Intergenerational risk of maternal childhood maltreatment on infant health concerns in low-income Mexican American mother-child dyads

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Intergenerational risk of maternal childhood maltreatment on infant health concerns in low-income Mexican American mother-child dyads

by

Amanda Marie Flagg

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Abstract

Childhood maltreatment confers greater risk for psychopathology, health problems, and early mortality in adulthood. Emerging literature suggests that maternal childhood maltreatment exposure may have intergenerational consequences for infant health by interfering with mothers’ abilities to engage in sensitive and responsive caregiving. Although no studies to date have investigated contributions of maternal sensitivity to infant health, parallel bodies of research have shown that sensitive responding is an important predictor of infant physiological regulation, which is also related to immune functioning. The current study examined the associations between maternal childhood maltreatment, infant health concerns, and maternal sensitivity in a low income, Mexican American sample. Data were collected from 322 mother-infant dyads during prenatal and 12-, 18-, and 24-week home visits. The present study is among the first to investigate links between maternal childhood maltreatment exposure, maternal sensitivity, and infant health. Results suggest that maternal childhood maltreatment exposure may have intergenerational consequences for infant health, but that changes in maternal sensitivity do not appear to account for their associations. Nevertheless, maternal sensitivity may represent an important resiliency characteristic that promotes infant health. Clarification about underlying risk processes and potentiating resiliency characteristics may help to elucidate ways in which to better support both mothers and infants across the lifespan.

Keywords: Maternal childhood trauma; child maltreatment; infant health; maternal sensitivity; intergenerational transmission; Mexican American
Intergenerational risk of maternal childhood maltreatment on infant health concerns in low-income Mexican American mother-child dyads

Childhood maltreatment is associated with a variety of physical health, behavioral health, and mental health problems across the lifespan (Choi et al., 2019; Felitti et al., 1998; Felitti et al., 2019; Li et al., 2016; Nanda et al., 2016; Norman et al., 2012; Vachon et al., 2015; Wegman & Stetler, 2009; Widom et al., 2007). Furthermore, an emerging literature suggests that maternal childhood maltreatment may have consequences for her child’s health as well (Lê-Scherban et al., 2018; McDonnell & Valentino, 2016). For example, Racine et al. (2018) found that mothers who experienced more childhood maltreatment had more health and medical risks during pregnancy, and in turn that their infants were born with more infant health risks and poor developmental outcomes at 12 months. If this is the case, then maternal early maltreatment may have intergenerational consequences for mothers’ and children’s health and well-being. Nevertheless, the mechanisms that link maternal childhood trauma exposure with infant development remain to be clarified. Similarly, to our knowledge, no studies have examined whether maternal childhood maltreatment has cascading effects for child health, specifically in early infancy.

Maternal Childhood Maltreatment

Childhood maltreatment has been defined as experiences of physical, emotional, or sexual abuse as well as emotional or physical neglect (Cicchetti & Valentino, 2006). Few studies to date have investigated associations between maternal childhood maltreatment and infant health. The studies that have been done provide evidence that maternal reports of child abuse exposure, a form of maltreatment, is associated with an increased risk of having a child diagnosed with asthma or allergy at age two (Tomfohr-Madsen et al., 2016). Similarly, maternal
adverse childhood experiences, psychosocial stressors and trauma that include maltreatment, are associated with dramatically higher odds of poor child health status and asthma diagnoses among children younger than 18 years ($M_{\text{age}}= 9$; Lê-Scherban et al., 2018). Despite these preliminary studies, whether the effects of maternal childhood maltreatment on child health may begin to manifest as early as infancy is unknown.

**Sensitive Caregiving and Infant Health**

Sensitive and responsive maternal caregiving has been found to play an important role in shaping the developing child stress response system (Enlow et al., 2014; Hostinar et al., 2014). The hypothalamic pituitary adrenal (HPA) axis, the primary mediator of the stress response, as well as the autonomic nervous system (ANS), a physiological system involved in the stress response, have been shown to be influenced in early life by caregiving quality (Enlow et al., 2014; Grant et al., 2010; Hostinar et al., 2014). Maternal stress has been demonstrated to influence both infant HPA and the immune system as they continue to develop after birth (Wright et al., 2010). In addition, maternal sensitivity has been linked with other signs of physiological regulation such as increased sleep (Bordeleau et al., 2012; Tétreault et al., 2016) and child vagal withdrawal (Perry et al., 2014), which in turn have been linked to better health. Child-reported maternal warmth has also been found to be predictive of lower cortisol stress responses by the time children reached young adulthood (Luecken et al., 2016). Thus, sensitive parenting may result in lower stress levels and indirectly contribute to better infant regulation and health. If this is the case, infants with sensitive mothers may have better immune function and in turn experience decreased risk for illness. It can then be inferred that postnatal factors, such as maternal sensitivity, that also impact HPA and ANS functioning and development, may also have implications for children’s physical health outcomes.
Behavioral Mechanism: Maternal Sensitivity

One mechanism through which maternal childhood maltreatment may influence infant health is by interfering with mothers’ capacities to engage in sensitive and responsive caregiving. Mothers’ who have been previously exposed to childhood maltreatment may have their own psychopathology that may affect parental bonding, attachment, or sensitive parenting style. Maternal insensitivity throughout the course of infancy puts infants’ developing autonomic nervous system (ANS) regulation in jeopardy (Kopp, 1982; Sroufe, 1996). Mothers who have frequently experienced childhood maltreatment may have increased difficulties acting synchronously (e.g., responding in a way that is contingent on child cues) with their infant and providing care in sensitive ways (George & Solomon, 2008; Krishnakumar & Buehler, 2000; Levondosky et al., 2006). A study conducted by Leerkes and Crockenberg (2006) found that mothers who experienced emotional neglect as infants were less empathetic and had less confidence in their ability to respond to their own infants’ distress compared to mothers who received emotional support. Mothers who have experienced high rates of childhood maltreatment have also been found to employ more harsh parenting practices, including corporal punishment and aggressive parenting tactics, and exhibited reduced empathy and responsiveness to infant needs than mothers who have not experienced trauma (Chung et al., 2009; Lyons-Ruth & Block, 1996; Newcomb & Locke, 2001; Windham et al., 2004). In particular, mothers with histories of childhood maltreatment have been found to display more emotionally withdrawn caregiving behaviors, interfering manipulation (e.g., moving an infant’s body abruptly or in a way that did not match what the infant was doing or playing with), and anger with their infants than those without (Lyons-Ruth & Block, 1996). Furthermore, mothers who have experienced childhood maltreatment have been found to be at an increased risk for postpartum depression (Alvarez-
Segura et al., 2014; Choi & Sikkema, 2016; Choi et al., 2017). A growing literature suggests that maternal postpartum depression may disrupt frequent and sensitive mother-infant interactions and bonding, particularly during a critical time for child development (e.g., Stein et al., 2014). For example, mothers who experience feelings of fatigue or worthlessness related to depression may display less sensitivity toward their infants (Ertel et al., 2011) which in turn contributes to being less attentive to their infants’ needs. Maternal depression has also been found to put children at risk for unfavorable physical health outcomes (Angel & Worobey, 1988; Klinnert et al., 2001; Turney, 2011). Thus, lowered levels of maternal sensitivity observed among mothers with histories of childhood maltreatment exposure may account for the links between mothers’ histories of childhood maltreatment and infant health outcomes.

**Biological Mechanism: Fetal Programming**

Consistent with the notion that maternal childhood maltreatment histories may have implications via sensitive and responsive caregiving, maternal childhood maltreatment exposure may also influence child health outcomes directly through a process often referred to as fetal programming. Fetal programming occurs during embryonic and fetal development and has been defined as the process in which excess fetal exposure to maternal stress hormones may result in structural and functional changes (e.g., changes in cells and organ systems) to infants’ central nervous system development that can influence infant health outcomes (Seckl, 2001; Seckl & Homes, 2007). Thus, childhood maltreatment may result in enduring changes to maternal physiology in ways that have consequences for the intrauterine environment (Glover et al., 2018; Palma-Gudiel et al., 2015). For example, due to chronic childhood maltreatment exposure, increased maternal stress can result in physiological changes to mothers’ HPA axis. These changes include the release of high intrauterine concentrations of maternal stress hormones such
as glucocorticoids and catecholamines (Agorastos et al., 2018; Champagne, 2008). Maternal child maltreatment has been shown to contribute to epigenetic alterations that can influence the development of the fetus in utero (Buss et al., 2017). Similarly, the fetus may also respond to biological cues in utero that reflect long-term biological and physiological consequences of child maltreatment exposure (Buss et al., 2017). Thus, physiological changes that result from childhood maltreatment exposure may alter maternal immune functioning and therefore the development of the fetal immune system in utero (Prescott & Clifton, 2009). As such, maternal childhood maltreatment has explicit implications for the intrauterine environment and the processes of fetal programming that may have lasting consequences for infant health.

Maternal childhood maltreatment exposure has also been associated with pregnancy complications and poor birth outcomes (Leeners et al., 2010; Mohler et al., 2008; Noll et al., 2007; Selk et al., 2016). Gray et al. (2017) found that infants’ physiological regulation is affected by mothers’ life course experiences of stress, with more maternal traumatic events, such as maltreatment, yielding decreased heart rate even in the absence of a current stressor as well as a lower physiological set point. These findings may have implications for later infant health problems as maternal life course experiences of maltreatment have been associated with mothers’ biophysiological functioning, which in turn negatively affects the infants’ immune system (Beauchaine & Thayer, 2015; McCraty & Shaffer, 2015; Veru et al., 2014). These adverse alterations to the intrauterine environment related to maternal childhood maltreatment may contribute to the intergenerational transmission of stress and adverse outcomes.

Because the stressors associated with economic stress, socioeconomic status (SES), as well as ethnic minority marginalization are known to confer risk for exposure to more childhood maltreatment (Brown et al., 1998; Lee & George, 1999; Slopen et al., 2016; Su et al., 2020;
Wildeman et al., 2014), it is imperative that stress research considers minority samples to determine if the transmission of childhood maltreatment and its negative sequelae can have intergenerational effects. For example, Mexican Americans experience disproportionate risk for low-income status and also for more childhood and lifetime stress (Gavin et al., 2004; Scher et al., 2004). The disproportionate experience of childhood and lifetime adversity in ethnic minority and low SES families is particularly problematic because they are already at a disadvantage for accessing health care and social resources (e.g., evidence-based early interventions, family services, and proper prenatal care). Even when adjusting for socioeconomic status (SES), ethnic minority and low SES families are more frequently exposed to early adverse childhood experiences, including child maltreatment (Bryant et al., 2010; Felitti et al., 1998, Slopen et al., 2016). Therefore, continued research on associations between maternal childhood maltreatment and infants’ health outcomes in high-risk, underserved populations is needed to examine if effects of maternal childhood trauma may cascade into the next generation as well as highlight areas in which we can best intervene to promote positive health outcomes for infants and children throughout the lifespan. To our knowledge, no studies have examined maternal childhood trauma and its association with infant health outcomes. Furthermore, we examined these associations within a Mexican American sample for whom these stressors are particularly salient.

**Present Study**

The current study examined whether maternal childhood trauma exposure would be associated with infant health concerns in a sample of low-income, Mexican American families. Additionally, this study tested whether maternal sensitivity would mediate associations between maternal childhood trauma exposure and infant health concerns. We predicted that maternal
reports of childhood trauma would be associated with poorer infant health concerns at 24 weeks of age, and that maternal sensitivity would partially mediate their associations.

**Method**

**Participants**

Data for this project were collected as part of a larger prospective longitudinal study. Participants included 322 low-income Mexican American mothers and their infants (46.3% male) who were recruited during pregnancy from a prenatal clinic in Maricopa County, Arizona. See Table 1 for demographic characteristics. Data were collected from prenatal home visits, and postpartum home visits at 12,18, and 24 weeks. At the time of the prenatal visit, mothers were on average 27 years old (range 18-42). Mothers were primarily born in Mexico (86%) and most preferred to speak Spanish (82%). On average, mothers exhibited moderate sensitivity ($M= 3.22$, $SD= .398$); and reported 3 infant health concerns ($M=3.24$, $SD= 2.00$) at 24 weeks. Maternal eligibility criteria included being at least 18 years of age, fluency in either Spanish or English, self-identification as Mexican American, and low-income status determined by self-reported family income below $25,000 or eligibility for Medicaid or Federal Emergency Services coverage.

**Procedure**

Data were collected between March 2010 and July 2013. Prior to study participation, mothers provided written informed consent at the prenatal home visit, which was approved by the Institutional Review Boards at Arizona State University and Maricopa Integrated Health Services. Prenatal home interviews were conducted in mothers’ choice of Spanish (82%) or English (18%). Bilingual female interviewers (75% were native Spanish speakers) read all questions aloud due to literacy concerns with a low-educated sample and provided mothers with
written and graphic response descriptions. Families were compensated for their participation. Mothers were asked to participate in a peek-a-boo interaction task with their infants during the 12- and 18-week home visits, and mother-infant interactions were video recorded for later behavioral coding. For the peek-a-boo interaction task, mothers were provided either a blanket or book to use as a shield and were instructed to play a game of peek-a-boo with their infants for three minutes. The current study drew data from behavioral observations of a peek-a-boo interaction task due to the likelihood that infants would be become dysregulated during the stimulating task and maternal sensitivity to infant cues could be assessed. Infants were considered to be dysregulated if they were unable to modulate their emotional, attentional, and behavioral arousal. Peek-a-boo, although fun, can be overstimulating for infants and thus induce dysregulation. Infants may attempt to disengage from the task by jerking their head away, leaning back away from the mother, or turning away.

Data for the longitudinal study followed a planned missingness design in which missingness was deliberately included to reduce participant burden (Graham et al., 2006). Planned missingness designs have been shown to result in increased power, lower rates of unplanned missing data, reduced study costs as well as participant fatigue (Little & Rhemtulla, 2013; Rhemtulla & Little, 2012). Thus, all participants completed the prenatal visit, but were randomly assigned to miss either the 12-, 18-, or 24-week home visits. When utilizing a planned missingness allocation, missing data is ascribed as Missing Completely at Random (MCAR; Rubin, 1978) because the missingness is randomized by the researcher.

**Measures**

*Maternal Childhood Maltreatment Exposure*
Maternal childhood maltreatment exposure was retrospectively ascertained during the prenatal home visit using the emotional abuse, sexual abuse, and physical abuse subscales from the Childhood Trauma Questionnaire- Short Form (CTQ-SF; Bernstein et al., 1997; Bernstein et al., 2003). Mothers rated how much each event was true using a 5-point Likert scale (1= never true, 3= sometimes true, and 5= very often true). A total CTQ score was computed by summing the number of events mothers endorsed. Higher scores reflected greater levels of traumatic childhood exposure. The CTQ-SF has been found to demonstrate discriminant and convergent validity (Bernstein et al., 2003) and displays good internal reliability in the current sample $\alpha = .84$.

**Infant Health Concerns**

Mothers reported on infant health concerns using the Baby Health Questionnaire (BHQ; Gress-Smith et al., 2012) when infants were 24 weeks old. The BHQ is an 8-item questionnaire that was developed for the study and assesses infant common health and minor medical issues (i.e., colic, cold, fever, cough, ear infection, rash, vomiting, and diarrhea). Mothers indicated whether each of the health concerns did or did not occur since birth by providing either a ‘yes’ or ‘no’ response; responses were then summed to form an infant health concern score. Higher scores reflected more health concerns. The BHQ has shown postdictive validity in indices of infant health in previous studies using the same sample of low-income, Mexican American children (e.g., Coburn et al., 2018; Gress-Smith et al., 2012). Alpha scale reliability for infant health concerns was $\alpha = 1.0$.

**Maternal Sensitivity**

Maternal sensitivity was assessed using objective observer ratings at the 12- and 18-week home visits using the Coding Interactive Behaviors coding system (CIB; Feldman, 1998).
Both the CIB coding system as well as the maternal sensitivity measure have previously demonstrated both predictive and construct validity in Mexican American samples (Lin et al., 2017; van Huisstede et al., 2019). Trained research assistants rated mothers on each of ten maternal behaviors on a scale ranging from 1 to 5 (1= almost no signs of maternal sensitivity, 5= highly sensitive): acknowledging, imitating, elaborating, parent gaze, positive affect, vocal appropriateness, appropriate range of affect, resourcefulness, affectionate touch, and supportive presence. Following standard guidelines for the CIB system (Feldman, 1998), a composite score reflecting maternal sensitivity during early infancy was formed by averaging ratings of each of the aforementioned maternal behaviors across the 12- and 18- week time points. Observational data at both timepoints were coded in teams of two by 8 undergraduate research assistants, all of whom were trained and supervised by a graduate-level “master” coder (i.e., a graduate research assistant). Coders were trained to 85% agreement within one point, and ongoing reliability meetings were held to reduce coder drift. Twenty percent of all videos were double coded by a master coder. Intraclass correlations for the peek-a-boo task were .85 at 12 weeks and .86 at 18 weeks. Alpha scale reliability for maternal sensitivity was $\alpha = .79$ at 12 weeks, and $\alpha = .85$ at 18 weeks.

**Control Variables**

The analytic model included maternal age. Criteria for control variables were those that were correlated with both an independent and dependent variable that was key in the model. Child sex, maternal level of education, household income, and marital/partnership status were considered as covariates but did not meet criteria. Demographic information was obtained from maternal report during the prenatal visit.

**Data Analytic Plan**
Variables were inspected for normality prior to analyses. The presence of extreme values in all variables were also assessed (i.e., $z > \pm 3.3$). Categorical variables were dummy coded to reduce nonessential multicollinearity (Cohen et al., 2003). Several cases were determined to be outliers on income-to-need ratio and were winsorized. Descriptive statistics and zero-order correlations were computed using SPSS 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). A path model examining associations between maternal childhood trauma, maternal sensitivity, and infant health concerns at 24 weeks was run in *Mplus* 8.2 (Muthén & Muthén, 2017).

**Missing Data Handling**

Missing data were addressed using full information maximum likelihood (FIML) with robust standard errors. FIML has been shown to produce unbiased parameter estimates and standard errors and minimize reductions in power (Enders & Bandalos, 2001). Additionally, due to the planned missing design, infant health concerns at 12 and 18 weeks were considered for inclusion as auxiliary variables. Auxiliary variables are not variables of interest but are ones that enhance estimation of the variables of interest, particularly for variables where data is incomplete or missing. Infant health concerns at 12 and 18 weeks were both correlated with infant health concerns at 24 weeks, $r > .30$, and thus were included as auxiliary variables.

**Results**

**Preliminary Analyses**

Descriptive and demographic information for key study variables is presented in Table 1. Zero-order correlations between child and mother demographic characteristics with key study variables are presented in Table 2. Mothers who were older at the time of the prenatal visit were more likely to be married or cohabitating and had completed fewer years of schooling. Mothers
who had a higher income to need ratio, on average, were married or cohabiting and completed more years of education. Child sex, marital status, years of education or income to need ratio were not significantly correlated with any key study variables. 54% of mothers endorsed at least one traumatic childhood exposure event.

**Path Model**

A path model examining associations between maternal childhood trauma, maternal sensitivity, and infant health concerns at 24 weeks was run (See Figure 1). Maternal childhood trauma exposure was not significantly associated with maternal sensitivity but was significantly associated with infant health concerns at 24 weeks. Maternal sensitivity was significantly associated with fewer infant health concerns at 24 weeks. Because paths linking childhood trauma exposure to maternal sensitivity were not significant, the indirect effect was not examined. Overall, the full model accounted for 4.6% of the variance for infant health concerns.

Maternal age was significantly associated with both maternal sensitivity ($\beta = 0.11, SE = .05, p = .04$ (95% CI [.01, .22])) and maternal childhood trauma exposure ($\beta = 0.11, SE = .05, p = .02$ (95% CI [.02, .21])). Maternal age was not significantly associated with infant health concerns.

**Discussion**

The current study investigated paths linking maternal childhood maltreatment and maternal sensitivity with infant health concerns. Study findings suggest that early maternal childhood maltreatment may have intergenerational consequences for infant health. Additionally, maternal sensitivity may not only have implications for socioemotional development, but also for infant health beginning in the first six months. To our knowledge, our findings are the first to explicitly find associations between maternal sensitivity and infant health concerns.
Consistent with study hypotheses, maternal childhood maltreatment exposure was significantly associated with more infant health concerns. This is consistent with literature suggestive that maternal adverse childhood experiences, such as maltreatment and trauma, are associated with poor infant health outcomes that include lower birthweight (McDonell & Valentino, 2016), increased odds of poor health status, and asthma diagnoses (Lê-Scherban et al., 2018). Similarly, previous evidence has linked elevated adverse childhood experiences such as childhood maltreatment with higher rates of overall health problems in Mexican women (Flores-Torres et al., 2020). Additionally, growing evidence suggests that both maternal prenatal and postnatal stress may be hazardous to infant health (Bush et al., 2021; Buss et al., 2021; Chiu et al., 2012; Phelan et al., 2015), as these stressors contribute to long-term consequences of maternal stress on the next generation. It is also important to consider the salience of health concerns as childhood health has been shown to be a predictor of future physical and socioemotional health outcomes (Oreopoulos et al., 2009). More specifically, infant health has been found to be associated with mortality up to age 17 years as well as being negatively associated with high school completion (Oreopoulous et al., 2009). Compared to work that has already been conducted, findings from this paper provide deeper understanding of intergenerational transmission of risk and suggest maternal childhood maltreatment has downstream consequences that may begin to appear in infancy. These consequences highlight the importance of considering both prenatal and postnatal mechanisms.

Similarly, although health disparities among ethnic minority populations are problematic in and of themselves, results from the current study provide preliminary evidence to suggest that they may be even more farther reaching than previously considered. While attempts to reduce childhood maltreatment to improve health would be a strategy for early intervention, focusing on
protective factors may also inform future research. Overall, preliminary evidence suggests that disparities in childhood maltreatment are even more insidious than previously established. Increasing the understanding of what underlies these intergenerational consequences, and the mechanisms of transmission will help to better inform ways to prevent cascading effects. These findings further elucidate that childhood maltreatment has intergenerational consequences and manifest as early as 24 weeks in infancy. This suggests that a focus on preventative efforts very early on could be meaningful. Increasing maternal sensitivity could be an important avenue for promoting infant health by improving infant physiology and regulatory development, irrespective of maternal childhood maltreatment histories.

Contrary to hypotheses, there was no evidence that the association between maternal childhood maltreatment and infant health concerns at 24 weeks was mediated by maternal sensitivity. Although maternal sensitivity seems to be a significant buffer, the lack of mediated effects suggests that the intergenerational mechanism underlying infant health risk is less about postnatal maternal behaviors and rather this increased risk is biologically embedded prenatally before birth. Previous evidence suggests that early childhood maltreatment can lead to altered stress physiology which extend to pregnancy (e.g., Moog et al., 2016; Ramo-Fernández et al., 2019). In this way, fetal programming may be a more pronounced mechanism. However, future attention to postnatal influences such as postpartum depression or maternal mood will still be important. It is also possible that other family or maternal behaviors such as psychopathology may better explain the mechanisms by which maternal childhood maltreatment effects infant health. In general, early maternal maltreatment and trauma may predispose mothers to increased risk (e.g., poor health, increased disease risk, school dropout) and stress exposure throughout their lives that could then affect their infant’s health (Kuh et al., 2003; Noll et al., 2009) by
making it more challenging to engage in prompt, sensitive caregiving as well as through biological fetal programming pathways.

Furthermore, and consistent with study hypotheses, maternal sensitivity was associated with fewer infant health concerns at 24 weeks. This finding extends upon extant literature by showing for the first time that maternal sensitivity may not only shape infant physiology and regulatory development, but it may also manifest in infant health concerns as early as 6 months. Insofar as mothers who engage in sensitive caregiving may be more attuned to their child’s cues, they may also promote health by noticing health symptoms more promptly and thus seek treatment earlier compared to mothers who engage in insensitive caregiving. Although sensitivity has not been studied in relation to infant health, maternal depression, which has demonstrated robust associations with lower maternal sensitivity, may support the notion that decreased sensitive caregiving may contribute to poor infant health. For example, corresponding literature that suggest mothers with less emotional availability are less likely to seek routine primary care or wellness visits for their children, or to ensure that their children are up to date on vaccinations at 24 months compared to mothers who do not show depressive symptoms (Flynn et al., 2004; Minkovitz et al., 2005). Greater depressive symptoms in mothers have also been found to be associated with more hospitalizations for their children (Casey et al., 2004). In addition, compared to mothers who exhibit low sensitivity, mothers with high sensitivity provide increased caring ability and comfort when their infants are sick. Less sensitive mothers may also experience increased anxiety and therefore may be less precise in describing their infants’ current symptoms, which may prolong a correct diagnosis or treatment. One recent study (Fuertes et al., 2020) yielded evidence that showed lower maternal sensitivity was associated
with increased odds of antibiotic use in infancy up to 9 months, suggesting that maternal behavior may contribute to infant health difficulties.

Similarly, mothers who display higher sensitivity may prevent increased stress for the child which in turn may prevent further infant health concerns by shaping children’s developing HPA axis and ANS. Nonetheless, these findings suggest there is a link between maternal sensitivity and infant health that should be explored. Medical professionals should consider addressing maternal mental health and providing psychoeducation particularly during prenatal care. Similarly, early interventions aimed at improving maternal sensitivity may be utilized to protect against associations between maternal sensitivity and infant health concerns.

Previous evidence has highlighted that ethnic minority children are at an increased risk for chronic health outcomes compared to ethnic majority children (Dominguez et al., 2015); thus, these findings underscore the importance of maternal sensitivity as a key factor that could improve infant health outcomes. This accompanies previous literature suggestive that maternal sensitivity may play an important promotive role for ethnic minority children (Mesman et al., 2011) and has been linked to positive child development.

**Limitations and Future Directions**

Limitations of the present study may inform future directions for related research. First, given that the sample of this study was demographically homogenous and consisted of low-income Mexican American mothers and infants, these findings may not generalize to other Hispanic, ethnic minority, or higher socioeconomic status Mexican American populations. Previous research has elucidated that Mexican American families face stressors related to their ethnic minority, immigration and low socioeconomic status (e.g., Cervantes et al., 1991). It is also reasonable to speculate that there may be important differences across Mexican American
and non-Mexican American populations related to influences of acculturation, immigration related stressors, or cultural related stressors on infant outcomes (D’Anna Hernandez et al., 2012; D’Anna Hernandez et al., 2015). Future research may explore whether these results are replicated in lower risk and/or higher socio-economic populations to understand how maternal childhood trauma, or lack thereof, impacts infants and mothers from a variety of backgrounds.

Secondly, both infant health concerns and maternal childhood trauma exposure were obtained through mother report and may thus be subject to reporter biases. For example, with respect to infant health concerns, it is conceivable that under-reporting would be most prominent among mothers who are less sensitive, and therefore less likely to be aware of infant distress related to health concerns. Conversely, mothers who are highly attuned to their infants may be more likely to pick up on minor changes to infant health status and thus overreport. With respect to maternal childhood maltreatment exposure, it is possible that social desirability bias may have contributed to underreporting of history in the current sample. It is important to note, however, that research supports retrospective measures (Hardt & Rutter, 2004) and that the CTQ has been found to correspond well with objective measures of maltreatment (Bernstein et al., 1997).

In addition, the CTQ does not explore information such as severity, duration, relationship to the perpetrator, or timing of abuse. The omission of these details is important to consider as it may not fully capture the effects of maternal childhood adversity on infants. Although this study did not explore protective factors specific to this sample that could increase maternal sensitivity and buffer effects of maternal ACEs on infant health, future research should consider these resiliency factors. Social support and family dynamics have both been found to be protective factors in Mexican American families, which may help to support new mothers, thus increasing sensitivity (Martinez-Schallmoser et al., 2003) and decreasing behavior linked to depression.
Research exploring resilience factors that foster infant health despite early adversity experienced in previous generations is needed.

**Conclusion**

The present study extends the current literature by being one of the first to explore the influence that maternal sensitivity has on infant health and suggests that both maternal childhood maltreatment and sensitivity may shape infant outcomes before 6 months of age. These findings not only highlight the influence of maternal childhood maltreatment on infant health outcomes but also suggest that fetal programming may be even more impactful than previously hypothesized. Clarification about underlying risk processes and potentiating resiliency characteristics may help elucidate ways in which to better support both mothers and infants across the lifespan.
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Table 1

**Demographic and Descriptive Statistics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percentage (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infant Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Sex (% male)</td>
<td>46.3% (149)</td>
</tr>
<tr>
<td><strong>Mother Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Country of origin</td>
<td></td>
</tr>
<tr>
<td>% United States</td>
<td>13.7% (44)</td>
</tr>
<tr>
<td>% Mexico</td>
<td>86% (277)</td>
</tr>
<tr>
<td>% Other</td>
<td>0.3% (1)</td>
</tr>
<tr>
<td>Preferred language (% Spanish)</td>
<td>82% (264)</td>
</tr>
<tr>
<td>Marital/partnership status</td>
<td>77.3% (249)</td>
</tr>
<tr>
<td>Mean age (at prenatal visit)</td>
<td>27.9 (6.5); 18–42</td>
</tr>
<tr>
<td>Years of education</td>
<td>10.14 (3.2); 0–18</td>
</tr>
<tr>
<td>Household income to need ratio</td>
<td>.814 (.559); 0.10–2.73</td>
</tr>
<tr>
<td><strong>Substantive Variables</strong></td>
<td>Mean (SD); range</td>
</tr>
<tr>
<td>Infant health concerns (24 weeks; BHQ)</td>
<td>3.24 (2.0); 0-8</td>
</tr>
<tr>
<td>Maternal childhood maltreatment exposure (CTQ)</td>
<td>4.78 (7.5); 0-40</td>
</tr>
<tr>
<td>Maternal sensitivity (12 weeks; CIB)</td>
<td>3.21 (.412); 2.30-4.43</td>
</tr>
<tr>
<td>Maternal sensitivity (18 weeks; CIB)</td>
<td>3.23 (.438); 1.40-4.00</td>
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*Note: BHQ= Baby Health Questionnaire; CTQ= Childhood Trauma Questionnaire; CIB = Coding Interactive Behaviors system*
Table 2

Zero-order Correlations

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<td><strong>Mother characteristics</strong></td>
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<td>2. Age</td>
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<td>3. Marital status</td>
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<td>.14*</td>
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<td>4. Years of education</td>
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<td>-.28**</td>
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<td>5. Income to need ratio</td>
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<td>-.02</td>
<td>.14*</td>
<td>.31**</td>
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<tr>
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<td>8. Maternal sensitivity</td>
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<td>-.02</td>
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<td>.08</td>
<td>.05</td>
</tr>
</tbody>
</table>

Note. * p < .05. ** p < .01. Marital status was coded 1 if endorsed marriage or domestic partnership. Infant sex was coded 1 if female.
Figure 1
Model results

Note. Light gray path depicted indicates a nonsignificant pathway. Standardized path coefficients are reported.