	6	23.56	7	0.001	0.948	0.045
	7	23.56	7	0.001	0.943	0.045
	8	23.56	7	0.001	0.577	0.045
	9	23.56	7	0.001	0.455	0.045
	10	23.56	7	0.001	0.965	0.045
Depressive and Anxiety Symptoms	11	14.47	7	0.04	0.977	0.030
	12	14.47	7	0.04	0.975	0.030
	13	14.47	7	0.04	0.830	0.030
	14	14.47	7	0.04	0.823	0.030
	15	14.47	7	0.04	0.984	0.030
Social Support	16	14.47	7	0.04	0.976	0.030
	17	14.57	7	0.04	0.974	0.031
	18	14.35	7	0.045	0.815	0.030
	19	14.69	7	0.04	0.739	0.031
	20	14.57	7	0.04	0.984	0.031
Social Support ↓ Maternal Depressive Symptoms	21	20.18	15	0.17	0.991	0.017
	22	20.12	15	0.17	0.991	0.017
	23	21.64	15	0.12	0.977	0.020
	24	21.41	15	0.12	0.978	0.019
	25	20.82	15	0.14	0.992	0.018
Social Support ↓ Maternal Anxiety Symptoms	26	37.71	15	0.001	0.953	0.036
	27	37.58	15	0.001	0.951	0.036
	28	38.64	15	<.001	0.885	0.037
	29	41.21	15	<.001	0.869	0.039
	30	38.74	15	<.001	0.963	0.037
Social Support ↓ Depressive and Anxiety Symptoms	31	28.35	15	0.02	0.976	0.028
	32	28.37	15	0.02	0.975	0.028
	33	29.53	15	0.01	0.948	0.029
	34	30.01	15	0.02	0.946	0.029
	35	29.76	15	0.01	0.979	0.029

Note. Final model appear in bold.

TABLE VI
SUMMARY OF THE EFFECTS OF SES MEASURES ON MI INTERACTION

SES measures	Direct effect	Indirect effect	Mediator	MI Interaction
Income-to-Needs Ratio	No	No	-	Maternal Parenting Behavior
Maternal Education	Yes	No	-	
Marital Status	Yes	No	-	
Neighborhood Environment	Yes	No	-	
Income-to-Needs Ratio	No	No	-	Infant Behavior (Infant Negative Mood)
Maternal Education	No	Yes*	• Maternal Depressive and Anxiety Symptoms	
Marital Status	No	No	-	
Neighborhood Environment	No	Yes	• Maternal Depressive and Anxiety Symptoms • Social Support	

*Only one dummy variable (Graduate degree) showed indirect effect compared to the reference.

II. Moderating Effect of Social Support on the Relationships Between Socioeconomic Adversity and Mother-Infant Interaction

Background

Socioeconomic adversity negatively influences parenting behavior such as mother-infant (MI) interaction (Ettekal et al., 2020; Heng et al., 2018; Mesman et al., 2012). Multiple socioeconomic status (SES) indicators (e.g., income-to-needs ratio, education level, marital status, and neighborhood environment) are used to characterize socioeconomic adversity (Sturge-Apple et al., 2017), and parenting is also an intricate set of activities influenced by multiple determinants (Belsky, 1984). Given the complexity of both socioeconomic adversity and parenting, research is needed to better understand the mechanisms linking SES indicators of socioeconomic adversity to parenting behavior.

High-quality MI interaction is vital in infancy (Bernier et al., 2016; Raby et al., 2015) because it provides an initial social learning environment (Csibra & Gergely, 2009b; Schore, 2002). However, mothers facing socioeconomic adversity may show suboptimal MI interaction because they experience high levels of adversity-related stress, and such stress could be associated with elevated symptoms of maternal depression or anxiety (Goyal et al., 2010; Kim & Bianco, 2014). In the presence of depressive or anxiety symptoms, mothers have shown suboptimal MI interaction (Beebe et al., 2011; Binda et al., 2019; Feldman et al., 2009; Reck et al., 2018).

Depression and anxiety may uniquely influence MI interaction (Barker, 2013; Nolvi et al., 2016). For example, while depressed mothers had less sensitive, engaged, and responsive interaction with their infants (Binda et al., 2019; Stanley et al., 2004), mothers with anxiety disorders displayed less sensitive but more intrusive or even fearful interaction with their infants (Beebe et al., 2011; Feldman et al., 2009; Nicol-Harper et al., 2007). These maternal

parenting behaviors can lead to distress and avoidance of social engagement in infants (Feldman et al., 2009; Warren et al., 2003). However, compared to the effect of maternal depressive symptoms on MI interaction, relatively little is known about the associations between maternal anxiety symptoms and MI interaction (Stein et al., 2012).

Social support, defined as “support accessible to an individual through social ties to other individuals, groups, and the larger community” (Lin et al., 1979), is an important determinant influencing parenting and may buffer the negative influence of socioeconomic adversity on MI interaction (Belsky, 1984). The potential mediating role of social support in the relationships between SES measures reflecting socioeconomic adversity and MI interaction was evaluated in Chapter 1. One hypothesis of that study was that SES measures positively influence MI interaction through social support and maternal psychological well-being in the sequential mediation pathways, and model test results for this hypothesis did imply a moderating effect of social support. More specifically, although social support did not mediate the effects of any SES measures on maternal psychological well-being in the sequential pathways, social support showed significant correlations with SES measures, maternal psychological well-being, and MI interaction. In particular, the fact that social support showed stronger correlations with maternal psychological well-being than with MI interaction warranted further investigation of the potential moderating role of social support in the associations between SES measures and maternal psychological well-being in the sequential mediation pathways.

The literature suggests that social support can moderate the effects of stress induced by socioeconomic adversity on maternal psychological well-being. For example, McConnell et al. (2011) suggested that in the presence of economic hardship, a high level of social support might alleviate negative effects of parenting stress on parent-child interaction. In addition, Lee et al. (2009) found that parents with low family income displayed a high level of depressive

symptoms when they had low social support, but this was not the case for those with greater social support, indicating a moderating effect. However, in contrast to these studies' findings, some researchers have found that a high level of social support was correlated with more negative parenting (Driscoll & Easterbrooks, 2007; Easterbrooks et al., 2011). The mixed study findings may be due to the complex association between social support and parenting (Driscoll & Easterbrooks, 2007). As such, it appears that the effect of social support on parenting cannot be explained simply in terms of its presence or absence but requires consideration of the quality and source of social support (Taraban et al., 2019).

The effects of social support may vary according to its sources (Antonucci & Jackson, 1990; Lepore, 1997), and various factors such as marital status and SES may contribute to differences in the crucial sources of social support available to mothers (Nath et al., 1991). For example, intimate spousal or partner support may play a more important role in a mother's positive parenting than support from the community or friends (Crnic et al., 1983; Levitt et al., 1986). However, among single mothers, the effect of family support may be greater than that of support from intimate relationships (Hetherington et al., 1985). Despite the potential importance of distinguishing between different sources of social support, many studies have employed the sum of social support from all available sources in evaluating the buffering effect of social support on parenting. This approach may not be sufficient to capture the complex effects of social support in the association between socioeconomic adversity and parenting. Therefore, additional exploration of the roles of different sources of social support is needed.

Given these considerations, understanding of the buffering effect of social support on the association between socioeconomic adversity and MI interaction is limited. Greater comprehension of the dynamics among these variables will support identification of potential targets for interventions to improve MI interaction in families facing socioeconomic adversity. Therefore, this study was conducted to examine whether social support moderates the

associations between SES measures representing socioeconomic adversity and MI interaction and, in these relationships, whether social support moderates the effects of SES measures on maternal psychological well-being. In this study, social support was categorized according to its source—community, friends, family, and partner or spouse—and each source of social support was evaluated in terms of how it moderated the associations among SES measures, maternal psychological well-being, and MI interaction. The study hypotheses were as follows:

1. Social support moderates the associations between SES measures and MI interaction

(Figure 4).

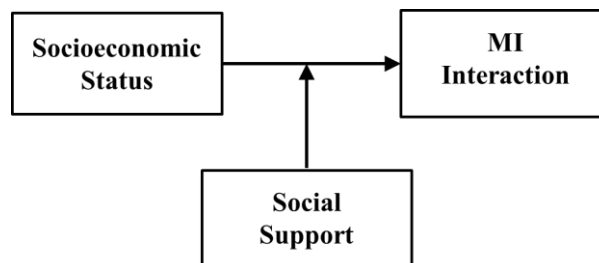


Figure 4. Hypothesized simple moderation model.

2. Social support moderates the associations between the SES measures and depressive and/or anxiety symptoms in the pathways by which SES measures influence MI interaction through the effects of these symptoms (Figure 5).

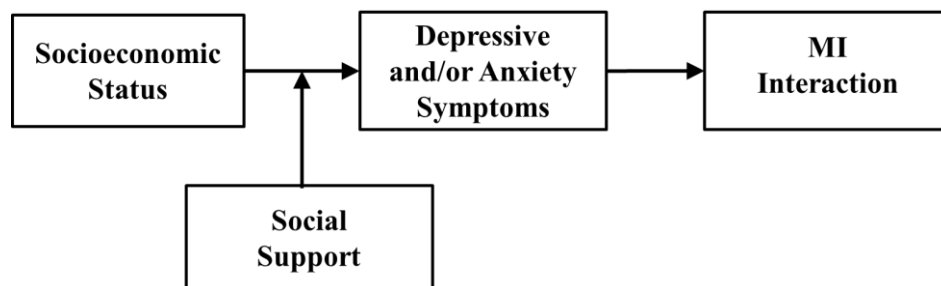


Figure 5. Hypothesized moderated mediation model.

Methods

A cross-sectional correlational study was conducted using data from the Family Life Project (FLP). The FLP was a longitudinal (2003-2008) investigation of families living in rural

areas in eastern North Carolina and central Pennsylvania with high poverty rates. In three selected counties of each of those states, 1,292 families were recruited. The FLP randomly selected three hospitals in the Pennsylvania counties and selected all three hospitals present in the North Carolina counties. Among families served by the hospitals who met multiple eligibility criteria, 58% were randomly selected and invited to participate. Of the invited families, 82% (1,292) were enrolled and received initial home visits by FLP researchers. The home visits included completion of self-report questionnaires and interviews in addition to videotaped observations of MI interaction (Burchinal et al., 2008).

Sample

A total of 1,198 mother and infant dyads who participated in the FLP were included in this study. Under the study's inclusion criteria, each maternal participant was (1) the biological mother in a dyad who participated in the FLP's 6-month home visit, (2) the primary respondent during that home visit, and (3) also the primary respondent during the 2-month home visit. Of 1,292 families initially recruited, 1,212 families participated in the 6-month home visit; of these, 14 families were excluded because another primary caregiver (father, foster parent, grandparent, or other adult relative) was the primary respondent during that home visit or because the primary respondent differed from that of the 2-month visit.

Measures

Maternal Socioeconomic Status

To measure maternal socioeconomic status, four indicators were considered: maternal participants' income-to-needs ratio, education level, marital status, and neighborhood environment.

Income-to-Needs Ratio, Education Level, and Marital Status. Data collected in the interview with each maternal participant during the 6-month home visit were used. Income-to-

needs ratio was calculated by dividing the annual total household income by the 2004 federal poverty threshold with adjustment for the size and composition of the family (Vernon-Feagans et al., 2008). Education level was coded in four categories reflecting the highest diploma or college degree completed. Finally, marital status was coded as either single or married.

Neighborhood Environment. The 3-item Neighborhood Environment Scale (NES) of the FLP's Windshield Survey (Burchinal et al., 2008) was used to measure neighborhood environment. During the survey, home visitors assessed participants' neighborhood characteristics at the end of the 6-month visit. The NES consisted of the following three items and 4-point scales: (a) the safety of the area outside this building (ranging from *1=obviously dangerous* to *4=above average safety*), (b) the noise level in the neighborhood (ranging from *1=very quiet* to *4=very noisy*), and (c) the safety of the neighborhood (ranging from *1=very safe/crime free* to *4 = very unsafe/high risk*). In this study, the mean score for the three items was used for analysis, and the Cronbach's α value for the NES was 0.77.

Social Support

The short form of the Questionnaire of Social Support (Crnic & Booth, 1991) was used to measure social support. The short form is a self-report instrument having 16 items and is used to evaluate satisfaction with social support. The instrument has 15 items in four subscales—community involvement, friendship, family, and intimate relationships (spouse or partner)—employing a 4-point Likert scale (ranging from *1=very dissatisfied* to *4=very satisfied*). The 16th item assesses parental attitude with respect to general life satisfaction. In this study, the mean values for each subscale were used in the data analysis. The Cronbach's α value for the community involvement, friendship, family, and intimate relationships subscales were 0.63, 0.77, 0.75, and 0.75, respectively.

Maternal Psychological Well-Being

The Brief Symptom Inventory-18 (Derogatis & Savitz, 2000) was used to measure maternal depressive and anxiety symptoms. The BSI-18 is a self-report instrument used to assess elevated psychological distress symptoms. The instrument has 18 items with a 5-point Likert scale (ranging from 0=*not at all* to 4=*extremely*) and consists of three six-item subscales: somatization, depression, and anxiety. This study considered only the depression and anxiety subscales. The mean scores for each 6-item subscale and for the combined 12 items were used. The Cronbach's α values for the depression and anxiety subscales and the combined subscales were 0.81, 0.78, and 0.87, respectively.

Mother-Infant Interaction

MI interaction was assessed during an observed episode of free-play interaction as part of the 6-month home visit. Specifically, MI interaction was videotaped for 10 minutes, and during the interaction, mothers were asked to play with their children using toys as they typically would during the day (Cox & Crnic, 2002; National Inst of Child Health & Human Development, 1999). The videotaped interaction was coded by two trained coders using a 5-point scale (ranging from 1=*not at all characteristic* to 5=*highly characteristic*).

Maternal Sensitivity and Positive Engagement. To assess the quality of maternal behavior during the interaction, seven subscales were used: (a) sensitivity/responsiveness, (b) detachment/disengagement, (c) positive regard, (d) animation, (e) stimulation of development, (f) intrusiveness, and (g) negative regard. The composite score for maternal sensitivity was composed of the mean scores for sensitivity/responsiveness, intrusiveness (reverse-scored), and negative regard (reverse-scored) (Vernon-Feagans et al., 2008). The composite score for maternal positive engagement was composed of the mean scores for detachment/disengagement (reverse-scored), positive regard, animation, and stimulation of

development. In this study, the Cronbach's α values for maternal sensitivity and maternal positive engagement were 0.69 and 0.87, respectively.

Infant Behavior. To assess the quality of infant behavior during the interaction, two subscales were used: (a) positive mood and (b) negative mood. The mean score for each subscale was used in the data analysis. Because each subscale was composed of a single item, internal consistency was not calculated.

Covariates

Covariates controlled for in the data analysis included maternal sociodemographic characteristics. Specifically, these characteristics consisted of maternal age, race, ethnicity, and number of children under 18 years of age living in the household.

Data Analysis

Stata/IC 15.1 was used to generate descriptive statistics (means, standard deviations, frequencies, and percentages) for participants' characteristics and for Pearson r correlation coefficients in order to examine associations among study variables. To test the hypothesized moderation models, PROCESS analyses were conducted using IBM SPSS Statistics 23. Specifically, the PROCESS macro (version 3.5.3) was used and models 1 and 7 of the macro were adopted to test the significance of the simple moderation models (hypothesis 1) and moderated mediation models (hypothesis 2), respectively. Multiple regression analysis was employed for both sets of models, and the analysis for the moderated mediation models was performed in two steps. First, SES variables, a social support variable, a subscale of maternal psychological well-being, and an interaction term (one of the four SES variables \times one of the five social support variables) were included in a model (step 1). Next, SES variables, a subscale of maternal psychological well-being, and MI interaction were included in the next model (step

2). In both steps, covariates were controlled for. In testing moderation and moderated mediation models, all possible combinations of variables were tested based on the study hypotheses.

In addition, the Johnson-Neyman technique (Johnson & Neyman, 1936) was applied to probe for significant interactions. The Johnson-Neyman technique can identify the transition point defining particular regions within the range of the moderator variable (social support in this study) at which the effect of SES measures on MI interaction is or is not statistically significant. Bootstrap confidence intervals based on 5,000 estimations were employed to assess for indirect (mediated) effects in the moderated mediation models, and in the models, a 95% confidence interval (CI) that did not include 0 indicated that the effect was significant.

Results

Maternal Characteristics

Among the maternal participants, 53.4% were under 26 years old ([Table 7](#)). Most maternal participants were non-Hispanic (98.5%) and White (59.5%). Most mothers had a high school diploma (60.5%) as their highest educational level, and about half were single (50.7%). The mean income-to-needs ratio was 1.82. The mean age of the infants was 7.72 months, and the average number of children under 18 years of age in the participants' households was 2.21. The mean scores, standard deviations, and ranges for neighborhood environment, maternal psychological well-being, social support, and MI interaction are reported in [Table 7](#). Because of missing data, the total number of participants reported for individual maternal characteristics varied.

Relationships Between Social Support and Other Variables

As Table 8 shows, social support from community involvement and from family was positively and weakly correlated with income-to-needs ratio ($r=0.08$, $p < 0.05$ for both subscales) and neighborhood environment ($r=0.14$, $p < 0.01$ and $r=0.08$, $p < 0.05$, respectively).

Social support from friendship showed no significant correlation with any SES variables, while social support from intimate relationships was positively correlated with all the SES variables ($r=0.19$ for income-to-needs ratio, $r=0.13$ for education level, $r=0.25$ for marital status, and $r=0.16$ for neighborhood environment; $p < 0.01$).

With respect to associations with MI interaction, social support from intimate relationships was significantly and positively correlated with maternal sensitivity ($r=0.19$, $p < 0.01$) and maternal positive engagement ($r=0.15$, $p < 0.01$) and negatively correlated with infant negative mood ($r=-0.12$, $p < 0.01$). On the other hand, social support from community involvement, friendships, and family showed no significant correlations with any MI interaction variables (Table 8).

All the social support subscales were negatively correlated with all the maternal psychological well-being subscales (r values ranging from -0.24 to -0.45 , $p < 0.01$). Relationships among other study variables are reported in Table 8.

Moderation Model Testing

Moderating Effects of Social Support in Simple Moderation Models (Hypothesis 1)

Among the subscales of social support, only social support from intimate relationships showed significant moderating effects in the relationships between SES measures and MI interaction. Social support from intimate relationships significantly moderated the effect of single parenthood on maternal positive engagement (coefficient= -0.17 , $p=0.02$; 95% CI= $[-0.32, -0.03]$) when maternal depressive symptoms were controlled for (see model 3 in Table 9). The result of the Johnson-Neyman analysis showed that the effect of single parenthood on maternal positive engagement was significant when the mean QSS score for social support from intimate relationships was > 3.57 out of 4 (Figure 6). In other words, single mothers who had social support from intimate relationships scored higher than 3.57 showed a lower level of maternal

positive engagement than married women with a similar level of social support from this source. Similarly, when maternal anxiety symptoms (model 4) or combined depressive and anxiety symptoms (model 5) were controlled for, the moderating effect of social support from intimate relationships on the association between single parenthood and maternal positive engagement was significant (Table 9). The significant transition point for model 4 was 3.60 (Figure 7) and for model 5 was 3.59 (Figure 8).

Social support from intimate relationships did not moderate the relationships between other SES variables (income-to-needs ratio, education, or neighborhood environment) and MI interaction.

Moderating Effects of Social Support in Moderated Mediation Models (Hypothesis 2)

Overall, maternal psychological well-being showed no significant mediating effects in the associations between SES measures and MI interaction while social support moderated the associations between SES measures and maternal psychological well-being. Although the hypothesized moderated mediation models were not significant, a significant moderating effect of social support was found in the association between neighborhood environment and maternal anxiety symptoms.

For example, as shown in Table 4, social support from intimate relationships significantly moderated the effect of neighborhood environment on maternal anxiety symptoms (coefficient=0.08, $p=0.04$; 95% CI=[0.01, 0.15]). The result of the Johnson-Neyman analysis showed that the significant transition point for social support from intimate relationships was 3.34 out of 4 (Figure 9); that is, for mothers having a mean QSS score for social support from intimate relationships < 3.34, living in a better neighborhood environment was significantly correlated with a lower level of maternal anxiety symptoms. At step 2 (see Table 10), maternal anxiety symptoms showed a significant positive correlation with infant negative mood

(coefficient=0.16, $p=0.01$; 95% CI=[0.04, 0.29]), but no significant direct or indirect effects of neighborhood environment on infant negative mood were observed. Similarly, for models having other MI interaction variables (maternal sensitivity, maternal positive engagement, or infant positive mood) as outcome variables, the moderating effects of social support from intimate relationships were significant for the association between neighborhood environment and maternal anxiety symptoms.

Although social support from intimate relationships moderated the effect of neighborhood environment on maternal anxiety symptoms, it did not moderate the effect of other SES measures on anxiety symptoms. Other subscales of social support showed no significant moderation effect in the associations between any SES measures and maternal anxiety symptoms. In other moderated mediation models having maternal depressive symptoms or combined maternal depressive and anxiety symptoms as a mediator, no social support subscales moderated the associations between SES measures and these two maternal psychological well-being subscales.

Discussion

This study was intended to achieve a better understanding of the potential buffering roles of varying kinds (community involvement, friendship, family, and intimate relationships) and degrees of social support for MI interaction in the context of socioeconomic adversity. The study results indicated that among all the subscales of social support, only social support from intimate relationships moderated the associations among SES measures, maternal psychological well-being, and MI interaction. This finding is congruent with Belsky's (1984) suggestion that when support from a spouse or partner is available to mothers, the influences of social support from other sources on quality of parenting may not be significant. Specifically, results indicated that social support from intimate relationships moderated the effect of single

parenthood on maternal positive engagement. That is, the significance of the association between single parenthood and maternal positive engagement varied depending on the level of social support from intimate relationships. In addition, although the hypothesized moderated mediation models were not significant, the study results showed that social support from intimate relationships moderated the effect of neighborhood environment on maternal anxiety symptoms. This indicates that whether or not neighborhood environment significantly influences maternal anxiety symptoms depends on the level of social support from intimate relationships.

The results partially supported the study hypothesis that social support moderates the relationships between SES measures and MI interaction, but unexpectedly, social support showed no buffering effect on the negative influences of SES measures on MI interaction. Although social support from intimate relationships moderated the effect of single parenthood on maternal positive engagement, single mothers showed lower levels of positive engagement when they had higher levels of support from intimate relationships. This finding conflicts with previous research reporting that social support from a personal intimate relationship played a protective role when quality of parenting was negatively influenced by stress (Kotch et al., 1997). However, the current study's findings are similar to those of Driscoll and Easterbrooks (2007) who reported that greater social support was positively correlated with negative parenting rather than with sensitive and engaged parenting.

Social support may function differently for mothers facing chronic stress compared to those not experiencing such stress (Green et al., 2007). Thus, there are two possible explanations for this study's finding that single mothers having greater social support from intimate relationships showed lower levels of positive engagement. One possibility is that when mothers facing chronic stress rely strongly on social support, their maternal role is impeded,

which in turn leads to suboptimal parenting behavior during interaction with their child (Driscoll & Easterbrooks, 2007; Richardson, R. A. et al., 1991). A second possibility is that for single mothers who have less support from intimate relationships, other factors such as maternal depression or anxiety may play a greater role in influencing their maternal parenting behavior than being a single parent. This possibility may be supported by the results of the simple moderation model analyses; although maternal psychological well-being was controlled for in those analyses, it showed a weak but significant association with maternal positive engagement (Table 9). The relationship between social support and parenting is complex, and social support does not function for all mothers in the same way (Taraban & Shaw, 2018). Investigation of the unexpected effect of social support was beyond the scope of this study, and further research is called for to explore the dynamics among single parenthood, social support from intimate relationships, and maternal psychological well-being.

The study results did not support the hypothesis that social support moderates the relationships between the SES measures and maternal psychological well-being in the pathways by which SES measures influence MI interaction through the effects of maternal psychological well-being. Contrary to expectations, the results showed no significant mediating effects of maternal psychological well-being on the associations between SES measures and MI interaction while social support moderated the associations between SES measures and maternal psychological well-being. However, in these pathways, social support from intimate relationships significantly moderated the effects of neighborhood environment on maternal anxiety symptoms. For mothers who had lower levels of social support from intimate relationships, living in an unsafe neighborhood was likely to increase maternal anxiety symptoms. However, for mothers who had higher levels of such support, neighborhood environment did not appear to influence maternal anxiety symptoms. This finding indicates

that social support from intimate relationships could reduce the negative effect of poor neighborhood conditions on maternal anxiety symptoms. This is important because maternal psychological well-being is a key factor influencing parenting behavior, including MI interaction (Belsky, 1984; Porreca et al., 2017). Thus, increasing social support for mothers living in poor neighborhood conditions may be a viable method of alleviating their anxiety symptoms, leading to improvement in MI interaction.

This finding--that mothers living in poor neighborhood conditions tend to show increased anxiety symptoms when social support from intimate relationships is low--is consistent with the results of two previous studies (Kingston, 2013; Kotchick et al., 2005). Those studies reported a significant moderating effect of social support on the association between neighborhood environment and maternal psychological well-being. However, the current study's findings also show inconsistencies with those studies; while they found that social support moderated the effect of neighborhood environment on maternal depressive and/or anxiety symptoms, the current study found no significant moderating effect of social support on those associations. In fact, little evidence is available to determine whether the moderating effect of social support on maternal anxiety symptoms differs from the effect on maternal depressive symptoms in the context of parenting. Additional investigation is needed of the mechanisms underlying the associations between SES measures and maternal psychological well-being moderated by social support.

Implications for Intervention

The study findings suggest that factors influencing MI interaction can differ depending on the level of social support that mothers experience. Interventions to improve MI interaction have been developed and implemented based on the assumptions that (a) the individual level is the appropriate target and (b) all mothers will respond to intervention in the same way.

However, this study's results indicate that these assumptions may need to be reconsidered. The study produced evidence that factors on both the interpersonal (social support) and community (neighborhood environment) levels play important roles in MI interaction. For example, a public policy targeted at improving neighborhood conditions could be beneficial for improving MI interaction by alleviating maternal psychological distress (Chapter 1), but in implementing this policy, mothers' social support levels should be considered. The policy might not be equally effective for every mother because for mothers who have higher levels of social support from intimate relationships, neighborhood improvement might have no mitigating effect on their anxiety symptoms. For such mothers, identifying and providing interventions for other factors influencing their psychological distress would be more effective.

In addition, the study findings suggest the potential value of interventions to enhance social support from intimate relationships. As only this type of support showed a significant moderating effect among the four sources of social support, interventions to improve relationships with a spouse or partner may be effective in reducing anxiety symptoms in mothers living in poor neighborhood environments and may improve their MI interaction. Carlson and McLanahan (2006) found that regardless of marital status, the quality of couple relationships was positively associated with positive parenting. In addition, a recent literature review suggested the importance of partner support for increasing the effectiveness of interventions to improve mothers' mental health and potentially for improving MI interaction (Sharma, 2020). Although previous interpersonal-level interventions targeting social support have shown mixed effectiveness in improving parenting (Olds et al., 1997), this may have been due to lack of understanding of social support's differing functions in individual mothers.

In conclusion, if this study's results are replicated in prospective studies, intervention development should include consideration of the moderating effect of social support, especially

support from intimate relationships. This approach may be beneficial in developing more effective interventions for improving MI interaction in the context of socioeconomic adversity.

Strengths and Limitations

One strength of this study is that by including four SES measures reflecting socioeconomic adversity, it was possible to evaluate how different components of socioeconomic adversity influence maternal psychological well-being and MI interaction with the moderating effect of social support. Moreover, in exploring the moderating roles of social support, including the four individual sources of social support made it possible to evaluate how each source functions in the associations among SES measures, maternal psychological well-being, and MI interaction. These efforts produced a broader understanding of the complex mechanisms by which socioeconomic adversity influences maternal psychological well-being and MI interaction and of how social support buffers these associations.

In addition, this is the first known study to employ the Johnson-Neyman technique to explore the moderating effects of different sources of social support on the associations among SES measures, maternal depressive and/or anxiety symptoms, and MI interaction. Instead of selecting arbitrary values for social support (e.g., low, medium, and high), which has been computed for the common pick-a-point approach, use of the Johnson-Neyman technique allowed identification of the specific range of social support that showed a significant moderating effect. While the pick-a-point approach produces results only for the arbitrary values selected for the moderator (Carden et al., 2017), the Johnson-Neyman technique provides richer information on the significance of the moderating effect by testing across all possible ranges of moderator values (Bauer & Curran, 2005). Moreover, although the Johnson-Neyman technique has not yet been widely used, it may be advantageous when the moderator is a continuous variable (Bauer & Curran, 2005; Johnson & Neyman, 1936).

Several limitations of the study should also be acknowledged. First, this study used the measurement of neighborhood environment (NES) generated by FLP home visit staff only. Using mothers' self-reported measurements of neighborhood environment would be beneficial to fully capture the effects of neighborhood environment on maternal psychological well-being and MI interaction. In addition, no study has reported on the validity of the 3-item NES, and thus the validity of this measure needs to be tested. Moreover, one QSS subscale of social support (support from community involvement) showed low internal consistency reliability (Cronbach's $\alpha=0.63$), and this may have affected the rigor of study results. No significant moderating effect of social support from community involvement was observed, but this result may have been affected by the low internal consistency reliability of the QSS community involvement subscale. Future studies should examine the effects of community involvement using a social support instrument known to have better internal consistency. Furthermore, no study has established the validity of the FLP's MI interaction measure. In particular, because each infant mood subscale consisted of only one item, the measure may not fully capture infant behavior during MI interaction. Consequently, the validity of the MI interaction measure should be evaluated to confirm the rigor of study results.

Also, all mothers who described themselves as being not married, divorced, separated, or widowed were combined into the category of "single mothers" in this study. Some of these mothers may have been in committed, supportive nonmarital relationships, but the FLP data provided no detailed information on nonmarital relationships of mothers. In future studies, consideration of a wider range of partnerships than simple binary categories would yield more rigorous study results on the buffering effect of social support from intimate relationships. Moreover, as the study sample largely consisted of non-Hispanic/Latinx, White, and Black mothers, the results may have limited generalizability to mothers in other racial/ethnic groups.

Finally, due to the cross-sectional study design, the long-term buffering effects of social support on the negative effects of socioeconomic adversity on maternal psychological well-being and MI interaction could not be assessed. Longitudinal studies should be conducted to explore these associations.

Conclusion

This study contributes to greater understanding of the roles of various kinds of social support in the associations among SES measures representing socioeconomic adversity, maternal depressive and/or anxiety symptoms, and MI interaction. The results indicated that social support from intimate relationships significantly moderated the effect of single parenthood on maternal positive engagement during MI interaction. In addition, social support from intimate relationships moderated the associations between neighborhood environment and maternal anxiety symptoms. These results highlight the importance of considering factors at both the interpersonal (social support) and community (neighborhood environment) levels when developing interventions. By assessing levels of social support from intimate relationships when designing interventions to improve neighborhood conditions, MI interaction in families experiencing socioeconomic adversity may be more effectively enhanced.

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TABLE VII**DESCRIPTIVE STATISTICS FOR PARTICIPANT CHARACTERISTICS**

Variable	N (%)	Mean (SD)	Range
Maternal age (years) (n=1,198)			
Under 15	5 (0.4)		
15-25	635 (53.0)		
26-35	485 (40.5)		
36-45	73 (6.1)		
Infant age (months) (n=1,190)		7.72 (1.47)	5.03-15.38
Race (n=1,190)			
White	708 (59.50)		
Black	477 (40.08)		
Other	5 (0.42)		
Ethnicity (n=1,190)			
Hispanic	18 (1.51)		
Non-Hispanic	1,172 (98.49)		
Education (n=1,190)			
Less than high school	231 (19.41)		
Graduated high school	720 (60.50)		
Associate/Bachelor's degree	201 (16.89)		
Graduate degree	38 (3.19)		
Marital status (n=1,182)			
Single	599 (50.68)		
Married	583 (49.32)		
Annual household income (n=1,198)			
≤ \$19,999	448 (37.40)		
\$20,000–39,999	331 (27.63)		
≥ \$40,000	419 (34.97)		
Income-to-needs ratio (n=1,198)		1.82 (1.68)	0-16.49
Number of children under 18 years of age in the household (n=1,190)		2.21 (1.12)	1-7
Neighborhood environment (n=1,174)		2.99 (0.58)	1-4
Social support			
Community involvement (n= 825)		3.06 (0.75)	1-4
Friendship (n=1,137)		3.19 (0.64)	1-4
Family (n=947)		3.25 (0.63)	1-4
Intimate relationships (n=1,009)		3.44 (0.69)	1-4
Maternal psychological well-being (n=1,188)			
Depressive symptoms		0.38 (0.55)	0-3.33
Anxiety symptoms		0.37 (0.52)	0-3.83
Depressive and anxiety symptoms		0.38 (0.49)	0-3.58
MI interaction			
Maternal sensitivity (n=1,138)		3.29 (0.69)	1-5
Maternal positive engagement		2.95 (0.84)	1-5
Infant positive mood (n=1,129)		2.60 (0.78)	1-5
Infant negative mood		1.68 (1.00)	1-5

TABLE VIII
RELATIONSHIPS AMONG SES MEASURES, SOCIAL SUPPORT, MATERNAL PSYCHOLOGICAL WELL-BEING,
AND MI INTERACTION

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Income-to-Needs Ratio														
2. Education	0.56**													
3. Marital Status	0.48**	0.45**												
4. Neighborhood Environment	0.35**	0.30**	0.33**											
5. Community Involvement ⁺	0.08*	0.06	0.05	0.14**										
6. Friendship ⁺	0.01	-0.02	0.01	0.04	0.48**									
7. Family ⁺	0.08*	0.06	0.03	0.08*	0.39**	0.52**								
8. Intimate Relationships ⁺	0.19**	0.13**	0.25**	0.16**	0.32**	0.45**	0.43**							
9. Depressive Symptoms	-0.15**	-0.14**	-0.13**	-0.14**	-0.25**	-0.33**	-0.33**	-0.42**						
10. Anxiety Symptoms	-0.04	-0.06	-0.01	-0.08**	-0.24**	-0.28**	-0.25**	-0.30**	0.69**					
11. Depressive and Anxiety Symptoms	-0.10**	-0.11**	-0.08**	-0.12**	-0.27**	-0.33**	-0.32**	-0.40**	0.92**	0.91**				
12. Maternal Sensitivity	0.33**	0.32**	0.35**	0.19**	0.03	-0.01	0.04	0.19**	-0.10**	-0.03	-0.07*			
13. Maternal Positive Engagement	0.32**	0.39**	0.31**	0.21**	0.00	-0.05	0.01	0.15**	-0.02	0.04	0.01	0.34**		
14. Infant Positive Mood	0.08**	0.13**	0.11**	0.09**	-0.03	-0.03	0.01	0.02	-0.04	0.01	-0.02	0.06*	0.27**	
15. Infant Negative Mood	-0.04	-0.02	-0.07*	-0.05	-0.07	-0.05	-0.05	-0.12**	0.14**	0.08**	0.12**	-0.26**	-0.06	-0.10**

⁺Social support subscales; *p < 0.05, **p < 0.01

TABLE IX
SIMPLE MODERATION MODEL: MODERATING EFFECTS OF SOCIAL SUPPORT
ON THE ASSOCIATIONS BETWEEN SES MEASURES AND MI INTERACTION

Model	Independent variable	Dependent variable					R ²	F (p)
		Maternal positive engagement						
		Coef.	SE	p	95% C.I.			
					Lower	Upper		
1	Marital status						0.22	16.18
(n=947)	Single	0.50	0.25	0.047*	0.01	0.99		(<.001**)
	Social support from intimate relationships	0.18	0.05	<.001**	0.08	0.29		
	Single*Social support from intimate relationships	-0.17	0.07	0.02*	-0.32	-0.03		
	Maternal depressive symptoms	0.11	0.05	0.02*	0.02	0.21		
	Income-needs ratio	0.03	0.02	0.10	-0.01	0.07		
	Education							
	High school diploma	0.31	0.07	<.001**	0.18	0.45		
	Associate/Bachelor degree	0.58	0.10	<.001**	0.39	0.77		
	Graduate degree	0.68	0.15	<.001**	0.38	0.97		
	Neighborhood environment	0.05	0.05	0.30	-0.04	0.14		
	Race							
	Black	-0.33	0.06	<.001**	-0.44	-0.22		
	Others	-0.28	0.43	0.52	-1.12	0.57		
	Ethnicity							
	Hispanic	0.22	0.19	0.25	-0.16	0.60		
	Maternal age (years)							
	16-25	0.23	0.43	0.59	-0.61	1.07		
	26-35	0.28	0.43	0.51	-0.56	1.13		
	36-45	0.37	0.44	0.40	-0.49	1.23		
	Number of children under 18	0.00	0.02	0.91	-0.04	0.05		

Note. Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE IX

SIMPLE MODERATION MODEL: MODERATING EFFECTS OF SOCIAL SUPPORT
ON THE ASSOCIATIONS BETWEEN SES MEASURES AND MI INTERACTION (continued)

Model	Independent variable	Dependent variable					R ²	F (p)
		Maternal positive engagement						
		Coef.	SE	p	95% C.I.			
					Lower	Upper		
2	Marital status						0.22	16.07
(n=947)	Single	0.51	0.25	0.04*	0.01	1.00		(<.001**)
	Social support from intimate relationships	0.17	0.05	0.001**	0.06	0.28		
	Single*Social support from intimate relationships	-0.18	0.07	0.01*	-0.32	-0.03		
	Maternal anxiety symptoms	0.09	0.05	0.049*	0.001	0.19		
	Income-needs ratio	0.03	0.02	0.11	-0.01	0.07		
	Education							
	High school diploma	0.31	0.07	<.001**	0.17	0.45		
	Associate/Bachelor degree	0.57	0.10	<.001**	0.38	0.76		
	Graduate degree	0.67	0.15	<.001**	0.37	0.97		
	Neighborhood environment	0.05	0.05	0.32	-0.04	0.14		
	Race							
	Black	-0.33	0.06	<.001**	-0.44	-0.22		
	Others	-0.28	0.43	0.51	-1.12	0.56		
	Ethnicity							
	Hispanic	0.22	0.19	0.25	-0.16	0.60		
	Maternal age (years)							
	16-25	0.24	0.43	0.57	-0.60	1.08		
	26-35	0.29	0.43	0.50	-0.55	1.14		
	36-45	0.38	0.44	0.39	-0.49	1.24		
	Number of children under 18	0.00	0.02	0.89	-0.04	0.05		

Note. Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE IX
 SIMPLE MODERATION MODEL: MODERATING EFFECTS OF SOCIAL SUPPORT
 ON THE ASSOCIATIONS BETWEEN SES MEASURES AND MI INTERACTION (continued)

Model	Independent variable	Dependent variable					R ²	F (p)
		Maternal positive engagement						
		Coef.	SE	p	95% C.I.			
					Lower	Upper		
3	Marital status						0.22	16.20
(n=947)	Single	0.51	0.25	0.04*	0.02	1.00		(<.001**)
	Social support from intimate relationships	0.18	0.05	<.001**	0.08	0.29		
	Single*Social support from intimate relationships	-0.18	0.07	0.01*	-0.32	-0.04		
	Maternal depressive and anxiety symptoms	0.13	0.05	0.02*	0.02	0.23		
	Income-needs ratio	0.03	0.02	0.10	-0.01	0.07		
	Education							
	High school diploma	0.31	0.07	<.001**	0.18	0.45		
	Associate/Bachelor degree	0.57	0.10	<.001**	0.38	0.77		
	Graduate degree	0.68	0.15	<.001**	0.38	0.98		
	Neighborhood environment	0.05	0.05	0.29	-0.04	0.14		
	Race							
	Black	-0.33	0.06	<.001**	-0.44	-0.22		
	Others	-0.28	0.43	0.51	-1.12	0.56		
	Ethnicity							
	Hispanic	0.22	0.19	0.25	-0.16	0.61		
	Maternal age (years)							
	16-25	0.23	0.43	0.59	-0.61	1.07		
	26-35	0.28	0.43	0.51	-0.56	1.13		
	36-45	0.37	0.44	0.40	-0.49	1.23		
	Number of children under 18	0.00	0.02	0.90	-0.04	0.05		

Note. Statistically significant estimates appear in bold (* p<.05; ** p<.01).

TABLE X
MODERATED MEDIATION MODEL TESTING (N=941)

Step	Dependent variable	Independent variable	Coef.	SE	p ^a	R ²	F (p)
1	Maternal anxiety symptoms	Neighborhood environment	-0.32	0.13	0.01* [-0.57, -0.06]	0.13	8.85 (<.001)**
		Social support from intimate relationships	-0.47	0.11	<.001** [-0.69, -0.24]		
		Neighborhood environment*Social support ^b	0.08	0.04	0.04* [0.002, 0.15]		
		Income-needs ratio	-0.01	0.01	0.38 [-0.04, 0.01]		
		Education					
		High school diploma	-0.02	0.05	0.64 [-0.11, 0.07]		
		Associate/Bachelor degree	-0.08	0.07	0.21 [-0.21, 0.05]		
		Graduate degree	-0.17	0.10	0.09 [-0.37, 0.03]		
		Marital status					
		Single	-0.05	0.04	0.27 [-0.13, 0.04]		
		Race					
		Black	-0.17	0.04	<.001** [-0.24, -0.10]		
		Others	0.09	0.29	0.75 [-0.47, 0.66]		
		Ethnicity					
		Hispanic	-0.11	0.13	0.41 [-0.36, 0.15]		
		Maternal age (years)					
		16-25	0.18	0.29	0.52 [-0.37, 0.75]		
		26-35	0.21	0.29	0.46 [-0.35, 0.78]		
		36-45	0.18	0.29	0.55 [-0.40, 0.75]		
		Number of children under 18	-0.01	0.02	0.61 [-0.04, 0.02]		
2	Infant negative mood	Neighborhood environment	-0.05	0.06	0.45 [-0.17, 0.07]	0.02	1.50 (0.10)
		Maternal anxiety symptoms	0.16	0.06	0.01** [0.04, 0.29]		
		Income-needs ratio	0.00	0.02	0.99 [-0.05, 0.05]		
		Education					
		High school diploma	-0.02	0.09	0.79 [-0.21, 0.16]		
		Associate/Bachelor degree	0.12	0.13	0.36 [-0.13, 0.37]		
		Graduate degree	-0.02	0.21	0.90 [-0.42, 0.37]		
		Marital status					

Single	0.06	0.08	0.46 [-0.10, 0.22]
Race			
Black	0.18	0.07	0.01* [0.04, 0.33]
Others	-0.16	0.57	0.77 [-1.28, 0.95]
Ethnicity			
Hispanic	-0.15	0.26	0.56 [-0.66, 0.35]
Maternal age (years)			
16-25	0.64	0.57	0.26 [-0.47, 1.75]
26-35	0.64	0.57	0.26 [-0.48, 1.75]
36-45	0.70	0.58	0.23 [-0.44, 1.84]
Number of children under 18	-0.03	0.03	0.34 [-0.09, 0.03]

Note. ^a 95 percent bias-corrected confidence intervals reported as [Lower Limit Confidence Interval, Upper Limit Confidence Interval]; ^b Social support from intimate relationships. Statistically significant estimates appear in bold (* p<.05; ** p<.01).

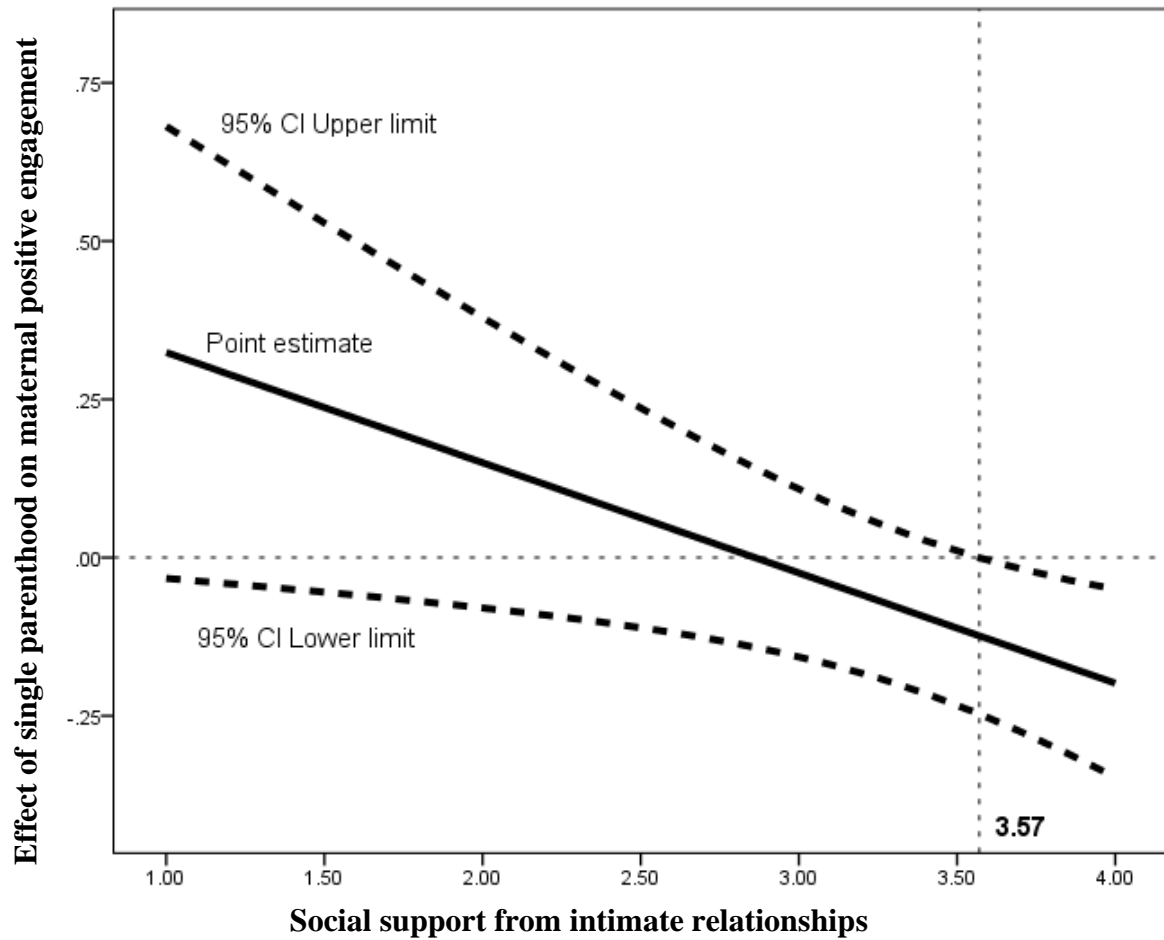


Figure 6. Controlling for maternal depressive symptoms, the effect of single parenthood on maternal positive engagement at different levels of social support from intimate relationships. CI=Confidence interval.

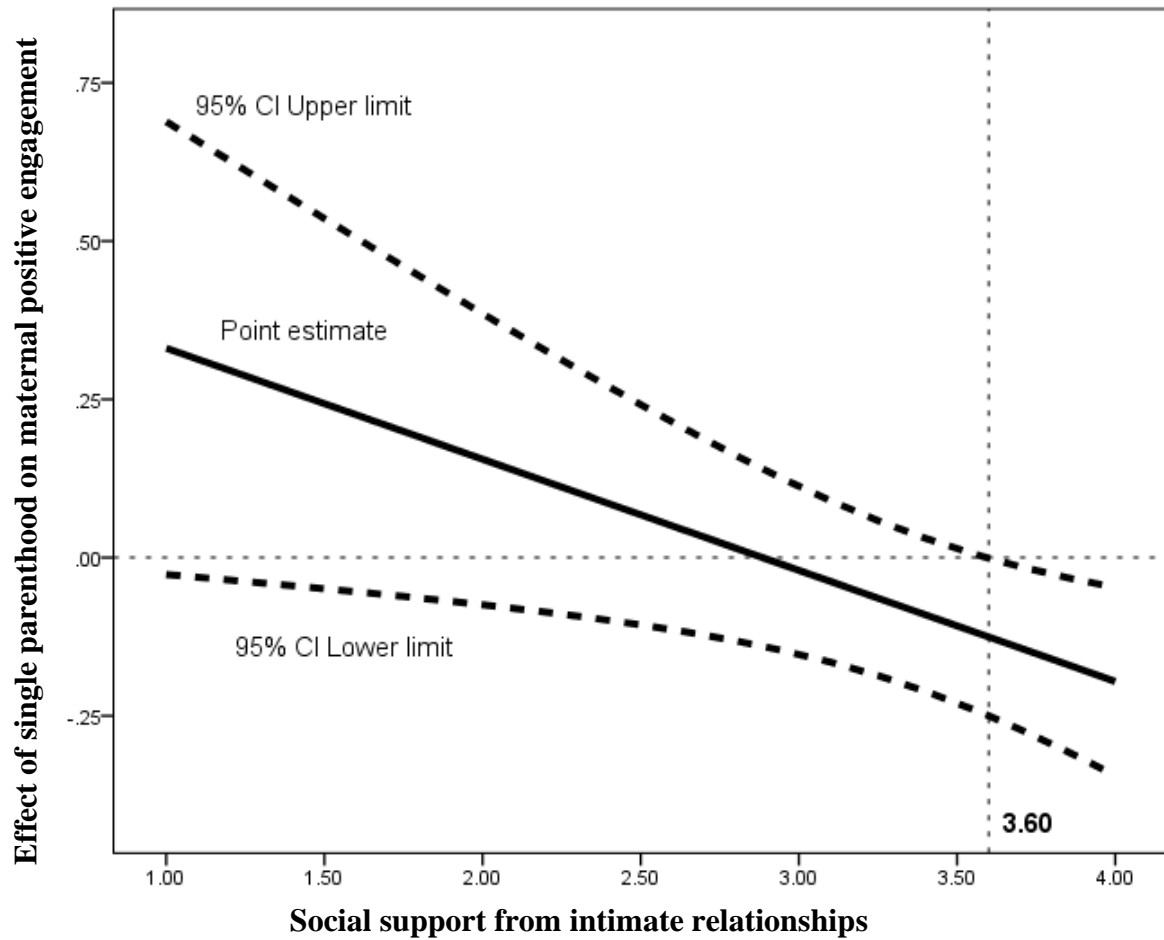


Figure 7. Controlling for maternal anxiety symptoms, the effect of single parenthood on maternal positive engagement at different levels of social support from intimate relationships. CI=Confidence interval.

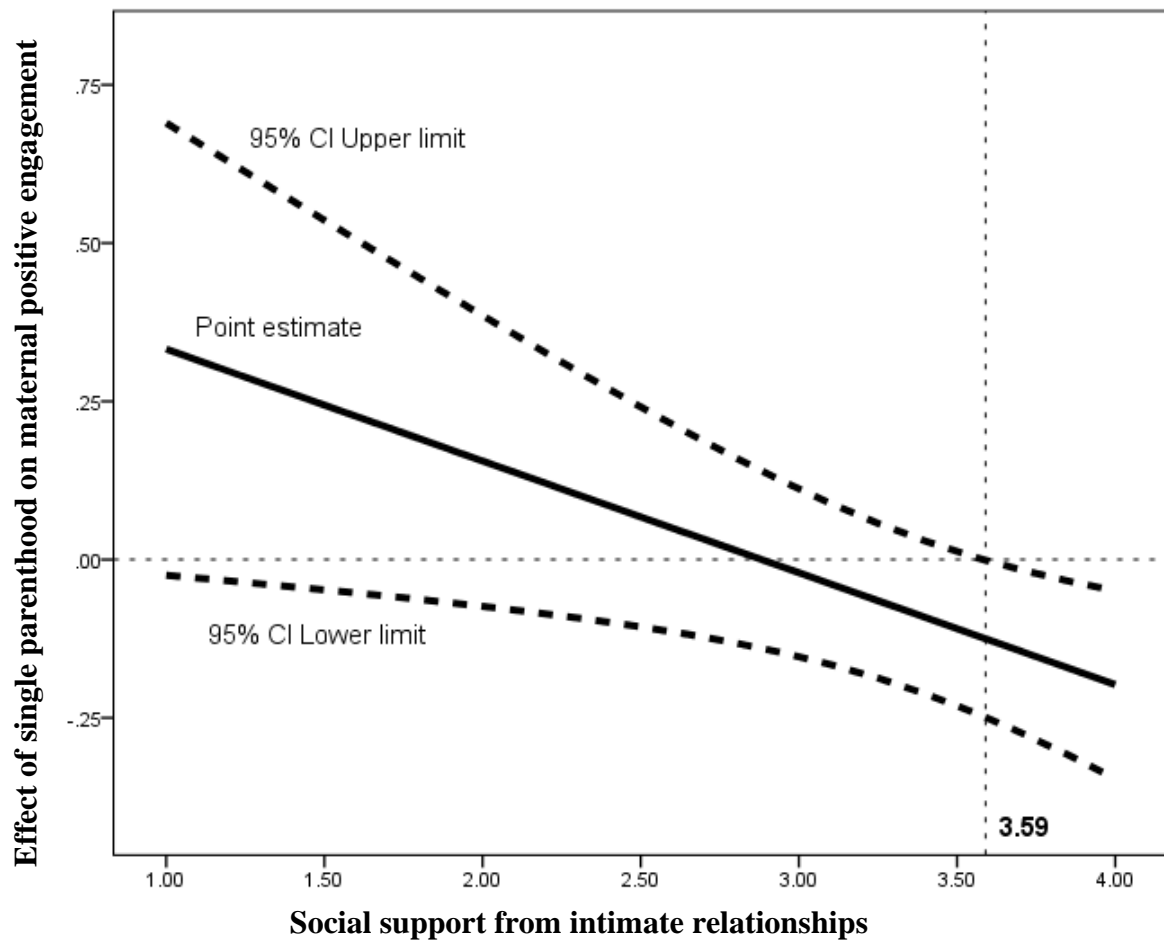


Figure 8. Controlling for maternal depressive and anxiety symptoms, the effect of single parenthood on maternal positive engagement at different levels of social support from intimate relationships. CI=Confidence interval.

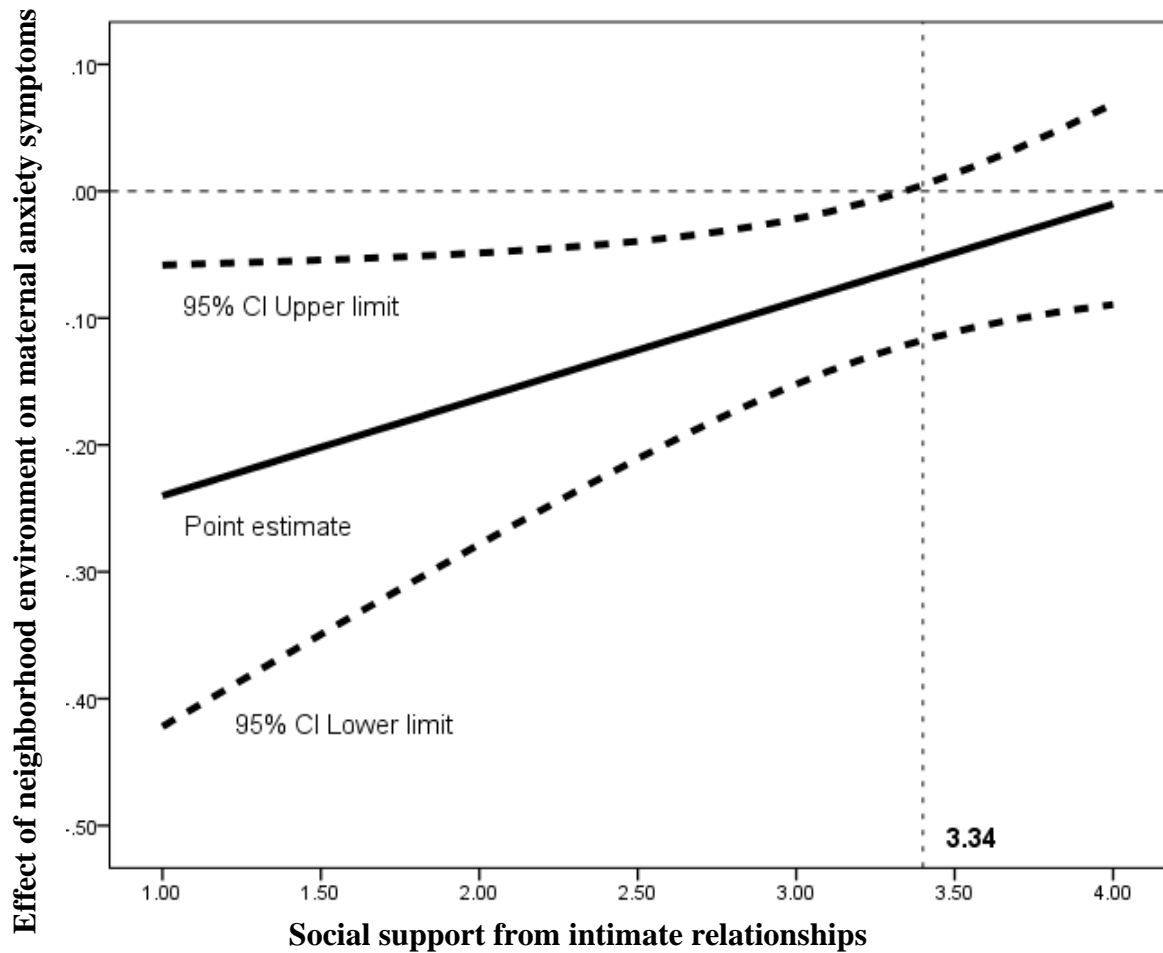


Figure 9. Effect of neighborhood environment on maternal anxiety symptoms at different levels of social support from intimate relationships when infant negative mood was an outcome variable in the moderated mediation model. CI=Confidence interval.

APPENDICES

APPENDIX A

Exemption Granted

August 6, 2020

Hyungkyung Kim
Women, Child, & Family Health Science

RE: **Protocol # 2020-1021**
“Effects of Socioeconomic Adversity on Mother-Infant Interaction”

Researchers at UIC will obtain existing coded ICPSR data initially obtained for the Family Life Project (FLP). Investigators at UIC will have no access to the raw data from the FLP self-report questionnaires, interviews, videotaped observations or the master list linking the data to individuals or families. Thus, UIC investigators will not be able to directly or indirectly link the FLP data provided by ICPSR to individuals or families. ICPSR, however, requires either UIC IRB approval or an exemption prior to releasing the de-identified FLP data to UIC.

Dear Hyungkyung Kim:

Your Claim of Exemption was reviewed on **August 6, 2020** and it was determined that your research meets the criteria for exemption as defined in the U.S. Department of Health and Human Services Regulations for the Protection of Human Subjects [45 CFR 46.104(d)]. You may now begin your research.

UIC Exemption Granted Date: August 6, 2020
Sponsor: None

The specific exemption category under 45 CFR 46.104(d) is: 4

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy.

Please remember to:

- Use your research protocol number (2020-1021) on any documents or correspondence with the IRB concerning your research protocol.
- Review and comply with the [policies](#) of the UIC Human Subjects Protection Program (HSPP) and the guidance [Investigator Responsibilities](#).

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS via [OPRS Live](#).

Sincerely,
Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB #7
Office for the Protection of Research Subjects

cc: Crystal Patil
Chang Gi Park

APPENDIX B

Measures Used in This Study

Instrument	Type	Subscales/Items	Scoring	Cronbach's alpha	
Neighborhood Environment Scale (NES; Burchinal et al., 2008)	Self-reported	Item 1: Safety of the area outside this building	1=obviously dangerous 2=slightly dangerous 3=average 4=above average safety	0.76	
		*Item 2: Noise level in the neighborhood	1=very quiet 2=average 3=noisy 4=very noisy		
		*Item 3: Safety of the neighborhood	1=very safe/crime free, 2=average for this city 3=unsafe 4=very unsafe/high risk		
Brief Symptom Inventory-18 (BSI-18; Derogatis & Savitz, 2000)	Self-reported	• Depression	0=not at all	0.81	
		• Anxiety	1=a little bit	0.78	
		• Combined depression and anxiety	2=moderately	0.87	
			3=quite a bit		
			4=extremely		
Questionnaire of Social Support (QSS; Crnic & Booth, 1991)	Self-reported	• Community involvement	1=very dissatisfied	0.86	
		• Friendship	2=somewhat dissatisfied		
		• Family	3=somewhat satisfied		
		• Intimate relationships (spouse or partner)	4=very satisfied		
MI Interaction measured by Cox & Crnic (Cox & Crnic, 2002; National Institute of Child Health and Human Development Early Child Care Research Network, 1999)	Observed	Maternal Behavior	• Sensitivity	1=not at all characteristic	0.69
			• Positive engagement	2=minimally characteristic	0.87
		Infant Behavior	• Positive mood	3=somewhat characteristic	n/a
			• Negative mood	4=moderately characteristic 5=highly characteristic	n/a
Home Observation for Measurement of the Environment (HOME Inventory; Caldwell & Bradley, 1984).	Interviewed and observed	• Parental responsivity • Acceptance of child • Learning materials	1=yes 0=no	0.81	

*reverse scored.

APPENDIX C

Relationships among SES Measures, Maternal Psychological Well-Being, Social Support, and MI Interaction

Spearman's rho (n=935)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Income-to-Needs Ratio												
2. Education	0.56**											
3. Marital Status	0.55**	0.45**										
4. Neighborhood Environment	0.37**	0.32**	0.34**									
5. Depressive Symptoms	-0.17**	-0.15**	-0.15**	-0.16**								
6. Anxiety Symptoms	0.01	-0.01	-0.01	-0.08*	0.62**							
7. Depressive and Anxiety Symptoms	-0.09**	-0.09**	-0.09**	-0.14**	0.88**	0.89**						
8. Social Support	0.08*	0.05	0.08*	0.11**	-0.47**	-0.40**	-0.49**					
9. Maternal Sensitivity	0.38**	0.34**	0.36**	0.17**	-0.13**	-0.02	-0.08*	0.06				
10. Maternal Positive Engagement	0.37**	0.37**	0.30**	0.16**	-0.04	0.08**	0.03	0.01	0.32**			
11. Infant Positive Mood	0.15**	0.14**	0.13**	0.12**	-0.03	0.07*	0.03	-0.02	0.09**	0.30**		
12. Infant Negative Mood	-0.06	-0.01	-0.05	-0.05	0.10**	0.05	0.09	-0.10**	-0.21**	-0.06	-0.06	
13. Maternal Parenting Behavior (HOME Inventory)	0.46**	0.41**	0.34**	0.32**	-0.03	0.11**	0.05	0.05	0.27**	0.41**	0.18**	-0.04

*p < .05, **p < 0.01

VITA

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EDUCATION:

2017-2021	Ph.D., Nursing Science, University of Illinois at Chicago, Chicago, Illinois
2013-2015	MSN, Nursing Science, Seoul National University, Seoul, South Korea
2005-2009	BSN, Nursing Science, Catholic Kwandong University, Gangneung, South Korea

EMPLOYMENT:

2018-2021	Research Assistant, College of Nursing, University of Illinois at Chicago
2017-2019	Teaching Assistant, College of Nursing, University of Illinois at Chicago
2016	Lecturer, Department of Nursing, Catholic Kwandong University
2015-2016	Clinical Research Assistant, Seoul National University Hospital
2014-2015	Research Assistant, College of Nursing, Seoul National University
2014	Clinical Research Assistant, Seoul National University Hospital
2013-2014	Research Assistant, College of Nursing, Seoul National University and Korea International Cooperation Agency
2013-2014	Teaching Assistant, College of Nursing, Seoul National University
2012	Research Assistant, College of Nursing, Seoul National University and Kolong Benit Co., Ltd
2009-2011	Registered Nurse, Samsung Seoul Hospital, Republic of Korea

RESEARCH GRANTS:

2021	Sigma Alpha Lambda Chapter Funding Award for Research and Evidence-Based Practice Projects, Sigma Theta Tau International Honor Society of Nursing
2021	College of Nursing PhD Student Research Award, University of Illinois at Chicago
2020	Award for Graduate Research, University of Illinois at Chicago

SCHOLARSHIPS, ACADEMIC AWARDS, AND HONORS:

2020-2021	Beverly J McElmurray Scholarship, University of Illinois at Chicago
2020	Laurette Kirstein Scholarship for International Students, University of Illinois at Chicago
2019, 2020	Chancellor's Student Service and Leadership Award, University of Illinois at Chicago
2018-2019	Dean Joan L. Shaver Scholarship, University of Illinois at Chicago
2018-2019	W. E. Van Doren Scholarship, University of Illinois at Chicago
2018-2019	Virginia Ohlson International Scholarship, University of Illinois at Chicago
2017-2019	Dean's PhD Student Award, University of Illinois at Chicago
2015	Award for Outstanding Research Plan, Korean Academy of Child Health Nursing
2013-2014	Seoul National University Development Fund Scholarship

2014	Lecture & Research Scholarship, Seoul National University
2013	Merit-Based Scholarship, Seoul National University
2009	Award for Outstanding Performance, Samsung Seoul Hospital
2005, 2007	Merit-Based Scholarship, Catholic Kwandong University

PUBLICATIONS:

In progress	Park, S., Kim, H. , Jang, M., Kim, H., Raszewski, R., & Doorenbos, A. Z. Community-based preparation and education for death: A scoping review. <i>Target journal: Death Studies</i> .
In progress	* Kim, H. , Bang, K., & Park, C. Factors influencing maternal-fetal attachment in unmarried pregnant women in Korea: The mediating role of adoption decisions. <i>Target journal: Journal of Obstetric, Gynecologic, & Neonatal Nursing</i> .
2018	*Bang, K., Song, M., Park, S., & Kim, H. Relationships among physical activity level, health-promoting behavior, and physiological variables in Korean university students. <i>Perspectives in Nursing Science</i> , 15(1), 11-17.
2015	*Kwon, M., Bang, K., & Kim, H. Comparison of knowledge and confidence of newborn care between mother and father. <i>Korean Parent Child Health Journal</i> , 18(1), 11-18.
2014	*Bang, K., Lee, I., Chae, S., Yu, J., Park, J., & Kim, H. Effects of maternal-child health education program for nurses in Tigray, Ethiopia on their knowledge and confidence. <i>Child Health Nursing Research</i> , 20(4), 275-282.

PRESENTATIONS:

2015	Kim, H. , & Bang, K. Factors influencing the maternal-fetal attachment of single mothers. Poster Presentation. 10th International Nursing Conference 2015, Seoul, Republic of Korea
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PROFESSIONAL LICENSURE & CERTIFICATION:

2009-Present	Registered Nurse (RN), Republic of Korea (264267)
2015	NCAST Parent-Child Interaction (PCI) Feeding and Teaching Scales

PROFESSIONAL MEMBERSHIPS & SERVICES:

Membership in Professional Organizations:

2020-Present	Sigma Theta Tau International Honor Society of Nursing
2020-Present	Global Korean Nursing Foundation in USA
2018-Present	Korean-American Scientists and Engineers Association

Leadership/Service:

2018-2019	Korean Graduate Student Association, University of Illinois at Chicago
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Treasurer: manage dues-based budget to fund quarterly graduate student meetings.